10 AIR QUALITY AND GREENHOUSE GAS

10.1 Introduction

This section describes the existing air quality of the works area and the predicted impacts associated with air emissions, including vehicle emissions and dust, related to the construction and operations phases of the Glebe Option. Greenhouse gas emissions are presented and discussed separately.

10.2 Methodology

Standard assessment processes in accordance with the *Environmental Protection (Air) Policy 1997* (EPP Air) (EPA, 1997a) were used to investigate air impacts while the estimation of Greenhouse Gas (GHG) emissions was determined through the adoption of the Department of Climate Changes' National Greenhouse Accounts (NGA) Factors Workbook (2008) and the Workbook for Carbon Dioxide from the Biosphere – Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks (AGO 1998).

10.3 Existing Environment

The relevant existing climatic conditions for the Glebe Option are described in Chapter 6.

Winds in the vicinity of Glebe Weir and the pipeline are generally variable but there are tendencies for:

- south-easterly winds on summer afternoons;
- south-easterly winds in autumn;
- south-east to south-west winds in winter; and
- north to north-west winds in spring.

Velocities are generally low, below 20 km/hour (Section 6.4)

Air quality in the Glebe weir area and the pipeline route is typical of a rural area where there is a mix of cropping and grazing. No industrial sources of air emissions exist within the vicinity. Particulates, dust, hydrocarbons, oxides of nitrogen and sulphur are expected to be within acceptable ranges.

Sources of dust and other particulates generated by human activities within the vicinity include:

- domestic animal movements;
- relatively infrequent light and heavy vehicle traffic on unsealed roads and farm tracks;
- diesel powered pumps;
- cultivation and harvesting work on farms;
- feedlots (near the pipeline); and
- occasional fires lit under permit or accidentally started.

The towns closest to Glebe Weir and the pipeline route are:

- Taroom — 32 km south-west of the weir;
- Cracow — 32 km north-east of the weir;
- Theodore — 58 km north of the weir; and
- Wandoan — 6.5 km from the southern end of the pipeline.

Relevant sensitive receivers for weir works are a number of homesteads identified in the vicinity of Glebe Weir (Table 10-1). The camping area at Glebe Weir has not been considered a sensitive receiver due to no public access when construction activity is taking place.

Table 10-1 Homesteads identified within 10 km of Glebe Weir

Property with homestead	Distance from Glebe Weir (km)	Direction	Occupation status	Notes
Lot 2 CP LE284	3.3	North-west	Occupied	Dense garden trees and shrubs on south-eastern side
Lot 15 CP FT2	3.8	South-west	Occupied	Few garden trees or shrubs on north-eastern side
Lot 9 CP LE68	4.6	North-east	Occupied	Stand of native trees and shrubs just outside garden on south-western side
Lot 14 CP FT1	5.0	South-east	Occupied	Garden trees and shrubs on north-western side Also approximately 2 km from the pipeline route
Lot 10 CP903254	7.3	North-east	Occupied	Some trees, shrubs and buildings on south-western side
Lot 2 CP LE246	9.5	South-west	Occupied	Garden trees and shrubs on north-eastern side

The sensitive receivers for construction of the pipeline are homesteads along Nathan Road. This road provides access to various properties and 21 houses are within 1 km of the road. Many of these are occupied though some may be vacant. The occupation status of the homes will be confirmed through ongoing consultation leading up to and in the early stages of construction.

There are no other sensitive receivers such as schools, medical centres, places of worship or community halls near the weir site or pipeline route.

10.4 Air Quality Criteria

Air quality in Queensland is administered under the *Environmental Protection (Air) Policy 1997* (EPP Air). The EPP Air supports the EP Act by:

- identifying environmental values to be enhanced or protected;
- specifying air quality indicators and goals to protect the environmental values;
- providing a framework for making consistent and fair decisions about management of the air environment; and
- involving the community in achieving air quality goals that best protect Queensland's air environment.

The environmental values of the air environment to be enhanced or protected under the EPP Air are those conducive to suitability for the life, health and wellbeing of people. Thus, the concept of exposure of people to polluted air is embodied in the EPP Air. Accordingly, the impacts associated with an increase in airborne particulate matter due to the construction stage of Glebe Weir and the pipeline must be assessed and controlled to acceptable levels at sensitive receivers.

The current goals for pollutants considered relevant to the assessment of air quality impacts for the Glebe Option, as shown in Schedule 1 of the EPP (Air), are:

- PM10 maximum 24-hourly average — 150 µg/m3;
- PM10 annual average — 50 µg/m3; and
- Total Suspended Particles (TSP) annual average — 90 µg/m3.

Total particulate matter in the atmosphere is considered as Total Suspended Particulates and particles range from effective diameters of 0.1 µm to 50 µm. Particulates of diameter less than 10 µm and 2.5 µm are referred to as PM_{10} and $PM_{2.5}$ respectively. Emissions of PM_{10} and $PM_{2.5}$ are considered important in terms of impact due to their ability to penetrate the respiratory system to varying degrees and cause human health impacts. Coarser particulates are often referred to as dust.

Dust deposition from Glebe Option construction activities has the potential to cause nuisance impacts at dwellings near to construction sites, haul routes and materials handling areas but deposited dust from construction activities does not have specific criteria outlined in EPP (Air).

Air impacts from construction are usually considered under nuisance laws outlined in Section 2A of the *Environmental Protection Regulation, 1998*, which generally require that dust emissions do not occur beyond the boundary of the property. The nuisance laws do not apply to activities covered by other state legislation, however the intent of the laws is often incorporated within the EMP for such activities, as it is in this case.

10.5 Air Quality Impacts and Mitigation Measures

No ambient measurements or modelling have been undertaken for this impact assessment as a desktop approach was considered commensurate to the risks associated with the Glebe Option. ERA's such as concrete batching will require an environmental authority (Chapter 3). Where ERA's are proposed, an air impact assessment and management plan would be undertaken as part of the subsequent development approval process for each ERA. This is appropriately done once the particular contractors have been commissioned and as part of the subsequent ERA process. Sufficient opportunity will exist to collect ambient data prior to construction commencing.

10.5.1 Weir, Pump Station and Pipeline Construction

Putrescible wastes and sewage will be enclosed before transport off-site for disposal so odours will not be generated.

All construction activities for Glebe Weir and the pipeline will take place in a rural setting with low background levels of emissions resulting from human activity and free air movement.
Construction machinery and transport vehicles used during construction works generate carbon monoxide (CO), carbon dioxide (CO_2), oxides of nitrogen (NO_X), sulphides (SO_X) and minor amounts of non-combustible

hydrocarbon (C_XH_X) emissions. Rates of emission depend on the number and power output of the combustion engines, quality of the fuel, and condition of the combustion engines, and impacts depend on resultant concentrations within the airshed as the material disperses.

The plant and equipment likely to be used during the Glebe Option is shown in the Table 10-2. As quarry material will be obtained from existing (or new) licensed quarries and management of dust will be the responsibility of the quarry operator, it is not assessed further here.

Table 10-2. Likely requirements for plant and equipment for Glebe Weir

Work item	Anticipated plant requirement
Access road construction, road upgrades and relocations	▪ 6 x Tippers/semi-tippers ▪ 2 x Water trucks ▪ 2 x 825 Compactors ▪ 2 x graders
Clearing (sub-contract)	A variety of excavators with attachments including: ▪ Tree-grabs, ▪ Hooks and mulches, ▪ Horizontal tub grinders, ▪ Broad acre mulches, ▪ Tippers and Semi-tippers, ▪ Transport vehicles.
Site establishment	▪ 2 x Excavators (tree mulches, pullers, pincers) ▪ 2 x Horizontal tub grinders ▪ 4 x 6x6 Dump trucks ▪ 1 x Concrete batch plant ▪ 1 x Transportable water treatment package plant ▪ 1 x Sand screening plant ▪ 2 x Excavators ▪ 2 x Graders ▪ 1 x Compactor ▪ 2 x Water trucks
Aggregate and sand transport	▪ 8 x Truck and trailer combinations carrying 30 tonnes per load
Foundation excavation	▪ 2 x Excavators ▪ 2 x Dump trucks
Concrete works	▪ 3 x Concrete delivery trucks ▪ 1 x Concrete pump ▪ 1 x Mobile crane ▪ 1 x Lighting tower
Rubber dam installation	▪ 2 x Mobile cranes ▪ 1 x Low loader
Outlet works and fishway fit-out	▪ 1 x Mobile crane ▪ 1 x Low loader ▪ 2 x Welding machines
Weir pump station	▪ 1 x Sheet pile driver (may be required for weir as well) ▪ 1 x Crane ▪ 1 x Excavator
Pipeline	▪ 2 x Heavy dozers ▪ 2 x Excavators ▪ 1 x Rock cutter (if required) ▪ 2 x Graders ▪ 2 x Mobile cranes ▪ 2 x Pipe welders

Work item	Anticipated plant requirement
Site reinstatement	▪ 2 x Graders ▪ 2 x Water trucks ▪ 1 x Dozer ▪ 1 x Excavator ▪ 3 x Body trucks ▪ 1 x Hydro-mulching rig

The main generators of particulates from the weir, pump station and pipeline construction works are likely to be:

- diesel engines powering a wide variety of machinery;
- soils disturbed during clearing, site preparation, excavations and backfilling;
- concrete jackhammering and cutting to reshape the existing spillway and discharge apron;
- vehicles moving around the various work sites;
- material being placed in stockpiles and retrieved from them;
- wind erosion of disturbed areas and stockpiles; and
- fires used to burn excess vegetative material if it cannot be mulched or disposed of in other ways (may not be required).

The respiratory systems of healthy individuals can usually effectively deal with an increase in dust and particulate levels, especially over relatively short durations. The main construction phase of Glebe Weir is expected to generate dust and other particulates over a period of approximately 22 months, therefore long-term adverse air quality impacts are not expected to occur. Planned works will likely span two dry seasons and site shut-downs are expected during wet seasons.

Earthworks, construction activities and wind erosion on construction sites and stockpiles generally give rise to dust emissions that are predominantly of larger diameters than PM_{10}. The impacts associated with coarser dust fractions are generally more significant in terms of nuisance and amenity rather than human health. The risk of potential health impacts and nuisance impacts at sensitive receivers is expected to be minimal because:

- the weir and pump station construction period will be restricted to about 22 months;
- the weir reserve and camping area will not be open for use during the construction period;
- a relatively low number of machines will be working at any one time in any one location so gaseous emissions will not be high or concentrated;
- distances between the weir, pump station and sensitive receivers will be at least 3.3 km, allowing significant dispersion;
- pipeline construction activity in the vicinity of any individual home will be of very short duration, up to several days as work moves along the route;
- pipeline construction component has a relatively light vehicle complement and no batch plant; and
- the closest home to the pipeline route is approximately 200 m and this should give considerable opportunity for particulates to settle and disperse in the intervening area.

The impact on air quality from works at the weir site is considered unlikely to be significant given the above. Standard mitigation measures will suffice. They are summarised below and are further developed in the Draft EMP (Chapter 21).

- clearing progressively in order to avoid large areas of bare earth;
- substituting tasks where possible, with alternative methods that produce less dust (for example, using wet cutting to remove concrete rather than jackhammering);
- minimising extended engine idling;
- ensuring regular maintenance of engines, including injectors and exhaust systems, to comply with emission standards;
- wetting working surfaces for high-impact dust generating activities or using dust collection devices on work tools;
- minimising vehicle speeds around work areas and using dust suppression techniques on on-site tracks;
- using dust/wind fencing around stockpiles and minimising drop distances onto stockpiles;
- using efficient techniques if burning is required; and
- establishing an effective complaints registration and handling process.

The pipeline easement will be a 30 m wide path some 83 km long. Dust nuisance can be minimised by clearing only a proportion in advance of the pipe laying and by rapidly rehabilitating the completed works.

Grey water from on-site facilities will be reused for dust suppression but supplies will be limited because of the small workforce. There are no known local sources of reclaimed water that could be used for dust suppression activities and alternative sources will be required. Rainwater tanks will be installed on all site structures and water captured in sediment traps will also be extracted and used to suppress dust.

Glebe Weir is likely to supply most water but other sources could include:

- Taroom town water supply;
- Wandoan town water supply; and
- other designated Council water points.

If high levels of dust deposition on vegetation are observed as a consequence of works activities, the vegetation will be sprayed to remove the dust.

The measures outlined above are predicted to reduce dust to acceptable levels.

The operation of the Glebe Option is not expected to have appreciable air quality impacts in the area because pumps will be powered by electricity and because vehicle movements required for operation and maintenance will be very infrequent in relation to existing traffic on the roads used.

10.5.2 Transport construction impacts on air quality

Particulates generated by the construction and operation of Glebe Weir will not directly affect any of the towns identified in Section 10-1 because roads in and in the immediate vicinity of all of them are bitumen sealed and paved. Any increases in 10 µm and 2.5 µm particulate emissions from the 4 – 6 % increase in heavy vehicle traffic (Chapter 9) is unlikely to be perceptible.

Transport of material for the raising of Glebe Weir will result in engine emissions and dust generation along unsealed roads. Transport of rock, aggregate and sand along the Taroom — Cracow Road, Red Range Road, Nathan Road, Glebe Road, and the access road to be constructed from Glebe Road to the weir pump station, and transport of pipes along the unsealed sections of Nathan Road will result in large increases in heavy vehicle traffic on these roads (Chapter 9).

Strategies to reduce the impacts of dust and other emissions from transport activities include:

- liaising with residents, Banana Shire Council, Dalby Regional Council and the District Superintendent of Traffic concerning the temporary imposition of speed limits;
- upgrading and maintaining unsealed roads as required;
- watering roads for dust suppression;
- covering loads;
- minimising extended engine idling;
- ensuring regular maintenance of engines, including injectors and exhaust systems, to comply with emission standards;
- timetabling of journeys if required to avoid high dust concentrations; and
- ensuring a community liaison / complaints process is in place and that complaints are addressed in a timely manner.

10.5.3 Conclusion

With the mitigation strategies proposed the risks to air quality will be minimal with the mitigation strategies proposed. Control of dust is the most significant issue but all actual work sites are relatively isolated. Of most concern is the safety risk to motorists associated with dust on unsealed roads caused by transport of materials and workers to the work sites. This latter concern will be managed primarily through traffic planning and watering of roads as required (Chapter 9 Transport and Chapter 19 Hazard and Risk).

10.6 Greenhouse Emissions

10.6.1 Methodology

The estimation of Greenhouse Gas (GHG) emissions from the construction and operation phases of the Glebe Option was determined through the adoption of the Department of Climate Changes' National Greenhouse Accounts (NGA) Factors Workbook (2008) and the Workbook for Carbon Dioxide from the Biosphere – Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks (AGO, 1998).

For ease of calculation and reporting, sources of GHG emissions were separated into construction and operation phases.

10.6.2 Emissions Classification

The sources of GHG emissions have been separated into different 'Scope' areas, based on the NGA (2008) workbook emission classification. This classification and the potential sources of GHG emissions from the Glebe Option are outlined in Table 10-3.

Table 10-3. Glebe Option emissions classification

Scope	Construction	Operational
Scope 1 – direct emissions, per unit of activity at the point of emissions release.	• Land use change and fuel use	• Fuel use and energy consumption
Scope 2 – indirect emissions from the combustion of purchased electricity consumed on-site.	• Energy consumption	• Energy consumption
Scope 3 – emissions generated by external operators that arise from an organisations activities but are not from sources owned or controlled by that organisation.	• Haulage of materials • Embodied energy of materials	NA

10.6.3 Construction emissions

10.6.3.1 Land use change

Land use change emissions are initially calculated as tonnes of Carbon per hectare. To convert this 'Carbon' into the required form (CO2-e), NGA (2008) recommend a conversion factor of 1:3.67 - C:C02-e'

The increase of the Glebe Weir's storage volume will result in the clearing or permanent inundation of vegetation. Simply, once cleared or inundated, the vegetation no longer has the ability to absorb CO_2 and through decomposition, produces gases such as methane. Therefore, land- use change is considered a source of GHG emissions.

It is proposed that the tree and shrub vegetation within the inundation area will be cleared except in the upper riparian zone of tributaries or where there is significant vegetation near FSL in the Dawson River. The machinery requirement for the clearing of vegetation will incur additional GHG emissions. Consumption of diesel is included in the construction energy consumption (Table 10-3).

The proposed additional area at FSL outside the bed and banks is 920 ha. Approximately 682 ha of this is open woodland vegetation. The remaining 238 ha is pasture, grassland or under cultivation. As the pipeline route will predominantly follow the existing road reserve, it is anticipated that only 23 ha will require clearing. Therefore, as a conservative estimate, some 705 ha of vegetation will require removal or will be inundated.

The identified carbon stocks are shown in Table 10-4.

Table 10-4. Carbon stores within proposed disturbed area.

Land Type	Area (ha)	Total Carbon (tonnes)	CO_2-e (tonnes)
Forest Type – Woodland and Scrub*	682	11746	43 108
Debris – Above-ground Decaying	929	1951	7 159
Crops**	238	71	261
Soil below-ground	929	21 594	79 250
TOTAL		33 554	129 778

Note: Emission factors taken from AGO (1998)
* Land type category used for Forest (Woodland and Scrub)
** Crop category includes pasture and grassland

The figures shown in Table 10-4 indicate that 129 778 t CO_2-e will potentially be emitted through inundation of vegetation, clearing and soil carbon release. Carbon can be released through anaerobic decay, degassing and bubbling for many years following inundation. A proportion of the inundated carbon sources will be used by algae, both macrophytes and plankton but this is not included in the calculations.

It should be noted that all vegetation cleared will be used (where possible) as millable timber, artisans' raw material, fauna habitat, mulch for site reinstatement or, as a last resort, firewood.

It should also be noted that these amounts do not take into account any vegetation offsets that may be provided by the Proponent as part of the Green Offset Program for the Project.

The amount of spoil associated with the weir is likely to be minimal and will be re-used on-site in levee construction and as part of the rehabilitation plan. The amount of spoil associated with the pipeline, however, will be appreciable as approximately 60% of the trench volume will be replaced with bedding sand and the pipe. To reduce GHG emissions, this spoil should be placed as close to source as possible. While some will be used as overfill along the trench to allow for settlement, the excess will be also be used in roadworks and potentially as fill in the Surat Basin Rail project. Selective use in appropriate areas (e.g. badly gullied sites) followed by revegetation with trees will help offset GHG emissions.

Revegetation of cleared areas outside the inundation zone will be undertaken in accordance with current land use as appropriate. If Glebe Weir becomes the long term water supply option for the Project, that is, the proposed Nathan Dam does not proceed, SunWater has committed to substantial riparian zone rehabilitation, particularly in the area adjacent to the levee on Boggomoss Creek. This practice has the potential to further reduce GHG emissions.

The estimated total GHG emissions stated in Table 10-4 are significantly larger than other sources of GHG emissions associated with the Glebe Option. The measures outlined above to re-use cleared vegetation and spoil and revegetate the site will effectively reduce the total amount of GHG land use change emissions. Of significant benefit may be the extraction and beneficial reuse of topsoil from areas of Good Quality Agricultural Land to be inundated, particularly the area near Cockatoo Creek. Quality topsoil is likely to be a sought after material for rehabilitation works associated with several proposed developments in the region.

10.6.3.2 Energy Consumption

The estimated GHG emissions resulting from energy consumption during construction are summarised in Table 10-5.

Table 10-5. GHG emissions (tonnes CO_2-e) resulting from energy consumption during construction.

Energy Source	Scope 1	Scope 2	Scope 3	Full Fuel Cycle
Diesel Use	12,012	N/A	1,333	13,345
Electricity Use	N/A	81	12	92
Total	12,012	81	1,345	13,438

The emissions stated in Table 10-5 encompass the following assumptions:

- the emissions are based on similar sized construction projects, with an approximate construction period of close to 4 equivalent years (22 months for the weir and 22 months for the pipeline);
- energy use is constant through construction (therefore this is an overestimate as it does not include provision for shut down over the wet season); and
- where electricity from the grid is not available, on-site diesel generators will be used.

10.6.3.3 Scope 3 emissions

The potential major sources of other GHG emissions identified are as follows:

- emissions associated with haulage of construction materials; and
- embodied energy associated with the production of construction materials.

An estimation of the emissions associated with haulage of construction materials has been broken into the following areas:

- truck trips associated with haulage of large construction items from Brisbane; and
- truck trips associated with haulage of construction materials from local sources, e.g. local towns and quarries

Using the vehicle movements provided in Chapter 9 as a guide, it is estimated that some 843 return long distance truck and road train movements will be made during the main construction period of 22 months for both the weir and pipeline. This includes the transport of pipe (the majority of trips), steel, relocatable buildings and plant and equipment. Of these trips, it has been estimated that approximately 80% will be from Brisbane to site and return, which is approximately 1000 km. The remainder of long distance return trips will be from Gladstone, a return distance of about 640 km. These trips constitute a total distance of 782,160 km.

The majority of the vehicle trips are likely to be local. Again, using the figures provided in Chapter 9 as a reference, it has been estimated that there will be approximately 50,586 local trips. This includes all local truck, bus and light vehicle trips where movements can be forecast.

These trips will mainly be from Taroom or Wandoan to the Glebe Weir site or along Nathan Road and return or from quarry sites to site and return. As a conservative estimate, a 150 km return trip has been used. These trips have been estimated to constitute a total distance of 7,587,900 km.

Overall for the Glebe Option, this amounts to an approximate total of 8,370,060 km. This amount of transportation will result in approximately 4, 436,132 L of fuel (based on an average fuel consumption of 53 L/100 km (QR Network Access, 2002). The resultant GHG emissions are estimated to be 887 t CO_2-e, using a conversion factor of 0.2 tCO2-e/kL of diesel (taken from NGA, 2008).

The embodied energy of the transported construction materials encompasses the total energy required to manufacture the materials. The largest amounts of materials required for construction are concrete and glass reinforced plastic (GRP) pipe. The embodied energy estimates associated with these materials are detailed in Table 10-6.

Table 10-6. GHG emissions associated with the embodied energy of major construction materials.

Component	Quantity	tCO_2-e
Concrete	7350 m^3	3,450
Pipe*	81 km	11,500
	TOTAL	14,950

* The embodied energy is only associated with the energy consumed at the point of pipe production as major contributing materials are processed and shipped from overseas and the associated energy is unknown. Average embodied energy intensity for piping material sourced from CSIRO (2002).

The embodied energy of other construction materials such as reinforcing steel has not been included. This is because *the National Greenhouse and Energy Reporting Act 2007* (which establishes a national framework for reporting emissions, abatement actions and energy consumption and production by corporations, from 1 July 2008) ensures that these emissions are recorded by the manufacturing companies themselves.

10.6.4 Operational Emissions

10.6.4.1 Energy Consumption

Once construction is complete, the major source of GHG emissions will occur from the ongoing electricity consumption by the on-site pump station and to a lesser extent the air compressor. Detailed specifications of the pump station are yet to be finalised, therefore, based on a similar pump station specification as given in Table 10-7, an estimate of the annual electricity consumption has been developed. The estimated annual GHG emissions resulting from the operation of the pump station is 569 t CO_2-e.

Table 10-7. Pump Station Specification

Characteristics and units	Amount
Duty Flow (L/s)	267
Duty Head (m)	20
Brake Horsepower (kW)	74.84
Time pump on per day (hours)	20
Energy Usage (kWh per day)*	1,500
Yearly kWh	547,500
tonnes of CO^2-e/year	569

* based on a pump efficiency of 70%

Maintenance inspections of the weir and pipeline will be undertaken regularly by SunWater staff based locally. It is difficult to quantify the amount of fuel that will be used for this aspect of the Glebe Option. Nonetheless, this is expected to contribute to a negligible carbon emission.

10.6.5 Summary

The overall potential GHG emissions resulting from the construction and operation of Glebe Weir and the pipeline are summarised below (as t CO2-e):

Construction

• Energy Consumption	13,438
• Land-use Change	129, 778
• Vehicle Emissions	887
• Embodied Energy of Materials	14,950
Total	159 053

Operation

• Annual Energy Consumption	569

By far the largest contributor to GHG emissions is land use change, mainly through inundation of soil.

In 2006, Queensland as a whole produced a total of 170 Mt CO_2 –e, of which 40 Mt CO_2-e was from land use change (Queensland GHG inventory (Department of Climate Change, 2006). The total Glebe Option emissions are estimated to be % 0.0009 of Queensland's total during the construction phase (over 22 months) and subsequently < 0.00003 %/annum over the operational life of the weir.

10.6.6 Greenhouse gas emissions management

Specific strategies to manage, minimise and offset GHG emissions over the life of the Glebe Option are set out below to highlight a focus on their reduction during both construction and operation namely:

- ensure all vehicles are regularly serviced and maintained and comply with emissions standards;
- logistics planning is undertaken to optimise haulage, vehicle and equipment movements and usage (including idling) to reduce emissions;
- all wastes are captured and the waste management hierarchy applied to the greatest extent practicable;
- spoil is disposed of as close to source as possible and revegetated with appropriate species;
- topsoil from areas of Good Quality Agricultural Land to be inundated should be stripped and stockpiled for beneficial reuse as part of this option or other proposed developments in the region;
- carbon offsets are implemented through extensive tree plantings on land acquired for the Glebe Option or through agreements with private landowners; and
- purchase green energy for long-term operational requirements of the weir and pump station.

Climate change adaptation is addressed in Chapter 6.