Tropicana Gold Project: Public Environmental Review

14. Greenhouse Gas Emissions





INDEPENDENCE GROUP NL

360 environmental

14. GREENHOUSE GAS EMISSIONS

This chapter relates to the potential impacts, management and proposed offset for greenhouse gas (GHG) emissions resulting from the construction and operation of the Tropicana Gold Project (the Project). The impact of general dust and other non-GHG emissions have been covered previously in section 7.2.7 (e.g. in ground clearing) and is not considered to be a major environmental factor for the Project. The Joint Venture has aimed to meet the Environmental Protection Authority (EPA) environmental objective to 'ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards' and also meet the overall objective of EPA Guidance Statement 12 (EPA 2002) (and documents referenced therein) to reduce GHG emissions to as low as practicable. In order to meet these aims, the Joint Venture has:

- consulted with stakeholders including:
  - Carbon Neutral;
  - Conservation Council of WA;
  - Office of Energy; and,
  - Office of Climate Change.
- optimised the efficient use of power/ fuel (and therefore minimised emissions) in the design of the Project layout and selection of equipment;
- commissioned studies into GHG emissions and air quality to identify impacts; and,
- designed an offset package that will lead to improvements in knowledge through emissions research and development that will enable the Joint Venture (and other operators) to minimise emissions in the future through better practices/ improved technology.

The Joint Venture's majority owner, AngloGold Ashanti Australia, is also committed to periodic reporting and assessment of improvement opportunities for this project. AngloGold have demonstrated their commitment in this area for other activities in Australia, for example, at the Sunrise Dam Gold Mine.

Consistent with recent EPA requirements and AngloGold's Integrated Management System Standard on Energy Efficiency and Climate Change (Appendix 3-A), GHG reduction measures shall be considered on a 'whole of activity or mine life' basis. The most effective way to mitigate greenhouse emissions is to reduce emissions at the source. The Joint Venture has committed to an energy-efficient project. Further to this, a trust fund to support a research and development program for GHG offsets is proposed.

14.1. GREENHOUSE GASES

The greenhouse effect is a natural phenomenon that warms the Earth, enabling life to be supported. Excessive production and release of greenhouse gases by humans is hypothesised to lead to increased temperatures (i.e. the greenhouse effect). Greenhouse gases identified and managed under the Kyoto Protocol are:

- carbon dioxide (CO_2);
- methane (CH_4);
- perflourocarbons (PFCs);
- hydroflourocarbons (HFCs);
- sulphur hexaflouride (SF_6); and,
- nitrous oxide (N_2O).

Some of these gases have greater or lesser warming potential than others. For example, over 100 years, one tonne of methane (high warming potential) will result in the same potential warming as 25 tonnes of carbon dioxide (International Panel on Climate Change 2007). To accommodate these differences in calculations of global warming potential resulting from emissions, warming potential is commonly expressed in terms of their CO_2 equivalence, which is abbreviated to $CO_{2\text{-}e}$.

The Joint Venture commissioned HAC Consulting to calculate potential GHG emissions for the Project (Appendix 2-B9). At the time, the Project was still in an optioneering phase, thus the HAC report is an at-most assessment of GHG emissions. For example the HAC report assumed:

- operational power requirements would be met by a 100% diesel generation. A 100% fossil fuel generator is the basis for this approval, with the option of changing the fuel source to gas or waste oil should opportunities arise in the future;
- road transport to the Operational Area would be via the longer (TT Corridor) route. The Joint Venture has since determined that the Pinjin route will be used for the mine access road; and,
- all staff would be fly-in-fly-out from Perth in the least efficient seating/ flight configuration. The Joint Venture will pursue the most efficient method of transporting staff and contractors from Perth. Some staff and contractors are likely to travel from Kalgoorlie and/ or other local centres, thus reducing emissions further.

The emissions figures reported in Appendix 2-B9 are an upper limit for emissions for the Project. The HAC report determined that the power station (assuming diesel) and the mining fleet make up 90% of the Project's GHG emissions.

14.1.1. Clearing – Reduction in Carbon Capture Ability

Clearing for the Project (assuming it reaches its maximum predicted extent) will result in the temporary loss of up to 3,440 ha hectares of vegetation (excluding the pit, which will be a permanent loss). Final rehabilitation and closure of the site will result in the re-creation of the carbon capture ability of the area, therefore long-term impacts are not anticipated. Appendix 2-B9 did not consider the loss of carbon capture due to the eventual revegetation of the majority of the disturbed area (excluding the pit/ s). In addition, the type of vegetated cover that will be cleared and the extent of clearing does not constitute a 'change in land use' under the Kyoto protocol.

The Joint Venture's actions to limit the clearing footprint have been discussed with previously. The impact of reduced carbon capture is not considered to be a major environmental impact for the Project and thus will not be dealt with further.

14.1.2. Greenhouse Generation

Several aspects of the Project will result in the generation of greenhouse gases. HAC (Appendix 2-B9) has quantified the predicted at-most generation of GHG by the Project, assuming that the Project reaches its maximum size. As stated above, Appendix 2-B9 assumes at-most emissions and thus is likely to be an over-estimate of actual emissions. For example, Appendix 2-B9 has assumed the use of heavy ammonium nitrate/ fuel oil (ANFO) for blasting when the explosives are actually likely to be a mix of ANFO and emulsion.

Some of the sources of GHG emissions are discussed below, for further information see Appendix 2-B9 (for GHG quantification) as well as section 2.3 and chapter 3 of this document (for design considerations and alternatives).

Mining and Processing

Mining of ore and waste material and the subsequent processing of ore are a significant source of GHG emissions for the Project. For example, 38% of the at-most estimate from Appendix 2-B9 is anticipated to come from the mining fleet. The mining method selected for use at the Project is open pit mining with conventional drill and blast techniques and a typical mining fleet, likely to consist of a fleet of trucks in the 200 to 300 tonne class and excavators in the 1,800 to 5,500 tonne class range (diesel powered). A key decision in the design phase for the Project is the positioning of the ramp systems, to enable practical and efficient movement of ore and waste material out of the pit. Other key considerations are the slope and length of the ramp which have implications for fuel usage and hence also for GHG emissions.

The processing method for the Project has been optimised to minimise power inputs and therefore also minimise fuel inputs/ GHG emissions. The grinding circuit is the most power consuming section in the processing plant with approximately 50% of the total power required for processing being used in this circuit. The selected high pressure grinding and ball mill grinding process pathway will provide the most economical and power efficient processing circuit for the Project and thereby minimise GHG emissions.

Power Supply

The Project's power supply accounts for over 50% of the total greenhouse emissions for the Project. The primary source of these emissions will be a fossil fuel power station located within the Operational Area. Additional, smaller power sources such as diesel generators will be required for remote infrastructure such as the borefield.

Operational Power Requirements

A power station of up to 40 MW total installed capacity is required to service the Operational Area. The average continuous electrical load for the Operational Area (primarily for the processing plant) is estimated at 27 MW. Electric power accounts for approximately half of the direct process operating costs, hence both the efficient use of electric power and unit cost are critical drivers for the Project. Selection of the Project's operational power supply has taken into consideration the technical, economic and environmental risks associated with each option considered.

Several options for an operational power source have been considered by the Joint Venture (sections 2.10 and 3.3):

- generator fuelled with diesel;
- generator/ boiler fuelled with waste oil;
- solar thermal generation with fossil fuel back up power (hybrid system);
- gas fuelled generator (piped or trucked); and,
- grid power from Kalgoorlie.

Power options for the Project are constrained by the lack of regional infrastructure and current supply shortages of gas and electrical power within the regional infrastructure. New gas developments in the Northwest Shelf of Western Australia may address the current gas shortages in WA making gas a potentially viable option for the Project in the future. The lack of capacity in existing grid infrastructure between Perth and Kalgoorlie, the lack of gas to generate additional power in Kalgoorlie and the very high costs of powerline infrastructure between Kalgoorlie and Tropicana are constraints to grid power being a viable option for the Project.

The Joint Venture recognises the potential advantages in reducing greenhouse emissions through the selection of a solar thermal option, with a diesel fired power plant as a back-up. However, the Joint Venture also recognises

that this option would result in the largest clearing impact and is a high risk supply option as the technology is untested in a remote resources project. Due to economic constraints the Solar Thermal option will not be pursued by the Joint Venture at this time as selection of a Solar Thermal power station would result in the Project being economically not viable without significant financial support from government. Government support could open the door to renewable baseload Solar Thermal power solutions in Australia, making a real contribution to the Government's 20% renewable energy by 2020 target. In the event that sufficient financial support is granted in the future, the Joint Venture would pursue environmental approvals for a Solar Thermal power station separately to this Public Environmental Review process. Based on the current infrastructure and energy market constraints the power supply selected for this approval is a fossil-fuel power source (Sections 2.10 and 3.3). HAC considered several fossil fuel options - a 100% diesel fuel source is the at-most scenario for emissions (Appendix 2-B9).

Diesel substitutes, including waste oil, are being assessed, but the application is likely to be limited by supply considerations of the waste oil. Although gas is not currently considered to be viable, the Joint Venture will ensure that the power station is designed to be capable of running on gas (as well as other fossil fuels) should gas become available in the future. If gas does become available and the Joint Venture considers that a gas pipeline is viable option, additional surveys and approvals (e.g. Clearing Permit) will be progressed outside of this Public Environmental Review process.

Other Power Requirements

Temporary power during construction will be provided by onsite portable diesel generator sets as described in section 2.10.2. These power requirements are insignificant in terms of GHG emissions when compared to the emissions of the main operational power source.

Mine Access Road

From a greenhouse perspective (as well as clearing and safety/ efficiency), the Pinjin option is preferred over the TT Corridor because it is shorter and thus has the lowest greenhouse footprint (a 380 km one way trip to Kalgoorlie over a 480 km one way trip). GHG calculations presented in Appendix 2-B9 have assumed that road transport to the Operational Area will be via the TT Corridor (representing the at-most option) and therefore are an overestimate of actual emissions along the Pinjin infrastructure corridor. Road freight accounts for less than one percent of total emissions for the Project.

Personnel - Village and Transport

Power for the village will be sourced from the power station at the Operational Area. The village will be designed with energy saving initiatives. Environmental initiatives being considered for the village include:

- solar hot water services;
- energy efficient equipment; and,
- all village buildings being constructed with a minimum five star energy efficiency rating.

Transport of staff and contractors to the Operational Area will also contribute to GHG emissions. HAC assumed all staff and contractors will be fly-in, fly-out from Perth in the least efficient available aircraft configuration – thus Appendix 2-B9 presents an at-most estimate for transport of approximately 2 % of total Project GHG emissions.

14.1.3. Greenhouse Monitoring and Carbon Trading

During 2008, the Federal Government initiated debate on new environmental legislation with the objective being to reduce the amount of carbon emitted by Australia. At that time, the National Government's Carbon Pollution Reduction Scheme/ Emissions Trading proposal (CPRS) aimed to limit the emission GHG in Australia, leading to corporations being required to pay for the right to emit. Government initially proposed a long term target of

reducing emissions to 40% of year 2000 emissions by 2050, and a medium term target of 5 - 15% reductions (depending on the level of international cooperation) by 2020. In 2008, the anticipated start date for carbon trading was thought to be 2010. As matters stand at present, the start date is likely to be delayed until 2011 due to the current 'global financial crisis' and further fine-tuning as the CPRS (or a revised framework) passes through parliament. The discussion provided here represents the current situation which may change prior to, or during, the life of the Project. The Joint Venture will monitor legislative and market developments in order to understand compliance requirements, costs and opportunities that may arise.

From 2011, under the CPRS, it is expected that all $CO_{2\text{-}e}$ emitters that exceed an emission threshold will be required to purchase pollution permits to balance their emissions as part of an Australian CPRS. To reduce the need to purchase permits, companies will need to reduce their carbon emissions. If the emissions threshold is set at 25 kt $CO_{2\text{-}e}$/annum, as has been suggested, the Project will be subject to the CPRS due to the expected emissions of the Project being up to 330 kt $CO_{2\text{-}e}$/annum in the peak production years (Figure 14.1).

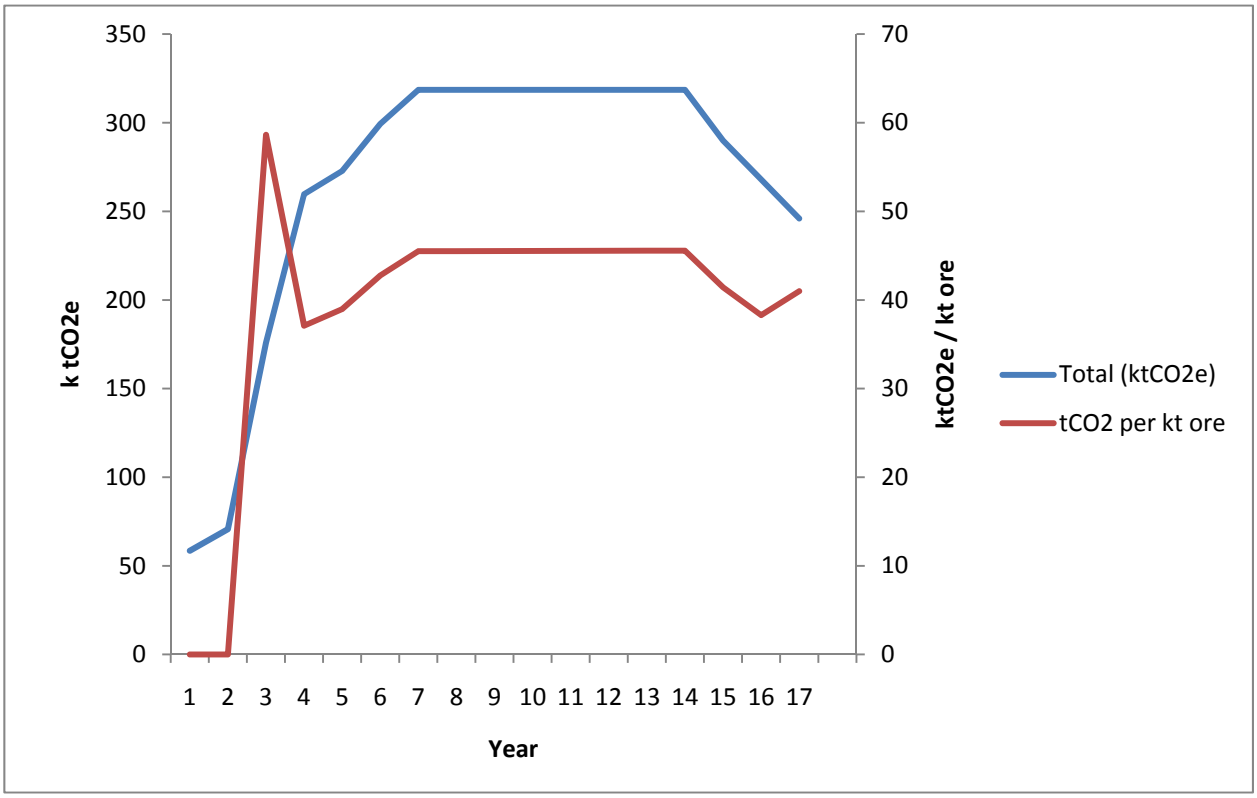

Figure 14.1: Total Greenhouse Gas Emissions for the Tropicana Gold Project (adapted from Appendix 2-B9)

To facilitate the expansion of renewable energy power generation and to reduce Australia's GHG emissions, the Federal Government may be expected to establish a Renewable Energy Target. The Project is unlikely to be directly impacted by the Renewable Energy Target as the power station at the Operational Area is less than the proposed 100 MW cut-off for inclusion in the scheme. However, the Project may be subject to indirect consequences if the grid-power option from Kalgoorlie does become viable as increased costs to power producers under the Renewable Energy Target scheme are likely to be passed onto consumers. Costs to power producers associated with the Renewable Energy Target include the cost of generating Renewable Energy Certificates or paying a Renewable Energy Shortfall Charge. The Project has the potential to generate Renewable Energy Certificates through the installation of solar hot water systems and renewable energy power solutions. A Solar Thermal power station has the potential to generate a significant number of Renewable Energy Certificates that may be sold to power producers if this power source becomes viable in the future.

The Joint Venture (AngloGold) participates in the Energy Efficiency Opportunities (EEO) program (as defined under the *Energy Efficiency Opportunities Act 2006*), which requires large energy users to closely monitor energy use and make public disclosures of the amount of energy produced and consumed. Under this program, AngloGold has developed a greater understanding of energy use and management. Similarly reporting obligations under the National Greenhouse and Energy Reporting System (NGERS) will further assist understanding the Project emissions profile, and highlight opportunities to reduce emissions. The Joint Venture has committed to continue their involvement in the Australian Government's Greenhouse Challenge Plus program (AngloGold has been involved since 2006) and the Project will be reported as part of the global G3 Environmental Indicator Protocols. These actions demonstrate the Joint Venture's commitment to an ongoing program to identify emissions reduction opportunities. For the Project, the Joint Venture will continue to review operations at the Project and identify opportunities to take advantage of new technologies/ techniques/ systems to reduce emissions (e.g. by further optimising efficiency).

14.2. Environmental Impact Assessment and Management

14.2.1. EPA Objectives in Relation to GHG Emissions

The Joint Venture has aimed to meet the EPA's environmental objective to 'ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards' and also meet the overall objective of EPA Guidance Statement 12 (EPA 2002) (and documents referenced therein) to reduce GHG emissions to as low as practicable.

14.3. Existing Environment

The existing environment around the Operational Area (and the wider region) is in a state similar to pre-European in terms of GHG emitters and carbon sinks. Mineral exploration activity in the area (by the Joint Venture and others, both currently and historically) has resulted in the release of GHGs, to a minor level (e.g. through vehicle use). These exploration activities have also reduced to a limited extent the carbon-uptake ability of some of the area through the removal of vegetation, however these are recoverable losses as active rehabilitation and natural regeneration progresses over time. The remoteness of the Operational Area and minimal anthropogenic impacts suggest that GHG levels emanating from existing activities and being absorbed are at (or close to) background levels.

14.4. Environmental Management

The overall aim of the Joint Venture in relation to GHG is to avoid unnecessary or unmitigated emissions as a result of the Project.

14.4.1. Applicable Standards and Guidelines

Guidance and legislation relevant to the management of GHG emissions in WA include the following:

- Environmental Protection Authority. 2002. Guidance No.12, Guidance Statement for Minimising Greenhouse Gas Emissions;
- *Energy Efficiency Opportunities Act 2006*;
- *National Greenhouse and Energy Reporting Act 2007*; and,
- various discussion papers on the proposed Carbon Pollution Reduction Scheme.

In line with EPA Guidance 12 (2002), the Joint Venture has:

- adopted best practice to maximise energy efficiencies and minimise emissions under the constraints of a fossil-fuel power station and diesel powered mining fleet;
- identified an offset for emissions that is designed to result in lower emissions for the Project, and other similar operations in the future; and,
- committed to undertake an ongoing program of monitoring, reporting and reducing emissions, as required under the Greenhouse Challenge, NGERS reporting and EEO participation.

14.4.2. Joint Venture Management Objectives

The Joint Venture has committed to reducing its greenhouse footprint and to operating both a water and energy efficient site. The Project has taken a proactive approach to reducing or offsetting emissions and has identified ways to minimise the GHG footprint of the Project.

Control options, in order of priority, included:

- avoidance/ elimination: e.g. minimising clearing impacts and maximising the efficiency of energy use;
- substitution: e.g. planning for the ability to substitute fuel sources if a less-polluting fuel becomes available in the future;
- engineering: e.g. installation of energy efficient fittings and the appropriate selection of mining rate, mining fleet and processing pathway to maximise efficiencies; and,
- administrative: e.g. regular review and reporting of emissions and the identification of opportunities to improve practices.

14.4.3. Potential Impacts

Over the 15 years of active gold production, the average $CO_{2\text{-}e}$/annum produced is 294 kt (if the Project reaches its full predicted extent), with a total over the 17 year life span (construction and operations) of approximately 4,500 kt $CO_{2\text{-}e}$ (Appendix 2-B9) This equates to an average emission of 44.1 kt $CO_{2\text{-}e}$ per tonne of ore milled. Actual operational emissions, based on a worst case scenario, in a typical maximum-capacity operating year, will not exceed 330,000 tonnes $CO_{2\text{-}e}$, equivalent to approximately 0.6% of total Australian emissions in 2006 (Appendix 2-B9).

The main sources, accounting for more than 90% of the Project GHG emissions, will be:

- combustion of diesel fuel for the mining vehicles; and,
- combustion of diesel to meet the Project's power requirements.

14.4.4. Management Measures

GHG emissions from the Project will be kept as low as practicable at all times, in accordance with the objectives outlined in EPA Guidance Statement 12 (2002). The Joint Venture will establish GHG governance systems to effectively manage emissions for the Project.

GHG emissions at the Project will be minimised by:

- incorporating energy efficient equipment into the plant e.g. adopting a processing flowsheet that incorporates high pressure grinding rolls (section 2.10);
- ensuring that site layout is efficient;
- limiting disturbance footprint (i.e. minimise biomass clearing);
- selection of mining fleet and equipment to maximise efficiency and minimise emissions;
- haul profiles optimised to minimise fuel use by the mining fleet;
- blast emissions and process emissions will be carefully analysed with a view to ensuring blast practices produce the most easily processed raw ore, which reduces processing energy use and emissions;
- periodically reviewing blasting effectiveness;
- regular review of the mine to mill process to identify improvement opportunities;
- future consideration will be given to the use of in-pit dumping to minimise haulage and therefore fuel use and emissions;
- maximising equipment reuse between construction and operation;
- maximising backloading;
- establish a greenhouse friendly/ 5-star energy rating village by incorporating solar panels, recycled water, double roofs, insulation, energy efficient lighting, refrigeration and cooling;
- continued active participation in the EEO program and reporting under the G3 Environmental Indicator Protocols;
- compliance with NGERS;
- compliance with CPRS (or similar legislation, once introduced); and,
- continue to investigate ways to improve efficiencies and reduce emissions over the life of the Project (e.g. under EEO).

The following GHG/ standards and performance indicators will be adopted for the Project (Table 14.1).

Table 14.1: Greenhouse Targets and Standards (source: Appendix 2-B9)

Management Objective	Performance Targets/ Standards	Performance Indicator
To ensure that greenhouse gas emissions comply with approval requirements.	Full Compliance.	Compliance Checks, based on Data Collected for NGERS reporting.
To monitor the effectiveness of greenhouse gas emissions controls.	Compliance with external programs (EEO) and corporate obligations.	Regular audits; scheduled maintenance.
To investigate and apply best practice means to reduce emissions intensity.	Leading practice.	International and nation industry benchmarking.
To report to the community and regulators on greenhouse gas management performance.	Company annual reports; EEO public reports; NGERS reports.	Reporting submitted on time and to the regulators satisfaction.

14.5. GREENHOUSE OFFSET

14.5.1. Mitigation Sequence

The EPAs mitigation sequence for environmental management is avoid, minimise, rectify, reduce and offset (as a last resort). With regard to GHG emissions, the Joint Venture has applied this sequence, as demonstrated in Table 14.2.

Table 14.2: The Joint Venture Proposed Social and Environmental Management Commitments for the Project

Mitigation Sequence (EPA 2006)	Greenhouse Emissions
Avoidance: Within reason, alternative locations or actions should be investigated to enable significant impacts to be avoided.	Alternative power sources with lower GHG emissions such as Solar thermal and gas have been investigated. At this point in time these options are not considered viable due to technological, financial and supply constraints. Should these constraints be overcome in the future, the Joint Venture will consider changing the Project's power supply (under a separate approvals process to this PER). To this end, the proposed power station will be designed to accept diesel and other fossil fuels such as gas. Diesel fuel is the only viable option at this point in time.
Minimisation: If adverse impacts are unavoidable, all practicable steps should be taken to minimise the impacts.	The Joint Venture is committed to reducing greenhouse gas emissions through the adoption of energy efficient technology such as High Pressure Grinding Rollers (HPGR) and onsite water recycling which reduced pumping requirements and optimisation of the mining schedule to prevent the need to double handle materials. The Joint Venture will also continue to participate in GHG reducing schemes such as the EEO program and Greenhouse Challenge.
Rectification: Where adverse impacts cannot be minimised, action should be taken to repair, rehabilitate or restore the site as soon as possible.	Prior to Project closure, disturbed areas will be revegetated, thus recovering carbon capture capability.
Reduction: Where action cannot be taken immediately, steps should be taken to repair/ restore the impact over time through preservation and maintenance activities throughout the life of the action.	The Joint Venture has designed a processing plant and mining fleet that maximises efficiencies in energy use, thereby reducing emissions. The Joint Venture is committed to investigating ways to continuously reduce emissions over the life of the Project as new technology and information becomes available.
Offsets: Where residual negative impacts are still apparent an offsets package can be utilised to achieve a "net environmental benefit" (as required by EPA and DEWHA).	The Joint Venture proposes a contributing offset against residual GHG emissions. Note that this offset may need to be reviewed once the details of the CPRS are known (i.e. if this proposed contributing offset is found to be contrary to, or incompatible with, requirements under the CPRS).

14.5.2. Proposed Offset Strategy

Like any other mining project in Australia, the Project will generate emissions from fossil fuels used during mining activities, from the onsite power station plus other supporting activities. It is possible that up to 4,500 kt $CO_{2\text{-}e}$ will be emitted as a result of the Project over a 17 year period of construction and operation (Appendix 2-B9). It has been estimated that the maximum quantity of greenhouse emissions produced by the Project will be up 330,000 t $CO_{2\text{-}e}$ per annum if the Project proceeds in the manner described in this document. As described above, the Joint Venture has sought to minimise GHG emissions where practicable, however residual emissions remain. Recent correspondence with the EPA has identified a requirement for the Joint Venture to not only identify ways to minimise the GHG footprint of the Project but also for the Joint Venture to identify offsets and abatement options that will be considered.

According to EPA Guidance Statement 12 (2002), offsets for GHG emissions can potentially include:

- establishment and maintenance of perennial vegetation. Rehabilitation of areas disturbed by the Joint Venture is a requirement under the *Mining Act 1978* and therefore on-site rehabilitation does not count towards an offset for GHG emissions;
- reduce carbon intensity of existing activities. As discussed above, the Joint Venture has sought to minimise emissions through the selection of the processing pathway and mining fleet which are significant contributors to the Project's overall GHG footprint. The Joint Venture is also committed to investigating ways to reduce the amount of GHG emitted per tonne of gold produced as part of their continuing participation in the EEO and Greenhouse Challenge Plus programs;
- fuel substitution to reduce emissions. This PER documentation has been based on the assumption that the main power supply for the Project will be sourced from a diesel fuelled power station. In the event that a substitute fuel source becomes available during the life of the Project, and is shown to be economically viable, the Joint Venture will consider the substitution. Likewise, if a technologically assured renewable option becomes available and is economically viable the Joint Venture would consider a conversion; and,
- development of new technologies. The Joint Venture's proposed contributing offset would be used in a research and development program to identify ways to reduce GHG emissions beyond the scope of the Project.

Initially, a framework will be developed for the research and development program in consultation with relevant stakeholders and research institution(s). The framework would be developed during the construction phase of the Project, so that the program is ready to be commenced during the operational phase, following the first year of full gold production. Each year following full gold production the Joint Venture will invest (into a trust fund) $1.00/tonne/ annum of $CO_{2\text{-}e}$ produced in the preceding year. This investment will be used to fund a research and development program to reduce GHG emission (e.g. the development of cleaner technologies) or to purchase emission permits (i.e. under the CPRS or similar) that would be retired. Preference will be given to the research and development program as this has greater social and environmental benefits through the facilitation of technological advancements in low carbon technology and improvements in energy efficiency equipment. Inputs to the trust could also be made by other parties to further improve research and development opportunities.

The Joint Venture envisages that the overall aim of the research and development is to stimulate and accelerate innovations that will reduce emissions and has the potential to lead to dramatic reductions in the emissions intensity of the mining sector as a whole, and perhaps have application beyond the mining sector. As stated in Appendix 2-B9, it is expected that the research and development program would involve the establishment of a Memorandum of Understanding (MOU) with a Western Australian University or National Research Centre, to be selected in consultation with the EPA and other stakeholders.

The EPA (2002) encourages the consideration of benefits to offsets at a scale broader than the proposal. Broader benefits (i.e. outside of the Project's emission footprint) are expected from the research and development program. For example, new technologies resulting from the research and development program should provide opportunities for other mining operations to reduce their GHG footprint. This contributing offset also addresses the following points identified by the EPA (2002):

- importance of partnerships between government, industry and the community in delivering an appropriate greenhouse response; and,
- need for greenhouse action to be informed by research.