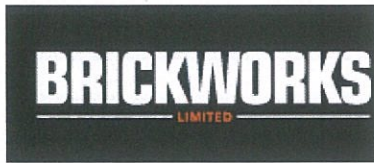


National Carbon Offset Standard Carbon Neutral Program Public Disclosure Summary



An Australian Government Initiative

1. Organisation and Product Information

Table 1: Organisation and Product Information

Organisation Name	Austral Bricks (Tas) Pty Ltd	
Name of the subject(s) of certification	Bricks and pavers produced in the Austral Bricks (Tas) Longford Plant	
Type of certification (tick all applicable)	<input type="checkbox"/> Organisation <input type="checkbox"/> Part of organisation	<input checked="" type="checkbox"/> Product/service <input type="checkbox"/> Event
Reporting year period	From 1/07/2014	To 30/06/2015
Emissions in this reporting year	3,245 t CO ₂ -e	
Base year period ^{1,2}	From 1/07/2012	To 30/06/2013
Emissions in the base year	3,402 t CO ₂ -e	

¹ First year for which the GHG Inventory has been completed – this will be considered to be the base year against which emission reduction activities will be measured.

² For events, a reference case can be provided against which emissions may be compared.



2. Description of Organisation Activities

Brickworks Ltd (Brickworks) is one of the major players in the Australian brick industry.

Brickworks has been transformed from originally a New South Wales state based operation to a national organisation with manufacturing operations in NSW, Victoria, Tasmania, South Australia, Western Australia and Queensland. Austral Bricks is a subsidiary of Brickworks. Austral Bricks manufactures and markets clay products such as bricks and pavers. The manufacturing process involves mining clay and shale and mechanically processing it prior to shaping and firing the bricks in kilns fuelled predominately by natural gas.

This NCOS application concerns bricks manufactured at Brickworks' operation in Longford, Tasmania – Austral Bricks Tasmania (see Figure 1). At this site Austral Bricks Tasmania produces a range of bricks and pavers for the Tasmanian and Victorian markets (see Figure 2).

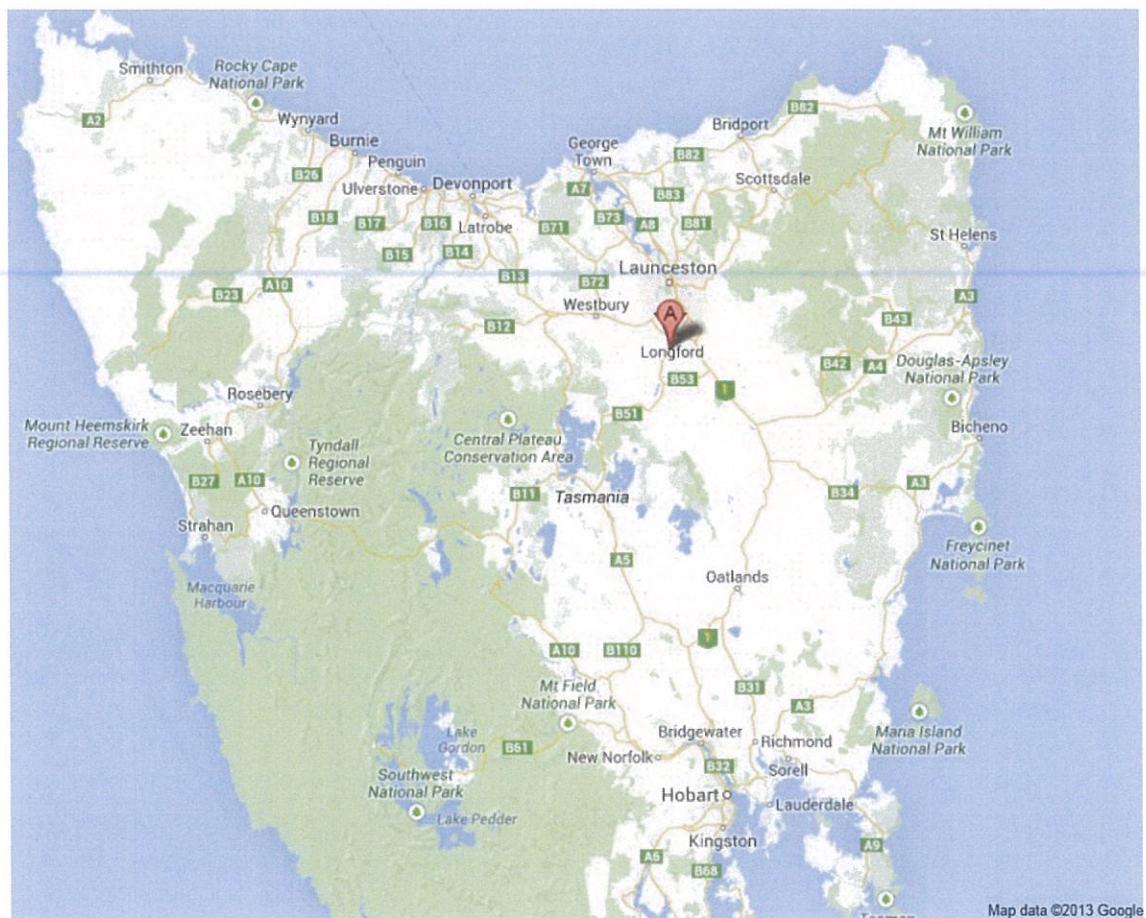


Figure 1: Plant location in Longford, Tasmania (Source: Google maps)



Figure 2: View of Longford plant storage yard (Source: Google maps)

3. Organisational & Geographic Boundary/ Scope & system Boundary

The items included in this chapter cover all mandatory issues from the ISO14044:2006 standard – Goal and scope definition section (International Organization for Standardization 2006b).

Product system description

This NCOS LCA encompasses the complete life cycle of bricks and pavers:

- Raw material extraction
- Transport of raw materials to Longford
- Brick and paver manufacturing at Longford
- Packaging of fired products
- Transport to customers
- Application in works
- Use and maintenance during their life time
- Demolition and disposal at end-of-life

Other attributable processes include non-production related company facilities at Longford (i.e. offices), company vehicles and business travel of staff based in Longford.

The bricks and pavers can be applied in a range of construction works. Ancillary items that might be required for the application, such as mortar, have been excluded as these items are not supplied by Austral Bricks Tasmania.

A description of the processes in each life cycle stage is provided hereafter. This section refers mostly to bricks only. Unless specifically stated, the process is identical for pavers.

Raw materials

Natural clay minerals, including shale, make up the main body of brick. Small amounts of manganese and other additives (sawdust, coal) are blended with the clay to produce different colours. Production waste (brick batts) is ground and recycled back into the clay mixture, resulting in a situation where no production waste leaves the Longford facility.

A variety of coating materials and methods are used to produce brick of a certain colour or surface texture. To create a typical coating, sand is mechanically mixed with some type of colorant (e.g. manganese, red oxide, char, sawdust, etc.). Sometimes frit (a glass containing colorant) is added to produce surface textures.

Extraction of raw materials

Clay and other minerals are extracted from the earth using typical mining equipment. Some clay pits require removal of a top layer before the clay can be extracted.

Diesel used to power equipment is the main greenhouse gas emission source.

Land use and Land Use Change emissions related to clay extraction have been excluded from this assessment as these are likely negligible. Clay pits typically operate for many years, with limited annual change in land use. Furthermore, any attempt to determine the land use emissions would be impractical due to the lack of verifiable data.

Transport of raw materials to Longford

All raw materials are transported to Longford by truck. Materials sourced from outside Tasmania require additional shipping. Raw materials such as clay and shale are 'stock piled' in proportioned layers for a desired mixture.

The brick manufacturing process

The initial step in producing bricks is crushing, followed by grinding. The raw materials are crushed by a crusher and then go through a pan mill for grinding. Particle size is controlled by a screen installed in the grinding machinery. The raw materials are mixed homogeneously in the crushing and milling process. Next, the blend of ingredients desired for each particular batch is sent on to the brick shaping processes (extrusion). Once the bricks are formed, they are dried to remove excess moisture that might otherwise cause an explosion during the ensuing firing process. The bricks are fired in a tunnel kiln and then cooled. Finally, they are destacked — automatically stacked on pallets and particleboard, wrapped with plastic bands, plastic corner protectors and potentially shrink film.

The Longford plant uses mainly sawdust to fire the kiln.

Transport of bricks to the customer

Packaged bricks are transported to Tasmanian customers using Austral Bricks Tasmania's own fleet of trucks. These trucks have specific booms to unload the bricks safely (see Figure 3). Contractors are used to transport bricks to customers in other states (mainly Victoria), overseas and parts of North-West Tasmania.

Austral Bricks Tasmania has provided fuel consumption data for its own trucks. Literature data have been used to estimate fuel use by contractors based on transport volumes (mass) and distances. Shipping has been included for all

transport to the Australian mainland (via Port of Melbourne, Victoria) and bricks that have been exported to Yokohama (Japan), Pusan (Korea) and Auckland (New Zealand). Exported bricks are assumed to travel 100 km by truck from the port of destination to the end-use.



Figure 3: Typical delivery truck

Application of bricks and pavers in their application

Bricklaying is mostly a manual exercise. Therefore there are no emissions associated with the application of bricks and pavers.

Note that ancillary materials, such as mortar, are not included within the system boundaries.

Use and maintenance of bricks and pavers

Bricks and pavers are inert. Therefore there are no (greenhouse gas) emissions directly associated with the products during use.³

Bricks do not require regular, extensive cleaning under normal circumstances. However there are a number of mechanisms that can lead to stains or damaged bricks. Examples⁴ are:

- Mortar smears. These are the result of the bricklaying process and can be easily wiped off with water before they have hardened. Removing hardened mortar smears requires a hydrochloric acid based cleaner.
- Stains – Efflorescence (see Figure 4). Crystallised salts on the surface of bricks can mostly be removed with a dry brush.
- Stains – Insoluble white deposits (e.g. Calcium). These deposits can be removed with particular acids.
- Stains – Iron oxide, manganese, vanadium stains. These stains can occur for various reasons when the mineral or oxide is present in the bricks. They can be removed with specific *acid based cleaning solutions*.

³ When bricks are used in the wall of a building they become part of the functional unit of that building. The operational energy used by the building depends on many factors and cannot be related to the bricks alone. Therefore, operational energy is outside the system boundary of this LCA.

⁴ Source: Think Brick Australia, Industry Reference Guide, Fifth Edition 2009

Apart from these examples walls might also be stained with organic growths, soils, timber and soots and smoke. It is clear that there is not a single or typical scenario for cleaning of bricks, especially given that many of the causes for smears or stains are external.

It is also not practical to define a cleaning scenario related to a single brick (or 1,000 Single Brick Equivalents – SBEs) as illustrated by Figure 4: many problems are restricted to minor areas on a wall.

For these reasons, cleaning of bricks has been excluded from the carbon footprint assessment.



Figure 4: Efflorescence; the result of soluble salts that migrated to the surface (Source: Think Brick Australia, Industry Reference Guide, Fifth Edition 2009)

The service life of bricks depends on the application. However, their durability means that under normal circumstances replacements are not required. The carbon footprint presented in this report is expressed for 1,000 SBEs and excludes any replacements.

Maintenance of bricks during their service life is not required under normal circumstances.

Therefore, we believe it justifies for exclusion from the LCA and it is in line with NCOS section 4.2.3 (f).

Demolition of bricks and pavers

Demolition is excluded from the life cycle of a brick or paver as it is assumed that demolition only takes place when the structure (e.g. house) is demolished. Given the scarcity of reliable data on demolition processes and their limited estimated impact (<5%) on the overall environmental impacts of a building, it was deemed not useful to try to allocate demolition impacts to a single brick, brick wall or paved area. This is in line with NCOS section 4.2.3 (f).

Disposal at end-of-life

In Tasmania, bricks are currently not recycled. Therefore, all bricks and pavers are assumed to go to landfill. In Victoria, 56% of masonry products is recycled (Hyder Consulting 2012). This percentage is likely an overestimate for clay bricks, although this detail is not available. Bricks can be recycled into rubble for landscaping, road foundations, pathways, etc. Only a very small percentage of bricks get recycled into new bricks. The recycled products typically replace sand, crushed rocks or clay. The environmental impacts and benefits from recycling have not been taken into

account in this study, as a cut-off has been applied after transport to the recycling facility.

We assume bricks are transported 50 km from the building site to the landfill site (or recycling facility) by truck.

Yard Stock

In this report, the stock that existed in the yard as of 30 June 2013 were reported, in order to offset the carbon emissions of all the bricks manufactured and sold by Austral Bricks Tasmania after 30 June 2013. For the yard stock, same methodology was applied to calculate the emissions from the raw materials and the same level of (average) emissions as the 13-14FY period were assumed for other emissions such as transport of bricks. The emissions for the yard stock are expressed in a separate table/section so that emissions from the manufacturing/functional unit during the 13-14FY period remains accurate and comparable to the base year and future reporting years.

Sawdust

Sawdust is a low-value by-product from sawmills. Detailed information on the contribution of sawdust to a mill's total income is not available. For the purpose of this LCA the sawdust has been treated as a zero-value (waste) material, which means no embodied emissions (scope 3 emissions resulting from energy use and land use change) are associated with the production of sawdust. We note that scope 3 emissions factors for biomass fuels are not available through the NGA factors workbook.

Sawdust is supplied from a number of different sawmills. We have used sawdust supply data from March 2014 to determine the weighted average transport distance (105km) between sawmills and Longford. The impact of this simplification is less than 1% on the total footprint.

4. Diagram of the Boundary of the Subject of Certification

The system boundary (key processes and flows shown in Figure 5) describes which processes are included and excluded in the LCA. This LCA for Austral Bricks Tasmania covers the full life cycle of clay bricks and pavers manufactured in Longford, Tasmania.

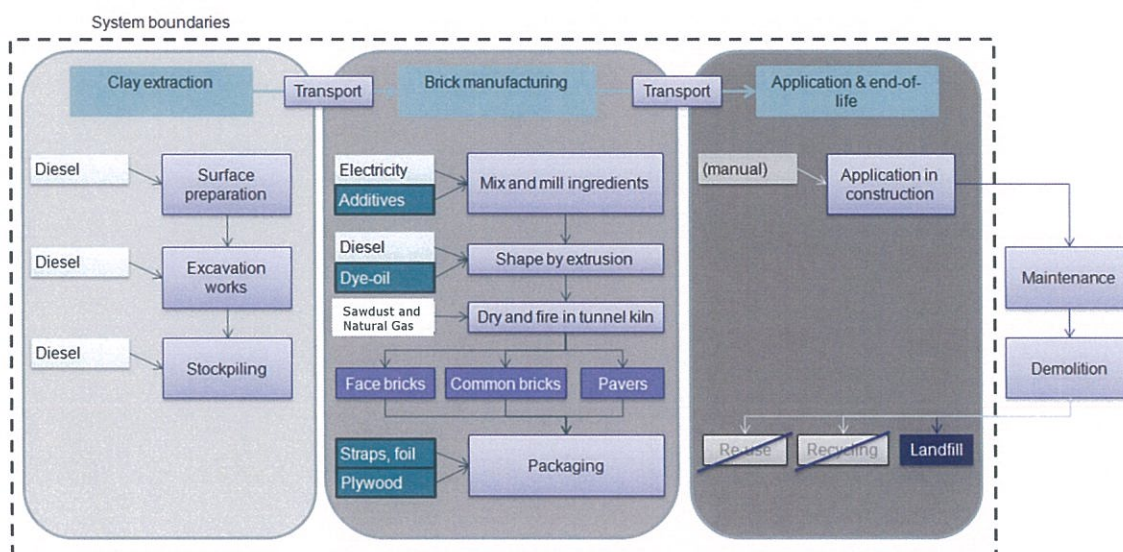


Figure 5: LCA System Boundary Diagram according to ISO14044 principles

For each life cycle stage, all attempts have been made to identify and quantify material flows to and from the environment. The inputs include materials, fuels and energy while the outputs include products, emissions and waste.

For the purposes of this study, the embodied energy incorporated in the infrastructure (buildings, plant, equipment, roads, vehicles, etc.) associated with manufacturing bricks and pavers is excluded from the product system. Other capital goods (e.g. power lines) are excluded as well. This is due to the long lifetime of capital goods in the brick lifecycle and the impact of this exclusion on the footprint is small. We believe this is in line with NCOS section 4.2.3 (f).

Austral Bricks Tasmania has applied a cut-off for flows smaller than 1% (mass and expected environmental impact). This means it has estimated environmental impacts, instead of collecting detailed information for these smaller emission sources.

Figure 6 shows how a product footprint is related to a company's emission reporting. Austral Bricks Tasmania reports its scope 1 & 2 emissions under the National Greenhouse and Energy Reporting Act 2007 (Commonwealth of Australia 2007). The footprint of bricks and pavers includes upstream and downstream emissions as well.

Figure [1.1] The relationship between the *Corporate, Scope 3, and Product Standards* for a company manufacturing product A

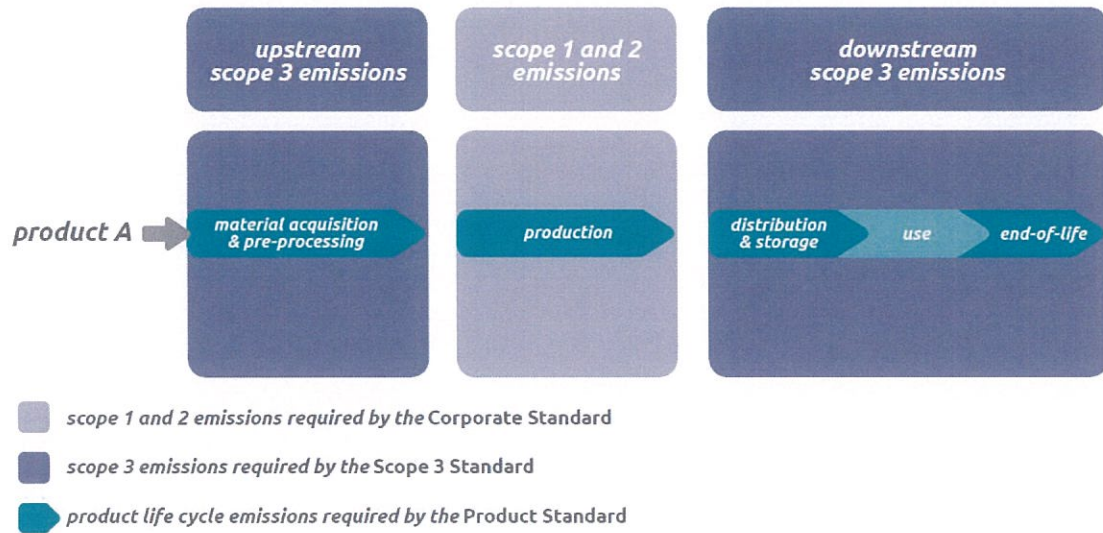


Figure 6: Relationship between GHG Protocol standards (Source: World Resources Institute and World Business Council for Sustainable Development 2011)

Austral Bricks Tasmania has checked the definition of the system boundary in this study with requirements from the GHG Protocol Product Life Cycle Accounting and Reporting standard (World Resources Institute and World Business Council for Sustainable Development 2011, Chapter 7). The system boundaries as defined by the GHG Protocol are slightly different from the ISO 14040 and ISO 14044 standards.

Based on this evaluation we have decided to add two emission sources to the footprint:

- Business travel of employees based in Longford
- Company vehicles of employees based in Longford.

The system boundaries according to the GHG Protocol are depicted in Figure 7.

After inclusion of these additional items we believe all relevant requirements have been met.

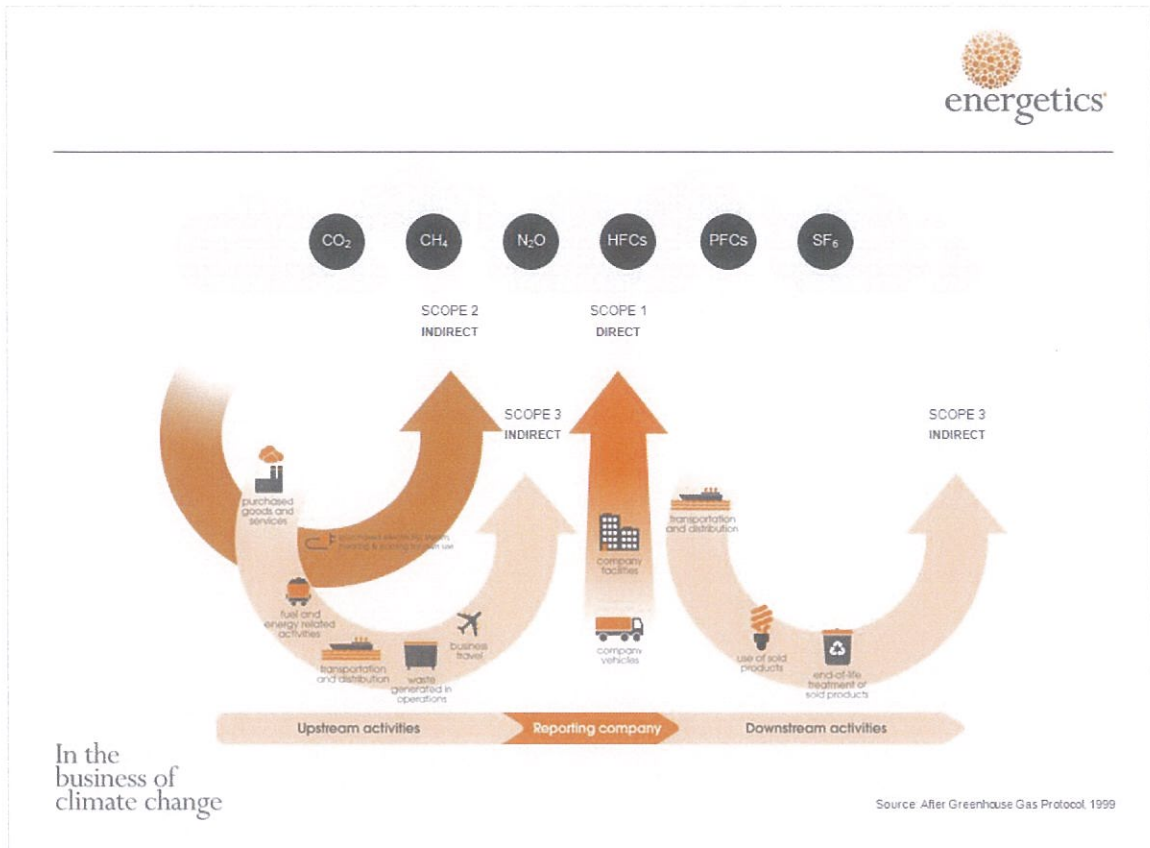


Figure 7: Emission sources covered by this LCA, GHG Protocol

5. Purchase of GreenPower and Retirement of GreenPower Eligible Large-Scale Generation Certificates (LGCS)

N/A

6. Purchase of NCOS Carbon Neutral Products

N/A

7. Total Carbon Footprint

Table 2: Summary of Emissions

Scope	Emission source	Emissions (t CO ₂ -e) ⁵
1	Truck vehicle fleet (diesel); on-site vehicles	65.5
1	Truck vehicle fleet (diesel); transport to customers, delivery trucks and company cars	368.0
1	Company cars (petrol)	0.0
1	Kiln fuel (bituminous coal) use	28.0
1	Kiln fuel (natural gas) use	189.6
1	Kiln fuel (saw dust) use	189.6
1	Body additive (coal) use	100.7
1	Body additive (sawdust) use	4.4
2	Longford plant electricity use	338.2
3	Truck vehicle fleet (diesel extraction & distribution losses); on-site vehicles	3.3
3	Truck vehicle fleet (diesel); transport to customers, delivery trucks and company cars	18.8
3	Company cars (petrol extraction & distribution)	0.0
3	Kiln fuel (bituminous coal) production	0.9
3	Kiln fuel (natural gas) production and distribution	95.7
3	Kiln fuel (saw dust) distribution	0.0
3	Kiln fuel (bituminous coal) distribution	0.1
3	Kiln fuel (saw dust) distribution	49.0
3	Body additive (coal) production and distribution	3.3
3	Body additive (sawdust) production and distribution	0.0
3	Body additive (manganor) production and supply	1.9
3	Body additives transport to Longford	15.1
3	Longford plant electricity transmission and distribution losses	56.4
3	Clay, sand & shale extraction	52.5
3	Clay, sand & shale transport to Longford	244.5
3	Various face additives - extraction / production	57.7
3	Various face additives - transport to Longford	2.0
3	Overhead - water use	2.2
3	Overhead - waste water	3.1
3	Overhead - Cardboard to recycling	0.0
3	Overhead - Solid waste to landfill	19.7
3	Overhead - business travel	6.9
3	Packaging - Plastic Wrap - polyester strap	44.6
3	Packaging - Austral labels - PP film	1.9
3	Packaging - DR labels - PP film	0.7
3	Packaging - Pallets FUM -EXPORT	0.0
3	Packaging - Pallets -930 X 940	0.0
3	Packaging - Export plastic strap - polyester	1.0
3	Contractor vehicle fleet; off-site vehicles; transport to customers	188.0
3	Third party shipping; off-site; transport to customers	418.8
3	End-of-life - transport to landfill	230.4
3	End-of-life - bricks in landfill	0.0

⁵ Emissions = Activity data x energy content factor (if applicable) x emission factor converted to tonnes CO₂-e

Scope	Emission source	Emissions (t CO ₂ -e) ⁵
	Total footprint from manufacturing during 13-14FY	3,245
	Average carbon footprint per functional unit (1,000 Single Brick Equivalent (SBE)) in tonnes CO ₂ -e for products manufactured during 14-15FY	0.356
	Total Emissions Offset for 13-14FY	3,245

8. Carbon Offset Purchases and Retirement for this Reporting Period

Upon determination of final tonnes of carbon emissions required to be offset, Brickworks has engaged an accredited provider (CTX Global) of carbon offsets (such as VCUs) to purchase and surrender the offsets as required under the NCOS at the end of the reporting period. The carbon emissions to be offset are determined based on the production volume of the bricks and pavers during the reporting period (14-15FY).

The purchase and surrender of the offsets will occur within 8 months of the each reporting period. It is Brickworks intention to purchase eligible offsets generated from Australia and NZ Projects as well as permits generated in overseas projects.

Table 3: Offset Cancellations

Offset type	Registry	Serial number	Quantity (t CO ₂ -e)
VCU	APX VCS Registry	3310-148792012-148793211-VCU-003-APX-CN-1-1200-01012010-31122010-0	62
VCU	APX VCS Registry	3229-145723613-145724612-VCU-016-MER-AU-14-587-01032012-28022013-0	1,000
VCU	APX VCS Registry	4093-174484197-174486396-VCU-003-APX-CN-1-1490-01122010-31122010-0	2,200

Total

3,262

62 t CO₂-e has remained as surplus cancelled offsets in the 13-14FY period as the emissions during the 13-14FY period were 5,238 t CO₂-e and 5,300 t CO₂-e were purchased and retired for the 13-14FY period. The serial numbers of the banked offsets are 3310-148791149-148791210-VCU-003-APX-CN-1-1200-01012010-31122010-0 and they were used to offset the emissions in the current reporting period (14-15FY)

17 t CO₂-e has remained as surplus cancelled offsets in the current (14-15FY) period as the emissions during the 14-15FY period were 3,245 t CO₂-e and 3,262 t CO₂-e were purchased and retired for the 14-15FY period. The serial numbers of the banked offsets are 4093-174484197-174486396-VCU-003-APX-CN-1-1490-01122010-31122010-0 and they will be used to offset the emissions in the next reporting period (15-16FY)

9. Emission Reduction Measures

Austral Bricks Tasmania understands and accepts its responsibility for environmental protection which is integral to the conduct of its commercial operations. Austral Bricks Tasmania's objective is to comply with all applicable environmental laws, regulations and community standards in a commercially effective way. We are committed to encouraging concern and respect for the environment and emphasising every employee's responsibility for environmental performance.

Reducing energy consumption, emissions and associated costs are key issues organisations are facing in a carbon constrained world with increasing energy prices. Austral Bricks Tasmania actively participates in greenhouse gas reporting scheme such as National Greenhouse and Energy Reporting (NGER) Act 2007. This programme requires organisations to measure and report their energy consumption, production and greenhouse gas emissions under strict protocols. The data is subsequently collated and reported to Senior Management and the Board

Austral Bricks Tasmania produces low embodied carbon bricks fired in traditional kilns fuelled by saw dust at over 1000°C. The management team has implemented numerous initiatives to reduce energy consumption and greenhouse gas emissions as below. These initiatives will drive down energy consumption per unit of production.

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New lighting system:

In order to reduce electricity use in the plant, the metal halide lighting system is being replaced with more efficient induction lighting system. 23 units have been replaced in this reporting period (14-15FY) and 24 units are planned to be replaced in 14-15FY.

Changing of 500W sodium vapour lighting system to 250W induction system reduced the consumption by 250W/unit. 23 units were replaced during this reporting period and estimated total energy saving was 23 units X 250W X 24 (hours/day) X 350 (operation days) = 48,300 kWh which equates to 6.8t CO_{2-e} based on NGA factors 2015. Replacement of 24 units are planned for the next reporting period and anticipated total energy saving is 24 units X 250W X 24 (hours/day) X 350 (operation days) = 50,400 kWh which equates to 7.1t CO_{2-e} based on NGA factors 2015

Reduction of fan speed by VSD:

Four centrifugal fans, are used as part of the Kiln, Dryer and Sawdust Preparation process. In order to provide the required flow rates inlet guide vane dampers have been installed to reduce the actual output of fans. These inlet guide vane dampers can be replaced by using VSD and the power demand of fan motors can be significantly reduced by reducing the fan speed. List of fans which are planned to be replaced with the VSD units (3 fans out of 4 fans used) are as below. This project was planned to be implemented during the 14-15FY period but it has been re-scheduled to the 15-16FY period due to financial reasons.

- Current kiln exhaust fan (34kW) will be replaced with a 20kW VSD unit, a reduction of 14kW
- Current saw dust induction fan (28kW) will be replaced with a 13kW VSD unit, a reduction of 15kW
- Current saw dust exhaust fan (7kW) will be replaced with a 4kW VSD unit, a reduction of 3kW

Considering the fans would operate 8,040hours per year, anticipated energy saving is;

(14kW + 15kW + 3 kW (reduction of electric motor capacity)) X 8084 hours = 259MWh

and the anticipated CO_{2-e} reduction is 36.3t CO_{2-e} based on NGA factors 2015.

Table 4: Emission Reduction Measures

Emission source	Reduction Measure	Scope	Status	Reduction t CO _{2-e}
Electricity	Replacement of light bulb	2	Implemented this reporting period	6.8
Electricity	Replacement of light bulb	2	Planned for future reporting period	7.1
Electricity	Replacement of Fan with VSD	2	Planned for future reporting period	36.3
Total emission reductions implemented in this reporting period				6.8
Total expected emission reductions in future reporting periods				43.4

10. Other Information [Optional]

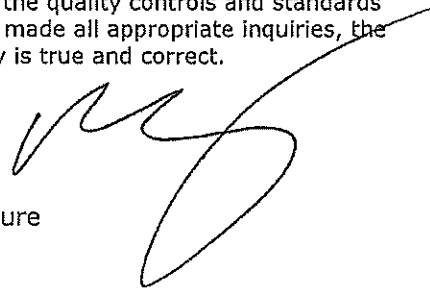
11. Declaration

To the best of my knowledge and having implemented the quality controls and standards required under the NCOS Carbon Neutral Program and made all appropriate inquiries, the information provided in this Public Disclosure Summary is true and correct.

Mark Finney

Name of Signatory

Signature

A handwritten signature in black ink, appearing to be 'M. Finney', written over a horizontal line.

Austral Bricks East Coast Group General Manager

Position / Title of Signatory

9/02/2016

Date