Application for Modification of Wollongong City Council Development Consent DA767/01A Environmental Assessment

Prepared for:

BlueScope Steel Limited

July 2008

CH2MHILL

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Form 2

Submission of Environmental Assessment (EA)

Prepared under Part 3A of the *Environmental Planning and Assessment Act 1979*

EA prepared by

name and qualifications	Jacqueline Roberts	BCom(Accg)/LLB
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in respect of		

development application

Modification Application to Wollongong City Council Development Consent (DA 767/01A) – Illawarra Cogeneration Plant

applicant name	BlueScope Steel Limited ABN 16 000 011 058
applicant address	Five Islands Road, Port Kembla NSW 2505 PO Box 1854 Wollongong NSW 2500
land to be developed	Port Kembla Steelworks
lot no., DP/MPS, vol/fol etc	Part Lot 1, DP 606434 and Part Lot 1 DP 606430
	Or
proposed development	
	☑ map(s) attached

certificate

an Environmental Assessment (EA) is attached

I certify that I have prepared the contents of this EA and to the best of my knowledge:

(i) the EA has been prepared in accordance with section 75W of the *Environmental Planning and Assessment Act 1979* and *Regulations*;

(ii) the EA contains all available information that is relevant to the assessment of the Project to which the EA relates, and

(iii) the information contained in the EA is neither false nor misleading.

Signature	J. Rob
Name	Jacqueline Roberts
Date	July 2008

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Glossary	
Basic Oxygen Steel Making	Basic Oxygen Steelmaking (BOS) facility where iron is converted into steel using gaseous oxygen to oxidise the carbon and other unwanted impurities in molten iron
Biodiversity	The variety of all life forms, comprising genetic diversity (within species), species diversity and ecosystem diversity
Blast Furnace	A large refractory lined cylindrical vessel standing approximately 40 m high, used to separate iron from the iron oxide in the ore through a series of chemical reactions which take place at very high temperatures. The name generally applies to include the surrounding structure and ancillaries
BOS off-gas	BOS off-gas is a fuel gas, rich in carbon monoxide produced during blowing in the BOS process. It should be noted that the name "BOS off-gas" is a site specific term, with most steelworks calling the gas Linz-Donawitz Gas (or LDG after Linz-Donawitz, the locations of the two steelworks where the basic oxygen process was first commercially used)
BlueScope Steel Limited	The Proponent
BlueScope Steel (AIS) Pty Ltd	The land owner
Condensate	The substance formed by condensation, as liquid from vapour
Cogeneration	The use of energy to produce electricity and steam
Contamination	Concentration of substances above that naturally present that poses, or is likely to pose, an immediate or long-term risk to human health or the environment
Decibel (dB)	A logarithmic measure of the variation in air pressure (sound waves)
Estuary	The part of a river in which water levels are affected by sea tides and where fresh and salt water mix
Greenhouse Gas	A gas which has an effect on the absorptivity of the earth's atmosphere and the atmosphere's temperature as identified under the Kyoto Protocol to the UN Framework convention on Climate Change
Habitat	The living space of a species or community, providing a particular set of environmental conditions
Hot Strip Mill	The Hot Strip Mill heats steel slabs in a walking beam furnace then rolls and coils the steel to produce hot rolled coil
Indigenous Fuels	Fuels that are by-products of the operation of the steelworks, including blast furnace gas, coke oven gas and BOS off-gas
LDG	Linz-Donawitz Gas – collected BOS off-gas which has been captured by the proposed collection system
Macro-fouling	Fouling of cooling systems caused by large organisms, such as oysters, mussels, clams and barnacles
Natural Gas	Combustible gas formed naturally in the earth
Ozone	A form of oxygen having three atoms to the molecule. Ozone is a powerful oxidising agent
Peaking	When the ICP burns natural gas to increase electricity generation to meet

	periods of increased demand in the New South Wales electricity grid
Relines	The periodic replacement of the blast furnace lining, which involves replacing refractory, staves and shell plate
Remediation	Under the *Contaminated Lands Management Act* 1997 remediation means: a) removing, dispersing, destroying, reducing, mitigating or containing the contamination of any land, or b) eliminating or reducing any hazard arising from the contamination of any land (including by preventing the entry of persons or animals on that land)
Sediment	Particulate organic and inorganic matter that settles to the bottom of lakes, rivers, oceans and other waters
Sinter	Fine particles of iron ore, coke and limestone, roasted into lumps (agglomerated) for use as Blast Furnace feed.
Switching Station	Diverts gas into the LDG collection system.
Wetland	Habitats where the influence of surface or groundwater has resulted in development of plant or animal communities adapted to aquatic or intermittently wet conditions

Abbreviations	
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environmental Conservation Council
APVMA	Australian Pesticides and Veterinary Medicines Authority
BACT	Best Available Control Technology
BFG	Blast Furnace Gas
BlueScope Steel	BlueScope Steel Limited
BOS	Basic Oxygen Steelmaking
CEMP	Construction Environmental Management Plan
CO	Carbon Monoxide
CO_2	Carbon Dioxide
tCO_2-e	Tonnes of carbon dioxide equivalent
CoAG	Council of Australian Governments
COG	Coke Ovens Gas
CLT	Cardno Lawson Treloar
DA	Development Application
DCP	Development Control Plan
DEC	(former) NSW Department of Environment and Conservation
DECC	NSW Department of Environment and Climate Change
DEI	Duke Energy International
DEWHA	Department of Environment, Water, Heritage and the Arts
DIPNR	(former) Department of Infrastructure Planning and Natural Resources
DL	Department of Lands
DLWC	(former) Department of Land and Water Conservation
DNR	Department of Natural Resources
DoP	Department of Planning
DPI	Department of Primary Industries
DUAP	(former) Department of Urban Affairs and Planning
DWE	NSW Department of Water and Energy
EA	Environmental Assessment
EARs	Environmental Assessment Requirements
ECC	Endangered Ecological Community

ECRTN	Environmental Criteria for Road Traffic Noise
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
ENCM	Environmental Noise Control Manual
EPA	Environment Protection Authority (now part of DECC)
EP&A Act	*Environmental Planning and Assessment Act NSW 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation NSW 2000*
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ESD	Ecological Sustainable Development
FY	Financial Year
GGBF	Green and Golden Bell Frog
GHG	Greenhouse Gas
GTA	General Terms of Approval
ha	Hectares
HV	High Voltage
INP	Industrial Noise Policy
IPCC	Intergovernmental Panel on Climate Change
kPa(g)	Kilopascal
kV	Kilovolt
LDG	Linz-Donawitz Gas (collected BOS off-gas)
LEP	Local Environment Plan
LGA	Local Government Area
m	Metre
ML	Megalitre
MSDS	Material Safety Data Sheet
MW	Megawatt
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measures
NGACs	NSW Greenhouse Abatement Certificates
NMVOCs	Non-Methane Volatile Organic Compounds
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NPI	National Pollutant Inventory

NSG	NewSouth Global Consulting
NSW	New South Wales
OPUP	Ore Preparation Upgrade Project
PHA	Preliminary Hazard Analysis
PKPC	Port Kembla Ports Corporation
PKSW	Port Kembla Steelworks
PM_{10}	Particulate matter less than 10 microns in diameter
POEO Act	*Protection of the Environment Operations Act* 1997
PRP	Pollution Reduction Program
REP	Regional Environment Plan
RIW	Recycled Industrial Water
RTA	Roads and Traffic Authority
SEPP	State Environmental Planning Policy
SO_2	Sulphur dioxide
SO_x	Oxides of sulphur
STG	Steam Turbine Generator
STP	Sewage Treatment Plant
SWC	Sydney Water Corporation
TAPM	The Air Pollution Model
tpa	tonnes per annum
tph	tonnes per hour
TTE	Tertiary Treated Effluent
UNSW	University of New South Wales
WCC	Wollongong City Council

Executive Summary

This Environmental Assessment (EA) has been prepared for the Department of Planning (DoP) on behalf of BlueScope Steel Limited (BlueScope Steel) to support an application under Section 75W of the *Environmental Planning and Assessment Act* 1979 (EP&A Act) and clause 8J(8) of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) for the modification of an existing development consent for the Illawarra Cogeneration Plant Project (ICP Project).

The ICP Project involves the construction and operation of a cogeneration plant at the Port Kembla Steelworks (PKSW).

In May 2001, Duke Energy International (DEI), under a contractual arrangement with BHP Steel Limited (now BlueScope Steel), applied to Wollongong City Council (WCC) for development consent for the ICP Project.

In August 2002, WCC granted consent to the construction and operation of the ICP Project at the PKSW, located 80 km to the south of Wollongong (the Development Consent). The main components of the existing Development Consent for the ICP Project are:

- A 225 MW condensing steam turbine generator
- Four boilers generating approximately 1,100 tonnes per hour (tph) of steam and auxiliary equipment required for the operation of the plant
- A substation and electrical connection (132 kV and 33 kV powerlines) from the cogeneration plant to the substation
- Basic Oxygen Steelmaking (BOS) off-gas (or Linz-Donawitz gas, LDG) collection system including a 70 m high by 40 m diameter gas holder
- A re-circulated fresh water system with cooling towers, using tertiary treated effluent (TTE) from the Wollongong Sewage Treatment Plant (STP) as make-up, and the piping and infrastructure for the connection of the ICP to the STP
- Piping and infrastructure connections from the ICP to BlueScope Steel infrastructure.

In October 2002, DEI's involvement in the ICP Project ceased and BlueScope Steel is now developing the ICP Project. In 2005, the Development Consent was modified on application of BlueScope Steel to enable the construction of the ICP Project in two stages. BlueScope Steel completed construction of Stage 1 of the ICP Project in 2005.

The ICP Project is an important development for BlueScope Steel and is designed to ensure the on-going viability of the PKSW by providing the PKSW with sufficient steam and energy to meet its requirements whilst proactively creating tangible and significant environmental benefits.

The benefits of the ICP Project include:

- Significant greenhouse gas (GHG) emission abatement - (approximately 880 000 tonnes per year CO_2-e through less electricity needing to be produced by offsite generators to meet the demands of the PKSW, making the ICP Project one of the single biggest GHG emission abatement projects in Australia).
- The capture and re-use of most of the by-product gases currently flared.
- Significant reduction in BlueScope Steel's physical reliance on electricity from the New South Wales (NSW) power supply grid. The ICP Project will ensure the PKSW is largely electricity self-sufficient.
- Improvement in visual amenity as a result of reduced flaring.
- Reduction in boundary noise levels as a result of the decommissioning of the No. 1 Power House.

Since the Development Consent for the ICP Project was granted, various changes to PKSW (both internal and external), have occurred which have resulted in BlueScope Steel proposing the current modifications to the ICP Project. The proposed modifications to the ICP Project involve:

- Modifications to the approved boilers.
- Relocation and resizing of the approved gas holder.
- Modification to the steam turbine generator (STG) cooling system to use a once-through salt water cooling system.
- Relocation of high voltage (HV) substation and associated cables.
- Consolidation of the ICP footprint.
- Relocation of construction laydown areas.

Key Environmental Issues

A risk assessment has been undertaken by BlueScope Steel to identify the key environmental issues associated with the proposed modifications to the ICP Project. The main findings of the assessment are outlined below.

Air Quality

Holmes Air Sciences was engaged to undertake an air quality assessment to determine the impacts associated with the ICP Project both locally and regionally. The approach of the assessment compared the existing operations i.e. emissions from the No.2 Blower Station and by-product fuel flares (pre-ICP) with the predicted emissions from the operation of the ICP as modified (post-ICP). The post-ICP case included the decommissioning of the No. 21 – 24 boilers at the No. 2 Blower Station. This produced a net result, identifying the change in emissions associated with the

ICP Project as modified. In addition, a comparison was made between the results of the air quality assessment for the modified ICP Project with the approved ICP Project.

Air quality impacts of NO_x, PM_{10} and SO_2 emission from the ICP are predicted to be close to or slightly lower than the current operations, for comparable scenarios. The most common operational ICP scenarios are unlikely to cause exceedances of the DECC's ambient air quality criteria.

Regionally, the assessment concluded that development of the ICP Project (as modified) would not increase NO_x emissions and would therefore not have an impact on regional air quality within the Illawarra Region.

The predicted outcomes of the air quality assessment for the proposed modified ICP Project are similar to impacts of the approved ICP Project, for comparable scenarios.

Greenhouse Gas Emissions

A greenhouse gas (GHG) impact assessment was undertaken by CH2M HILL to provide an estimate of the changes in GHG emissions as a direct result of the modified ICP Project compared to current operations. The assessment concluded that the ICP Project would provide significant GHG benefits. These benefits primarily result from the ability of the ICP Project, by using a combination of by-product gases and natural gas, to produce electricity at a significantly lower GHG emissions intensity than existing off-site generators connected to the grid. The GHG emission abatement benefits is estimated to be approximately 880 000 t CO_2-e per annum.

The GHG impact assessment also compared the emissions calculated for the modified ICP Project with the approved ICP Project. The assessment concluded that the emissions reductions from the ICP Project as modified are similar to the emissions reductions from the approved ICP Project.

Water Quality

An assessment was undertaken of the potential impacts on water quality associated with the proposed modifications as outlined in this EA. The assessment included:

- Impacts during the construction phase of the Project (i.e. water quality impacts during construction of a gantry and gas ducts across Allan's Creek and construction of the salt water cooling system)
- Impacts during the operational phase of the Project including:
  - Additional heat load discharge to Allan's Creek and Port Kembla Harbour
  - Macro-fouling control requirements
  - Impacts resulting from the potential discharge of liquid wastes as a result of the ICP Project.

Construction of a gantry and gas ducts across Allan's Creek, required as part of the gas connection from the ICP to the proposed relocated gas holder, as well as construction of the salt water cooling system, would be managed in accordance with the Construction Environmental Management Plan (CEMP). The CEMP would be updated to incorporate the proposed modifications. There is not expected to be any significant impacts during this construction phase.

Cardno Lawson Treloar was engaged to undertake a range of 3D numerical cooling water studies to model the heat load pre-ICP and post-ICP to describe any changes in heat field conditions. During typical operations, the increase in temperature in Allan's Creek and Port Kembla Inner Harbour was predicted by modelling to be < 1°C during both the summer and winter months. All other scenarios modelled, including both summer maximum conditions and the heat load due to intermittent thermal treatment, resulted in an average temperature increase of less than 3°C throughout Port Kembla Harbour except in the localised mixing zone when the ICP is running at maximum heat load conditions.

BlueScope Steel propose to use a combination of thermal, mechanical and (if necessary) chemical methods to control macro-fouling in the turbine condenser cooling system. The use of chemical, mechanical and physical control methods is currently used successfully at PKSW with little impact.

It is considered that the impacts associated with the additional heat load into Allan's Creek and Port Kembla Harbour, and any residual concentration discharged from the use of a chemical macro-fouling control program, are not significant. The proposed modification to the ICP Project will prevent the need to consume approximately 10ML/day of fresh water which would have been required as system make-up, if the approved re-circulated fresh water cooling system was installed. It was originally intended to use tertiary treated effluent (TTE) from the Wollongong STP as make-up, with dam water as a back-up if TTE was not available. Following recent agreements between BlueScope Steel and Sydney Water, where TTE (further processed to "Recycled Industrial Water") is being used to displace dam water consumption, it is not clear if sufficient TTE would be available to meet the make-up requirements of an ICP fresh water cooling system. A fresh water ICP cooling system would require approximately 10ML/day of make-up, being either dam water, or water from the Wollongong STP which could potentially displace dam water consumption at the PKSW or elsewhere. Based on these anticipated water savings the potential water quality impacts on Allan's Creek and Port Kembla Harbour are considered acceptable.

Aquatic Ecology

New South Global Consulting (NSG) was engaged to assess the impact on the aquatic ecology of Allan's Creek and Port Kembla Harbour from an increase in water temperature resulting from the operation of the ICP cooling system.

The assessment concluded that the additional heat load during typical conditions would not cause any major loss of biota from marine communities within the already highly modified ecosystem of the Harbour. However, if the temperature increase in Allan's Creek or at Port Kembla Harbour exceeded 3°C, there was potential to impact on the aquatic ecology.

In addition, NSG undertook an assessment on the impact of increased entrainment of plankton in the salt water cooling system. Based on conceptual models and a conservative premise of 100% mortality of all plankton entrained, the assessment concluded that there is likely to be alterations to the abundance of plankton, benthic invertebrates and fish in waters adjacent to the discharge point in Port Kembla Inner Harbour. Three possible scenarios outlining the potential scale of impact on the ecology of Port Kembla Inner Harbour post-ICP were identified. It was concluded that Scenario 2, which identified moderate impacts, could potentially occur.

Terrestrial Ecology

An assessment was undertaken of the potential impacts of the ICP Project (as modified) on terrestrial flora and fauna. One threatened species listed under the *Threatened Species Conservation Act 1995* which had the potential to be impacted at the PKSW from the ICP Project was identified as the Green and Golden Bell Frog (GGBF). Gaia Research Pty Ltd was engaged to conduct a site walk-over to identify potential habitat of, and the existence of, the GGBF at the ICP Project sites. The survey did not find any GGBF at the ICP Project sites but identified the presence of suitable habitat for the GGBF.

An assessment was carried out in accordance with the Threatened Species Assessment Guidelines (DECC, 2007) to determine whether the construction and operation of the ICP Project would have a significant impact on the GGBF.

The assessment concluded that development of the ICP Project as modified would not have a significant impact on the GGBF within the PKSW. Any GGBF encountered during the development will be handled in accordance with the Green and Golden Bell Frog Management Plan, currently being drafted by BlueScope Steel.

Hazard and Risk

The Preliminary Hazard Analysis (PHA) undertaken in 2001 as part of the approved development application (DA767/01A) was updated in accordance with the proposed modifications. The potential risks imposed by the proposed modifications to the ICP Project were identified, estimated and compared with the land use safety planning criteria established by the former Department of Urban Affairs and Planning (DUAP), now the Department of Planning (DoP).

The PHA for the proposed modifications concluded that the risk levels for the proposed facilities satisfied the land use safety planning criteria. The ICP Project did not pose an off-site risk to people, property or the environment.

Visual Amenity

A visual impact assessment was undertaken to determine the likely impact on the visual amenity of the closest residential suburbs as a result of the proposed modification. This assessment was completed as part of the Preliminary Environmental Assessment. The assessment concluded that, due to the small number of potential viewers, siting of the gas holder within the PKSW and the high visual absorption capacity of the PKSW, modification of the size and location of the LDG holder is not expected to have a significant impact upon the visual amenity of residents in the surrounding suburbs.

In addition, the potential impact associated with lighting from the proposed relocated gas holder and high voltage (HV) substation is not expected to have a significant impact on motorists or the closest residents.

Noise

Bridges Acoustics Pty Ltd was engaged during the original ICP Project in 2001 to undertake a noise impact assessment. The noise impact assessment and its conclusions have been outlined in this EA.

The proposed relocation of some aspects of the ICP Project were considered in light of the noise assessment, notably the proposed relocation of construction laydown areas. Based on the original noise assessment and the proposed changes as outlined in this EA, there is not expected to be a significant change in noise generated during the construction or operation of the ICP Project as modified.

All noise generated during the construction phase would be within the existing noise limits outlined in the Development Consent. Traffic movements will be via main arterial roads and the entrance to the site and laydown areas will be buffered by the existing landscape.

The discharge of water from the salt-water cooling system is the only potential noise generating activity that will result from the modification to the ICP Project. The discharge point is located at the far eastern boundary of the PKSW and surrounded by industrial operations and Port Kembla Inner Harbour. There is not predicted to be any noise impacts upon the surrounding residents as a result of operation of the ICP Project as modified.

Waste - Liquid Waste Streams

BlueScope Steel has investigated opportunities to beneficially re-use liquid waste streams produced in the various processes associated with the ICP Project. These streams include by-product fuel condensates, discharge water from the ICP Feedwater Demineralisation Plant, boiler blowdown streams, various maintenance drains and stormwater.

The re-use of the liquid waste streams in existing iron and steelmaking processes, whenever possible and practical, will reduce the consumption of industrial water in those applications.

Cumulative Impacts

During the construction phase of the ICP Project, construction for the approved No. 5 Blast Furnace Reline Project and the approved Ore Preparation Upgrade Project

(OPUP) will occur simultaneously for approximately 1-3 months. Due to the shortages of labour resources and the location of these operations within the PKSW, there is not expected to be a cumulative impact during the construction phase.

As air quality impacts of NO_x and SO_2 emissions from the ICP are predicted to be close to or slightly lower than current operations, for comparable scenarios, there is not expected to be a cumulative impact on air quality during operation of the ICP.

Conclusion

No significant adverse environmental impacts have been identified during the preparation of this EA. The potential impact to the marine community of Allan's Creek and Port Kembla Harbour from the additional heat load, entrainment of plankton and use of a macro-fouling control have been identified and, where possible, these potential impacts will be mitigated by appropriate design safeguards and/or management strategies.

The ICP Project, as modified, will result in significant environmental, social and economic benefits including:

- GHG emission abatement benefits of approximately 880 000 t CO_2-e per annum making it one of the single biggest GHG emission abatement projects in Australia
- Potential reduction in fresh water usage of approximately 10ML/day if Sydney Water further treats the TTE to recycled water standard for use in industrial processes in the Ilawarra.
- Recovery of otherwise wasted heat energy
- Reduction in flaring events
- Improvement in visual amenity as a result of reduced flaring
- Reduction in electrical power transmission losses
- Securing the steam supply for the PKSW with less operational risk
- Improvements to the efficiency and productivity of the PKSW
- Capacity to increase electricity generation to meet periods of increased demand in the NSW electricity grid.
- Provide significant investment and employment opportunities for the Illawarra Region and NSW.

1 Introduction

This Environmental Assessment (EA) has been prepared for the Department of Planning (DoP) on behalf of BlueScope Steel Limited (BlueScope Steel) to support an application made under Section 75W for modification of Wollongong City Council's Development Consent (DA767/01A) under Part 3A of the *Environmental Planning and Assessment Act* 1979 (NSW) (EP&A Act) and clause 8J(8) of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation). This EA has been prepared in accordance with the Minister for Planning's approval (see **Appendix A**) and the Director-General's Environmental Assessment Requirements (EARs) (see **Appendix B**). A checklist outlining the EARs and a reference to the section in this EA where each issue has been addressed can be found in **Appendix C**.

The purpose of the EA is to:

- Provide a detailed description of the proposed modifications to the Illawarra Cogeneration Plant Project (ICP Project) located at BlueScope Steel's Port Kembla Steelworks (PKSW) New South Wales
- Identify the key potential environmental impacts associated with the proposed modifications
- Assess the key potential environmental impacts associated with the proposed modifications
- Outline mitigative measures to reduce any potential environmental impacts identified
- Outline BlueScope Steel's commitment to manage, where possible, any potential impacts identified.

The EA has been prepared in accordance with Division 5, Part 3A of the EP&A Act and the EP&A Regulation.

1.1 The Project

In 2002, Wollongong City Council approved the construction and operation of a cogeneration plant at the PKSW. The project was called the "Illawarra Cogeneration Plant Project" (ICP Project). The ICP will produce steam and electricity for the PKSW whilst generating surplus electricity that will be returned to the NSW grid for utilisation by other consumers.

The Project is an important development for BlueScope Steel designed to secure the ongoing viability of PKSW whilst proactively creating tangible and significant environmental benefits.

Cogeneration is a power generation method that uses energy available in by-product fuel gases to provide two useful outputs, electricity and steam. It represents a clean solution to the challenge of achieving sustainable energy generation for the future. Cogeneration from by-product fuels in the new boilers at the PKSW provides significant benefits including:

- Increased operating efficiency
- Abatement of greenhouse gas (GHG) emissions through displacement of generation from higher GHG emission intensity generators
- The provision of power at the place where it is required, freeing up electrical infrastructure
- Minimising electrical transmission losses.

The Project will use state-of-the-art technology, harnessing primary fuels which are by-products of the PKSW iron and steelmaking processes. These by-product gases are currently utilised at the PKSW in various iron and steelmaking processes or flared to the atmosphere. The Project will also burn some natural gas to ensure complete and stable combustion of the by-product gases. Natural gas would also be used if the supply of by-product gases is interrupted. In addition, natural gas will be used during peaking periods (i.e. when the ICP burns natural gas to increase electricity generation to meet periods of increased demand in the New South Wales electricity grid).

1.2 Project Objectives

The key objectives of the Project are to:

- Improve the reliability and security of steam supply to the PKSW
- Allow the decommissioning of old steam and power generating plants at BlueScope Steel's PKSW. These plants have relatively high operating and maintenance costs and have, by modern standards, poor efficiency and availability. The fuel currently used by these plants will be used by the ICP
- Improve the efficiency by which fuels generated at the PKSW are converted to steam and electricity
- Put surplus fuels, produced at the PKSW and currently flared, to a useful purpose.

1.3 Project Benefits

The Project will deliver the following benefits:

- Significant GHG emission offsets - the Project provides an opportunity for BlueScope Steel to offset approximately 880 000 tonnes per year of GHG emissions making it one of the single biggest GHG emission reduction projects in Australia
- A high level of electricity self sufficiency for BlueScope Steel at the PKSW

- Embedded generation benefits - electricity is generated at the point where it is used, reducing load on the electrical transmission system, reducing transmission losses and thereby further contributing to GHG emission reductions

- An increase in the buffer zone between the residential area of Cringila and the power generating facilities in the Steelworks

- A reduction in noise generated at the Steelworks boundary due to the closure of No. 1 Power House steam turbine generators (STGs).

The modifications proposed and outlined in this EA will deliver the following additional benefits:

- The use of a once-through salt water cooling system will allow BlueScope Steel, in conjunction with Sydney Water, to investigate further reduction in its use of dam water

- Remove the need for significant quantities of hazardous chemical storage

- An improvement in visual amenity due to the removal of the need for the cooling tower resulting in the removal of the visual impact of the cooling tower plume.

1.4 Background

In 1999, BHP Steel Limited (now BlueScope Steel Limited) entered a contractual arrangement with Duke Energy International (DEI) under which DEI would develop the Project on behalf of BHP Steel.

In May 2001, DEI submitted a development application to Wollongong City Council (WCC), the consent authority, to build and operate a cogeneration plant at the PKSW, a 742 hectare (ha) heavy industrial site 80 km south of Sydney (see **Figure 1-1**). The project was called the "Illawarra Cogeneration Plant" (ICP). The development application (DA) was supported by an environmental impact statement (EIS); *Illawarra Cogeneration Project Environmental Impact Statement Volume 1 and 2 – Appendices* (CH2M HILL, 2001).

WCC granted consent for the construction and operation of the ICP in August 2002 (*Notice of Determination of Integrated Development Application No. D767/01*) (the Development Consent).

In October 2002, DEI ceased its involvement in the Project. BlueScope Steel is now sole developer of the Project.

The Development Consent was subsequently modified (D767/01A) to allow for a phased construction of the Project (see **Appendix D** for the original and modified Development Consent). BlueScope Steel completed construction of Stage 1 of the Project in 2005.

Since the granting of development consent in 2002, various changes to the PKSW (both internal and external), have occurred. The current modifications are a direct response to those changes.

Internal changes within BlueScope Steel which have contributed to the proposed modifications include:

- A $14 million upgrade to the existing No. 25 Boiler to improve its environmental performance and extend its economic operating life
- The re-direction of a significant quantity of Coke Ovens Gas (COG) to the Hot Strip Mill for use in the recently commissioned No. 2 Walking Beam Furnace which has resulted in a reduction in the amount of this relatively high energy fuel available to the Project
- BlueScope Steel's target of zero dam water use resulting in investigations to further reduce dam water consumption.

External changes that have occurred since 2002 which have contributed to the proposed modifications include:

- Changes in NSW State Government policy, specifically those relating to water and energy conservation, and regional air quality goals. This Project supports those policies through the reduction in GHG emissions, energy production and significant water savings
- An agreement between BlueScope Steel and the NSW Government signed on 16 November 2006 relating to the construction of the Project and the reline of the No. 5 Blast Furnace, the reduction of GHG emissions, the application of the NSW Greenhouse Gas Abatement Scheme to the Project and the consequences arising from the potential introduction of a State based national emissions trading scheme. In accordance with this Agreement, a target date for the operation of the Project has been set as December 2012.

BlueScope Steel has commissioned CH2M HILL to assist in the preparation of a request to the Minister for Planning to modify the Development Consent for the construction and operation of the Project.

1.5 Proponent Name and Address

Details of the Proponent are as follows:

Name:	BlueScope Steel Limited
Contact:	Steve Shaw
Phone:	(02) 4275 3813
Address:	PO Box 1854
	Wollongong NSW 2500

1.6 Land Owner's Consent

The Proponent, BlueScope Steel Limited, has received consent from the relevant landowners, BlueScope Steel (AIS) Pty Ltd, Railcorp, RTA and Wollongong City Council to make the application for modification to the Development Consent (see **Section 2.1**).

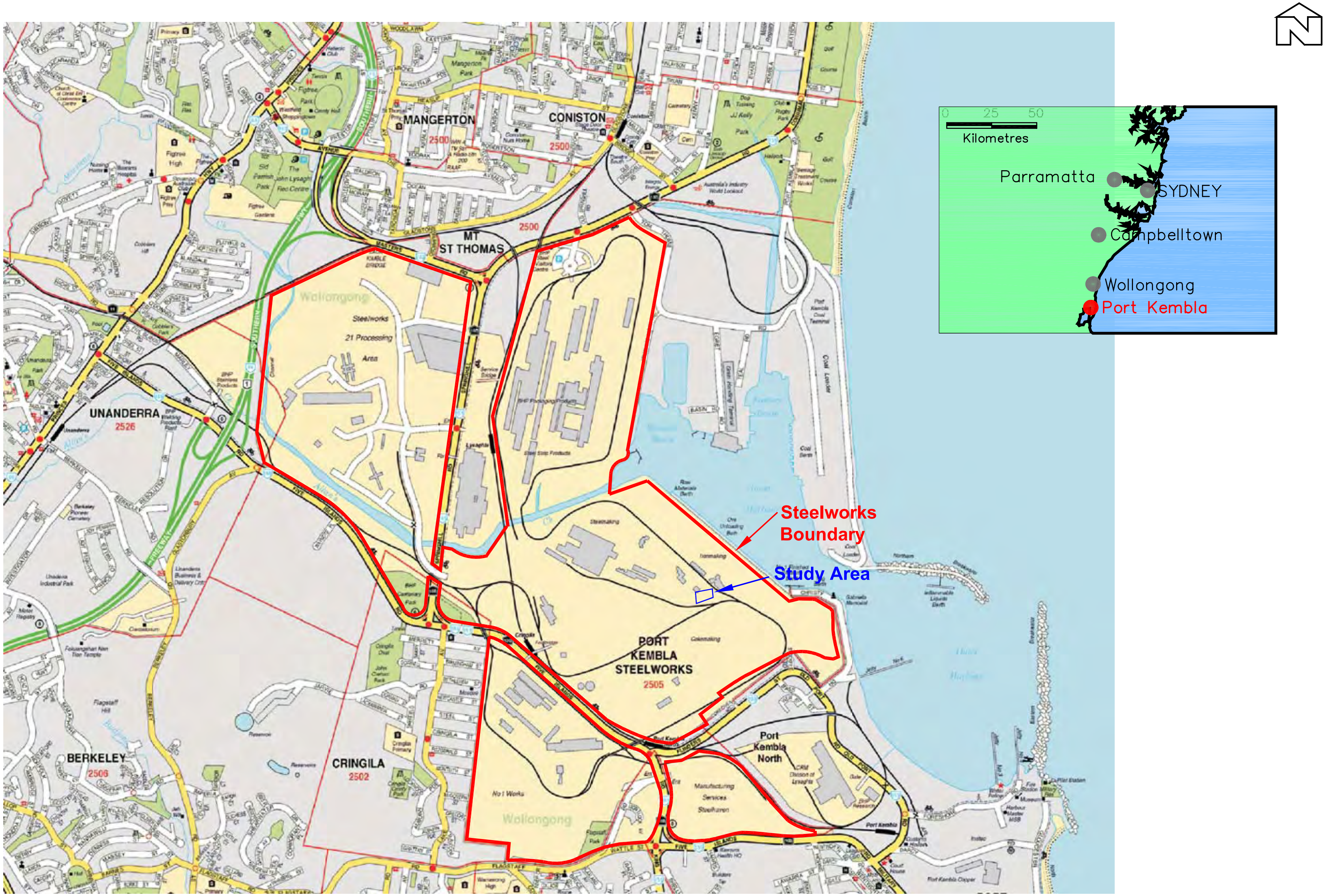


Figure 1.1
Locality Plan

2 Consultation

2.1 Consultation with Government Agencies

The following agencies were consulted regarding the proposed modifications to the ICP Project:

- Department of Planning
- Department of Environment and Climate Change
- Department of Water and Energy
- Department of Primary Industries
- Port Kembla Ports Corporation
- Roads and Traffic Authority
- RailCorp
- Wollongong City Council.

2.1.1 Consultation with the Department of Planning

After consultation with the Minister for Planning, on the 30 November 2007, the Minister for Planning approved treating the Development Consent (DA767/01A) as an approval under Part 3A of the EP&A Act for the purposes of the modification application process under section 75W of the EP&A Act (the Approval)(see **Appendix A**).

An application was lodged with the Minister for Planning under section 75W of the EP&A Act for modification of the Development Consent (DA767/01A). BlueScope Steel submitted a Preliminary Environmental Assessment (Preliminary EA) to the Department of Planning (DoP) outlining in detail the proposed modifications to the ICP in December 2007.

In response to the Preliminary EA, DoP issued Environmental Assessment Requirements (EARs) on the 2 April 2008 (see **Appendix B**). The EARs detail the issues of the proposed modification which BlueScope Steel is to address in the EA. A summary of the EARs and where each issue has been addressed in this EA is outlined in **Appendix C**.

BlueScope Steel has also been meeting regularly with the DoP during the pre-lodgement phase of the EA.

2.1.2 Consultation with the Department of Environment and Climate Change

Regular consultation has occurred between the Department of Environment and Climate Change (DECC) and BlueScope Steel. These regular meetings have allowed BlueScope Steel to discuss the proposed modifications and the status of environmental impact assessments. In addition, these meetings have provided DECC with the opportunity to raise questions, queries and concerns regarding the proposed modifications for BlueScope Steel to consider and address.

On the 11th November 2005 and 13th December 2005, DECC and BlueScope Steel met to discuss the proposed modifications to the existing consent, namely the proposed modification from the approved recirculating fresh water cooling system to a once-through salt water cooling system.

The following information was provided to DECC:

- BlueScope Steel Presentation, 11 November 2005
- Report entitled, "*Review of the likely ecological effects of increased temperatures in Allans Creek and Port Kembla Harbour* (J. Carey School of Botany, University of Melbourne, April 2005)
- *Numerical Modelling of Cooling Water Field – Progress Report 3* (CLT 2005).

DECC subsequently reviewed the above reports and responded with a number of issues to be addressed in correspondence dated 21 December 2005.

Further to a meeting between BlueScope Steel and DECC on 18 October 2007, DECC raised additional issues to be addressed in correspondence dated 26 October 2007.

Regular meetings have been held between BlueScope Steel and DECC to provide a forum for open discussion and communication to ensure the environmental assessment process for the proposed modifications is effectively managed.

2.1.3 Department of Water and Energy

BlueScope Steel has liaised with the Department of Water and Energy (DWE) regarding the proposed modifications. Controlled Activity Approvals are required from the DWE for any works within 40 m of waterfront land (i.e. works within 40 m of Allan's Creek) under the *Water Management Act* 2000 (see **Section 5.1.2**). BlueScope Steel provided plans and drawings regarding the proposed modifications to DWE.

On 4 March 2008, DWE issued a Controlled Activity Approval (Reference ERM 2008/04753) for the following activities:

- Construction of an LDG gas holder; and
- Salt water cooling pipeline and outlet on Allan's Creek.

The Approval from DWE has been appended by the DoP to the EARs (see **Appendix B**).

BlueScope Steel will seek further Controlled Activity Approvals for any additional works within 40 m of Allan's Creek or on any other waterfront land.

2.1.4 Department of Primary Industries

On 4 February 2008, BlueScope Steel provided the Department of Primary Industries (DPI) Fisheries Division with a copy of the Preliminary EA outlining the proposed modifications to the ICP Project at the PKSW. The letter requested that DPI identify any key issues and environmental assessment requirements to be addressed in the EA.

The DPI responded in correspondence dated 18 February 2008 outlining the issues BlueScope Steel was required to address. This correspondence was included as part of the EARs (see **Appendix B**).

2.1.5 Port Kembla Port Corporation

The Port Kembla Port Corporation (PKPC) is responsible for the environmental management and commercial operation of the port of Port Kembla, including all land, water and infrastructure. NSW Maritime is the state government department that owns the harbour bed and any vacant portside land. NSW Maritime was not consulted in the preparation of this EA as the PKPC, in its role as operational and environmental manager of the Harbour, is considered the appropriate agency to consult.

BlueScope Steel outlined the proposed modifications of the ICP Project to the PKPC in a presentation on 6 February 2008. Since then, BlueScope Steel has kept in contact with the PKPC to ensure the PKPC is informed of the progress of the proposed modifications to the ICP Project.

2.1.6 Roads and Traffic Authority

BlueScope Steel provided the Roads and Traffic Authority with correspondence outlining the proposed modifications to the ICP Project. The RTA reviewed the information provided and concluded that the proposed modifications were unlikely to lead to any additional traffic impact on the external road network. The RTA concluded that it had no objections to the proposed modifications. This correspondence was appended to the EARs (see **Appendix B**).

In addition, the RTA was consulted regarding the proposed transmission line route from the HV substation within PKSW to the Integral Energy substation. BlueScope Steel discussed the options for the transmission line route to travel below Springhill Road and/or under the rail corridor. The RTA, in correspondence dated 10 April 2008, indicated that it would have no objection, in principal, to the proposed works. Application for approval of the required works would be sought under the Roads Act 1993.

BlueScope Steel will continue to consult with the RTA regarding any construction works which may impact on the RTA's property.

2.1.7 RailCorp

BlueScope Steel has advised RailCorp that the proposed modifications include a high voltage connection to Integral Energy. The connection would be required to cross RailCorp land. BlueScope Steel presented two options for crossing RailCorp property between Lysaght and Cringila stations. Consultation has included site inspections with RailCorp's Rail Corridor Management Group.

RailCorp has advised BlueScope Steel of their consent for BlueScope Steel to lodge the modification application. However, BlueScope Steel will still be required to apply for permission from RailCorp to carry out works in and around the rail corridor after the Minister for Planning's determination.

BlueScope Steel will continue to liaise with RailCorp and seek permission to perform any works across RailCorp land.

2.1.8 Wollongong City Council

Wollongong City Council (WCC) was the consent authority for the approved ICP Project. Although the Minister for Planning is the approval authority for the proposed modifications, after determination by the Minister for Planning, WCC will retain responsibility for the development consent for the ICP Project.

BlueScope Steel has regularly consulted with WCC regarding the proposed modifications. In correspondence dated 19 February 2008, WCC requested involvement during the modification application assessment period and formulation of conditions of approval. This correspondence has been appended to the EARs (see **Appendix B**). BlueScope Steel has maintained regular contact with WCC during the planning approvals process.

2.2 Community Consultation

BlueScope Steel recognises the importance of community consultation not only during the planning approvals process but during the construction and commissioning phases of the Project.

During the ICP Project's inception and during the original planning approvals process, BlueScope Steel undertook considerable measures to ensure the community was well informed of the proposed project. These measures included the identification of stakeholders affected or interested in the ICP Project and the instigation of forums to facilitate open communication and discussion. In addition, a toll-free Community Affairs Hotline was set up so the community could have any questions or queries responded to by the ICP Project team directly.

Due to the proposed modifications as outlined in this EA, BlueScope Steel is continuing to ensure that the community is well informed of the proposed modifications.

On 6 February 2008 BlueScope Steel addressed the Port Kembla Harbour Environment Group (PKHEG). The PKHEG is a collaborative consultation group which has evolved from the Port Users Group and the various interest groups around the Harbour. It is made up of representatives from Port Kembla Ports Corporation, Port Kembla Harbour industries including BlueScope Steel, GrainCorp, and Port Kembla Coal Terminal. It also includes representatives from DECC, WCC, University of Wollongong, Environment Groups such as Friends of Tom Thumb Wetland and representatives from the broader community.

BlueScope Steel took the opportunity to give a presentation on the ICP Project and the current proposed modifications. This presentation enabled the proposed modifications, the reasoning behind the changes and the benefits and predicted impacts associated with the Project to be discussed with the community. Additionally, BlueScope Steel's presence at the PKHEG meeting gave members of the broader community a forum to put questions directly to BlueScope Steel.

BlueScope Steel is currently developing a communication plan to disseminate information to key community groups and stakeholders and to provide a forum to discuss the proposed modifications to the ICP Project.

3 Existing Environment and Existing Development Consent

3.1 Existing Environment

The PKSW is a 742 ha industrial site located in the Wollongong Local Government Area (see **Figure 1-1**). Approximately 80km from Sydney and 2.5km from the City of Wollongong, the PKSW is the largest steel production facility in Australia. The PKSW specialises in the production of flat steel products, including slab, hot rolled coil, cold rolled coil, plate and value-added metallic coated and painted steel products.

The site comprises the No.1 Works, No.2 Works, Steelhaven and the Recycling Area. The No.2 Works is divided into two sections by Allan's Creek. The southern half of the No.2 Works comprises the Cokemaking, Ironmaking and Steelmaking Facilities, while the northern half contains the 21 Processing Area and the Flat Products section (see **Figure 3-1**).

The PKSW operates under the existing Environment Protection Licence (EPL) 6092 (see **Section 5.1.2**).[1]

All sections of the PKSW are internally linked by road and rail and are currently provided with electricity, water and gas services.

3.1.1 Iron and Steelmaking Process

Primary iron production is undertaken in two blast furnaces (No. 5 and No. 6) which produce in excess of 15 000 tonnes of iron per day. Blast furnace gas (BFG) is a by-product of this process. The production of iron in the blast furnaces is supported by other primary operations; namely the coke ovens, sinter plant and ore handling facilities. The coke ovens convert metallurgical coal into coke for use as the reducing agent in the blast furnaces. Coke ovens gas (COG) is a by-product gas of the coke-making processes. BFG and COG are used extensively across the PKSW as a fuel with the excess flared to atmosphere.

Secondary processing of the iron to form steel is undertaken in the Basic Oxygen Steelmaking (BOS) Plant. This process involves burning out impurities from the iron by blowing oxygen into a molten mixture of iron, scrap steel and alloying agents. BOS off-gas is a by-product of this operation, produced intermittently due to the batch operation of the three BOS vessels. Currently, all of BOS off-gas is currently sent to flare (see **Figure 3-2**).

Steel produced in the BOS process is then moved to one of three casting machines where steel slabs, one of the main products of PKSW, are produced. The other main production area on the PKSW comprises hot rolling mills and

[1] *It is noted that the Springhill Works operates under a separate EPL (No. 571).*

cold rolling mills. These facilities convert the slabs from the slab caster into either coils of strip steel or flat plates of varying thickness.

3.1.2 Existing Facilities for the Generation of Steam and Power

Currently, the PKSW generates all of its steam and approximately 15% of its power requirements internally in two facilities:

- No.1 Power House; and
- No.2 Blower Station.

The existing boilers currently burn a combination of BFG and COG which are by-products of the iron and steelmaking process. The facilities also burn natural gas which is not a by-product gas, but is imported to the PKSW.

No. 1 Power House

The No. 1 Power House was built in 1928 and currently generates electricity for the PKSW. Medium Pressure (MP) steam is used for driving two steam turbine generators (STGs) which have a combined electrical output of 30 mega watts (MW).

Salt water from Port Kembla Harbour is currently used to cool the STG condensers at the No. 1 Power House. The cooling water is then discharged back into Allan's Creek via the Main Drain at a rate of approximately 124ML/day with a temperature differential (ΔT) of 10°C (i.e. the discharge temperature is approximately 10°C higher than the intake water temperature).

No. 2 Blower Station

The No. 2 Blower Station was built progressively from the 1950's to 1980's. The No. 2 Blower Station operates five boilers which produce high pressure (HP) steam and have a cycle efficiency for converting fuel to power of approximately 25%. A description of the No. 2 Blower Station boilers and stacks is outlined in **Table 3-1**. The HP steam generated is used for powering a number of steam turbines which drive air blowers, compressors and a generator.

Table 3-1 No. 2 Blower Station Boilers and Stacks

Boiler	Supplier and Year	Stack Height (m)	Exit Internal Diameter (m)	Fuel Inputs	Steam flow Design (t/h)	Burners Required
No. 21	Babcock and Wilcox; 1959	61	4.284	COG	90	6
				BFG	82	6
				Natural Gas	36	2
No. 22	Babcock and Wilcox; 1960	61	4.284	COG	90	6
				BFG	82	6
				Natural Gas	36	2
No. 23	Babcock and Wilcox; 1970	61	3.6	COG	100	6
				BFG	120	8
				Fuel Oil	145	8

Boiler	Supplier and Year	Stack Height (m)	Exit Internal Diameter (m)	Fuel Inputs	Steam flow Design (t/h)	Burners Required
				Natural Gas	60	2
No. 24	Babcock and Wilcox; 1971	61	3.6	COG	100	6
				BFG	120	8
				Fuel Oil	145	8
				Natural Gas	60	2
No. 25	Babcock and Wilcox; 1983	63	2.59	COG	180	8
				BFG	140	8
				Natural Gas (pilot)	20	8
				Natural gas (main)	180	8

The No. 2 Blower Station uses make-up water at approximately 1.886 ML/day from the water treatment plant installed at the No. 2 Blower Station. Approximately 0.15 ML/day of boiler blow-down is discharged from the No. 2 Blower Station into Allan's Creek.

Salt water is currently pumped from Port Kembla Harbour, directed through a channel to the No. 2 Blower Station and used as cooling water for the No. 2 Blower Station's steam turbine condensers. Up to 720ML/day is used as cooling water which is discharged into Allan's Creek with a ΔT of approximately 6°C.

3.1.3 Existing Energy Sources at Port Kembla Steelworks

The iron and steelmaking process results in the generation of several combustible by-product gases. They include BFG, COG and BOS off-gas. These by-product fuels, as well as natural gas (which is imported to the PKSW), are discussed below.

Blast Furnace Gas (BFG)

BFG is produced by Blast Furnaces No. 5 and No. 6. Approximately 50% of BFG generated is used for heating in the coke ovens batteries and blast furnace stoves. The remainder is available as fuel to generate steam at the No. 2 Blower Station. Excess BFG is sent to flare. A gas holder with a maximum capacity of 142,000 m^3 is used to regulate the pressure in the system and to provide a degree of storage to reduce flaring during periods of irregular gas generation or consumption.

Coke Ovens Gas (COG)

COG is produced in four coke ovens. Approximately 82% is consumed by various facilities across the PKSW with approximately 18% directed to the No. 2 Blower Station. Excess COG is sent to flare. A gas holder with a maximum capacity of 85,000 m^3 is used to regulate the pressure in the system and to provide a degree of storage to reduce flaring during periods of irregular gas generation or consumption.

Basic Oxygen Steelmaking (BOS) Off-Gas / Linz-Donawitz Gas (LDG)

BOS off-gas is produced during oxygen blowing in the BOS process. This gas is produced intermittently due to the batch operation of the BOS vessels and as there currently are no collection facilities, all of this gas is disposed of by combustion in flares. It is common for BOS off-gas, once it is diverted into a collection system, to be called Linz-Donawitz Gas (LDG).

Natural Gas (imported)

The PKSW imports natural gas which is directed to various users throughout the Steelworks including the boilers in the No. 2 Blower Station to ensure complete and stable combustion of the by-product gases. It is also possible to fire natural gas in the No. 2 Blower Station boilers if the supply of by-product gases is interrupted. Natural gas is delivered to the PKSW via a pipeline which terminates at the western boundary of the site.

3.2 Description of the Existing Development Consent (DA 767/01)

The main components of the existing Development Consent (DA No. 767/01) issued by WCC on 9 August 2002 to construct and operate the ICP Project are:

- A 225 MW condensing steam turbine generator (STG)
- Four boilers generating approximately 1,100 tonnes per hour (tph) of steam and auxiliary equipment required for the operation of the plant
- A substation and electrical connection (132 kV and 33 kV powerlines) from the cogeneration plant to the substation
- Basic Oxygen Steelmaking (BOS) Off-Gas collection system including a 70 m high by 40 m diameter gas holder
- A cooling tower system using tertiary treated effluent from Wollongong Sewage Treatment Plant (STP) and the piping and infrastructure for the connection of the Illawarra Cogeneration Plant to the Sewage Treatment Plant
- Piping and infrastructure connections from the ICP to BlueScope Steel infrastructure.

See **Figure 3-3** for the approved ICP Project and **Appendix D** for the Development Consent issued by WCC.

3.2.1 225 MW Condenser Steam Turbine Generator (the ICP)

Due to increases in BFG production, the No. 2 Blower Station boilers no longer have the capacity to consume all of the by-product gases generated at the PKSW. Excess BFG and COG are currently sent to flare with 100% BOS off-gas flared.

The approved ICP Project involved the decommissioning of electricity generating facilities at the No.1 Power House and the boilers of the No.2

Blower Station and construction of the ICP to generate steam and electricity at the PKSW.

The approved ICP location is immediately south of the No.2 Blower Station on land currently occupied by office space and some minor production facilities. The approved ICP occupied an area of approximately 8,000 m^2, excluding the BOS off-gas collection and storage facility. The main components of the ICP are:

- One nominal 225 MW condensing STG; and
- Four boilers burning a combination of Steelworks by-product gases and natural gas (see **Section 3.2.2**).

The ICP condensing STG was located to the north of Iron Ore Road with the four ICP boilers located south of Iron Ore Road (see **Figure 3-5**).

The approved ICP generated, on average, 145 MW of electricity and during peak periods, generate up to 225 MW to satisfy the increase in demand.

3.2.2 Four boilers generating approximately 1,100 tonnes per hour (tph) of steam and auxiliary equipment required for the operation of the plant

The approved ICP boilers would have burned COG, BFG and LDG, as well as natural gas (when required), to produce approximately 1,100 tonnes per hour (tph) of very high pressure (HHP) steam (see **Table 3-2** for description of the ICP boilers and stacks). The approved boilers were fitted with low NO_x burners.

The HHP steam was to be directed to the ICP STG. A proportion of high pressure HP steam would have been directed from the ICP STG to the No. 2 Blower Station to meet its steam requirements and the rest of the steam transported via pipelines to the ICP STG to produce power.

Table 3-2 Approved ICP Boilers and Stacks

Boiler	Supplier and Year	Stack Height (m)	Exit Internal Diameter (m)	Fuel Inputs	Exit Velocity (t/h)
No. 31	Ishikawajima Heavy Industries Co., Ltd	64	3.5	COG	15.2
				BFG	
				LDG	
				Natural Gas	
No. 32	Ishikawajima Heavy Industries Co., Ltd	64	3.5	COG	15.2
				BFG	
				LDG	
				Natural Gas	
No. 33	Ishikawajima Heavy Industries Co., Ltd	64	3.5	COG	15.2
				BFG	
				LDG	
				Natural Gas	
No. 34	Ishikawajima Heavy Industries Co., Ltd	64	3.5	COG	15.2
				BFG	
				LDG	
				Natural Gas	

3.2.3 Substation and electrical connection (132 kV and 33 kV powerlines) from the cogeneration plant to the substation.

The approved electrical substation was located adjacent to the Central Lab, just north of Five Islands Road. The substation consisted of a power transformer occupying an area of approximately 247 m^2 and a Gas Insulation Switch Room building occupying an area of approximately 152 m^2.

The approved electrical substation was connected to the ICP by a 132 kV powerline which will follow the existing salt water cooling channel. Other power cables with 33 kV capacities connected the ICP with existing substations within the PKSW.

3.2.4 Linz-Donawitz Gas (Basic Oxygen Steelmaking Waste Gas) (LDG) collection system including a 70 m high by 40 m diameter gas holder.

The approved ICP Project included a BOS off-gas collection system including a gas holder and piping and infrastructure connection. The gas holder is required to stabilise the flow of gas to the ICP, providing a continuous supply of BOS-off gas.

BOS off-gas was collected from the BOS Plant and transported through ducting to a gas holder 70 m high by 40 m in diameter. The approved gas holder had a capacity of 40,000 m^3 and a footprint of approximately 3,800 m^2. A booster fan assisted the gas transport to, and from, the gas holder. The gas holder and accompanying booster fans were to be located south of the No. 5 Blast Furnace.

3.2.5 A cooling tower system using tertiary treated effluent (TTE) from the Wollongong Sewage Treatment Plant (STP) and the piping and infrastructure for the connection of the ICP to the STP.

The approved ICP Project includes the operation of a recirculated fresh water cooling system cooled by a number of cooling towers. The approved cooling tower was to be located on the northern part of the ICP site with the following dimensions: 117 m long by 15.3 m wide by 12 m high. The cooling tower flow rate is approximately 650 ML/day for a ΔT of 10°C. The cooling tower would utilise approximately 10ML/day of tertiary treated effluent (TTE) from Wollongong Sewage Treatment Plant (STP) as system make-up water (with dam water as a back-up if TTE was not available).

The cooling system required treatment of a biocide to control the growth of bacteria such as Legionella.

3.2.6 Piping and infrastructure connections from the ICP to BlueScope Steel infrastructure.

Additional piping and infrastructure connections include:

- Fuel pipelines to transfer gases (BFG, COG and natural gas) to the ICP boilers from the existing gas mains

- Steam pipelines to connect the ICP and the No.2 Blower Station
- Water supply pipelines for process water, drinking water, general site water uses as well as fire protection water
- Nitrogen and compressed air pipelines.

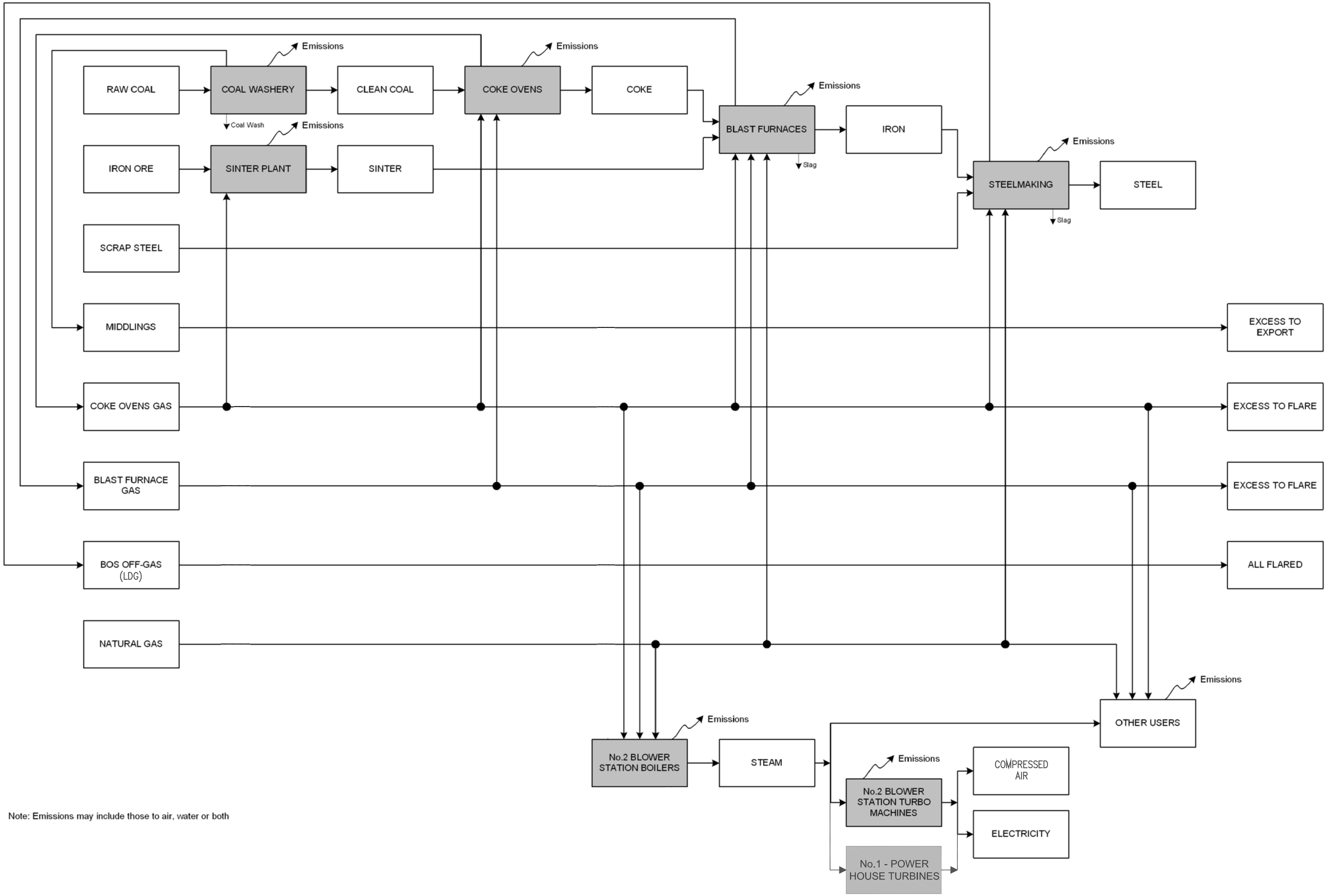
The approved ICP Project is shown in **Figure 3-3** and a process flow diagram of the approved ICP operations is outlined in **Figure 3-4.** See **Figure 3-5** for the approved ICP site layout.

3.3 Description of the Development Consent as Previously Modified (DA 767/01A)

The Development Consent as issued by WCC on the 9 August 2002 was subsequently modified by WCC on application by BlueScope Steel (DA No. D767/01A – see **Appendix D**) to enable the construction of the Project in two stages, being the construction of an LDG delivery duct and its steel supports and foundations (Stage 1) and the construction of the remainder of the ICP (Stage 2). BlueScope Steel completed construction of Stage 1 of the Project.

The Development Consent incorporates General Terms of Approval (GTAs) from the NSW Environment Protection Authority (EPA, now part of the Department of Environment and Climate Change, DECC) as well as required changes to the existing Environment Protection License (EPL No. 6092) for PKSW.

Figure 3.1
Port Kembla Steelworks



Note: Emissions may include those to air, water or both

Figure 3.2
Existing (Pre ICP) Port Kembla Steelworks Process Flow Diagram

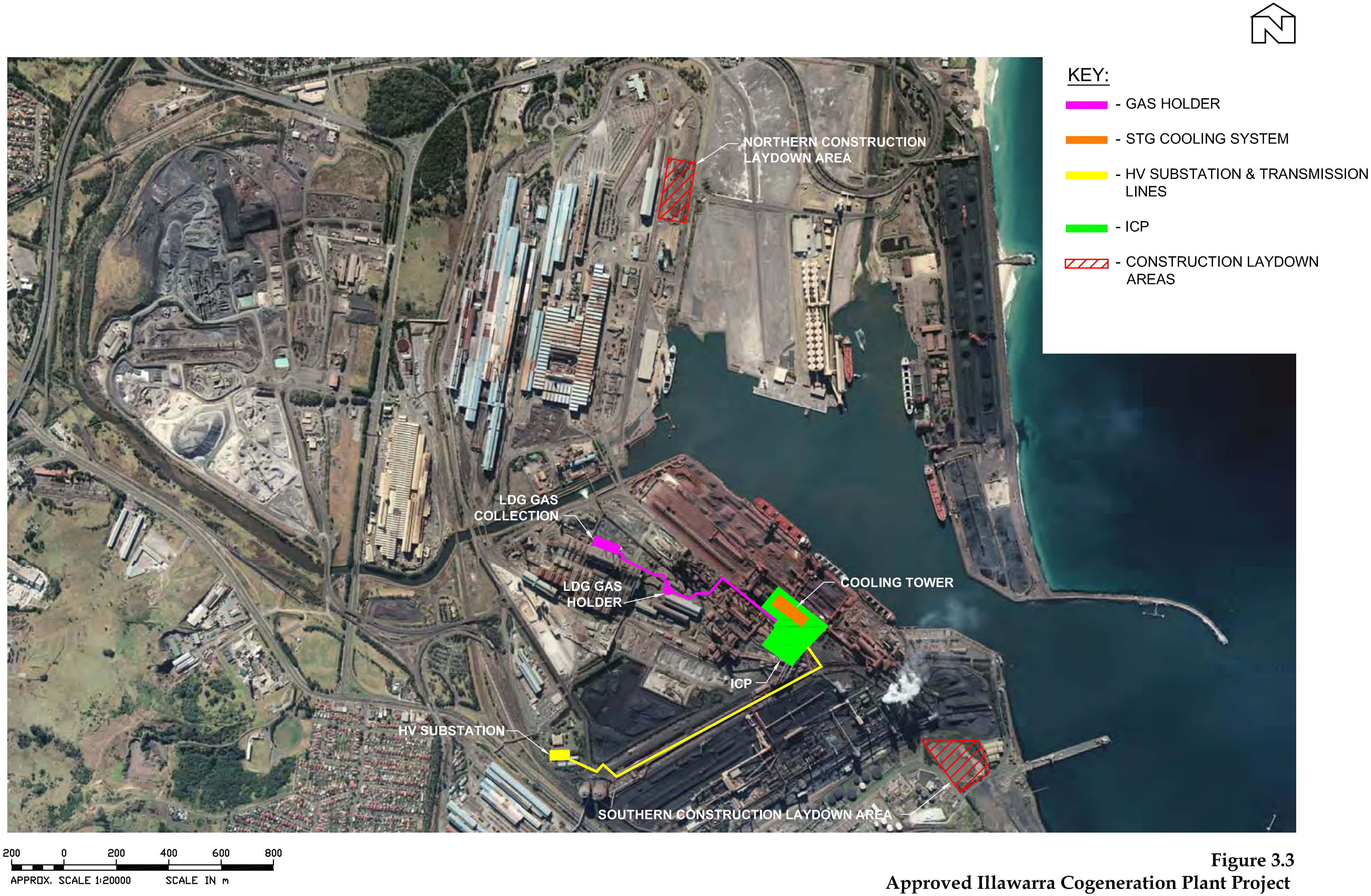


Figure 3.3
Approved Illawarra Cogeneration Plant Project

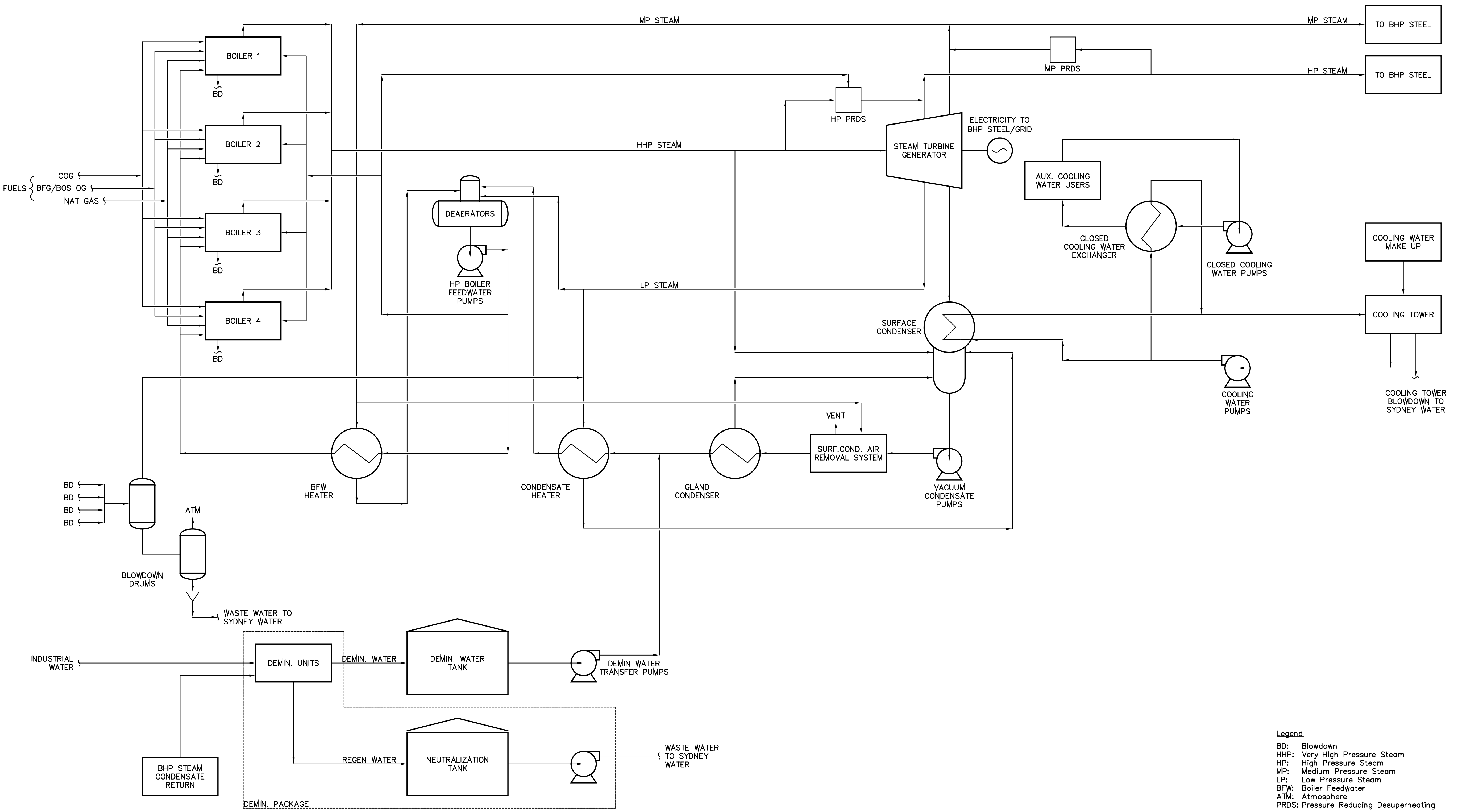


Figure 3.4
Approved ICP Process Flow Diagram

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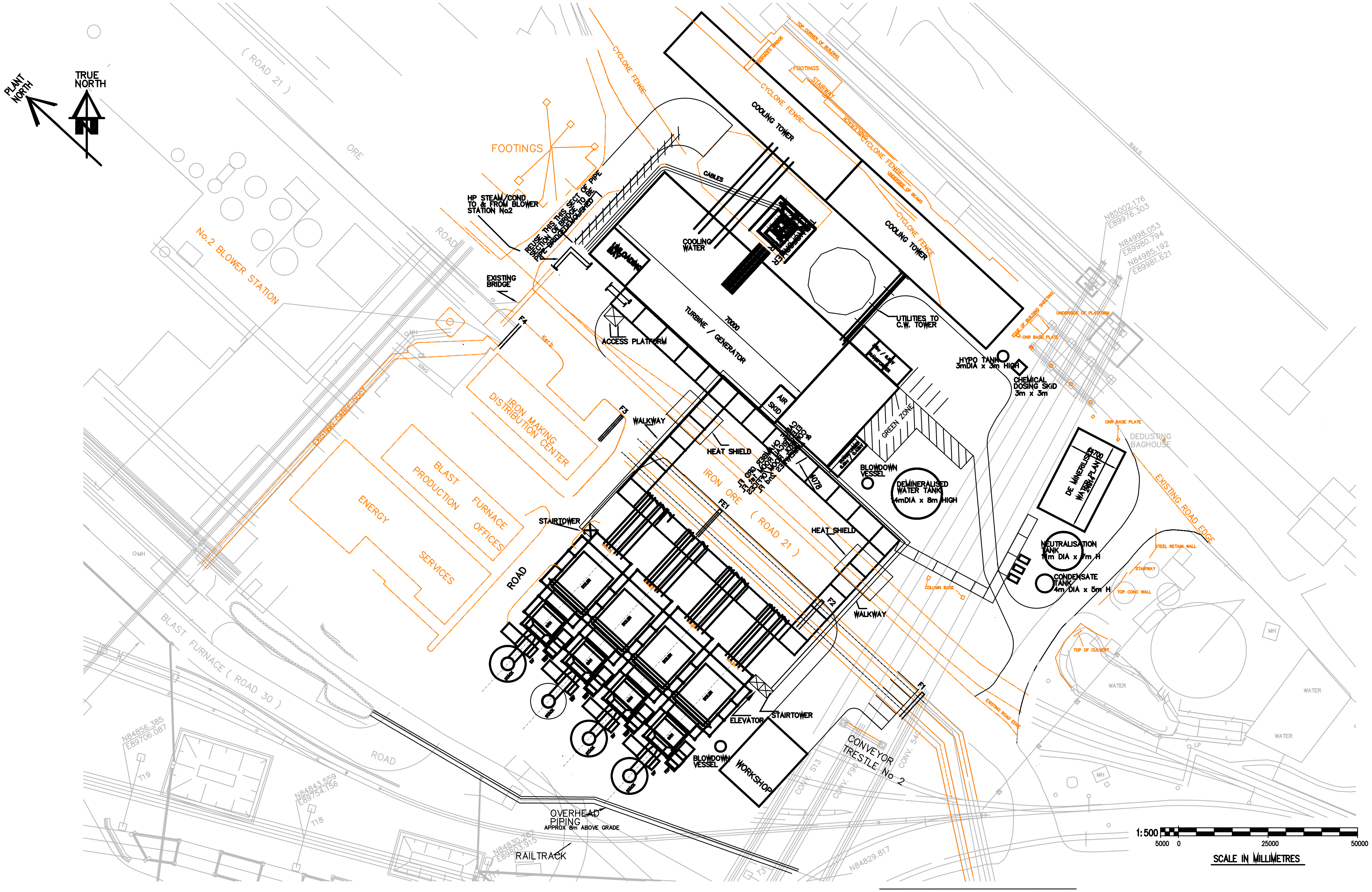

Figure 3.5
Site Layout of Approved ICP

4 Proposed Modifications and Associated Benefits

4.1 Scope of Modification

Since the Development Consent was issued by WCC in 2002 and modified in 2005, changes both external and internal to the PKSW have occurred. In response to those changes, BlueScope Steel is proposing to modify the approved ICP Project (DA767/01A). The key modifications include:

- Installation of three new boilers (approximately 366 tonnes per hour (tph) each), instead of four new boilers, and the continued use of the upgraded No. 25 Boiler (until No.25 Boiler is decommissioned when no longer economically viable).
- Changing the location of the proposed LDG holder to another location within the PKSW site. The proposed location is north of Allan's Creek and is in a safer, more remote location.
- Changing the size of the LDG holder from 70 m x 40 m to 60 m x 66 m diameter. The increase in size will result in improved capture of LDG currently flared.
- Replacing the recirculated fresh water cooling system and cooling towers for the ICP Project with the use of once-through salt water and discharging spent water into Port Kembla Inner Harbour. The TTE intended to be used in the earlier approved system is potentially available for use in the PKSW. BlueScope Steel is in discussions with Sydney Water to use that water (further treated to "Recycled Industrial Water" quality - RIW) to further reduce dam water consumption at PKSW. The change to a once-through salt water cooling system will also substantially reduce the need for hazardous chemical storage on-site.
- Amending the layout and connection configurations of the ICP Project having regard to the above changes, as well as changes in the way that the power plant connects to the external electricity grid. The amended layout includes relocation of the high voltage substation from next to the existing gas holders to Area 18 (within PKSW). This will also involve the extension of the 132 kV cable to reach Area 18 and the inclusion of a 33 kV sixth incoming cable.
- Consolidating the ICP Project footprint.
- Relocating construction laydown areas. The construction laydown areas will be relocated within "21 Recycling Area", west of Springhill Road.

These proposed modifications are discussed in detail below and are outlined in **Figure 4-1**.

Figure 4-2 shows the ICP in the iron and steelmaking process.

See the end of the EA report, "Additional ICP Project Plans" for additional detailed plans of the following components of the ICP Project:

- Illawarra Cogeneration Plant
- Gas holder
- HV Substation
- Transmission line route
- Salt water cooling system including the discharge device.

4.1.1 Modification to Approved Boilers

The existing Development Consent permits the construction and commissioning of four boilers with the capacity to generate 275 tonnes per hour (tph) of steam each, producing a total of 1,100 tph of steam (refer **Section 3.2.2**).

A recent investment by BlueScope Steel of approximately $14 million to upgrade the existing No. 25 Boiler has extended its economic operating life, thereby negating the need to construct four new boilers.

BlueScope Steel is proposing to modify the Development Consent by constructing three new boilers (refer **Table 3-2**) and retaining and utilising No. 25 Boiler (refer **Table 3-1**) as the fourth boiler, for the remainder of its economic life.

The new boilers will have a height of approximately 45m and the boiler stacks will be 64m high.

The No. 25 Boiler has a capacity of 140tph of steam generation which is smaller than the originally proposed new boilers. To offset the smaller boiler, it is proposed that the three new boilers will each be larger (approximately 366 tph) to utilise the maximum amount of available by-products fuel.

See **Figure 4-3** for the proposed ICP process flow diagram and **Figure 4-4** for a conceptual model of the ICP.

During operation of the ICP Project, the No. 25 Boiler may come to the end of its operating life and be decommissioned. If this occurs, the remaining three new boilers will be of an adequate size to generate sufficient quantities of steam for the Steelwork's needs.

4.1.2 Modification to Gas Holder

The existing Development Consent includes a gas holder with a capacity of 40,000 m^3 located south of the No. 5 Blast Furnace to stabilise the LDG flow to the ICP.

The proposed modification involves the relocation of the gas holder (and accompanying booster fans which assist in the transport of the gas from the gas holder to the boilers) to the northern side of Allan's Creek (see **Figure 3-3** and **Figure 4-1)**.

The collected BOS off-gas (now referred to as LDG) will be transported through the new switching stations where the gas is diverted from the inlet of the existing flare stacks into the LDG supply main towards and over Allan's Creek to the new gas holder site (see **Figure 4-5**). As the gas travels along the main, some cooling will occur and condensate will drop out in the main. A number of condensate collection points will be provided along the gas main to allow continuous removal of condensate.

The gas will be transported back via a parallel pipeline over Allan's Creek, assisted by a booster fan, past the BOS to the ICP boilers where it will be burnt to produce steam used for power generation. Two booster fans will be provided.

Table 4-1 compares the gas holder dimensions currently approved and the proposed new dimensions.

Table 4-1 Gas Holder Dimensions

	Approved Gas Holder	Proposed Gas Holder
Height	70 m	66[a] m
Diameter	40 m	60[b] m
Capacity	40,000 m^3	120,000 m^3

[a] Gas holder shell height
[b] Gas holder shell inside diameter

The proposed holder will be capable of storing 120,000m^3. The gas holder will include all safety and monitoring features as previously approved.

The proposed modification has resulted from the construction of the No. 2 Walking Beam Furnace in the Hot Strip Mill. The slab reheat furnace is now utilising a substantial quantity of COG, reducing it's availability to be used as a counter cycling fuel in the ICP Project. It is necessary to provide a new gas holder of sufficient size to enable a more constant flow of LDG to the ICP during typical operations whilst collecting as close to practicable 100% of collectable LDG.

Due to the re-sizing of the gas holder from 40,000 m^3 to 120,000 m^3, its original position south of the No.5 Blast Furnace is not large enough to accommodate the structure. The new site north of Allan's Creek and west of the Cryogenic Plant was determined to be the best location for a gas holder with the proposed new dimensions. This site is approximately 750 m northwest of the approved site. A Preliminary Hazard Analysis (PHA) for the larger LDG gas holder has been prepared and does not indicate any areas of concern (see **Section 9.6**).

The benefits associated with the re-sizing and relocation of the gas holder include:

- The capture, storage and reuse of increased quantities of LDG;
- Reduction in LDG flaring
- Increased GHG emission reduction offsets
- Increased BlueScope Steel self sufficiency in electricity
- Relocation of gas holder to a more remote location within PKSW
- A reduction in the variability of LDG flow to the ICP boilers.

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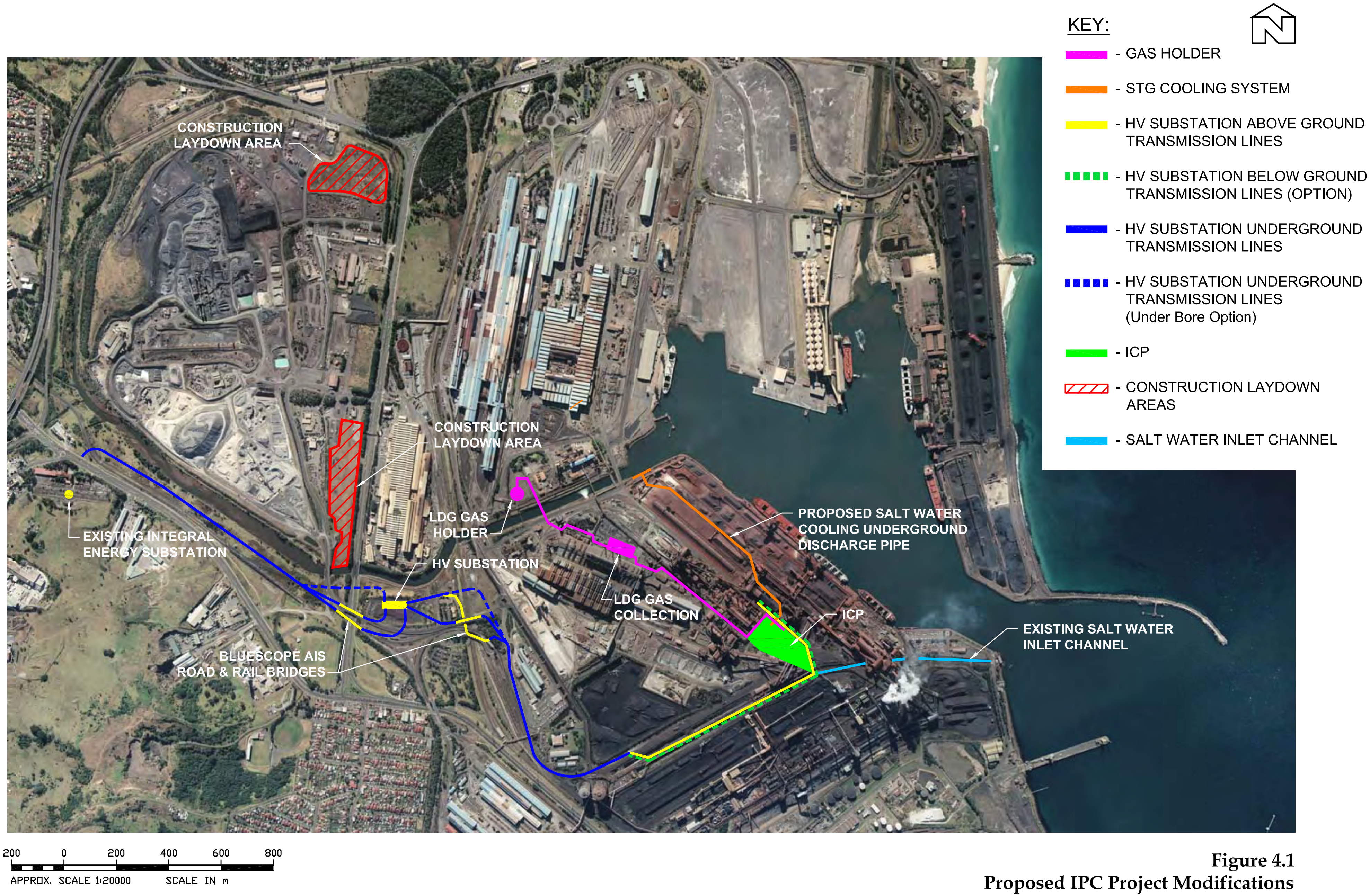

Figure 4.1
Proposed IPC Project Modifications

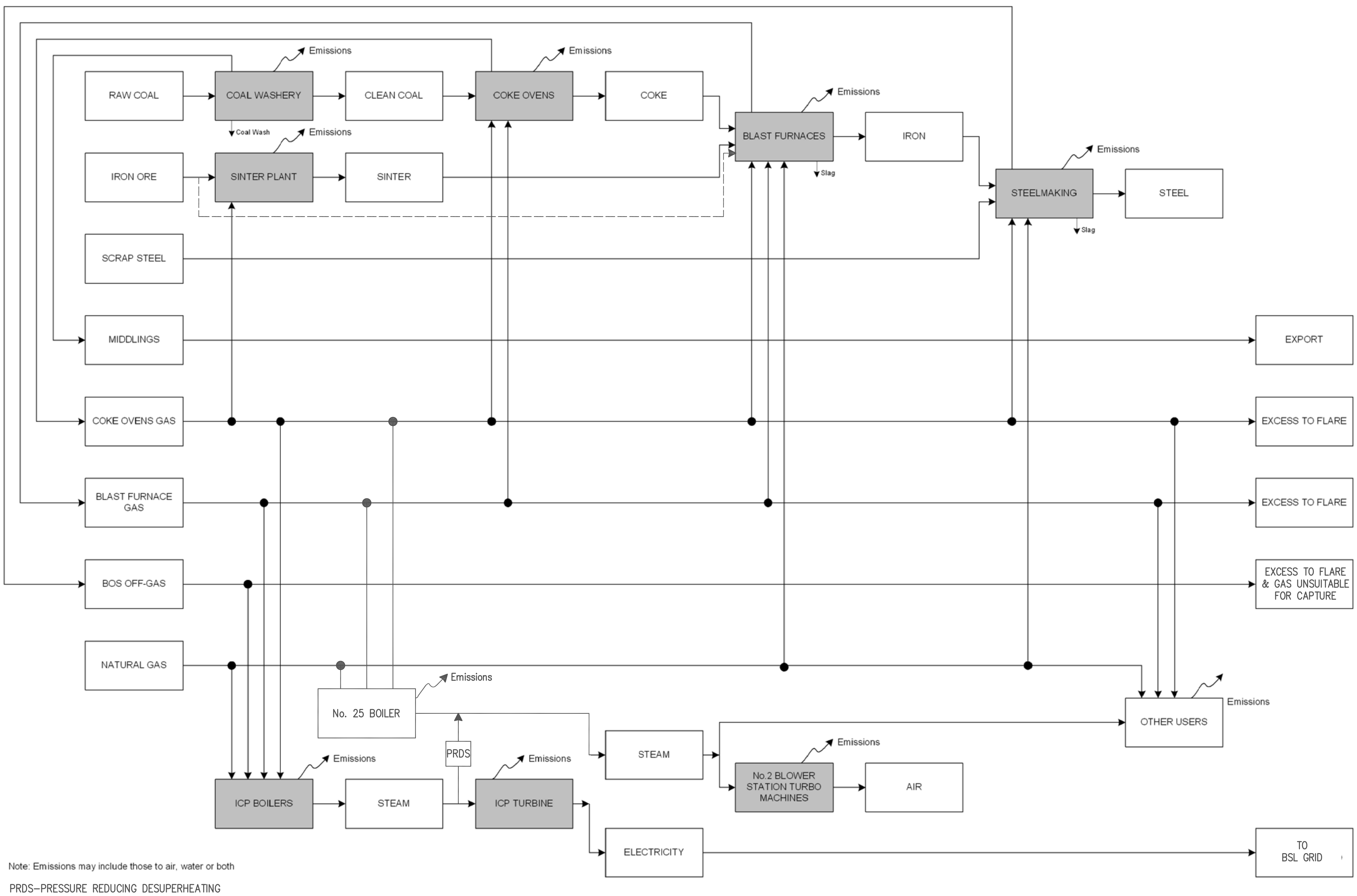

Figure 4.2
Port Kembla Steelworks Post-ICP Process Flow Diagram

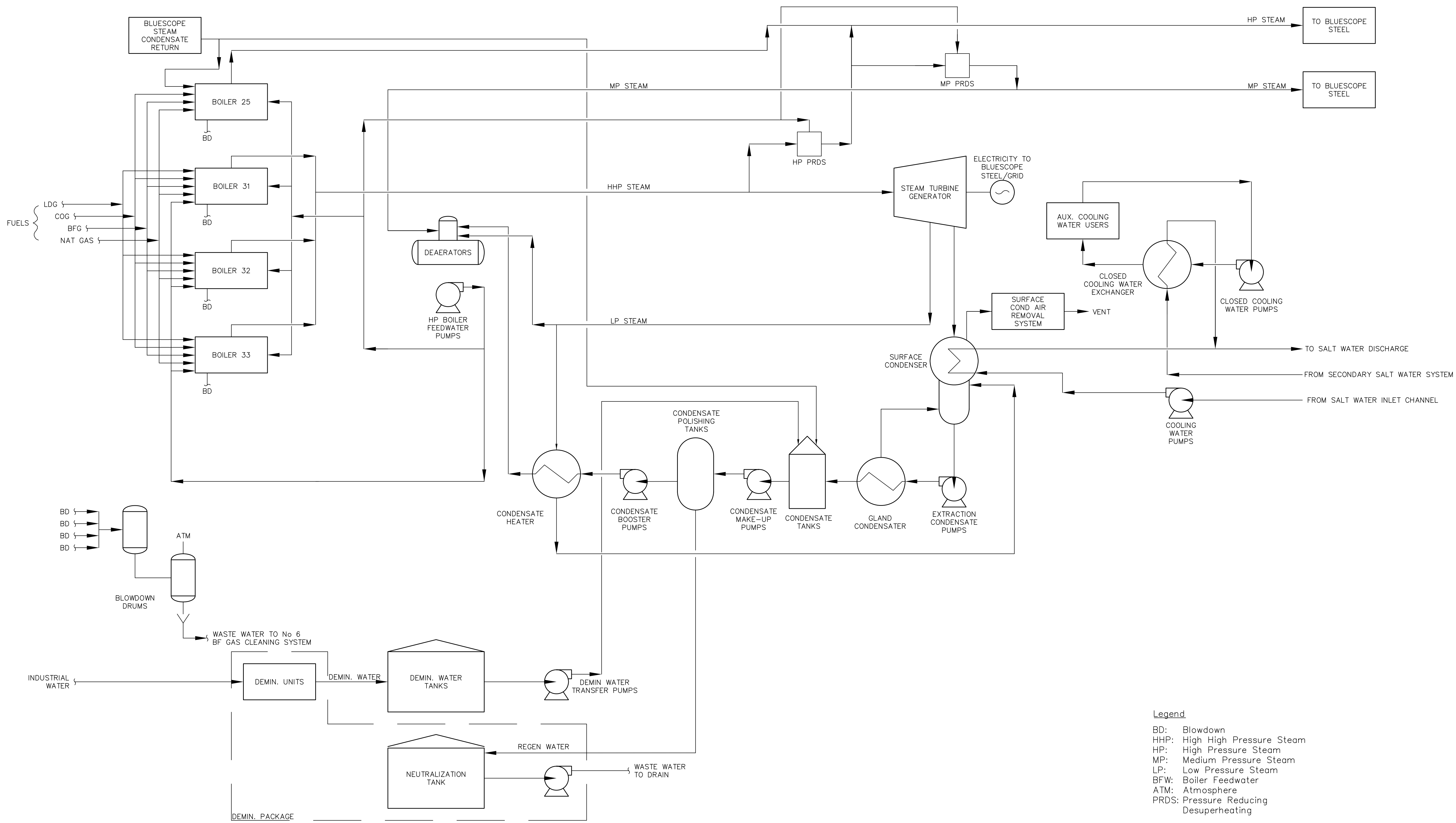

Figure 4.3
Proposed ICP Process Flow Diagram

Figure 4.4
ICP Conceptual Model

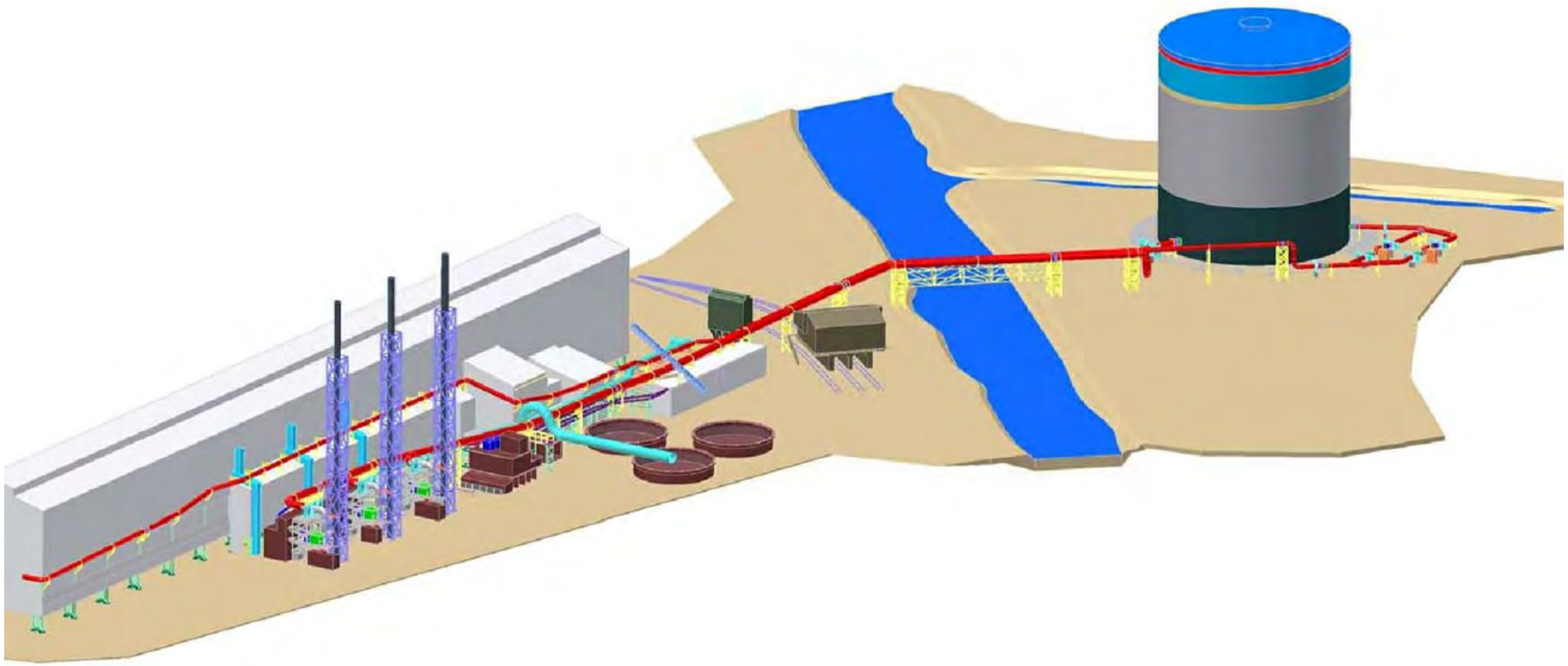

Figure 4.5
Gas Holder & Pipework Conceptual Model

4.1.3 Modification of Steam Turbine Generator (STG) Cooling System

BlueScope Steel is proposing to modify the approved STG cooling system. The cooling system provided in the existing Development Consent is a recirculated fresh water cooling system with cooling towers which would require the use of TTE from Wollongong STP as system make-up water (refer **Section 3.2.5**). The proposed modification will be a once-through salt water cooling system utilising salt water from Port Kembla Harbour.

The proposed modification involves drawing salt water from Port Kembla Harbour via the existing salt water channel utilising the spare capacity in the existing lift pumps at the entrance to the Port Kembla Inner Harbour ("the cut"). There are five existing pumps, with only 1-2 currently in operation which draw approximately 30,000m3/hr of salt water. The salt water is currently directed to the No.1 Power House and No. 2 Blower Station for cooling the steam turbine condensers.

The salt water will be used as cooling water through the condenser of the new ICP turbine then returned back to the Inner Harbour via underground pipelines and box culvert running adjacent to the Raw Materials Secondary Ore Yards and discharged via a new dispersion structure into the mouth of Allan's Creek (see **Figure 4-6).** The discharge point will be approximately 200m east from the existing Blower Station Drain discharge point, where Allan's Creek widens before joining Port Kembla Inner Harbour (see **Figure** 4-7**).**

The proposed modification would require 2-3 pumps in operation (with 1-2 pumps on standby) to be able to draw from Port Kembla Harbour up to 60,000 m^3/hr as cooling water supply to the ICP. Modification of the motors of some of the lift pumps may be required from the existing fixed speed to variable speed. This modification will give flow control which may remove the need to stop and start the lift pumps which impacts upon the flow and level of salt water in the channel.

The new pump inlet basin and the new pumping station located at the ICP site will provide an adequate and constant flow of salt water to be directed to the ICP via new pipeline infrastructure. The new pump inlet basin and the new pumping station will be constructed to draw approximately 30,000 m^3/hr of cooling water from the inlet channel, directing it to the ICP. In addition, some work may be required to facilitate the higher flow and higher water levels expected in the inlet channel.

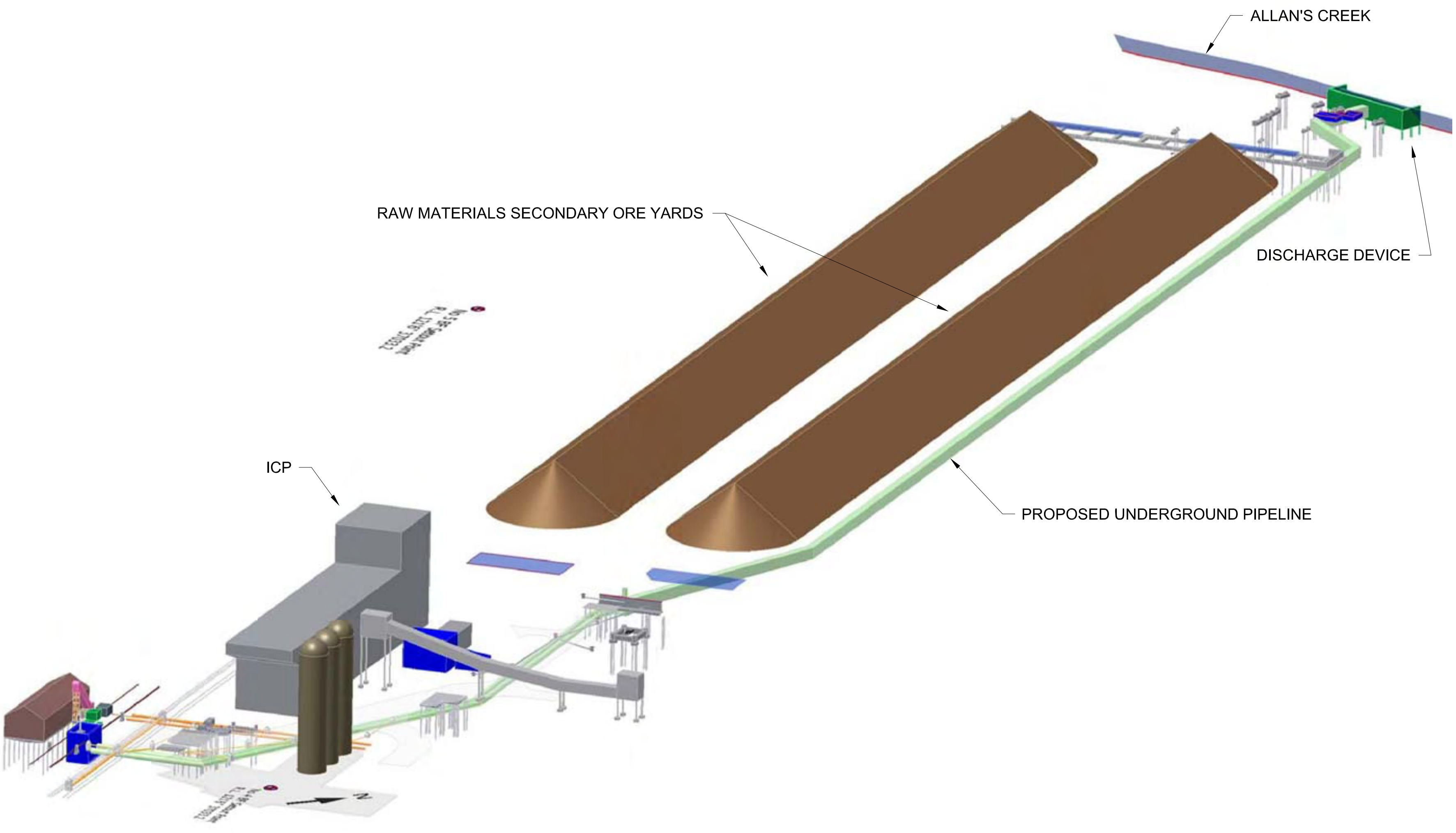

Figure 4.6
Salt Water Discharge Conceptual Model

Figure 4.7
Proposed Discharge Point

As a result of the proposed modification, a method to control macro-fouling of the salt water pipework will be required. It is BlueScope Steel's preferred option to use thermal treatment which involves recirculating heated salt water through the cooling system, however intermittent dosing of an anti-fouling agent or a combination of both may be required. The use of any anti-fouling agent will be carefully controlled using procedures consistent with routine procedures currently in use at PKSW (see **Section 9.3.4**).

Regionally, and locally, water has increasingly become a more valued resource. Mandatory water restrictions have been imposed as a result of drought affected water catchment areas which are unable to adequately replenish dam levels. This has resulted in the need to reduce water consumption and increase efficient water usage. In accordance with the Federal and NSW government's water conservation policies and BlueScope Steel's own corporate goals and objectives, BlueScope Steel is actively taking measures to reduce its reliance on potable dam water for industrial processes.

The TTE intended to be used in the earlier approved system is potentially available for use in the PKSW. BlueScope Steel is in discussions with Sydney Water to use that water (further treated to RIW) to further reduce dam water consumption at PKSW.

Other benefits of this proposed modification include:

- Elimination of the blow down waste stream from the cooling towers back to the STP
- Certainty of availability and quality of the salt water resource
- Removal of the cooling towers and the associated operational issues such as:
  - Large on-site chemical inventory necessary for it's operation (see **Table 4-2** and **Table 4-3** for a comparison of the chemical inventory required for the approved cooling tower and proposed salt water cooling)
  - The large visible plume from the cooling tower.

Table 4-2 Chemical Inventory Required for the Approved Cooling Tower

System Description	Product	Annual Usage (kgs)	Maximum quantity to be held on site (kgs)
ICP Cooling (TTE Towers)	Dianodic DN 2317	12,969	3,000
	Inhibitor AZ 8104	3,843	500
	Flogard MS 6208	2,402	500
	Spectrus BD 1500	2,402	500
	Spectrus OX 1201	44,677	5,000
	98% Sulphuric Acid	284,059	10,000
	Sodium Hypochlorite	430,876	20,000

Table 4-3 Chemical Inventory Required for the Proposed Salt Water Cooling

System Description	Product	Annual Usage (kgs)	Maximum quantity to be held on site (kgs)
ICP Cooling (Saltwater)	Spectrus CT1300	12,500	2000

Note: Chemicals used for treating boiler plant & auxiliary plant not included
Note: To be used in salt water inlet channel and, if required, in the STG cooling circuit.

4.1.4 Relocation of high voltage (HV) substation and associated power cables

The Development Consent includes electrical connections (132 kV and 33 kV) running parallel along Sinter Plant Road from the Project to a proposed electrical substation on Five Islands Road adjacent to the existing gas holders.

The substation is now proposed to be located further north west, to the east of Springhill Road at "Area 18" and adjacent to Allan's Creek (refer **Figure 4-1).** As indicated in **Figure 4-1**, the transmission lines are likely to run underground. Based on further analyses, the transmission line route will either run aboveground over main roads and railway lines (where it will run across the bridge structure) and along Iron Ore Road within the PKSW site or alternatively, run under Springhill Road and the rail corridor if geotechnical reports conclude it is safe to do so.

4.1.5 Consolidation of ICP Footprint

The ICP Project as approved in the Development Consent was to be located south-east of the No.2 Blower Station on two sites separated by Iron Ore Road, occupied by the former No. 4 Blast Furnace on the eastern side of the road and various production and office facilities on the western side of the road (refer **Section 3.2.1**).

The proposed removal of the cooling towers substantially reduces the overall footprint of the Project. It is therefore proposed to relocate the turbine hall of the Project from the former No. 4 Blast Furnace site to the western side of the road. The turbine hall is now proposed to be built north of Sinter Plant Road, in the same location as the boilers and other ancillary equipment, consolidating the Project footprint on a smaller total area of land. This change requires the relocation of water treatment facilities associated with the Project to the area immediately north of the No. 2 Blower Station (see **Figure 4-8**).

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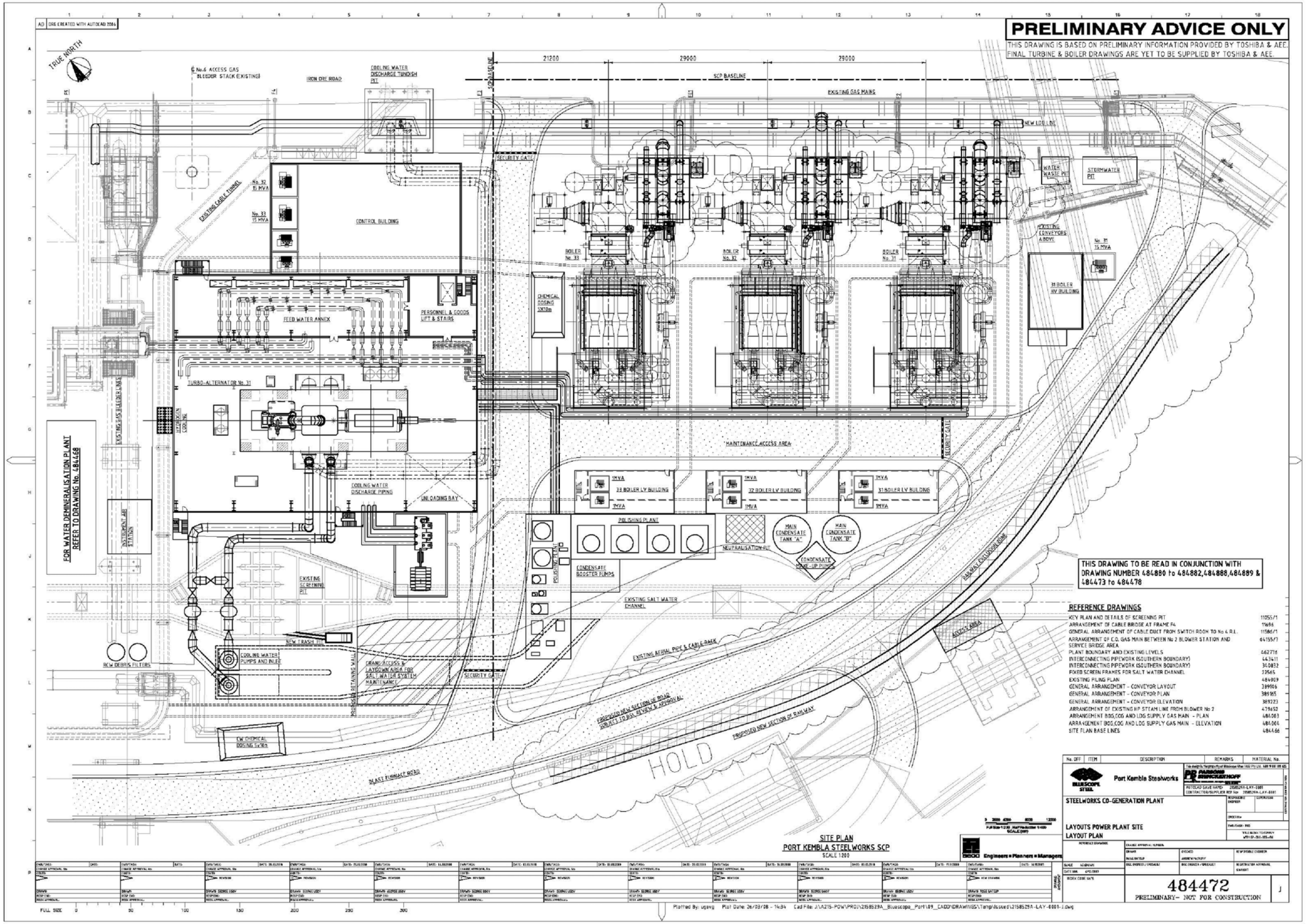

Figure 4.8
Proposed ICP Site Layout

In addition, consolidating the footprint ensures the most efficient use of the site and avoids having a road and railway line run through the middle of the site. It also allows for the expansion of any surrounding facilities such as the Raw Materials Handling Area in the future.

The clearing of buildings and minor production facilities necessary to allow the construction of the ICP Project, along with the construction of replacement facilities in other locations have been approved under separate development consents to WCC.

4.1.6 Relocation of Construction Laydown Areas

The approved construction laydown areas consist of two sites, a northern laydown area and a southern laydown area. The northern area was located between Tom Thumb Road and Illawarra Road east of the Products Dispatch Export Warehouse. The southern area was bordered by Flinders St, Old Port Road, Stockpile Road and Christy Drive, south of the coke stockpile.

As the approved laydown areas are currently being utilised, alternate laydown areas are proposed on land within "21 Recycling Area", west of Springhill Road (refer **Figure 4-1**). 21 Recycling Area is a recycling, spares and storage area within the boundary of PKSW and is regularly used for laydown of equipment.

5 Planning and Legislative Requirements

5.1 The Approvals Process

5.1.1 Planning Approval

The *Environmental Planning and Assessment Act* 1979 (EP&A Act) and the *Environmental Planning and Assessment Regulation* 2000 (EP&A Regulation) provide the framework for the assessment of the environmental impact of development proposals in NSW.

Section 5 outlines the objectives of the EP&A Act. These objectives include:

(a) the encouragement of:

i) *the proper management, development and conservation of natural and artificial resources…* (see **Section 1.3**),

ii) *the promotion and co-ordination of the orderly and economic use and development of land* (see **Section 3.1**),

iii) *the protection, provision and co-ordination of communication and utility services* (see **Section 1.3**),

iv) *the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats* (see **Section 9.5**),

v) ecologically sustainable development (see **Section 10**).

Relevant Approval Authority

The Development Consent was granted by WCC for the construction and operation of the Project (No. D767/01). This was subsequently modified by WCC on application by BlueScope Steel (No. D767/01A) to enable the construction of the Project in two stages, being the construction of an LDG delivery duct and its steel supports and foundations (Stage 1) and the construction of the remainder of the Project (Stage 2). BlueScope Steel completed construction of Stage 1 in 2005 (refer **Section 3.2**).

The current proposed changes require an application for modification to be submitted by BlueScope Steel to the appropriate approval authority.

The Development Consent was issued before commencement of Part 3A of the EP&A Act. The Project would be classified as a "Major Project" under Part 3A if there was no existing development consent and BlueScope Steel was seeking approval for the Project today.

Clause 8J(8) of the EP&A Regulation provides a mechanism for a development consent granted under Part 4, for a project which would otherwise have been subject to Part 3A, to be modified under Section 75W of the EP&A Act.

Clause 8J(8) states:

(8) A development consent in force immediately before the commencement of Part 3A of the Act may be modified under section 75W of the Act as if the consent were an approval under that Part, but only if:

(a) the consent was granted with respect to development that would be a project to which Part 3A of the Act applies but for the operation of clause 6 (2) (a) of State Environmental Planning Policy (Major Projects) 2005, and

(b) the Minister approves of the development consent being treated as an approval for the purposes of section 75W of the Act.

The development consent, if so modified, does not become an approval under Part 3A of the Act.

The mechanism provided for in Clause 8J(8) is available only if the Minister for Planning approves of the development consent being treated as an approval for the purposes of a Section 75W modification. The Minister has given his approval for the Development Consent for the Project being treated as an approval under Part 3A of the EP&A Act for the purposes of this modification (see **Appendix A**).

Modification of a Minister's Approval

Section 75W of the EP&A Act states:

> *"(1) In this section:*
>
> *Minister's approval means an approval to carry out a project under this Part, and includes an approval of a concept plan.*
>
> *Modification of approval means changing the terms of a Minister's approval, including:*
>
> > *(a) revoking or varying a condition of the approval or imposing an additional condition of the approval, and*
> >
> > *(b) changing the terms of any determination made by the Minister under Division 3 in connection with the approval.*
>
> *(2) The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part…"*

BlueScope Steel is seeking to modify the Development Consent under Section 75W of the EP&A Act. However, it is noted that although the modification process is a Part 3A process, the Development Consent for the Project as modified will remain a consent granted under Part 4 of the EP&A Act and Wollongong City Council will remain the Consent Authority.

5.1.2 Licensing and Permits

Licensing

Under section 55 of the *Protection of the Environment Operations Act* 1997 (POEO Act), BlueScope Steel is the holder of the existing Environment Protection Licence (EPL) No. 6092 for a Scheduled Activity (Premises Based). BlueScope Steel will apply for modification of EPL No. 6092 to incorporate the ICP Project.

DECC has regularly been consulted during the planning process and is aware of the requirement for BlueScope Steel to modify its existing EPL to incorporate operation and management of the Project.

In accordance with section 66 of the POEO Act, EPL 6092 incorporates Pollution Reduction Programs which identify actions to progressively reduce the environmental impact of the activity or work authorised or controlled by the licence which the licence holder is required to carry out. Details of relevant Pollution Reduction Programs (PRPs) are outlined below. It is noted these PRPs are part of BlueScope Steel's long term PRPs over the period 2008-2013.

Pollution Reduction Program 146 - Port Kembla Inner Harbour Flora and Fauna Study

The objective of this PRP is to conduct a comprehensive assessment of water quality as well as fish, intertidal, and benthos populations and health to assess the biological condition of the Inner Harbour and at the same time identify any pollutants of concern.

By the 31 July 2009, BlueScope is required to present a Study Plan to DECC for review which will outline the study scope, methodology and timetable. By 30 June 2012, BlueScope Steel must submit a written report which details the findings of the study including any recommendations for actions or works.

Pollution Reduction Program 151 – Elimination of Gas Main Seal Pot Discharges that Present an Unacceptable Environmental Risk

Gas derived from coke ovens and blast furnaces is used as a fuel for many BlueScope Steel process operations. Condensate from the gas recirculation system contains a range of pollutants and is removed from the system at the seal pots. Some seal pot condensate discharges remain uncontrolled. The objective of this PRP is to manage the remaining uncontrolled discharges that present an unacceptable environmental risk.

BlueScope Steel is required to submit a report to DECC identifying all uncontrolled coke ovens and blast furnace seal pot discharges from the gas main system and the preferred management option and work schedule by the 31 January 2008 and 30 November 2009, respectively.

The works for the coke ovens and blast furnace seal pot discharges are to be completed by the 30 April 2011 and 30 November 2012, respectively.

BlueScope Steel has, at this stage, submitted the first report for the coke ovens seal pot discharges.

Pollution Reduction Program 152 – Green and Golden Bell Frog Management Plan

The Green and Golden Bell Frog (GGBF - *Litoria aurea*) is a listed endangered species in NSW. The objective of this PRP is to minimise the risk of harm or damage to the GGBF and its habitat from any actual or potential pollution from the premises.

By the 31 July 2008, BlueScope Steel will develop a draft GGBF Management Plan and implementation timeline. By 30 September 2008, the final Management Plan will be submitted to the DECC. By the 30 November 2011, BlueScope Steel will prepare a report for submission to the DECC on the progress of the Management Plan.

Permits/Approvals

As the Development Consent, as modified, remains a consent granted under Part 4 of the EP&A Act, a Controlled Activity Approval under Part 3 of the *Water Management Act 2000* from the NSW Department of Water and Energy (DWE) will be required for:

- The proposed pipework and gantry over Allan's Creek
- The proposed salt water discharge device at the mouth of Allan's Creek
- Any part of the high voltage electrical substation and associated cables within 40m of Allan's Creek
- For any other works within 40 metres of waterfront land (as defined under the *Water Management Act 2000*).

BlueScope Steel has already applied for these approvals (refer **Section 2.1.3**).

BlueScope Steel may require the use of Clamtrol II for control of macro-fouling of the proposed salt water cooling system. Clamtrol II is currently used at PKSW in No. 1 Power House and No. 2 Blower Station. The manufacturer of Clamtrol II has an interim permit from the Australian Pesticides and Veterinery Medicines Authority (APVMA). This interim permit has consistently been renewed and is expected to be renewed until formalisation of the manufacturer's permanent licence (see Section 3.5.5 of **Appendix K**).

5.2 NSW Planning Instruments

Planning and environmental decision making in NSW is made in the context of State, Regional and Local Environmental Planning Instruments (EPIs) made under Part 3 of the EP&A Act.

Table 5-1 identifies EPIs that are applicable to the Project and its proposed modifications.

Table 5-1 NSW Environmental Planning Instruments

NSW Environmental Planning Instruments	
State Environmental Planning Policies (SEPPs)	SEPP 33 Hazardous and Offensive Development 1992
	SEPP 55 Remediation of Land
	SEPP 71 Coastal Protection
	SEPP (Major Projects) 2005
	SEPP (Infrastructure) 2007
Regional Environmental Plans (REPs)	Illawarra Regional Environmental Plan No.1, 1998
Local Environmental Plans (LEP)	Wollongong Local Environment Plan, 1990
Development Control Plans (DCP)	Wollongong Development Control Plan No.6 Commercial and Industrial Premises

The abovementioned EPIs have been assessed for the proposed modification to the ICP, and all provisions in these plans addressed.

5.2.1 State Environmental Planning Policies

There are five State Environmental Planning Policies (SEPPs) relevant to the proposed modifications. These are briefly discussed below:

SEPP (Major Projects) 2005

State Environmental Planning Policy (Major Projects) 2005 classifies certain development of industrial infrastructure as a "Major Project". If a project falls within the SEPP, the Part 3A planning approvals process will apply.

Under Clause 6 and Item 24 of Schedule 1 of SEPP 2005, a proposed development may be deemed a Major Project under Part 3A of the EP&A Act if it is:

> *"Development for the purpose of a facility for the generation of electricity or heat or their co-generation (using any energy source, including gas, coal, bio-fuel, distillate and waste and hydro, wave, solar or wind power), being development that:*
>
> *(a) has a capital investment value of more than $30 million, or*
>
> *(b) has a capital investment value of more than $5 million and is located in an environmentally sensitive area of State significance."*

Under this clause, the ICP Project would be considered a Major Project as it is a cogeneration plant and has a capital investment value of over $30 million.

However, clause 6(2) excludes certain developments from the provisions and requirements of SEPP Major Projects if the carrying out of that development has been authorised by a consent that is in force under Part 4 of the Act before it is declared a Major Project. As the Project is already the subject of a development consent granted by WCC (development consent No.D767/01A) under Part 4 of the EP&A Act, which is currently in force, the proposed modifications do not fall within the definition of a Major Project under Part 3A of the EP&A Act.

SEPP 55 – Remediation of Land

The objective of this SEPP is to provide for a coordinated statewide planning approach to the remediation of contaminated land. SEPP 55 aims to promote the remediation of contaminated land with the objective of reducing the risk of harm to human health or other aspects of the environment. (see Table 3.1 CH2M HILL, 2001 for a detailed assessment of SEPP 55).

The proposed new site for the gas holder (north of Allan's Creek), consistent with PKSW site as a whole, was constructed through the gradual filling of the Tom Thumb Lagoon at the mouth of Allan's Creek. Although there may be a small possibility of contamination due to the components of the site's soil, it is unlikely to be of concern due to the limited amount of excavation required and the proposed use of the site.

SEPP 71 – Coastal Development

SEPP 71 applies to land the whole or any part of which is within the coastal zone. Under the *NSW Coastal Protection Act 1979*, Port Kembla is identified as part of the greater metropolitan area within the NSW Coastal Zone. The purpose of SEPP 71 is to ensure that development in the coastal zone is appropriate and suitably located and that there is a consistent strategic approach and framework guiding development in the coastal zone.

The original approved development and current proposed modifications are considered to be suitably located at the highly industrialised PKSW, adjacent to Port Kembla Harbour, an industrial working harbour.

SEPP 33 - Hazardous and Offensive Development 1992

This SEPP links the permissibility of an industrial development proposal to its safety and environmental performance. Certain activities may involve handling, storing or processing a range of materials which, in the absence of controls, may create risk outside of operational borders to people, property or the environment. Such activities are defined by SEPP 33 as a 'potentially hazardous industry' or 'potentially offensive industry'.

The original development application included a comprehensive Preliminary Hazard Analysis (PHA). Due to the relocation and re-sizing of the gas holder which is identified as "potentially hazardous", as defined by SEPP 33, the PHA has been updated. In accordance with clause 12 of SEPP 33 this Project modification is supported by an updated PHA (see **Section 9.6).**

SEPP (Infrastructure) 2007

SEPP (Infrastructure) 2007 identifies 25 infrastructure and service developments and details for each development planning provisions and development controls.

Part 3 Division 4 identifies "Electricity Generating Works" as an infrastructure development. Clause 34 states:

1) Development for the purpose of electricity generating works may be carried out by any person with consent on land in a prescribed zone.

Under this SEPP, BlueScope Steel requires development consent for any electricity generating works. BlueScope Steel has, in the first instance, been granted development consent by WCC for the construction and operation of the Illawarra Cogeneration Plant Project (DA767/01) and its subsequent modification breaking the Project into 2 stages (DA767/01A). BlueScope Steel is now seeking approval for the proposed modifications outlined in this EA. Therefore it is consistent with the objectives of the SEPP.

5.2.2 Regional Environmental Planning Policies

The *Illawarra Regional Environmental Plan No. 1 1998* is the regional environmental planning policy for the proposed modifications.

Illawarra Regional Environmental Plan No. 1 1998

The *Illawarra Regional Environmental Plan No. 1 1998* (Illawarra REP) outlines objectives, policies and principles to be taken into account in the preparation of LEPs in the Illawarra region. The Illawarra REP covers a wide range of issues including social and economic development, transport, natural resources, environmental protection, conservation and recreation. The Illawarra REP was considered in the original ICP EIS (see section 3.2.2 CH2M HILL, 2001).

The proposed modifications are considered consistent with the objectives, policies and principles of the Illawarra REP.

5.2.3 Local Environmental Planning Policies

Wollongong Local Environmental Plan 1990

Wollongong Local Environment Plan 1990 (LEP 1990) is the local EPI for the proposed modifications.

Under the Wollongong LEP 1990, the site for the ICP and proposed modifications is zoned *4(b) Heavy Industrial.* In this zone, the proposal is permissible with development consent. In accordance with Wollongong LEP 1990, BlueScope Steel is seeking approval for the proposed modifications under s75W of the EP&A Act (see **Section 5.1**).

The Project and proposed modifications are considered consistent with Wollongong LEP 1990.

Wollongong Development Control Plan No.6 Commercial and Industrial Premises

The aim of Development Control Plan (DCP) No.6 Commercial and Industrial Premises is to identify relevant State and Council building and planning policies and to establish Council's standards and guidelines affecting commercial and industrial development in Wollongong.

Under DCP No. 6, the ICP and proposed modifications are located in zone *4(b) Heavy Industrial*. The objective of zone 4(b) as outlined in DCP No. 6 are:

a) *to provide suitable areas for those industrial enterprises which should be kept well away from residential neighbourhoods*

b) *to make the best use of public utilities and infrastructure by substantial enterprises; and*

c) *to allow some diversity of activities which will not prejudice objectives (a) and (b) from being achieved or significantly detract from the operation of existing or proposed industrial enterprises.*

PKSW is a suitable area for the development and proposed modifications. The operation of the ICP will operate in conjunction with existing operations at the PKSW.

The proposed modifications are considered consistent with the objectives of DCP No. 6.

5.2.4 Other NSW Policies/Planning Agreements

NSW Government Agreement with BlueScope Steel– Greenhouse Gas Reduction and Capital Investment

On 16 November 2006, BlueScope Steel and the NSW Government signed an agreement entitled, "*NSW Government Agreement with BlueScope Steel Ltd on Port Kembla Steelworks Greenhouse Gas Reduction and Capital Investment*" (the Agreement).

The Agreement identifies the Government policy goal of achieving a NSW target of year 2000 GHG emission levels by 2025 and the importance of reducing both global and NSW's total GHG emissions. The Agreement relates to the construction of the ICP Project and the reline of the No. 5 Blast Furnace, the reduction of GHG emissions from electricity usage at PKSW, to 2000 levels by 2025, the application of the NSW Greenhouse Gas Abatement Scheme to the ICP Project and the potential introduction of a State based national emissions trading scheme. In accordance with this Agreement, a target date for the operation of the ICP Project has been set as December 2012.

State Policy –State Plan: A New Direction for NSW

The NSW Government's *State Plan: A New Direction for NSW (2006)* (State Plan) sets priorities for Government action and a means to deliver on the priorities by setting targets under the State Plan. The State Plan is structured in terms of five areas of Government activity:

1. Rights, Respect and Responsibility, which addresses the justice system and community involvement;

2. Delivering Better Services, which addresses the provision of health, education and transport services;

3. Fairness and Opportunity, which addresses services that promote social justice and reduce disadvantage;

4. Growing and Prosperity Across NSW, which addresses activities that promote productivity and economic growth; and

5. Environment for Living, which addresses planning, environmental protection, arts and recreation.

Of these areas of activity "Growing and Prosperity" and "Environment for Living" are the two relevant areas for consideration in relation to the Project and proposed modifications.

One of the priorities under Growing and Prosperity is to maintain and invest in infrastructure in a manner so as to balance the need for development of major projects with the maintenance of existing infrastructure. Construction and operation of the ICP Project will assist the government to meet this priority with respect to the provision of securing energy for the State to meet demand.

Development of the ICP will decrease BlueScope Steel's need for energy supplied from the State grid, freeing up energy for other users across the State. In addition, the ICP Project has the potential to generate sufficient power to return energy to the grid, assisting the State to meet the increasing demand of the Sydney market for energy.

The other area of Government activity that is applicable to the ICP Project and proposed modifications is the area of Environment for Living. The applicable priorities under this area of activity are:

1) A secure and sustainable water supply for all users

Water is now considered a precious resource in NSW and the ability to meet NSW water needs in the face of drought, climate change and population growth has become an issue of concern. The NSW State Plan recognises that a sustained effort to balance supply and demand, increase recycling and improved efficiency of water use is required.

The TTE intended to be used in the earlier approved system is potentially available for use at the PKSW. BlueScope Steel is in discussions with Sydney Water to use that water (further treated to RIW quality) to further reduce dam water consumption at PKSW.

2) A reliable electricity supply with increased use of renewable energy

The construction and operation of the ICP will reduce BlueScope Steel's reliance on electricity sourced from the NSW grid. The ICP Project will, on average, make BlueScope Steel electricity self-sufficient. This will result in more available electricity to meet NSW electricity needs and will reduce the load on the electrical transmission system as the electricity will be generated at the point where it is used, thus improving electricity reliability for NSW. This will assist the state Government in meeting the priority of providing a reliable electricity supply.

3) *Cleaner air and progress on greenhouse gas reduction.*

This priority sets two targets for the State Government. They are;

(a) Clean air target – meet national air quality goals as identified in the National Environment Protection Measure (NEPM) for Ambient Air Quality (see **Section 5.3.2**); and

(b) Greenhouse gas target – achieve 60% cut in GHG emissions by 2050 and return to a year 2000 GHG emission levels by 2025.

Action for Air

Beneath the State Plan sits a number of 'Action Plans', such as the NSW Government's "*Action for Air*" 1998. Action for Air was originally released in 1998 as a 25 year air quality management plan for the Greater Metropolitan Region of NSW. The plan was recently updated in 2006; however it retains the seven objectives of the original Action for Air, two of which are outlined below:

- To promote cleaner business
- To monitor, report on and review air quality.

There are a number of ways that the development of the ICP Project and the proposed modifications will assist the NSW Government to meet its objectives and priorities under both the NSW State Plan and Action for Air.

The proposed re-sizing and relocation of the gas holder will result in the capture, storage and re-use of increased quantities of surplus by-product fuels generated at the PKSW, which are currently flared, to assist in the generation of steam and electricity. In addition, the proposed changes to the ICP will mean that BlueScope Steel will require less electricity from the grid, which is powered by coal-fired power stations, resulting in greenhouse gas emission reduction benefits.

The proposed changes will help the NSW government meet the priorities of the State Plan and the objectives under Action for Air.

BlueScope Steel will also undertake monitoring and reporting of air emissions from the ICP in accordance with the final ICP Development Consent. In doing so, BlueScope Steel will be assisting the government to meet the objective of monitoring, reporting and reviewing air quality under Action for Air.

5.3 Commonwealth Polices/Planning Instruments

5.3.1 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires referral to and approval from the Commonwealth Minister for the Environment for actions which have, may have, or are likely to have a significant impact on a matter of National Environmental Significance (NES) or Commonwealth lands.

During the original planning approval's process, the ICP Project was previously referred to the Commonwealth Minister for the Environment by DEI under section 68 of the EPBC Act. The Minister determined that the ICP Project is not likely to have a significant impact on a matter of NES or Commonwealth Lands and is not a "controlled action".

An assessment of the impact upon matters of NES was undertaken as a result of the proposed modifications to the ICP Project (see **Section 9.5**). The potential impact on each matter of NES was considered in light of the proposed modifications. It was determined that the ICP Project, as modified, is not likely to have a significant impact on matters of NES or Commonwealth lands, as defined by the EPBC Act and therefore a referral to the Minister was not actioned.

5.3.2 National Environment Protection Measures

National Environment Protection Measures (NEPMs) are broad framework-setting statutory instruments made under the *National Environment Protection Council Act* 1994 (Commonwealth). They outline agreed national objectives for protecting or managing particular aspects of the environment.

Relevant NEPMs include:

- Ambient Air Quality standards and goals
- Air toxics
- National Pollutant Inventory goals.

Ambient Air Quality

In 1998, the National Environment Protection Council (NEPC), consisting of Commonwealth, State and Territory Ministers, finalised the NEPM on Ambient Air Quality. This NEPM established a set of Standards and Goals for six air pollutants - carbon monoxide, photochemical oxidants (as ozone), nitrogen dioxide, sulphur dioxide, lead, particles as PM_{10} - and outlined the methods by which these pollutants are to be measured, assessed and reported.

The air quality NEPM is aimed to ensure a satisfactory level of air quality to protect the health and well being of the community. The air quality goals within this NEPM are outlined in **Table 5-2**.

Table 5-2 Ambient Air Quality - Standards and Goals

Pollutant	Averaging Period	Max Concentration	Goal Within 10 yrs max allowable exceedances
Carbon Monoxide	8 hours	9.0ppm	1 day a year
Nitrogen Dioxide	1 hour	0.12ppm	1 day a year
	1 year	0.03ppm	none
Photochemical Oxidants (as ozone)	1 hour	0.10ppm	1 day a year
	4 hours	0.08ppm	1 day a year
Sulphur dioxide	1 hour	0.20ppm	1 day a year
	1 day	0.08ppm	1 day a year
	1 year	0.02ppm	none
Lead	1 year	0.50 $\mu g/m^3$	none
Particles as PM_{10}	1 day	50 $\mu g/m^3$	5 days a year
*Particles as $PM_{2.5}$	1 day	25 $\mu g/m^3$	Gather sufficient national data to facilitate development of a standard.
	1 year	8 $\mu g/m^3$	Gather sufficient national data to facilitate development of a standard.

* This pollutant standard and goal is advisory only

See **Section 9.1** regarding the predicted air quality impact associated with the ICP and proposed modifications.

Air Toxics

Air toxics are gaseous, aerosol or particulate pollutants which are present in the air in low concentrations but which are considered to be hazardous to human, plant or animal life. They include compounds such as volatile and semi-volatile organic compounds, polycyclic aromatic hydrocarbons, heavy metals and aldehydes.

This NEPM is aimed at providing a framework for monitoring, assessing and reporting of ambient air data on air toxics at locations where elevated levels are expected to occur and a likelihood that significant population exposure could occur. This collection of information is to assist in the future development of national air quality standards for these pollutants.

Monitoring investigation levels for five air toxics are outlined in this NEPM. They are not compliance standards but have been established for use in assessing the significance of the monitored levels of air toxics with respect to the protection of human health. If these monitoring levels are exceeded, further investigation by the relevant jurisdiction is required. This further investigation is to determine whether the cause of the exceedance is considered appropriate, as exceedance does not automatically mean that adverse health effects occur.

See **Section 9.1.3** for a discussion on air toxic emissions resulting from the ICP and proposed modifications.

National Pollutant Inventory

Established in 1998, this NEPM provides the framework for the development and establishment of the National Pollutant Inventory (NPI). The aim of this NEPM is to disseminate to the public information on the types and amounts of certain substances being emitted to the air, land and water. Amended in June 2007, this NEPM was updated to include reporting on GHG emissions.

See **Section 9.2** for an assessment on the GHG emissions and GHG emission benefits associated with the ICP Project.

6 Approved ICP Project Alternatives and Proposed Modification ICP Project Alternatives

6.1 Approved ICP Project Alternatives

Various alternatives were considered prior to, and during, the original planning approvals process for the ICP Project. Alternatives considered included:

- ICP location
- Gas holder location
- ICP technology options
- Cooling water technology, discharge and source options
- Emission control options.

See section 5.2 of the original EIS (CH2M, 2001) for a detailed assessment of these options.

6.2 Proposed Modification Alternatives

The proposed modifications to the ICP Project include the relocation of the gas holder and the HV substation (refer **Sections 4.1.2** and **4.1.4**). Although alternatives for their locations were considered during the original planning approvals process, due to the proposed modifications, the previously considered alternatives are no longer suitable. As the proposed relocations are considered the only options currently available, further discussion of alternative locations for the gas holder or HV substation has not been presented.

Alternatives were considered for the design and maintenance of the salt water cooling system proposed to replace the approved recirculated fresh water cooling system (refer **Section 3.2.5**). The use of a once-through salt water cooling system was chosen to avoid an increase in BlueScope Steel's reliance on fresh or recycled water.

Alternatives to the direct discharge of salt water were considered to minimise the impact on Allan's Creek and Port Kembla Harbour water quality and aquatic ecology. The alternatives considered included the use of chiller units or cooling by cryogenic liquid vaporisation and variants of discharge point location, size and configuration.

In addition, as a result of using salt water as the cooling medium, it is common for macro-fouling in the pipework by marine organisms, plant and debris to occur. Macro-fouling results in blockages of the system which can reduce the effectiveness of the cooling system and hence power generation, and after a prolonged period of time, can result in a shut down of the ICP.

Various alternatives were considered to maintain the salt water cooling system effectiveness by controlling macro-fouling. The alternatives included physical, mechanical, chemical and thermal options.

The alternatives considered are outlined below.

6.2.1 Proposed Salt Water Cooling System Design

Discharge Point Location

BlueScope Steel considered various options to determine the preferred location of the salt water cooling discharge point. Some of the locations considered included:

- *Construction of a pipeline with a discharge point outside of Port Kembla Harbour*

  Placement of the discharge point outside of Port Kembla Harbour would require a pipeline to cross various other industrial enterprises and other stakeholder properties.

  It was considered that this option would cause difficulties during construction as well as when conducting general maintenance activities. It would also direct the heat load to a less disturbed area of the coastline outside of Port Kembla Harbour, increasing the zone affected by anthropogenic influences. This option was rejected.

- *Construction of a pipeline at an intermediate point along Allan's Creek*

  Construction of a pipeline at an intermediate point along Allan's Creek would require negotiation around many other utilities located around the No.2 Blower Station and elsewhere in the PKSW. This would ultimately result in construction challenges with other internal infrastructure such as bridges.

  In addition, due to the velocity of the predicted salt water cooling discharge flow, construction of a pipeline at some intermediate point along Allan's Creek had the potential to cause erosion of the northern bank of Allan's Creek and/or cause increased levels of sedimentation movement, increasing the potential impact on the aquatic ecology of Allan's Creek. This option was rejected.

- *Construction of a pipeline into Port Kembla Harbour directly*

  Construction of a pipeline into Port Kembla Harbour directly introduces the possibility of the recirculation of heated cooling water being prematurely taken in at the lift pump station saltwater intake, thereby creating the possibility of an upwardly spiralling temperature regime which would have adverse effects on both plant operability and the surrounding aquatic ecology. This option was rejected.

- *Construction of a pipeline at the mouth of Allan's Creek*

  Construction of a pipeline approximately 200m downstream of the existing No.2 Blower Station Drain at the mouth of Allan's Creek has been considered.

  This location takes advantage of reduced interaction with other services thereby minimising plant disruptions. The location is far enough away from the salt water intake lift pumps that it does not present any direct risk of re-circulating heat load.

  The location is also exposed to the dispersing influences of the tide and atmospheric cooling effects. In addition, the discharge point at the location at the mouth of Allan's Creek (i.e. where Allan's Creek widens), would reduce the possible disturbance of sediments and would eliminate the potential for erosion of the northern bank. This option was considered to be the most preferable.

Size of Salt Water Cooling Discharge

A specialist consultant, Cardno Lawson Treloar Pty Ltd (CLT) was engaged to undertake temperature modelling to determine the potential temperature increases due to the heat load discharged into Allan's Creek from the salt water cooling system (see **Section 9.3**). These modelling scenarios revealed that with the initial discharge system design it was possible to see average temperature increases above 3°C over a significant area.

BlueScope Steel looked into alternative means which would maximise atmospheric cooling effects, minimise the extent of the mixing zone and minimise the aquatic ecological impacts. The following different scenarios were considered and modelled:

- *A single discharge port*

  Based on the predicted flow rate and predicted temperature change, the modelling considered the temperature increase on Allan's Creek and Port Kembla Harbour with the cooling water being discharged via a single discharge port into Allan's Creek. The results indicated a possible increase to Port Kembla Harbour temperature at maximum heat load simulations by over 3.5ºC.

- *Increasing the salt water cooling flow through a single discharge port*

  Increasing the flow of salt water through the ICP condensers and out through a single discharge port to increase the discharge flow rate with the aim of reducing the temperature of the cooling water discharge was modelled. However, the reduction in impact to Allan's Creek was found to be insignificant as the cooling water discharge was still mixing with the various layers of the water column, reducing the cooling water's ability to transfer heat to atmosphere.

- *Multi-port discharge*

  A multi-port discharge was considered but found to have little impact on the reduction of the temperature increase in Allan's Creek and Port Kembla Harbour.

- *30m discharge device (mixing fully through the water column)*

  The use of a 30m discharge device where the cooling water would cascade down the batter of Allan's Creek and plunge into the creek water was considered. This scenario was modelled as fully mixing through the layers of the water column. This resulted in an increase in the bottom layer temperature at the mouth of Allan's Creek with temperature increases in excess of 3.0ºC.

- *60m discharge device (mixing fully through the water column)*

  A discharge device 60m long with the cooling water mixing through the entire water column. There was no reduction in the heat load discharged and there was the potential to cause a thermal plug, inhibiting passage of aquatic ecology upstream and downstream along Allan's Creek.

- *60m discharge (partial mixing through the water column)*

  A discharge device 60m long with the cooling water entering Allan's Creek as a horizontal flow entering only the upper half of the water column. This reduced the temperature increase in Allan's Creek but would require a large footprint to accommodate the discharge device.

- *30m discharge device (partial mixing through water column)*

  A discharge device 30m long with the cooling water entering Allan's Creek as a horizontal flow entering only the upper half of the water column. This reduced the temperature increase in Allan's Creek below 3°C and required only half the footprint of other options considered to accommodate its size.

The results modelled indicated that the most effective method of minimising the impacts of the cooling water on Allan's Creek during summer maximum heat load discharges would result from the use of a 30m structure permitting the cooling water discharge to mix only with the upper half of the water column. This discharge method would provide an increased ability for heat dissipation of the discharge water (see **Section 9.3.3**).

6.2.2 Anti-fouling Options

BlueScope Steel considered various options to control macro-fouling in the salt water cooling system. These control options included:

- Mechanical

- Physical
- Paints and Coatings
- Chemical
- Thermal.

These options are discussed below.

Mechanical

Mechanical controls include:

- Screens
- Strainers
- Filters.

These mechanical controls prevent the cooling water lifted from Port Kembla Harbour from entraining large macro-fouling organisms, fish and debris. Although these mechanical controls are effective and have a minimal impact on the environment, they are not effective at removing microscopic larvae.

BlueScope Steel currently uses mechanical controls for the existing salt water cooling systems on site and will continue, in conjunction with other methods, to use the existing mechanical controls.

Physical - "Taprogge"

The Taprogge system is a common physical method of controlling macro-fouling in a salt water cooling system. This system involves a regular or continuous application of abrasive sponge balls which pass through the condenser cooling system. The sponge balls are collected at the end of the system and returned to the start of the system for recirculation.

BlueScope Steel considered this method, however past usage at the PKSW and the operational problems associated with this method revealed its ineffectiveness. These operational problems included frequent loss of balls from the circuits, often due to jamming at tube inlets and fouling of the catching strainers and other smaller pipes affecting the flow of cooling water.

Paints and Coatings

BlueScope Steel considered the use of paints and coatings to control macro-fouling in the salt water cooling system. The most effective types of internal pipe coatings were found to be hard epoxy resins containing copper, and silicone rubber oil based paints.

The toxic copper in the hard epoxy resin is slowly released in order to control macro-fouling in cooling water systems. However, the formation of corrosion-resistant films on the surface of the resin coating diminishes the effectiveness of the coating. Subsequent applications would require initial activation and semi-annual reactivation by light abrasive blasting.

Silicone rubber oil based paints were considered as they are non-toxic therefore reducing the potential impact on the environment. This method required annual re-application. BlueScope Steel considered it was not the most effective means to control macro-fouling.

Chemical

Oxidising Compounds

Several oxidising compounds including chlorine, chlorine dioxide, bromine and hydrogen peroxide have been utilised for macro-fouling control in industrial once-through salt water cooling systems in the past. Although these oxidising compounds were found to be effective, they were effective only in large quantities and many are highly toxic to humans.

Due to operation problems resulting from use of oxidising compounds and the high risk to humans of keeping such large quantities on site, BlueScope Steel ceased its use of these compounds.

Non-Oxidising Compounds

Non-oxidising compounds include quaternary and tertiary amines. Non-oxidising compounds target more specific organisms which cause macro-fouling.

Non-oxidising compounds only require brief, low dose exposures which results in less chemicals being released into the environment.

BlueScope Steel started using Clamtrol I in 1995, a quaternary compound, and later changed to Clamtrol II, an improved and more environmentally friendly option.

Based on its current effectiveness at the PKSW, BlueScope Steel considers that this is one of the most effective methods of controlling macro-fouling of the salt water cooling system.

Thermal

Thermal treatment is another control method to reduce macro-fouling in salt water cooling systems. Methods of thermal control include:

- Reverse flow where heated discharge water from a parallel heat exchanger (condenser) is directed to the discharge of the unit to be treated, producing a rapid increase in the water temperature surrounding the target organisms
- Direct injection of steam into the cooling water intake

- Recirculation of the cooling water discharge from a heat exchanger (condenser) system back to the system inlet.

The use of thermal treatment via recirculation is currently being considered by BlueScope Steel to control macro-fouling. Thermal treatment has been found to be effective in other plants to control macro-fouling by temporarily increasing the temperature in the cooling system. This method may reduce the need to dose with chemical agents. The viability of using thermal treatment at the PKSW for the ICP Project still requires further investigation but is considered preferable to the use of chemical agents.

Based on consideration of the alternative methods to control macro-fouling in the salt water cooling system, BlueScope Steel's preferred method involves the:

- Use of mechanical screens and filters
- Physical cleaning
- Use of a recirculated thermal treatment system for the STG condensers in conjunction with, if necessary, intermittent dosing of a chemical agent.

Currently divers are contracted by BlueScope Steel to physically remove marine organisms and other debris from the salt water cooling inlet channel. With the significant increase in channel velocity post-ICP, this will no longer be an option due to safety concerns. The following preferred methods to control macro-fouling in the inlet channel include:

- Intermittent dosing of a chemical agent
- Use of mechanical screens and filters.

See **Section 9.3.4** for a more detailed assessment on macro-fouling control options.

7 Proposed Modifications and Impact on Construction and Commissioning

7.1 Equipment, Construction and Commissioning

7.1.1 Timing and Project Staging

The following proposed timing for Stage 2 of the Project is outlined in **Table 7-1**.

Table 7-1 Construction Timing

	Start Date*	End Date*
Construction of ICP and associated facilities	1/11/2008	31/01/2012
Construction of proposed salt water cooling system	01/07/2009	01/08/2011
Construction of gas holder	01/12/2008	01/08/2011
Construction of LDG Duct and Collection System	1/07/2009	01/08/2011
Construction of HV substation	01/07/2009	01/08/2011

*The timing of construction activities may vary depending on construction constraints and other unforeseeable events.

The overall staging of the Project will involve the following general steps:

- Site clearances
- Civil works
- Structural/mechanical and electrical works
- Commissioning
- Operation.

At this stage no plant or equipment within the PKSW is expected to be shut down during the construction period.

7.1.2 Equipment Needs

The following change in equipment will be required as a result of the proposed modifications:

- Three new boilers instead of four
- Additional transmission lines connecting the HV substation to the existing Integral Energy substation
- Pre-cast concrete pipes and culverts for the salt water cooling system
- Concrete construction of the salt water cooling discharge device.

Equipment will be delivered to PKSW using a combination of road, rail and sea.

7.1.3 Construction Phase

It is estimated that approximately 300 contractors on average will be required during the construction phase of the project with an estimated 450 contractors during peak construction periods. Peak construction periods are predicted between the second quarter 2009 to the end of the fourth quarter 2011.

Machinery used during construction is expected to include cranes, excavators, pile drivers, jack hammers, concrete pouring equipment as well as back hoes and trucks for the salt water discharge system and the switch rooms.

7.1.4 Commissioning Phase

In accordance with BlueScope Steel's detailed internal commissioning methodology, the following steps will be undertaken for each component of the Project as well as the proposed modifications:

- Quality assurance checks of plant installation;
- "Cold commissioning" – confirmation of equipment capability without product flow
- "Hot commissioning" – confirmation of equipment capability with product flow
- "Transition commissioning" – bringing equipment up to maximum capability and integration into the PKSW plant.

Commissioning of boilers and the STG is expected to begin in the third quarter 2011 and be completed by the end of the first quarter 2012.

Approximately 10-50 contractors will be required during the commissioning phase. Transition to full operational capabilities is expected by the second quarter of 2012.

8 Environmental Issues and Risk Assessment

8.1 Environmental Issues

A comprehensive EIS in relation to the Project was submitted and assessed as part of the original development application to WCC for approval of the Project.

Environmental impacts and management strategies associated with the Project were assessed and determined to be acceptable. **Appendix E** includes a summary of the environmental issues assessed as part of the original development application for approval of the Project. **Appendix E** outlines the following:

- Each environmental issue
- The EIS 2001 conclusion
- The EIS reference
- DA reference from D767/01A (original consent modification)
- Comment identifying how the environmental issues will potentially be affected as a result of the proposed modifications.

8.2 Risk Assessment

As part of the Preliminary EA, a risk assessment was undertaken to identify the potential key environmental issues associated with the Project as modified, compared with the environmental impacts of the Project as originally approved in the Development Consent.

The risk assessment classified each potential environmental impact and its associated aspect as Key, Moderate or Low Risk based on the likelihood and consequence of each aspect. In addition, changes which are expected to result in an environmental benefit were identified.

Appendix F contains the details of the risk assessment process, risk definitions and environmental issue classification.

The nature of the modifications, compared to the overall scale of the Project, together with the fact that the ICP Project is located in the middle of a major heavy industrial facility means that material environmental impacts of the proposed modifications are limited to a few environmental issues. The proposed modifications are not expected to have any material adverse impact on the following:

- Surface water quality
- Hydrology and flooding
- Hydrogeology and groundwater
- Soils

- Socio-economic setting
- Human health
- Noise and Vibration
- Traffic and transportation
- Indigenous and Non-indigenous Heritage.

The following environmental issues were identified from the risk assessment as Key and/or Beneficial environmental issues arising from the modifications:

- Air Quality
- GHG Emissions
- Water Quality/Water Resource
- Flora and Fauna (Aquatic and Terrestrial)
- Hazard and Risk Assessment
- Visual Amenity

A discussion of these environmental issues and further assessment is contained in **Section 9.**

In addition, noise and vibration and liquid waste streams have been re-visited at the request of DECC.

9 Assessment Of Key Environmental Benefits and Effects

9.1 Air Quality

BlueScope Steel currently burns a combination of by-product gases which are generated from the iron and steelmaking operations at the PKSW. These by-product gases are currently burnt in various process uses throughput the PKSW and at the No. 2 Blower Station and include Blast Furnace Gas (BFG) and Coke Ovens Gas (COG). All basic oxygen steelmaking (BOS) off-gas which is also produced as a result of the iron and steelmaking operations at the PKSW is currently flared.

BOS off-gas is produced during oxygen blowing in the BOS process. It is produced intermittently due to the batch operation of the three BOS vessels. BFG is produced by the No. 5 and No. 6 Blast Furnaces and COG is produced by the four coke oven batteries (Nos 4, 5, 6 and 7A). Excess BFG and COG that cannot be used across the PKSW is also flared (refer **Section 3.1.3**).

9.1.1 Air Quality Impact Assessment – Approved ICP Project

In 2001, Holmes Air Sciences (Holmes) was engaged to undertake an air quality impact assessment to assess the environmental impacts associated with construction and operation of the ICP Project at the PKSW.

The US EPA industrial source complex model ISCST3 and CALPUFF model were used to undertake the assessment.

The approach of the assessment compared the existing operations i.e. emissions from the No.1 Power House and No.2 Blower Station (pre-ICP) with the predicted emissions from the operation of the ICP (post-ICP). The post-ICP case included the decommissioning of the No.1 Power House and No. 2 Blower Station boilers. This would produce a net result, identifying the change in emissions associated with the ICP Project.

The assessment concluded that air emissions from the ICP were predicted to result in compliance with air quality goals in the Illawarra region. In addition, reduction in emissions of NO_x, SO_x and particulates and air toxics from the PKSW were predicted resulting from the decommissioning of boilers in No.1 Power House and No. 2 Blower Station and operation of the ICP (see also **Section 9.1.3**). Finally, carcinogenic risk factors for the ICP were well below an acceptable level of risk.

See Section 8.2 of the original ICP Project EIS (CH2M, 2001) for details of the air quality impact assessment.

9.1.2 Air Quality Impact Assessment – Proposed Modifications to ICP Project

Holmes Air Sciences was re-engaged to undertake an air quality impact assessment as a result of the proposed modifications to the ICP Project (see **Appendix G**). The same approach was undertaken (as previously approved by DECC), which involved a comparison with the existing emissions pre-ICP from the No. 2 Blower Station with the predicted emissions from the ICP, taking into consideration decommissioning of boilers from the No. 2 Blower Station. This would produce a net result, identifying the change in emissions associated with the modified ICP Project.

Air Quality Criteria

The emissions generated from the modified ICP Project must be compared to the air quality criteria as outlined in DECC's guideline, "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (August 2005). The air quality criteria are outlined in **Table 9-1**. Assessment against the criteria will determine whether the Project is likely to result in exceedances, potentially causing adverse health or nuisance effects at the nearest receptors.

The most significant emissions from the ICP Project i.e. nitrogen dioxide (NO_2), particulate matter less than 10µm (PM_{10}) and sulphur dioxide (SO_2) have been considered.

Table 9-1 DECC Air Quality Criteria

Pollutant	Criterion	Averaging period
Nitrogen dioxide (NO_2)	246 µg/m³	1-hour maximum
	62 µg/m³	Annual mean
Particulate matter less than 10 µm (PM_{10})	50 µg/m³	24-hour maximum
	30 µg/m³	Annual mean
Sulfur dioxide (SO_2)	570 µg/m³	1-hour maximum
	228 µg/m³	24-hour maximum
	60 µg/m³	Annual mean

Existing Air Quality

To understand the potential impact of the modified ICP Project on the local air quality, existing ambient air quality needs to be determined. Between 2000 and 2006, data from DECC monitoring stations at Kembla Grange, Warrawong and Wollongong has been collected. A summary of these results is provided in Table 4 of **Appendix G**. These results showed that:

- Measured nitrogen dioxide (NO_2) concentrations did not exceed the 1-hour average criterion (246 µg/m³) annual average criterion (62 µg/m³) at any of the monitoring stations
- Measured ozone (O_3) concentrations exceeded either the 1-hour average criterion (214 µg/m³) and/or the 4-hour average criterion (171 µg/m³) for most years at each of the monitoring stations
- Measured particulate matter (PM_{10}) concentrations exceeded the 24-hour average criterion (50 µg/m³) for three out of the monitored years at two of the monitoring stations (there was no data available from Kembla Grange monitoring station) but did not exceed the annual average (PM_{10}) concentrations

- Measured sulphur dioxide (SO_2) concentrations did not exceed the 1-hour average criterion (570 $\mu g/m^3$), the 24-hour average criterion (228 $\mu g/m^3$) or the annual average criterion (60 $\mu g/m^3$) at any of the monitoring stations (there was no data available from Kembla Grange monitoring station).

This indicates that currently, ambient air quality in the Illawarra region already exceeds DECC criteria for both ozone and 24-hour average criterion for particulate matter.

Methodology

BlueScope Steel identified up to 40 scenarios (see **Appendix G**) covering the range of possible ICP operations, containing 24 different fuel scenarios. The available fuel for each scenario was then used to calculate NO_x, PM_{10} and SO_2 emissions from the ICP boiler stacks, the No. 25 Boiler stack and the flares. Seven of these scenarios were picked, in consultation with DECC, for dispersion modelling, based on the potential frequency of occurrence and the magnitude of mass emission rates. The scenarios chosen and the reasoning behind each choice is outlined below:

- Scenario 1: Based on highest NO_X mass emission rate from the ICP boilers.
- Scenario 2: Based on the description "Normal operations" and relatively high operating occurrence (8.57% of time).
- Scenario 14: Based on highest combined SO_x emissions from the No.25 Boiler and the ICP boilers.
- Scenario 17: Based on high frequency of occurrence (15%), and relatively high total NO_x emissions.
- Scenario 28: Based on relatively high frequency of occurrence (approximately 9%) and selected to cover scenarios 29, 30, 30A and 30B, which are similar.
- Scenario 34: Near highest PM_{10} emissions from flares. This scenario would occur more often than the scenario with highest PM_{10} emissions from flares. In addition, this scenario included the highest SO_x ground level concentrations.
- Scenario 35: Based on the scenario description, that is, “Normal operations with natural gas”. This scenario would also have a high frequency of occurrence (assuming 15% peaking with natural gas).

In addition, a base case scenario was developed. This case represents the consumption of maximum available by-product fuel in the existing facilities, which is directly comparable to Scenario 1, which represents the same fuel consumption.

It is noted that when No. 25 Boiler is no longer operational, BFG will need to be redirected to the new ICP boilers. Due to their modern design incorporating low NO_x technology (which No. 25 Boiler does not currently have), there is not expected to be an increase in NO_x emissions. Scenarios without No. 25 Boiler were considered during identification of the potential operating scenarios. However, as they did not represent worst case scenario or were not considered to represent an emissions event of concern, additional modelling of these scenarios was not undertaken. NO_x emissions produced from operation of the three new ICP boilers without the use of No. 25 Boiler, is expected to be below Scenario 35, which is considered to be the "worst case" scenario. SO_x and PM_{10} emissions will not change as they are not affected by which boilers are consuming the available fuel. They are expected to be lower for all scenarios.

Modelling Results

The CALPUFF dispersion modelling results are outlined in Table 8 of **Appendix G**. The results show the predicted concentrations due to modelled emissions only and do not include existing pollutant concentrations. The results are outlined below:

- Existing maximum and average NO_2 and SO_2 concentrations are within air quality criteria noted by the DECC.
- Existing maximum O_3 and PM_{10} concentrations exceed the DECC's criteria on several occasions each year in the Illawarra region.
- Particulate matter concentrations arising from natural sources, such as bushfires or dust storms, may continue to result in elevated PM_{10} levels on occasions.
- Air quality impacts of NO_x, PM_{10} and SO_2 emissions from the ICP are predicted to be close to or slightly lower than current operations, for comparable scenarios.
- The most significant improvements are predicted to be for SO_2 although these improvements are most likely to be observed close to the PKSW, rather than in residential areas which are further from the site.
- Differences between impacts of the base case and ICP for all pollutants are unlikely to be detectable at the DECC monitoring locations or beyond.
- The most common operational ICP scenarios are unlikely to cause exceedances of the DECC's ambient air quality criteria.
- One operational scenario (scenario 34 where a significant proportion of off-gases are flared)), which is present for both the current and ICP operations, has been identified as having the potential for ground-level concentrations above ambient air quality criteria close to the emission sources. The frequency of this scenario, in the ICP case, is low at less than 1% so the probability of adverse air quality impacts is also low. This highlights a benefit of using the off-gases for power generation rather than flaring these gases.
- Predicted maximum impacts of the modified ICP Project represent a similar level of impact to the approved Project, for the comparable emission scenarios.

- Air quality impacts of NO_x, PM_{10} and SO_2 emissions from the ICP would not increase after the decommissioning of No. 25 Boiler.

These outcomes are consistent with the outcomes of the assessment of the approved Project in that the ICP is likely to provide some benefits, albeit small in some scenarios, to local air quality. It was observed also, that predicted air quality impacts of NO_x and SO_2 emissions from the modified ICP Project are similar to impacts of the approved ICP Project, for the comparable scenario.

9.1.3 Air Toxics and Metals

Section 7.2 of the "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" (DEC, 2000) states that principal air toxic pollutants must be minimised to the maximum extent achievable through the application of best-practice process design and/or emission controls, taking into consideration technical, logistical and financial considerations.

The proposed modifications to the ICP Project are not expected to increase emissions of air toxics and metals. Therefore, no emission calculations or dispersion modelling has been carried out for this modification application. However, modelling and assessment of air toxics and metals for the approved ICP Project was previously undertaken during the original planning approvals process.

The outcomes from assessment of the approved Project concluded that:

- Concentrations of air toxics will improve (i.e. decrease) post-ICP
- Model predictions were well below air quality criteria
- Carcinogenic risk factors for the ICP case were well below $1x10^{-6}$, which is considered to be an acceptable level of risk.

As the proposed modifications to the ICP Project will not increase air toxics or metal emissions, the above conclusions are still considered to be applicable.

Based on section 7.2 of DECC's guidelines (DEC, 2000), reducing metal emissions was considered. Common methods in power plants have involved the injection of ammonia or carbon monoxide to oxidise metals with the resulting metal oxides being attracted to particulates in the flue gas stream. The particulates are removed by electrostatic precipitators or baghouses which are commonly found at coal-fired power plants to collect fly ash. As the ICP Project is not a coal-fired plant, an electrostatic precipitator and/or baghouse is not required to be incorporated into the operation of the ICP. Based on the conclusions from the previous assessment, no further measures to reduce air toxics or metals will be introduced.

9.1.4 Operational Impacts on Air Quality and Proposed Mitigation Measures

As discussed above, the CALPUFF dispersion model has been used to assess the net change in emissions post-ICP at the PKSW.

On the basis of the CALPUFF dispersion modelling results of the proposed modification to the ICP Project as modelled by Holmes Air Sciences, it is unlikely that there would be any significant impact on local air quality.

Based on the modern design of the new ICP boilers which will incorporate low NO_x technology, no additional mitigation measures have been recommended.

9.1.5 Best Available Control Technology / Offsets

The NSW Government's Action for Air 1998 policy, outlines the NSW Government's 25-Year Air Quality Management Plan (see **Section 5.2.4**). It outlines goals, objectives and actions over 25 years to manage and improve the air quality in NSW.

An objective of this policy is to promote clean business through a strategy of reducing industrial emissions. Action 4.5 to achieve this objective is the "Development of a framework to control NO_x emissions in the Greater Metropolitan Region". This action states:

"*For replacement proposals, a minimum requirement of no net increase in NO_x emissions from the individual sites, and an economic impact analysis of the cost of available control technologies for new plant, will apply*."

In accordance with this policy, DECC advised (see **Appendix B**), that the EA must either:

- demonstrate NO_x neutrality for the Project or alternatively, outline equivalent NO_x reductions off-site (i.e. Project off-sets) ; or
- provide a discussion on Best Available Control Technology (BACT).

As the Project is not expected to increase NO_x emissions, in accordance with the DoP's EARs and the NSW Government's Action for Air, an assessment on BACT and Project off-sets is not required. NO_x emissions from the ICP Project will meet the existing Conditions of Consent load limit of 1080tpa. It is noted that the design of the new ICP boilers includes low NO_x technology burner systems, staged combustion using over-fire air and flue gas recirculation. In addition, the by-product fuels will be mixed prior to delivery to the burners. All of these measures are aimed at minimising the maximum flame temperature which in turn, reduces thermal NO_x generation.

9.1.6 Regional Air Quality

As the modified ICP Project is not expected to increase NO_x emissions from the PKSW, no regional assessment of ozone formation is required. It is noted, however, that currently, as outlined in **Section 9.1.2**, the Illawarra region currently exceeds DECC ozone criterion at all monitoring stations.

9.2 Greenhouse Gas Impact Assessment

9.2.1 Greenhouse Gases

Gases that trap heat in the atmosphere are called greenhouse gases. Some greenhouse gases such as carbon dioxide occur naturally and are emitted to the atmosphere through natural processes and human activities. Other greenhouse gases (e.g. fluorinated gases) are created and emitted solely through human activities. The principal greenhouse gases that enter the atmosphere because of human activities are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Fluorinated Gases.

Greenhouse gas (GHG) emissions have been linked to climate change (i.e. variability in the earth's long term average temperature) and has, over the past few decades, become a cause for concern for the global community.

The Intergovernmental Panel on Climate Change (IPCC), an international panel of scientists and researchers, provides advice on climate change to the international community. In 2007, the IPCC released its fourth assessment report on climate change and concluded that "*Warming of the climate system is unequivocal*". In addition, the IPCC report predicted that "*World temperatures could rise by between 1.1 and 6.4 °C (2.0 and 11.5 °F) during the 21st century*".

In response to global concern regarding the impact of climate change, the Kyoto Protocol, an international agreement under the United Nations Framework Convention on Climate Change, was created. The aim of the Kyoto Protocol is the reduction of global GHG emissions. Australia recently ratified the Kyoto Protocol in December 2007, coming into force in March 2008. Under the Kyoto Protocol, Australia is committed to limit its GHG emissions to no more than 8% above 1990 levels by 2008-2012.

The Australian Government Department on Climate Change released its estimates on Australia's total greenhouse gas emissions in 2005. The estimate amounted to 559.1 million tonnes of carbon dioxide equivalent (Mt CO_2-e) under the accounting provisions applying to Australia's 108% emissions target. NSW was found to emit 158.2Mt CO_2-e.

In accordance with:

- NSW State Plan – A New Direction for NSW **(**refer **Section 5.2.4)**
- NSW Action for Air (refer **Section 5.2.4)**
- NEPM Ambient Air Quality Goal (1 day per year exceedance of photochemical oxidants) (refer **Section 5.3.2**)
- "*NSW Government Agreement with BlueScope Steel Ltd on Port Kembla Steelworks Greenhouse Gas Reduction and Capital Investment*" (refer **Section 5.2.4**).

BlueScope Steel's ICP Project will assist the NSW Government in achieving a reliable electricity supply while at the same time, resulting in significant GHG emission reductions supporting local, regional and global commitments.

9.2.2 Greenhouse Gas Impact Assessment

In 2001, a GHG Assessment was undertaken to calculate the amount of CO_2-e emissions predicted from the proposed ICP operations. The GHG Assessment was incorporated within the original Environmental Impact Statement of the Illawarra Cogeneration Plant (see section 7.9, CH2M HILL, 2001).

Two cases were considered:

1. The Base Case - which assessed emissions from the continued operation of the No. 1 Power House and No. 2 Blower Station; and
2. The ICP Case - which assessed the decommissioning of the No. 1 Power House and No.2 Blower Station and operation of the ICP.

Based on a comparison of the Base Case against the ICP Case, the GHG Assessment determined that the ICP case would result in predicted annual GHG emission savings between 663 700 t CO_2-e and 961 100 t CO_2-e, an average of 864 000 t CO_2-e from 2004 - 2018. Over 15 years this would reduce emissions by 13 million tonnes of CO_2-e.

In addition, the ICP was expected to generate 1.43x106 MWh of electricity which would also reduce the demand for electricity which is generally sourced from coal-fired plant operations.

9.2.3 Greenhouse Gas Impact Assessment – Modified Proposal

As a result of the proposed modifications, the GHG assessment was updated by CH2M HILL in 2008 (see **Appendix H**) to determine the amount of CO_2-e emissions predicted from the ICP's operation.

GHG Impact Assessment - Methodology

The GHG Assessment was completed in accordance with the following guidelines:

1. The NSW Department of Planning Draft Guidelines for Energy and Greenhouse in EIA (DoP, 2002)
2. The Australian Department of Climate Change, National Greenhouse Accounts (NGA) Factors (NGA, 2008)
3. The World Business Council on Sustainable Development and World Resources Institute The Greenhouse Gas Protocol (WBCSD & WRI, 2004).

The assessment of GHG emissions under the Draft NSW EIA Guidelines is broken down into four "scopes" which are outlined below.

- Scope 1: Direct Energy Use Greenhouse Gas Emissions

- Scope 2: Indirect Energy Use or Greenhouse Gas Emissions from Imports and Exports of Electricity, Heat or Steam
- Scope 3: Other Indirect Energy Use or Greenhouse Gas Emissions
- Scope 4: Greenhouse Gas Emissions Abatement from Offset Opportunities.

See Section 2.2.1 of **Appendix H** for a more detailed discussion of each of the scopes outlined above.

Based on the Draft NSW EIA Guidelines, a Level 2 assessment was undertaken (due to predicted emissions exceeding 20 000 t CO_2-e). The requirements for a Level 2 assessment are as follows:

- A more detailed description of the proposal
- Establishment of the scope of assessment
- Identification of energy sources and GHG emission sources
- Justification of proposed mitigation measures.

Below is a summary of the results from the assessed scopes. The full results, calculations and a comprehensive discussion of the findings can be found in **Appendix H**.

The GHG assessment provides an estimation of the changes in GHG emissions associated with the PKSW as a result of the ICP Project. The Scope 1 assessment considers the GHG emissions generated as a result of the combustion of natural gas (rather than combined by-product gas and natural gas). This is because there is no change to the amount of combustion of by-product gas on site as a result of the ICP Project. There will only be changes to the amount of natural gas combusted on site.

Scope 1

The results of the assessment of Scope 1 emissions associated with the ICP Project are presented in **Table 9-2**.

All activities that occur within the boundary of BlueScope Steel's PKSW that generate GHG emissions were considered to be direct GHG emissions.

Direct sources that have the potential to generate GHG's include:

- Combustion sources, or processes resulting in the generation of heat, steam or electricity e.g. furnaces, incinerators, boilers and flares
- Fugitive sources, e.g. emissions from fuel gas system leaks or equipment leaks
- Other vents including venting during equipment/process blowdowns, venting from emergency shut-downs, lifting of pressure relief valves etc.

The major contributor to the change in generation of Scope 1 GHG emissions associated with the ICP Project is a result of the natural gas consumed in the boilers.

Greenhouse gas emissions resulting from natural gas combustion will decrease post-ICP due to the ability to allow gas mixing in the new ICP boilers and hence the elimination of the need to run gas pilots in the boilers under a majority of operating scenarios.

This decrease will be in the order of approximately 22.2% of emissions attributable to natural gas combustion on site prior to the ICP Project (based on FY06-07 figures). Under the 15% natural gas peaking scenario, Scope 1 emissions will increase by 9.9% (compared with FY06/07 figures).

Other potential Scope 1 GHG emissions associated with the ICP Project such as fugitive emissions and vent releases are expected to be insignificant in comparison to the emissions arising from combustion within the ICP Project boilers.

Scope 2

The results of the assessment of Scope 2 emissions associated with the ICP Project are presented in **Table 9.2**.

BlueScope Steel intends to export electricity from the ICP to the grid and to import electricity from the grid due to the proposed connection arrangements. As the ICP will be generating significant amounts of electricity which will be exported to the grid, the net imports of electricity from the NSW grid to the PKSW will reduce substantially through the implementation of the ICP.

The Scope 2 assessment includes both GHG emissions associated with the purchase of electricity by BlueScope Steel from the grid and the offset in GHG emissions arising from the export of electricity to the grid from the ICP Project.

An assessment of GHG emissions was conducted for the existing imported energy usage for the site during the baseline Financial Year (FY) 06/07 as well as the expected imported energy usage for the site and export of electricity from the PKSW once the ICP is operational.

Two sets of data are provided for the post ICP operation – maximum generation and minimum generation. The figures provided for the maximum generation scenario represent the case where the ICP is generating the expected amount of electricity. This figure is averaged over the life of the ICP facility such that short term variations in steelworks by-product fuel availability, as well as variations in available steam and electricity generation capacity due to scheduled boiler and STG maintenance outages, are taken into account.

Estimated electricity generation values are based on the results of completed feasibility design work. A number of factors could impact on these estimates, including:

- Process or equipment modifications during detailed design
- The possibility of variation in boiler or STG performance

- Changes to Steelworks output or equipment configurations which may impact on future fuel availability and steam demand
- Inaccuracies associated with metering large scale by-product fuel gas and steam flows.

These potential variations lead to a range in estimated electricity generation values and the above factors are used to determine the post-ICP minimum generation scenario. As for the maximum generation figures, the post-ICP minimum generation figures also reflect the predicted long term average operation of the ICP. It should be noted that the actual values will not be confirmed until the completion of performance tests after the equipment is fully commissioned.

Throughout the GHG assessment, the differences between the pre-ICP, i.e. FY 06/07, case and the post-ICP case, which reflect the impact of the ICP, are calculated relative to the minimum generation scenario post-ICP as this represents the more conservative case.

Purchased electricity on the site will decrease slightly once the ICP is fully operational. Scope 2 emissions relating to imported electricity for FY06/07 totalled 1 020 128 tCO_2-e and for post-ICP it is estimated that the emissions will decrease to 1 005 498 tCO_2-e. This means that there will be a decrease of 1.4% of Scope 2 emissions associated with the import of electricity.

The Scope 2 emissions which will be displaced from the NSW grid by the export of electricity is calculated as 815 647 t CO_2-e/year. Due to the large amount of electricity which is expected to be exported as a result of the ICP, and the fact that the electricity generated will be at a much lower emissions intensity compared to that supplied by the NSW electricity grid, the amount of GHG emissions displaced from the NSW grid are significant.

The net Scope 2 emissions arising from the ICP is a reduction of GHG emissions of approximately 830 276 t CO_2-e per year.

Scope 3

The results of the assessment of Scope 3 emissions associated with the ICP Project are presented in **Table 9-2**.

Scope 3 emissions are the result of activities undertaken by BlueScope Steel, however they occur from sources outside the control or ownership of the company.

The ICP Proposal Scope 3 emissions assessed included:

- Indirect emissions resulting from the extraction, production and transport of fuel associated with the supply of electricity to the Steelworks, and the indirect emissions attributable to the electricity lost in delivery in the transport and distribution network
- Indirect emissions from the extraction, production and transport of natural gas fuel which is consumed by the Steelworks

- Mobile sources not owned by BlueScope Steel, associated with the construction phase of the Project
- Emissions generated from the production of steel and cement used in the construction phase of the Project.

The Scope 3 emissions associated with purchased electricity for the site have been calculated to be approximately 194 856 t CO_2–e using 06/07 data (therefore under existing conditions prior to the ICP Project) and approximately 192 061 t CO_2–e for post-ICP (no extra grid electricity use is expected during the construction phase). This is an estimated 1.43% decrease in emissions associated with the ICP Project.

The Scope 3 emissions associated with the purchase of natural gas will decrease by 22.2% once the ICP is fully operational. Scope 3 emissions (associated with natural gas) under typical operating scenarios will be reduced by 10 264 t CO_2–e/year as a result of this Project. This is due to the elimination of the need to use natural gas pilots in the new boilers under most operating scenarios.

The Scope 3 emissions associated with the use of mobile construction sources have been estimated to be approximately 1960 t CO_2–e. This figure includes allowances for Scope 1 and Scope 3 transportation emissions as all transportation on site will be undertaken by sub-contractors. This is a one off value and is calculated for the 2 year construction period, for this reason it is not added to the other Scope 3 emissions which occur annually after commissioning of the ICP (refer to Table 5.3 and 5.4 of **Appendix H**).

Scope 3 emissions associated with steel and cement production that will be brought onto the site during construction has been estimated to be 21 235 t CO_2–e. This figure has been calculated using approximate values for the tonnes of steel and cement that will be used during construction. This is a once off Scope 3 figure for construction only.

Scope 3 emissions relating to on-going activities decreases. Scope 3 emissions relating to construction are relatively minor when compared to total Scope 1, 2, and 3 emissions and they are also only 'one-off' emissions created only during the construction phase which is a finite term of approximately 2 years.

A summary of all Scope 3 emissions associated with the Project can be seen in Table 5.12 of **Appendix H.**

Scope 4 (Other)

Scope 4 emissions are defined in the Greenhouse and Energy Guideline in EIA as emission reductions which are associated with any carbon offsets that will occur as a direct result of the Project. This Scope 4 concept is similar to the GHG Protocol which aims to capture GHG emission reductions that will occur as a result of the Project and are sold or traded externally.

In terms of the ICP, this relates to the reduced net import export of electricity to the NSW Electricity Network and the creation of NSW Greenhouse Abatement Certificates.

BlueScope Steel is eligible to apply to the NSW Greenhouse Gas Reduction Scheme Administrator to become an accredited provider of NSW Greenhouse Gas Abatement Certificates (NGACs) and is pursuing recognition of this abatement activity. However, these abatement activities were not assessed as a carbon offset and are not reported as Scope 4 or other emissions for the purposes of the assessment. The emission reductions associated with the displaced electricity arising from the generation of electricity by the ICP have been estimated within the Scope 2 category in accordance with the Greenhouse and Energy Guidelines in EIA.

Summary

Table 9-2 presents a summary of results for Scopes 1, 2, and 3 both pre-ICP (FY06/07) and post-ICP.

Table 9-2 GHG Emissions – Results for Scopes 1, 2 and 3

	Units	FY 06/07 (Pre-ICP)	Post-ICP	Change (see Note 1)
Scope 1 – direct emissions resulting from NG use	t CO_2-e/year	167 086	130 005	- 37 081
Scope 2 – imported electricity	t CO_2-e/year	1 020 128	1 005 498	-14 629
Scope 2 – exported electricity (displaced emissions from NSW grid)	t CO_2-e/year	0	- 815 647	- 815 647
Scope 3 [Note 2] – indirect emissions	t CO_2-e/year	241 106	228 047	- 13 058
Total	t CO_2-e/year	1 428 320	547 904	**-880 415**

Notes:

1. The change figures are based on the difference between the FY 06/07 and the post-ICP minimum generation case data as this reflects a conservative typical operation.

2. This Scope 3 figure is excluding mobile sourced and other construction emissions, as these are only temporary in nature.

Peak Electricity Generation

The ICP will be capable of generating "peaking electricity" using natural gas as a supplement to by-product fuels. Under the peaking scenario, additional natural gas will be used to generate electricity at times when it is economical to do so. Predictions of future natural gas and electricity pricing have been used to assess the likely opportunities for peaking. Current predictions for economic peaking using natural gas is for 15% of the time and was used as the nominal value for the assessment. As different parameters within the model change with time, the actual amount of time for peaking may also vary.

Scope 1 and Scope 3 emissions resulting from the ICP both increase slightly compared to FY06/07 figures under the 15% natural gas peaking scenario. This is different to the non-peaking scenario because of the use of additional natural gas to generate electricity. The results of the Scope 2 displaced emissions from the NSW grid show a benefit compared to that of the non-peaking scenario due to the larger amount of electricity generated by the ICP by the combustion of additional natural gas fuel.

Overall, the results show a significant net decrease in GHG emissions, due to the lower GHG intensity of natural gas generation of that compared to coal.

See Chapter 8 of **Appendix H** for further detail on GHG emissions from peak electricity generation.

Comparison of Annual Emissions

In order to assess the GHG mitigation performance of the ICP Project, this section presents a comparison of ICP GHG emissions (post-ICP) to:

1. total annual NSW emissions (so the impact of the proposal on NSW emission reduction targets can be evaluated)
2. emissions from a coal fired facility producing an equivalent amount of electricity
3. 'best practice' emissions for peak electricity generation.

Comparison to Total Annual NSW Emissions

The total emissions for NSW in 2005 (AGO 2005) from the most recent State GHG inventory were 152 200 200 t CO_2-e. The ICP (without peaking) will provide emission reductions to the total annual NSW emissions primarily of approximately 880 000 t CO_2-e per year due to its ability to reduce the net imports of electricity to PKSW from the NSW grid, as well as the reduction in natural gas consumption. The reduced GHG emissions attributable to the ICP represent a decrease of approximately 0.6% of the total NSW emissions.

Comparison with Emissions From a Coal Fired Facility Producing an Equivalent Amount of Electricity

The net amount of electricity that the ICP Project will be exporting to the grid is estimated at 1 021 735 MWh per annum. To produce this amount of electricity at a NSW based coal fired facility, approximately 974 735 t CO_2-e per annum of emissions would be generated. This compares to an overall reduction in emissions of 64 768 t CO_2-e/yr resulting from the ICP (i.e. total of Scope 1, 2 and 3, excluding displacements associated with exporting electricity).

Comparison with Best Practice Emissions

The ICP will use a steam boiler in combination with a STG for the generation of both electricity and process steam. In terms of overall cycle efficiency, this configuration is not best practice for cogeneration. Current best practice configurations involve the use of a gas turbine (GT) to drive an electrical generator and heat recovery steam generators (HRSG) to produce useable process heat. The applications of the latter cogeneration technology have been more recent and the efficiency of this technology can be significantly higher than that of the more conventional boiler and turbine generator arrangement. BlueScope Steel considered this technology but it was rejected due to site constraints, reliability of operations (i.e. steam production), and higher operation and maintenance costs.

Overall the ICP will provide emission reductions to the total annual NSW emissions primarily due to its ability to export significant electricity into the NSW grid and also the reduction in natural gas consumption.

Generally, maximising the use of existing by-product gases on site (which are currently flared) for the generation of electricity and process steam is a major improvement on the current situation and is a major benefit of the ICP.

9.3 Water Quality

Water quality in Allan's Creek and Port Kembla Harbour is potentially impacted as a result of the proposed modifications during both the construction phase and operation phase of the ICP Project.

9.3.1 Impact on Water Quality (Construction Phase)

The proposed relocation of the gas holder will require a gantry to be constructed on either side of Allan's Creek to support gas ducts which will cross Allan's Creek, connecting the ICP to the proposed relocated gas holder (refer **Figure 4-1** and **Figure 4-5**).

Construction of transmission lines from the proposed new location of the HV substation at Area 18 to the Integral Energy substation on Five Islands Road, parallel to Allan's Creek and Five Islands Road, will be required. This will involve minor excavation at a depth of approximately 1.5m to lay the transmission lines underground (see **Figure 4-1)**.

In addition, construction of the salt water cooling system discharge device which will discharge the ICP cooling water into Allan's Creek, will be required.

BlueScope Steel has sought and obtained permission from the DWE to undertake construction within 40m of waterfront land (refer **Section 5.1.2**).

9.3.2 Water Quality Mitigation Measures – Construction Phase

The minor construction activities outlined in **Section 9.3.1** have the potential to impact upon the water quality of Allan's Creek through soil erosion and sedimentation resulting from excavation, movements of construction machinery and general construction activities. To minimise any potential impact on the water quality of Allan's Creek, control measures will be implemented during the construction phase (see Section 7.3.4, EIS CH2M HILL, 2001). These measures will be outlined in the Construction Environmental Management Plan (EMP) which, in accordance with the Development Consent DA767/01A, will include:

- Details of the proposed construction methods and environmental management procedures
- Details of the proposed dust emission control measures and monitoring
- Details of the proposed soil erosion and sedimentation control measures
- Details of the proposed construction noise emission measures
- Checking and corrective action.

The Construction EMP will be updated to incorporate the change in location of construction activities associated with the proposed modifications including the new location of the gas holder gas ducts and gantry across Allan's Creek, construction of the proposed new transmission line route and relocated HV substation and the construction of the salt water cooling system and discharge device.

9.3.3 Impact on Water Quality (Operation Phase) – Additional Heat Load

BlueScope Steel currently uses salt water as a cooling medium for the No. 1 Power House and the No. 2 Blower Station operations. The cooling water from the No. 1 Power House is discharged into Allan's Creek via the Main Drain. The No. 2 Blower Station discharges its cooling water into Allan's Creek via the No. 2 Blower Station Drain.

The proposed modification to the ICP cooling system involves the change from a re-circulated fresh water cooling system with cooling towers using TTE (sourced from Wollongong STP) as system make-up water, to a once-through salt water cooling system (see **Section 4.1.3**). The proposed modification includes the construction of new underground pipelines and box culvert running adjacent to the Raw Materials Secondary Ore Yards which would discharge the cooling water from the ICP into the mouth of Allan's Creek, approximately 200m east of the No. 2 Blower Station Drain.

The proposed ICP salt water cooling system has potential to impact on the water quality of Allan's Creek and Port Kembla Harbour. The predicted impact is due to the following:

1. An additional heat load from the new ICP's cooling water discharge; and
2. Macro-fouling control measures to inhibit the growth of marine organisms and the collection of plants and debris in the cooling system (see **Section 9.3.4**).

A detailed assessment of the potential impacts associated with the proposed once-through salt water cooling system has been undertaken (see **Appendix I**).

Additional Heat Load

BlueScope Steel engaged Cardno Lawson Treloar Pty Ltd (CLT) to undertake a range of 3D numerical cooling water studies in the report, "*Steelworks Cogeneration Plant (SCP) Proposed Salt Water Cooling Numerical Cooling Water Studies*", August 2006 (see Appendix D of **Appendix I**) which was subsequently supplemented by an addendum report, "*Steelworks Cogeneration Plant (SCP) Proposed Salt Water Cooling Numerical Cooling Water Studies- Addendum Report*", March 2008 (see Appendix E of **Appendix I**).

The purpose of these analyses was to simulate the temperature fields arising from the existing and post–ICP as modified heat loads in order to describe any changes in heat field conditions (i.e. determine whether the additional ICP cooling water discharge will impact on the temperature of Allan's Creek and Port Kembla Harbour). The model used to simulate the change in heat loads was the Delft3D model which took into consideration the bathymetry of Port Kembla Harbour, the heat load, tidal influences, meteorological factors and salinity. The modelling included all existing flows in Allan's Creek pre-ICP and the change to the flows post-ICP as modified (see **Appendix I** for additional information including model parameters and verification).

The modelling took into account a specially designed 30m long discharge device which would discharge the ICP cooling water into the top half of the water column (refer **Section 6.2.1**).

The following simulations were undertaken:

- Pre-ICP summer average heat loads
- Pre-ICP winter average heat loads
- Post-ICP summer and winter typical loads[2]
- Post-ICP summer maximum heat loads[3].

[2] *"typical" heat load involved two periods of maximum heat load per day in the new ICP drain; one in the morning, the other in the evening. The modeling simulated the ICP generating at a rate of 145MW per day for all times except for two one-hour bursts of peak generation (at a rate of 230MW per day) between 6-7am and 6-7pm.*

[3] *This scenario could occur during extended periods of high demand*

Temperature was modelled at six locations in Port Kembla Harbour and three locations along Allan's Creek, 100m, 300m and 500m upstream from the No. 2 Blower Station Drain. Each location was modelled at three levels in the water column:

- Surface layer
- Middle layer
- Bottom layer.

See Section 2.2.8 of **Appendix I** for the modelled locations.

Modelling Results – Typical Summer, Typical Winter and Summer Maximum Scenarios

Table 9-3 compares the existing average temperature conditions at each location and layer (surface, middle and bottom) with predicted post-ICP average temperatures for Summer Typical Heat Loads (CLT, August 2006).

Table 9-3 Existing and Post-ICP Average Water Temperatures (°C) for Typical Summer Heat Load Conditions

	Surface			Middle			Bottom		
Location	Existing	Post-ICP	Change in Temp. (°C)	Existing	Post-ICP	Change in Temp. (°C)	Existing	Post-ICP	Change in Temp. (°C)
22,67 (Services Bridge)	27.21	26.94	-0.27	28.20	28.17	-0.03	27.57	28.29	0.72
45,68 (Inner Harbour)	24.42	24.93	0.51	23.32	23.55	0.23	22.92	23.02	0.10
60,62 (Inner Harbour)	23.85	24.28	0.43	23.23	23.45	0.22	22.81	22.89	0.08
77,46 (The Cut)	23.54	23.89	0.35	22.99	23.14	0.15	22.64	22.68	0.04
81,40 (Outer Harbour)	23.38	23.68	0.30	22.83	22.92	0.09	22.67	22.72	0.05
80,34 (Outer Harbour)	23.01	23.18	0.17	23.03	23.19	0.16	22.93	23.05	0.12
Allan's Creek 100 m	27.30	27.03	-0.27	28.25	28.23	-0.02	27.64	28.33	0.69
Allan's Creek 300 m	26.94	26.53	-0.41	27.99	27.85	-0.14	27.56	28.15	0.59
Allan's Creek 500 m	26.79	26.11	-0.68	27.83	27.27	-0.56	28.08	27.83	-0.25

The results outlined in **Table 9-3** indicate that the use of a specifically designed structure to discharge the proposed cooling water into the surface layers of Allan's Creek, maintains an average temperature increase at less than 0.8°C throughout the six modelled Harbour locations with the greatest temperature increase occurring at the bottom layer at the Services Bridge (22,67) of 0.72°C.

Table 9-4 compares the existing average temperature conditions at each location and layer (surface, middle and bottom) with predicted post-ICP average temperatures for Winter Typical Heat Loads (CLT, August 2006).

Table 9-4 Existing and Post-ICP Average Water Temperatures (ºC) for Typical Winter Heat Load Conditions

	Surface			Middle			Bottom		
Location	Existing	Post-ICP	Change in Temp. (°C)	Existing	Post-ICP	Change in Temp. (°C)	Existing	Post-ICP	Change in Temp. (°C)
22,67 (Services Bridge)	20.14	19.80	-0.34	21.08	21.06	-0.02	21.05	21.70	0.65
45,68 (Inner Harbour)	17.42	17.89	0.47	16.44	16.76	0.32	16.29	16.54	0.25
60,62 (Inner Harbour)	16.84	17.29	0.45	16.40	16.72	0.32	16.25	16.46	0.21
77,46 (The Cut)	16.51	16.91	0.40	16.30	16.54	0.24	16.21	16.35	0.14
81,40 (Outer Harbour)	16.40	16.74	0.34	16.26	16.41	0.15	16.22	16.35	0.13
80,34 (Outer Harbour)	16.14	16.32	0.18	16.22	16.40	0.18	16.21	16.36	0.15
Allan's Creek 100 m	20.32	19.96	-0.36	21.20	21.13	-0.07	21.14	21.76	0.62
Allan's Creek 300 m	19.71	19.32	-0.39	20.77	20.75	-0.02	21.02	21.54	0.52
Allan's Creek 500 m	19.36	18.81	-0.55	20.52	20.13	-0.39	21.30	21.16	-0.14

The results in **Table 9-4** indicate some reductions and some increases in water temperatures throughout the water columns. Surface water temperatures are up to 0.34ºC lower (location 22,67), the middle layer is up to 0.32ºC higher (location 45,68) and the bottom layer water temperature up to 0.65ºC higher (location 22,67) for the post-ICP simulation. All increases in average temperatures were less than 0.7ºC at the six modelled Harbour locations, the greatest increase occurring at the bottom layer at the Services Bridge (22,67) of 0.65 ºC.

The results indicate that, during winter, there would be a minimal temperature increase on Port Kembla Harbour.

Table 9-5 compares the existing average temperature conditions at each location and layer (surface, middle and bottom) with predicted post-ICP average temperatures for Maximum Summer Heat Loads (CLT, April 2008).

Table 9-5 Existing and Post-ICP Average Water Temperatures (ºC) for Maximum Summer Heat Load Conditions

	Surface			Middle			Bottom		
Location	Existing	Post-ICP	Change in Temp. (°C)	Existing	Post-ICP	Change in Temp. (°C)	Existing	Post-ICP	Change in Temp. (°C)
22,67 (Services Bridge)	28.62	27.89	-0.73	28.04	28.63	0.59	23.92	26.49	2.57
45,68 (Inner Harbour)	25.08	26.24	1.16	23.38	23.74	0.36	22.94	23.11	0.17
60,62 (Inner Harbour)	24.30	25.25	0.95	23.30	23.66	0.36	22.84	22.97	0.13
77,46 (The Cut)	23.86	24.60	0.74	23.06	23.34	0.29	22.66	22.72	0.06
81,40 (Outer Harbour)	23.64	24.29	0.65	22.89	23.06	0.17	22.70	22.79	0.09
80,34 (Outer Harbour)	23.16	23.51	0.35	23.15	23.46	0.31	23.01	23.25	0.24

The results indicated that increasing the heat load increased temperatures at all locations. The largest temperature increase for this scenario occurred at the bottom layer at location (22,67) resulting in an increase of 2.6°C.

Overall, the results concluded that:

- During the post-ICP typical summer scenario;
  - The use of a specifically designed discharge structure would maintain average temperature increase at less than 0.8°C throughout the six modelled harbour locations
  - The greatest temperature increase occurred at the bottom layer at the Services Bridge of 0.72°C
  - As a result of the cessation of heat load from the Main Drain, surface temperature in Allan's Creek would be reduced by about 0.5°C at 300m to 500m upstream of the No.2 Blower Station.
- During the post-ICP typical winter scenario:
  - The use of a specifically designed discharge structure would maintain average temperature increase at less than 0.7°C throughout the six modelled harbour locations
  - The greatest temperature increase occurred at the bottom layer at the Services Bridge of 0.65°C
  - As a result of the cessation of heat load from the Main Drain, surface temperature in Allan's Creek would be reduced by about 0.5°C at 300m to 500m upstream of the No.2 Blower Station.
- During the post-ICP summer maximum scenario[4]:
  - The largest average temperature difference between the existing maximum heat load case and the post-ICP case occurred at the bottom layer at the Services Bridge of 2.6°C
  - The initial mixing zone near the discharge point may result in an increase above 3°C which may extend between 30m-40m but this temperature rapidly decreases beyond this point.

The results of the modelling indicated that a thermal plume would be created from the ICP discharge point at the mouth of Allan's Creek which would extend to Port Kembla Inner Harbour. This plume would only cover the top half/third of the water column increasing the rate of dissipation to atmosphere.

[4] At this stage, further detailed design work had been undertaken which resulted in the decision to re-locate the discharge point 30m further downstream at the mouth of Allan's Creek where it widens before joining Port Kembla Inner Harbour, . This was considered necessary to avoid any potential erosion of the northern bank of Allan's Creek due to the velocity of the discharged cooling water. CLT concluded this would have a very minimal impact upon the modeling undertaken to date.

9.3.4 Impact on Water Quality (Operation Phase) – Macro-fouling Control

The use of salt water for cooling purposes leads to the introduction and accumulation of aquatic plants, algae and macro-organisms, such as mussels and barnacles, within the cooling system. The accumulation of these organisms, a process known as macro-fouling, leads to restrictions within the cooling pipes reducing coolant flow and efficiencies within the plant.

In February 2005, the National Heritage Trust released the report "*National Priority Pests: Part II Ranking of Australian Marine Pests* (Hayes et al)". The report identified species established in Australia which resulted in "nuisance fouling". These were identified as M2 species. The M2 species were then cross referenced against the species identified in Port Kembla Harbour and Allan's Creek by NSG (Aug 2006), Marine Science & Ecology Pty Ltd and Coastal Environmental Consultants Pty Ltd (MS&E and CEC) of Port Kembla Harbour (1991) and Allan's Creek (1995).

Based on the results of these studies, **Table 9-6** outlines a list of potential macro-fouling organisms identified by the National Heritage Trust as pest species which cause nuisance fouling and which have been identified in Port Kembla Harbour and Allan's Creek. In addition, the temperature tolerance range, based on the NSG 2006 report, for the species' distribution (where available) has been identified.

Table 9-6 Macro-fouling Organisms Identified in Port Kembla Harbour and Allan's Creek

Species Name	Common Name	Temperature Tolerance Range (°C)
Bugula neritina	Bryozoan	N/A
Ciona intestinalis	Sea Squirt	Above 21°C
Hydroides ezoensis	Bristleworm	N/A
Sphaeroma walkeri		Wide range – better conditions between 15-25°C
Trichomya hirsuta	Mollusc	35.2*

*Incipient lethal temperature of *Trichomya hirsuta* acclimated to 25°C - this species was identified in R.L. Wallis Report (1977)
N/A: Not available

The entrainment of these species (or other similar species found in Port Kembla Harbour or Allan's Creek) in the ICP cooling system will result in the need for BlueScope Steel to adopt some form of macro-fouling control.

At the PKSW, macro-fouling affects both the salt water inlet channel (which currently supplies water from the Port Kembla Inner Harbour to the No. 1 Power House and the No.2 Blower Station), and individual cooling circuits such as STG condensers and the discharge pipework of No. 1 Power House and the No.2 Blower Station.

A number of options exist for the control of macro-fouling, including mechanical, physical and chemical controls (refer **Section 6.2.2**). BlueScope Steel currently uses a chemical control (biocide) called Spectrus CT1300 (Clamtrol II) in conjunction with physical and mechanical controls to control macro-fouling at the salt water inlet channel, No.1 Power House and No.2 Blower Station.

For a detailed assessment on macro-fouling control for condenser cooling at the PKSW see **Appendix I**.

Assessment of Anti-fouling Controls

The various options to control macro-fouling in the ICP cooling system have been discussed in **Section 6.2.2**. A summary of the advantages and disadvantages of these options is outlined in **Table 9-7**.

Table 9-7 Advantages and Disadvantages of Macro-Fouling Options

Control Method	Advantages	Disadvantages
Mechanical		
Screens	• Minimal impact on the environment	• Limited in effectiveness as sole option as fails to remove microscopic larvae of macro-organisms which attach to downstream locations resulting in fouling.
Physical		
Manual Cleaning	• Low environmental impact	• Highly intensive and laborious • Costly as cleaning must take place off-line • Some smaller diameter pipelines cannot be manually cleaned
Taprogge Ball	• Minimal impact on the environment (when successfully operated)	• Ball causes erosion of the condenser cooling surfaces • Requires a large, on-site footprint • High levels of maintenance required • Known to create environmental issues when balls are not captured
Thermal	• Economical benefits when incorporated into original plant design • Relatively rapid mortality rates for many macro-organisms	• High water temperatures can be lethal to non-target organisms • Use of high water temperatures can create excessive turbine back pressure • Retrofitting of plants is cumbersome and expensive • Large footprint required • Not all forms of macro-fouling removed thermally
Paints and Coatings	• Affects only macro-organisms within the cooling system	• Formation of corrosion-resistant films within pipes reduces the effectiveness of the coating • Re-application required every 2-5 years • Re-application required complete dewatering of the cooling water system • Reduces cooling water efficiency through reduction in the heat transfer co-efficient
Chemical		
Oxidising Compounds	• Highly effective	• Long exposure time required as readily detected by macro-organisms, which withdraw for protection • Large amounts of chemical are required • Lethal to non-target species, such as plankton and fish at similar concentrations to macro-organisms • Reactive nature of the agents causes corrosion • React to produce chlorinated and halogenated bi-products • Many oxidising agents are highly toxic to humans • Risk to human health
Non-oxidising Compounds	• More specific to target organisms and hence more	• Some environmental impacts on marine ecology • Not effective on marine plants entrained in the

Control Method	Advantages	Disadvantages
	environmentally sound • Do not react with naturally occurring organics to produce chlorinated and halogenated by-products • Lower exposure time than oxidising compounds • Active ingredient is short-lived in the environment and biodegrades to CO_2 or H_2O	cooling water system

Current Anti-Fouling Methods Used at the PKSW

BlueScope Steel currently uses a variety of methods to control macro-fouling at the PKSW. They include the following:

- *Mechanical* –salt water channel inlet screens
- *Physical* – manual cleaning of large channels (e.g. the salt water inlet channel) by divers during low flow velocities; manual cleaning of condensers and pipework during scheduled maintenance periods
- *Chemical* – Clamtrol II is currently dosed at the No. 1 Power House and the No. 2 Blower Station (the current discharge limits for Clamtrol II are 0.15 mg/L at the Main Drain (for No. 1 Powerhouse) and 0.25mg/L at Allan's Creek discharge point (for No. 2 Blower Station). Dosing occurs at four-weekly intervals during summer and six-weekly intervals during winter.

Preferred Option(s) By BlueScope Steel for Control of ICP Macro-fouling

The preferred option for the control of macro-fouling within the cooling water system is a combination of a variety of options which are outlined below.

Inlet Channel

Divers are currently contracted by BlueScope Steel to physically remove marine organisms from the salt water cooling inlet channel. With the significant increase in channel velocity post-ICP, this will no longer be an option due to safety concerns.

BlueScope Steel is proposing to control macro-fouling at the inlet channel by dosing it with Clamtrol II. A dosing protocol would be developed and implemented to ensure macro-fouling is adequately controlled.

In addition, new screens and filters will be constructed for the proposed STG condenser, which the cooling water would pass through. These screens and filters would remove large macro-fouling organisms. Initially, dosing of Clamtrol II is expected to increase the load on the screens and filters due to the high level of macro-fouling which occurs in the inlet channel. The initial dosing of Clamtrol II would be required at low concentrations to minimise any potential blockages of the existing and new screens from the temporary increased load on the screens. Subsequent dosing of the inlet channel would be performed in accordance with an established dosing regime.

In addition, it may be possible to reduce the current dosing of Clamtrol II at the No. 2 Blower Station due to the potential impacts of any residual concentration of Clamtrol II from the inlet dosing regime.

ICP Condenser and Discharge Pipework

Mechanical

As described above, salt water supply to the ICP from the inlet channel would pass through a series of screens and filters to remove large macro-fouling organisms. The screen and filters would capture a greater amount of organisms and debris than the existing screens and filters due to dosing of the inlet channel. However, the screen and filters cannot prevent microscopic larvae and ribbon weed from entering the cooling water system and therefore alone, would not be adequate to prevent macro-fouling.

Physical

Physical cleaning of the STG condensers would still be undertaken during maintenance periods once every six years during major outages and once every two years for minor outages. Injection of “cleaning darts” will be required through the small STG condenser tubes.

Thermal

BlueScope Steel would prefer to use a form of thermal treatment to control macro-fouling which would significantly reduce (and potentially eliminate) the need for dosing of Clamtrol II in the new STG cooling circuit. BlueScope Steel proposes to periodically recirculate the salt water cooling discharge from the STG condenser back to the ICP cooling water pump inlet basin (see **Figure 9-1**).

Recirculation of the cooling water would result in an increase in the salt water temperature to a level which is fatal to the organisms. The system would continue to recirculate the heated cooling water for a period of 4-8 hours approximately every three to four weeks in summer and every six weeks in winter, similar to the required frequency for chemical dosing.

Over the recirculation period, the system would continually release some of the heated water back into Allan’s Creek. This discharge would be of a higher temperature but a significantly lower volume. Recent modelling undertaken by CLT March, 2008 (see Section 5.1, Appendix E of **Appendix I**), revealed that during summer maximum conditions, at a flow rate of 10,000kL/hr (2.78m^3/s) with an outlet temperature of 40°C, the expected temperature increase into Allan’s Creek was a maximum of 2.6°C at Location (22,67).

If, after testing the effectiveness of the allowable temperatures on local macro-fouling organisms, or commissioning and monitoring of thermal treatment, BlueScope Steel becomes aware that it is not adequate in controlling macro-fouling alone, BlueScope Steel would also intermittently dose the ICP cooling system (as well as the inlet channel) with Clamtrol II, to control macro-fouling. A protocol would be developed to ensure that any dosing of Clamtrol II, in conjunction with dosing of the inlet channel, would adhere to the discharge concentration limit.

Chemical

If BlueScope Steel undertook further analyses and concluded that the thermal method was not suitable for use as a means of controlling macro-fouling in the ICP cooling system, BlueScope Steel would then dose the ICP STG condenser with Clamtrol II to control macro-fouling without any thermal treatment. This has been proven over the past 13 years as a successful method of controlling macro-fouling at the No. 2 Blower Station.

The STG condenser would be designed with two individual water circuits which would be dosed separately. By splitting the condenser into two circuits, this would result in an increase in the dilution rate of Clamtrol II, minimising the discharge concentration into Allan's Creek.

Proposed Protocol and Dosing Regime

The use of an anti-fouling agent is necessary when using salt water as a cooling medium to inhibit the growth of sessile marine organisms and prevent fouling of pipework.

The process additive Spectrus CT1300 (Clamtrol II) is currently used by BlueScope Steel in its existing salt water cooling systems for the No. 1 Power House and No.2 Blower Station. Clamtrol is an aqueous solution of an alcohol and quaternary ammonium compound. Colourless to yellow in appearance, it is 100% soluble in water (MSDS, 2002).

Dosing may be required for the ICP STG condensers. BlueScope Steel is currently trialling a 1mg/L dosing rate at the No.1 Power House (lower than previous dosing concentrations) with a discharge concentration at the Main Drain licensed discharge point of approximately 0.15mg/L. The reduction in concentration is due to consumption of the biocide and dilution of Clamtrol II which occurs from the dosing point (i.e. the condensers) to the Main Drain where discharge limits are applied.

If at the conclusion of this trial period, the results are positive, BlueScope Steel may seek to implement this dosing concentration for the ICP salt water cooling system with subsequent monitoring to determine its effectiveness.

The results of the trial at the No. 1 Power House and the plant configuration of the ICP salt water cooling system indicate that with a dosing rate of 1mg/L, the minimum achievable discharge concentration will be 0.225mg/L.

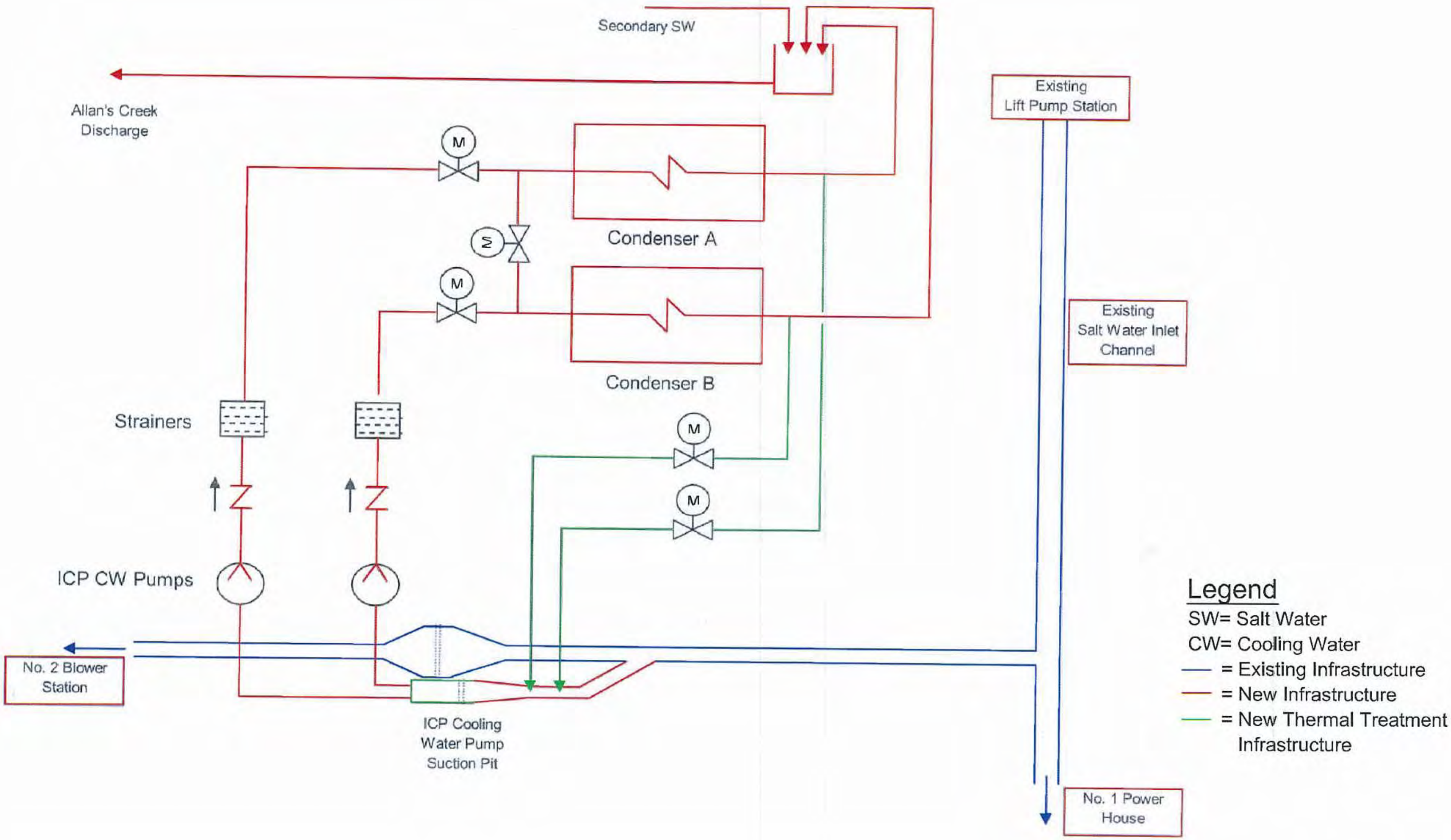

Figure 9.1
Thermal Treatment Infrastructure

9.3.5 Water Quality Mitigation Measures (Operation Phase)

Additional Heat Load

In accordance with appropriate water quality guidelines, (i.e. ANZECC 2000) and in consultation with DECC, BlueScope Steel will commit to a temperature monitoring study of Allan's Creek and Port Kembla Inner Harbour. The study would involve the collection of data pre-ICP and post-ICP.

Limitations associated with monitoring would be considered including the continued expansion of Port Kembla Harbour by the surrounding industrial neighbours and its likely impact on monitoring results.

Based on the proposed location of the salt water cooling discharge point, the modelling undertaken by CLT and the use of a discharge device to laterally discharge the cooling water to the top third/half of the water column, further mitigation measures have not been recommended.

The additional heat load into Allan's Creek and Port Kembla Harbour is not considered to be significant. In addition, the relatively minor impact on Allan's Creek and Port Kembla Harbour is considered acceptable in light of the significant water savings associated with the use of salt water cooling system.

Macro-fouling Control

During commissioning, dosing would commence at low concentration levels whilst monitoring the discharge concentration. The dosing concentration would be slowly increased to the required effective concentration to ensure that concentrations of Spectrus CT 1300 remain under the discharge limits.

During operation of the ICP, BlueScope Steel will monitor the discharge point for residual concentrations of Clamtrol II to monitor compliance with prescribed discharge limits.

9.4 Aquatic Ecology

Due to the prediction of elevated water temperatures within Port Kembla Harbour and Allan's Creek resulting from the additional heat load from the salt water cooling system (see **Section 9.3.3**), the potential ecological effects on the aquatic ecology of Port Kembla Harbour and Allan's Creek have been assessed.

9.4.1 Existing Ecology in Port Kembla Harbour

A desktop study was undertaken by NSG Consulting entitled, "*Ecological Issues in Relation to BlueScope Steel SCP Proposed Salt Water Cooling*" (April 2006) (see Appendix F of **Appendix I**). The report was aimed at gaining a greater understanding of the existing ecology in Port Kembla Harbour and the potential impact on that ecology associated with an increase in temperature predicted from operation of the ICP's proposed salt water cooling system.

The report identified over 500 aquatic species recorded from Port Kembla Harbour. From those species identified, some of the taxon include:

- Cyanophyta (blue-green algae) including *Oscillatoria sp*. and *Spirilina*
- Bacilliariophyta (diamtoms) including *Ardissonea crystallina*, *Cocconeis sp*., *Nitzchia longissima* and *Thalassionema sp*.
- Dinophyta (dinoflagellates) including *Ceratium arientium*, *Gymnodinium spp*. and *Prorocentrum compressum* (it is noted that many of he dinophyta were found in the Outer Harbour only).
- Chlorophyta/Phaeophyta/ Rhodophyta (green, brown and red algae) including *Codium harveyi*, *Dictyota alternifida* and *Polysiphona scopulorum*
- Porifera (sponges) including *Callyspongia sp*. *Haliclona sp*. and *Tethya sp*.
- Mollusca (shellfish) including *Anomia trigonopsis* and *Mytilus galloprovincialis, Clanculus plebejus* and *Haliotis coccoradiata*
- Polychaeta (bristleworms) including Nereidae (*Neanthes cricognatha*) and Serpulidae (*Hydroides brachyacantha*)
- Crustacea: Amphipoda including *Corophium sp*. and *Elasmopus rapax*; Brachyuran (true crabs) including *Charybdis feratus*
- Cirrepedia (barnacles) including *Megabalanus zebra, Tesseropera rosea* and *Sphaeroma walkeri*
- Bryozoa (sea mats) including *Bugula neritina*, *Celleporaria sp*. and *Schizoporella errata*
- Ascidiacea (sea aquirts) including *Herdmania momus* and *Ciona intestinalis*
- Osteichthyes (bony fish) including *Acanthopagrus nigrofuscus, Apogon limenus* and *heteroclinus abdominalis.*

The NSG Report (April 2006) noted that generally there is a greater abundance of species present than those which have been recorded to date.

The NSG Report also noted that Port Kembla Harbour is a highly disturbed estuary in accordance with the definitions of ANZECC 2000 water quality guidelines, and that certain species such as particular sponges and ascidians may be excluded from Port Kembla Harbour due to existing water quality.

A search of the Environment Protection and Biodiversity Conservation Act 1999 was undertaken as part of this assessment. The search included both terrestrial and marine species. A discussion of the outcome of the search and any potential impacts is included in **Section 9.5**.

9.4.2 Impact on Existing Ecology in Port Kembla Harbour

Direct Impact

Modelling undertaken by CLT predicted a temperature increase in Port Kembla Harbour of 0.8°C and 0.7°C during typical summer and winter conditions, respectively, and up to 2.6°C during summer maximum conditions (refer **Section 9.3.3**). As a result, the NSG Report (April 2006) considered impacts on the ecology of Port Kembla Harbour of a potential temperature increase of more than 3°C. These potential impacts are outlined below:

- Species already in the Inner Harbour that are able to tolerate a relatively wide range of temperatures might be expected to show little change such as the barnacle *Balanus trigonus* and the ascidian *Styela plicata* with wide ranges temperature tolerances of 13°C -31°C.
- The abundance of moderately successful species under the current temperature regime may be reduced in parts of the Inner Harbour. Those species which may reduce include the barnacles *Amphibalanus variegates* and *Chthamalus antennatus* with temperature tolerances of 13°C - 27°C and 11°C - 27°C, respectively.
- The abundance of moderately successful species under the current temperature regime may increase in parts of the Inner Harbour. Species which may become more abundant include the spider crab *Hyastenas elatus,* and the silverbelly fish *Gerres subfasciatus* with temperature tolerances of 17°C - 31°C.
- Species presently found in the Inner Harbour at or near the northern limits of their distribution may be eliminated with any further increase in water temperature such as the peanut worm *Phascolosoma annulatum* and the gastropod *Clanculus plebejus* with temperature tolerances of 11°C-22°C and 13°C-24°C, respectively.

The NSG Report (April 2006) also observed that those species who are at the upper limit of their thermal tolerance may not be eliminated or reduced but rather, may withdraw from the upper warmer water layer of the water column to the cooler water beneath the thermal plume. Alternatively, those species may also choose to relocate horizontally to cooler parts of the Inner or Outer Harbour.

Indirect (Secondary) Impact

In addition to direct impacts (i.e. potential change in species abundance), secondary effects may also result from an increase in temperature in Port Kembla Harbour, influencing the marine community structure. Although the

NSG Report (April 2006) recognises that prediction of the net effect cannot be precisely determined, some secondary impacts may occur.

Some species may gain a competitive edge over others resulting from a changed interaction among species. For example, an increase in temperature may result in a decrease in predator numbers, allowing those species often preyed upon to increase in abundance. Alternatively, reduced competition for space may also allow a species to increase in abundance.

The NSG Report (April 2006) concluded that:

> "*no major losses of biota from the Inner Harbour are anticipated as a result of the proposed temperature increases given:*
>
> - *The predicted changes to water temperatures are less than 0.8°C across most of the Inner Harbour; and*
> - *Species currently residing in the Inner Harbour have been shown to survive temperatures higher than would be expected at the latitude of Port Kembla."*

It was acknowledged that some changes to the composition of the assemblages may be expected to occur, particularly at the innermost location near the mouth of Allan's Creek, where the predicted changes in water temperatures are greatest.

9.4.3 Impact on Ecology in Port Kembla Harbour – Plankton

As requested by DECC, further assessment was undertaken to determine the potential impact on plankton in Port Kembla Harbour and Allan's Creek resulting from the proposed salt water cooling system.

The following reports were prepared to address the potential impact on Plankton:

- *Ecological Issues in Relation to BlueScope Steel SCP Proposed Salt Water Cooling*" (NSG, Dec 2006) (see Appendix G of **Appendix I**)
- *Conceptual Models of Potential Ecological Impacts of Plankton Entrainment in the Port Kembla Steelworks Cogeneration Plant*" (UNSW Global, 2008) (see Appendix H of **Appendix I**).

Plankton in Port Kembla Harbour

Plankton are separated into two basic plant and animal groups, phytoplankton and zooplankton. Ranging in size from bacteria of 1μm in length to jellyfish up to 1m in diameter and tentacles that can extend for 10m, plankton are primary producers and are a source of food for higher trophic level organisms such as fish. Many marine organisms spend at least part of their life-cycle as planktonic larvae before they settle and become sessile.

Both phytoplankton and zooplankton drift within the water column or surface of the water column with limited motility. Phytoplankton are restricted to the photic zone (due to their need for light), whereas zooplankton remain below this zone during the day and move up towards the surface at night to graze on phytoplankton.

Phytoplankton utilises nutrients and light to grow and reproduce. The lifespan of plankton can vary greatly, ranging from a few days to several months and even in some cases, longer than a year.

Plankton are also distinguished by the length of their planktonic life stages. Organisms which are planktonic for their entire life cycle such as diatoms, dinoflagellates or krill are commonly referred to as 'holoplankton'. Organisms that are planktonic for only a part of their life cycle, usually their larval stage such as crustaceans, marine worms or fish, are commonly referred to as 'meroplankton'.

Impact on Plankton in Port Kembla Harbour

To determine the potential impact on plankton, the following issues have been considered:

1. The rate of entrainment (based on a calculated extraction index)
2. The likelihood of entrainment (i.e. a comparison of the larval life span of plankton and the length of time they reside in Port Kembla Harbour)
3. The impact on plankton which are entrained in the cooling system
4. The consequences of entrainment on the aquatic ecology of Allan's Creek and Port Kembla Harbour.

Rate of Entrainment

To determine the rate of entrainment, an extraction index was calculated (CLT, Sept 2006).[5]

The extraction index provides a basis for assessing and comparing the impact on plankton biomass in Port Kembla Harbour due to the change in salt water intake before and after commissioning of the ICP.

The extraction index (I) was calculated by using the following formula:

$I = Ti/Tr$

where Ti = time required to extract a volume of cooling water equal to the volume of water in Port Kembla Harbour (both Inner and Outer Harbour) and Tr = average residence time of harbour water.

[5] *The formula for the extraction index was provided by DECC in correspondence dated 21/12/05*

To calculate Ti, the volume of Port Kembla Harbour was calculated based on the model bathymetry.[6] The volume of water was determined to be 24.25 x $10^6 m^3$.

The average residence time (Tr) is the average time that water resides in Port Kembla Harbour under existing conditions including tidal flushing influences.

With Ti and Tr determined, the extraction index was calculated (see **Table 9-8**).

Table 9-8 Extraction Index

Parameter	Summer-Pre-Ave	Summer-Post-Ave	Winter-Pre-Ave	Winter-Post-Ave	Summer-Pre-Peak	Summer-Post-Peak
Ti (days)	28.5	18.4	26.9	18.4	26.9	17.9
Tr (days)	3.8	3.2	6.5	6.0	3.2	2.4
Index (I)	7.5	5.8	4.1	3.1	8.4	7.5
Pump Flow (m^3/s)	9.85	15.26	10.43	15.26	10.44	15.72

Table 9-8 indicates the following:

- The time it would take to run a volume of water equal to Port Kembla Harbour through the salt water cooling system (Ti) reduces from 28.5 days in summer pre-ICP to 18.4 days post-ICP. This is to be expected as commissioning of the ICP will lead to an increase in the volume of water used for cooling.
- The average time that water resides in Port Kembla Harbour under existing conditions which include tidal flushing influences reduces from 3.8 days pre-ICP to 3.2 days post-ICP in summer.
- The extraction index reduces from 7.5 units pre-ICP to 5.8 units post-ICP in summer.[7] This is to be expected as commissioning of the ICP will lead to an increase in the volume of water used for cooling, reducing Ti, Tr and therefore reducing the extraction index.

Likelihood of Entrainment

A comparison of the life and larval span of various organisms present in Port Kembla Harbour with the residence time pre-ICP and post-ICP is outlined below in **Table 9-9**.

[6] Subsequent to the calculation of Port Kembla Harbour bathymetry of 24.25x$10^6 m^3$, developments at Port Kembla Harbour including harbour dredging were approved. The bathymetry was re-calculated (CLT, 2008) based on a loss of Harbour volume of 85,000m^3 and loss of tidal prism of 8,000m^3. This resulted in a net increase in harbour volume of 0.2% and a decrease in tidal prism of 0.3%. Changes to the previous extraction index calculations were found to be less than 0.5%.

[7] An extraction index greater than 1 indicates that the volume of the Harbour is greater than the drawing capacity of the intake and that the existing forces of exchange in the Harbour are replacing the water many times faster than the pumps can pass the resident water, or equivalent volume through the ICP.

Table 9-9 Comparison of Life and Larval Span of Plankton and Residence Time (Tr)

		Summer								Winter			
Taxa	Life / Larval Span (days)	pre ICP (3.8)	post ICP (3.2)	pre ICP (3.8)	post ICP (3.2)	peak pre ICP (3.2)	peak post ICP (2.4)	peak pre ICP (3.2)	peak post ICP (2.4)	pre ICP (6.5)	post ICP (6.0)	pre ICP (6.5)	post ICP (6.0)
		Lower limit	Lower limit	Upper limit	Upper limit	Lower limit	Lower limit	Upper limit	Upper limit	Lower limit	Lower limit	Upper limit	Upper limit
Bryozoan Larvae	0.05-5	0.01	0.02	1.32	1.56	0.02	0.02	1.56	2.08	0.01	0.01	0.77	0.83
Diatoms	3-7	0.79	0.94	1.82	2.19	0.94	1.25	2.19	2.92	0.46	0.50	1.08	1.18
Mussel Larvae	3-7	0.79	0.94	1.82	2.19	0.94	1.25	2.19	2.92	0.46	0.50	1.08	1.18
Barnacle Larvae	14-21	3.68	4.38	5.53	6.56	4.38	5.83	6.56	8.75	2.15	2.33	3.23	3.50
Copepods	90-365	23.68	28.13	96.05	114.06	28.13	37.5	96.05	152.08	13.85	15.00	56.15	60.83
Crab Larvae	90-365	23.68	28.13	96.05	114.06	28.13	37.5	96.05	152.08	13.85	15.00	56.15	60.83

The comparison helps assess whether certain plankton are more likely to be entrained during their life span based on the change in residence time post-ICP.

Table 9-9 indicates that taxa such as bryozoan larvae, which have a maximum larval period of five days, will be able to complete its larval period before entrainment into the cooling water intake system throughout the year, although entrainment is possible.

Plankton such as diatoms or mussel larvae with a larval period of 3-7 days may increase the possibility of entrainment but it is still likely for these taxa to be able to spend their entire lives without being impacted by the cooling system, notably during the winter months.

Taxa such as copepods and crab larvae which have a larval period of 90-365 days are highly likely to become entrained into the cooling system at one stage of their larval period depending on their levels of motility.

However, the potential for entrainment can not be considered in isolation. Port Kembla Harbour is tidal and is subject to tidal flushing. The Harbour and its waters are also strongly influenced by winds. Certain species may be moved out from Port Kembla Harbour and, conversely, brought in to Port Kembla Harbour as a result of these processes. The resultant impact on plankton assemblages originating in the Harbour is offset by this interchange with plankton assemblages from outside the Harbour.

Impact on Entrained Plankton

Entrainment within the ICP cooling system will expose plankton to increased temperatures, biocide (during the dosing periods only) and the general mechanical effects of being pumped through the pipes and valves of the cooling system.

The literature review undertaken by NSG indicated that previous studies have observed a large variation in the range of mortality rates for differing species. For example, a 2004 study by Bamber and Seaby suggested a 10-20% mortality of copepods and larval shrimp and lobster compared to a study by Carpenter in 1974 which indicated a 70% mortality of copepods. Such variability in literature introduces uncertainty regarding the precise effects of entrainment on the various planktonic assemblages in Port Kembla Harbour.

Due to the large variation of mortality rates, NSG noted that "*an assumption of 100% mortality is conservative*". It is unlikely, therefore, that the total plankton entrained in the cooling system will cause 100% mortality however, across the wide range of taxa, mortality rates may differ significantly.

The following assessment on the impact of plankton entrained in the ICP cooling system is based on a conservative premise of 100% mortality as requested by DECC.

Table 9-10 compares the proportion of Port Kembla Harbour passing through the cooling system, pre-ICP and post-ICP in one residence time. This is calculated by inverting the extraction index as follows:

Pm = 1/I

Where I = Ti/Tr (extraction index)

Due to the conservative assumption of 100% mortality of plankton through the ICP cooling system, Pm can be interpreted as not only the proportion of Port Kembla Harbour's volume of water through the ICP cooling system in one residence time, but also the mortality rate of plankton per residence time.

Table 9-10 Comparison of Residence Times and Harbour Volume in One Residence Time

	Tr (days) Pre-ICP	I	Pm (%)	Tr (days) Post ICP	I	Pm (%)	Percentage Change (%)
Summer Ave/ Typical	3.8	7.5	13	3.2	5.8	17	4
Winter Ave/ Typical	6.5	4.1	24	6.0	3.1	32	8
Summer Peak	3.2	8.4	12	2.4	7.5	13	1

Table 9-10 indicates that post ICP, during summer typical operations, in 1 residence time (3.2 days) approximately 17% of the volume of Port Kembla Harbour will travel through the ICP cooling system. In winter, in one residence time (6 days), approximately 32% of the volume of Port Kembla Harbour will travel through the ICP cooling system.

This is an increase of 4% when compared with the current pre-ICP average summer conditions, 8% increase compared with the winter average conditions and 1% increase compared with the summer peak conditions. This suggests that there would be an increased impact in one residence time on the aquatic ecology of Port Kembla Harbour based on the current salt water intake levels, which is likely to be greater during the winter months.

Consequences of Entrained Plankton on the Aquatic Ecology of Port Kembla Harbour

Due to the limited available information on the aquatic ecology of Port Kembla Harbour and research to date on the potential effects of plankton entrainment, mortality and its impact beyond the point of discharge, UNSW Global (UNSW, 2008) assessed the potential ecological effects of plankton extraction and mortality upon the ecology of Port Kembla Harbour beyond the discharge point using conceptual models to determine likely scenarios and the scale of impact on the aquatic ecology. The conceptual models took into consideration pre-ICP and post-ICP circulation patterns in Port Kembla Harbour. The importance of circulation patterns was noted in this report:

> *"Turnover of seawater through tidal flushing of the Outer Harbour, and the sub-surface thermal counter current between the Outer and Inner Harbours are important factors which will interact with the thermal plume to determine the precise scale of ecological impact."*

The following scenarios and conclusions were made having regard to both the Outer Harbour and Inner Harbour of Port Kembla:

Outer Harbour

The Report concluded that there is unlikely to be an appreciable impact on the abundance of plankton in Port Kembla Outer Harbour as "*plankton removed in cooling water is likely to be replaced by plankton entering the harbour during tidal exchange relatively quickly*" (UNSW, March 2008).

Inner Harbour

Three possible scenarios were outlined to assess the potential impact of plankton entrainment on the ecology of Port Kembla Inner Harbour. The report recognised that the scale of the potential impact would be largely determined by the circulation patterns within the Inner Harbour post-ICP.

The following scenarios and conclusions for the Inner Harbour were made:

- Scenario 1 – Additional extraction does not appreciably influence pre-ICP circulation patterns resulting in no detectable, or slight ecological impacts. Under this scenario, any deleterious effects would most likely be confined to the mouth of Allan's Creek

- Scenario 2 – Additional extraction increases flow rates in the thermal plume, and underlying counter current resulting in moderate impacts. Under this scenario, replenishment from the counter current beneath the thermal plume may be slow, resulting in a larger area of the Inner Harbour being affected by the outflow of cooling water

- Scenario 3 – Additional extraction dominates circulation patterns within Port Kembla Harbour resulting in large impacts (worst case scenario). Under this scenario, a uni-directional flow of water across most depths is generated resulting in the Inner Harbour being unable to replenish plankton communities.

The report concluded that the most likely outcomes were those proposed in Scenarios 1 and 2, with Scenario 3 being unlikely to occur (see Appendix H of **Appendix I**).

In addition to the direct impact on plankton, an indirect impact on the ecology in Port Kembla Harbour may also occur. Based on a conservative assumption of 100% mortality, the following consequences of the ICP salt water cooling system may occur:

- If the plankton remain suspended in the water column, the abundance of filter feeders and fish which rely on live plankton may decrease
- If filter feeders and fish don't require live plankton, the abundance of filter feeders may increase – the discharge may act as a delivery vector, concentrating food particles in a small area, allowing certain species to feed off the suspended matter
- If the plankton sink to the seafloor, benthic deposit feeders such as amphipods and some polychaetes which consume dead organic matter in surface sediments would be expected to increase in abundance.

Therefore, a change in the abundance of certain species (both positive and negative) in Port Kembla Inner Harbour may occur from the ICP cooling system (see section 2.1 UNSW 2008, Appendix H of **Appendix I**).

Summary

Based on the above information, the following conclusions can be made about the potential impact on plankton from the ICP cooling system:

- Various types of plankton within Port Kembla Harbour will be able to complete their life span without being entrained into the ICP cooling water system however the likelihood of entrainment will increase for some forms of plankton
- A 100% mortality rate of plankton entrained into the system is a conservative premise based on available literature
- An increase in entrained plankton can be expected due to the increase in salt water intake into the cooling system. Based on vector modelling undertaken by CLT (see Section 2.4 of **Appendix I**) and the 3 potential scenarios outlined by UNSW (March 2008), the impact on plankton in Port Kembla Harbour is likely to correspond to Scenario 1. Scenario 1 suggests that the impact on plankton is more likely to be confined to the mouth of Allan's Creek.

9.4.4 Ecological Impacts of Thermal Discharge – Other Power Stations

Research was undertaken to identify the ecological impacts associated with thermal discharges from other power stations in Australia where salt water cooling has been employed. The recorded impacts of salt water cooling on the water body to which they discharge were compared to those predicted in Port Kembla Harbour. Five power plants using salt water cooling were identified:

1. Munmorah Power Station;
2. Vales Point Power Station;
3. Eraring Power Station;
4. Gladstone Power Station; and
5. Torrens Island Power Station.

Munmorah Power Station

Munmorah Power Station, on the NSW Central Coast, commenced operation in 1967. The power station draws water from Lake Munmorah and discharges it to Lake Budgewoi at a rate of 4,600 ML per day when the plant is operating at maximum power generation. Over the past 10 years the power plant has reduced its operations and is currently on stand-by mode as an intermittent service.

A number of studies have been undertaken on the impacts of the plant on Budgewoi and Munmorah Lakes, including studies by Ruello (1978), Henry and Virgona (1980), Batley et al. (1990) and Thresher et al. (1993). When the plant was operating at full capacity, 25% of the total volume of water in Lake Munmorah would pass through the power station every day. Physical damage was suffered by some fish species which were caught in the screens in the inlet channel which act as a filter for the cooling system. Batley et al (1990) observed that the plant's cooling water discharge affected beds of ribbonweed within Budgewoi Lake, close to the discharge point and generally within a 2km radius. The affect was linked to the discharge as ribbon weed has a maximum temperature tolerance of approximately 30°C. Ruello (1978) observed a decrease in greasyback prawns within Lake Budgewoi, which was attributed to the effects of the high temperature and entrainment within the cooling system of the plant. It was concluded that most commercial catches in the two lakes did not show a noticeable decline as a result of operation of the plant (Scott, 1999).

Vales Point Power Station

Vales Point Power Station is located on the southern shore of Lake Macquarie, near the township of Mannering Creek. The plant was originally built in 1960 and underwent an upgrade in 1978/79. The original plant was decommissioned in 1989. The plant draws cooling water from Lake Macquarie and discharges it back to the lake. A study by Robinson (1987) noted declines in seagrass beds immediately adjacent to the cooling water discharge point.

Eraring Power Station

Eraring Power Station, located on the western shore of Lake Macquarie, commenced operation in 1982. The plant draws water from Bonnel's Bay and discharges it to Myuna Bay, within Lake Macquarie. The natural temperature of Lake Macquarie ranges between 13°C and 28°C. The temperature of the water discharged into Lake Macquarie from the plant is generally limited to below 35°C (http://www.eraring-energy.com.au/).

Gladstone Power Station

Gladstone Power Station is located in the Gladstone region of Queensland and commenced operation in 1976. The plant draws cooling water from Auckland Creek and discharges into the Calliope River. In 1982 Saenger et al. undertook a study comparing the macrobenthos concentrations within the Calliope River pre-thermal discharge from the plant and during thermal discharge from the plant. The study found that discharge of cooling water with a maximum ΔT of 8.2°C was unlikely to affect the benthic fauna of the Calliope River adjacent to the power station.

Torrens Island Power Station

Torrens Island Power Station, located on Torrens Island near Adelaide in South Australia, commenced operation in 1963. The plant extracts cooling water from the Port River and discharges it to the Barker Inlet within Gulf St Vincent. The plant discharges approximately 3.9 million m^3 of heated water (at up to 10°C above intake temperature) per day. A study by Jones et al. found that the rise in water temperature as a result of the discharge influenced the distribution of fish fauna. During the warmer summer-autumn period the inner estuary was most affected with average temperatures reaching 29°C and a marked decrease in the abundance of commercially important species during the warmer months in the thermally affected area.

Table 9-11 contains a general comparison of thermal impacts observed at the power stations discussed above. It should be noted that due to the variables of each power station and the receiving water, direct comparison between each power stations is difficult. However, the comparisons outlined below can assist in a general understanding of the potential impacts associated with the use of salt water cooling.

Table 9-11 Comparison of Thermal Impacts from Other Power Stations

Study	Plant	Water Body(s) Impacted	Temperature Change (°C)	Cooling Water Flow Rate	Fauna or flora impacted
Bately et al. (1990)	Munmorah Power Station	Lake Munmorah	10°C increase (maximum ΔT)	57,600 kL/hr (at full capacity)	Ribbon weed
		Lake Budgewoi	7°C increase (500 m from discharge)		Ribbon weed
Thresher et al					Jellyfish (Catostylus)
Ruello (1978)			0.8°C average lake temp increase		Greasyback prawn
Robinson (1987)	Vales Point Power Station	Lake Macquarie	N/A	N/A	Seagrass
	Eraring Power Station		N/A	N/A	Seagrass

Study	Plant	Water Body(s) Impacted	Temperature Change (°C)	Cooling Water Flow Rate	Fauna or flora impacted
Saenger et al. (1982)	Gladstone Power Station	Calliope River	8.2°C (maximum ΔT)	234,000 kL/hr (at full capacity)	No effects noted or predicted on benthic organisms
Jones et al.	Torrens Island Power Station	Port River – Barker Inlet	≈ 6°C	N/A	*A. fosteri* *A. georiana* *A. truttacea* *H. melanochir*
NSG (Aug 2006)	ICP at PKSW	Port Kembla Harbour	10.29°C (maximum ΔT) 0.8°C average temperature increase in Inner Harbour	10,000 kL/hr	**Amphibalanus variegates* **Chthamalus antennatus* **Phascolosoma annulatum* **Clanculus plebejus*

N/A = not available
*Potential flora and fauna impacts

Table 9-11 indicates that varied impacts have resulted from the use of salt water cooling systems at most of power plants. The studies would also indicate that the impacts are usually limited to the vicinity of the discharge point, where species distribution may change (Jones et al., 1996).

9.4.5 Aquatic Ecology – Mitigation Measures

The proposed salt water cooling system has been predicted to increase the temperature of Allan's Creek and Port Kembla Harbour. As a result, this may impact on the aquatic ecology.

BlueScope Steel, as part of their existing PRP 146 (see **Section 5.1.2**), will undertake a study of the flora and fauna of the Port Kembla Harbour and Allan's Creek both pre-ICP and post-ICP. This will help BlueScope Steel increase its understanding of the ecology in Port Kembla Harbour and assist in the assessment of the potential impact of the proposed salt water cooling system.

9.5 Terrestrial Ecology

Although the PKSW is a highly disturbed 742 ha industrial site, there is the potential to impact terrestrial ecology during the construction phase of the Project. The following section outlines the potential impact on any threatened species, both flora and fauna, which may be present.

Particular focus has been directed to the proposed modifications including the new transmission line route along Five Islands Road.

9.5.1 Identification of Threatened Species

A desktop search and site walkover was undertaken to identify the existence and location of threatened species, both flora and fauna at the ICP Project site.

On 4 February 2008, a search of the National Parks and Wildlife Atlas was performed. The Atlas is a search tool which provides recorded plant and animal sightings of threatened species in NSW listed under the *Threatened Species Conservation Act* 1995. The following results were found:

- There were 1149 records of 59 threatened fauna species (classified as either endangered or vulnerable) within the Wollongong local government area recorded since 1980
- There were 154 records of 14 threatened flora species classified as either endangered or vulnerable) within the Wollongong local government area recorded since 1980.

Fauna

The fauna species which were sighted closest to the transmission line route were identified as the endangered Green and Golden Bell Frog (*Litoria aurea*), endangered Swift Parrot (*Lathamus iscolour*) and the vulnerable Black-tailed Godwit (*Limosa limosa*).

With 326 sightings since 1980, the Green and Golden Bell Frog has previously been found in small, separated and isolated locations along the coast. Large populations have previously been found around the metropolitan areas of Sydney, Shoalhaven and mid north coast. The Atlas located the Green and Golden Bell Frog within and approximately 2 km south of the PKSW's Cokemaking facilities. This is in close proximity to the internal transmission line route approved in the original approval, DA 767/01A.

Both the Swift Parrot and Black-tailed Godwit are migratory birds, the Swift Parrot breeding in Tasmania and migrating to the NSW coast in the autumn/winter months. The Black-tailed Godwit is known to breed in Mongolia and Eastern Siberia, flying to Australia for the southern summer, arriving in August and leaving in March. The Atlas recorded 25 sighting of the Swift Parrot, approximately 1-2 km south of the PKSW. The Atlas recorded 1 sighting of the Black-tailed Godwit within the Port Kembla Inner Harbour since 1980.

Flora

Out of 14 different threatened species sighted in the Wollongong local government area, only one, the White-flowered Wax Plant (*Cynanchum elegans*) was found to be in the vicinity of the proposed transmission line route.

The endangered White-flowered Wax Plant has 34 recorded sightings since 1980 in the Wollongong local government area. These sightings are generally located to the north east, east and south-east of the PKSW. The Atlas identified a sighting south of Five Islands Road. The transmission line route will run north of that segment of Five Islands Road.

Environment Protection and Biodiversity Conservation Act Search

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the primary Commonwealth statute addressing environment protection and the implementation of ecologically sustainable development.

Under the EPBC Act, an action will require approval from the Minister for the Environment if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance (NES). The proposed modifications to the ICP Project must be assessed to determine whether an impact may occur.

The EPBC Act Protected Matters Search Tool identifies matters of NES and other matters regarding Commonwealth Land that may occur in, or near the nominated search area. Identified matters of NES must be assessed to determine whether the proposed activity may have an impact. Matters of NES include Threatened Ecological Communities, Threatened Species as well as Threatened Migratory Species listed under the Commonwealth EPBC Act.

A search was undertaken on the 11 April 2008 which included a 1 km buffer around the ICP site (study area). The results identified no threatened ecological communities, the potential for 15 threatened species (including the Green and Golden Bell Frog – *Litoria aurea*) and the potential for 16 migratory species which may potentially occur in the area.

As the EPBC Act Protected Matters Search Tool identified matters of NES that may occur in, or near the ICP Project site, an assessment must be undertaken to determine whether the proposed modifications to the ICP Project "will have, or is likely to have, a significant impact" on the matters of NES (see **Appendix J**).

The search identified the potential existence of a listed marine species, *hippocampus abdominalis* (big-bellied seahorse), within the 1 km buffer of PKSW. The known distribution of the big-bellied seahorse extends from the central coast of NSW, east to New Zealand and south to Tasmania and the Great Australian Bight. The temperature associated with this distribution ranges between 11 and 24°C (NSG Report, April 2006). A 1992 report by Marine Science & Ecology and Coastal Environmental Consultants Pty Ltd noted the presence of the big-bellied seahorse in Port Kembla Outer Harbour. Post-ICP, the increase in water temperature in Port Kembla Harbour is predicted to be less than 0.8°C at most depths. As the big-bellied seahorse has a fairly large temperature tolerance, an increase of 0.8°C is not expected to have a significant impact on the big-bellied seahorse. In addition, the greatest temperature change resulting from the ICP cooling system is predicted to occur in the mixing zone, near the discharge point located at the mouth of Allan's Creek. As the big-bellied seahorse was identified in the Outer Harbour only, there is not expected to be a significant impact or interruption on the lifecycle of the big bellied seahorse such that a viable local population of the species is likely to be placed at risk of extinction, or an impact such as removal or modification of habitat as a result of the proposed operation of the ICP and associated salt water cooling system.

The assessment concluded that the ICP Project as modified would not significantly impact on matters on NES and therefore referral to the Minister was not considered to be required.

Other Searches

In accordance with the "Native Vegetation of the Illawarra Escarpment and Coastal Floodplain Report", DECC and NPWS 2003, the Endangered Ecological Community (EEC) Swamp Oak Floodplain Forest was identified along the proposed transmission line route (see **Figure 9-2**). Although this EEC was not revealed from the desk-top searches, a site walkover was subsequently undertaken to confirm whether it still was present in the area (see below).

Site walkover

A specialist sub-consultant, Gaia Research Pty Ltd, was engaged to undertake an ICP Project site walkover to determine the specific presence of the GGBF and/or its habitat and secondly, comment on the presence of the Swamp Oak Floodplain Forest along the proposed transmission line route (see **Appendix K**). A site walkover took place on the morning of the 17th March 2008. Particular focus was on the proposed modifications including:

- the proposed transmission line route;
- the proposed new construction laydown areas;
- the proposed relocated HV substation;
- the new salt water cooling channel and discharge point; and
- the proposed new gas holder location.

Site Walkover – Results

Observations from the site walkover did not result in any sightings of the GGBF. However, habitat for the GGBF was identified at several locations. Based on historical sightings of the GGBF in the local government area and the existence of suitable habitat for the GGBF, the ecologist concluded that the GGBF may occur on the Subject Site.

In addition, the ecologist also recognised that the area once supported the EEC Swamp Oak Forest. Although a few Swamp Oak trees were sighted along the banks of Allan's Creek, it was concluded that the EEC was no longer present at the site.

In accordance with Section 5A of the EP&A Act and in accordance with the Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC, 2004) and the Threatened Species Assessment Guidelines (DECC, 2007), an Assessment of Significance (see **Table 9-12)** was undertaken to assess whether the proposed modifications has the potential to significantly impact upon the Green and Golden Bell Frog.

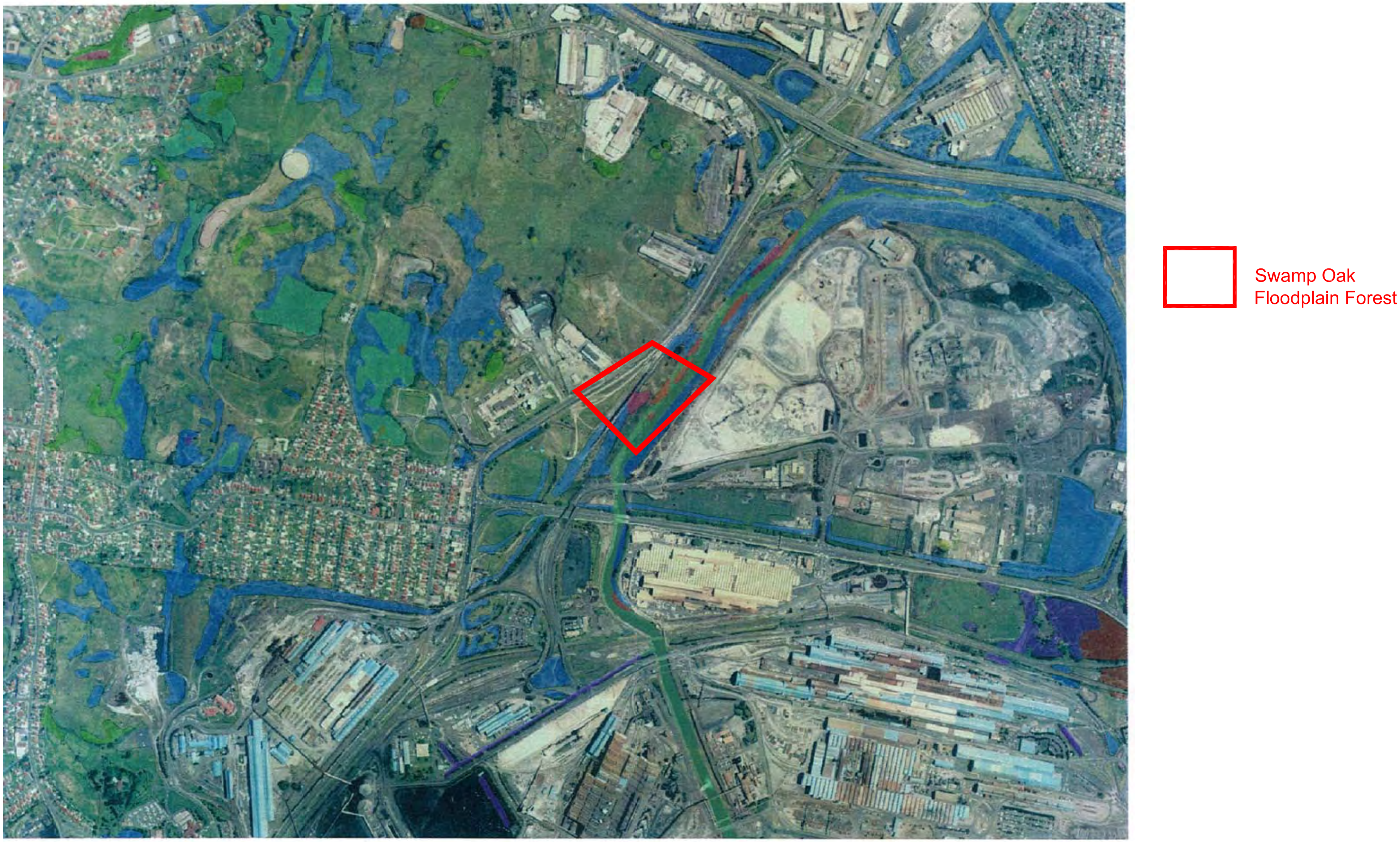

Figure 9.2
Swamp Oak Floodplain Forest (2003)

Table 9-12 EP&A Act '7-Part Test'

Section	Criteria	Assessment
a)	In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction;	Damage to existing limited habitat on site should be minimised. The ICP Project is not expected to disrupt a viable population of the GGBF.
b)	In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised;	No endangered populations were found within the proposed development area.
c)	In the case of an EEC or critically EEC, whether the action proposed is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction or is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	The existing bushland within the Subject Site is not considered critically important to the long-term survival of EEC in the locality and will not put any EEC at risk of extinction.
d)	In relation to the habitat of a threatened species, population or Ecological community, the extent to which habitat is likely to be removed or modified as a result of the action proposed and whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action and the importance of that habitat to the long-term survival of the species in the locality.	The extent of potential habitat alteration associated with the proposed work is minimal, the proposed action will not further fragment the existing habitat and the existing bushland within the Subject Site is not considered critically important to the long-term survival of threatened species in the locality.
e)	Whether critical habitat will be affected (directly or indirectly);	The proposal will not have an adverse affect on critical habitat.
f)	Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	A draft recovery plan has been prepared by DECC for the GGBF (DEC 2005). The action is consistent with those listed in the draft recovery plan.
g)	Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The development is not expected to remove significant quantities of native vegetation.

The ecologist concluded that based on the current data, "*the proposal will not have a significant effect on threatened species within the Subject Site*".

9.5.2 Construction and Operation– Potential Impacts

Construction works for the proposed modifications will only involve work within the boundary of the PKSW. Construction of the transmission line will entail the excavation of a trench 1.5m-2m deep with the proposed transmission lines being laid approximately 1m deep alongside a dirt track used for access within the secured area.

The EPBC Protected Matters Search Tool identified a small number of threatened species which have been sighted in the local government area of Wollongong in the past twenty years. The GGBF has been identified as the only threatened species which may potentially be impacted as a result of the proposed ICP Project.

9.5.3 Terrestrial Ecology - Mitigation Measures

A range of mitigation measures would be implemented to avoid construction erosion and migration of potentially contaminated soils into the surrounding land, Allan's Creek and the Harbour. Successful implementation of the Construction Soil and Water Management Plan (outlined in the original Illawarra Cogeneration Project EIS (CH2MHILL, May 2001) would mitigate any potential impacts on the surrounding area during construction.

During the construction of the transmission line route, any vegetation outside of the construction area, including the vegetation along Allan's Creek, would be fenced off. This would reduce the potential impact to the vegetation and Allan's Creek during the construction phase.

Although no Green and Golden Bell Frogs have been identified along the proposed transmission line route or on the ICP site, if any Green and Golden Bell Frog's are discovered either prior to, or during construction, then the Green and Golden Bell Frog Management Plan submitted to the DECC as part of PRP152 for the Environmental Protection Licence (EPL 6092) will be implemented (see below).

PRP 152 - Green and Golden Bell Frog Management Plan

BlueScope Steel is currently drafting a Green and Golden Bell Frog Management Plan as part of Pollution Reduction Program (PRP 152) under Environment Protection Licence (EPL 6092). A draft of this Management Plan will be submitted to the DECC by 31 July 2008 and will identify any known or likely populations of the Green and Golden Bell across the PKSW.

This Plan will be completed in accordance with the DECC's Draft Green and Golden Bell Frog Litoria Aurea Recovery Plan (DECC, 2005).

9.6 Hazard and Risk Assessment

9.6.1 Preliminary Hazard Analysis

In May 2001, a Preliminary Hazard Analysis (PHA) of the BlueScope Steel ICP Project was completed as part of the approved Development Application (DA767/01). The PHA was prepared in accordance with State Environmental Planning Policy 33 - Hazardous and Offensive Development (SEPP 33) (see Appendix E, CH2M HILL, 2001). SEPP 33 requires the identification of proposed activities or facilities which may pose an off-site risk to people, property and/or the environment.

The PHA included the approved gas holder located south of the No. 5 Blast Furnace. The gas holder was to be 70 m in height, 40 m in diameter and with a capacity of 40,000m^3.

The PHA comprised:

- A hazard identification of incidents that may pose a significant risk to the public from accidental and atypical events
- An outline of proposed operational and organisational safety management controls
- A consequence and frequency analysis to determine the magnitude, impact and likelihood of major incidents
- An evaluation of the calculated hazard and risk levels with respect to the (former) NSW Department of Urban Affairs and Planning (DUAP) guidelines.

A range of incident scenarios were considered in the analysis, including major gas leaks, explosions and fires from gas holder and pipe failures. The consequence analysis demonstrated that, except for major release from a catastrophic failure of the gas holder or gas supply lines during unfavourable wind/weather conditions, impacts are contained within site boundaries.

However, the likelihood of such occurrences resulting in land use safety impact is very low, and was estimated to be at less than one chance in ten million per year at the nearest residential area.

The risks imposed by the proposed works were identified, estimated and compared with the criteria applied by DUAP for land use safety assessment. The land use safety planning risk levels for the proposed facilities satisfied the land use safety planning criteria. It was concluded that the ICP Project did not pose an off-site risk to people, property, or the environment.

9.6.2 Preliminary Hazard Analysis - Update

The PHA was reviewed and updated to assess the off-site risk to people, property and the environment in light of the proposed modifications.

The relevant proposed modifications include:

- Relocation of the gas holder north of Allan's Creek
- An increase in the gas holder size to 120,000m^3.

A comprehensive updated PHA incorporating these changes is included in **Appendix L.** A summary of the conclusions of the updated PHA as it pertains to the resizing and relocation of the gas holder is outlined below:

- In terms of individual fatality risk criteria, the residential criteria of 1 in a million per year is not exceeded (the individual risk fatality level at the nearest residential area is at least an order of magnitude less i.e.: less than 1 in 10 million per year). With due consideration to the conservative nature of the assessment; and the technical, operational and locational controls which, although most difficult to quantify, would clearly reduced the actual risk levels, the actual risk levels would be significantly less than the calculated risk levels. Therefore, it is concluded that the development and proposed modifications does not significantly increase the land use safety planning risk outside the site boundary, and also satisfies the DoP's Individual Fatality Risk Criteria.

- In terms of societal risk:
  - The potentially hazardous components of the proposed facility is located well away from any major high density residential area or sensitive land uses (at least 1000m)
  - The individual fatality risk levels at the nearest residential level are at least an order of magnitude below the associated individual risk criteria
  - Only under the extremely conservative modelling conditions of F1 weather conditions have fatality concentrations been calculated outside site boundaries
  - The actual number of obstacles between the release location and nearest residential area are such that they would be expected to greatly interfere with the stability of any stable gas release, resulting in additional dispersion dynamics such that it would be expected the dispersion would be similar to less stable weather conditions which do not result in calculated fatalities outside site boundaries.

Therefore, it is concluded that the proposed facility taking into consideration the proposed modifications will not be unacceptable on societal risk grounds.

- The respective criteria of 10 and 50 in a million per year for injurious and irritant toxic levels are not exceeded. The proposed development including the proposed modifications satisfies the DoP's Injury Risk Criteria.

- As no hazard scenario results in heatflux or overpressure levels exceeding 4.7kW/m^2 and 7kPa at site boundaries, the Injury Risk Criteria is satisfied. This also implies that the Risk Criteria for Property Damage and Accident Propagation is satisfied (the Risk Criteria for Property Damage and Accident Propagation has a threshold of 23kW/m^2 and 14kPa at site boundaries).

- As no accidental emission was identified which would threaten the long-term viability of any ecosystem or any species within it, it is considered that the intention of the DoP's risk criteria for the biophysical environment is satisfied.

The risks imposed by the proposed works have been identified, estimated and compared with the criteria currently applied by the DoP for land use safety assessment. The land use safety planning risk levels for the ICP incorporating the proposed modifications satisfies the land use safety planning criteria.

9.6.3 Mitigation Measures

As outlined in the original PHA, the proposed safety systems (both hardware and software) are to be finalised for individual plant items. As the design is detailed, the integrity, need and performance of such systems will be specifically considered through formal safety reviews such as Hazard and Operability (HAZOP) studies.

9.7 Visual Impact Assessment

9.7.1 Visual Amenity – Visibility and Visual Absorption

A visual impact assessment to determine the likely impact on the visual amenity of the closest residential suburbs as a result of the proposed modification was completed as part of the Preliminary Environmental Assessment, Appendix D (CH2M HILL, December 2007) (see **Appendix M**). The focus of the visual amenity impact assessment was the proposed relocation of the gas holder from south of the No. 5 Blast Furnace to the northern side of Allan's Creek, as well as the resizing of the gas holder from 40m x 70m to 60m x 66 m (refer **Section 4.1.2**).

The visual impact assessment took into consideration both the visibility of the gas holder (i.e. the visibility from surrounding suburbs, the number of potential viewers and the viewing distance) and the visual absorption capacity of the surrounding landscape (i.e. the context of the view) from the two closest residential suburbs of Cringila and Mount Saint Thomas.

In summary, the assessment determined that the proposed modification to the size and location of the gas holder is not expected to have a significant impact on the visual amenity of the residents in the surrounding suburbs due to:

- A small number of potential viewers from the east and the west
- The high visual absorption capacity of PKSW and its ability to allow additional infrastructure without significantly altering the context of existing views
- The siting of the proposed gas holder within the existing PKSW site, in close proximity to other structures with similar heights and colourings.

9.7.2 Visual Amenity - Lighting

The proposed consolidation of the ICP footprint, relocation of the HV substation and gas holder have been assessed due to the potential to impact on the closest residents due to the lighting associated with these operations.

ICP

The proposed consolidation of the ICP footprint would not have any impact on residents. The ICP will be located near the eastern boundary of the PKSW and is surrounded by other PKSW industrial operations. The closest residential premises are over 1km to the east and any lighting associated with the ICP would not have an impact.

HV Substation

The HV Substation is proposed to be relocated further west from the approved location, to the east of Springhill Road at "Area 18" and adjacent to Allan's Creek (see **Figure 3-3** and **Figure 4-1**). The proposed location is north of the nearest residents in Merrett Avenue, Cringila.

The following lighting approach associated with the HV Substation is outlined below:

- Entrance lighting at the main access gate
- Standard entry and exit lights for the switch room
- Transformer lights
- Perimeter lighting.

The transformer lights and perimeter lights will only be turned on during periods of maintenance or alarm or emergency response when it is necessary to ensure the substation is operating safely and efficiently.

The proposed location of the HV Substation is surrounded by Allan's Creek to the north, Springhill Road to the west (a main arterial road), the PKSW to the east and Five Islands Road to the south (a main arterial road). The proposed location of the HV Substation, known as Area 18, is screened from Allan's Creek and Springhill Road by a manmade landscaped mound around the perimeter. This will also reduce any potential impacts associated with the minor lighting associated with the HV Substation.

With limited lighting associated with the proposed HV substation and its proposed location, there is not considered to be a significant impact on motorists or the closest residents as a result of the lighting from the HV substation.

Gas Holder

The gas holder is proposed to be relocated north of Allan's Creek, west of the Cryogenic Plant and east of Shellharbour Roofing (**Figure 3-3** and **Figure 4-1**). The closest residents are Cringila to the south and Mount St Thomas to the north.

The following lighting approach associated with the gas holder would involve approximately twelve standard fluorescent lights installed along the stairwell of the gas holder. These lights would be turned on once every 8 hour shift for general inspection of the gas holder. The lights would be on for approximately 30 min and would be an approximate lux level (i.e. strength of lighting/illuminance) of 40 (as opposed to office or workstation lux levels of approximately 400).

The minimal amount of lighting and minimal strength of the lighting proposed to be installed on the gas holder, in addition with its infrequent use, is not considered to have a significant impact on the surrounding closest residents and motorists.

9.8 Noise Assessment

In 2001, Bridges Acoustics Pty Ltd was engaged to undertaken a noise impact assessment. The scope of the noise impact assessment included the noise generated from the proposed construction and operation of the ICP Project, which included the decommissioning of the No.1 Power House and boilers from the No. 2 Blower Station (see Appendix H in the original ICP EIS - CH2MHILL, May 2001).

This assessment was conducted according to guidelines in the EPA's Industrial Noise Policy (INP) (EPA, 2000).

A summary of the results of the Noise Impact Assessment is outlined below.

9.8.1 Existing Noise Environment

Three locations at the closest residences were monitored to represent and sample the acoustic environment experienced by close residences or those most likely to be affected by the Project. Noise loggers to record existing noise levels were placed at:

- The corner of Merrett Ave and Emily Road
- Steel Street (closest to the PKSW)
- Corner of Flagstaff Road and Inner Crescent.

Relatively high background noise levels were measured at all survey locations, with industrial noise the dominant background noise. The Flagstaff Road and Merrett Avenue locations were both affected by traffic noise.

9.8.2 Construction and Commissioning Noise Impacts and Mitigation Measures

Received noise levels from construction and commissioning of the proposed ICP Project were calculated using a model established for the site (refer Appendix H in the original Illawarra Cogeneration Project EIS (CH2M HILL, May 2001)). Two construction and three commissioning scenarios were assessed.

The noise impact assessment concluded that all construction noise (including noise generated during peak construction periods and/or during the use of significant noise generating machinery) will not exceed noise criteria in residential and industrial areas. Peak construction traffic is estimated to produce an additional temporary 1 dB on most roads in the area.

An assessment of the noise modelling for the commissioning phase indicated that noise levels post-ICP would be similar to the existing situation. The exception to this is during a short period of steam blowing to clear construction debris from pipework. As steam blowing occurs for a few minutes every few hours, during construction hours and for a maximum period of four weeks, the predicted noise levels were considered acceptable.

9.8.3 Traffic Noise

An increase of 1 decibel is expected as a result of peak hourly construction traffic on major roads in the area, with no change in traffic noise levels from future operation from the plant - Illawarra Cogeneration Project EIS (CH2MHILL, May 2001).

9.8.4 Noise Impacts (Construction) – Mitigation Measures

A Construction Noise Management Plan was prepared to identify and control any noise impacts during the construction and commissioning phases. The complete Noise Management Pan is provided in Appendix H in the original Illawarra Cogeneration Project EIS (CH2M HILL, May 2001). The main components of the plan include:

- Procedures for handling community complaints during construction and commissioning
- Time restrictions
- Procedures to handle steam blowing noise (as well as traffic noise)
- Noise and vibration monitoring requirements.

The requirements of this plan will be incorporated into the modified ICP Project's Environment Management Plan.

9.8.5 Noise Impacts (Operational) - Mitigation Measures

Noise levels produced post-ICP were compared with the existing pre-ICP noise levels (which include operation of the No. 1 Power House and the No.2 Blower Station boilers, which are to be decommissioned as part of the ICP Project). The results of the modelling indicated fairly consistent noise levels in all areas, for all day/evening operational scenarios and for all night operational scenarios.

It was concluded that overall, noise levels from the PKSW are expected to decrease as a result of the Project, with Cringila residents expected to receive a significant acoustic benefit from the decommissioning of the nearby No.1 Power House.

9.8.6 Proposed Modifications to Approved Project

The proposed modifications to the original development consent DA767/01A which have the potential to impact on noise include:

- Relocation of the gas holder and accompanying booster fans north of Allan's Creek
- Relocation of the HV substation
- Extension of the transmission line route along Five Islands Road from the HV substation to the existing Integral Energy Substation
- The proposed modification from a recirculated fresh water cooling system to a once-through salt water cooling system.

Construction Noise

Due to the modifications proposed including the relocation of certain operations of the ICP Project, construction activities and associated construction noise will be generated at different locations across PKSW and along Five Islands Road.

All construction activities will remain within the PKSW.

As outlined in the original ICP EIS, noise limits are not specified in the EPA's Environmental Noise Control Manual (ENCM) for construction periods in excess of 26 weeks. However, a limit of 5 dB above the background level is considered appropriate.

All construction activities including those outlined in this Environmental Assessment will be undertaken in accordance with the Conditions of Consent outlined in section L3 of the original DA 767/01A which comply with the DECC's Environmental Noise Control Manual (ENCM). In addition, construction activities will remain within the time restrictions outlined in the

ENCM. If construction activities are required outside of those hours, noise levels will not exceed normal operational noise levels for these periods.

Traffic Noise

Traffic – Construction Phase

Due to the proposed relocation of certain operations associated with the ICP Project and the current use of the approved construction laydown areas, it is necessary to relocate the construction laydown areas for the modified ICP Project (see **Figure 3-3** and **Figure 4-1**). The proposed construction laydown areas will require construction traffic to enter the PKSW from a different entrance.

However, the PKSW is surrounded by a main arterial road network and as such, will be able to handle the increase in construction traffic. In addition, the new proposed construction laydown areas are frequently used for this purpose and are located within the PKSW at 21 Recycling Area. Buffered by the existing landscape of the area, the use of these construction laydown areas will be in accordance with the existing noise limits outlined in the original development consent.

Traffic – Operation Phase

During the operation of the ICP, a small reduction of traffic may occur along the surrounding roads including Springhill Road, Five Islands Road and the F6 Freeway.

Traffic modelling in 2001 concluded that:

> *"the modelling results show no measurable change in noise levels from the current situation to future operation of the site, from the reduction of only 100 vehicle movements per day."*

This is not expected to change based on the proposed modifications.

Operational Noise

Proposed Change to Boilers

The original noise impact assessment undertaken by Bridges Acoustics in 2001 showed fairly consistent noise levels for day and evening operational scenarios and for all night operational scenarios pre-ICP and post-ICP.

The noise assessment included the noise generated from the approved ICP which included four new boilers, each with the capacity to generate 275 tph of steam.

The proposed modifications include the change from four new boilers to three new boilers and the continued use of existing No. 25 Boiler (until it comes to the end of its efficient economic life).

The three new boilers will be larger to accommodate the use of the smaller No. 25 Boiler. They will have the capacity to generate more steam (approximately 366 tph). As there will now only be three new boilers instead of four and they will be placed in a similar position, embedded well within the PKSW and surrounded by other industrial operations, there is not expected to be any change in noise levels associated with the proposed modification to the boilers.

Gas Holder and Accompanying Booster Fans

The original noise impact assessment undertaken by Bridges Acoustics in 2001 concluded that received noise levels from the ICP Project were within appropriate INP criteria (except for a 1 decibel exceedance for a small area of Cringila). This assessment included the booster fans associated with the BOS collection system at the current approved location.

The gas holder and accompanying booster fans will remain approximately 1km from the nearest residents. The noise generated from the gas holder booster fans is not expected to impact on the nearest residential receivers.

HV Substation and Transformer

The original noise impact assessment undertaken by Bridges Acoustics in 2001 assessed the location of the HV substation and power transformer, which was approximately 500m from the nearest residences. The noise impact assessment concluded,

> *"As distribution transformers are regularly located in quiet residential areas, sometimes within 30m of a residence with only marginal noise shielding, these proposed units are not expected to be audible under any conditions and are not considered further in this assessment."*

The proposed relocation of the HV substation is still expected to be located approximately 500m from the nearest residential properties. The proposed relocation is not expected to have any noise impact on the closest residents.

Salt Water Cooling System

The proposed modifications include the use of once-through salt water cooling to cool the STG condensers. This cooling system will involve the discharge of cooling water into Allan's Creek via a specially engineered discharge structure. This discharge device will reduce the velocity of cooling water being discharged to the top third to top half of the water column.

The discharge device is approximately 30 m x 8 m, located along the southern side at the mouth of Allan's Creek before it meets Port Kembla Inner Harbour. The closest noise receptors to the discharge device include the PKSW Raw Materials Handling Area to the south, the Cryogenic Plant to the north west, the Roll-on Roll-Off Berth to the north east and the Port Kembla Inner Harbour to the east.

As the discharge device is embedded at the far east of the PKSW surrounded by industrial operations and Port Kembla Inner Harbour, the limited noise generated from the discharge device is not expected to impact upon any residents in the surrounding suburbs of Mount St Thomas and Cringila.

Noise Impacts - Mitigation Measures

It is considered that no additional mitigation measures outside those outlined in the original DA 767/01A will be required. Mitigation measures will be outlined in detail in the Construction Noise Management Plan and will be in accordance with the Conditions of Consent outlined in the original DA 767/01A. The complete Noise Management Pan is provided in Appendix H in the original Illawarra Cogeneration Project EIS (CH2M HILL, May 2001).

9.9 Waste - Liquid Waste Streams

BlueScope Steel has investigated opportunities to beneficially re-use liquid waste streams produced in the various processes associated with the ICP Project (see **Appendix N**). These streams include by-product fuel condensates, discharge water from the ICP Feedwater Demineralisation Plant, boiler blowdown streams, various maintenance drains and stormwater.

For each stream, the following have been identified:

- Source
- Quantity / frequency
- Primary destination
- Contingency destination (if appropriate).

Many of the identified streams are very infrequent batches. The largest continuous stream is approximately 44m^3/hr.

As part of BlueScope Steel's goal of reaching zero dam water use, the ICP Project includes collection systems incorporating tanks, pumps, pipework and instrumentation to re-use suitable water streams, where it is practical to do so. Such re-use will result in the reduction in consumption of Industrial Water (and therefore dam water).

A number of the streams are either salt water or potentially contaminated with salt water. The presence of high levels of chlorides in those streams makes them unsuitable for re-use in iron or steelmaking processes. Those streams would be discharged into the No. 2 Blower Station Salt Water Inlet Channel. The potentially contaminated steam condensate streams may contain trace levels of the chemicals added to the boiler feedwater. A review of toxicity information in relevant Material Safety Data Sheets (MSDSs) was conducted to demonstrate that the concentrations of toxicants in all of those streams would be lower than that necessary to cause harm to aquatic species, prior to discharge.

The quality of "fresh" water streams has been reviewed and their suitability confirmed for re-use in near-by operating departments. On infrequent occasions (eg maintenance down days), when the destination systems could not accept the ICP waste flows, and collection and transfer tanks were full, the streams would be re-directed into either the Ironmaking East Drain or the No.2 Blower Station Drain. The concentrations of toxicants in those streams was also seen to be lower than that necessary to cause harm to aquatic species, prior to discharge from the relevant drain.

BlueScope Steel intends to beneficially re-use suitable (non-chloride contaminated) liquid waste streams in existing iron and steelmaking processes whenever possible and practical, thereby reducing the consumption of industrial water in those applications.

9.10 Cumulative Impacts

The ICP Project as modified may have potential cumulative impacts during its construction and operation phase. There are two other projects within the PKSW that have been identified as potentially resulting in cumulative impacts. These projects are:

- No. 5 Blast Furnace Reline Project
- Ore Preparation Upgrade Project (OPUP).

The degree of cumulative impacts which these projects may have will depend on the approval, timing and staging of each project. A description of these projects, their status in the approval process and the nature of the cumulative impacts with the ICP Project as modified are discussed below.

9.10.1 No. 5 Blast Furnace Reline Project

The No.5 Blast Furnace Reline Project is focused on ensuring the security of BlueScope Steel's iron and steel making operations. The project will involve major repair work associated with the No. 5 Blast Furnace, including replacement of the refractory lining, the cooling elements and the refurbishment of ancillary equipment.

The No. 5 Blast Furnace Reline Project was approved by the DoP on 9 November 2005. Works are scheduled to begin in March 2009 and continue for a period of approximately three months. As such, during that 3 month period, there is expected to be an overlap during the construction phase of the No. 5 Blast Furnace Reline Project and the construction phase of the ICP Project.

During that 3 month period, the activities of the ICP Project will be restricted to basic civil works such as initial development of foundations. The scope of the ICP works will be deliberately restricted during this time due to shortages in labour resources within the Illawarra Region and so as to not disrupt the work on No. 5 Blast Furnace.

There will not be an impact on traffic as a result of the cumulative works as all access to the site will be via main arterial roads that have the capacity to accommodate the traffic associated with both projects.

Due to the minimal scope of works that will be undertaken as part of the ICP Project during the 3 month period, and due to the location of both the No. 5 Blast Furnace and the ICP which are embedded well within the PKSW, cumulative impacts from the simultaneous construction of both projects are not expected to be significant.

Once construction of the No. 5 Blast Furnace Reline is complete, there are not expected to be any cumulative operational impacts associated with the operation of the No. 5 Blast Furnace and the ICP.

9.10.2 Ore Preparation Upgrade Project

The Ore Preparation Upgrade Project (OPUP) was approved by DoP in July 2007. The OPUP involves an increase in the production capacity of the Sinter Plant and improvements to the facilities at the Raw Materials Handling Area and associated equipment.

The OPUP is planned to occur in the mid to latter half of 2009. It will consist of a set of small to medium sized individual projects that will stretch over a 24 month time period. Construction of the OPUP and the ICP Project as modified will occur concurrently, potentially overlapping for approximately one month with the No. 5 Blast Furnace Reline Project as well. The potential cumulative impacts associated with construction of the ICP Project, the OPUP and No. 5 Blast Furnace Reline Project include traffic and noise.

BlueScope Steel will ensure that all noise generated during the construction phase will comply with noise conditions as outlined in the ICP Project Development Consent. There is not expected to be an impact on traffic as a result of the cumulative works as all access to the site will be via main arterial roads that have the capacity to accommodate the traffic associated with the projects.

Cumulative impacts associated with the operation of both the ICP Project as modified and the OPUP includes air quality and GHG emission impacts.

Air Quality

Operation of the OPUP is expected to result in a 10% increase in the amount of NO_X generated and an 18% increase in the amount of SO_X generated at the Sinter Plant. Operation of the ICP Project as modified is not expected to increase NO_x site wide emissions and would result in minor SO_2 ground level concentration reductions compared to operation of the existing power generation facilities.

Greenhouse Gas Emissions

The OPUP will result in an increase in Sinter Plant GHG emissions of approximately 7.4% from 1 360 532 t CO_2-e to 1 469 382 t CO_2-e (an overall increase in the GHG profile of PKSW by 1%). Operation of the ICP Project as modified will result in a net reduction of 37 081 t CO_2-e per year from existing emissions. In total, a benefit of approximately 880 000 t CO_2-e per year will result from the modified ICP Project due to the clean generation of electricity from by-product fuels rather than from coal-fired operations.

There are not expected to be any significant cumulative impacts during the construction or operation phases of the ICP Project.

10 Ecologically Sustainable Development

In 1992 a National Strategy for Ecologically Sustainable Development (ESD) was developed and endorsed by the Council of Australian Governments (CoAG) along with an Inter-governmental Agreement on the Environment (IGAE). The agreement stated that all relevant policies should take place within the context of the National Strategy for ESD. In response to this requirement the NSW Government incorporated consideration of the principles of ESD into the objectives of the EP&A Act.

The most common and broadest definition of Ecologically Sustainable Development (ESD) is "development that improves the quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends" (National Strategy for ESD, 1992).

The ICP Project must be considered having regard to the four principles of ESD as outlined in section 6(2) of the *Protection of the Environment Administration Act* 1991 (as amended by the POEO Act 1997 and Schedule 2 of the EP&A Regulation 2000).

These principles are:

- The precautionary principle – if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- Intergenerational equity –the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations
- Conservation of biological diversity and ecological integrity – conservation of biological diversity and ecological integrity should be a fundamental consideration
- Improved valuation, pricing and incentive mechanisms – that users pay for their products or services, including their full life-cycle impacts, and cost-effective market mechanisms to attribute externalities will be implemented.

The following is a discussion of how the ICP Project is consistent with the principles of ESD.

10.1 The Precautionary Principle

The precautionary principle requires that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The precautionary principle requires the emphasis to be placed on anticipation and prevention of harm to the environment, rather than reactive measures to be implemented after harm has occurred. The planning approval's process that has been undertaken as part of the ICP Project meets the requirements of the precautionary principle as it provides a process for identifying and assessing uncertainty relating to the environmental consequences of the ICP Project.

In particular, BlueScope Steel, in accordance with the precautionary principle, has taken measures to assess and minimise the potential impact on the aquatic ecology of Allan's Creek and Port Kembla Harbour. In accordance with the precautionary principle, consideration has been given as to whether there is a threat of serious or irreversible harm to the aquatic environment and whether there is scientific uncertainty as to the environmental damage. Whilst there may be some scientific uncertainty about the precise impact on aquatic ecology, BlueScope Steel has taken proportionate measures to reduce the potential impact in order to minimise or remove any material threat to serious or irreversible harm to the environment

In particular, BlueScope Steel has undertaken extensive thermal modelling and, arising from the modelling, specifically designed the cooling water discharge device and location to achieve a predicted increase of temperature under worse case conditions of no more than 3°C in order to minimise impact on aquatic ecology in the highly disturbed harbour environment. A discharge device has been designed to discharge the salt water cooling water to the top third/half of the water column. This will increase heat transfer to atmosphere, reducing the temperature increase in Allan's Creek and Port Kembla Inner Harbour. This is predicted to reduce the potential impact on the aquatic ecology of Allan's Creek and Port Kembla Inner Harbour to minimise the prospect of serious or irreversible harm.

BlueScope Steel has undertaken a similar analysis with respect to the proposed strategy of controlling macro-fouling. BlueScope has considered numerous mechanical, chemical and thermal options and is proposing a macro-fouling control strategy which is designed to remove any potential serious threat to the environment.

In addition to water quality, comprehensive environmental studies have been undertaken, including air quality assessments (including assessments on GHG emissions and NO_x emissions) and terrestrial ecology, to determine and minimise the potential environmental impacts of the ICP Project.

As discussed in **Chapter 9**, these studies concluded that significant environmental impacts will not result from the ICP Project.

As part of the original planning approvals process, a number of mitigation measures have been identified that will be adopted to minimise the potential impacts that may occur.

The ICP Project as modified also has a number of environmental benefits, including the capture and re-use of by-product gases currently flared at the PKSW, significant GHG emission offsets and provide potential to increase the use of recycled water. These benefits result in an overall improvement to the environmental performance of the PKSW and are considered to be consistent with the precautionary principle.

10.2 Intergenerational Equity

The principle of intergenerational equity is expressed in the Inter-governmental Agreement on the Environment (IGAE):

> *'the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations'.*

This definition includes both intra-generational and inter-generational equity.

Intra-generation equity requires that the economic and social benefits of development be distributed appropriately amongst all members of the community. Inter-generational equity requires the environment be maintained or enhanced so that future generations are not disadvantaged due to developments occurring now.

The ICP Project is considered to meet the requirements of intra-generational equity. The TTE intended to be used in the earlier approved system is potentially available for use in the PKSW. BlueScope Steel is in discussions with Sydney Water to use that water (further treated to RIW) to further reduce dam water consumption at PKSW.

Water from the Avon Dam supplies drinking water to the Illawarra region. A reduction in dam water usage by the PKSW will mean that more water is available for use by the wider community. The ICP Project will also meet the requirements of inter-generational equity by retaining options for future generations with regards to the use of natural resources. The capture of a significant amount of gases that are currently sent to flare and the re-use of these gases to produce steam and electricity means that less non-renewable resources, such as coal, are consumed for the production of electricity.

The use of by-product gases currently flared that were previously considered waste means that other resources that would have previously been used remain available for future generations.

Mitigation measures outlined in DA 767/01A will be implemented to manage environmental impact of the ICP Project and to provide environmental protection into the future.

10.3 Biological Diversity and Ecological Integrity

Conserving biological diversity and ecological integrity requires that ecosystems, genetic diversity and species are protected. The implementation of environmental safeguards throughout the construction and operation of the ICP Project will reduce impacts on the surrounding environment and help to conserve biological diversity and ecological integrity.

A Green and Golden Bell Frog (GGBF) Management Plan is being drafted in accordance with the DECC's Draft Green and Golden Bell Frog Recovery Plan. The GGBF Management Plan will be incorporated in the ICP Project's Construction Management Plan to minimise the potential impact of construction activities on the GGBF and its habitat, conserving biological diversity and ecological integrity.

'Anthropogenic Climate Change' is listed as a key threatening process in Schedule 3 of the *Threatened Species Conservation Act 1995*. Natural ecological systems are considered vulnerable to the impacts of climate change as changes in patterns of rainfall and temperature distribution are a key factor in determining the distribution of species.

The ICP Project will deliver GHG emission benefits. The ICP Project will deliver abatements through displacement of up to 880 000 tonnes per year of GHG emissions, thus helping to conserve biological diversity and ecological integrity.

10.4 Improved Valuation, Pricing and Incentive Mechanisms

The principle of improved valuation, pricing and incentive mechanisms requires environmental factors to be included in the valuation of assets and services. BlueScope Steel has undertaken a number of cost-benefit analyses to assess the relevant costs associated with undertaking the ICP Project and implementation of environmental protection measures.

Although there is an increased cost in the development of the discharge device, the benefit to the environment by the reduced temperature increase into Allan's Creek and the corresponding benefit to the aquatic ecology was considered to be a higher priority or resultant value. The chosen option delivers economic benefits through savings relating to power consumption, reduced water consumption and greater reliability in production through power and steam self-sufficiency.

Socially, the proposed modifications delivers benefits through improvements to visual amenity through the reduction in flaring and removing the need for a cooling tower and resultant cooling tower plume. The ICP Project also delivers social benefits through providing an increase in the buffer zone between the residential area of Cringila and the decommissioning of existing power generating facilities in the PKSW with benefits of a reduction in noise impacts. In addition, the ICP will provide power to the NSW grid and, during periods of peaking, satisfy increased levels of consumer demand.

Environmentally, the ICP Project delivers benefits of approximately 880 000 tonnes per year of GHG emissions. The allocated TTE for the ICP Project, further treated to RIW, will also potentially be used to reduce the PKSW's reliance on dam water, helping to conserve this increasingly scarce resource.

10.5 Conclusion

The ICP Project has taken into consideration the principles of ESD and is considered to be consistent with:

- The precautionary principle
- Intergenerational equity
- Conservation of biological diversity and ecological integrity
- Improved valuation, pricing and incentive mechanisms.

The ICP Project as a whole delivers environmental benefits to current and future generations. These benefits are considered to meet the requirements of ESD.

11 Project Justification and Conclusions

11.1 Project Justification

Development of the ICP Project and the proposed modifications is important to secure the ongoing viability of PKSW, whilst proactively creating tangible and significant environmental benefits. The proposed modifications to the ICP Project are the result of both internal and external changes at PKSW that have occurred since the granting of the existing Development Consent in 2002.

The proposed changes and associated benefits are briefly summarised below:

- Utilising the existing upgraded No. 25 Boiler for the rest of its economic life has resulted in the need for only three new boilers instead of four to generate the required steam
- Reallocation of COG on-site has required a larger gas holder to provide a more consistent flow of available LDG gas to the ICP. It will capture more and allows better utilisation of the LDG, reducing the need to flare
- The use of a once-through salt water cooling system will potentially allow BlueScope Steel to further reduce its reliance on fresh or recycled water.

Additional benefits include:

- Securing steam for the PKSW with less operational risk
- Recovery of otherwise wasted heat energy
- Capture of additional by-product gases for re-use
- Reduction in flaring events.

The justification of the ICP Project as modified is discussed below, having regard to the environmental, social and economic considerations.

11.1.1 Environmental Considerations

Environmental aspects of the proposed modifications to the ICP Project were identified and assessed in this EA. The main findings are addressed below.

Air Quality

An assessment was undertaken of the air quality impacts associated with the ICP Project as modified. The assessment found that the ICP Project as modified would not impact upon the air quality of the Illawarra Region. In addition, assessment concluded that impacts of NO_x, PM_{10} and SO_2 emissions from the ICP are predicted to be close to or slightly lower than current operations, for comparable scenarios.

Greenhouse Gas Emissions

A greenhouse gas (GHG) impact assessment was undertaken by CH2M HILL to provide an estimation of the changes in GHG emissions as a direct result of the ICP Project as modified. The assessment concluded that the ICP Project would provide significant GHG benefits.

These benefits result from the net reduction of GHG emissions due to the reduction of natural gas consumption post-ICP. In addition, production of electricity from cogeneration methods, utilising by-product gases, as opposed to the generation of electricity from a coal-fired facility, would result in significant GHG emission benefits estimated at approximately 880 000 t CO_2-e per annum.

As noted previously in this EA, the estimated electricity generation values are based on the results of completed feasibility design work. Potential variations from minor detailed design changes or actual operation of the proposed boilers and steam turbine generator lead to a range in estimated electricity generation values. Over the life of the ICP facility, there are expected to be short-term variations in steelworks by-product fuel availability, as well as variations in available steam and electricity generation capacity due to scheduled boiler and STG maintenance outages. Combination of all these factors has resulted in the range of values presented in this assessment for the post-ICP case.

The ICP Project, as modified, is expected to have significant GHG emissions benefits.

Water Quality

The proposed modifications to the ICP Project include the use of a once-through salt water cooling system to cool the STG condensers.

Water quality impacts in Port Kembla Harbour as a result of the salt water cooling system were assessed including an increase in heat load discharged to Allan's Creek and Port Kembla Harbour as well as the use of macro-fouling controls.

Using a discharge device to discharge the cooling water to the top half of the water column, an increase in water temperature of less than 1°C during the summer and winter months during typical operations was predicted with an temperature increase of up to 2.6°C during a conservative worst case maximum summer heat load periods.

Macro-fouling control measures will be required to prevent macro-fouling of the cooling system. A combination of mechanical, thermal and chemical macro-fouling methods is expected to be employed. BlueScope Steel will determine the appropriate thermal treatment and dosing regime to minimise environmental impacts on the aquatic ecology of Allan's Creek and Port Kembla Harbour.

The water quality of Allan's Creek and Port Kembla Harbour will potentially be impacted from the ICP Project. However, the proposed modification to the ICP Project will prevent the need to consume approximately 10ML/day of fresh water (either dam water or "Recycled Industrial Water" from the Wollongong STP, which could potentially displace dam water consumption at the PKSW or elsewhere). Based on these anticipated water savings the potential water quality impacts on Allan's Creek and Port Kembla Harbour are considered acceptable.

Aquatic Ecology

Studies were undertaken to assess the impact on aquatic ecology as a result of the modification to the ICP Project to use a once-through saltwater cooling system. The predicted increase in water temperature within Allan's Creek and Port Kembla Inner Harbour was not predicted to have a significant impact upon aquatic ecology based on typical operations.

Engineering design controls at the discharge point will mean that the cooling water will generally only mix in the top half of the water column. This will provide aquatic organisms the opportunity to relocate to the bottom half of the water column or another position within the Harbour so as to avoid adverse impacts.

The studies indicated that there may be an impact upon plankton due to the increased entrainment in the salt water cooling system. The likely impact is a decrease in abundance of plankton which would be confined to an area surrounding the mouth of Allan's Creek. This is not considered to be a significant impact.

Terrestrial Ecology

PKSW is a highly disturbed heavy industrial site with little conservation significance in terms of flora and fauna. Generally, most of the areas for the ICP Project as modified are currently occupied by infrastructure or paved.

A site inspection of the PKSW revealed the presence of potential Green and Golden Bell Frog (GGBF) habitat at several locations within the PKSW. A 7-Part Test, in accordance with the TSC Act, concluded that development of the ICP Project as modified would not pose a significant risk of harm to the GGBF.

BlueScope Steel is currently preparing a GGBF Management Plan that will detail how any GGBF encountered or GGBF habitat encountered will be managed. Due to the industrial nature of the PKSW site and the implementation of the GGBF Management Plan, impacts on terrestrial flora and fauna as a result of the ICP Project as modified are not considered to be significant.

Waste - Liquid Waste Streams

BlueScope Steel has investigated opportunities to beneficially re-use liquid waste streams produced in the various processes associated with the ICP Project.

Waste streams were identified as either suitable for re-use in near-by operating departments or alternatively, were identified as either salt water or potentially contaminated with salt water, therefore unsuitable for re-use.

BlueScope Steel intends to beneficially re-use suitable liquid waste streams in existing iron and steelmaking processes whenever possible and practical, thereby reducing the consumption of industrial water in those applications.

11.1.2 Social Considerations

Air Quality

The ICP Project as modified is not expected to have an impact on air quality within the wider Illawarra Region or local air quality.

The air quality assessment also concluded that the ICP Project as modified will result in an improvement in SO_2 ground level concentrations which will have a positive impact in the vicinity of the PKSW. Residents within the surrounding suburbs of the PKSW are unlikely to experience negative impacts on air quality as a result of the ICP Project as modified.

The impact on air quality as a result of the modified ICP Project is not considered to be significant.

Hazard and Risk

A Preliminary Hazard Analysis (PHA) was prepared to determine whether the ICP Project, including the proposed modifications, may have an off-site impact on the closest residents. The PHA concluded that the land use safety planning criteria were met and the individual fatality risk levels at the nearest residential level are at least an order of magnitude below the associated individual risk criteria.

There is not considered to be any land use safety concerns associated with the modified ICP Project.

Visual Amenity

The visual amenity assessment that was undertaken as part of the Preliminary EA concluded that the ICP Project as modified would not have a significant impact upon the visual amenity of surrounding residents.

The assessment determined that, due to the small number of potential viewers and the high visual absorption capacity of the PKSW, modification of the size and location of the gas holder is not expected to have a significant impact upon the visual amenity of residents in the surrounding suburbs. In addition, the ICP Project as modified will lead to a reduction in flaring events, improving the visual amenity of the surrounding areas.

Lighting impacts from the relocated gas holder and HV substation were also not considered to significantly impact motorists or the surrounding residents.

Noise

The assessment of noise impacts from construction of the ICP Project as modified concluded that the construction phase would not exceed noise limits in the surrounding industrial and residential areas.

Noise from the discharge of cooling water to Allan's Creek during the operational stage of the ICP Project as modified has been considered. Based on the location of the discharge point within PKSW and the surrounding industrial operations, noise from the discharge of cooling water is not expected to have a significant impact on the closest residents.

In addition, there is not expected to be an impact on the nearest residential receivers as a result of the relocation of the gas holder and the accompanying booster fans to north of Allan's Creek.

11.1.3 Economic Considerations

The ICP Project as modified will provide a range of economic benefits for the Port Kembla industrial area and the Illawarra Region. The proposed investment in PKSW is expected to ensure its ongoing viability.

In terms of employment, the construction phase of the ICP Project as modified will generate a significant number of jobs. A proportion of the capital cost of the ICP Project as modified will be spent in the Illawarra Region, including the payment of direct income to the local workforce.

This economic benefit is also expected to spread beyond the Illawarra, into surrounding regions, due to the current high level of demand for labour within the Illawarra region. Other indirect economic benefits will derive from the purchase of materials, payment of licence fees, stamp duties and taxes.

11.2 Conclusions

BlueScope Steel is seeking to modify the existing Development Consent under Section 75W, 'Modification of Minister's Approval', of the EP&A Act through the application of Clause 8J(8) of the EP&A Regulation.

This EA addresses the requirements of the EARs and describes the potential environmental impacts associated with the proposed modifications. These requirements include:

- Air Quality
- Greenhouse Gas and Energy Efficiency

- Water Quality (including anti-fouling agents)
- Flora and Fauna
- Hazards and Risks
- Visual Amenity
- Noise
- Liquid Waste Streams

The proposed modified ICP represents an investment of approximately $750M in the PKSW and will improve the environmental performance and operational security of the PKSW. The by-product gases are already produced and burned at PKSW and will continue to be generated over the life of the PKSW. The Project will result in the recovery and re-use of the energy contained in those gases. The by-product gases will be captured and burned in a cleaner, more efficient manner to reduce flaring and produce steam and electricity for the PKSW.

The operation of the ICP will result in GHG emission abatement in the order of approximately 880 000 tonnes of CO_2-e per year, making it one of the largest industrial greenhouse gas reduction projects in Australia.

The proposed modifications are delivering the same functional and operational outcomes as intended and approved in the existing Development Consent (DA767/01A).

The proposed modifications represent improvements to the original design and methodology and are expected to deliver significant environmental benefits. These benefits include:

- GHG emission abatement benefits of approximately 880 000 t CO_2-e per annum
- Potential reduction in the PKSW reliance on fresh or recycled water of approximately 10ML/day in support of the PKSW aim of zero dam water use
- Recovery of otherwise wasted heat energy
- Reduction in flaring events
- Reduction in the visual impact of flaring events
- Reduction in electrical power transmission losses
- Securing the steam supply for the PKSW with less operational risk
- Improvements to the efficiency and productivity of the PKSW

- Provide significant investment and employment opportunities for the Illawarra Region and NSW
- Capacity to increase electricity generation to meet period of increased demand in the NSW electricity grid.

12 Statement of Commitments (Draft)

In accordance with Part 3A of the EP&A Act and the Department of Planning's EARs, the following chapter outlines BlueScope Steel's commitment of environmental management, mitigation and monitoring measures as part of the Illawarra Cogeneration Plant (ICP) Project's proposed modifications.

The Statement of Commitments details the commitments that BlueScope Steel will undertake as part of the proposed modifications. In addition, BlueScope Steel is required to comply with the Conditions of Consent issued by Wollongong City Council as outlined in DA767/01A (see **Appendix D**) as modified by the Minister for Planning.

1. Statutory Commitments

1.1. BlueScope Steel will ensure that all statutory licenses, permits and approvals are obtained and maintained for the Project. Copies of all relevant licences, permits and environmental approvals will be available on site at all times during the Project.

2. Project Compliance

2.1. BlueScope Steel will establish a project specific induction program for employees, contractors and sub-contractors which will incorporate responsibilities under relevant statutory licences, permits and environmental approvals.

2.2. BlueScope Steel will ensure that employees, contractors and subcontractors are inducted in the project induction program prior to commencing work on the site.

3. Management of Key Modification Issues

3.1. Air Quality Impacts

3.1.1. BlueScope Steel will meet the emission limits for the ICP Project as agreed to by the DECC.

3.1.2. The NO_x emissions from the ICP Project will meet the existing Conditions of Consent load limit of 1080 tpa.

3.2. Greenhouse Gas

3.2.1. The ICP Project will maximise, where reasonably practicable, the use of available by-product gases to produce steam and electricity. Electricity generated will reduce consumption from the NSW grid or be put back into the NSW grid to offset GHG emissions generated elsewhere in the state.

3.3. Water Consumption

3.3.1. The proposed ICP Project salt water cooling system will negate the need to consume the additional 10ML/day (approximately) of fresh water approved in the existing Conditions of Consent.

3.4. Water Quality

Salt Water Cooling – Water Quality

3.4.1. BlueScope Steel will develop a water quality monitoring program in consultation with DECC. The program must include but need not necessarily be limited to the following: monitoring locations, monitoring methodologies and standards, parameters and reporting.

3.4.2. BlueScope Steel will conduct one study pre-ICP and one study post-ICP to validate the thermal modelling conducted by Cardno Lawson Treloar as outlined in this Environmental Assessment. The timing and scope of the studies will be developed in consultation between BlueScope Steel and the DECC.

Salt Water Cooling – Macro-fouling Control

3.4.3. BlueScope Steel will develop in consultation with DECC a Macro-fouling Management Plan to minimise the environmental impacts from the control of macro-fouling. The Macro-fouling Management Plan will include options to control macro-fouling including physical, mechanical, thermal and chemical controls. It is BlueScope Steel's preference to design, install and operate a thermal and mechanical system to control macro-fouling (in the ICP steam turbo alternator condenser).

Allan's Creek and other Waterways

3.4.4. BlueScope Steel will develop an ICP Project Construction Environmental Management Plan to manage all environmental impacts and ensure compliance with any licenses, approvals, or permits during the construction phase of the Project.

LDG Condensate

3.4.5. BlueScope Steel in consultation with DECC will develop an LDG condensate management plan that will maximise opportunities for reuse on site where practicable.

3.5. Terrestrial Flora and Fauna

3.5.1. BlueScope Steel will prepare a Green and Golden Bell Frog Management Plan for the site. The measures outlined in the Green and Golden Bell Frog Management Plan will be incorporated into the Construction Environmental Management Plan and Operational

Environmental Management Plan for the ICP Project and implemented where appropriate.

3.6. Aquatic Flora and Fauna

3.6.1. BlueScope Steel will conduct one pre and one post ICP field study to validate the findings of the *UNSW Global Study – Conceptual Models of Potential Ecological Impacts of Plankton Entrainment in the Port Kembla Steelworks Cogeneration Plant March 2008*. This will include but not necessarily be limited to the ecology, health and distribution of plankton (including vertical zonation) and other organisms in the Inner and Outer harbour. Timing and scope of the aquatic flora and fauna studies will be determined in consultation between BlueScope Steel and DECC.

3.6.2. If there is an impact on plankton in excess of trigger values that will be determined in consultation between BlueScope Steel and DECC, BlueScope Steel will investigate the feasibility options for amelioration.

4. Environmental Management and Reporting

Construction Environmental Management Plan

4.1. BlueScope Steel will update and implement the ICP Project Construction Environmental Management Plan in accordance with the relevant provisions set out in DA767/01A, incorporating the modifications as outlined in this Environmental Assessment. The Plan will include but may not necessarily be limited to: stormwater management, dust management, and management of the Green and Golden Bell Frog.

Operational Environmental Management

4.2. BlueScope Steel will update and implement the relevant operational, environmental and safety management procedures in accordance with the modifications as outlined in this Environmental Assessment.

5. Commitment

5.1. This commitment is made under authority of the undersigned, who is legally empowered to make this undertaking on behalf of the applicant, BlueScope Steel Limited ABN 16 000 011 058.

Signature:

Name: Phillip Smith

Position: Vice President – Capital Development

Date: 3 July 2008

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