APPENDIX 14

Copy Archival Record and Statement of Heritage Impact, BOS Plant

STATEMENT OF HERITAGE IMPACT

PROPOSED DEMOLITION OF THE BOS PLANT

Figure 0.1 Interior view looking east BOS Plant
Source: Author, Roll 9878-29/03/2000

Prepared By:

EJE
ARCHITECTURE

NEWCASTLE

412 King Street
Newcastle West NSW 2302

Telephone: (02) 4929 2353
Facsimile: (02) 4926 3069
e-mail: mail@eje.com.au
Web Site: www.eje.com.au

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1.0 THE PROPOSAL

Major changes have occurred in Newcastle and the hunter Region over the past 20 years. The downsizing and eventual decision to close BHP steel making operations and the rationalisation of the coal industry are a reflection of these changes. The BHP steel making site is strategically placed, not only on a local and regional level, but on a State and National level. It has been proposed that the existing site "Front End" be redeveloped as a major Multi Purpose Terminal servicing the east coast of Australia. The area to be developed as the Multi Purpose Terminal, would require the demolition of all above ground structures located within this area (see Appendices for location plan) to enable remediation of the land and redevelopment of the site. Development of the remainder of the site at a later stage for industrial/commercial purposes is also proposed. The buildings proposed for demolition are:

1. No. 1 Blast Furnace
2. No. 1 Blower House
3. Open Hearth Building
5. No. 1 Bloom & Rail Mill
6. Steel Foundry
10. DC Sub Station
11. Wharves
14. No. 3 Blast Furnace
15. AC Pump House
16. Power House
19. Open Hearth Change House
20. Mould Conditioning Building
21. BOS Plant
23. No. 4 Blast Furnace

2.0 CONTEXT OF THE PROPOSAL

2.1 Physical Context

The BOS Plant building is located within the "Front End: site at the North Eastern sector of BHP's Port Waratah works. It is at the central, southern area parallel to and north of the Bloom Caster and No. 1 Bloom and Rail Mill and immediately east of the former Steelmaking Department. It is immediately to the South of the Power House.

2.2 Statutory Context

The B.O.S. Plant is identified within the group identification forming Part B of Schedule 4 (Port Waratah – BHP Steelworks and Office) of "The Hunters Heritage" – Hunter Regional Environmental Plan 1989. It is identified individually within Schedule 4 of The Newcastle Local Environmental Plan 1987 as having an item of Regional – level heritage significance. (This ascribed level of significance is consistent with the level of significance determined in the Port Waratah Steelworks Conservation Plan prepared by EJE Architecture in 1991). The item does not fall within a Conservation Area and is not included on the State Heritage Register. Under the EP and A Act, if an item is of State level heritage significance, the local council is required to obtain the consent and concurrence of the Department of Urban Affairs and Planning to any major intervention into the item. Under the Integrated Approvals Amendment Act 1998, "Integrated development" is development (not being complying development) that, in order for it to be carried out, requires development consent and approval under other, listed environmental legislation (s 91 (1)). The "other listed environmental legislation" includes the Heritage Act 1977. Under the new legislation, (in Section 91a):

(2) Before granting development consent to an application for consent to carry out the development, the consent authority must, in accordance with the regulations, obtain from each relevant approval body the general terms of any approval proposed to be granted by the approval body in relation to the development. Nothing in this section requires the consent authority to obtain the general terms of any such approval if the consent authority determines to refuse to grant development consent. A Consent granted by the consent authority must be consistent with the general terms of any approval proposed to be granted by the approval body in relation to the development and of which the consent authority is informed. For the purposes of this Part, the consent authority is taken to have power under this Act to impose any condition that the approval body could impose as a condition of its approval.

(3) A consent granted by the consent authority must be consistent with the general terms of any approval proposed to be granted by the approval body in relation to the development and of which the consent authority is informed. For the purposes of this Part, the consent authority is taken to have power under this Act to impose any condition that the approval body could impose as a condition that the approval body could impose as a condition of its approval.

3.0 HISTORICAL REVIEW

The BOS (Basic Oxygen Steel) Plant grew from the necessity to compete on the world steel production markets and to replace open-hearth furnaces, which had seen 45 years of service, with more modern equipment. In 1958 it was decided to replace the old existing open hearth furnaces with five 350 ton modern open hearth furnaces on the same site, thus enabling production to continue while the new work proceeded.

However by 1959 a decision was made to install two BOS furnaces in lieu of the large open hearths at the Newcastle Steelworks. At that time, however, the building to house the open hearths was already under construction, so an unusual furnace design concept resulted, with charging scrap steel from one side of the furnace and hot metal from the other side. The new building had, by necessity, to be constructed over the old shop, which was then to be dismantled in sections. BHP's engineers designed a building system by which pre-constructed roof trusses were wheeled along and over the old building. When the first of the 200 ton furnaces was commissioned in 1962, it was the first such installation in Australia and among the largest in the world. The BOS furnace was barrel-shaped steel shell, open at the top and lined with refractories and capable of tilting through an arc of 360 degrees. A taphole was located on one side of the vessel below the mouth, enabling the steel to be poured from under the floating slag when the vessel was tilted.

Scrap steel was charged to the furnace, followed by molten iron which was poured from a ladle, then fluxes, burnt lime, fluorspar and iron ore which were gravity fed to the furnace from a system of conveyors, bins and larry cars. Steel was refined in the furnace by a direct jet of pure oxygen, blown through a three or four holed water cooled lance onto the surface of the charge. The steel was tapped into a ladle where ferro alloys were added to bring the steel to the required specification, after which it was teemed in to ingot moulds, then transported to the rolling mills on a narrow gauge railway line.

The first stage of construction was carried out in the area east of, and adjacent to, the old shop. The hot metal mixer was removed, then four of the original fourteen open hearth furnaces, together with building and ancillaries. In order to maintain production at the level necessary to feed the rolling mills, the new building was erected completely around the operating building, which was later removed in sections.

Commissioning of the BOS plant increased Newcastle's steel making capacity of 1.6 million tons a year, resulting in a need to replace and enlarge a number of production units. Significant developments at this time included the provision of improved raw materials handling facilities, construction of No. 4 Blast Furnace and a major rebuild of No. 1 Bloom Mill. In 1963 the second BOS furnace was installed.

In 1965 an additional 300 ton hot metal crane was installed and in 1967 a 50-ton furnace for a four-strand continuous billet casting machine was constructed.

Demolition of the B.O.S. Mould Conditioning Plant and tar machine took place in 1971. Other progressive changes were made to the building to ensure a more efficient metallurgical operation and to comply with

modern air quality and safety legislation of the 1980's and 1990's.

In March 1982, composite blowing equipment was installed on both 200 ton furnaces. More simply referred to as "bottom blowing", this system was a significant advance in BOS technology which greatly improved blowing performance and gave better control of the steel making process. The operation provided for simultaneous top and bottom blowing. A ladle additive system, costing $43.3m, was also installed during 1981-2. During this period the 60 ton furnace was de-commissioned.

A major task in 1987 involved the replacement of both BOS vessels, installation of new hoods and a new fume collection system, which vastly reduced emissions from the plant. The first of a series of capital improvement programmes at the works which was announced in 1989 included a $25.86m project to provide sublance, mainlance and fluxhandling facilities, boosting the output from the furnaces to match the capacity of the Bloomcaster. In addition, $4.5m was provided to upgrade the three major ladle handling cranes with weighing systems to improve both charge and yield control. The secondary fume system was upgraded in 1991 and equipment installed for measuring the ladle lining in 1992. In 1993 the old precipitators were demolished and the desulphurisation plant was demolished in 1997.

4.0 SUMMARY CONDITION ASSESSMENT

The building and its internal components remain in substantially interpretable condition, although much of the equipment/components have been abandoned in their shutdown condition (i.e. uncleaned).

The building structure is in sound condition with cladding generally intact, but requiring surface maintenance. Internal cranes, ladles, platforms, stairways and railings and ladle transfer cars, as well as internal applied signage remain generally intact.

The condition of each of the subject buildings is fully described in written and photographic form in the Archival Record document produced to accompany this Statement of Heritage Impact.

Asbestos in the BOS Plant:
AC sheeting was used in the office block ceilings on the upper, middle and lower floors. Asbestos bearing gaskets have been extensively used in pipe-work and duct-work through the Steel-making area.

5.0 ASSESSMENT OF SIGNIFICANCE

The BOS Plant has been assessed (1991 Port Waratah Steelworks Conservation Plan) as having Regional significance within the context of the development of the Steelworks.

The following detailed Assessment of Significance has been undertaken to reflect current NSW Heritage Act, Heritage Amendment Act and Burra Charter requirements.

Historic Significance

The BOS Plant represents a significant contribution to the development of steel making in New South Wales through being among the largest and most modern of its type at installation.

The innovative design concept of the charging operation of the furnaces and the creative building engineering design represent association with a significant phase in the development of Steel making in the state and nation. It also clearly demonstrates the evolution of change in the process of making steel in NSW and Australia. For these reasons the building has highest-level REGIONAL HISTORIC Significance.

Aesthetic Significance

The BOS Plant provides evidence of a unique operational layout concept in the evolution of Steel making in N.S.W.

The conversion of the Open Hearth furnaces site while still in operation and construction of the BOS Plant over and around these elements demonstrates innovative structural design and construction. It therefore, demonstrates technical innovation or achievement. This achievement is rare at the regional level. Thus, the BOS Plant has REGIONAL AESTHETIC significance.

Social Significance

Like all of the elements on the Steelworks site, the BOS Plant represents the development of integrated iron and steel making on the Newcastle steelworks site and continues to bear evidence of its important linkage with the creation of employment in Newcastle and the region. As such, this building and the larger site has highest level REGIONAL, SOCIAL Significance.

Technical Significance

The BOS Plant, by virtue of its capacity and unique operational layout, continues to provide an indication of techniques of exceptional interest and rarity at the regional level.

Technical innovations in production and ladle metallurgy form important benchmarks in steel and alloy production. The item has highest-level potential to reveal historical/industrial archaeological information of value to the region. For these reasons it has highest-level REGIONAL Technical Significance.

Overall, the item has REGIONAL heritage significance.

6.0 OPTIONS FOR PHYSICAL INTERVENTION

The Conservation Plan BHP Port Waratah Site Addendum 1999 described the following options:

"After closure of steelmaking, the 27 items of heritage significance identified in the Newcastle LEP 1987 (as well as all other heritage items identified in this Conservation Plan), will remain in situ until:

a) the item becomes unsafe and/or uneconomic to maintain; or
b) the item is to be removed to facilitate remediation of the site; or
c) the item is sold; or
d) the item is to be removed to facilitate the proposed redevelopment

Where "Front End" items are to be demolished they should, where easily transportable and relocatable, be relocated, to a low impact, operating environment within the overall Steelworks site. Components/elements of existing structures/buildings should be similarly relocated or preferably, be relocated to either the proposed Interpretation Centre or, (if that is not appropriate), to the proposed State Industrial Archaeological Repository, both being within the existing Steelworks site. Items capable of continuing to provide service within a steel-making operation, should be relocated to Port Kembla Steelworks or other iron and steel making operation elsewhere in Australia or the world. Where buildings/structures of higher level significance are demolished and removed, interpretation of the building form at ground level is required (Burra Charter and NSW Heritage Act – As Amended).

This item is to be removed to facilitate this proposal. Therefore in accordance with Burra Charter and NSW Heritage Office requirements, recording and interpretation must be undertaken.

Items identified as having been removed or with potential for removal elsewhere is tabled as follows:

Items transferred / sold to other BHP Centres	Items sold Externally
• **Alloy feeding System from Ladle metallurgy Furnace.** • **Ladle pre heating equipment** • **Steel-making Crane Components and controls** • **Lance & sub-lance equipment** • **Heat exchangers** • **Components of Caster cranes.**	• **Steel-making cranes, vessels and remainder of Ladle Metallurgy Furnace.**

It would be preferable for the building to remain. However, this proposition is considered untenable given:

a) If the BOS Plant remains, it cannot easily be re-used or adapted, will require continuous expensive stabilisation and maintenance, or will otherwise deteriorate and become a potential health and safety hazard. Its location does not readily allow for access by private citizens. The item as a whole cannot be relocated. However, some items can/might be salvaged for reuse at other BHP Group Sites. See below.

b) Remediation of this area of the site is required. The remediation proposal involves capping the proposed Multi Purpose Terminal site with a monolithic concrete slab.

Structural members, cladding materials etc are capable of re-use elsewhere or removal for interpretation. Off-site (i.e. not in-situ) interpretation, will only be undertaken where on-site interpretation is not possible and will involve samples of highest-level fabric/fittings/equipment.

Possible re-use or interpretation items include: building frames, cladding, cranes and gantry equipment.

As part of the overall interpretation strategy for iron and steel making at Newcastle, it is proposed to relocate some components to a location on the bridge and the new water body on the entry road to the proposed Industrial Precinct. This will ensure accessibility for the public and a major interpretive component for the overall character of the heavy industrial nature and history of the site.

7.0 THE HERITAGE IMPACT OF THE PROPOSAL

This item is substantiated as having STATE level significance, therefore demolition of the item to enable development of the Multi Purpose Terminal will impact on the high-level significance of the item. The closure of operations at the Newcastle Steelworks impacted on the interpretation of the processes of iron and steel making; demolition of the item changes the interpretation of the processes and the significance of the item.

This impact will be ameliorated by fully recording the item in accordance with the NSW Heritage Council Guidelines and interpretation and protection of the in-situ remains below the pavement of the proposed Multi-Purpose Terminal. The individual site will be interpreted using pavement treatment that can identify the extent of the item and accommodate the operation of the Terminal. The processes associated with the item will be further interpreted on the main site at Port Waratah via the Delprat Interpretive Centre and supplemented by selected items being deposited in the proposed State Archaeological Repository. However, the physical site will remain and its location will be identified through interpretive design within the pavement of the Multi Purpose Terminal.

8.0 APPENDICES:

Appendix 8.1 Site Development Masterplan – showing area of proposed Multi Purpose Terminal in yellow

Appendix 8.2: Three Precincts Concept Plan – Showing Identified Heritage Items to be demolished

Appendix 8.3: Conceptual Design for Heritage Interpretation of BOS Plant

ARCHIVAL RECORD

WATERFRONT PRECINCT HERITAGE BUILDINGS, MAIN SITE BHP PORT WARATAH STEELWORKS, NEWCASTLE

BOS PLANT

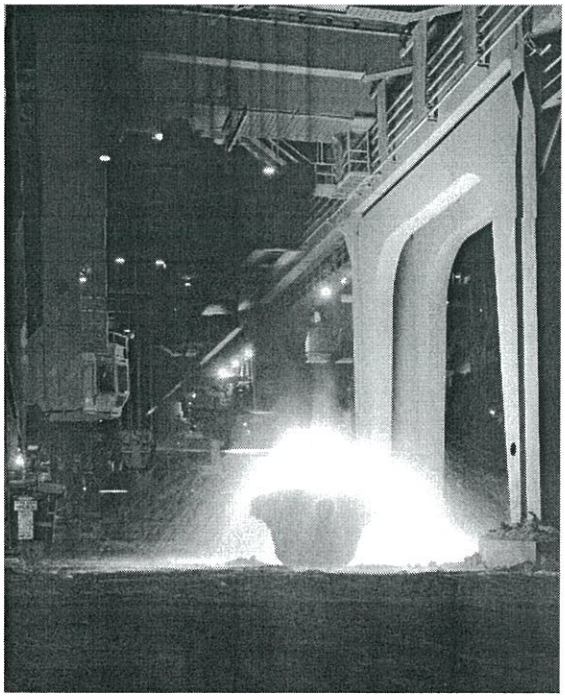

Figure 0.1: Dumping slag into slag pot. 200 tonne crane driver in position operating crane to rotate slag ladle

Source: Erzetich No.058 Ref – B03/01

Prepared by:

EJE ARCHITECTURE

In Association with:

Rosemary Melville – Historian
Bill Jordan – Heritage Engineer
Austral Archaeology Pty Ltd

NEWCASTLE

412 King Street
Newcastle NSW 2300

Telephone: (02) 4929 2353
Facsimile: (02) 4926 3069
E-mail: mail@eje.com.au
Web Site: www.eje.com.au

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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background to the project

Major changes have occurred in Newcastle and the Hunter region over the past 20 years. The downsizing and eventual decision to close BHP steel making operations and the rationalisation of the coal industry are a reflection of these changes. The BHP steel making site is strategically placed, not only on a local and regional level, but also on a State and National level. It has been proposed that the existing site be redeveloped as a major Container Handling Terminal servicing the east coast of Australia. The area to be developed as the Container Handling Terminal would require the demolition of all above ground structures located within this area to enable remediation of the land and redevelopment of the site. Development of the remainder of the site at a later stage for industrial /commercial purposes is also proposed.

In light of the above, EJE Architecture has been commissioned to prepare detailed archival records of the buildings proposed to be demolished that are considered to have heritage value. These records involve documenting the relevant buildings and items they contain as well as the industrial processes that took place within them. Designed to help ascertain the heritage significance of the buildings and associated processes, these archival records also form a statement for the future interpretation of this now redundant part of Newcastle's industrial culture.

The following document constitutes the Archival Record of the BOS Plant - an item classified as having a 'Regional level of heritage significance'

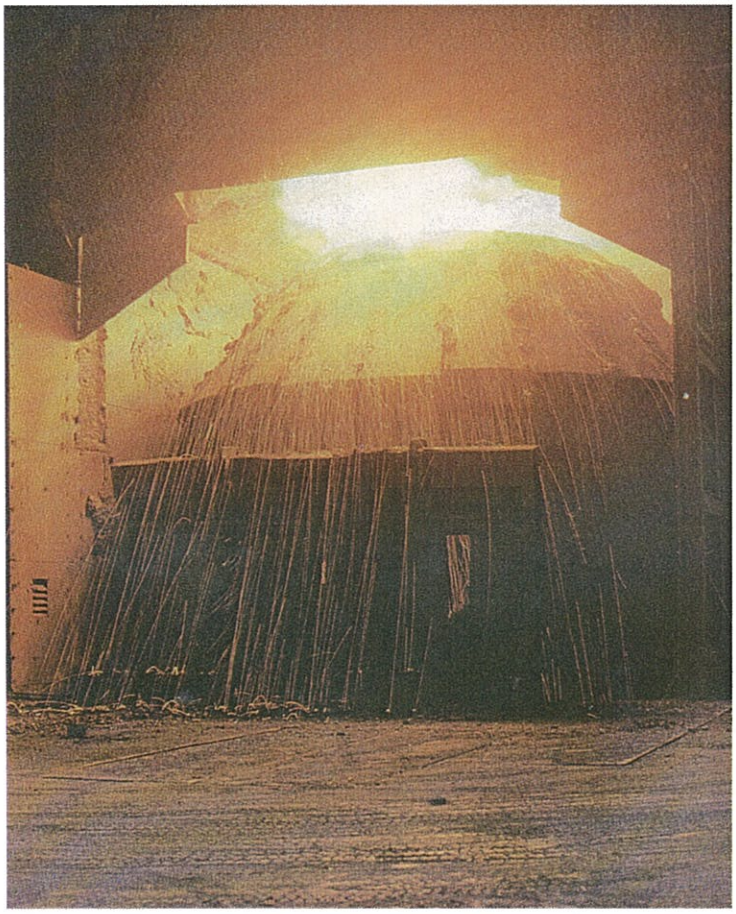


Figure 1.1: A 200 ton furnace during an oxygen blow
Source: Greenhalgh (1999: 117)

1.2 Archival Recording Methodology

The approach taken in recording these heritage items and the document format is based on heritage consultant input and current NSW Heritage Office's guidelines including those relating to the preparation of archival records and their photographic recording.

A number of important aspects have been identified in the statement of heritage significance included in the report whose recording was necessary to reflect the item's character and value described. Hence it is this statement that drives the rationale for the report and determines the relevance of information collected. Derived from three main elements - buildings (structure and fabric), the individual items they housed and the processes that took place within them - these aspects are elaborated on in a number of different ways, which reflect their respective social, technical and aesthetic qualities.

As a way of dealing with the items various facets of heritage value, the report is broken into 3 main components:

-Written descriptions (history, process and heritage statement),
-Pictorial descriptions (photographs and working drawings)
-Inventories and other supporting information

Together these components create a comprehensive account of the chronological development of both the buildings and the industrial technologies held within them that have invariably changed throughout their lives. At times the components are incorporated into each other to provide a more coherent and illuminating description. All material is cross-referenced to each other and referenced to archival registers and source publications.

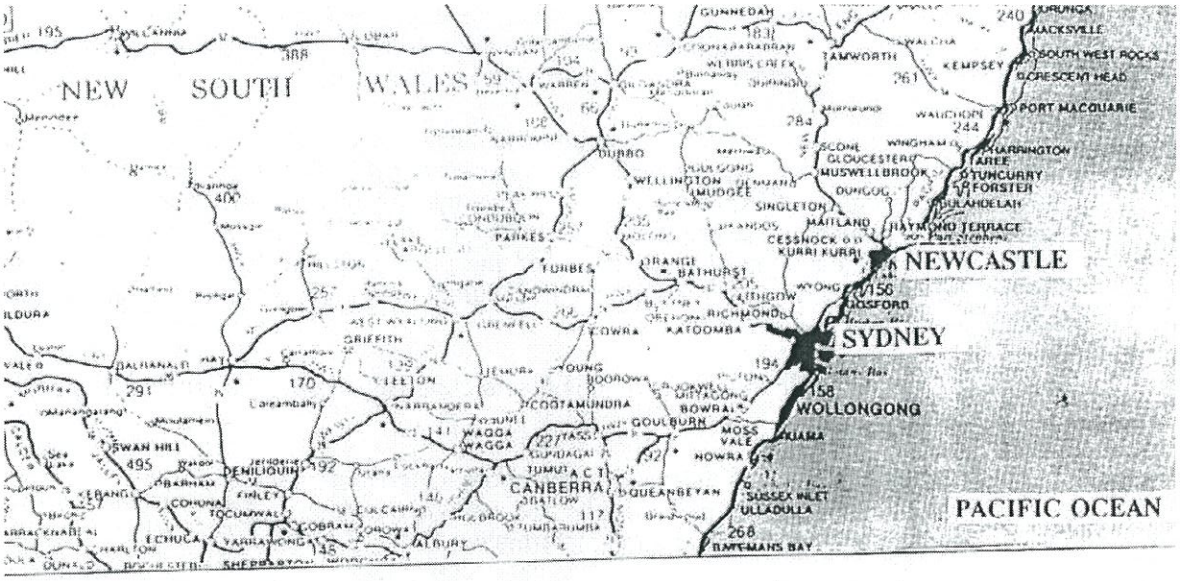
The written descriptions provide a background to the building and the functions that it housed and incorporate relevant photographs. As an essential part of the written component, a statement on the item's heritage significance details why the item is valued.

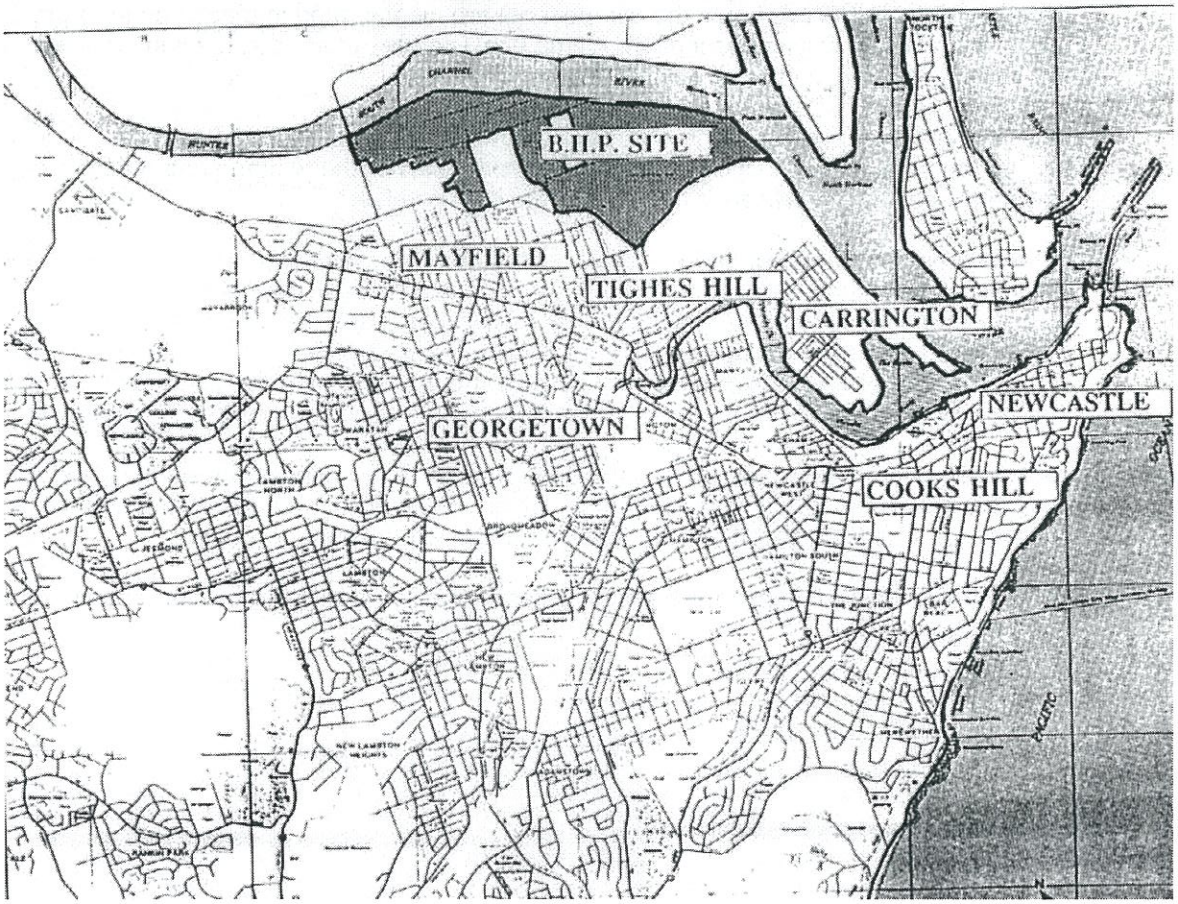
The bulk of the information in this report comes from the pictorial descriptions. Comprising of both historic and contemporary photographs, an account of the building fabric, the various industrial processes contained and the changes that have taken place through time is made. In addition, a selection of original working drawings provide a detailed picture of the construction techniques, structure and fabric details and offer substantial dimensions and measurements, making largely redundant any requirement for contemporary measured drawings or scaled photographs.

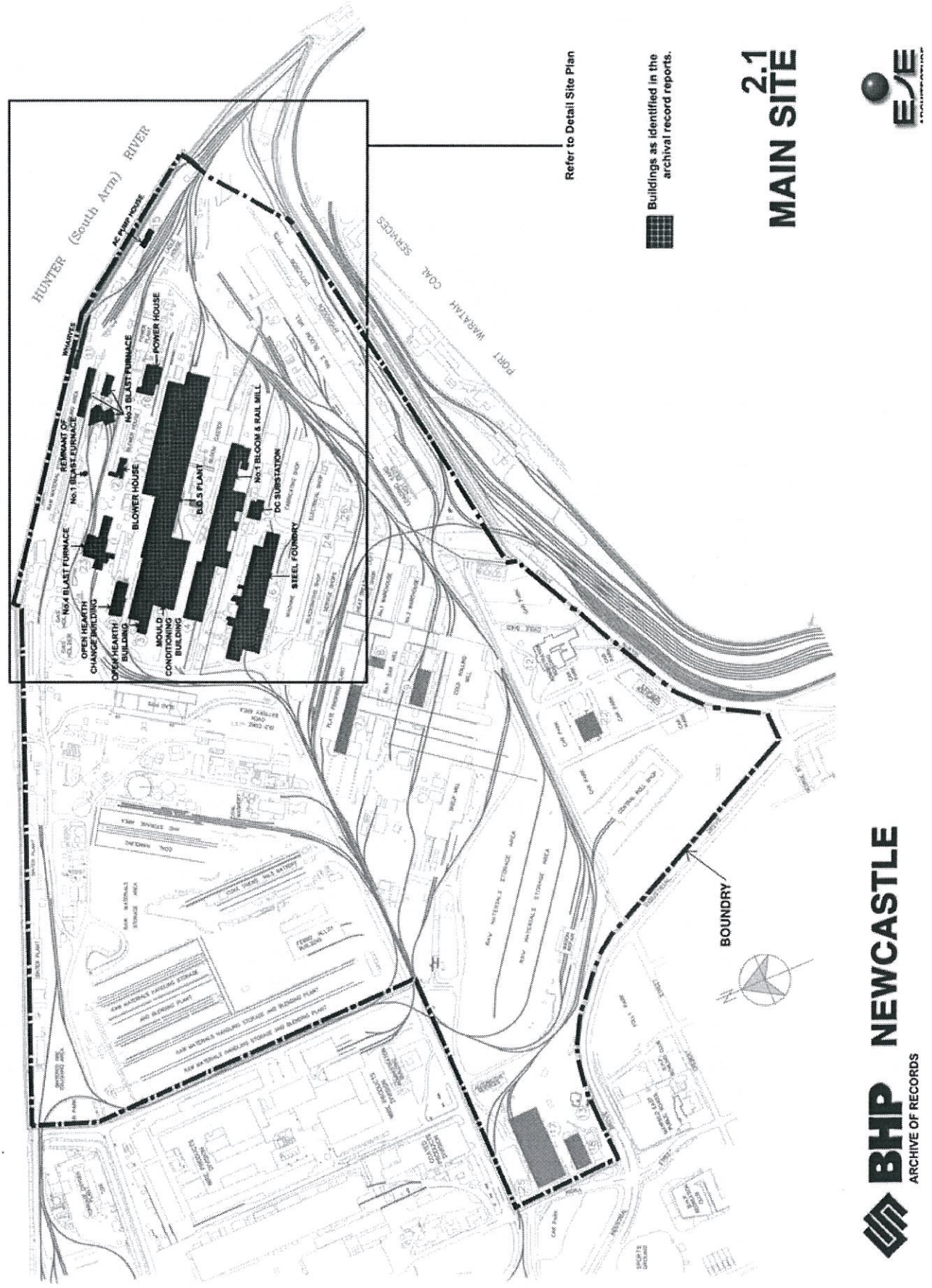
Supporting both the written and pictorial information is a series of inventories and tables which provide details of equipment contained within the building, cross referenced descriptions of photographs and shot locations, and bibliographical information.

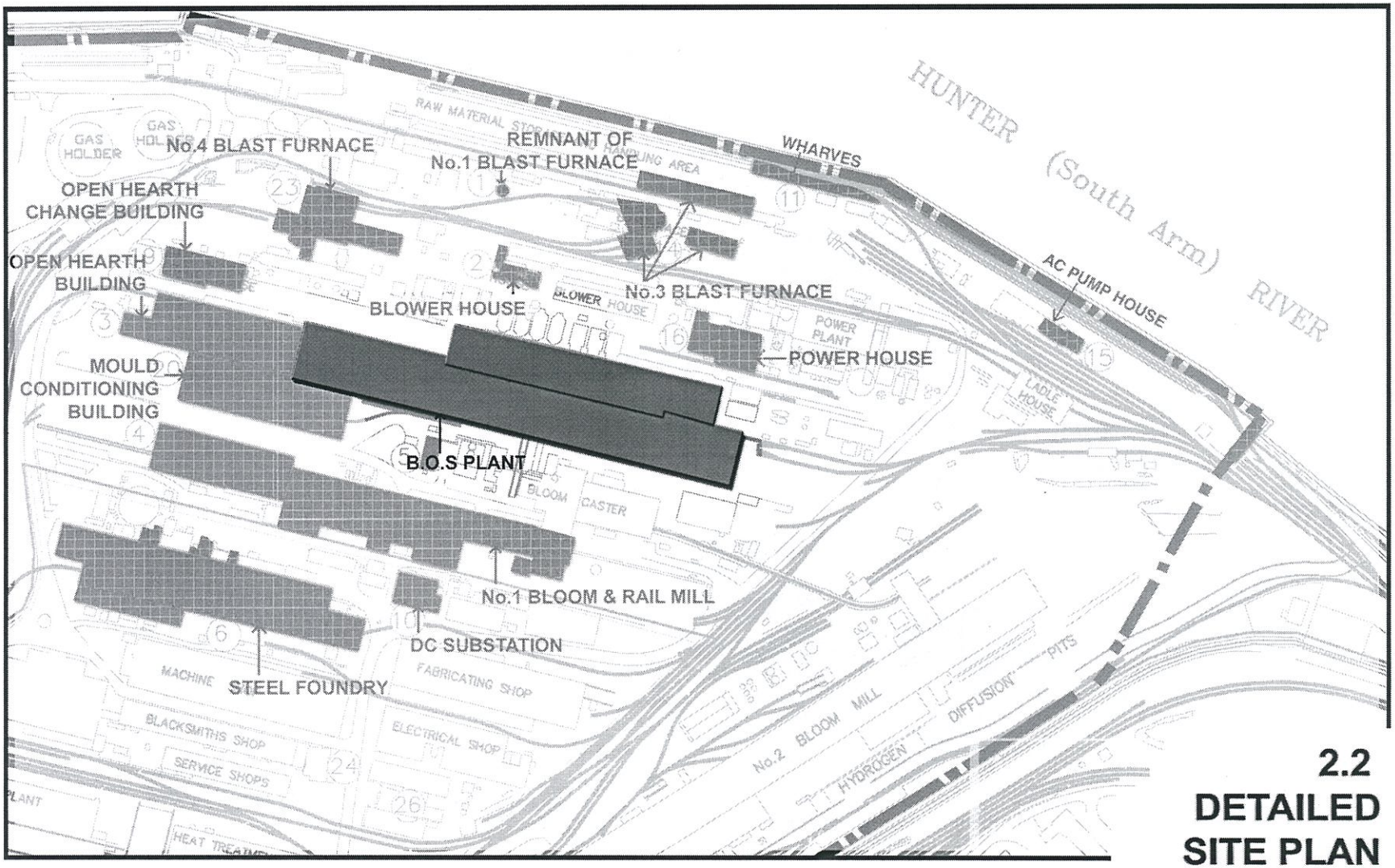
The process of documenting the heritage items involved a number of input teams, of which EJE was the coordinator.

2.0 LOCATION PLANS






2.1
MAIN SITE
Refer to Detail Site Plan
Buildings as identified in the archival record reports.
HUNTER (South Arm) RIVER
AC PUMP HOUSE
REMNANT OF No.1 BLAST FURNACE
No.3 BLAST FURNACE
POWER HOUSE
No.4 BLAST FURNACE
BLOWER HOUSE
B.O.S PLANT
No.1 BLOOM & RAIL MILL
DC SUBSTATION
STEEL FOUNDRY
OPEN HEARTH CHARGE BUILDING
OPEN HEARTH BUILDING
MOULD CONDITIONING BUILDING
PORT WARATAH COAL SERVICES
BOUNDRY
BHP NEWCASTLE
ARCHIVE OF RECORDS



2.2 DETAILED SITE PLAN
B.O.S PLANT

3.0 OUTLINE OF HISTORY, INDUSTRIAL PROCESS & DESCRIPTION

By 1958 it was becoming clear that Newcastle's open hearth furnaces, almost 45 years old in design, could not successfully compete with the modern open hearth and oxygen steel plants being developed in other parts of the world. It was decided to replace the existing furnaces with five 350 tonne modern open hearth furnaces on the same site, steel production was to continue by erecting the new building over and around the existing building.

However, a new process which became known as "basic oxygen" steelmaking had been developed in Austria, where there was a lack of raw materials suitable for the Bessemer and open hearth processes. The first basic oxygen steel plant commenced operation at Linz, on the Danube, in 1952 and shortly afterwards a second plant commenced operation at Donawitz, also in Austria. It is from these two centres that the process took its original name of "L.D", but it became more commonly known as "basic oxygen steelmaking" or BOS. After 1956, most new steelmaking plants around the world were constructed in this fashion.[1]

The BOS furnace was a barrel-shaped steel shell, open at the top and lined with refractory bricks and capable of tilting through an arc of 360 degrees. A taphole was located on one side of the vessel below the mouth, enabling the steel to be poured from under the floating slag when the vessel was tilted.

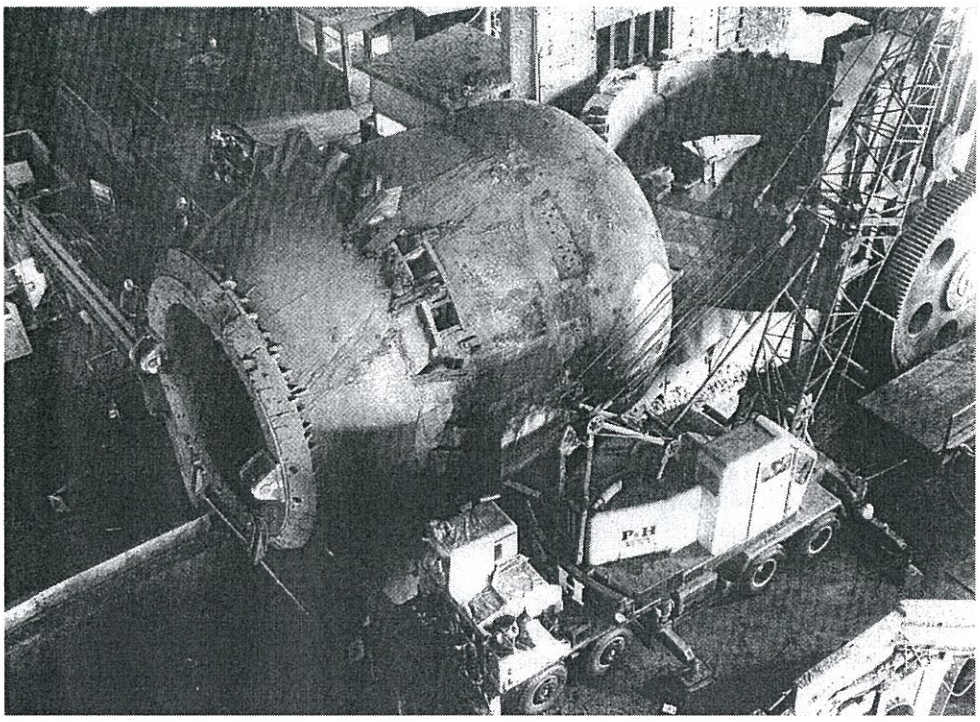


Figure 3.1: Removing No.1 Furnace Vessel shell from its trunnion ring. (c.1970)
Source: Greenhalgh (1999: 19)

Scrap steel was charged to the furnace, followed by molten iron which was poured from a ladle, then fluxes, burnt lime, fluorspar and iron ore which were gravity fed to the furnace from a system of conveyors, bins and Larry cars, located above the furnace. Steel was refined in the furnace by a direct jet of pure oxygen, blown through a three or four holed water-cooled lance onto the surface of the charge. The oxygen blow lasted about 18 minutes, with the lance held 200 mm above the surface of the molten material. The steel was tapped into a ladle where Ferro alloys were added to bring the steel to the required specification, after which it was teemed in to ingot moulds which were then transported to the rolling mills on a narrow gauge railway line.[2]

[1] J. Anderton, "Newcastle's Basic Oxygen Steelmaking Plant", *The BHP Review,* February 1963, p.6.
[2] B. Black & J. Ellis, "A Century of Engineering in BHP 1885-1985", Unpublished Draft.

In 1959 it was decided to install BOS furnaces in lieu of the large open hearths at the Newcastle steelworks. Erection of the new building had already started, so the BOS shop design and layout were restricted in order to fit the new plant into the building. This resulted in the unusual concept of charging scrap from one side of the furnace, and charging hot metal and tapping the furnace from the other. Company officers travelled overseas during the planning stage in 1959, and again in 1962, when they learned the techniques required for operation of the new plant.[3]

The first stage of construction was carried out in the area east of, and adjacent to, the old shop. The hot metal mixer was removed, then four of the original fourteen open hearth furnaces, together with the building and ancillaries were also demolished. In order to maintain production at the level necessary to feed the rolling mills, the new building was erected completely around the operating building, which was later removed in sections.[4] To enable this task to be carried out successfully, the Company's engineers designed a system which involved constructing the roof trusses, then placing them on wheels and sliding them along and over the old building.[5]

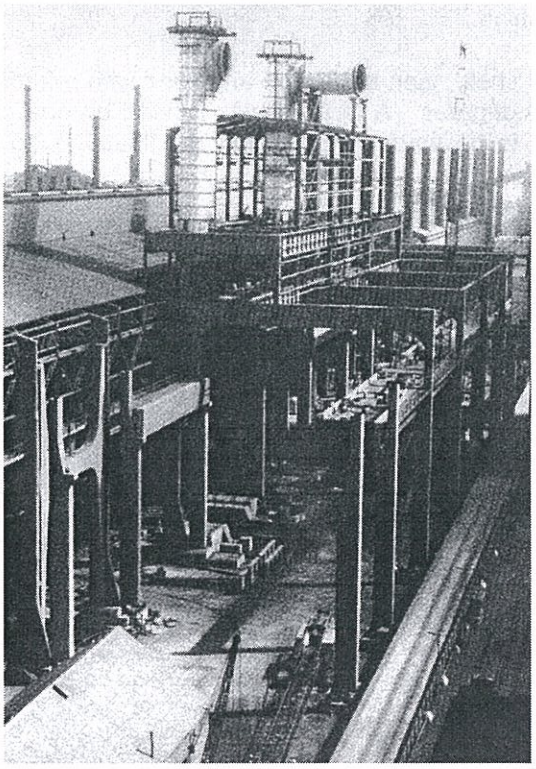


Figure 3.2: BOS furnace cross over main and building under construction.
Source: Greenhalgh (1999: 19)

When the first of the 200 tonne furnaces was commissioned in December 1962 it was the first such installation in Australia and among the largest in the world, most other BOS vessels being less than 100 tonnes capacity.[6] A second BOS vessel was commissioned in 1963.[7]

Commissioning of the BOS plant increased Newcastle's steelmaking capacity to 1.6 million tons a year, resulting in a need to replace and enlarge a number of production units. Significant developments at this time included the provision of improved raw materials handling facilities, construction of No.4 Blast Furnace and a major rebuild of No.1 Bloom Mill.

In 1967, a 50-ton BOS furnace was commissioned with associated 4-strand continuous billet casting machine at the western end of the BOS building.[8] The departmental attitude toward these two items of plant equipment was highlighted in an anecdotal history which was published to mark the cessation of steelmaking at Newcastle:

> *The billet caster and 50 ton [due to the relatively small size of the furnace] together were considered by many of the other departmental steelmakers as a bit of a joke. Operating crews were kept separate and once you went to the 50 ton your chances of moving back to the 200 ton were very limited. This was the department within the department. The 50 ton was known as "the coffee pot" and the caster as "the sausage machine.*[9]

[3] *ibid.*
[4] J. Anderton, "Newcastle's Basic Oxygen Steelmaking Plant"
[5] R. Melville, *Drawing to a Close: An Anecdotal History of the Drawing Office,* Newcastle, 1999, p.101.
[6] B. Black & J. Ellis, "A Century of Engineering in BHP 1885-1985".
[7] Greenhalgh (1999:11)
[8] C.L. Parker and B.N. Black, "Great Engineering Achievements in the Australian Steel Industry", February 1985.
[9] Greenhalgh (1999:50)

Improvements to the BOS in 1970 included the installation of additional precipitators, and larger oxygen lances but an economic downturn resulted in the de-commissioning of the 50-ton furnace in 1976.[10] With the return of a degree of optimism in BHP's Steel Division in the late 1970s, the furnace was re-commissioned in 1979 to produce special heats and upgraded to 60 tons capacity.[11] The continuous casting machine was dismantled at this time, and special ingot casting facilities installed. (Ingot casting was replaced in 1987 by a four strand continuous Bloomcasting machine.[12])

1980-81 saw significant developments in the BOS Department. A secondary fume collection system to reduce BOS emissions was installed at a cost of $8.5 million,[13] and leaded steel facilities provided in the No.1 BOS shop.[14]

In March 1982, composite blowing equipment (known as the LBE system) was installed on both 200 tonne furnaces at a cost of $12.46m. More simply referred to as "bottom blowing", this system was a significant advance in BOS technology which greatly improved blowing performance and gave better control of the steelmaking process. The operation provided for simultaneous top and bottom oxygen blowing. BHP entered into a licence agreement with ARBED of Luxembourg for the process. A ladle additive system, costing $3.3m, was also installed during 1981-2. During this period the 60 tonne furnace was de-commissioned.[15]

A major task in 1987 involved the replacement of both BOS vessels, installation of new hoods and a new fume collection system, which vastly reduced emissions from the plant.[16] The first of a series of capital improvement programmes at the works which was announced in 1989 included a $27.86m project to provide sub-lance, main-lance and flux handling facilities, boosting the output from the furnaces from 1.77 million tonnes a year to two million tonnes, to match the capacity of the Bloomcaster. In addition, $4.5m was provided to upgrade the three major ladle handling cranes with weighing systems to improve both charge and yield control.[17] The secondary fume system upgraded in 1991 and equipment installed for measuring the ladle lining in 1992. In 1993 the old precipitators were demolished and the desulphurisation plant was demolished in 1997.

In 1990, the Ladle Metallurgy Furnace (LMF) was commissioned to deal with the limitations of the Ladle Treatment Plant.[18] This Furnace consisted of sending electricity from the 35MW transformer through 3 graphite electrodes and into the steel whilst still in the Ladle. This electrical current generated the required heat to add other alloys and prepare the steel for final casting.

In its last year of operation the BOS produced 1,582,542 tonnes of steel, compared to its annual production record of 2,190,014 tonnes in 1974.

[10] Greenhalgh (1999:13).
[11] G. Blaxell, "Time Chart of Significant Events at BHP Newcastle Steelworks" (unpublished) 1998
[12] G. Gallagher, *Those Magnificent Men and their Casting Machine: A History of Bloomcasting in Newcastle,* Newcastle, 1999, p.9.
[13] Greenhalgh (1999:15)
[14] G. Blaxell, "Timeline of Significant Events"
[15] G. Blaxell, "Timeline of Significant Events"
[16] *ibid.*
[17] Greenhalgh (1999:22)
[18] Greenhalgh (1999:5)

3.1 Steel condition & protection at BHP Steelworks site

The BHP site in Newcastle is in a "Marine" to "Severe Marine" zone in accordance with AS/NZ 2312:1994 — "Guide to protection of iron and steel against exterior atmospheric corrosion". Now that the localized micro-climate from the operation of the plant has been removed, protection of the steelwork needs to be considered in terms of this Standard.

Observation at the site indicates that none of the steelwork on site has a coating system complying with this Standard for a design life of greater than 5 years. Some of the steelwork, such as the blast furnaces, is not protected at all and has been designed to operate in a hot environment where corrosion is inhibited by high temperatures driving off moisture; other steelwork was designed with extra thickness to form a sacrificial layer. In almost all buildings and in areas nearby the high temperature operations have been successful in keeping the corrosion under control except where steel has been insulated by brickwork which has trapped moisture and corrosion has been severe. There does not appear to be any general galvanic protection (i.e. galvanizing or zinc-rich coating) on major structural elements.

If major structural elements were to be retained on the site for a period in excess of 10 years the Standard gives the following coating systems:

(i) galvanizing plus a two coat paint system (not possible in situ);

(ii) various two and three coat paint systems applied after abrasive blast cleaning and having either a zinc based primer or high-build epoxy;

(iii) a sprayed metal coating followed by a two coat painting system.

Of these, only (ii) is likely to be practical. All would be extremely expensive and require continuing maintenance.

4.0 STATEMENT OF HERITAGE SIGNIFICANCE

The B.O.S. Plant is identified within the group identification forming Part B of Schedule 4 (Port Waratah – BHP Steelworks and Office) of "The Hunters Heritage" – Hunter Regional Environmental Plan 1989. It is identified individually within Schedule 4 of The Newcastle Local Environmental Plan 1987 as having an item of Regional – level heritage significance. (This ascribed level of significance is consistent with the level of significance determined in the Port Waratah Steelworks Conservation Plan prepared by EJE Architecture in 1991). The item does not fall within a Conservation Area and is not included on the State Heritage Register. The following Assessment of Significance has been undertaken to reflect current NSW Heritage Act, Heritage Amendment Act and Burra Charter requirements.

Historic Significance

The BOS Plant represents a significant contribution to the development of steel making in New South Wales, being among the world's largest and most modern if its type at the time of its installation.

The innovative design concept of the charging operation of the furnaces and the creative engineering of the building represent a significant phase in the development of Steel making in the state and nation. It also clearly demonstrates the evolution in the process of making steel in NSW and Australia. For these reasons the building has highest-level STATE Historic Significance.

Aesthetic Significance

The BOS Plant provides evidence of a unique operational concept in the evolution of Steel making in N.S.W. by means of its twin charging aisle layout.

The conversion of the Open Hearth furnaces site while still in operation and construction of the BOS Plant over and around these elements demonstrates innovative structural design and construction. As such the building has highest-level AESTHETIC significance. The building's Technical integrity has not been significantly compromised thus the building continues to provide substantial evidence of this. It displays sufficient evidence to retain its REGIONAL level Aesthetic Significance.

Social Significance

Like all of the elements on the Steelworks site, the BOS Plant represents a part in the development of integrated iron and steel making on the Newcastle steelworks site. It also represents an important link with the creation of employment in Newcastle and the region. As such, this building and the larger site has highest level REGIONAL (and therefore State), Social Significance.

Technical Significance

The BOS Plant, by virtue of its furnace capacity and unique operational layout, continues to provide information about techniques of exceptional interest and rarity.

Technical innovations in production and ladle metallurgy form important benchmarks in steel and steel alloy production. The item has highest-level potential to reveal historical/industrial archaeological information of value. For these reasons it has highest-level REGIONAL Technical Significance.

5.0 INVENTORY OF ARCHIVAL DOCUMENTS

The Following list constitutes the archival documents used for this report and other documents that contain related material for this archival record. For archival drawings, the BHP drawings document register (documents located in the BHP archive, Melbourne) may be found on the computer disk located in the appendix.

Anderton, J. "Newcastle's Basic Oxygen Steelmaking Plant", *The BHP Review,* February 1963

Black, B. & Ellis, J. "A Century of Engineering in BHP 1885-1985", Unpublished Draft.

Blaxell, G. "Time Chart of Significant Events at BHP Newcastle Steelworks". (unpublished), 1998.

Gallagher, G. *Those Magnificent Men and their Casting Machine: A History of Bloomcasting in Newcastle,* Newcastle, 1999

Melville, R. *Drawing to a Close: An Anecdotal History of the Drawing Office,* Newcastle, 1999.

Parker, C.L. and Black, B.N. "Great Engineering Achievements in the Australian Steel Industry", February 1985.

Greenhalgh, K. G. *Men of Steel: An Anecdotal History of Steelmaking,* Newcastle, 1999.