

BASIX Assessment
for the proposed development known as
Australia Towers,
Sydney Olympic Park

March 15, 2012

Report Reference No. WA999-07F03(rev0)- BASIX Report

Document Control

Revision Number	Date	Revision History	Prepared By (initials)	Reviewed & Authorised By (initials)
0	15/03/2012	Updated and revised from previous report (ref: WA999-03F02(rev1))	TH	-

The work presented in this document was carried out in accordance with the Windtech Consultants Pty Ltd Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for our Client's particular requirements which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Windtech Consultants Pty Ltd. This report should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

The information contained herein is for the purpose of wind, thermal and or solar effects only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the scope of this report.

Table of Contents

	Page
1.0 Introduction	4
2.0 Analysis	4
2.1 Water Usage	4
2.2 Thermal Comfort	4
2.3 Energy Usage	4
3.0 Results of the BASIX Assessment	5
3.1 Water	5
3.2 Thermal Comfort	6
3.2.1 Initial Results	6
3.2.2 Results with Treatments	7
3.3 Energy	32
4.0 Conclusion	34
Appendix A - Certified Architectural Drawings	
Appendix B - ABSA Certificate	
Appendix C - BASIX Certificate	

1.0 Introduction

This study investigates the estimated thermal comfort and water and energy usage of Towers 1 and 2 of the proposed development known as Australia Towers, located in Sydney Olympic Park. The assessment is carried out using online BASIX and BERS Pro Thermal Performance assessment tool. This assessment is based on the architectural drawings prepared by Bates Smart, issue E, received March, 2012 are attached in Appendix A of this report.

2.0 Analysis

A BASIX assessment is split into three sections; Water, Thermal Comfort and Energy. Each section measures the efficiency of the development in these areas. For the Water and Energy sections, the development is given a score based on the efficiency. BASIX sets a minimum score in these areas that the development must satisfy. The Thermal Performance section of the BASIX assessment requires a BERS Pro simulation to be undertaken. BASIX sets requirements on the maximum heating and cooling loads for each residential apartment of the development. The results of this are rated in BASIX as either a pass or fail.

2.1 Water Usage

The water usage of the development is measured based on the area of gardens/lawn and the number and efficiency of permanent fixtures within the development (such as showerheads, taps and toilets). The development is given a rating, with BASIX requiring a minimum rating of 40% to pass this section.

Bonus points are available in this section by using a rainwater tank. Water from a rainwater tank can be used for the outdoor landscape, private garden/lawn, laundry and toilets.

2.2 Thermal Comfort

The thermal comfort of the development is measured using the BERS Pro Thermal Performance assessment tool. This gives an expected level of energy consumption (expressed in MegaJoules used per square metre per annum) for the heating and cooling loads.

The thermal comfort of the development can be improved by using higher performance building materials (such as performance glazing) and/or insulation materials. BASIX sets a maximum heating and cooling load that the development is to achieve. This is given as a weighted average heating and cooling load for the entire development, **and** for each individual unit to achieve. Bonus points can be obtained for the cooling load through natural ventilation throughout the development.

2.3 Energy Usage

The energy section of the BASIX assessment measures the energy efficiency of the development based on the efficiency of the fixed

appliances to be used. This includes the hot water system, air-conditioning system, exhaust fans, lighting and the cook top/oven. If a pool is to be included in the proposal then the efficiency measure of the pool heater and the pool pump is also required. The development is given a rating, with BASIX requiring a minimum rating of 20% to pass this section.

3.0 Results of the BASIX Assessment

3.1 Water

The target score in BASIX to achieve water usage compliance is **40%**. For the proposed development a score of **57%** is achieved through the following;

- The alternative water supply available under the Sydney Olympic Park Authority will be used for all public landscaping (5200m²) and private toilets systems within each residential dwelling of the proposed development
- All common area showerheads will have a rating of at least 3.0 Stars (>7.5 but <=9L/min).
- All common area toilet and taps will have a rating of at least 4.0 Stars.
- All showerheads within each residential dwelling of the proposed development should have a water efficiency rating of at least 3.0 Stars (>7.5 but <=9L/min).
- All toilets within the 2, 3, 4 bedroom penthouse apartments of the proposed development should have a water efficiency rating of at least 3.0 Stars.
- The remaining toilets within of the proposed development should have a water efficiency rating of at least 4.0 Stars.
- All kitchen taps within each residential dwelling of the proposed development should have a water efficiency rating of at least 4.0 Stars.
- All bathroom taps within each residential dwelling of the proposed development should have a water efficiency rating of at least 3.0 Stars.
- Dishwashers within each residential dwelling of the proposed development will have a water efficiency rating of at least 3.0 Stars.
- All clothes washers and dryers within each residential dwelling of the proposed development should have a water efficiency rating of at least 4.0 Stars.

3.2 Thermal Comfort

The BERS Pro assessments take into account the following fundamental aspects of energy efficient design:

- The orientation and size of the walls.
- The location, proportion and type of windows and doors, and any internal or external coverings to them.
- The materials and colours of the exterior of the building.
- Internal floor, wall and ceiling materials.
- Cross ventilation.
- Provision of any insulation in walls, roof or ceiling.
- Overshadowing to walls and windows from eaves, other parts of the development and neighbours.
- The topography and climate of the area around the proposed development.

In BASIX, the required weighted averaged maximum heating and cooling loads of the **entire** proposed development are **51.0 MJ/m²/year for heating** and **45.0 MJ/m²/year for cooling** and **for each individual unit** a maximum heating and cooling load of **66.0 MJ/m²/year for heating** and **59.0 MJ/m²/year for cooling**. The required heating and cooling loads for the individual residential units are indicated in Tables 1 and 2. Note that the overall weighted average heating and cooling loads are significantly harder to achieve than the individual unit requirements indicated in Tables 1 and 2.

3.2.1 Initial Results

The following construction materials were initially selected for the assessment. Note that the materials described are not prescriptive. The construction materials used on the subject development should be selected to have similar performance characteristics as the ones detailed below so as not to effect the overall thermal performance rating of each apartment. The U-value and Solar Heat Gain Coefficient (SHGC) for the glazing is also indicated.

- The external walls of the building are Concrete Blocks. No external wall insulation has been initially proposed.
- The internal walls within the development are Plasterboard on Studs, Hebel Panel System and Concrete Block. No internal wall insulation has been initially proposed.
- The glazing **systems** will have the following properties: U = 6.57, SHGC = 0.74. This typically represents a standard single-glazed clear glazing system set within standard aluminium frames.

- The floor coverings will be carpet in the living and bedrooms, with tiles for the kitchen, bathroom and ensuite. The floors will be concrete slabs. No initial insulation is proposed for the floors.
- The ceilings will be plasterboard suspended from concrete with no initial insulation proposed.
- The roof will be a concrete slab with no initial insulation proposed.

The climate zone selected for analysis was Climate Zone 56 (Sydney East). The results of the analysis, indicated in Table 3, indicate that several of the residential units within the proposed development will not satisfy the individual thermal requirements of BASIX. The weighted average heating and cooling loads for the proposed development, with the construction materials listed above, are listed below.

- **Heating Load: 57.2 MJ/m²/year**
- **Cooling Load: 34.2 MJ/m²/year**

Hence treatment is required to some of the residential units of the development.

3.2.2 Results with Treatments

Further analysis of the proposed development resulted in some recommended treatments to achieve the BASIX requirements for thermal performance. Note that the following unit numbers listed are in accordance with those indicated in Appendix A of this report. The recommended treatments are listed in the following Tables 1 and 2 for Towers 1 and 2 respectively:

Table 1: Recommended Treatments – Tower 1

Unit Numbers	Recommended Treatment(s)
L01-U01, L01-U02, L01-U03	<ul style="list-style-type: none"> • R1.0 insulation is to be installed in all floors.
L01-U04, L01-U05, L01-U06, L01-U07, L01-U08, L02-U08, L02-U12, L02-U13	<ul style="list-style-type: none"> • R1.0 insulation is to be installed in all floors. • All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames.

Table 1: Recommended Treatments – Tower 1 (cont..)

Unit Numbers	Recommended Treatment(s)
L02-U10, L02-U11	<ul style="list-style-type: none"> • R1.0 insulation is to be installed in all floors. • All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. • Foil (reflective one side, anti-glare other) is to be used in all external walls.
L23-U08	<ul style="list-style-type: none"> • Floor insulation is to be installed in all floors exposed to air below. • All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. • Foil (reflective one side, anti-glare other) is to be used in all external walls.
L22-U07, L24-U04a, L24-U04b	<ul style="list-style-type: none"> • Foil (reflective one side, anti-glare other) Ceiling or roof insulation • Foil (reflective one side, anti-glare other) is to be used in all external walls.
L12-U03, L13-U03, L14-U03, L15-U03, L16-U03, L17-U03, L18-U03, L19-U03, L20-U03, L21-U03,	<ul style="list-style-type: none"> • Foil (reflective one side, anti-glare other) is to be used in all external walls.

Table 1: Recommended Treatments – Tower 1 (cont..)

Unit Numbers	Recommended Treatment(s)
L03-U13, L04-U13, L05-U13, L06-U13, L07-U13, L08-U13, L09-U13, L10-U13, L11-U08, L12-U08, L13-01a, L13-U07, L13-U08, L14-01a, L14-U07, L14-U08, L15-01a, L15-U07, L15-U08, L16-01a, L16-U07, L16-U08, L17-01a, L17-U07, L17-U08, L18-01a, L18-U07, L18-U08, L19-01a, L19-U07, L19-U08, L20-01a, L20-U01b, L20-U07, L20-U08, L21-U01a, L21-U01b, L21-U07, L21-U08, L22-U01a, L22-U02b, L23-U01, L23-U06, L23-U07	<ul style="list-style-type: none"> All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames.
L03-U10, L03-U11, L04-U10, L04-U11, L05-U10, L05-U11, L06-U10, L06-U11, L07-U10, L07-U11, L08-U10, L08-U11, L09-U10, L09-U11, L10-U10, L10-U11, L11-U10, L11-U11, L12-U09, L12-U10, L13-U09, L13-U10, L14-U09, L14-U10, L15-U09, L15-U10, L16-U09, L16-U10, L17-U09, L17-U10, L18-U09, L18-U10, L19-U09, L19-U10, L20-U09, L20-U10, L21-U09, L21-U10, L22-U02B, L22-U06B, L22-U08, L23-U03, L23-U09, L24-U06	<ul style="list-style-type: none"> All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. Foil (reflective one side, anti-glare other) is to be used in all external walls.

Table 1: Recommended Treatments – Tower 1 (cont..)

Unit Numbers	Recommended Treatment(s)
L24-U03, L24-U05	<ul style="list-style-type: none"> All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. Foil (reflective one side, anti-glare other) Ceiling or roof insulation Foil (reflective one side, anti-glare other) is to be used in all external walls.
L24-U07	<ul style="list-style-type: none"> All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. R2.5 Ceiling/ roof insulation
L11-U01, L11-U13, L24-U01	<ul style="list-style-type: none"> All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. Foil (reflective one side, anti-glare other) Ceiling/ roof insulation
All remaining units	<ul style="list-style-type: none"> No Treatment Required

Table 2: Recommended Treatments – Tower 2

Unit Numbers	Recommended Treatment(s)
L01-U01, L02-U07, L02-U09	<ul style="list-style-type: none"> R1.0 insulation is to be installed in all floors.
L01-U02, L02-U10	<ul style="list-style-type: none"> R1.0 insulation is to be installed in all floors. All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames.
L01-U03, L01-U04, L01-U05, L02-U08, L02-U11, L02-U12	<ul style="list-style-type: none"> R1.0 insulation is to be installed in all floors. All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. Foil (reflective one side, anti-glare other) is to be used in all external walls.

Table 2: Recommended Treatments – Tower 2 (cont...)

Unit Numbers	Recommended Treatment(s)
L02-U02, L03-U05, L03-U08, L04-U05, L04-U08, L05-U05, L05-U08, L06-U05, L06-U08, L07-U05, L07-U08, L08-U05, L08-U08, L09-U05, L09-U08, L10-U05, L10-U08, L11-U05, L11-U08, L12-U05, L12-U08, L13-U05, L13-U08, L14-U05, L14-U08, L15-U05, L15-U08, L16-U05, L16-U08, L17-U05, L17-U08, L18-U05, L18-U08, L19-U05, L19-U08, L20-U05, L20-U08, L21-U05, 21-U08, L22-U05, L22-U08, L23-U02, L23-U05, L23-U0809, L24- U01, L24-U0708. L24-U12, L25-U01, L25-U0607, L25- U11, L26-U01, L26-U11, L27- U01, L27-U04, L27-U07, L28- U01, L28-U04, L28-U07, L29- U01, L29-U06, L29-U07	<ul style="list-style-type: none"> All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames.
L02-U05, L03-U11, L04-U11, L05-U11, L06-U11, L07-U11, L08-U11, L09-U11, L10-U11, L11-U11, L12-U11, L13-U11, L14-U11, L15-U11, L16-U11, L17-U11, L18-U11, L19-U11, L20-U11, L21-U11, L22-U11, L23-U11, L23-U12, L27-U03	<ul style="list-style-type: none"> All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. Foil (reflective one side, anti-glare other) is to be used in all external walls.
L26-U0607, L28-U03, L29-U04	<ul style="list-style-type: none"> All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames. R2.5 Ceiling/ roof insulation

Table 2: Recommended Treatments – Tower 2 (cont...)

Unit Numbers	Recommended Treatment(s)
L29-U03	<ul style="list-style-type: none">• All glazing systems should have properties that satisfy the following: U-value = 4.70 Solar Heat Gain Coefficient = 0.63 This typically represents a single Low E glazing system set within standard aluminium frames.• R2.5 Ceiling or roof insulation• Foil (reflective one side, anti-glare other) is to be used in all external Concrete Block walls.
All remaining units	<ul style="list-style-type: none">• No Treatment Required

The glazing types selected for the windows of the proposed development should *at least* satisfy the required performance data listed in this report. Higher performing glass types than those listed in this report are also acceptable. Reducing the amount of glazing in each unit is expected to significantly increase the thermal performance of each unit. That is, alternative glazing systems or specifications may be used if their U value is lower, and the SHGC value is less than 10% higher or lower, than the U and SHGC values of the product specified above.

With these treatments in place the weighted average maximum heating and cooling loads are **47.3 MJ/m²/year for heating** and **32.8 MJ/m²/year for cooling**.

The BASIX requirements for the weighted averaged maximum heating and cooling loads of the entire proposed development are **51.0 MJ/m²/year for heating** and **45.0 MJ/m²/year for cooling**. Hence, with the recommended treatments listed above, the proposed development will satisfy the thermal performance requirements of BASIX.

Table 3: Thermal Performance Results – Tower 1

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T1-L01-01	66.0	59.0	77.7	46.3	60.5	49.8
T1-L01-02	66.0	59.0	53.5	26.4	39.5	27.6
T1-L01-03	66.0	59.0	58.6	32.8	44.0	35.1
T1-L01-04	66.0	59.0	85.8	26.6	61.3	23.2
T1-L01-05	66.0	59.0	75.2	54.5	58.2	43.4
T1-L01-06	66.0	59.0	81.1	29.8	44.5	24.6
T1-L01-07	66.0	59.0	95.4	32.2	53.8	26.7
T1-L01-08	66.0	59.0	103.4	66.2	63.4	54.3
T1-L02-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L02-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L02-03	66.0	59.0	48.3	35.0	48.3	35.0
T1-L02-04	66.0	59.0	61.1	57.9	61.1	57.9
T1-L02-05	66.0	59.0	35.4	58.9	35.4	58.9
T1-L02-06	66.0	59.0	32.1	57.8	32.1	57.8
T1-L02-07	66.0	59.0	63.4	56.0	63.4	56.0
T1-L02-08	66.0	59.0	77.0	65.8	56.4	55.7
T1-L02-09	66.0	59.0	64.1	45.0	64.1	45.0
T1-L02-10	66.0	59.0	93.0	21.8	58.5	16.6
T1-L02-11	66.0	59.0	117.4	48.0	61.2	37.3
T1-L02-12	66.0	59.0	72.8	41.0	53.9	32.5
T1-L02-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L03-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L03-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L03-03	66.0	59.0	48.3	35.0	48.3	35.0
T1-L03-04	66.0	59.0	42.4	34.6	42.4	34.6
T1-L03-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L03-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L03-07	66.0	59.0	24.6	45.6	24.6	45.6
T1-L03-08	66.0	59.0	56.8	33.9	56.8	33.9
T1-L03-09	66.0	59.0	51.2	28.4	51.2	28.4
T1-L03-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L03-11	66.0	59.0	105.7	38.1	66.0	28.7

T1-L03-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L03-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L04-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L04-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L04-03	66.0	59.0	48.3	35.0	48.3	35.0
T1-L04-04	66.0	59.0	42.4	34.6	42.4	34.6
T1-L04-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L04-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L04-07	66.0	59.0	24.6	45.6	24.6	45.6
T1-L04-08	66.0	59.0	56.8	33.9	56.8	33.9
T1-L04-09	66.0	59.0	51.2	28.4	51.2	28.4
T1-L04-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L04-11	66.0	59.0	105.7	38.1	66.0	28.7
T1-L04-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L04-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L05-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L05-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L05-03	66.0	59.0	48.3	35.0	48.3	35.0
T1-L05-04	66.0	59.0	42.4	34.6	42.4	34.6
T1-L05-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L05-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L05-07	66.0	59.0	24.6	45.6	24.6	45.6
T1-L05-08	66.0	59.0	56.8	33.9	56.8	33.9
T1-L05-09	66.0	59.0	51.2	28.4	51.2	28.4
T1-L05-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L05-11	66.0	59.0	105.7	38.1	66.0	28.7
T1-L05-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L05-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L06-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L06-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L06-03	66.0	59.0	48.3	35.0	48.3	35.0
T1-L06-04	66.0	59.0	42.4	34.6	42.4	34.6
T1-L06-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L06-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L06-07	66.0	59.0	24.6	45.6	24.6	45.6
T1-L06-08	66.0	59.0	56.8	33.9	56.8	33.9
T1-L06-09	66.0	59.0	51.2	28.4	51.2	28.4

T1-L06-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L06-11	66.0	59.0	105.7	38.1	66.0	28.7
T1-L06-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L06-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L07-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L07-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L07-03	66.0	59.0	48.3	35.0	48.3	35.0
T1-L07-04	66.0	59.0	42.4	34.6	42.4	34.6
T1-L07-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L07-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L07-07	66.0	59.0	24.6	45.6	24.6	45.6
T1-L07-08	66.0	59.0	56.8	33.9	56.8	33.9
T1-L07-09	66.0	59.0	51.2	28.4	51.2	28.4
T1-L07-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L07-11	66.0	59.0	105.7	38.1	66.0	28.7
T1-L07-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L07-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L08-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L08-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L08-03	66.0	59.0	48.3	35.0	48.3	35.0
T1-L08-04	66.0	59.0	42.4	34.6	42.4	34.6
T1-L08-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L08-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L08-07	66.0	59.0	24.6	45.6	24.6	45.6
T1-L08-08	66.0	59.0	56.8	33.9	56.8	33.9
T1-L08-09	66.0	59.0	51.2	28.4	51.2	28.4
T1-L08-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L08-11	66.0	59.0	105.7	38.1	66.0	28.7
T1-L08-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L08-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L09-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L09-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L09-03	66.0	59.0	48.0	35.1	48.0	35.1
T1-L09-04	66.0	59.0	39.9	32.9	39.9	32.9
T1-L09-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L09-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L09-07	66.0	59.0	24.6	45.6	24.6	45.6

T1-L09-08	66.0	59.0	56.8	33.9	56.8	33.9
T1-L09-09	66.0	59.0	51.2	28.4	51.2	28.4
T1-L09-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L09-11	66.0	59.0	103.3	39.3	64.8	30.3
T1-L09-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L09-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L10-01	66.0	59.0	59.4	45.7	59.4	45.7
T1-L10-02	66.0	59.0	33.3	39.0	33.3	39.0
T1-L10-03	66.0	59.0	48.0	35.1	48.0	35.1
T1-L10-04	66.0	59.0	39.9	32.9	39.9	32.9
T1-L10-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L10-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L10-07	66.0	59.0	24.6	45.6	24.6	45.6
T1-L10-08	66.0	59.0	56.8	33.9	56.8	33.9
T1-L10-09	66.0	59.0	51.2	28.4	51.2	28.4
T1-L10-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L10-11	66.0	59.0	103.3	39.3	64.8	30.3
T1-L10-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L10-13	66.0	59.0	86.1	52.3	60.6	46.1
T1-L11-01	66.0	59.0	88.4	80.9	64.2	58.1
T1-L11-02	66.0	59.0	45.7	57.4	45.7	57.4
T1-L11-03	66.0	59.0	48.0	35.1	48.0	35.1
T1-L11-04	66.0	59.0	39.9	32.9	39.9	32.9
T1-L11-05	66.0	59.0	22.2	33.9	22.2	33.9
T1-L11-06	66.0	59.0	27.6	42.8	27.6	42.8
T1-L11-07	66.0	59.0	24.6	45.6	24.6	45.6
T1-L11-08	66.0	59.0	67.5	61.8	47.6	50.4
T1-L11-09	66.0	59.0	63.0	44.7	63.0	44.7
T1-L11-10	66.0	59.0	83.2	28.6	57.8	23.5
T1-L11-11	66.0	59.0	103.3	39.3	64.8	30.3
T1-L11-12	66.0	59.0	42.6	35.2	42.6	35.2
T1-L11-13	66.0	59.0	88.3	77.3	62.9	58.4
T1-L12-01	66.0	59.0	53.2	40.7	53.2	40.7
T1-L12-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L12-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L12-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L12-05	66.0	59.0	42.4	26.4	42.4	26.4

T1-L12-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L12-07	66.0	59.0	49.4	30.1	49.4	30.1
T1-L12-08	66.0	59.0	72.9	42.2	50.3	34.6
T1-L12-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L12-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L12-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L13-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L13-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L13-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L13-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L13-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L13-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L13-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L13-08	66.0	59.0	85.1	18.5	62.9	15.8
T1-L13-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L13-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L13-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L14-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L14-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L14-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L14-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L14-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L14-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L14-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L14-08	66.0	59.0	85.2	15.9	60.4	14.2
T1-L14-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L14-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L14-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L15-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L15-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L15-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L15-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L15-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L15-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L15-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L15-08	66.0	59.0	85.2	15.9	60.4	14.2
T1-L15-09	66.0	59.0	66.8	19.3	42.0	13.9

T1-L15-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L15-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L16-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L16-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L16-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L16-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L16-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L16-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L16-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L16-08	66.0	59.0	85.2	15.9	60.4	14.2
T1-L16-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L16-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L16-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L17-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L17-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L17-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L17-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L17-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L17-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L17-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L17-08	66.0	59.0	85.2	15.9	60.4	14.2
T1-L17-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L17-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L17-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L18-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L18-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L18-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L18-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L18-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L18-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L18-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L18-08	66.0	59.0	85.2	15.9	60.4	14.2
T1-L18-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L18-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L18-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L19-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L19-02	66.0	59.0	30.0	25.7	30.0	25.7

T1-L19-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L19-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L19-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L19-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L19-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L19-08	66.0	59.0	85.2	15.9	60.4	14.2
T1-L19-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L19-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L19-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L20-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L20-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L20-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L20-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L20-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L20-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L20-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L20-08	66.0	59.0	85.2	15.9	60.4	14.2
T1-L20-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L20-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L20-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L21-01a	66.0	59.0	61.5	30.1	44.6	24.5
T1-L21-02	66.0	59.0	30.0	25.7	30.0	25.7
T1-L21-03	66.0	59.0	67.7	17.5	58.0	16.7
T1-L21-04	66.0	59.0	65.5	26.9	65.5	26.9
T1-L21-05	66.0	59.0	42.4	26.4	42.4	26.4
T1-L21-06	66.0	59.0	40.5	47.6	40.5	47.6
T1-L21-07	66.0	59.0	38.5	19.0	26.1	16.0
T1-L21-08	66.0	59.0	85.2	15.9	60.4	14.2
T1-L21-09	66.0	59.0	66.8	19.3	42.0	13.9
T1-L21-10	66.0	59.0	115.7	23.7	65.4	16.9
T1-L21-11	66.0	59.0	62.9	16.8	62.9	16.8
T1-L22-01a	66.0	59.0	72.3	47.4	55.7	38.4
T1-L22-02a	66.0	59.0	53.7	23.4	53.7	23.4
T1-L22-03	66.0	59.0	65.5	26.9	65.5	26.9
T1-L22-04	66.0	59.0	42.4	26.4	42.4	26.4
T1-L22-05	66.0	59.0	40.5	47.6	40.5	47.6
T1-L22-06a	66.0	59.0	53.6	46.9	53.6	46.9

T1-L22-07	66.0	59.0	74.9	27.4	61.1	25.3
T1-L22-08	66.0	59.0	115.7	23.7	65.4	16.9
T1-L22-09	66.0	59.0	62.9	16.8	62.9	16.8
T1-L23-01	66.0	59.0	65.5	36.9	43.7	29.2
T1-L23-02	66.0	59.0	56.8	46.6	56.8	46.6
T1-L23-03	66.0	59.0	107.7	19.0	56.6	16.1
T1-L23-04a	66.0	59.0	49.8	24.8	49.8	24.8
T1-L23-05	66.0	59.0	40.5	47.6	40.5	47.6
T1-L23-06	66.0	59.0	52.9	22.0	43.3	21.0
T1-L23-07	66.0	59.0	92.5	46.2	61.6	37.7
T1-L23-08	66.0	59.0	112.4	19.0	65.5	16.2
T1-L23-09	66.0	59.0	114.6	18.8	55.5	12.7
T1-L23-10	66.0	59.0	60.6	18.8	60.6	18.8
T1-L24-01	66.0	59.0	89.8	57.6	58.2	44.8
T1-L24-03	66.0	59.0	121.0	22.1	56.6	16.7
T1-L24-04a	66.0	59.0	81.9	24.9	62.3	22.2
T1-L24-04b	66.0	59.0	76.6	23.8	56.4	23.4
T1-L24-05	66.0	59.0	90.9	25.5	50.6	20.5
T1-L24-06	66.0	59.0	88.0	28.0	65.7	23.0
T1-L24-07	66.0	59.0	136.5	29.8	64.8	21.1

Table 4: Thermal Performance Results – Tower 2

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L01-U01	66	59	83.8	19	59.7	19.3
T2-L01-U02	66	59	109.2	59.2	63.4	35.1
T2-L01-U03	66	59	103.1	40.7	64.6	26.6
T2-L01-U04	66	59	102.5	20.2	43.2	17.6
T2-L01-U05	66	59	79.6	25.4	38	22.2
T2-L02-U01	66	59	53.1	51.7	53.1	51.7
T2-L02-U02	66	59	66.6	62	51	50.1
T2-L02-U03	66	59	36	49.3	36	49.3
T2-L02-U04	66	59	54.2	37.8	54.2	37.8
T2-L02-U05	66	59	85.3	56.7	60.8	47.7
T2-L02-U06	66	59	58.5	19.7	58.5	19.7
T2-L02-U07	66	59	81.2	39.2	64.4	39.2
T2-L02-U08	66	59	99.7	54.8	65.5	43.3
T2-L02-U09	66	59	66.4	49.5	47.5	51.1
T2-L02-U10	66	59	84.4	26	62.9	19.5
T2-L02-U11	66	59	116.1	34.9	64.6	29.4
T2-L02-U12	66	59	95.2	45.6	63.1	36.1
T2-L03-U01	66	59	46.8	35.8	46.8	35.8
T2-L03-U02	66	59	44	56.9	44	56.9
T2-L03-U03	66	59	31.3	34.7	31.3	34.7
T2-L03-U04	66	59	50.5	21.6	50.5	21.6
T2-L03-U05	66	59	75.8	36	60.1	31.1
T2-L03-U06	66	59	58.5	19.7	58.5	19.7
T2-L03-U07	66	59	51	25.2	51	25.2
T2-L03-U08	66	59	73.5	35.2	50.2	28.9
T2-L03-U09	66	59	46.9	35.4	46.9	35.4
T2-L03-U10	66	59	36.6	21.1	36.6	21.1
T2-L03-U11	66	59	103.1	28.5	64	22.9
T2-L03-U12	66	59	61.4	28	61.4	28
T2-L04-U01	66	59	46.8	35.8	46.8	35.8
T2-L04-U02	66	59	44	56.9	44	56.9
T2-L04-U03	66	59	31.3	34.7	31.3	34.7

Table 4: Thermal Performance Results – Tower 2 (cont...)

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L04-U04	66	59	50.5	21.6	50.5	21.6
T2-L04-U05	66	59	75.8	36	60.1	31.1
T2-L04-U06	66	59	58.5	19.7	58.5	19.7
T2-L04-U07	66	59	51	25.2	51	25.2
T2-L04-U08	66	59	73.5	35.2	50.2	28.9
T2-L04-U09	66	59	46.9	35.4	46.9	35.4
T2-L04-U10	66	59	36.6	21.1	36.6	21.1
T2-L04-U11	66	59	103.1	28.5	64	22.9
T2-L04-U12	66	59	61.4	28	61.4	28
T2-L05-U01	66	59	46.8	35.8	46.8	35.8
T2-L05-U02	66	59	44	56.9	44	56.9
T2-L05-U03	66	59	31.3	34.7	31.3	34.7
T2-L05-U04	66	59	50.5	21.6	50.5	21.6
T2-L05-U05	66	59	75.8	36	60.1	31.1
T2-L05-U06	66	59	58.5	19.7	58.5	19.7
T2-L05-U07	66	59	51	25.2	51	25.2
T2-L05-U08	66	59	73.5	35.2	50.2	28.9
T2-L05-U09	66	59	46.9	35.4	46.9	35.4
T2-L05-U10	66	59	36.6	21.1	36.6	21.1
T2-L05-U11	66	59	103.1	28.5	64	22.9
T2-L05-U12	66	59	61.4	28	61.4	28
T2-L06-U01	66	59	46.8	35.8	46.8	35.8
T2-L06-U02	66	59	44	56.9	44	56.9
T2-L06-U03	66	59	31.3	34.7	31.3	34.7
T2-L06-U04	66	59	50.5	21.6	50.5	21.6
T2-L06-U05	66	59	75.8	36	60.1	31.1
T2-L06-U06	66	59	58.5	19.7	58.5	19.7
T2-L06-U07	66	59	51	25.2	51	25.2
T2-L06-U08	66	59	73.5	35.2	50.2	28.9
T2-L06-U09	66	59	46.9	35.4	46.9	35.4
T2-L06-U10	66	59	36.6	21.1	36.6	21.1
T2-L06-U11	66	59	103.1	28.5	64	22.9

Table 4: Thermal Performance Results – Tower 2 (cont...)

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L06-U12	66	59	61.4	28	61.4	28
T2-L07-U01	66	59	46.8	35.8	46.8	35.8
T2-L07-U02	66	59	44	56.9	44	56.9
T2-L07-U03	66	59	31.3	34.7	31.3	34.7
T2-L07-U04	66	59	50.5	21.6	50.5	21.6
T2-L07-U05	66	59	75.8	36	60.1	31.1
T2-L07-U06	66	59	58.5	19.7	58.5	19.7
T2-L07-U07	66	59	51	25.2	51	25.2
T2-L07-U08	66	59	73.5	35.2	50.2	28.9
T2-L07-U09	66	59	46.9	35.4	46.9	35.4
T2-L07-U10	66	59	36.6	21.1	36.6	21.1
T2-L07-U11	66	59	103.1	28.5	64	22.9
T2-L07-U12	66	59	61.4	28	61.4	28
T2-L08-U01	66	59	46.8	35.8	46.8	35.8
T2-L08-U02	66	59	44	56.9	44	56.9
T2-L08-U03	66	59	31.3	34.7	31.3	34.7
T2-L08-U04	66	59	50.5	21.6	50.5	21.6
T2-L08-U05	66	59	75.8	36	60.1	31.1
T2-L08-U06	66	59	58.5	19.7	58.5	19.7
T2-L08-U07	66	59	51	25.2	51	25.2
T2-L08-U08	66	59	73.5	35.2	50.2	28.9
T2-L08-U09	66	59	46.9	35.4	46.9	35.4
T2-L08-U10	66	59	36.6	21.1	36.6	21.1
T2-L08-U11	66	59	103.1	28.5	64	22.9
T2-L08-U12	66	59	61.4	28	61.4	28
T2-L09-U01	66	59	46.8	35.8	46.8	35.8
T2-L09-U02	66	59	44	56.9	44	56.9
T2-L09-U03	66	59	31.3	34.7	31.3	34.7
T2-L09-U04	66	59	50.5	21.6	50.5	21.6
T2-L09-U05	66	59	76.6	36.8	59.9	31
T2-L09-U06	66	59	58	21.7	58	21.7
T2-L09-U07	66	59	51	25.2	51	25.2

Table 4: Thermal Performance Results – Tower 2 (cont...)

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L09-U08	66	59	73.5	35.2	50.2	28.9
T2-L09-U09	66	59	46.9	35.4	46.9	35.4
T2-L09-U10	66	59	36.6	21.1	36.6	21.1
T2-L09-U11	66	59	80.5	30.1	58	25.6
T2-L09-U12	66	59	60	29.3	60	29.3
T2-L10-U01	66	59	46.8	35.8	46.8	35.8
T2-L10-U02	66	59	44	56.9	44	56.9
T2-L10-U03	66	59	31.3	34.7	31.3	34.7
T2-L10-U04	66	59	50.5	21.6	50.5	21.6
T2-L10-U05	66	59	76.6	36.8	59.9	31
T2-L10-U06	66	59	58	21.7	58	21.7
T2-L10-U07	66	59	51	25.2	51	25.2
T2-L10-U08	66	59	73.5	35.2	50.2	28.9
T2-L10-U09	66	59	46.9	35.4	46.9	35.4
T2-L10-U10	66	59	36.6	21.1	36.6	21.1
T2-L10-U11	66	59	80.5	30.1	58	25.6
T2-L10-U12	66	59	60	29.3	60	29.3
T2-L11-U01	66	59	46.8	35.8	46.8	35.8
T2-L11-U02	66	59	44	56.9	44	56.9
T2-L11-U03	66	59	31.3	34.7	31.3	34.7
T2-L11-U04	66	59	50.5	21.6	50.5	21.6
T2-L11-U05	66	59	76.6	36.8	59.9	31
T2-L11-U06	66	59	58	21.7	58	21.7
T2-L11-U07	66	59	51	25.2	51	25.2
T2-L11-U08	66	59	73.5	35.2	50.2	28.9
T2-L11-U09	66	59	46.9	35.4	46.9	35.4
T2-L11-U10	66	59	36.6	21.1	36.6	21.1
T2-L11-U11	66	59	80.5	30.1	58	25.6
T2-L11-U12	66	59	64	55.7	64	55.7
T2-L12-U01	66	59	46.8	35.8	46.8	35.8
T2-L12-U02	66	59	44	56.9	44	56.9
T2-L12-U03	66	59	31.3	34.7	31.3	34.7

Table 4: Thermal Performance Results – Tower 2 (cont...)

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L12-U04	66	59	50.5	21.6	50.5	21.6
T2-L12-U05	66	59	75.5	36	59.2	31.2
T2-L12-U06	66	59	56.4	20.6	56.4	20.6
T2-L12-U07	66	59	51	25.2	51	25.2
T2-L12-U08	66	59	73.5	35.2	50.2	28.9
T2-L12-U09	66	59	46.9	35.4	46.9	35.4
T2-L12-U10	66	59	36.6	21.1	36.6	21.1
T2-L12-U11	66	59	95.4	31	58.1	25.6
T2-L12-U12	66	59	57.2	33.8	57.2	33.8
T2-L13-U01	66	59	46.8	35.8	46.8	35.8
T2-L13-U02	66	59	44	56.9	44	56.9
T2-L13-U03	66	59	31.3	34.7	31.3	34.7
T2-L13-U04	66	59	50.5	21.6	50.5	21.6
T2-L13-U05	66	59	75.5	36	59.2	31.2
T2-L13-U06	66	59	56.4	20.6	56.4	20.6
T2-L13-U07	66	59	51	25.2	51	25.2
T2-L13-U08	66	59	73.5	35.2	50.2	28.9
T2-L13-U09	66	59	46.9	35.4	46.9	35.4
T2-L13-U10	66	59	36.6	21.1	36.6	21.1
T2-L13-U11	66	59	95.4	31	58.1	25.6
T2-L13-U12	66	59	57.2	33.8	57.2	33.8
T2-L14-U01	66	59	46.8	35.8	46.8	35.8
T2-L14-U02	66	59	44	56.9	44	56.9
T2-L14-U03	66	59	31.3	34.7	31.3	34.7
T2-L14-U04	66	59	50.5	21.6	50.5	21.6
T2-L14-U05	66	59	75.5	36	59.2	31.2
T2-L14-U06	66	59	56.4	20.6	56.4	20.6
T2-L14-U07	66	59	51	25.2	51	25.2
T2-L14-U08	66	59	73.5	35.2	50.2	28.9
T2-L14-U09	66	59	46.9	35.4	46.9	35.4
T2-L14-U10	66	59	36.6	21.1	36.6	21.1
T2-L14-U11	66	59	95.4	31	58.1	25.6

Table 4: Thermal Performance Results – Tower 2 (cont...)2

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L14-U12	66	59	57.2	33.8	57.2	33.8
T2-L15-U01	66	59	46.8	35.8	46.8	35.8
T2-L15-U02	66	59	44	56.9	44	56.9
T2-L15-U03	66	59	31.3	34.7	31.3	34.7
T2-L15-U04	66	59	50.5	21.6	50.5	21.6
T2-L15-U05	66	59	75.5	36	59.2	31.2
T2-L15-U06	66	59	56.4	20.6	56.4	20.6
T2-L15-U07	66	59	51	25.2	51	25.2
T2-L15-U08	66	59	73.5	35.2	50.2	28.9
T2-L15-U09	66	59	46.9	35.4	46.9	35.4
T2-L15-U10	66	59	36.6	21.1	36.6	21.1
T2-L15-U11	66	59	95.4	31	58.1	25.6
T2-L15-U12	66	59	57.2	33.8	57.2	33.8
T2-L16-U01	66	59	46.8	35.8	46.8	35.8
T2-L16-U02	66	59	44	56.9	44	56.9
T2-L16-U03	66	59	31.3	34.7	31.3	34.7
T2-L16-U04	66	59	50.5	21.6	50.5	21.6
T2-L16-U05	66	59	75.5	36	59.2	31.2
T2-L16-U06	66	59	56.4	20.6	56.4	20.6
T2-L16-U07	66	59	51	25.2	51	25.2
T2-L16-U08	66	59	73.5	35.2	50.2	28.9
T2-L16-U09	66	59	46.9	35.4	46.9	35.4
T2-L16-U10	66	59	36.6	21.1	36.6	21.1
T2-L16-U11	66	59	95.4	31	58.1	25.6
T2-L16-U12	66	59	57.2	33.8	57.2	33.8
T2-L17-U01	66	59	46.8	35.8	46.8	35.8
T2-L17-U02	66	59	44	56.9	44	56.9
T2-L17-U03	66	59	31.3	34.7	31.3	34.7
T2-L17-U04	66	59	50.5	21.6	50.5	21.6
T2-L17-U05	66	59	75.5	36	59.2	31.2
T2-L17-U06	66	59	56.4	20.6	56.4	20.6
T2-L17-U07	66	59	51	25.2	51	25.2

Table 4: Thermal Performance Results – Tower 2 (cont...)

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L17-U08	66	59	73.5	35.2	50.2	28.9
T2-L17-U09	66	59	46.9	35.4	46.9	35.4
T2-L17-U10	66	59	36.6	21.1	36.6	21.1
T2-L17-U11	66	59	95.4	31	58.1	25.6
T2-L17-U12	66	59	57.2	33.8	57.2	33.8
T2-L18-U01	66	59	46.8	35.8	46.8	35.8
T2-L18-U02	66	59	44	56.9	44	56.9
T2-L18-U03	66	59	31.3	34.7	31.3	34.7
T2-L18-U04	66	59	50.5	21.6	50.5	21.6
T2-L18-U05	66	59	75.5	36	59.2	31.2
T2-L18-U06	66	59	56.4	20.6	56.4	20.6
T2-L18-U07	66	59	51	25.2	51	25.2
T2-L18-U08	66	59	73.5	35.2	50.2	28.9
T2-L18-U09	66	59	46.9	35.4	46.9	35.4
T2-L18-U10	66	59	36.6	21.1	36.6	21.1
T2-L18-U11	66	59	95.4	31	58.1	25.6
T2-L18-U12	66	59	57.2	33.8	57.2	33.8
T2-L19-U01	66	59	46.8	35.8	46.8	35.8
T2-L19-U02	66	59	44	56.9	44	56.9
T2-L19-U03	66	59	31.3	34.7	31.3	34.7
T2-L19-U04	66	59	50.5	21.6	50.5	21.6
T2-L19-U05	66	59	75.5	36	59.2	31.2
T2-L19-U06	66	59	56.4	20.6	56.4	20.6
T2-L19-U07	66	59	51	25.2	51	25.2
T2-L19-U08	66	59	73.5	35.2	50.2	28.9
T2-L19-U09	66	59	46.9	35.4	46.9	35.4
T2-L19-U10	66	59	36.6	21.1	36.6	21.1
T2-L19-U11	66	59	95.4	31	58.1	25.6
T2-L19-U12	66	59	57.2	33.8	57.2	33.8
T2-L20-U01	66	59	46.8	35.8	46.8	35.8
T2-L20-U02	66	59	44	56.9	44	56.9
T2-L20-U03	66	59	31.3	34.7	31.3	34.7

Table 4: Thermal Performance Results – Tower 2 (cont...)

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L20-U04	66	59	50.5	21.6	50.5	21.6
T2-L20-U05	66	59	75.5	36	59.2	31.2
T2-L20-U06	66	59	56.4	20.6	56.4	20.6
T2-L20-U07	66	59	51	25.2	51	25.2
T2-L20-U08	66	59	73.5	35.2	50.2	28.9
T2-L20-U09	66	59	46.9	35.4	46.9	35.4
T2-L20-U10	66	59	36.6	21.1	36.6	21.1
T2-L20-U11	66	59	95.4	31	58.1	25.6
T2-L20-U12	66	59	57.2	33.8	57.2	33.8
T2-L21-U01	66	59	46.8	35.8	46.8	35.8
T2-L21-U02	66	59	44	56.9	44	56.9
T2-L21-U03	66	59	31.3	34.7	31.3	34.7
T2-L21-U04	66	59	50.5	21.6	50.5	21.6
T2-L21-U05	66	59	75.5	36	59.2	31.2
T2-L21-U06	66	59	56.4	20.6	56.4	20.6
T2-L21-U07	66	59	51	25.2	51	25.2
T2-L21-U08	66	59	73.5	35.2	50.2	28.9
T2-L21-U09	66	59	46.9	35.4	46.9	35.4
T2-L21-U10	66	59	36.6	21.1	36.6	21.1
T2-L21-U11	66	59	95.4	31	58.1	25.6
T2-L21-U12	66	59	57.2	33.8	57.2	33.8
T2-L22-U01	66	59	46.8	35.8	46.8	35.8
T2-L22-U02	66	59	44	56.9	44	56.9
T2-L22-U03	66	59	31.3	34.7	31.3	34.7
T2-L22-U04	66	59	50.5	21.6	50.5	21.6
T2-L22-U05	66	59	75.5	36	59.2	31.2
T2-L22-U06	66	59	56.4	20.6	56.4	20.6
T2-L22-U07	66	59	51	25.2	51	25.2
T2-L22-U08	66	59	73.5	35.2	50.2	28.9
T2-L22-U09	66	59	46.9	35.4	46.9	35.4
T2-L22-U10	66	59	36.6	21.1	36.6	21.1
T2-L22-U11	66	59	95.4	31	58.1	25.6

Table 4: Thermal Performance Results – Tower 2 (cont...)

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L22-12	66	59	57.2	33.8	57.2	33.8
T2-L23-01	66	59	49.9	53.4	49.9	53.4
T2-L23-02	66	59	68.2	65.5	53.1	53.1
T2-L23-03	66	59	31.3	34.7	31.3	34.7
T2-L23-04	66	59	50.5	21.6	50.5	21.6
T2-L23-05	66	59	75.5	36	59.2	31.2
T2-L23-06	66	59	56.4	20.6	56.4	20.6
T2-L23-07	66	59	51	25.2	51	25.2
T2-L23-0809	66	59	73.4	61.8	52.8	49.3
T2-L23-10	66	59	36.6	21.1	36.6	21.1
T2-L23-11	66	59	77.2	37.9	46	29.9
T2-L23-12	66	59	78.8	53.5	58.1	41.8
T2-L24-01	66	59	69.2	65	46.1	52.4
T2-L24-02	66	59	7.6	38.1	7.6	38.1
T2-L24-03	66	59	7.7	29.9	7.7	29.9
T2-L24-04	66	59	36.9	39.7	36.9	39.7
T2-L24-05	66	59	31.5	28.5	31.5	28.5
T2-L24-06	66	59	18.3	27.3	18.3	27.3
T2-L24-0708	66	59	73.2	62.1	52.5	49
T2-L24-09	66	59	6.2	36.5	6.2	36.5
T2-L24-10	66	59	18.8	55.9	18.8	55.9
T2-L24-11	66	59	21.5	57	21.5	57
T2-L24-12	66	59	32	52.6	23.3	40.9
T2-L25-01	66	59	69.2	65	46.1	52.4
T2-L25-02	66	59	14.8	45.8	14.8	45.8
T2-L25-03	66	59	17.5	45.3	17.5	45.3
T2-L25-04	66	59	31.5	28.5	31.5	28.5
T2-L25-05	66	59	18.3	27.3	18.3	27.3
T2-L25-0607	66	59	73.2	62.1	52.5	49
T2-L25-08	66	59	6.2	36.5	6.2	36.5
T2-L25-09	66	59	18.8	55.9	18.8	55.9
T2-L25-10	66	59	21.5	57	21.5	57

Table 4: Thermal Performance Results – Tower 2 (cont...)

Unit Number	BASIX Requirements (MJ/m ² /year)		Initial Results (MJ/m ² /year) (no treatments)		Final Results (MJ/m ² /year) (with treatments)	
	Heating	Cooling	Heating	Cooling	Heating	Cooling
T2-L25-11	66	59	32	52.6	23.3	40.9
T2-L26-01	66	59	80.5	90.7	63.5	58.8
T2-L26-02	66	59	14.8	45.8	14.8	45.8
T2-L26-03	66	59	26.7	40.1	26.7	40.1
T2-L26-04	66	59	35.2	51.5	35.2	51.5
T2-L26-05	66	59	29.8	33.7	29.8	33.7
T2-L26-0607	66	59	89.9	57.9	58.5	44.3
T2-L26-08	66	59	6.2	36.5	6.2	36.5
T2-L26-09	66	59	18.8	55.9	18.8	55.9
T2-L26-10	66	59	21.5	57	21.5	57
T2-L26-11	66	59	41.2	35.1	29.8	27.4
T2-L27-01	66	59	80.5	90.7	63.5	58.8
T2-L27-02	66	59	8.9	35.6	8.9	35.6
T2-L27-03	66	59	128.7	32.5	58.9	24.6
T2-L27-04	66	59	23.4	71.2	13.9	57.6
T2-L27-05	66	59	18.8	55.9	18.8	55.9
T2-L27-06	66	59	21.5	57	21.5	57
T2-L27-07	66	59	41.2	35.1	29.8	27.4
T2-L28-01	66	59	80.5	90.7	63.5	58.8
T2-L28-02	66	59	8.9	35.6	8.9	35.6
T2-L28-03	66	59	121.8	31.8	63.4	22.5
T2-L28-04	66	59	23.4	71.2	13.9	57.6
T2-L28-05	66	59	18.8	55.9	18.8	55.9
T2-L28-06	66	59	21.5	57	21.5	57
T2-L28-07	66	59	41.2	35.1	29.8	27.4
T2-L29-01	66	59	34.8	67.5	27.7	50.7
T2-L29-02	66	59	47.2	47.9	47.2	47.9
T2-L29-03	66	59	157.7	36.5	64.7	25.8
T2-L29-04	66	59	27.3	73	17.6	56.2
T2-L29-05	66	59	34.3	45.5	34.3	45.5
T2-L29-06	66	59	46.9	65.2	38.8	57.8
T2-L29-07	66	59	48.4	66.3	65.9	48.3

3.3 Energy

The target score in BASIX to achieve energy usage compliance is **20%**. A score of **20%** is achieved for the development through the following;

- The central hot water systems (1 and 2) are to be gas solar boosted system with a solar collector area of 43m². All piping (internal and external) for the system is to include R0.45 (~20mm) insulation.
- The lift system in the development is to be gearless traction with VVVF motor.
- The mechanical ventilation system within the Gyms will be an air conditioning system and is to be controlled by time clocks.
- No mechanical ventilation system has been proposed within the Level 0 car park areas of the proposed development.
- The mechanical ventilation system within the underground B1 and B2 car park areas will be ventilation exhaust only and is to be controlled by carbon monoxide monitor and VSD fans.
- The mechanical ventilation system within the underground B3 and B4 car park areas will be ventilation supply and exhaust, and is to be controlled by carbon monoxide monitor and VSD fans.
- The mechanical ventilation system within the garbage rooms within the proposed development will be ventilation exhaust only.
- The mechanical ventilation system within the Community rooms will be an air conditioning system and is to be controlled by time clocks.
- The mechanical ventilation system within the electrical plant and switch rooms will be ventilation supply only and is to be thermostatically controlled.
- The mechanical ventilation system within the storage and other internal common areas will be ventilation supply only and is to be controlled by time clocks.
- No mechanical ventilation system has been proposed in the hallways and lobbies within the proposed development.
- All lighting within the Gym, car parks, lifts, hallways, switch, plant, garbage, storage and other internal common areas are to be compact fluorescent.
- The lighting system in the Gym, Community rooms and lobbies is to be controlled by time clocks.
- The lighting system in all car parks is to be controlled by time clocks and motion sensors.
- The lighting system in each lift is to be connected to the lift call button.

- The lighting system in all switch, plant, garbage, storage and other internal common areas is to be controlled by a manual on/off switch.
- Bathrooms with external windows within the residential units of the proposed development will be naturally ventilated. The remaining bathrooms are to have motorised damper into central duct + VSD fans and are to be controlled by manual on/off switches.
- The kitchen exhaust fans of all residential units are individual fans, not ducted to the façade and are to be controlled by manual on/off switches.
- The laundry exhaust fans of all residential units are to be motorised damper into central duct + VSD fans and are to be controlled by manual on/off switches.
- Single-phase air-conditioning systems are to be installed in the living room and bedrooms of each residential unit. Each system is to have an energy rating of at least 5.0 for heating and cooling. The system is to be used for heating and cooling and are to be zoned.
- The bedrooms, living room, kitchen, bathroom, laundry and hallways within each residential dwelling of the proposed development will be primarily lit by fluorescent or LED lamps (i.e. at least 80% of the light fittings in the room).
- A gas cook top and electric oven will be installed in each kitchen in the development.
- All dishwasher units are to be installed in all residential dwellings of Tower 1 and should have an energy efficiency rating of at least 3.5 stars.
- All dishwasher units are to be installed in all residential dwellings of Tower 2 and should have an energy efficiency rating of at least 3 stars.
- All clothes washers and dryer units are to be installed in all residential dwellings of the proposed development and should have an energy efficiency rating of at least 4.5 stars.

Note that if any of the above systems are to be substituted by less efficient systems, an update to the BASIX certificate would also be required.

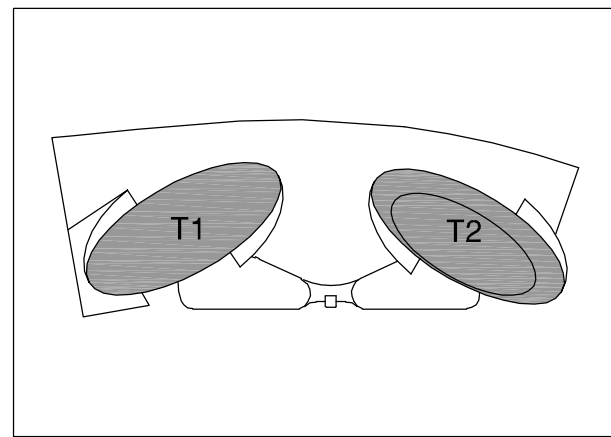
4.0 Conclusion

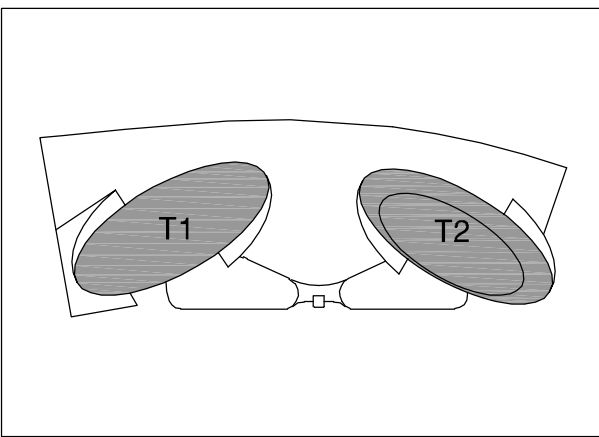
A BASIX assessment of Towers 1 and 2 of the proposed development known as Australia Towers, located in Sydney Olympic Park has been carried out. The results of the assessment indicate that the development will satisfy the requirements of BASIX if all of the items outlined in this report are carried out.

The certified architectural drawings, ABSA certificate and BASIX certificate are attached in the following appendices of this report.

Appendix A

Certified Architectural Drawings

Date 15/03/2012BATESSMART™




D	04/11/11	Revised Design following SOPA comments	JC	MD
A	06/04/11	DA Submission	JL	MD
Revision	Date	Description	Initial	Checked

Check all dimensions and site conditions prior to commencement of any work, the purchase or ordering of any materials, things, plant, services or equipment and the preparation of shop drawings and/or the fabrication of any components.

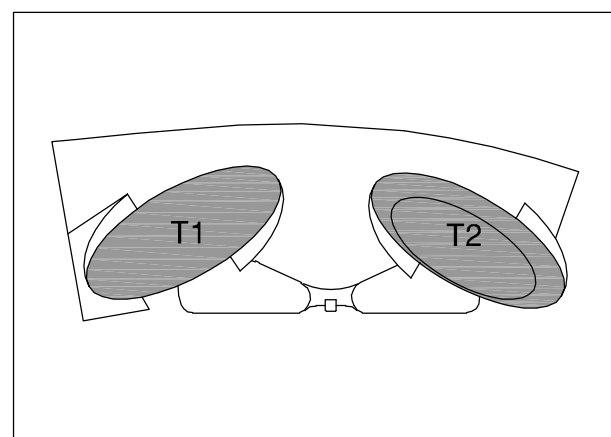
Do not scale drawings - refer to figured dimensions only. Any discrepancies shall immediately be referred to the architect for clarification.

All drawings may not be reproduced or distributed without prior permission from the architect.



Bates Smart Pty Ltd ABN 70 004 999 400

BATESSMART™

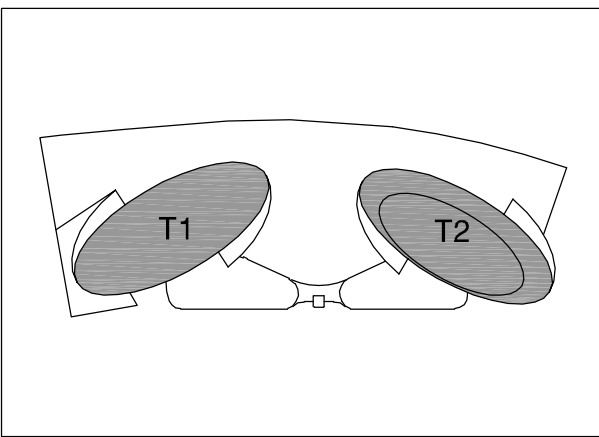


Site 3
Sydney Olympic Park
Ground Floor Plan

Scale	1:200 @ A1, 1:400 @ A3
Drawn	Checked
Project No.	S11202
Status	DA
Plot Date	23/2/2012 5:05:11 PM
Plot File	S:\11200-11299\11202_dwg\da\berglia_homebush\00_eolcad\plots\C ... \A\DA02.200\DA02.dwg
Drawing No.	[Revision]
DA02.200[D]	

Bates Smart Pty Ltd ABN 70 004 999 400

BATESSMART™



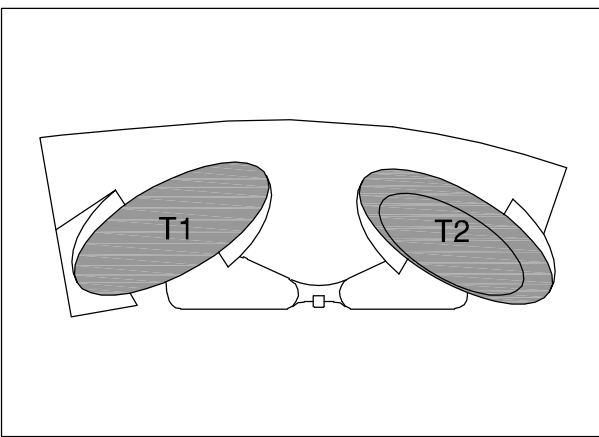
D	04/11/11	Revised Design following SOPA comments	JC	MD
A	06/04/11	DA Submission	JL	MD
Revision	Date	Description	Initial	Checked

Check all dimensions and site conditions prior to commencement of any work, the purchase or ordering of any materials, fittings, plant, services or equipment and the preparation of shop drawings and/or the fabrication of any components.
Do not scale drawings - refer to figured dimensions only. Any discrepancies shall immediately be referred to the architect for clarification.
All drawings may not be reproduced or distributed without prior permission from the architect.

DA02.201[D]

Bates Smart Pty Ltd ABN 70 004 999 400

BATES SMART™



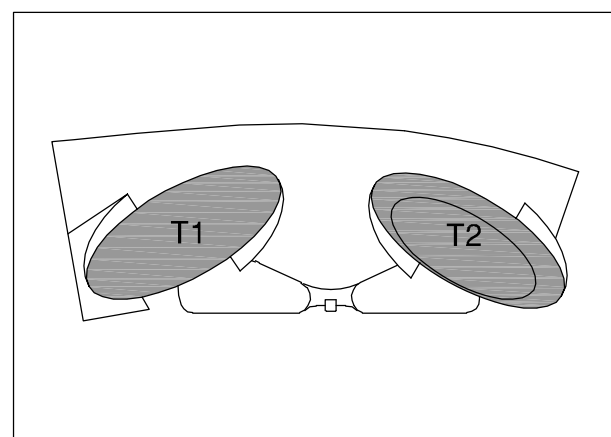
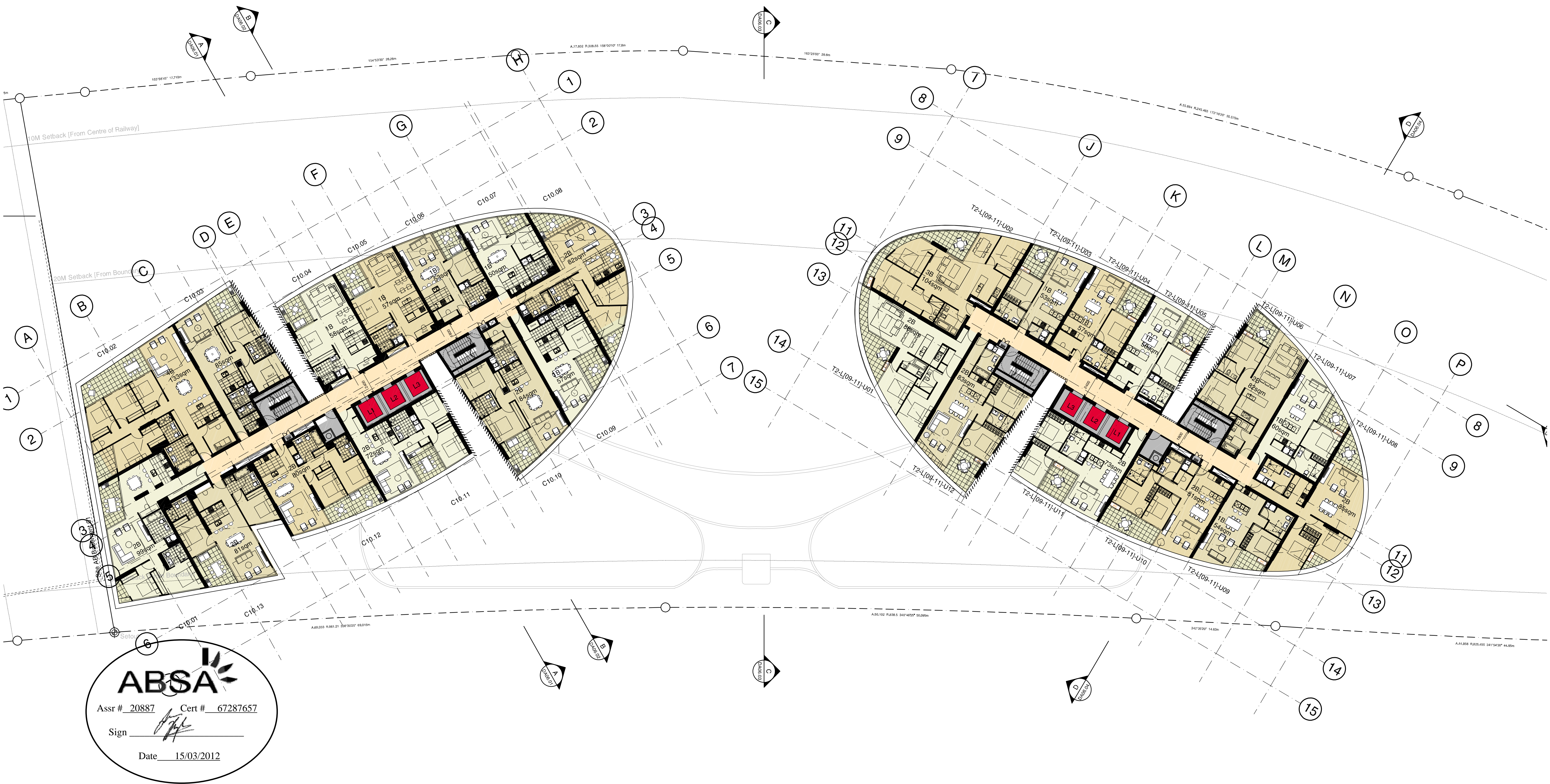
D	04/11/11	Revised Design following SOPA comments	JC	MD
A	06/04/11	DA Submission	JL	MD
Revision	Date	Description	Initial	Checked

Check all dimensions and site conditions prior to commencement of any work, the purchase or ordering of any materials, fittings, plant, services or equipment and the preparation of shop drawings and/or the fabrication of any components.
Do not scale drawings - refer to figured dimensions only. Any discrepancies shall immediately be referred to the architect for clarification.
All drawings may not be reproduced or distributed without prior permission from the architect.

DA02.202[D]

Bates Smart Pty Ltd ABN 70 004 999 400

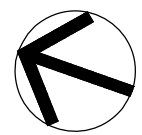
BATESSMART™



D	04/11/11	Revised Design following SOPA comments	JC	MD	
A	06/04/11	DA Submission	JL	MD	
Revision	Date	Description	Initial	Checked	

Site 3
Sydney Olympic Park
Plan
Level 03 - 11

Check all dimensions and site conditions prior to commencement of any work, the purchase or ordering of any materials, fittings, plant, services or equipment and the preparation of shop drawings and/or the fabrication of any components.
Do not scale drawings - refer to figured dimensions only. Any discrepancies shall immediately be referred to the architect for distribution.
All drawings may not be reproduced or distributed without prior permission from the architect.



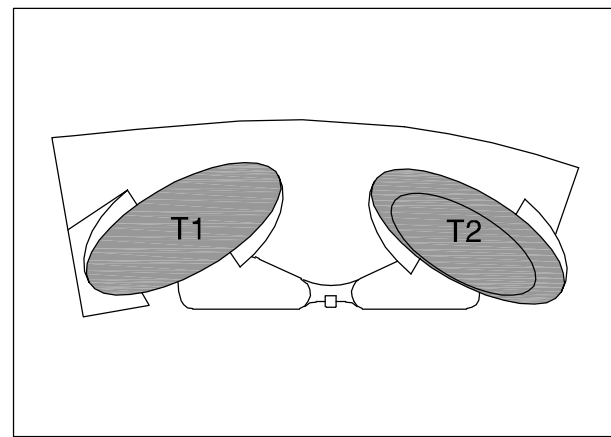
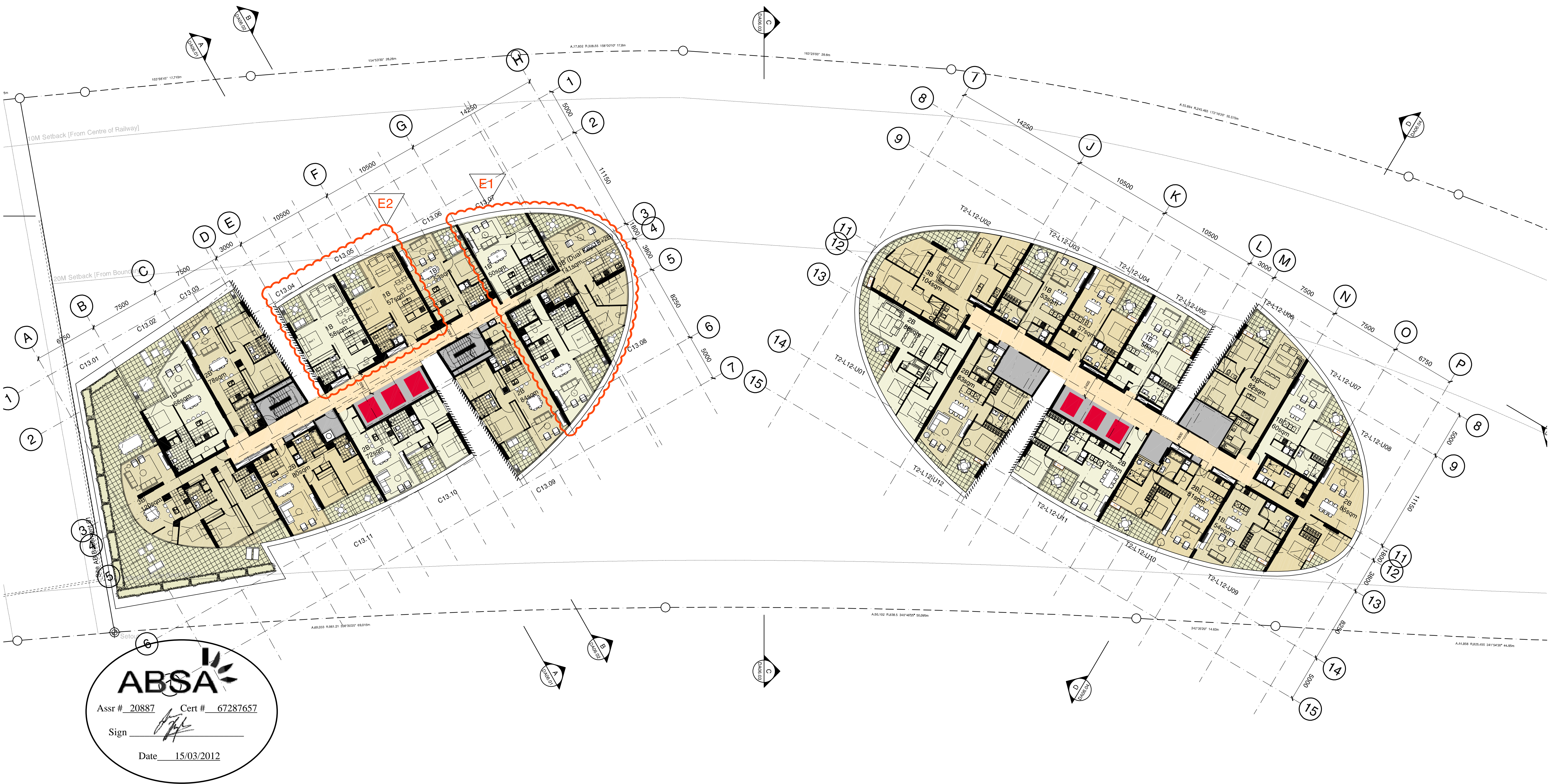
Scale	1:200@A1, 1:400@A3
Drawn	Checked
Project No.	S11202
Status	DA
Plot Date	23/2/2012 5:06:09 PM
Plot File	S:\11200-11299\11202_billbergio_homebush\00_eo\cad\plot ...
Drawing No.	DA02.203[D]

Sydney 1/243 Liverpool Street
East Sydney NSW 2010 Australia
T 02 8354 5100 F 02 8354 5199
email syd@batesmart.com.au
http://www.batesmart.com.au

Melbourne 1 Nicholson Street
Melbourne VIC 3000 Australia
T 03 8664 6200 F 03 8664 6300
email melb@batesmart.com.au
http://www.batesmart.com.au

Bates Smart Pty Ltd ABN 70 004 999 400

BATESSMART



Revision E - Section 75W Amendments.

1. Change of apartment mix from one 3-Bed and one 2-Bed (C13.07 & C13.08) to one 1-Bed and one 3-Bed Dual Key (1-Bed+2-Bed) (C13.07 & C13.08).

2. Apartments C13.04 & C13.05 have been allocated as adaptable units.

Revision	Date	Description	Initial	Checked
E	23/02/12	Section 75W Submission	PL	MD
D	04/11/11	Revised Design following SOPA comments	JC	MD
A	06/04/11	DA Submission	JL	MD

Site 3
Sydney Olympic Park
Plan
Level 12

Check all dimensions and site conditions prior to commencement of any work, the purchase or ordering of any materials, fittings, plant, services or equipment and the preparation of shop drawings and/or the fabrication of any components.
Do not scale drawings - refer to figured dimensions only. Any discrepancies shall immediately be referred to the architect for distribution.
All drawings may not be reproduced or distributed without prior permission from the architect.

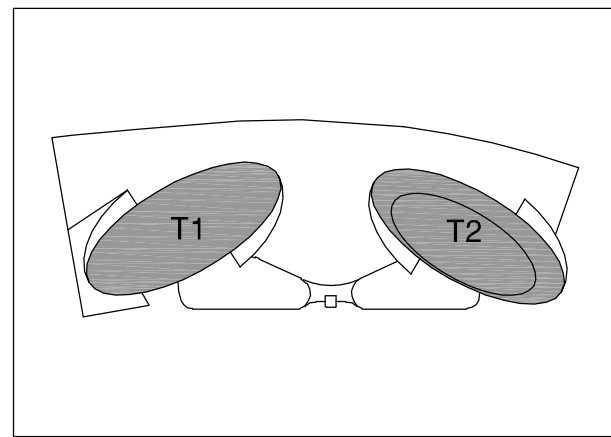
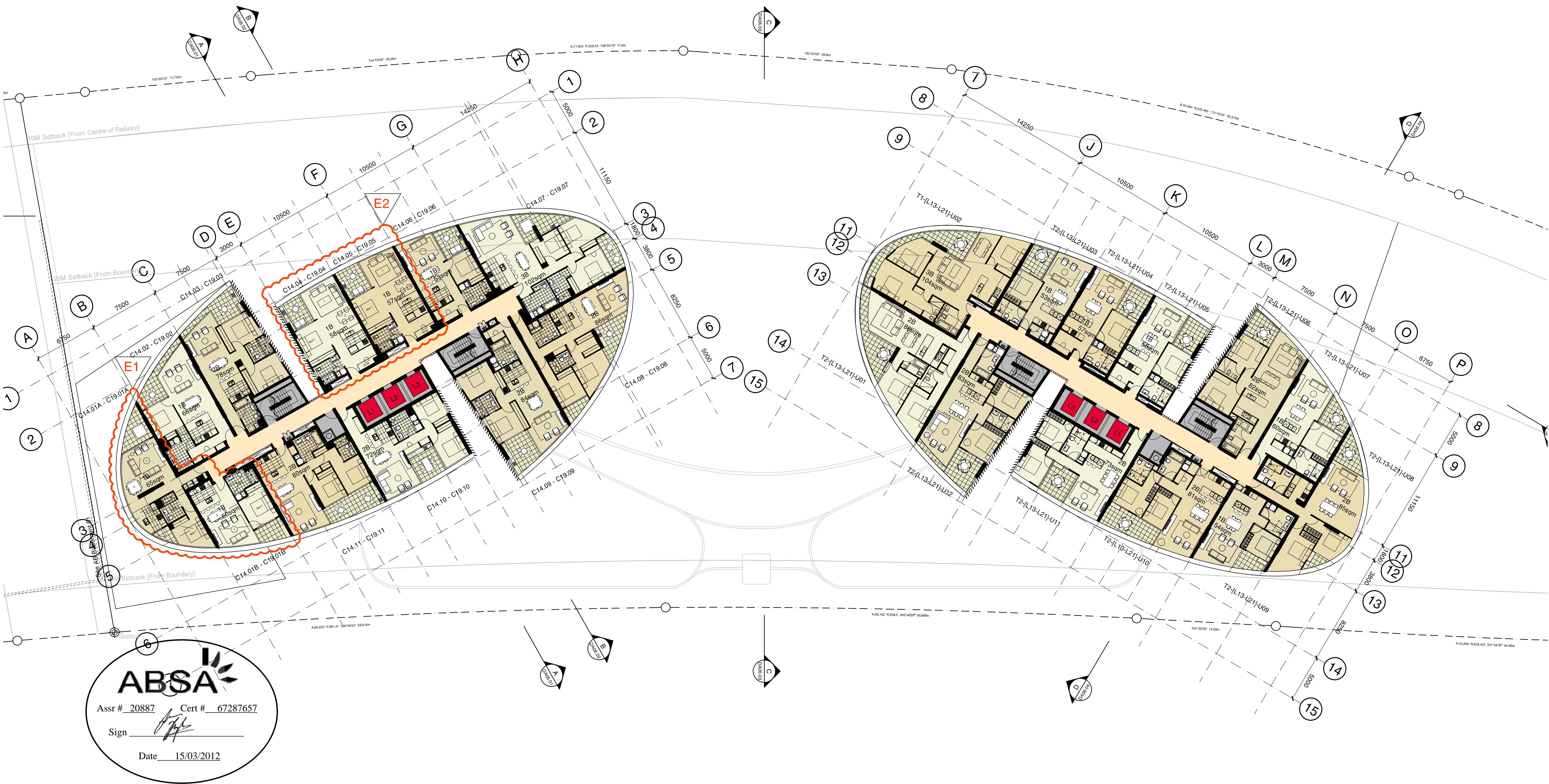
Scale	1:200@A1, 1:400@A3
Drawn	Checked
Project No.	S11202
Status	DA
Plot Date	7/3/2012 5:35:17 PM
Plot File	S:\11200-11299\11202_billbergio_homebush\00_eo\cad\plot ...
Drawing No.	DA02.212[E]

Sydney 1/243 Liverpool Street
East Sydney NSW 2010 Australia
T 02 8354 5100 F 02 8354 5199
email syd@batesmart.com.au
http://www.batesmart.com.au

Melbourne 1 Nicholson Street
Melbourne VIC 3000 Australia
T 03 8664 6200 F 03 8664 6300
email melb@batesmart.com.au
http://www.batesmart.com.au

Bates Smart Pty Ltd ABN 70 004 999 400

BATESSMART



Revision E - Section 75W Amendments.

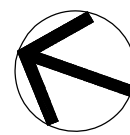
1. Change of apartment mix from one 3-Bed (C14.01-C22.01) to two 1-Bed (C14.01A-C22.01A & C14.01B-C22.01B).

2. Apartments C14.04-C22.04 & C14.05-C22.05 have been allocated as adaptable units.

E	23/02/12	Section 75W Submission	PL MD
D	04/11/11	Revised Design following SOPA comments	JC MD
A	06/04/11	DA Submission	JL MD
Revision	Date	Description	Initial Checked

Site 3
Sydney Olympic Park
Plan
Level 13-18

Check all dimensions and site conditions prior to commencement of any work, the purchase or ordering of any materials, fittings, plant, services or equipment and the preparation of shop drawings and/or the fabrication of any components.
Do not scale drawings - refer to figured dimensions only. Any discrepancies shall immediately be referred to the architect for distribution.
All drawings may not be reproduced or distributed without prior permission from the architect.



Scale	1:200@A1, 1:400@A3
Drawn	Checked
Project No.	S11202
Status	DA
Plot Date	7/3/2012 4:18:16 PM
Plot File	S:\11200-11299\11202_billbergia_homebush\00_eolicad\plots\T...
Drawing No.	DA02.213[E]

Sydney 1/243 Liverpool Street
East Sydney NSW 2010 Australia
T 02 8354 5100 F 02 8354 5199
email syd@batesmart.com.au
http://www.batesmart.com.au

Melbourne 1 Nicholson Street
Melbourne VIC 3000 Australia
T 03 8664 6200 F 03 8664 6300
email melb@batesmart.com.au
http://www.batesmart.com.au

Bates Smart Pty Ltd ABN 70 004 999 400

BATESSMART