Inquiry: proposed construction of Centre for Accelerator Science and extension to facilities for the Australian Nuclear Science and Technology Organisation

Submission 1b: The Bragg Institute Offices and Laboratory Proposed Extension

Part 2 of 3. Parts 1 and 3 are:

- Submission 1a: Proposal for a new Centre for Accelerator Science
- Submission 1c: Opal Offices, Workshops and Laboratories Extension

Australian Government

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SUBMISSION TO THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

THE BRAGG INSTITUTE OFFICES AND LABORATORY PROPOSED EXTENSION

JANUARY 2010

AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION

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PREFACE

The Australian Nuclear Science and Technology Organisation (ANSTO) is Australia's national nuclear research and development organisation and the centre of Australian nuclear expertise. ANSTO is responsible for delivering specialised advice, scientific services and products to government, industry, academia and other research organisations.

At the centre of ANSTO's facilities is the OPAL reactor. The OPAL reactor is utilised for a number of purposes, including the use of neutron scattering techniques to solve complex research and industrial problems. That research program is conducted by ANSTO's Bragg Institute. This proposal outlines the justification for the construction and fit out of additional Bragg Institute offices and laboratories. These facilities are necessary for the continuous expansion of their research facilities.

The OPAL Reactor was designed to accommodate up to 18 neutron beam instruments, and to operate up to 340 days per year. In the initial contract signed in June 2000 with INVAP S.E., there was provision for an initial suite of eight neutron beam instruments and ANSTO presently has operational staff to operate the instruments in "full user-service" mode for 250 days per year. The present building complex can accommodate these staff. However, one of ANSTO's medium-term strategic goals is to build one-two extra neutron beam instruments per year, until the facility is fully instrumented. We have already successfully raised funds to do some of this: five further instruments are under construction or in design, with funding already in place from a variety of sources including the Commonwealth's Super-Science Initiative, the National Science Council of Taiwan and ANSTO's own capital allocation. There is also strong evidence of demand (in four competitive proposal rounds so far) to fully use the 300+ days of beam time from OPAL. The present buildings are currently completely full with staff, and we have had to bring in temporary buildings for project staff associated with the Super-Science Initiative funding.

Another consequence of building the extra instruments is that office space, laboratory space and floor area in the Neutron Guide Hall that are presently used for assembly and support activities will soon be occupied by the extra instruments and the instrument cabins for their users. Extra laboratory and assembly space is therefore needed to fill the gap.

In addition, ANSTO has made the strategic decision to merge the NCRIS-funded "National Deuteration Facility", including its laboratories and equipment, into the Bragg Institute and to co-locate the staff and apparatus. This move is being made on the advice of the Bragg Institute Advisory Committee, with the aim of: (1) providing excellent customer service and a common user experience; (2) raising scientific standards at the National Deuteration Facility; and (3) providing a seamless user experience that is greater than the sum of its parts. Space for the Deuteration Facility is included in the project.

Table of Contents

1. IDENTIFICATION OF THE NEED

1.1. Historical Background

In 1997, the Australian Government made the decision to fund the OPAL Research Reactor at Lucas Heights, as a landmark piece of scientific infrastructure. A major component of that decision was a desire to see Australia pursuing world-class research in materials science and structural biology, using the intense neutron beams from OPAL. In mid-2000, a contract for the reactor, cold source, neutron guides and guide hall was signed with INVAP S.E., an Argentinean company. In parallel, ANSTO was funded to construct the initial suite of eight neutron beam instruments. The OPAL Reactor went critical in mid-2006, and seven of the instruments are now in operation. At the end of 2009, a total of 23 refereed scientific publications have been published from six of the instruments, and involving users from leading institutions around Australia and overseas, and from ANSTO. Demand for the present instruments is high, and continues to increase.

1.2. The Need for the Work

The OPAL reactor, and its current guide hall, can accommodate 18 instruments. In addition to the eight initial instruments, the construction of a further five is funded from various sources, including the Commonwealth's Super-Science Initiative, the National Science Council of Taiwan and ANSTO's appropriation. The building extension is needed to fulfil the 10-year forward plan for the OPAL reactor:

1. provide office space for sufficient staff to operate 18 instruments at OPAL, in excess of 300 days per year (we currently have space for staff to operate eight instruments 250 days per year);
2. provide office space, amenities and meeting rooms for up to 50 users and long-term visitors;
3. provide laboratory and office space for the NCRIS-funded National Deuteration Facility (NDF), which is presently spread over the ANSTO site;
4. provide sufficient laboratory and assembly space for other activities, that are presently done in space to be occupied by the new instruments;
5. provide a unified high-quality user service and scientific experience across the Bragg Institute and the NDF.
6. construct the building extension in such a way that further office space can be installed (at a later date) if and when the second guide hall is constructed.

The need for the new facilities is summarised in the following table and figure:

Table 1: Ongoing staff needs

	Estimated Need		Capacity		
	Present complement (eight instruments)	Complement for 18 instruments (in 2017)	Capacity in B87	Capacity in B82	**Needs in New Building**
Bragg Institute staff	45	130	45	19[1]	**66**
NDF staff	13	13	0	0	**13**
Staff seconded from elsewhere[2]	23	15	0	0	**15**
Users	0	18	0	16	**2**
Post docs & Students	20	50	15	0	**35**
Total number of people	101	226	60	35	**131**

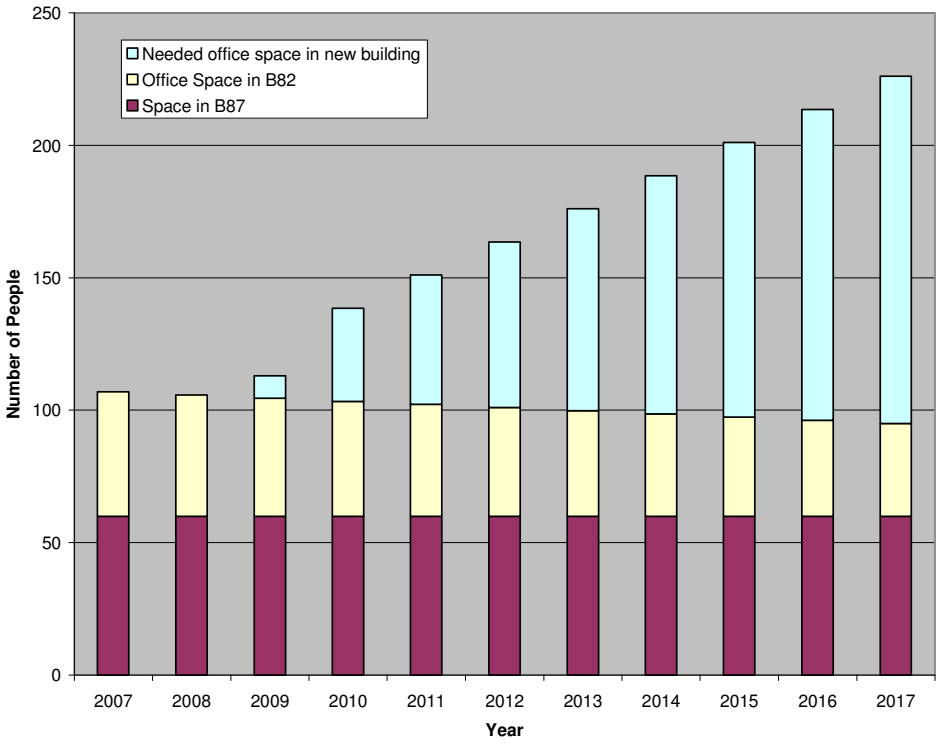

Figure 1: Future Office Space

[1] Accounting for loss of 6 instrument cabins presently used for (2-person) office space
[2] e.g. Joint appointments, Taiwan team, staff seconded from E&TS

1.3. Project Objectives

The objective is to have an extension to the Neutron Guide Hall and existing Bragg Institute Building, with direct roll-through access into the Neutron Guide Hall for sample-environment and other equipment, and the sense of being in one common intellectual space for all 18 instruments possible in the present OPAL Reactor configuration, including the National Deuteration Facility. The building will house roughly 150 people, a mixture of ANSTO staff, users, long-term visitors, and students/post docs based at the Institute, and will serve the Bragg Institute's needs for the next 10 years, or until a second Guide Hall is built at OPAL .

1.4. Description of the Proposal

The proposal is to construct additional offices, laboratories and assembly areas for the Bragg Institute. The project is estimated to cost $24.614 million and will be staged between the 2009-2010 and 2012-2013 financial years, with the following milestones:

- Detailed design completion date July 2010;
- Office construction by November 2011;
- Laboratory construction by March 2012.

1.5. Consultation

The matter is primarily a design and construction issue. The design of the facility will be in accordance with best practice for laboratories and office space. Given the low levels of radioactivity that will be present in the building, the construction project does not require the approval of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Any use of radioactive material in the building will be subject to ARPANSA regulation.

1.6. Environmental and Heritage Considerations

The proposed site is a vacant, flat, grassed site adjacent to Buildings 82 and 87 within the ANSTO general area. In general, construction of the facility will result in short term, localised, small–scale impact to soils, air quality, flora and fauna, noise, visual and landscape. Management protocols will restrict any impact on surface runoff and erosion and mitigate any other environmental effects.

There will be no impacts on Aboriginal or non-Aboriginal cultural heritage as a result of the construction of the proposed facility. There are no heritage considerations for the project.

It is therefore concluded that the proposed works are unlikely to produce a significant environmental impact. Nevertheless, an assessment of the project under the *Environment Protection and Biodiversity Conservation Act 1999* will be undertaken.

2. TECHNICAL INFORMATION

2.1. Project Location

ANSTO is situated in the local government area of Sutherland Shire, approximately 30 kilometres south-west of Sydney's central business district. The site for the proposed Bragg Institute additional offices and laboratories is adjacent to Building 82 and 87, within the 70 hectare ANSTO site at Lucas Heights.

2.2. Design Objectives and General Design Principles

Design will be to Australian Standards and the BCA (Building Code of Australia), thereby delivering a reliable and maintainable facility. ANSTO standards will also apply where practical.

The design of the facility will be in accordance with best practice for laboratories and office accommodation and will achieve a minimum 4.5 star ABGR/NABER rating.

The objective is to produce a biological research facility incorporating biodistribution and imaging laboratories and cell culture laboratories, purpose built for world-class research.

2.3. Scope of Works

The facility is to be a purpose built, world class laboratory and office facility incorporating biodistribution, imaging and cell culture laboratories accommodating all of the critical biological processes including in vivo imaging and immunohistochemical techniques under one roof and in close proximity to both the animal housing facility and to Building 76 for convenient radiotracer transfers. Preliminary planning has indicated a floor space requirement of approximately 3,360 square metres for the facility extension.

2.4. Responsibilities and Resources

ANSTO's Engineering and Technical Services (E&TS) Major Projects Deliveries Office will be responsible for the overall project management of the project, from the design development of the concept design through to final completion and commissioning. External consultants will be engaged to carry out the design development and detailed design. Procurement for the construction will involve tender action in accordance with the Commonwealth Procurement Guidelines.

Within ANSTO, the proposal will be developed with extensive consultation and support from:

- The Bragg Institute;
- Engineering & Technical Services;
- Occupational Health, Safety & Environment Division;
- Capital Investment Committee;
- Executive;

- ANSTO Board; and
- Campus Services.

2.5. Quality Assurance

ANSTO Engineering and Technical Services is certified as complying with Quality System Standard *AS/NZ ISO 9001:1994 'Quality Systems, Model for Quality Assurance in Design, Development, Production, Installation and Servicing'*.

The work will be carried out in accordance with the appropriate Business Management System Procedures and Instructions.

2.6. Project Time Schedule

Once the Committee has approved the proposal, consultants will be engaged for the detailed design phase.

The construction may be staged, with the office accommodation area building being completed four months prior to completion of laboratory construction. The following milestones have been set for the project

Table 2: Schedule

Detailed design documentation	July 2010
Construction & implementation phase for offices	November 2011
Construction & implementation phase for laboratories	March 2012

2.7. Project Budget

The business case budget for the proposed facility is $24.6 million. External Quantity Surveyors were engaged by E&TS during the preliminary concept design phase to carry out a preliminary cost plan for the project. Appropriate contingencies and cost escalation allowances have been factored into the cost plan.

2.8. Risk Assessment

The project is subject to the risk management processes of ANSTO. ANSTO has a risk management policy and framework consistent with the Australian Standard 4360:1999. This framework has been benchmarked favourably against Comcover better practice principles.

It is ANSTO policy that all major projects assess risks, identify risk owners and develop action plans to mitigate identified risks. Risks for this project are being assessed for their potential impact on budget, schedule and performance. Risks are discussed on a regular basis at relevant ANSTO management meetings, and the ANSTO Board Audit Committee has an oversight role on ANSTO risk management.

The main identified risks for the proposed facility can be categorised as follows:

- High Level Risks
    - Customer expectations not being met;
    - Non-compliance with Government Regulations.
- Significant Risks
    - Budget (risk of not achieving value for money);
    - Scope creep (impacting adversely on project objectives);
- Medium Risks
    - Probity (Governance);
    - Funding;
    - Construction (Project Management, Completion Date);
    - OHS and Security;
    - Staffing (key staff, staff communication);
- Low Risks
    - Staff dislocation;
    - Fit out;
    - Services installation (timing).

These risks will be assessed for likelihood and project impact, and dispositions developed for further review.

2.9. Floor Area

The proposed development will comprise 3,360 square metres.

2.10. Civil and Structural

The proposed development will be provided with a small access road to the assemble laboratory loading and unloading area. The building foundations will be designed for safe operation under seismic, dead, live, vibration, settlement and equipment loads over the life of the facility and are expected to be concrete column pads keyed into bedrock.

2.11. Electrical Services

The new buildings will require a separate power supply to be provided from a new local sub-station that will also cater for new extensions as well as any future expansion. A main switchboard will be installed in a new main switch room located in the ground floor level of the new building. A number of distribution boards will be located throughout the building to provide power to the various items of plant, process equipment and general power requirements. The power for the mechanical plant will be supplied from local switchboards located in the mechanical plant areas.

2.12. Communications

The existing telephone, EWIS and public address systems will be extended to cover the new areas as required.

An integrated voice / data cabling system will be provided to link each voice and data outlet in each building back to the communications closet in the building.

2.13. Mechanical Services

The entire building will be designed around the mechanical systems and laboratory processes, to ensure that the required internal design conditions can be achieved. Primary confinement areas will be kept at a negative pressure in order to provide the necessary containment. Certain laboratories will need to comply with clean laboratory design codes and regulations. This will be achieved by a building and mechanical services design that incorporates specialised pressure regimes between the different areas.

The air conditioning to the various areas of the building will be provided by separate mechanical plant, in order to ensure that no cross-contamination between different areas can occur. Chilled water air handling units will be used for the cooling requirements of the air conditioning system, while the heating function will be met by using electrical heating systems. The air conditioning systems, together with the necessary exhaust systems, will provide the required building pressurisation regimes.

A main plant mezzanine room will be located below the ground floor and will provide a large area for the extensive plant requirements. There is also an allowance for some mechanical plant to be located on the under level for fume cupboard extraction.

2.14. Gases and Compressed Air Service

The proposed facility will require a liquid nitrogen source. Reticulation for nitrogen gas, vacuum and site wide compressed air reticulation will be extended to the new buildings and distributed to locations as required. Additional non-flammable laboratory gases will be reticulated from the existing adjoining gas enclosure.

2.15. Fire Detection, Fire Alarm and Security Systems

Fire detection and fire alarm systems will be installed and interconnected with the existing site-wide system to ensure that the entire facility operates as a single unit. A new hydrant and hose reel system will be installed throughout the new building. It will fully comply with all relevant codes.

There will be a building security system installed, with secure card access to control and monitor access to certain physical containment (PC2) laboratory areas.

2.16. Hydraulic Services

The main supply of cold water for the new extension will be derived from the extension of the site wide water reticulation. Solar hot water heaters will generate locally within the new areas

to cater for change rooms, showers and sinks. Provision for a number of safety showers has been made throughout the new facility.

The new building will also necessitate additional stormwater control systems for existing drainage catchments, with implementation of contouring, bunds, retention ponds and stormwater litter collection. The system will be integrated into the existing ANSTO stormwater control system.

2.17. Energy Conservation Measures

Consideration will be given to the incorporation of passive energy conservation measures into the building and landscape design, and active measures into the design of the mechanical, electrical and hydraulic services to reduce the usage of conventional fossil fuel energy. Measures to be considered will include:

- Screening of north-facing windows ;
- Shading to the east and west windows, to control solar heat gains;
- Thermal insulation, to reduce heating and cooling loads;
- Significant daylight incorporated into the design, to minimise the use of artificial lighting;
- A building management system to operate, control and monitor engineering services;
- Variable speed drives for all variable air volume handling plant and secondary chiller water and heating water pumps;
- Use of long life low energy light fittings; and
- Measures to reduce water consumption - water flow control tap ware, dual flush WC pan cisterns, programmable boiling water units, etc.

2.18. Technical References

The works will be undertaken in accordance with all relevant Australian Standards and with relevant regulations, including:

- Building Code of Australia;
- NSW Occupational Health and Safety Act and Regulations;
- Construction Safety Act and Regulations;
- NSW Workcover Administration Act and Regulations;
- ComCare Regulations;
- Australian Building Codes;
- AS/NZ 2243 Safety in Laboratories - Parts 1 to 7;
- AS 2982 Laboratory Construction Code;

- AS 1386.1 Clean rooms and clean workstations Part 1 - Principles of clean space control;
- AS 1386.2 Clean rooms and clean workstations Part 2 - Laminar flow clean rooms;
- AS 1386.3 Clean rooms and clean workstations Part 3 - Non-laminar flow clean rooms - Class 350 and cleaner;
- AS 1386.4 Clean rooms and clean workstations Part 4 - Non-laminar flow clean rooms - Class 3500;
- AS 1386.6 Clean rooms and clean work stations Part 6 - Operation and inspection of clean rooms;
- AS 1668.1 The use of Mechanical Ventilation and Air Conditioning in Buildings Part 1 - Fire and Smoke Control;
- AS 1668.2 The Use of Mechanical Ventilation and Air Conditioning Part 2 - Mechanical Ventilation for Acceptable Indoor - Air Quality;
- AS 3000 Wiring Rules;
- AS 1055 Acoustics - Application to Specific Situation;
- AS 1324 Air Filters for Use in Air Conditioning and General Ventilation;
- AS 2430 Classification of Hazardous Areas;
- AS 4254 Ductwork For Air Handling Systems in Buildings;
- AS 4260 High efficiency particulate air (HEPA) filters - Classification, construction and performance;
- AS 4426 Thermal Insulation of Pipework, Ductwork and Equipment – Selection Installation and Finish;
- AS 1170 Minimum Design Loads on Structures;
- AS A185 Solvent-welding cement for use with Rigid PVC Pipes and Fittings;
- AS 1023 Low Voltage Switchgear and Control Gear;
- AS 1029 Low Voltage Contractor;
- AS 1055 Acoustics -Description and measurement of Environment Noise;
- AS 1074 Medium and Heavy Steel Tube;
- AS 1099 Tests for Electronic Equipment;
- AS l I00 Technical Drawings;
- AS 1 101 Graphical Symbols for General Engineering;
- AS 1102 Graphical Symbols for Electrotechnology;
- AS 1104 Informative Symbols for use on Electrical and Electronic Equipment;
- AS 1167 Allow Filler Rods for Brazing;
- AS 1172 Vitreous China Water Closet Pans;
- AS1192 Electroplated Coatings of Nickel and chromium;

- AS 1202 A.C. Motor Starters;
- AS 1210 Unfired pressure levels;
- AS 1218 Flushing cisterns;
- AS1221 Fire Hose Reels;
- AS 1260 Unplasticised PVC (UPVC) pipes and fittings for sewerage application;
- AS 1324 Air filters for use in air conditioning and general ventilation;
- AS 1342 Precast Reinforced Concrete Drainage Pipes;
- AS 1345 Rules for Identification of piping, conduits and ducts;
- AS 1371 Toilet Seats of Moulded Plastic;
- AS 1397 Steel sheet and strip - Hot dipped zinc coated or aluminium/zinc coated;
- AS 3415 Unplasticised PVC (UPVC) pipes and fittings for soil, waste and vent (SWV) applications;
- AS I432 Copper Tubes for Water, Gas and Sanitation;
- AS 1464 UPVC pipes and fittings for gas reticulation;
- AS 1470 Health and safety at work - Principles and practice;
- AS 1477 & ASK138 UPVC pressure pipes with solvent cement joints;
- AS 1530 Part 3: Tests for early fire hazard properties;
- AS 1571 Seamless copper tubes for use in refrigeration;
- AS 1572 Seamless copper and copper alloy tubes for General Engineering purposes;
- AS 1585 Capillary and Brazing Fittings for Copper and Copper Alloy;
- AS 1588 Filler Rods for Welding;
- AS 1589 Copper and Copper Based Alloy Fittings for use in Sanitary Plumbing installations;
- AS 1596 LP Gas Storage and Handling;
- AS 1628 Copper Alloy Gate Valves and Non Return Valves for use in Water Supply and Hot Water Supply;
- AS 1646 Rubber Joint Rings for Water Supply, Sewerage and Drainage Purposes;
- AS 1668 SAA Mechanical Ventilation and air conditioning code:

  Part 1: Fire and smoke control;

  Part 2: Mechanical ventilation for acceptable indoor-air quality;
- AS 1670 Automatic fire detection and alarm systems;
- AS 1677 SAA Refrigeration Code;
- AS 1730 Wash Basins;
- AS 1756 Household Sinks;

- AS 1768 Lightning Protection;
- AS 2005 Low Voltage Fuses;
- AS 2032 Code of Practice for Installation of UPVC Pipe Systems;
- AS 2052 Metallic Conduits and fittings;
- AS 2053 Non-Metallic Conduits and Finings;
- AS 2067 Switchgear Assemblies and ancillary equipment;
- AS 2129 Flanges for pipes, valves, and fittings;
- AS 2129 Flanges for Pipes, Valves and Fittings;
- AS 2201 Intruder Alarm Systems (parts 1,2 and 3);
- AS 2279 Disturbances in Mains Supply Networks;
- AS 2373 Control cables for electricity supply systems;
- AS 2417 1980 Parts 1,2 and 3 - The International Acceptance Test Codes;
- AS 2419 Fire hydrants;
- AS 2441 Installation of Fire Hose Reels;
- AS 2528 Bolts, stud bolts and nuts for flanges;
- AS 2546 Printed Circuit Boards;
- AS 2566 Plastic pipe laying design;
- AS 2613 Safety Devices for Gas Cylinders;
- AS 2638 Cast Iron sluice valves for water works purposes;
- AS 2758 Aggregates and rocks for engineering purposes - Part 1 Concrete Aggregates;
- AS 3000 SAA Wiring Rules,
- AS 3008 Electrical Installations - Selection of cables,
- AS 3080 Integrated Telecommunications cabling systems for commercial buildings,
- AS 3084 Telecommunications pathways and spaces for commercial buildings,
- AS 3086 integrated Telecommunications cabling systems for small office/home office Premises;
- AS 3013 Electrical Installations - Wiring systems for specific applications;
- AS 3147 Approval and test specification - Electric cables;
- AS 3500 National Plumbing and Drainage Code - Suite of standards I to 4;
- AS 3600 Concrete structures;
- AS 3610 Formwork for concrete;
- AS 3700 SAA Masonry Code;
- AS 3901 Quality Assurance Standards;

- AS 3905.2 Quality Systems Guidelines;
- AS 4041 Pressure Piping;
- AS 4100 Steel structures;
- AS 4254 Ductwork for air-handling systems in buildings;
- AS 4600 Cold-formed steel structures;
- SMACNA Low pressure duct construction standards;
- AS CA33 Code of practice for concrete pipe laying design;
- AG 601-1787 - Installation Code for Gas Burning Appliances and Equipment;
- AS HB3 Drawing Standards;
- AS HB-27 Hand Book for Field Testing of Balanced Cable Installations;
- SAA/SNZ MP77 - A Definition of Year 2000 Conformity Requirements;
- Local supply authority regulation;
- AUST ROADS Design Codes
- Water Services Association of Australia - Sewage and Water Codes;
- Others if subsequently identified.

ATTACHMENT 1 – ARCHITECTURAL PRELIMINARY CONCEPT PLANS

- A1E 123875 – Preliminary Concept Plans - Sheets 1 – 10

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The Bragg Institute Extension

Sketch Design

JACKSON ARCHITECTURE

DARYL JACKSON ROBIN DYKE

Architects

JACKSON ARCHITECTURE

Aerial Image

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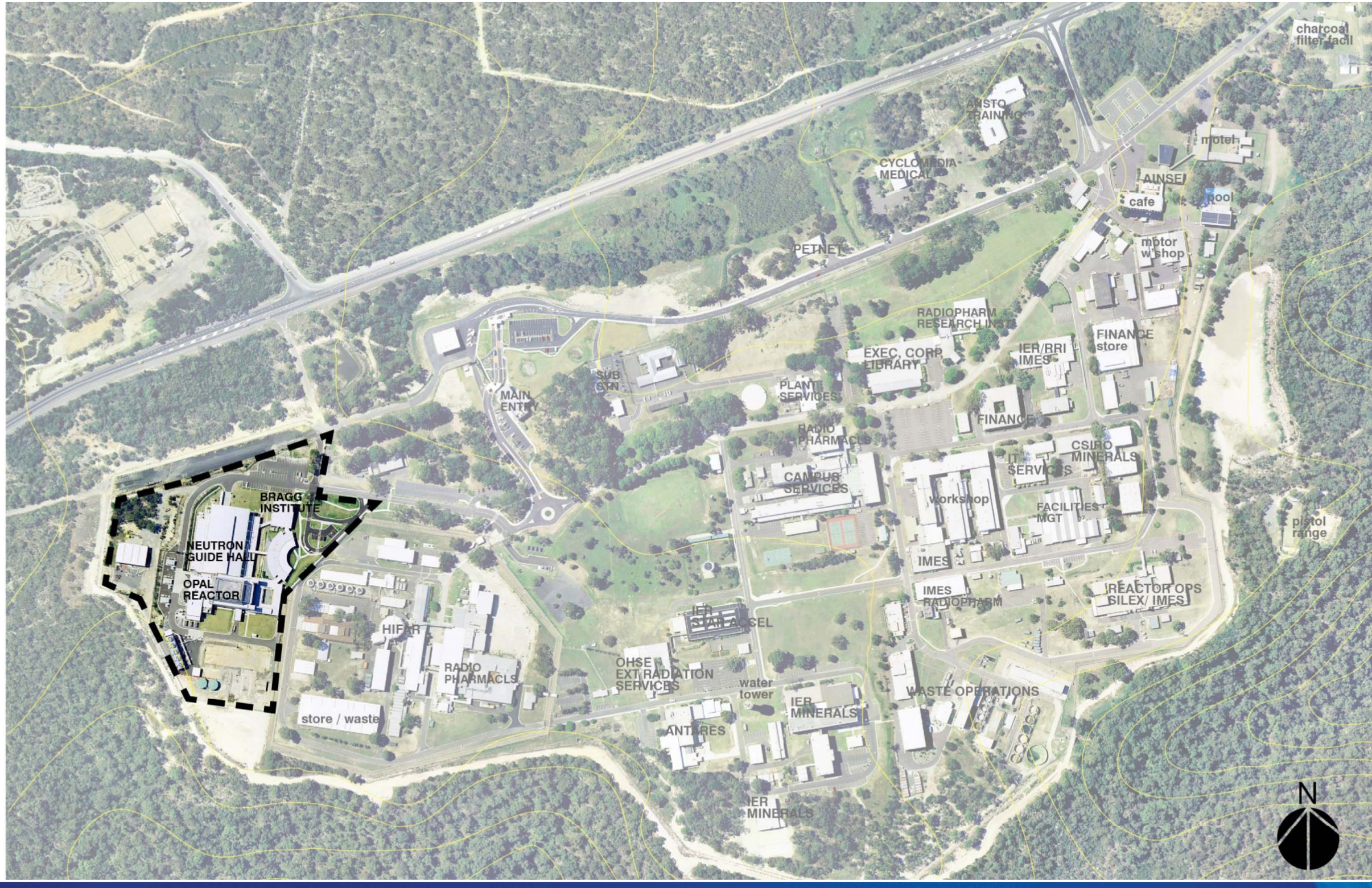
JACKSON ARCHITECTURE



Site Location Plan

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Building 80	Opal Reactor
Building 82	Neutron Guide Hall
Building 83	Main Entry Building
Building 87	The Bragg Institute
Building 21B	National Deuteration Facility, Enviromental research
Building 22	NDF, Environmental Research

Existing Site Plan

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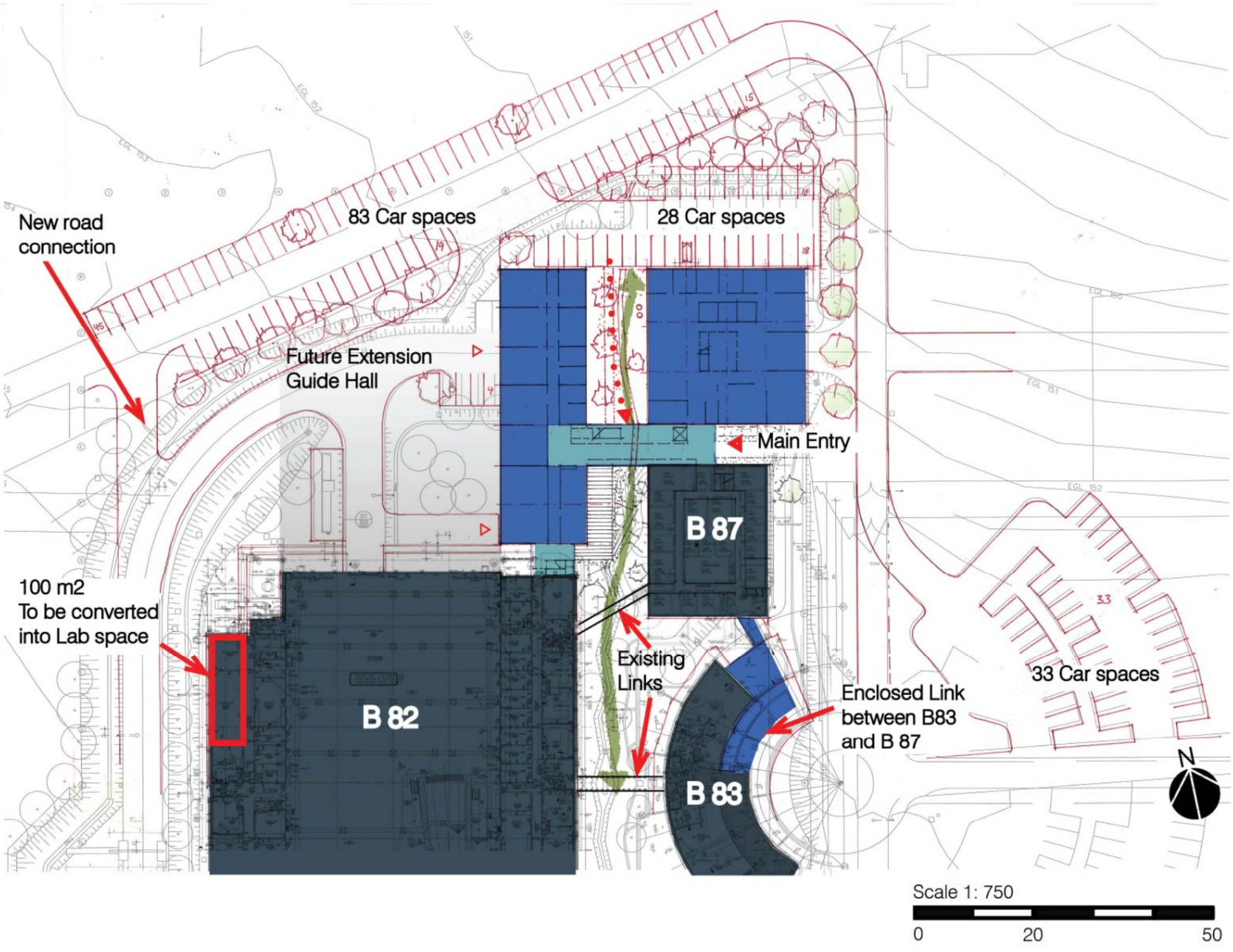

The Bragg Institute Extension – Site Plan

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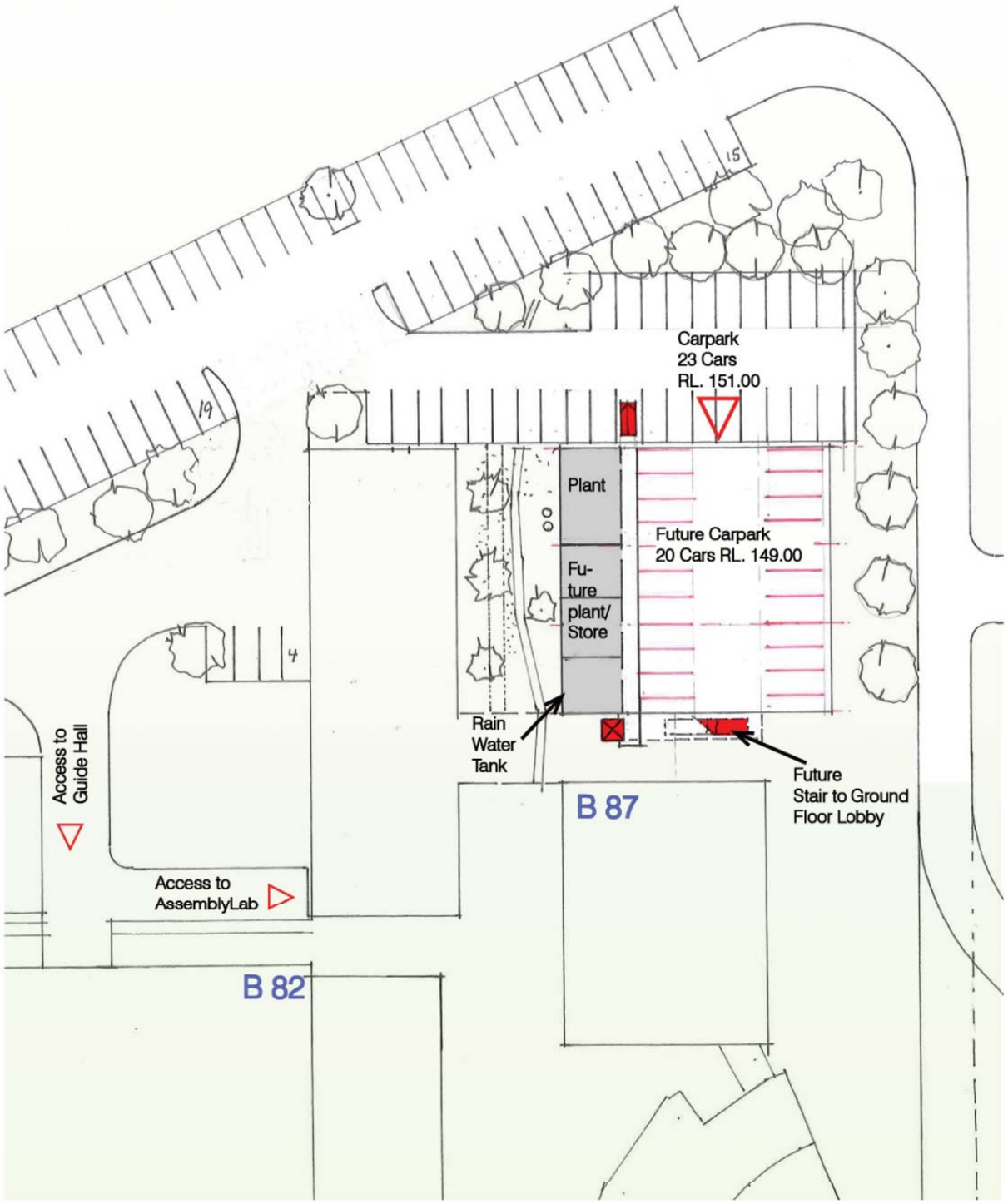

Basement, RL 149.00, Scale 1:500 @ A3

Basement, RL 149.00	
Plant rooms and stores	200
Service Corridor	60
Future Carpark	500
Basement Total Gross Area	760

Ground Floor, RL 153.00	
Total Office Area	670
Total Lab Area	350
Total Area Amenities/Riser	56
Total Area Circulation/Interaction/Eng.	442
Ground Floor Total Gross Area (m²)	1518

First Floor, RL 157.00	
Total Office Area	583
Total Lab Area	350
Total Area Amenities/Riser	56
Total Area Circulation/Interaction/Eng.	443
First Floor Total Gross Area	1432

Plant Room, RL 161,00 (top of Lab's)	150

Total Gross Floor Area New Bragg Building	
Total Office Area	1253
Total Lab Area	700
Total Area Amenities/Riser	112
Total Area Circulation/Interaction/Eng.	945
Total Area Plant rooms/ Storage	350

Total Floor Area (m²) approx.	3360

LEGEND

- OFFICES
- LABORATORIES
- AMENITIES
- PLANT
- VERTICAL CIRCULATION

N

Scale 1: 500

0 5 10 15 20 25

Basement Plan and Area Calculations

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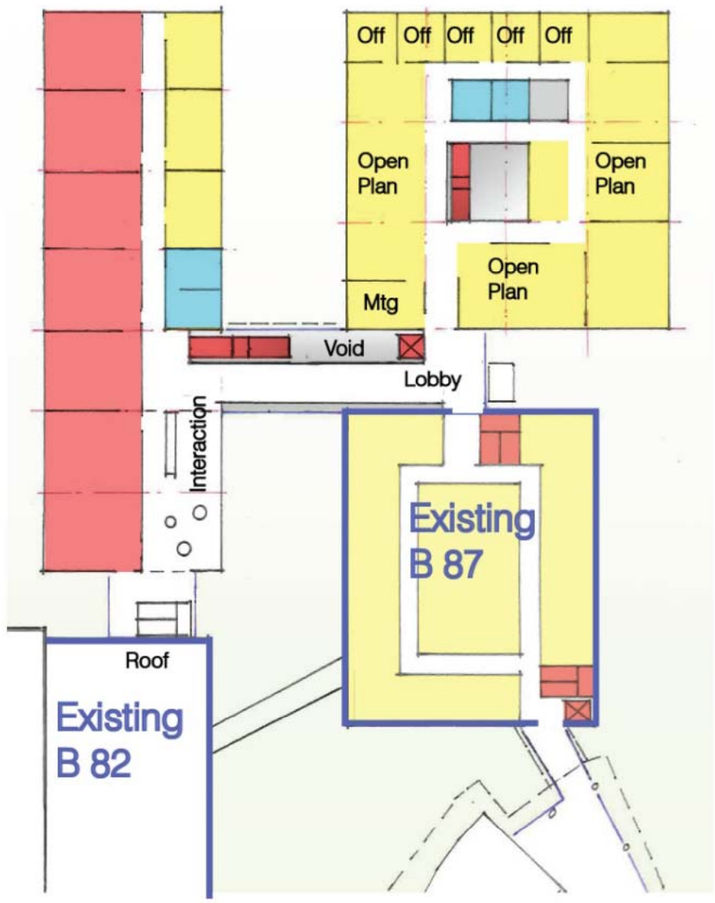
Ground Floor, RL 153.00, Scale 1:500 @ A3



First Floor, RL 157.00, Scale 1:500 @ A3

LEGEND

- OFFICES
- LABORATORIES
- AMENITIES
- PLANT
- VERTICAL CIRCULATION

N

Scale 1: 500

0 5 10 15 20 25

Ground and First Floor Plan

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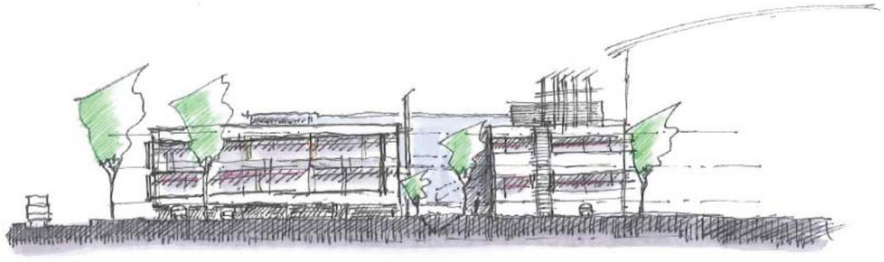
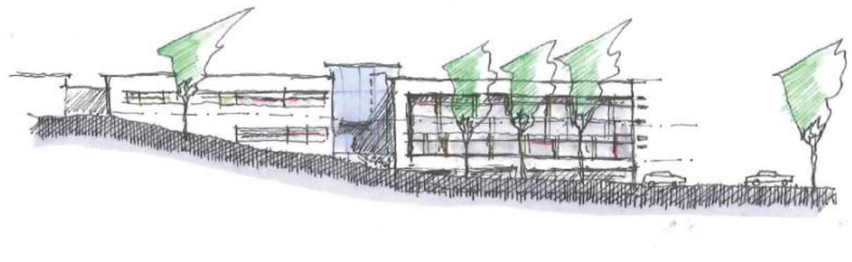
Aerial Sketch



North Elevation



East Elevation - Entry

The Bragg Institute Extension - Sketches

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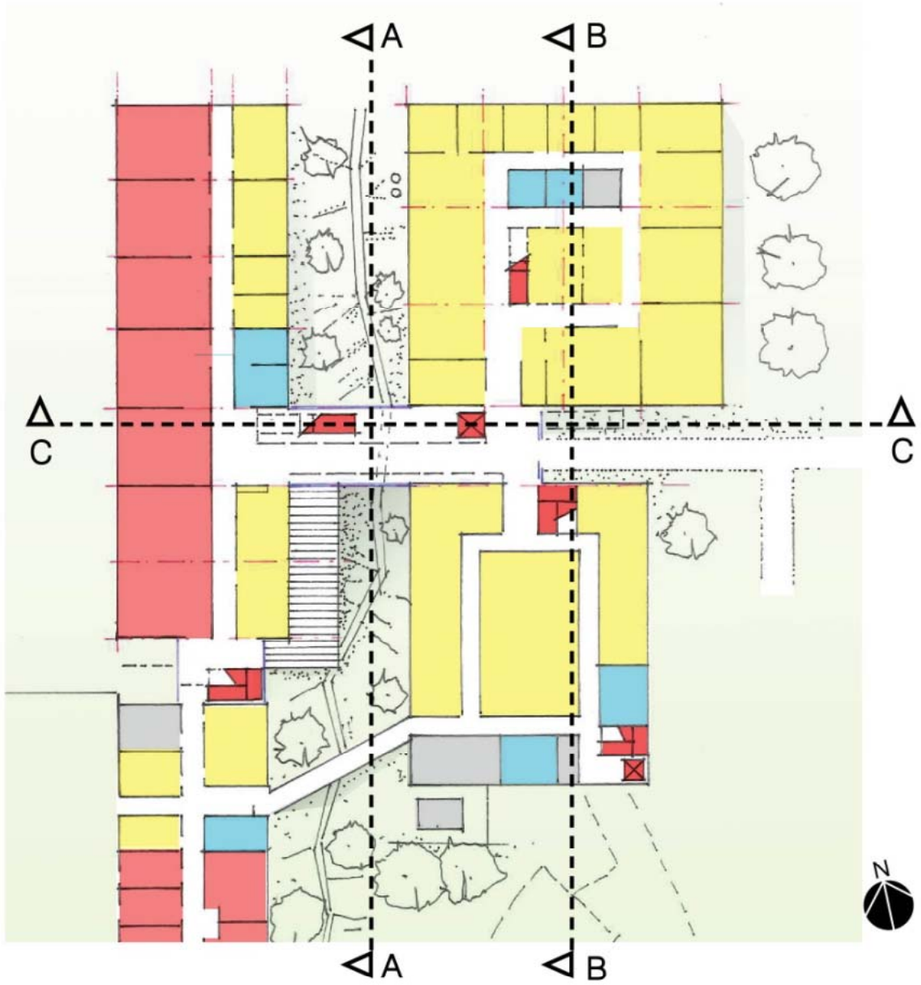
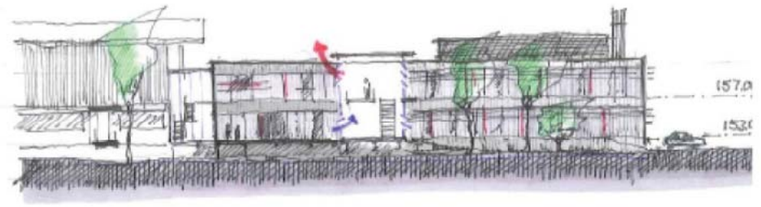
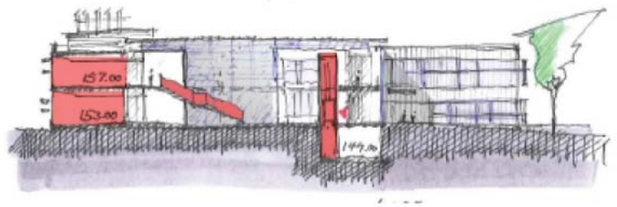


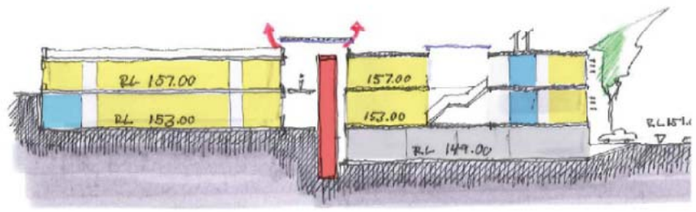
Ground Floor, RL 153.00



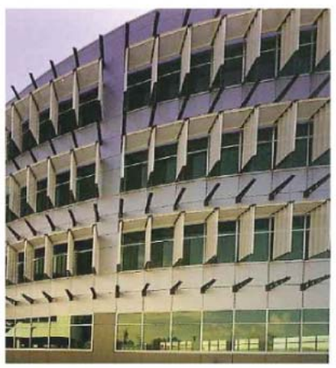
Section A-A



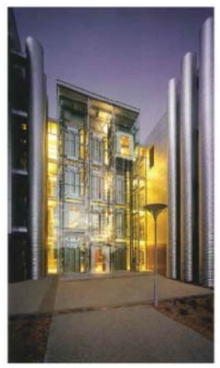
Section B-B



Section C-C



Brindabella Buisiness Park, Canberra, Sunshading



SVRBP, Sydney

University of South Australia CERAR and CRC Care, Adelaide

Section Sketches and Images

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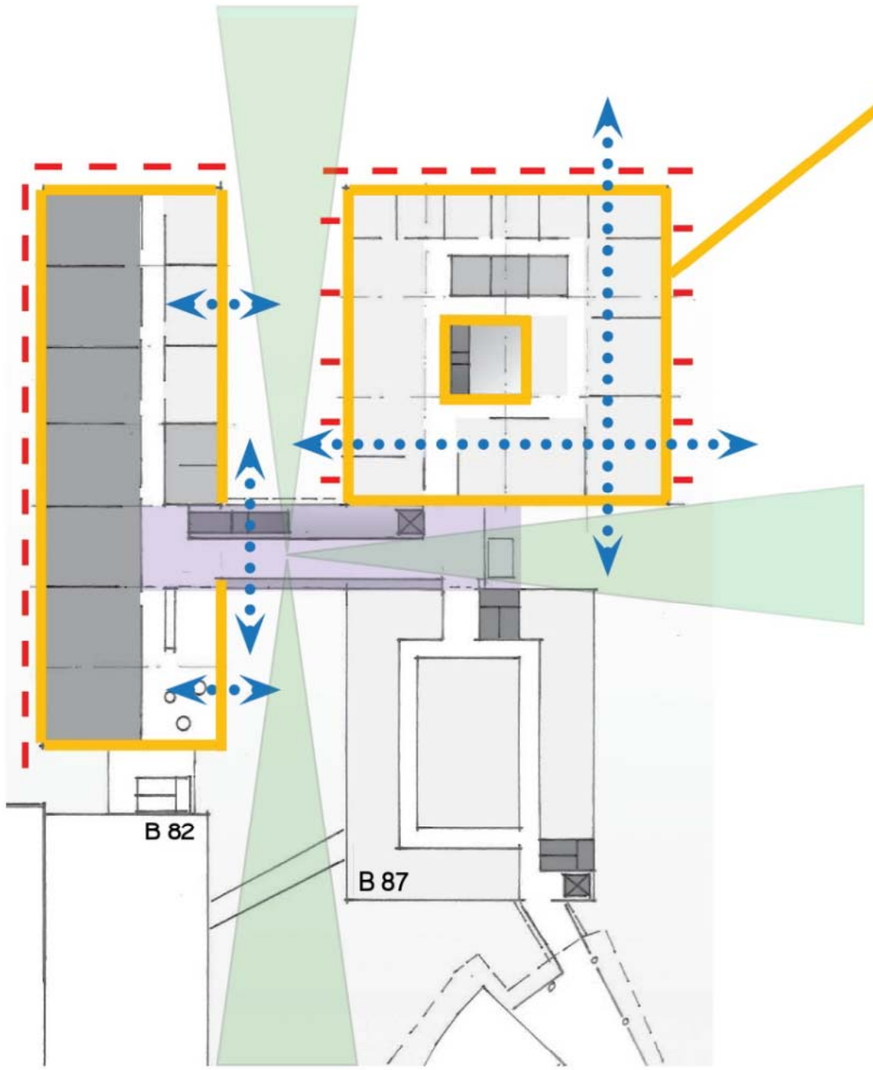
JACKSON ARCHITECTURE



Daylight access to all Offices and Lab areas

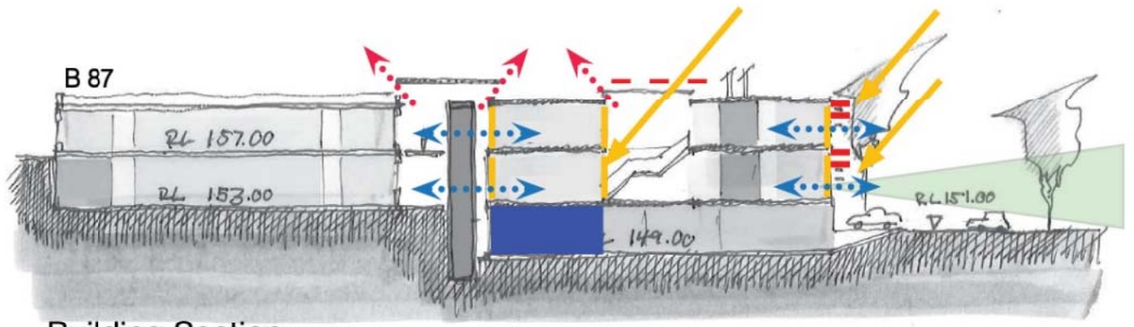
Sunshade devices East, North and West side, Glare control

View Corridors, view out

Openable windows to all Office areas, Cross ventilation

Thermal Zoning

Rain water harvesting, Grey water usage



Building Section

ESD Basic Design Principles

Nuclear-based science benefiting all Australians

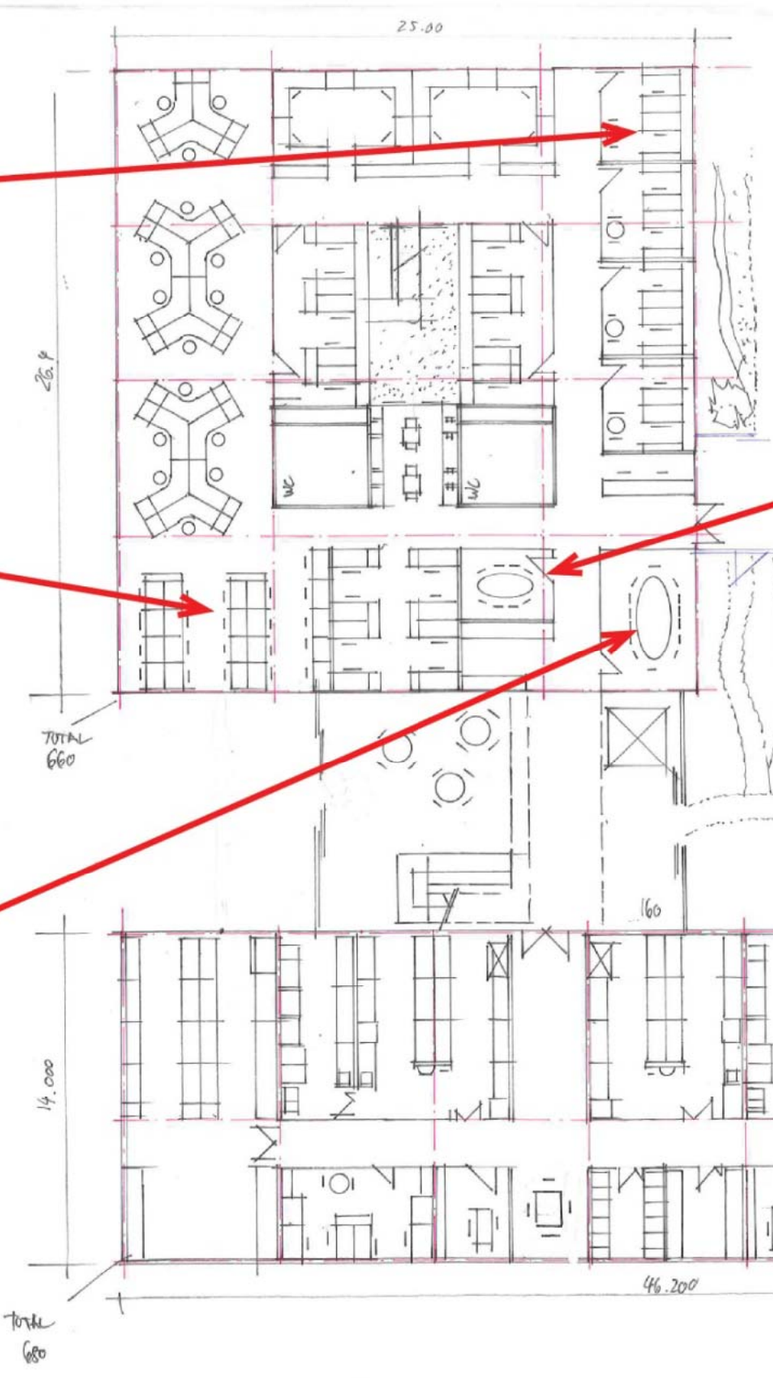
JACKSON ARCHITECTURE

Individual Office

Open Plan Office

Meeting Room

Tee Kitchen



Lab Areas

Meeting Room

Lab

Interaction

Interiors and possible room layouts

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