University of Tasmania Sandy Bay Masterplan

Introduction – Planning Scheme Amendment incl. Sandy Bay Masterplan

After more than a decade of increasing and enhancing our city-based presence, in 2019 the University made a choice between two options regarding the future of our southern campus: consolidate in central Hobart or maintain the current distributed model split across Sandy Bay and the city.

Following extensive consultation with our community, the University decided to consolidate in the city. We did so in order to secure the future of higher education in Tasmania, and to provide better access, better facilities, a better student and staff experience and a more sustainable institution. Consultation and planning continued around how the city campus would take shape.

In 2021, the University began the process of consulting and engaging with the community about what the future of the Sandy Bay campus would be. We sought what the community valued and what principles they thought should guide it. Then, after a great deal of input from staff, students, the local community and a range of stakeholders, through multiple engagement processes, we developed a masterplan setting out the long-term vision for the site. We shared the key elements of the vision with the community. It was a proposal that protected bushland and featured a mix of housing, education, aged care, sporting facilities, retail and commercial space and more.

For any such new future to be realised on the site, we would need to apply for a planning scheme amendment to remove the educational overlay from the site. Such an application is made to the relevant council, in this case the City of Hobart, which then initiates the process enabling a period of public consultation and feedback before it is ultimately considered by the Tasmanian Planning Commission.

In December of 2021, the University lodged our application for a planning scheme amendment, which incorporates the full Sandy Bay masterplan and all supporting reports, but later withdrew it to enable further engagement through council processes. This means the proposal never got to the stage where the application and all the material it contains was available for the public to see. Given the community interest in the move to the city and the possible futures for Sandy Bay, we are releasing the application in full.

This document is split over six downloadable files. This is file 6 of 6 - Go to Building our Hobart University presence since 2007 for more.

Appendix 8 Analytical Results - Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EM2116538	Page	: 1 of 18
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Project	: UTAS Sandy Bay - Precinct 1	Date Samples Received	: 19-Aug-2021 11:10
Order number	: ----	Date Analysis Commenced	: 21-Aug-2021
C-O-C number	: ----	Issue Date	: 27-Aug-2021 20:56
Sampler	: A. Plummer		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 18		
No. of samples analysed	: 18		

NATA

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
* = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EP075(SIM): EM2116538_007 Unable to determine matrix spike recovery due to matrix effects.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT1 0.5-0.6m	GT1 1.0-1.1m	GT1 2.0-2.1m	GT1 3.0-3.1m	GT1 4.0-4.1m
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116538-001	EM2116538-002	EM2116538-003	EM2116538-004	EM2116538-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	19.0	19.1	28.2	35.8	36.1
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	90	20	40	20	40
Beryllium	7440-41-7	1	mg/kg	<1	<1	1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	12	18	18	21	22
Cobalt	7440-48-4	2	mg/kg	40	10	15	12	43
Copper	7440-50-8	5	mg/kg	42	31	95	45	82
Lead	7439-92-1	5	mg/kg	6	<5	10	13	16
Manganese	7439-96-5	5	mg/kg	744	115	258	229	519
Nickel	7440-02-0	2	mg/kg	42	14	18	18	26
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	260	104	122	49	83
Zinc	7440-66-6	5	mg/kg	30	23	79	48	46
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	GT1 0.5-0.6m	GT1 1.0-1.1m	GT1 2.0-2.1m	GT1 3.0-3.1m	GT1 4.0-4.1m
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
				EM2116538-001	EM2116538-002	EM2116538-003	EM2116538-004	EM2116538-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**84.5**	**87.2**	**84.0**	**85.0**	**82.3**
Anthracene-d10	1719-06-8	0.5	%	**129**	**119**	**109**	**126**	**105**
4-Terphenyl-d14	1718-51-0	0.5	%	**101**	**105**	**101**	**104**	**101**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT1 0.5-0.6m	GT1 1.0-1.1m	GT1 2.0-2.1m	GT1 3.0-3.1m	GT1 4.0-4.1m
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116538-001	EM2116538-002	EM2116538-003	EM2116538-004	EM2116538-005
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	97.5	96.5	95.5	91.7	98.5
Toluene-D8	2037-26-5	0.2	%	78.5	76.5	75.2	71.5	82.3
4-Bromofluorobenzene	460-00-4	0.2	%	72.2	75.3	69.7	68.2	77.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT2 0.5-0.6m	GT2 1.0-1.1m	GT2 2.0-2.1m	GT2 3.0-3.1m	GT2 4.0-4.1m
			Sampling date / time	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116538-006	EM2116538-007	EM2116538-008	EM2116538-009	EM2116538-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	8.5	19.0	17.9	33.2	38.0
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	140	150	70	60	100
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	10	16	10	16	13
Cobalt	7440-48-4	2	mg/kg	20	22	15	36	38
Copper	7440-50-8	5	mg/kg	28	67	27	37	134
Lead	7439-92-1	5	mg/kg	14	86	6	12	13
Manganese	7439-96-5	5	mg/kg	118	290	138	548	649
Nickel	7440-02-0	2	mg/kg	14	23	13	15	48
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	193	86	132	49	214
Zinc	7440-66-6	5	mg/kg	13	112	14	38	93
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3.6	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	1.0	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	8.3	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	9.4	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4.6	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	5.1	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	5.2	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4.7	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6.2	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3.2	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	1.3	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT2 0.5-0.6m	GT2 1.0-1.1m	GT2 2.0-2.1m	GT2 3.0-3.1m	GT2 4.0-4.1m
			Sampling date / time	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116538-006	EM2116538-007	EM2116538-008	EM2116538-009	EM2116538-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	**4.1**	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	**56.7**	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	**9.4**	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**9.4**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**9.4**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	**240**	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	**180**	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	**420**	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	**370**	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	**370**	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**86.6**	**91.2**	**90.6**	**90.2**	**84.8**
Anthracene-d10	1719-06-8	0.5	%	**119**	**126**	**125**	**118**	**125**
4-Terphenyl-d14	1718-51-0	0.5	%	**111**	**102**	**115**	**119**	**117**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT2 0.5-0.6m	GT2 1.0-1.1m	GT2 2.0-2.1m	GT2 3.0-3.1m	GT2 4.0-4.1m
			Sampling date / time	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00	17-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116538-006	EM2116538-007	EM2116538-008	EM2116538-009	EM2116538-010
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	81.7	87.5	70.0	76.4	74.0
Toluene-D8	2037-26-5	0.2	%	83.7	86.6	75.0	67.1	63.9
4-Bromofluorobenzene	460-00-4	0.2	%	77.9	84.2	79.0	78.2	75.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT2 5.0-5.1m	DUP	GT3 0.5-0.6m	GT3 1.0-1.1m	GT3 2.0-2.1m
			Sampling date / time	17-Aug-2021 00:00	17-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116538-011	EM2116538-012	EM2116538-013	EM2116538-014	EM2116538-015
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	25.4	9.1	24.9	20.4	24.9
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	10	150	110	70	120
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	15	9	37	16	19
Cobalt	7440-48-4	2	mg/kg	14	25	16	9	34
Copper	7440-50-8	5	mg/kg	34	25	49	31	41
Lead	7439-92-1	5	mg/kg	7	8	20	36	6
Manganese	7439-96-5	5	mg/kg	252	133	369	135	271
Nickel	7440-02-0	2	mg/kg	22	14	21	11	28
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	185	80	159	109	135
Zinc	7440-66-6	5	mg/kg	70	11	46	57	22
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	1.4	1.0	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	3.0	2.3	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	3.6	2.7	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	1.8	1.3	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	2.0	1.6	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	1.4	1.2	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	1.5	1.2	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	1.8	1.3	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

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Work Order	: EM2116538
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS Sandy Bay - Precinct 1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT2 5.0-5.1m	DUP	GT3 0.5-0.6m	GT3 1.0-1.1m	GT3 2.0-2.1m
			Sampling date / time	17-Aug-2021 00:00	17-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116538-011	EM2116538-012	EM2116538-013	EM2116538-014	EM2116538-015
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	**1.0**	**0.7**	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	**18.2**	**13.3**	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	**2.4**	**1.7**	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**2.6**	**2.0**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**2.9**	**2.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**86.2**	**84.1**	**88.7**	**86.8**	**88.3**
Anthracene-d10	1719-06-8	0.5	%	**123**	**125**	**120**	**118**	**129**
4-Terphenyl-d14	1718-51-0	0.5	%	**118**	**117**	**108**	**106**	**119**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	GT2 5.0-5.1m	DUP	GT3 0.5-0.6m	GT3 1.0-1.1m	GT3 2.0-2.1m
			Sampling date / time	17-Aug-2021 00:00	17-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116538-011	EM2116538-012	EM2116538-013	EM2116538-014	EM2116538-015
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	67.3	84.7	78.2	79.1	82.4
Toluene-D8	2037-26-5	0.2	%	72.6	79.0	82.4	68.0	67.6
4-Bromofluorobenzene	460-00-4	0.2	%	67.4	88.0	74.0	77.5	84.0

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Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS Sandy Bay - Precinct 1

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	GT3 3.0-3.1m	GT3 5.0-5.1m	----	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM2116538-016	EM2116538-017	------	------	------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	23.9	32.9	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Barium	7440-39-3	10	mg/kg	20	10	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	12	18	----	----	----
Cobalt	7440-48-4	2	mg/kg	26	16	----	----	----
Copper	7440-50-8	5	mg/kg	79	64	----	----	----
Lead	7439-92-1	5	mg/kg	8	12	----	----	----
Manganese	7439-96-5	5	mg/kg	415	58	----	----	----
Nickel	7440-02-0	2	mg/kg	28	22	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	230	56	----	----	----
Zinc	7440-66-6	5	mg/kg	24	56	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.2	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT3 3.0-3.1m	GT3 5.0-5.1m	----	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM2116538-016	EM2116538-017	-------	-------	-------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	83.9	85.6	----	----	----
Anthracene-d10	1719-06-8	0.5	%	112	126	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	114	84.2	----	----	----

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Work Order	: EM2116538
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS Sandy Bay - Precinct 1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT3 3.0-3.1m	GT3 5.0-5.1m	----	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM2116538-016	EM2116538-017	-------	-------	-------
				Result	Result	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	77.0	71.7	----	----	----
Toluene-D8	2037-26-5	0.2	%	69.4	71.4	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	76.8	72.0	----	----	----

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Work Order : EM2116538
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : UTAS Sandy Bay - Precinct 1

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	Rinsate	----	----	----	----
			Sampling date / time	18-Aug-2021 00:00	----	----	----	----
				EM2116538-018	----	----	----	----
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Rinsate	----	----	----	----
			Sampling date / time	18-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2116538-018	-------	-------	-------	-------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	20.8	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	52.4	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	58.5	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	58.0	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	65.6	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	67.4	----	----	----	----

Page	: 17 of 18
Work Order	: EM2116538
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS Sandy Bay - Precinct 1

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	Rinsate	----	----	----	----
			Sampling date / time	18-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2116538-018	-------	-------	-------	-------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	103	----	----	----	----
Toluene-D8	2037-26-5	2	%	97.1	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	103	----	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: WATER

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	51
2-Chlorophenol-D4	93951-73-6	30	114
2.4.6-Tribromophenol	118-79-6	26	133
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	35	127
Anthracene-d10	1719-06-8	44	122
4-Terphenyl-d14	1718-51-0	44	124
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2116910**	Page	: 1 of 6
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Project	: UTAS Sandy Bay - Precinct 1	Date Samples Received	: 26-Aug-2021 10:10
Order number	: ----	Date Analysis Commenced	: 27-Aug-2021
C-O-C number	: ----	Issue Date	: 01-Sep-2021 12:35
Sampler	: AP		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 2		
No. of samples analysed	: 2		

NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.

Page	: 3 of 6
Work Order	: EM2116910
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS Sandy Bay - Precinct 1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Precinct 1 bank	Precinct 1 rugby	----	----	----
			Sampling date / time	19-Aug-2021 00:00	19-Aug-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM2116910-001	EM2116910-002	-----	-----	-----
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.0	16.7	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Barium	7440-39-3	10	mg/kg	80	80	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	11	11	----	----	----
Cobalt	7440-48-4	2	mg/kg	17	14	----	----	----
Copper	7440-50-8	5	mg/kg	32	28	----	----	----
Lead	7439-92-1	5	mg/kg	45	226	----	----	----
Manganese	7439-96-5	5	mg/kg	317	212	----	----	----
Nickel	7440-02-0	2	mg/kg	11	12	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	67	64	----	----	----
Zinc	7440-66-6	5	mg/kg	92	69	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Precinct 1 bank	Precinct 1 rugby	----	----	----
			Sampling date / time	19-Aug-2021 00:00	19-Aug-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM2116910-001	EM2116910-002	------	------	------
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.05	mg/kg	<0.05	<0.05	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	93.0	83.2	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Precinct 1 bank	Precinct 1 rugby	----	----	----
			Sampling date / time	19-Aug-2021 00:00	19-Aug-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM2116910-001	EM2116910-002	-------	-------	-------
				Result	Result	----	----	----
EP068T: Organophosphorus Pesticide Surrogate - Continued								
DEF	78-48-8	0.05	%	104	110	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	62	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	40	139

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2116913**	Page	: 1 of 6
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Project	: UTAS Sandy Bay - Precint 2	Date Samples Received	: 26-Aug-2021 10:10
Order number	: ----	Date Analysis Commenced	: 27-Aug-2021
C-O-C number	: ----	Issue Date	: 01-Sep-2021 12:33
Sampler	: AP		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 12		
No. of samples analysed	: 12		

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- Analytical Results

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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Work Order : EM2116913
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : UTAS Sandy Bay - Precint 2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT5 0.5-0.6	GT5 0.9-1.0	GT5 2.0-2.1	Dup 2	GT7 1.5-1.6
			Sampling date / time	19-Aug-2021 00:00	19-Aug-2021 00:00	19-Aug-2021 00:00	19-Aug-2021 00:00	20-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116913-001	EM2116913-002	EM2116913-003	EM2116913-004	EM2116913-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	24.1	23.5	20.6	19.4	8.7
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	240	170	80	180	20
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	23	21	15	17	10
Cobalt	7440-48-4	2	mg/kg	25	24	20	19	26
Copper	7440-50-8	5	mg/kg	70	72	37	62	27
Lead	7439-92-1	5	mg/kg	32	13	8	26	12
Manganese	7439-96-5	5	mg/kg	471	355	330	398	315
Nickel	7440-02-0	2	mg/kg	24	24	16	20	43
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	96	100	52	75	28
Zinc	7440-66-6	5	mg/kg	72	28	15	105	28
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GT7 2.5-2.6	Dup 3	GT9 0.5-0.6	GT9 1.5-1.6	GT9 6.0-6.2
			Sampling date / time	20-Aug-2021 00:00	20-Aug-2021 00:00	25-Aug-2021 00:00	25-Aug-2021 00:00	25-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2116913-006	EM2116913-007	EM2116913-008	EM2116913-009	EM2116913-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	7.0	14.0	2.4	3.6	19.3
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	10	<10	20	20	70
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	10	10	5	7	11
Cobalt	7440-48-4	2	mg/kg	5	7	7	9	18
Copper	7440-50-8	5	mg/kg	22	29	64	74	40
Lead	7439-92-1	5	mg/kg	8	13	<5	<5	6
Manganese	7439-96-5	5	mg/kg	40	47	109	148	647
Nickel	7440-02-0	2	mg/kg	9	12	16	19	22
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	18	20	29	36	44
Zinc	7440-66-6	5	mg/kg	27	28	13	17	34
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Dup 4	----	----	----	----
			Sampling date / time	25-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2116913-011	-------	-------	-------	-------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	3.1	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Barium	7440-39-3	10	mg/kg	20	----	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----	----	----
Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	6	----	----	----	----
Cobalt	7440-48-4	2	mg/kg	9	----	----	----	----
Copper	7440-50-8	5	mg/kg	72	----	----	----	----
Lead	7439-92-1	5	mg/kg	<5	----	----	----	----
Manganese	7439-96-5	5	mg/kg	134	----	----	----	----
Nickel	7440-02-0	2	mg/kg	17	----	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
Vanadium	7440-62-2	5	mg/kg	35	----	----	----	----
Zinc	7440-66-6	5	mg/kg	17	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----

Page	: 6 of 6
Work Order	: EM2116913
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS Sandy Bay - Precint 2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Rinsate	----	----	----	----
			Sampling date / time	25-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2116913-012	-------	-------	-------	-------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2118090**	Page	: 1 of 14
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Project	: UTAS Precinct 2	Date Samples Received	: 10-Sep-2021 10:50
Order number	: ----	Date Analysis Commenced	: 11-Sep-2021
C-O-C number	: ----	Issue Date	: 15-Sep-2021 16:30
Sampler	: JPC		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 11		
No. of samples analysed	: 10		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
* = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP074: Where reported, Total Trihalomethanes is the sum of the reported concentrations of all Trihalomethanes at or above the LOR.
- EP074: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP074: Where reported, Sum of chlorinated hydrocarbons includes carbon tetrachloride, chlorobenzene, chloroform, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichlorothene, trans-1,2-dichlorothene, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, vinyl chloride, hexachlorobutadiene and methylene chloride.
- EP074: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Glass Houses 1	Glass Houses 2	Glass Houses 3	Animal Family 1	Animal Family 2
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-001	EM2118090-002	EM2118090-003	EM2118090-004	EM2118090-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**34.5**	**32.9**	**26.2**	**30.8**	**31.3**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**6**	**6**	**6**	**7**	<5
Barium	7440-39-3	10	mg/kg	**90**	**100**	**80**	**120**	**120**
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**19**	**13**	**13**	**35**	**32**
Cobalt	7440-48-4	2	mg/kg	**30**	**30**	**22**	**22**	**44**
Copper	7440-50-8	5	mg/kg	**69**	**63**	**58**	**74**	**56**
Lead	7439-92-1	5	mg/kg	**10**	**8**	**8**	**24**	**19**
Manganese	7439-96-5	5	mg/kg	**453**	**462**	**401**	**583**	**1140**
Nickel	7440-02-0	2	mg/kg	**39**	**39**	**35**	**35**	**52**
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	**110**	**101**	**112**	**92**	**138**
Zinc	7440-66-6	5	mg/kg	**80**	**72**	**69**	**504**	**125**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	Glass Houses 1	Glass Houses 2	Glass Houses 3	Animal Family 1	Animal Family 2
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-001	EM2118090-002	EM2118090-003	EM2118090-004	EM2118090-005
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Glass Houses 1	Glass Houses 2	Glass Houses 3	Animal Family 1	Animal Family 2
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-001	EM2118090-002	EM2118090-003	EM2118090-004	EM2118090-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	**250**	<50
C15 - C28 Fraction	—	100	mg/kg	**440**	**360**	**250**	**780**	<100
C29 - C36 Fraction	—	100	mg/kg	**180**	**170**	**140**	**740**	<100
^ C10 - C36 Fraction (sum)	—	50	mg/kg	**620**	**530**	**390**	**1770**	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	**60**	**50**	<50	**410**	<50
>C16 - C34 Fraction	—	100	mg/kg	**500**	**430**	**320**	**1080**	<100
>C34 - C40 Fraction	—	100	mg/kg	**120**	**110**	<100	**330**	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	**680**	**590**	**320**	**1820**	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	**60**	**50**	<50	**410**	<50
EP080: BTEXN								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Glass Houses 1	Glass Houses 2	Glass Houses 3	Animal Family 1	Animal Family 2
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-001	EM2118090-002	EM2118090-003	EM2118090-004	EM2118090-005
				Result	Result	Result	Result	Result
EP080: BTEXN - Continued								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	117	105	108	107	107
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	132	129	130	132	117
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	87.8	94.1	97.6	103	91.9
2-Chlorophenol-D4	93951-73-6	0.5	%	81.0	87.2	90.3	95.6	85.1
2.4.6-Tribromophenol	118-79-6	0.5	%	83.0	89.2	91.9	98.2	80.3
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	89.8	96.0	99.5	102	94.6
Anthracene-d10	1719-06-8	0.5	%	93.0	100.0	103	107	98.2
4-Terphenyl-d14	1718-51-0	0.5	%	89.8	98.7	102	102	95.6
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	76.6	78.4	77.0	71.0	75.1
Toluene-D8	2037-26-5	0.2	%	75.0	74.1	71.7	68.2	72.2
4-Bromofluorobenzene	460-00-4	0.2	%	79.1	77.4	77.5	72.1	75.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Chem Store 1	Chem Store 2	Chem UST 0.5	Chem UST 2.5	Duplicate
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-006	EM2118090-007	EM2118090-008	EM2118090-009	EM2118090-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	29.2	29.8	28.6	20.9	34.6
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	8	<5	6	6	7
Barium	7440-39-3	10	mg/kg	100	90	230	90	90
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	7	9	6	6	18
Cobalt	7440-48-4	2	mg/kg	30	20	55	25	31
Copper	7440-50-8	5	mg/kg	78	49	65	61	62
Lead	7439-92-1	5	mg/kg	15	7	10	9	8
Manganese	7439-96-5	5	mg/kg	508	334	1160	457	459
Nickel	7440-02-0	2	mg/kg	48	30	62	43	40
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	321	119	249	231	101
Zinc	7440-66-6	5	mg/kg	64	72	70	60	73
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	----	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	----	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	----	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	----	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	----	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	----	----	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	----	----	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	----	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	----	----	----	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	----	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	----	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	----	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	----	----	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	----	----	----	<0.05
Endrin	72-20-8	0.05	mg/kg	----	----	----	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Chem Store 1	Chem Store 2	Chem UST 0.5	Chem UST 2.5	Duplicate
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-006	EM2118090-007	EM2118090-008	EM2118090-009	EM2118090-010
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	----	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	----	----	----	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	----	----	----	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	----	----	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	----	----	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	----	----	----	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	----	----	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	----	----	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	----	----	----	----	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.05	mg/kg	----	----	----	----	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	----	----	----	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	----	----	----	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	----	----	----	----	<0.2
Dimethoate	60-51-5	0.05	mg/kg	----	----	----	----	<0.05
Diazinon	333-41-5	0.05	mg/kg	----	----	----	----	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	----	----	----	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	----	----	----	----	<0.2
Malathion	121-75-5	0.05	mg/kg	----	----	----	----	<0.05
Fenthion	55-38-9	0.05	mg/kg	----	----	----	----	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	----	----	----	<0.05
Parathion	56-38-2	0.2	mg/kg	----	----	----	----	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	----	----	----	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	----	----	----	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	----	----	----	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	----	----	----	----	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	----	----	----	----	<0.05
Ethion	563-12-2	0.05	mg/kg	----	----	----	----	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	----	----	----	----	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	----	----	----	----	<0.05
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	----	----	----
n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Chem Store 1	Chem Store 2	Chem UST 0.5	Chem UST 2.5	Duplicate
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-006	EM2118090-007	EM2118090-008	EM2118090-009	EM2118090-010
				Result	Result	Result	Result	Result
EP074A: Monocyclic Aromatic Hydrocarbons - Continued								
1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	----	----	----
sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	----	----	----
1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	----	----	----
tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	----	----	----
p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	----	----	----
n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	----	----	----
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	----	----	----
2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	----	----	----
4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	----	----	----
2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	----	----	----
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	----	----	----
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	----	----	----
1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	----	----	----
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	----	----	----
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	----	----	----
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	----	----	----
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	----	----	----
Chloromethane	74-87-3	5	mg/kg	<5	<5	----	----	----
Vinyl chloride	75-01-4	5	mg/kg	<5	<5	----	----	----
Bromomethane	74-83-9	5	mg/kg	<5	<5	----	----	----
Chloroethane	75-00-3	5	mg/kg	<5	<5	----	----	----
Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	----	----	----
1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	----	----	----
Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	----	----	----
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	----	----	----
1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	----	----	----
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	----	----	----
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	----	----	----
1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	----	----	----
Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Chem Store 1	Chem Store 2	Chem UST 0.5	Chem UST 2.5	Duplicate
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-006	EM2118090-007	EM2118090-008	EM2118090-009	EM2118090-010
				Result	Result	Result	Result	Result
EP074E: Halogenated Aliphatic Compounds - Continued								
1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	----	----	----
Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	----	----	----
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	<0.5	----	----	----
1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	----	----	----
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	----	----	----
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	----	----	----
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	----	----	----
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	----	----	----
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	----	----	----
Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	----	----	----
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	----	----	----
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	----	----	----
2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	----	----	----
4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	----	----	----
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	----	----	----
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	----	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	----	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	----	----	----
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	----	----	----
EP074G: Trihalomethanes								
Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	----	----	----
Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Chem Store 1	Chem Store 2	Chem UST 0.5	Chem UST 2.5	Duplicate
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-006	EM2118090-007	EM2118090-008	EM2118090-009	EM2118090-010
				Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued								
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	**130**	<100	<100	**300**
C29 - C36 Fraction	----	100	mg/kg	<100	**120**	<100	<100	**140**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Chem Store 1	Chem Store 2	Chem UST 0.5	Chem UST 2.5	Duplicate
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-006	EM2118090-007	EM2118090-008	EM2118090-009	EM2118090-010
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	250	<50	<50	440
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	220	<100	100	360
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	220	<50	100	360
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	----	----	----	108
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	----	----	----	133
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.5	%	82.0	80.2	----	----	----
Toluene-D8	2037-26-5	0.5	%	80.0	76.2	----	----	----
4-Bromofluorobenzene	460-00-4	0.5	%	90.2	84.6	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	95.1	96.5	93.1	96.1	101
2-Chlorophenol-D4	93951-73-6	0.5	%	87.8	89.0	84.7	88.9	92.4
2.4.6-Tribromophenol	118-79-6	0.5	%	83.9	88.2	82.8	85.4	93.1
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	98.1	98.0	94.6	98.7	101

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

			Sample ID	Chem Store 1	Chem Store 2	Chem UST 0.5	Chem UST 2.5	Duplicate
			Sampling date / time	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00	08-Sep-2021 00:00
Compound	CAS Number	LOR	Unit	EM2118090-006	EM2118090-007	EM2118090-008	EM2118090-009	EM2118090-010
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
Anthracene-d10	1719-06-8	0.5	%	102	102	100	103	106
4-Terphenyl-d14	1718-51-0	0.5	%	99.0	100	95.3	100	104
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	77.5	76.1	77.1	74.5	93.1
Toluene-D8	2037-26-5	0.2	%	79.5	77.2	73.6	70.0	87.8
4-Bromofluorobenzene	460-00-4	0.2	%	97.5	95.3	78.8	75.4	95.1

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	62	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	40	139
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	62	122
Toluene-D8	2037-26-5	64	120
4-Bromofluorobenzene	460-00-4	66	124
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EM2115765	Page	: 1 of 30
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Project	: UTAS - Precinct 3	Date Samples Received	: 11-Aug-2021 10:50
Order number	: ----	Date Analysis Commenced	: 11-Aug-2021
C-O-C number	: ----	Issue Date	: 18-Aug-2021 16:13
Sampler	: G MCDONALD		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 31		
No. of samples analysed	: 31		

NATA

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
* = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231X: Poor matrix spike recovery for sample EM2115765-030 due to sample matrix interference.
- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG035T: EM2115765 #1 Poor duplicate precision for total mercury due to sample matrix. Confirmed by re-extraction and re-analysis.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Page	: 3 of 30
Work Order	: EM2115765
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS - Precinct 3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	200 BH01 CHEM 0.20	200 BH02 CHEM 0.20	MED BH01 UST 0.20	MED BH02 UST 0.20	HC BH01 UST 0.50
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-001	EM2115765-002	EM2115765-003	EM2115765-004	EM2115765-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.6	27.1	24.6	27.3	4.5
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	6	<5	----	----	----
Barium	7440-39-3	10	mg/kg	50	80	----	----	----
Beryllium	7440-41-7	1	mg/kg	1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	8	15	----	----	----
Cobalt	7440-48-4	2	mg/kg	11	26	----	----	----
Copper	7440-50-8	5	mg/kg	35	36	----	----	----
Lead	7439-92-1	5	mg/kg	16	10	----	----	----
Manganese	7439-96-5	5	mg/kg	311	649	----	----	----
Nickel	7440-02-0	2	mg/kg	13	19	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	36	137	----	----	----
Zinc	7440-66-6	5	mg/kg	86	26	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	1.5	<0.1	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	<0.5	----	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	----	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	----	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	----	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	----	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	----	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	----	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	----	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg	<2	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	200 BH01 CHEM 0.20	200 BH02 CHEM 0.20	MED BH01 UST 0.20	MED BH02 UST 0.20	HC BH01 UST 0.50
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-001	EM2115765-002	EM2115765-003	EM2115765-004	EM2115765-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	**160**
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	**230**
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	**390**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	**250**
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	**540**
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	**790**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	200 BH01 CHEM 0.20	200 BH02 CHEM 0.20	MED BH01 UST 0.20	MED BH02 UST 0.20	HC BH01 UST 0.50
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-001	EM2115765-002	EM2115765-003	EM2115765-004	EM2115765-005
				Result	Result	Result	Result	Result
EP080: BTEXN - Continued								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	81.2	84.1	85.0	82.2	86.3
2-Chlorophenol-D4	93951-73-6	0.5	%	79.5	81.6	82.6	79.0	83.6
2.4.6-Tribromophenol	118-79-6	0.5	%	68.8	65.5	66.2	65.0	69.3
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	91.2	92.9	94.8	92.9	94.6
Anthracene-d10	1719-06-8	0.5	%	99.0	102	102	106	81.8
4-Terphenyl-d14	1718-51-0	0.5	%	97.7	101	102	104	107
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	73.4	78.2	75.1	66.6	71.4
Toluene-D8	2037-26-5	0.2	%	80.5	86.5	81.6	75.7	77.1
4-Bromofluorobenzene	460-00-4	0.2	%	82.6	88.0	84.8	79.1	76.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH01 UST 1.50	HC BH01 UST 2.00	HC AREA 1 0.20	HC AREA 2 0.20	HC AREA 3 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-006	EM2115765-007	EM2115765-008	EM2115765-009	EM2115765-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	21.2	11.9	28.3	24.0	24.3
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	<5	<5	<5
Barium	7440-39-3	10	mg/kg	----	----	60	60	80
Beryllium	7440-41-7	1	mg/kg	----	----	<1	<1	<1
Boron	7440-42-8	50	mg/kg	----	----	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	----	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	----	----	10	11	10
Cobalt	7440-48-4	2	mg/kg	----	----	34	48	45
Copper	7440-50-8	5	mg/kg	----	----	46	36	50
Lead	7439-92-1	5	mg/kg	----	----	25	9	16
Manganese	7439-96-5	5	mg/kg	----	----	866	1060	1060
Nickel	7440-02-0	2	mg/kg	----	----	22	23	26
Selenium	7782-49-2	5	mg/kg	----	----	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	----	----	156	169	165
Zinc	7440-66-6	5	mg/kg	----	----	39	27	44
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05

Page	: 7 of 30
Work Order	: EM2115765
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS - Precinct 3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH01 UST 1.50	HC BH01 UST 2.00	HC AREA 1 0.20	HC AREA 2 0.20	HC AREA 3 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-006	EM2115765-007	EM2115765-008	EM2115765-009	EM2115765-010
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----

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Work Order : EM2115765
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : UTAS - Precinct 3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH01 UST 1.50	HC BH01 UST 2.00	HC AREA 1 0.20	HC AREA 2 0.20	HC AREA 3 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-006	EM2115765-007	EM2115765-008	EM2115765-009	EM2115765-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	**110**	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	**110**	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH01 UST 1.50	HC BH01 UST 2.00	HC AREA 1 0.20	HC AREA 2 0.20	HC AREA 3 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-006	EM2115765-007	EM2115765-008	EM2115765-009	EM2115765-010
				Result	Result	Result	Result	Result
EP080: BTEXN - Continued								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	----	107	108	107
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	----	127	126	121
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	82.7	85.8	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	81.5	85.2	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	61.9	67.8	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	94.0	97.4	----	----	----
Anthracene-d10	1719-06-8	0.5	%	102	105	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	101	106	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	73.6	73.7	----	----	----
Toluene-D8	2037-26-5	0.2	%	81.8	80.6	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	84.2	84.1	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC AREA 4 0.20	HC AREA 5 0.20	HC BH01 DRAINAGE 0.20	HC BH02 DRAINAGE 0.20	HC BH01 G HOUSE DRAINAGE 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-011	EM2115765-012	EM2115765-013	EM2115765-014	EM2115765-015
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	32.2	18.6	47.9	49.8	33.1
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	8	<5
Barium	7440-39-3	10	mg/kg	70	60	70	100	60
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	16	24	25	27	21
Cobalt	7440-48-4	2	mg/kg	48	19	35	55	20
Copper	7440-50-8	5	mg/kg	46	23	47	106	48
Lead	7439-92-1	5	mg/kg	26	24	13	31	<5
Manganese	7439-96-5	5	mg/kg	1070	580	500	1120	910
Nickel	7440-02-0	2	mg/kg	25	22	35	39	51
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	170	86	173	188	75
Zinc	7440-66-6	5	mg/kg	61	45	150	653	14
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

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Work Order	: EM2115765
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS - Precinct 3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC AREA 4 0.20	HC AREA 5 0.20	HC BH01 DRAINAGE 0.20	HC BH02 DRAINAGE 0.20	HC BH01 G HOUSE DRAINAGE 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-011	EM2115765-012	EM2115765-013	EM2115765-014	EM2115765-015
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC AREA 4 0.20	HC AREA 5 0.20	HC BH01 DRAINAGE 0.20	HC BH02 DRAINAGE 0.20	HC BH01 G HOUSE DRAINAGE 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-011	EM2115765-012	EM2115765-013	EM2115765-014	EM2115765-015
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	0.5	mg/kg	----	----	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	----	----	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	----	----	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	----	----	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	----	----	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	----	----	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	----	----	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	<0.5	<0.5	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	----	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	----	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	----	----	**0.6**	**0.6**	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	----	----	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	----	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	----	----	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	----	----	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg	----	----	<100	**160**	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	----	----	<50	**160**	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	----	<10	<10	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	----	----	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg	----	----	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg	----	----	<100	**190**	----
>C34 - C40 Fraction	----	100	mg/kg	----	----	<100	<100	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	----	----	<50	**190**	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	----	----	<50	<50	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC AREA 4 0.20	HC AREA 5 0.20	HC BH01 DRAINAGE 0.20	HC BH02 DRAINAGE 0.20	HC BH01 G HOUSE DRAINAGE 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-011	EM2115765-012	EM2115765-013	EM2115765-014	EM2115765-015
				Result	Result	Result	Result	Result
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	----	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	----	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	----	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	----	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg	----	----	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg	----	----	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg	----	----	<1	<1	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	108	114	116	110	113
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	126	127	122	120	129
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	----	90.2	87.4	----
2-Chlorophenol-D4	93951-73-6	0.5	%	----	----	86.8	86.0	----
2.4.6-Tribromophenol	118-79-6	0.5	%	----	----	73.6	81.4	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	----	100	97.8	----
Anthracene-d10	1719-06-8	0.5	%	----	----	109	104	----
4-Terphenyl-d14	1718-51-0	0.5	%	----	----	108	106	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	----	70.2	65.7	----
Toluene-D8	2037-26-5	0.2	%	----	----	76.1	72.3	----
4-Bromofluorobenzene	460-00-4	0.2	%	----	----	74.9	71.2	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 G HOUSE DRAINAGE 0.20	HC BH01 MACHINERY 0.20	HC BH02 MACHINERY 0.20	HC BH01 G HOUSE 0.20	HC BH02 G HOUSE 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-016	EM2115765-017	EM2115765-018	EM2115765-019	EM2115765-020
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	38.5	25.2	22.2	24.9	15.5
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	50	60	70	50	30
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	33	11	18	8	4
Cobalt	7440-48-4	2	mg/kg	15	48	38	17	2
Copper	7440-50-8	5	mg/kg	60	27	38	17	9
Lead	7439-92-1	5	mg/kg	<5	9	23	10	7
Manganese	7439-96-5	5	mg/kg	362	765	926	414	76
Nickel	7440-02-0	2	mg/kg	44	20	30	12	3
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	100	99	156	68	13
Zinc	7440-66-6	5	mg/kg	21	39	194	42	30
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

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Work Order : EM2115765
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : UTAS - Precinct 3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 G HOUSE DRAINAGE 0.20	HC BH01 MACHINERY 0.20	HC BH02 MACHINERY 0.20	HC BH01 G HOUSE 0.20	HC BH02 G HOUSE 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-016	EM2115765-017	EM2115765-018	EM2115765-019	EM2115765-020
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 G HOUSE DRAINAGE 0.20	HC BH01 MACHINERY 0.20	HC BH02 MACHINERY 0.20	HC BH01 G HOUSE 0.20	HC BH02 G HOUSE 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-016	EM2115765-017	EM2115765-018	EM2115765-019	EM2115765-020
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	**0.6**	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	**1.2**	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	----	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	----	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	----	<100	**130**	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	<50	**130**	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	----	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	----	**110**	**170**	----	----
>C34 - C40 Fraction	----	100	mg/kg	----	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	**110**	**170**	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	<50	<50	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 G HOUSE DRAINAGE 0.20	HC BH01 MACHINERY 0.20	HC BH02 MACHINERY 0.20	HC BH01 G HOUSE 0.20	HC BH02 G HOUSE 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-016	EM2115765-017	EM2115765-018	EM2115765-019	EM2115765-020
				Result	Result	Result	Result	Result
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg	----	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	----	<1	<1	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	116	109	105	110	121
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	110	114	125	125	112
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	84.0	82.3	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	----	81.4	79.4	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	----	73.8	80.1	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	94.2	93.0	----	----
Anthracene-d10	1719-06-8	0.5	%	----	102	99.6	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	----	102	101	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	67.0	65.3	----	----
Toluene-D8	2037-26-5	0.2	%	----	73.8	72.3	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	----	75.2	74.7	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH01 CHEM 0.20	HC BH02 CHEM 0.20	HC BH01 SHADE 0.20	HC BH02 SHADE 0.20	HC BH01 BUNKER 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-021	EM2115765-022	EM2115765-023	EM2115765-024	EM2115765-025
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	22.7	16.0	30.1	21.6	15.9
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	60	50	100	190	70
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	9	7	25	129	10
Cobalt	7440-48-4	2	mg/kg	36	23	64	45	30
Copper	7440-50-8	5	mg/kg	40	64	36	33	42
Lead	7439-92-1	5	mg/kg	15	<5	8	12	8
Manganese	7439-96-5	5	mg/kg	990	509	1120	1130	572
Nickel	7440-02-0	2	mg/kg	19	22	36	49	23
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	117	85	230	79	118
Zinc	7440-66-6	5	mg/kg	104	38	32	205	29
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH01 CHEM 0.20	HC BH02 CHEM 0.20	HC BH01 SHADE 0.20	HC BH02 SHADE 0.20	HC BH01 BUNKER 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-021	EM2115765-022	EM2115765-023	EM2115765-024	EM2115765-025
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH01 CHEM 0.20	HC BH02 CHEM 0.20	HC BH01 SHADE 0.20	HC BH02 SHADE 0.20	HC BH01 BUNKER 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-021	EM2115765-022	EM2115765-023	EM2115765-024	EM2115765-025
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	**100**	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	**100**	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH01 CHEM 0.20	HC BH02 CHEM 0.20	HC BH01 SHADE 0.20	HC BH02 SHADE 0.20	HC BH01 BUNKER 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-021	EM2115765-022	EM2115765-023	EM2115765-024	EM2115765-025
				Result	Result	Result	Result	Result
EP080: BTEXN - Continued								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	116	112	113	106	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	109	127	120	125	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	87.9	87.8	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	85.7	85.5	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	81.4	79.6	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	98.9	96.8	----	----	----
Anthracene-d10	1719-06-8	0.5	%	106	105	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	106	104	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	68.6	68.5	----	----	----
Toluene-D8	2037-26-5	0.2	%	77.8	75.4	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	77.1	77.4	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 BUNKER 0.20	DUPLICATE 1	DUPLICATE 2	HC BH01 CREEK 0.20	HC BH02 CREEK 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-026	EM2115765-027	EM2115765-028	EM2115765-029	EM2115765-030
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	21.4	22.6
Moisture Content	----	1.0	%	22.0	19.8	29.4	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	----	----
Barium	7440-39-3	10	mg/kg	90	60	40	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	11	8	11	----	----
Cobalt	7440-48-4	2	mg/kg	22	26	22	----	----
Copper	7440-50-8	5	mg/kg	48	70	26	----	----
Lead	7439-92-1	5	mg/kg	42	5	16	----	----
Manganese	7439-96-5	5	mg/kg	370	551	462	----	----
Nickel	7440-02-0	2	mg/kg	20	24	19	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	----
Vanadium	7440-62-2	5	mg/kg	84	106	89	----	----
Zinc	7440-66-6	5	mg/kg	41	44	40	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	----	<0.05	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 BUNKER 0.20	DUPLICATE 1	DUPLICATE 2	HC BH01 CREEK 0.20	HC BH02 CREEK 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-026	EM2115765-027	EM2115765-028	EM2115765-029	EM2115765-030
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	----	<0.05	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	<0.05	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	----	<0.05	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	<0.2	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.05	mg/kg	----	<0.05	<0.05	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	<0.05	<0.05	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	<0.05	<0.05	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	----	<0.2	<0.2	----	----
Dimethoate	60-51-5	0.05	mg/kg	----	<0.05	<0.05	----	----
Diazinon	333-41-5	0.05	mg/kg	----	<0.05	<0.05	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	<0.05	<0.05	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	----	<0.2	<0.2	----	----
Malathion	121-75-5	0.05	mg/kg	----	<0.05	<0.05	----	----
Fenthion	55-38-9	0.05	mg/kg	----	<0.05	<0.05	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	<0.05	<0.05	----	----
Parathion	56-38-2	0.2	mg/kg	----	<0.2	<0.2	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	<0.05	<0.05	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	<0.05	<0.05	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	<0.05	<0.05	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	----	<0.05	<0.05	----	----
Prothiofos	34643-46-4	0.05	mg/kg	----	<0.05	<0.05	----	----
Ethion	563-12-2	0.05	mg/kg	----	<0.05	<0.05	----	----
Carbophenothion	786-19-6	0.05	mg/kg	----	<0.05	<0.05	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	----	<0.05	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 BUNKER 0.20	DUPLICATE 1	DUPLICATE 2	HC BH01 CREEK 0.20	HC BH02 CREEK 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-026	EM2115765-027	EM2115765-028	EM2115765-029	EM2115765-030
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	0.5	mg/kg	—	<0.5	<0.5	—	—
Fluorene	86-73-7	0.5	mg/kg	—	<0.5	<0.5	—	—
Phenanthrene	85-01-8	0.5	mg/kg	—	<0.5	<0.5	—	—
Anthracene	120-12-7	0.5	mg/kg	—	<0.5	<0.5	—	—
Fluoranthene	206-44-0	0.5	mg/kg	—	<0.5	<0.5	—	—
Pyrene	129-00-0	0.5	mg/kg	—	<0.5	<0.5	—	—
Benz(a)anthracene	56-55-3	0.5	mg/kg	—	<0.5	<0.5	—	—
Chrysene	218-01-9	0.5	mg/kg	—	<0.5	<0.5	—	—
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	—	<0.5	<0.5	—	—
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	—	<0.5	<0.5	—	—
Benzo(a)pyrene	50-32-8	0.5	mg/kg	—	<0.5	<0.5	—	—
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	—	<0.5	<0.5	—	—
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	—	<0.5	<0.5	—	—
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	—	<0.5	<0.5	—	—
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	—	<0.5	<0.5	—	—
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	—	<0.5	<0.5	—	—
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	—	**0.6**	**0.6**	—	—
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	—	**1.2**	**1.2**	—	—
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	—	<10	<10	—	—
C10 - C14 Fraction	—	50	mg/kg	—	<50	<50	—	—
C15 - C28 Fraction	—	100	mg/kg	—	<100	<100	—	—
C29 - C36 Fraction	—	100	mg/kg	—	<100	**130**	—	—
^ C10 - C36 Fraction (sum)	—	50	mg/kg	—	<50	**130**	—	—
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	—	<10	<10	—	—
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	—	<10	<10	—	—
>C10 - C16 Fraction	—	50	mg/kg	—	<50	<50	—	—
>C16 - C34 Fraction	—	100	mg/kg	—	<100	**150**	—	—
>C34 - C40 Fraction	—	100	mg/kg	—	<100	**100**	—	—
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	—	<50	**250**	—	—
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	—	<50	<50	—	—

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 BUNKER 0.20	DUPLICATE 1	DUPLICATE 2	HC BH01 CREEK 0.20	HC BH02 CREEK 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-026	EM2115765-027	EM2115765-028	EM2115765-029	EM2115765-030
				Result	Result	Result	Result	Result
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg	----	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	----	<1	<1	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	----	----	----	**0.0004**	**0.0002**
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	----	----	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	----	----	----	**0.0004**	**0.0002**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	----	----	----	**0.0004**	**0.0002**
EP068S: Organochlorine Pesticide Surrogate								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	HC BH02 BUNKER 0.20	DUPLICATE 1	DUPLICATE 2	HC BH01 CREEK 0.20	HC BH02 CREEK 0.20
			Sampling date / time	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00	09-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	EM2115765-026	EM2115765-027	EM2115765-028	EM2115765-029	EM2115765-030
				Result	Result	Result	Result	Result
EP068S: Organochlorine Pesticide Surrogate - Continued								
Dibromo-DDE	21655-73-2	0.05	%	----	115	106	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	127	126	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	87.8	84.8	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	----	85.9	83.8	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	----	81.0	77.7	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	99.2	95.9	----	----
Anthracene-d10	1719-06-8	0.5	%	----	108	104	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	----	107	103	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	70.6	66.0	----	----
Toluene-D8	2037-26-5	0.2	%	----	80.0	72.2	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	----	80.2	73.5	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	----	----	----	111	99.0
13C8-PFOA	----	0.0002	%	----	----	----	99.1	102

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	RINSATE	----	----	----	----
			Sampling date / time	09-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2115765-031	-------	-------	-------	-------
				Result	----	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	RINSATE	----	----	----	----
			Sampling date / time	09-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2115765-031	-------	-------	-------	-------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	25.9	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	68.1	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	75.2	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	76.6	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	79.5	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	81.8	----	----	----	----

Page	: 29 of 30
Work Order	: EM2115765
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS - Precinct 3

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	RINSATE	----	----	----	----
			Sampling date / time	09-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2115765-031	-------	-------	-------	-------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	108	----	----	----	----
Toluene-D8	2037-26-5	2	%	97.7	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	112	----	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	62	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	40	139
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124
EP231S: PFAS Surrogate			
13C4-PFOS	----	68	136
13C8-PFOA	----	69	133

Sub-Matrix: WATER

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	51
2-Chlorophenol-D4	93951-73-6	30	114
2.4.6-Tribromophenol	118-79-6	26	133
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	35	127
Anthracene-d10	1719-06-8	44	122
4-Terphenyl-d14	1718-51-0	44	124
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EM2114845	Page	: 1 of 15
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Project	: UTAS	Date Samples Received	: 30-Jul-2021 10:50
Order number	: ----	Date Analysis Commenced	: 30-Jul-2021
C-O-C number	: ----	Issue Date	: 04-Aug-2021 16:39
Sampler	: G MCDONALD		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 12		
No. of samples analysed	: 12		

ilac-MRA NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG005T:EM2114845 #6 has been diluted prior to cadmium analysis due to sample matrix. LOR value has been raised accordingly.
- EG020-T : EM2114845 #12 results for total metal have been confirmed by re-digestion and re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP1 0.50	TP2 0.50	TP3 0.50	TP3 1.00	TP3 1.50
			Sampling date / time	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	EM2114845-001	EM2114845-002	EM2114845-003	EM2114845-004	EM2114845-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	15.0	19.6	13.2	10.5	10.5
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	90	70	120	60	30
Beryllium	7440-41-7	1	mg/kg	<1	<1	1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	1	<1	<1
Chromium	7440-47-3	2	mg/kg	46	35	72	64	62
Cobalt	7440-48-4	2	mg/kg	15	9	19	11	9
Copper	7440-50-8	5	mg/kg	19	14	33	17	13
Manganese	7439-96-5	5	mg/kg	514	400	518	384	402
Nickel	7440-02-0	2	mg/kg	28	10	21	13	8
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	97	176	376	332	342
Zinc	7440-66-6	5	mg/kg	35	45	33	19	14
Lead	7439-92-1	5	mg/kg	6	23	13	10	11
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP1 0.50	TP2 0.50	TP3 0.50	TP3 1.00	TP3 1.50
			Sampling date / time	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	EM2114845-001	EM2114845-002	EM2114845-003	EM2114845-004	EM2114845-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**96.8**	**95.8**	**94.8**	**92.8**	**92.0**
2-Chlorophenol-D4	93951-73-6	0.5	%	**93.7**	**92.4**	**92.3**	**91.6**	**90.0**
2.4.6-Tribromophenol	118-79-6	0.5	%	**56.3**	**78.0**	**70.1**	**74.1**	**61.9**

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Work Order : EM2114845
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : UTAS

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

			Sample ID	TP1 0.50	TP2 0.50	TP3 0.50	TP3 1.00	TP3 1.50
			Sampling date / time	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	EM2114845-001	EM2114845-002	EM2114845-003	EM2114845-004	EM2114845-005
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	104	102	102	100	98.2
Anthracene-d10	1719-06-8	0.5	%	122	108	110	123	116
4-Terphenyl-d14	1718-51-0	0.5	%	115	113	111	114	114
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	93.0	87.0	81.2	93.7	88.3
Toluene-D8	2037-26-5	0.2	%	86.8	77.6	73.7	87.0	78.8
4-Bromofluorobenzene	460-00-4	0.2	%	109	92.5	94.0	106	96.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP4 0.50	TP4 1.00	TP4 1.50	TP5 0.50	TP5 1.00
			Sampling date / time	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	EM2114845-006	EM2114845-007	EM2114845-008	EM2114845-009	EM2114845-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	18.6	15.9	17.9	15.4	17.5
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	50	70	70	40	30
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<5	<1	2	<1	<1
Chromium	7440-47-3	2	mg/kg	82	42	67	37	52
Cobalt	7440-48-4	2	mg/kg	14	21	21	8	10
Copper	7440-50-8	5	mg/kg	25	39	30	18	27
Manganese	7439-96-5	5	mg/kg	428	414	733	109	98
Nickel	7440-02-0	2	mg/kg	19	22	18	11	17
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	417	194	286	195	248
Zinc	7440-66-6	5	mg/kg	36	34	41	24	15
Lead	7439-92-1	5	mg/kg	16	10	19	8	6
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

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Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP4 0.50	TP4 1.00	TP4 1.50	TP5 0.50	TP5 1.00
			Sampling date / time	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	EM2114845-006	EM2114845-007	EM2114845-008	EM2114845-009	EM2114845-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**90.6**	**92.8**	**81.0**	**83.2**	**81.0**
2-Chlorophenol-D4	93951-73-6	0.5	%	**88.9**	**91.1**	**85.5**	**86.8**	**84.4**
2.4.6-Tribromophenol	118-79-6	0.5	%	**63.7**	**75.1**	**70.5**	**75.3**	**69.4**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	TP4 0.50	TP4 1.00	TP4 1.50	TP5 0.50	TP5 1.00
			Sampling date / time	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	EM2114845-006	EM2114845-007	EM2114845-008	EM2114845-009	EM2114845-010
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**96.8**	**99.6**	**101**	**101**	**99.1**
Anthracene-d10	1719-06-8	0.5	%	**112**	**108**	**126**	**126**	**125**
4-Terphenyl-d14	1718-51-0	0.5	%	**110**	**116**	**103**	**111**	**108**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**82.8**	**87.6**	**86.8**	**83.6**	**88.5**
Toluene-D8	2037-26-5	0.2	%	**75.7**	**78.2**	**78.3**	**75.5**	**80.0**
4-Bromofluorobenzene	460-00-4	0.2	%	**93.6**	**96.8**	**94.7**	**91.7**	**96.9**

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	DUPLICATE	----	----	----	----
			Sampling date / time	27-Jul-2021 00:00	----	----	----	----
				EM2114845-011	-----	-----	-----	-----
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	17.6	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Barium	7440-39-3	10	mg/kg	70	----	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----	----	----
Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	54	----	----	----	----
Cobalt	7440-48-4	2	mg/kg	17	----	----	----	----
Copper	7440-50-8	5	mg/kg	26	----	----	----	----
Manganese	7439-96-5	5	mg/kg	623	----	----	----	----
Nickel	7440-02-0	2	mg/kg	17	----	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
Vanadium	7440-62-2	5	mg/kg	251	----	----	----	----
Zinc	7440-66-6	5	mg/kg	39	----	----	----	----
Lead	7439-92-1	5	mg/kg	14	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----

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Work Order : EM2114845
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Project : UTAS

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	DUPLICATE	----	----	----	----
			Sampling date / time	27-Jul-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2114845-011	----	----	----	----
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**81.1**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**85.5**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**77.2**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	DUPLICATE	----	----	----	----
			Sampling date / time	27-Jul-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2114845-011	-------	-------	-------	-------
				Result	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	101	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	124	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	110	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	77.8	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	71.7	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	82.7	----	----	----	----

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Work Order	: EM2114845
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	RINSATE	----	----	----	----
			Sampling date / time	27-Jul-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2114845-012	----	----	----	----
				Result	----	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.002**	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	RINSATE	----	----	----	----
			Sampling date / time	27-Jul-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2114845-012	-----	-----	-----	-----
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	29.1	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	80.8	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	87.1	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	92.2	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	93.9	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	92.4	----	----	----	----

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Work Order	: EM2114845
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: UTAS

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	RINSATE	----	----	----	----
			Sampling date / time	27-Jul-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2114845-012	-------	-------	-------	-------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	110	----	----	----	----
Toluene-D8	2037-26-5	2	%	110	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	110	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	51
2-Chlorophenol-D4	93951-73-6	30	114
2.4.6-Tribromophenol	118-79-6	26	133
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	35	127
Anthracene-d10	1719-06-8	44	122
4-Terphenyl-d14	1718-51-0	44	124
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

REPORTING TO INFORM THE MASTERPLAN DESIGN

Aboriginal Heritage Assessment

Addendum 1A

Addendum 1B

CHMA

UTAS Sandy Bay Campus, Hobart, Tasmania

Aboriginal Heritage Assessment Report

Final Draft Version 2

AUTHOR: Stuart Huys and Rocky Sainty
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CLIENT: UTAS

24.9.2019

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CULTURAL
HERITAGE
MANAGEMENT
AUSTRALIA

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Executive Summary

Project Details
The University of Tasmania (UTAS) is exploring options for the reuse and development of its assets at its Sandy Bay Campus, as part of an overall strategy to relocate infrastructure within Central Hobart. The UTAS Sandy Bay campus encompasses approximately 100ha of land. Figures 1-3 show the location and boundaries of the UTAS Sandy Bay campus (the study area).

All Urban Planning Pty Ltd has been engaged by UTAS to review the scope of technical studies that are required to shape future planning options for the Sandy Bay campus. As part of the initial planning process, CHMA and Rocky Sainty have been engaged by UTAS to undertake an Aboriginal heritage assessment for the UTAS Sandy Bay campus. The information generated from the assessment will be used to inform future planning decisions for the Precinct Plan. This report presents the findings of the assessment.

Registered Aboriginal Sites in the Vicinity of the Study Area
As part of Stage 1 of the assessment process, a search was undertaken of the Aboriginal Heritage Register (AHR) to determine whether any registered Aboriginal heritage sites are located within or in the general vicinity of the UTAS Sandy Bay campus study area.

The search shows that there are a total of 25 registered Aboriginal sites that are located within an approximate 2km radius of the study area (search results provided by Kate Moody from AHT on the 23-8-2019). None of these 25 sites are situated within or in the immediate vicinity of the UTAS Sandy Bay campus study area. The closest site is AH977 (a shell midden) which is located at Wrest Point, 700m to the east of the study area. Table i provides the summary details for these 25 sites (based on information generated from the AHR). The detailed AHR search results are presented in section 4.2 of this report.

Table i: Summary details for the 25 registered Aboriginal sites located within a 2km radius of the UTAS Sandy Bay study area (Based on the results of the AHR search dated 23/8/2019)

AH Site Number	Site Type	Locality	Grid Reference (GDA94) Easting	Grid Reference (GDA94) Northing
345	Stone Quarry		529401	5248390
972	Shell Midden	Sandy Bay	529341	5248680
973	Shell Midden	Sandy Bay	528456	5249241
974	Shell Midden	Sandy Bay	528380	5249274
975	Shell Midden	Sandy Bay	528276	5249312
976	Shell Midden	Sandy Bay	528137	5249355
977	Shell Midden	Sandy Bay	527502	5249842
978	Shell Midden		527687	5251250

AH Site Number	Site Type	Locality	Grid Reference (GDA94) Easting	Grid Reference (GDA94) Northing
980	Shell Midden	Battery Point	527512	5251582
11786	Artefact Scatter	South Hobart	524253	5250923
6592	Unoccupied Rockshelter	West Hobart	524753	5251693
6593	Occupied Rockshelter	West Hobart	524754	5251705
6594	Unoccupied Rockshelter	West Hobart	524753	5251719
6595	Unoccupied Rockshelter	West Hobart	524759	5251787
6839	Isolated Artefact	South Hobart	525352	5251082
6974	Shell Midden	Sandy Bay	529312	5248682
6975	Shell Midden	Sandy Bay	529424	5248635
7990	Isolated Artefact	South Hobart	523134	5249699
7991	Unoccupied Rockshelter	Ridgeway	523735	5248933
7992	Unoccupied Rockshelter	Ridgeway	523512	5248982
7993	Artefact Scatter	Ridgeway	522912	5248882
8555	Artefact Scatter	Sandy Bay	529058	5248767
13036	Isolated Artefact	Battery Point	527033	5251664
13037	Artefact Scatter	Battery Point	527047	5251665
13119	Artefact Scatter, Shell Midden	Battery Point	527042	5251662

Summary of Results

The field survey was undertaken over a period of two days (9-9-2019 and 11-9-2019) by Stuart Huys (CHMA archaeologist) and Rocky Sainty (Aboriginal Heritage Officer). The study area encompasses a total of approximately 100ha. The field team walked a series 14.2km of survey transects across the study area, with the average width of each transect being 5m. The survey transects were mainly focused in those parts of the study area where natural ground surfaces and original soil deposits were still present. This was in the central and south-west parts of the campus, to the west of Churchill Avenue. This approach was adopted, because it was assessed that these areas had the highest potential for Aboriginal heritage sites to still be present in the landscape.

No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment of the UTAS Sandy Bay campus study area. As noted in section 4.2 of this report, the results of the AHR search shows that there are no registered Aboriginal sites that are located either within or in the immediate vicinity of the study area boundaries. On the basis of these negative results, it is determined that there are no known Aboriginal heritage sites that occur within the study area.

The field survey assessment did not identify any evidence for Aboriginal stone quarrying/procurement activity within the study area. The geology of the study area is dominated by Jurassic dolerite. This stone material type is typically not suited for artefact manufacturing. A geological contact zone was noted in the south-west portion of the study area, around Olinda Grove, where the dolerites intersect with Triassic sedimentary sequences. However, no metamorphosed stone material suitable for artefact manufacturing was identified in this area. Given the nature of the geology in the study area, it is assessed that it is very unlikely that any undetected Aboriginal stone quarry or procurement sites would be present.

No potential Aboriginal rock shelter features were identified in the study area. Again, given the nature of the geology across the study area, which is dominated by dolerite, it is highly unlikely that any undetected rock shelter features will be present.

The apparent absence of Aboriginal heritage sites within the study area can most likely be attributed to a combination of three main factors; the nature of the topography and resources of the study area, the extent of very high levels of disturbances in parts of the study area, and poor conditions of surface visibility. Overall, it is assessed that there is a low potential for undetected Aboriginal heritage sites to be present within the UTAS Sandy Bay campus study area.

The detailed survey results are presented in section 7 of this report.

Management Recommendations

Recommendation 1

No Aboriginal heritage sites were identified during the field survey of the Sandy Bay campus study area. A search of the Aboriginal Heritage Register (AHR) shows that there are no registered Aboriginal sites located either within, or in the immediate vicinity of the study area footprint. On this basis, it is advised that there are no site specific Aboriginal heritage constraints, or legal impediments to the project proceeding.

Recommendation 2

No specific areas of elevated archaeological potential, or suspected Aboriginal cultural features were identified within the study area, and it is assessed that there is generally a low to very low potential for undetected Aboriginal heritage sites to occur within the study area. On this basis it is advised that there are no requirements for any further Aboriginal heritage investigations to be undertaken within the Sandy Bay campus study area.

Recommendation 3

If, during the course of the proposed development works across the UTAS campus, previously undetected archaeological sites or objects are located, the processes outlined in the Unanticipated Discovery Plan should be followed (see Appendix 1). A copy of the Unanticipated Discovery Plan should be kept on site during all ground disturbance and construction work. All construction personnel should be made aware of the Unanticipated Discovery Plan and their obligations under the *Aboriginal Heritage Act 1975* (the Act).

Recommendation 4

Copies of this report should be submitted to Aboriginal Heritage Tasmania (AHT) for review and comment.

1.0 Project Outline

1.1 Project Details

The University of Tasmania (UTAS) is exploring options for the reuse and development of its assets at its Sandy Bay Campus, as part of an overall strategy to relocate infrastructure within Central Hobart. The UTAS Sandy Bay campus encompasses approximately 100ha of land, and includes the following land titles:

- 2 Churchill Avenue (Title 167424/1);
- 301 Sandy Bay Road (Title 167420/1);
- 6 Grace Street (Title 167420/2).

The existing Hobart Interim Planning Scheme 2015 (planning scheme) applies a Particular Purpose Zone 3 across the entire 100ha Sandy Bay site and limits the use of the land for non-educational purposes. Figures 1-3 show the location and boundaries of the UTAS Sandy Bay campus (the study area).

All Urban Planning Pty Ltd has been engaged by UTAS to review the scope of technical studies that are required to shape future planning options for the Sandy Bay campus. These technical studies and options are intended to inform the University's deliberations on the future of the site and open stakeholder engagement that will be critical to the formulation of a Master Plan for the campus. The resultant master plan will ultimately form the basis of a request for planning scheme amendments pursuant to Section 34 of the Land Use Planning and Approvals Act (Act).

As part of the initial planning process, CHMA and Rocky Sainty have been engaged by UTAS to undertake an Aboriginal heritage assessment for the UTAS Sandy Bay campus. The information generated from the assessment will be used to inform future planning decisions for the Precinct Plan. This report presents the findings of the assessment.

1.2 Aims of the Investigation

The principal aims of the current Aboriginal Heritage assessment are as follows.

- To undertake an Aboriginal cultural heritage assessment for the 100ha parcel of land encompassed by the UTAS Sandy Bay campus (the study area). The assessment is to be compliant with the *Aboriginal Heritage Standards and Procedures (June 2018)*
- Search the Aboriginal Heritage Register (AHR) to identify previously registered Aboriginal heritage sites within and in the general vicinity of the study area.
- Undertake relevant archaeological, environmental and ethno-historical background research to develop an understanding of site patterning within the study area.
- To locate, document and assess any Aboriginal heritage sites located within the study area.
- To assess the archaeological and cultural sensitivity of the study area.

- To assess the scientific and Aboriginal cultural values of any identified Aboriginal cultural heritage sites located within the study area.
- Consult with (or ensure the Aboriginal community representative consults with) Aboriginal organisation(s) and/or people(s) with an interest in the study area in order to obtain their views regarding the cultural heritage of the area.
- To develop a set of management recommendations aimed at minimising the impact of any future development plans on any identified Aboriginal heritage values.
- Prepare a report which documents the findings of the Aboriginal heritage assessment, and meets the standards and requirements of the *Aboriginal Heritage Standards and Procedures (June 2018)* prepared by AHT, Department of Primary industries, Parks, Water and Environment.

1.3 Project Limitations

All archaeological investigations are subject to limitations that may affect the reliability of the results. The main constraint to the present investigation was restricted surface visibility due primarily to the presence of built surfaces, fill material and vegetation cover. Surface visibility across the study area was estimated to have averaged 25%, which is in the low range. These constraints limited to some extent the effectiveness of the survey assessment. The issue of surface visibility is further discussed in Section 6 of this report.

In addition, the field team was unable to access the UTAS Horticulture research facility on the campus. This area, which encompasses approximately 4ha, and is located on the south-east boundary of the study area, has a security fence around the perimeter of the site. In addition, the field team was unable to access the UTAS Horticulture research facility on the campus. This area, which encompasses approximately 4ha, and is located on the south-east boundary of the study area, has a security fence around the perimeter of the site. The area appears to have been heavily developed (based on observations made from the perimeter fence and aerial imagery), and it is unlikely that this constraint will have any major bearing on the outcomes of this assessment.

1.4 Project Methodology

A three stage project methodology was implemented for this assessment.

Stage 1 (Pre-Fieldwork Background Work)

Prior to field work being undertaken, the following tasks were completed by CHMA staff.

Consultation with Aboriginal Heritage Tasmania

AHT was contacted and informed that a field survey was to be undertaken for the UTAS Sandy Bay campus. As part of this initial contact a search request of the Aboriginal Heritage Register (AHR) was submitted to AHT in order to ascertain the presence of any previously registered sites in the vicinity of the study area (search request dated 16-8-2019).

The collation of relevant documentation for the project
As part of Stage 1 the following research was carried out and background information was collated for this project:

- A review of the relevant heritage registers (AHR register) and the collation of information pertaining to any registered heritage sites located within the general vicinity of the study area.
- Maps of the study area;
- Relevant reports documenting the outcomes of previous Aboriginal heritage studies in the vicinity of the study area;
- Ethno-historic literature for the region;
- References to the land use history of the study area;
- GIS Information relating to landscape units present in the study area;
- Geotechnical information for the study area, including soil and geology data.

Consultation with Aboriginal Heritage Officer (AHO)
Rocky Sainty is the AHO for this project. As part of Stage 1 works Stuart Huys (CHMA archaeologist) was in regular contact with Rocky Sainty. The main purpose of this contact was to discuss the scope of the present investigations, to ratify the proposed methodology for the investigations and to co-ordinate the timeframes for implementing field work.

Stage 2 (Field Work)
Stage 2 entailed the field work component of the assessment. The field survey was undertaken over a period of two days (9-9-2019 and 11-9-2019) by Stuart Huys (CHMA archaeologist) and Rocky Sainty (Aboriginal Heritage Officer).

The study area encompasses a total of approximately 100ha. The field team walked a series 14.2km of survey transects across the study area, with the average width of each transect being 5m. The survey transects were mainly focused in those parts of the study area where natural ground surfaces and original soil deposits were still present. This was in the central and south-west parts of the campus, to the west of Churchill Avenue. This approach was adopted, because it was assessed that these areas had the highest potential for Aboriginal heritage sites to still be present in the landscape.

The field survey avoided those areas where there were built surfaces such as carparks, roads, playing fields and existing buildings. This decision was based on the premise that any Aboriginal sites that may once have been present in these areas will have been destroyed by past development activity. The survey coverage achieved as part of the field assessment is discussed in more detail in Section 6 of this report.

The results of the field investigation were discussed by Rocky Sainty and Stuart Huys. This included the potential cultural and archaeological sensitivity of the study area, and possible management options for any identified Aboriginal sites.

Stage 3

Stage three of the project involves the production of a Draft and Final Report that includes an analysis of the data obtained from the field survey, an assessment of archaeological sensitivity and management recommendations. The report has been prepared by Stuart Huys in consultation with Rocky Sainty. The report has been structured to comply with the standards and requirements of the current *Aboriginal Heritage Standards and Procedures* prepared by AHT, Department of Primary industries, Parks, Water and Environment.

Plate 1: Rocky Sainty, the designated AHO for the Project

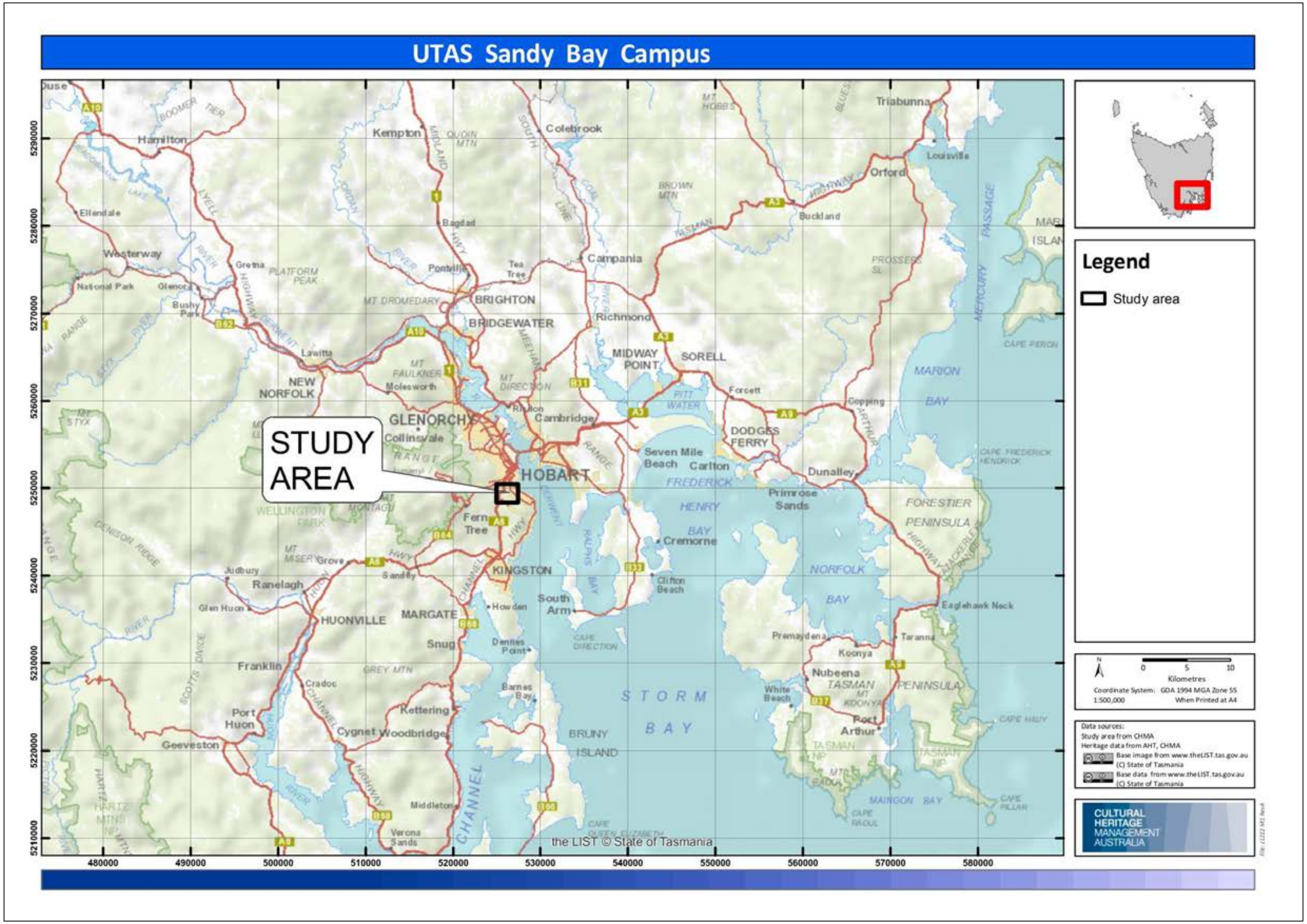


Figure 1: Topographic map showing the general location of the UTAS Sandy Bay campus (the study area)

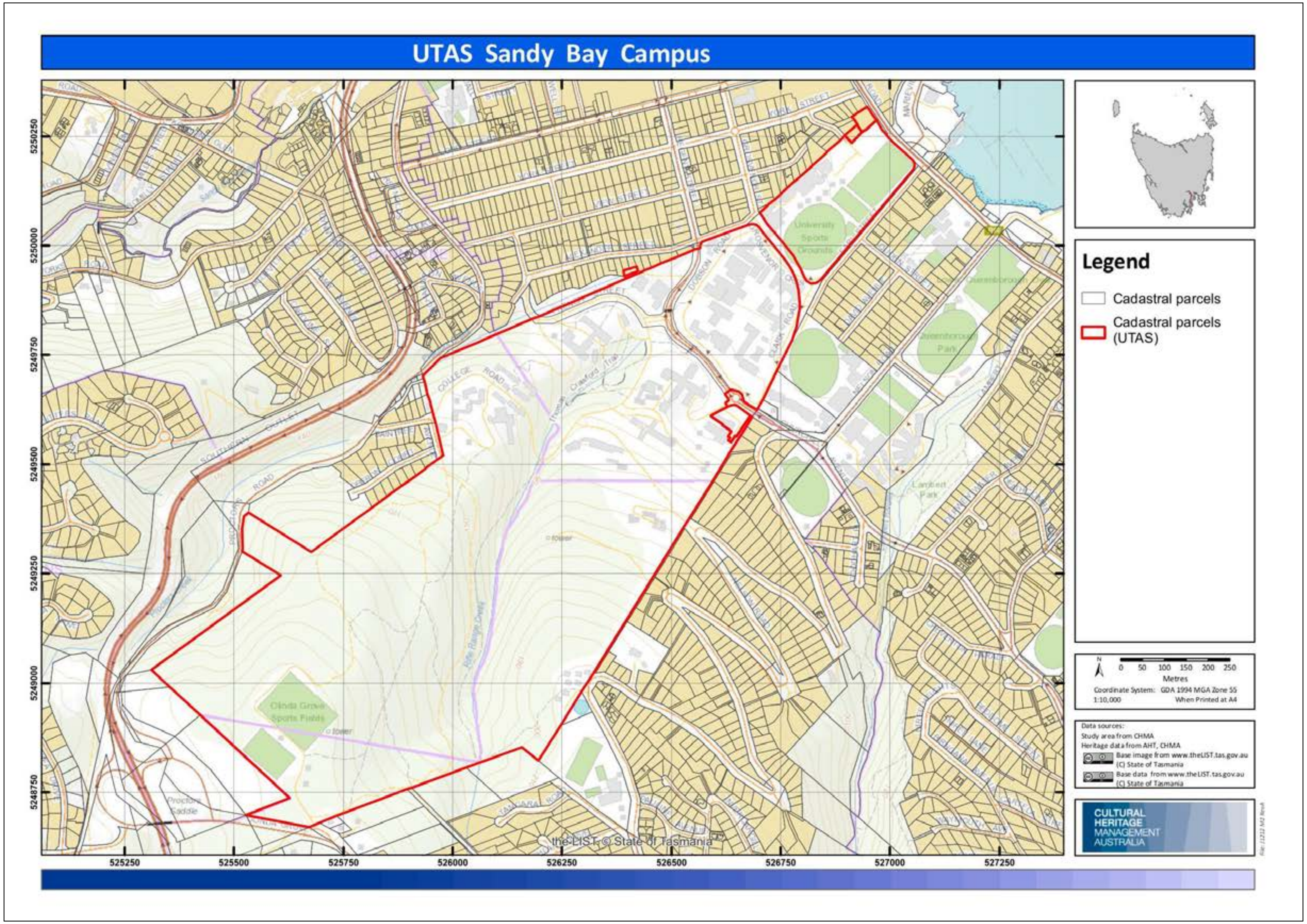


Figure 2: Topographic map showing the boundaries of the UTAS Sandy Bay Campus study area

Figure 3: Aerial image showing the boundaries of the UTAS Sandy Bay Campus study area

2.0 Environmental Setting of the Study Area

2.1 Introduction

Prior to undertaking archaeological survey of the study area, it is necessary to characterise the landscape. This includes considering environmental factors such as topography, geology, climate, vegetation and past and current landscape use. An assessment of the environmental setting helps to develop an understanding of the nature of Aboriginal occupation and site patterning that might be expected to occur across the study area. In addition, it must be remembered that in Aboriginal society, the landscape extends beyond economic and technological behaviour to incorporate social geography and the embodiment of Ancestral Beings.

The archaeological context is generally only able to record the most basic aspects of Aboriginal behaviour as they relate to artefact manufacture and use and other subsistence related activities undertaken across the landscape such as raw material procurement and resource exploitation. The distribution of these natural resources occurs intermittently across the landscape and as such, Aboriginal occupation and associated archaeological manifestations occur intermittently across space. However, the dependence of Aboriginal populations on specific resources means that an understanding of the environmental resources of an area accordingly provides valuable information for predicting the type and nature of archaeological sites that might be expected to occur within an area.

The primary environmental factors known to affect archaeological patterning include the presence or absence of water, both permanent and ephemeral, animal and plant resources, stone artefact resources and terrain.

Additionally, the effects of post-depositional processes of both natural and human agencies must also be taken into consideration. These processes have a dramatic effect on archaeological site visibility and conservation. Geomorphological processes such as soil deposition and erosion can result in the movement of archaeological sites as well as their burial or exposure. Heavily vegetated areas can restrict or prevent the detection of sites, while areas subject to high levels of disturbance may no longer retain artefacts or stratified deposits.

The following sections provide information regarding the landscape context of the study area including topography, geology, soils and vegetation. Much of this information is derived from The LIST – the Tasmanian Government Land Information System.

2.2 The Environmental Setting of the Study Area

The UTAS Sandy Bay Campus (the study area) is situated within the suburb of Sandy Bay, in the City of Hobart, in the South East region of Tasmania. The campus encompasses approximately 100ha, and extends from Sandy Bay Road, south-west through to the Olinda Grove sports fields on Mount Nelson (see Figures 1-3).

The campus is situated on the north-east slopes of the series of rugged mountain ranges that fringe the western margins of the River Derwent. The two prominent landscape features bordering the study area are Tolmans Hill, immediately to the west of the study area, and Mount Nelson to the south-east of the study area.
The slope gradients across the study area are in the range of between 2º to 50º. The steeper slope gradients occur in the south-west portion of the study area, on the upper to mid hill side slopes (see Plate 2). The Olinda Grove sporting fields, in the south-west corner of the study area is sited on the flat to gently undulating summit of a small knoll, and slope gradients in this area decrease to between 2-10 (see Plate 3). Across the lower hill slopes, in the north-east portion of the study area, the slope gradients gradually decrease to below 5º, approaching Sandy Bay Road. It should be noted that much of these lower hill slopes have been artificially levelled as part of the development of the UTAS campus.

The north-east hill slopes are drained by a series of semi-permanent and ephemeral water courses. The drainage pattern is typically from south-west to north-east, with all water courses eventually emptying into the River Derwent. The only named water course within the study area is Rifle Range Creek (see Plate 4). This ephemeral water course has its headwaters around Olinda Grove on the south-west boundary of the study area, and flows through a very steeply incised, narrow valley, eventually entering the River Derwent at Sandy Bay, just to the north of Wrest Point. Other water courses in the immediate vicinity of the study area are the Lambert Rivulet, a semi-permanent water course which is around 500m to 1km to the south-east and Proctors Creek, an ephemeral water course which is situated just to the north-west of the study area. Both water courses empty into the River Derwent at Sandy Bay.

The UTAS campus is situated on the River Derwent estuary, which is within the lower section of the River Derwent valley system. The River Derwent estuary is a ‘ria’ or drowned river valley formed by coastal submergence about 6,000 years ago. The shoreline of the estuary in the surrounds of Sandy Bay is low-energy, with mudflats, sandy beaches and shoals exposed at low tide. The River is estuarine in this area, and subject to tidal influences. This low energy shoreline hosts a range of low energy shell fish species, including mud oyster and black mussel, which would have been important components of the traditional Aboriginal diet. Much of the foreshore areas around Sandy Bay have been developed, and the foreshore margins landscaped, and fortified against coastal erosion.

The underlying geology across UTAS study area is dominated by Jurassic dolerites, which cover the majority of the central and south-west portions of the study area (see Plate 5). On the south-west boundary of the study area, around the Olinda Grove sports fields, the dolerites interface with Triassic sedimentary sequences. In the north-east of the study area, around the lower hill slopes, there are patches of Undifferentiated conglomerate gravels and Quaternary sediments. From an Aboriginal heritage perspective, these rock types are typically not suited for artefact manufacturing, and it is therefore unlikely that Aboriginal stone quarry or stone procurement sites will be encountered in the study area.

The soils across the area largely mirror the underlying geology. Where the dolerites occur, the soils are Podzolic and Black soils developed on dolerite. Undifferentiated soils occur in the south-west of the study area, overlying the Triassic sedimentary sequences. In the north-east of the study area alluvial soils overly the Undifferentiated conglomerate gravels and Quaternary sediments. Soil depth across the majority of the study area is typically very shallow, with the underlying geology exposed to the surface across the steeper hill side slopes, and on the flat crests of the hills. Soil depth is significantly deeper in the north-east of the study area. However, virtually this entire area has been developed, with the resulting removal of much of the soil deposits.

The majority of the 100ha UTAS Sandy Bay campus is largely undeveloped, and is part of the University Reserve, which encompasses approximately 90ha. The reserve lays between the Southern Outlet and the suburban arterial roads of Olinda Grove, Churchill Avenue and Mount Nelson Rd to the south east. It covers virtually the entire central and south-west portions of the study area, with the exception of the Olinda Grove playing fields (see Plate 9). The native vegetation within the reserve is largely intact, and comprises stands of open Eucalypt forest and dense stands of Casuarina. A number of biodiversity studies have been completed on the reserve, and the reserve area is covered by a Biodiversity Protection Area under the Biodiversity Code of the Planning Scheme. There is a network of graded vehicle tracks, and walking tracks that run throughout the reserve (see Plates 6-8). From an archaeological perspective, the reserve, being largely undisturbed, has the highest potential to comprise Aboriginal heritage sites.

The remainder of the UTAS Sandy Bay campus has been extensively developed, and comprises a range of different buildings, playing fields and interconnecting roads and formed walking paths. The north-east portion of the campus, between Churchill Road and Sandy Bay Road, is the most heavily developed area, with the original landscape entirely modified (see Plates 10 and 11). From an Aboriginal heritage perspective, there is very little potential for Aboriginal heritage sites to have survived in this very heavily modified landscape. If sites are present, they will have been severely impacted, or covered under built surfaces.

Plate 2: View north-east across the steep hill side slopes that occur throughout much of the central and south-west parts of the study area

Plate 3: View south-west across the gently undulating crest of a prominent knoll in the south-west corner of the study area


Plate 4: View south along Rifle Range Creek, which runs through the study area


Plate 5: Triassic dolerite bedrock exposed in a track cutting within the central portion of the study area

Plate 6: View north along one of the many vehicle tracks that run through open Eucalypt forest in the University Reserve

Plate 7: View south along a walking track running through casuarina forest within the University Reserve

Plate: 8 View north-east along one of several walking tracks running through the University Reserve, in the central portion of the study area

Plate 9: View north-east at the Olinda Grove playing fields on the south-west boundary of the study area

Plate: 10: View south-west at the playing fields within the north-east portion of the study area, on the lower campus, adjacent to Sandy Bay Road

Plate 11: View north at one of many buildings within the UTAS Sandy Bay campus, in the area between Churchill Road and Sandy Bay Road

3.0 Ethno-historic Background

3.1 Aboriginal Social Organisation in Tasmania

Ryan (2012) explains that the terms 'nation' and 'clan' are the preferred terms used by the Tasmanian Aboriginal community in place of 'tribe' and 'band' respectively. This terminology has been adopted in the following discussion.

According to Jones (1974), the social organisation of Tasmanian Aboriginal society appears to have consisted of three social units, these being the hearth group, the band (clan) and the tribe (nation). The hearth group was the basic family unit and would generally have consisted of a man and woman, their children, aged relatives and sometimes friends and other relatives. The size of hearth groups would generally range from between 2-8 individuals (Jones 1974: Plomley 1983). Plomley (1983) provides a description made by Peron of a hearth group he encountered at Port Cygnet:

> *There were nine individuals in this family, and clearly they represented a hearth group, because Peron visited their campsite with its single hut. The group comprised an older man and wife, a younger man and wife, and five children, one a daughter (Oure-Oure) of the older man and wife, and the other four the children of the younger man and wife. (Plomley 1983:168).*

The clan appears to have been the basic social unit and was comprised of a number of hearth groups (Jones 1974). Jones (1974:324-325) suggests that the clan owned a territory and that the boundaries of this territory would coincide with well-marked geographic features such as rivers and lagoons. Whilst the clan often resided within its territory, it also foraged widely within the territories of other clans. Brown (1986:21) states that the band was led by a man, usually older that the others and who had a reputation as a formidable hunter and fighter. Brown also suggests that the clan (as well as the hearth group) was ideally exogamous, with the wife usually moving to her husband's band and hearth group.

Each clan was associated with a wider political unit, the nation. Jones (1974:328-329) defines the tribe (or nation) as being:

> *…that agglomeration of bands which lived in contiguous regions, spoke the same language or dialect, shared the same cultural traits, usually intermarried, had a similar pattern of seasonal movement, habitually met together for economic and other reasons, the pattern of whose peaceful relations were within the agglomeration and of whose enmities and military adventures were directed outside it. Such a tribe had a territory, consisting of the sum of the land owned by its constituent bands…The borders of a territory ranged from a sharp well defined line associated with a prominent geographic feature to a broad transition zone.* Jones (1974:328-329)

According to Ryan (2012:11), the Aboriginal population of Tasmania was aligned within a broad framework of nine nations, with each nation comprising between six to fifteen clans (Ryan 2012:14). The mean population of each nation is estimated to have been between 350 and 470 people, with overall population estimates being in the order of between seven to ten thousand people prior to European occupation (Ryan 2012:14).

Ryan (2012:13) presents a map showing the approximate boundaries for the nine Tasmanian Aboriginal Nations. This map shows that the UTAS Sandy Bay campus study area falls within the boundaries of land occupied by the South East Nation (see Figure 4). The South East Nation was essentially a maritime people with their territory encompassing 555km of coastline, and their economy being based primarily on coastal resources. The boundaries of their territory extended from the west bank of the Derwent River, around present day New Norfolk down to South Cape, an inland through to the Huon Valley, and included all the D’Entrecasteaux Channel and Bruny Islands. In total, the territory of the South East Tribe encompassed 3100km2 (Ryan 2012).

It is believed that prior to European contact the South East Nation probably consisted of seven individual bands. However, only four clans (bands) have been definitively recorded by the early European settlers. The study area falls within the range of the Mouheneenner Band who occupied the land around present day Hobart.

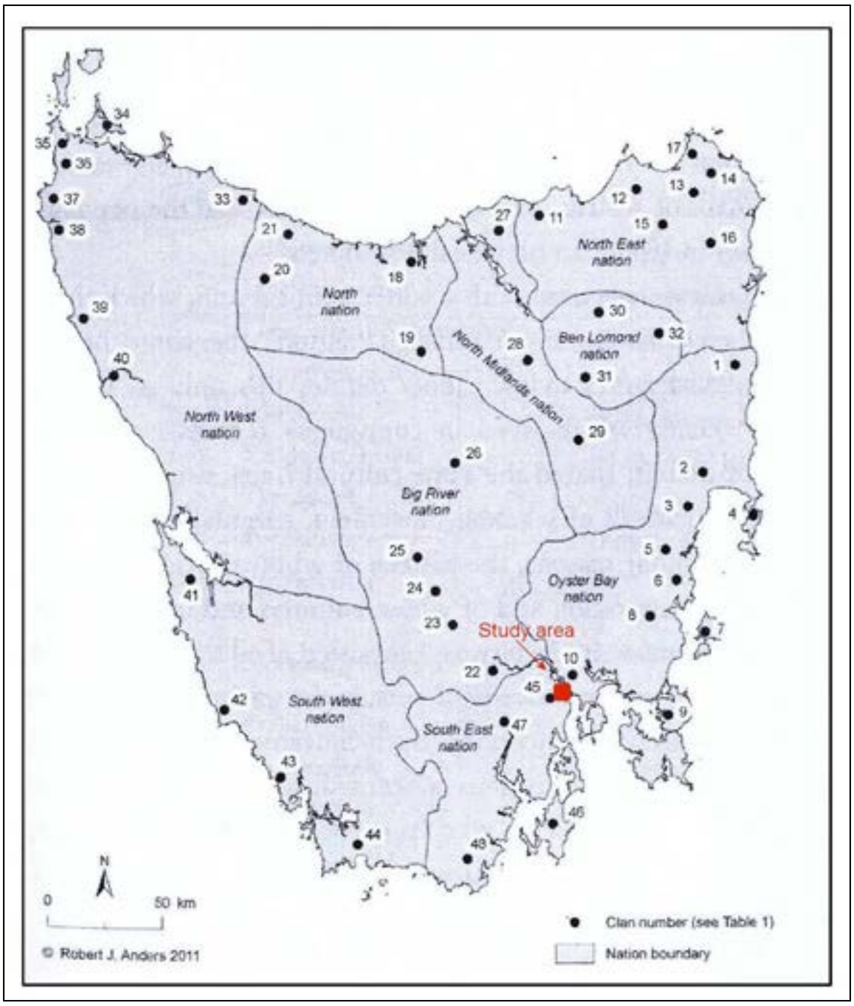


Figure 4: The Aboriginal Nations of Tasmania in relation to the proposed study area (after Ryan 2012:13)

The South East Nation is believed to have spent the vast majority of the year exploiting the resources along the coastline, and the immediate hinterland areas. Their seasonal movement took place up and down the coastline. In winter they were primarily focused along the coastline gathering shellfish. In November they are reported to have gathered on North Bruny Island to exploit the mutton-bird colonies. By mid-summer the people had moved down to Recherché Bay to hunt seals. The South East People are known to have built sturdy bark catamarans, which were used to access the various Islands D'Entrecsasteaux Channel and Bruny Islands. More extensive voyages were also undertaken across Storm Bay to the Tasman Peninsula (Ryan 2012). Figure 5 illustrates the proposed movements of the South East Nation.

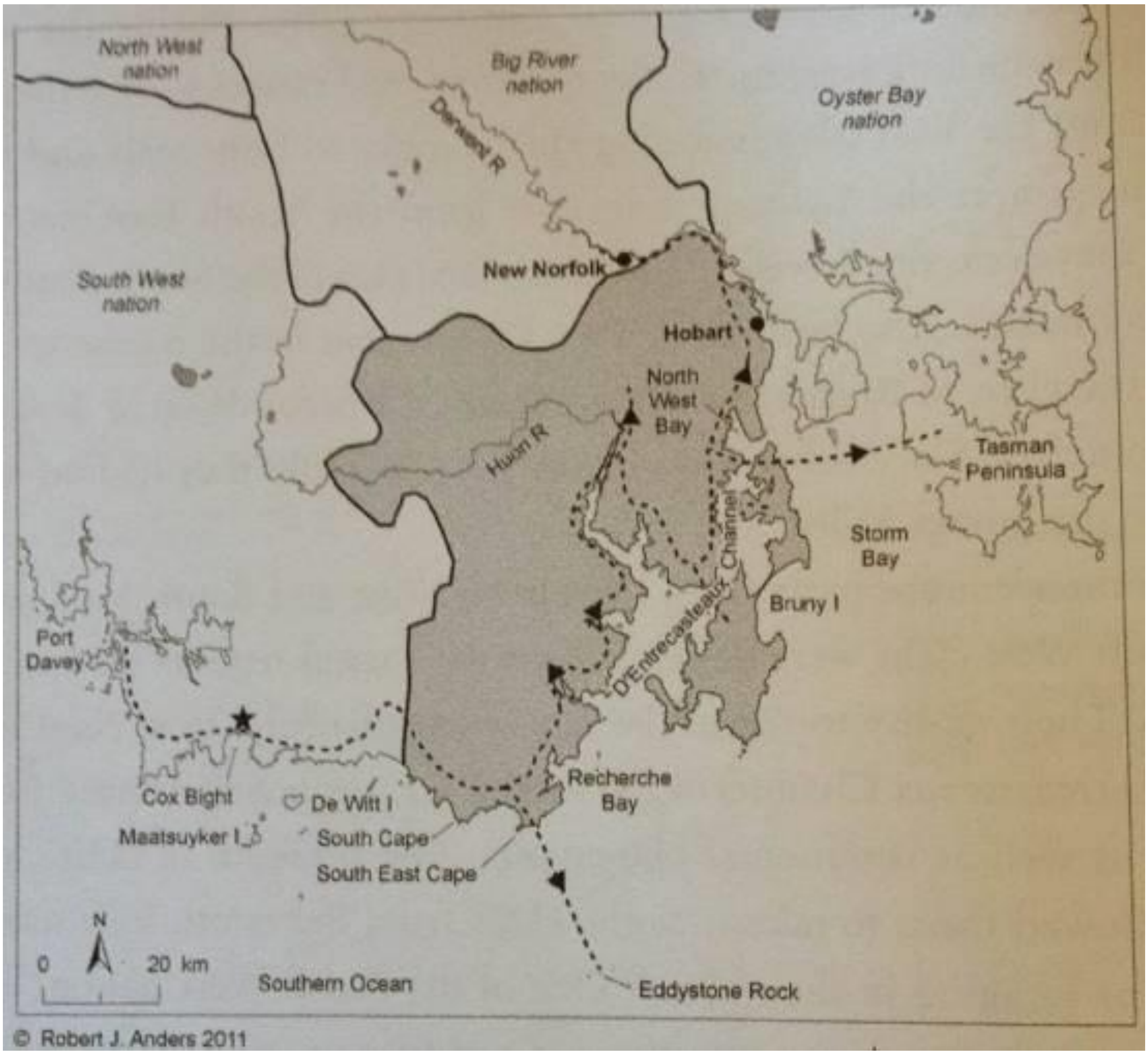


Figure 5: Seasonal movement of the South East Nations (after Ryan 2012:40)

The Subsistence Economy of the South East People

Information gleaned from the variety of ethnographic and historical sources for South East Tasmania provides some illustration of the subsistence economy in this region.

There are a number of ethno-historic accounts that comment on the prevalence of shellfish and crustaceans in the diet of the local inhabitants (see Plomley 1966 and 1983). The archaeological evidence (in the form of midden sites) provides testimony to this.

In contrast, archaeological evidence for the consumption of fish is comparatively very sparse. This has led to some suggestions that fish was not a component of the diet of the Tasmanian Aborigines (see Jones 1974). At Adventure Bay in 1777 Cook reported how Aboriginal people refused a gift of fish (AT 2010:10). Robinson also recorded an instance of trying to convince his Aboriginal companions to eat fish, and the strong reluctance which they demonstrated (Plomley 2008:59).

Ethnographic accounts also indicate that terrestrial fauna was an important component of the Aboriginal diet. This is particularly the case with kangaroos and wallabies, which appear to have been hunted *en masse* at certain times of the year. McGowan (1985:92), for example reports that in May 1804 a large group of Aborigines, variously estimated to be up to 500 individuals, including men women and children were observed hunting kangaroo near the first European settlement at Risdon Cove. Robinson provides an account of the ‘chief’ Mannalargennana of the Oyster Bay tribe cooking wallaby:

> *…The animal is first thrown on the fire whole as is their custom with all animals, and when the hair is singed they take the carcase off the fire and rub off the scorched hair with their hands. This practice is tenaciously observed with all animals except the possum; the fur of this animal is first pulled off previous to its being placed on the fire. After the chief has rubbed the hair off the wallaby, he broke the fore leg by twisting it with his hands…He then cut the hind legs, after which he made a hole in the belly with his fingers and pulled out the entrails and then thrust in some hot ashes, the animal being previously roasted outside.* (Plomley 1966:548-549).

Possum also seems to have been frequently hunted. Plomley (1966:533) describes possums being knocked down out of trees with waddies, or people climbed trees to reach possum holes. Women again are recorded as hunting possum. Robinson records how foot and hand holes were cut in trees to assist climbing and the women used fibre ropes to pull themselves up the trunk (Plomley 1966:533).

Unfortunately, there are very few accounts available for the hunting of other terrestrial fauna. It is likely that a much wider range of species were targeted, including echidna and smaller marsupials.

In the midlands region, birds and eggs appear to have also formed a major component of the diet of the local inhabitants, with swans, ducks and red bills being some of the main species targeted (Plomley 1966: 217). However, there are very few historical accounts are available for South East Tasmanian regarding the hunting of birds and gathering of eggs. Nonetheless, it is reasonable to assume that this also was carried out at certain times of the year.

Only a few plant foods are documented in the ethnohistoric accounts as having been eaten. This includes a bulbous plant known as 'native bread' and a plant that has the appearance of asparagus which was found by the roots of peppermint trees (Plomley 1966). It is very likely that many more plant foods were eaten by the local Aboriginal population. Jones (1971:91-95) for example lists 70 edible plant species that are available in Tasmania, and are likely to have been consumed at times of seasonal availability. This would include tree ferns, fern roots, pig face and a variety of sea weeds.

Material Culture

The ethnographic observations of early European explorers provide a valuable snapshot into aspects of the material cultural and social customs of the Aboriginal people of South East Tasmania. These observations are especially valuable where they describe to those items and practices that do not survive in the archaeological record. Clothing, shelter, weapons and hunting tools are all aspects of material culture described in ethnographic sources.

While the early European explorers generally recorded the people of South East Tasmania as being mostly naked, there are references to kangaroo skin being used for capes, slings and binding for wounds. Both William Anderson (Cook's surgeon in 1777 when he anchored briefly in Adventure Bay) and Labillardiere (the 1793 expedition anchored in Recherche Bay) recorded seeing kangaroo skin used to bind injured feet (Dyer 2005:25). This was very effective it would seem as the people were able to keep up with their companions (Dyer 2005:26). Cook also recorded women using kangaroo skin slings to carry children, and there are several illustrations of this in the paintings by Petit and Lasueur from the Baudin expedition (Bonnemains *et al* 1988). Baudin's diaries suggest that women wore kangaroo skins slung across their shoulders, which provided both warmth and a means of carrying children and other items (Cornell 1974:329).

Ethnographic sources document a range of shelters used in Tasmania. The most common in the South East were simple windbreaks of thick strips of bark woven together and supported on vertical wooden poles, as seen in the artwork from the Baudin expedition (Bonnemains *et al* 1988). These shelters were often built facing west, offering protection against the cold winds off the Channel to the east (AT 2010:16). The other major type of shelter in South Eastern Tasmania was a durable, weatherproof structure made from bending leafy branches together to form a 'beehive' looking hut (AT 2010:15).

Robinson reported seeing huts that were decorated with symbols he recognised as similar to those observed in rock engraving sites at Cape Grim (Plomley 2008:17). In June 1804 Lieutenant Governor Collins made contact with Aboriginal people living on the Huon River (Plomley 2008:18). He recorded an 'Aboriginal village' with about twenty families congregated at the site. Labilliare similarly documented seeing a group of 5-6 huts made of 'leafy branches' and surrounded by a single fire, suggesting communal cooking, and piles of shellfish (AT 2010:16).

Plomley (1983:185-194) provides a comprehensive account of the weapons and hunting implements used by the Tasmanian Aborigines, based on the ethnographic accounts. It appears that the two main weapons used by the local inhabitants were the spear and the club. The spear was a simple flexible rod with a point at one end, the length of which appears to have varied significantly from between 6-12 feet. Spears in South East Tasmania do not seem to have been hafted with points, nor were they barbed (AT 2010:17). The waddie or club is described as a piece of wood about 60cm long, 2.5cm in diameter and slightly tapered toward the gripping end. This item is reported to have been used as a throwing stick as well as a club. In addition, Labilliardere records women at Recherche Bay collecting shellfish using a small chisel like wooden implement to prise the shellfish from the rocks (Plomley 1983:22).

In many of the early ethnographic accounts for the South East region, there is reference to the baskets carried by the Aboriginal people. The ethnographic sources indicate at least four different types of basket making in South East Tasmania. There are a number of reports of water vessels constructed from the fronds of giant kelp which could hold up to five to ten litres of water (see Labillardiere 1800:190). Other types include braided baskets made from bark and dried seaweed, woven rush baskets and grass baskets made from a grass called an iris that grew on Bruny Island (AT 2010:17). One of the more detailed descriptions of basket manufacture comes from Robinson while he was on Bruny Island:

> *The native basket is made of rushes of a species of grass called iris. In preparing them for use they place the same on a slow fire which gives them a tenacity that enables the manufacturer to twist them into threads. These are plaited together and then formed into a basket which in shape is somewhat semiglobular.* (Plomley 1966:58)

There are numerous ethnographic accounts for the South East region describing the watercraft used by the local inhabitants. From these accounts it appears that the South East people were active in their travels between the mainland and the numerous offshore islands.

One of the most detailed descriptions of these watercraft comes from Louis Freycinet, an officer on the *Naturalist* in 1802:

> *We have seen them and have measured several. They had the same dimensions and were constructed in exactly the same way. Three roles of the bark of the eucalypt made up its whole structure…These bundles when taken separately, resemble in a way the yard of a vessel, were joined at their ends, and this caused them to stick up in a point and make up the whole of the canoe. The assemblage was made quite firm with a sort of grass or sedge. In this state, the craft had the following dimensions-*
>
> - *Length inside 2.95m*
> - *Breadth outside 0.89m*
> - *Total height 0.65m*

- *Depth inside 0.22m*
- *Size at the ends 0.27m*

The savages can put five or six peoples in these canoes; but more commonly only three or four are taken at a time. Their paddles are plain pieces of wood… Usually they sit down to manoeuvre their canoes; in that case they place bundles of grass to serve as seats. At other times they stand up. We have seen them cross the Channel only in fine weather. One can imagine that such a fragile and imperfect craft would never be able to make their way, let alone keep afloat, in a rough sea… It is to be noted that they always put a fire at one end of their canoes, and to prevent the fire from spreading they place under it a bed of earth or ashes of sufficient thickness. (Plomley 1983:119-120).

Interestingly, although stone artefacts dominate the archaeological record for Tasmania (and Australia generally), there are few ethnographic accounts in Tasmania documenting their use. Those observations that are made, primarily relate to the finding of stone implements at camp sites. Frustratingly, there are virtually no accounts regarding the form of the implements, how they were made and used. Robinson reports that he:

> *Obtained a stone from one of the Bruny natives with which they sharpen their waddies…It has the resemblance of flint and is found at the Isthmus of Brune [sic]* (Plomley 1966:113)

One of the very few descriptions of Aboriginal people carrying out quarrying activity comes from Raynor who recounted that his father had come across about 20-30 Aborigines, men, women and children, at a quarry near Plenty on the southern side of the middle Derwent Valley:

> *Noisily chatting, they were breaking the stone into fragments, either by dashing them on the rocks or by striking them with other stones, and picking up the sharp edged ones for use…* (Raynor in Roth 1899:151)

This quarry was subsequently visited by Rhys Jones, who noted that the quarried material was an indurated cherty hornfel and that the quarry extended over an area of about 2 ½ hectares (Jones 1971:456).

Aboriginal people of South East Tasmania are described as frequently bearing tattoos and cicatrices. The ethnographers generally describe these as decorative, although it is likely that they held a range of other meanings as well. Robinson described the process of cutting the skin with a sharp stone and rubbing the wound with charcoal or red ochre mixed with animal fat (Plomley 2008:137). The scarring was observed on both men and women and typically was either in the form of a series of short lines, or straight, concentric or circular liens across the chest (AT 2010:25). At Rocky Bay Labillieire noted that people rubbed their bodies with powdered charcoal and records one man whose cropped hair was 'plastered with ochre' (AT 2010:25).

Burial Practices

Burial customs were also observed by the ethnographers. Cremation was the usual form of disposing of a deceased person (Plomley 2008:17). The cremated remains were observed by Robinson to sometimes be wrapped in kangaroo skins and carried as an amulet by members of the deceased person's clan (AT 2010:21). Robinson reports on a funeral pyre built by both men and women of branches and twigs. The body was placed on the pyre with bound arms and legs. This was left to burn for a day, with the relatives returning the following day. The remains were collected and burnt a second time, after which the ash was scattered through the grass (Plomley 2008:17).

Other burial practices in the South East region include internment and burial in hollow trees. Illustrations from the Baudin expedition show 'tombs' at Maria Island (Bonnemains *et al* 1988:131). These were bark tepee-like constructions built over remains that have been covered in fibres or leaves weighted down by rocks (Bonnemains *et al* 1988:131). The practice of placing remains in hollow trees in the South East region is reported by Robinson (Plomley 2008; Austral Tasmania (AT) 2010:21). Hollow tree burials are perhaps associated with violent deaths, as occurred in the Central Highlands (AT 2010:20).

Land Management

Aboriginal people across South Eastern Tasmania appear to have actively managed their environment. Historical sources provide numerous references to burning vegetation. AT (2010:9) suggest that this had a range of applications, including modifying the environment, attracting terrestrial game, encouraging edible plant regrowth and maintaining pathways used to travel across the country. Robinson recorded that Aboriginal people in the South East would travel along 'well beaten paths' and leave abalone shells at drinking places along rivers (Plomley 2008:59). Aboriginal pathways were also utilised by the first European settlers to the area.

The Aboriginal people of the South East greatly valued fire and there are several first-hand accounts of fire being transported by means of burning torches or 'fire brands'. In 1777 Bligh recorded seeing a basket of white 'flint like stones' at Adventure Bay (AT 2010:12). These are likely to have been fire brands.

Baudin in 1802 reported seeing a 'multiplicity of fires' burning in 'on all sides' from where his ship was anchored in North West Bay (AT 2010:12). Captain Hamlin reported to Baudin watching two Aboriginal men pull up their canoe at North West Bay and walk into the scrub, setting fire to the undergrowth as they walked (AT 2010:12).

3.2 Contact History

It appears that outside the initial settlements at Risdon and Sullivan's Cove, there was a brief period of amicable relations between Aboriginal people and the European settlers. For the most part, the Mouheneener would not visit British camp at Sullivan's Cove, and were friendly to small groups of Europeans met in the bush.

In 1804, Colonial chaplain Robert Knopwood records observing 'a great many native huts and fires they made' on the western shore of the Derwent, north of Hobart (Nicholls 1986). He also recorded that Aboriginal people were around the camp at Sullivans Cove but could not be persuaded to enter (Nicholls 1986). By 1805, Aboriginal people were visiting outlying huts in areas near now Kingston, Taroona and New Town, with trades systems established in which Aboriginal people would exchange kelp and crayfish in return for bread and potatoes (AT 2013:8).

However, these friendly relations where relatively short-lived. Conflicts over food resources triggered a deterioration in these relationships as European settlers sought to augment their meagre resources with freshly caught game. Hobart the surrounding areas became vital hunting grounds supplying kangaroo meat to the struggling colony on the brink of starvation (Alexander 2006:5).
The economic importance of the kangaroo hunters to the success of the colony cannot be over emphasised. Without the supply of kangaroo meat, the government would have been unable to meet the rations and maintain the settlement (Boyce 2009:52). The European consumption of kangaroo was so great that by late 1808 they had been largely exhausted from the immediate surrounds of Hobart – causing hunting parties to venture further afield. The reliance of the colonisers on kangaroo brought them into direct conflict with the Aboriginal people.

At first, the Europeans were at an advantage as they had hunting dogs that greatly increased the numbers of kangaroo that a hunter could kill (Boyce 2009:52). But, Aboriginal people quickly adapted to the use of dogs, an example of rapid cultural and economic adaptation. This brought the two groups onto a more even par (Boyce 2009:66). This period of parity only lasted while the European population was small; as early as 1806 the kangaroo populations around Hobart had been decimated and the hunters were being forced to move further north, towards the Brighton district (Boyce 2009:54). The British settlement was literally starving, and there was a strong economic imperative for hunters to extend to the north in search of fresh sources of game. As the settlement continued to expand, both the colonists need for a meat supply, and their transformation of the hunting grounds into cleared, pastoral farms set the scene for an escalation in conflict (Boyce 2009).

As the population of Van Diemen's Land increased, farms gradually spread out along the shores of the Derwent, the agricultural economy grew and land grants increased in number.

Isolated relationships between Aboriginal people and European settlers have been recorded during this time. For example, Knopwood, who was granted land at Battery Point, records having a 17 year old Aboriginal girl come to his home seeking fire (1806), and several years later a group of seven Aboriginal people coming to his home and camping in the garden to gather oysters and mussels from the nearby shore (now Salamanca Place) (Nicholls 1986).

Of William Collins, a settler at Macquarie Point, Knopwood records 'He see many of the natives and was conducted to the town by some of them. Where there were about 20 families, he stayed all night with them; they were very friendly. He see 3 of their cattermerans or small boats made of bark that will hold about 6 of them' (Nicholls 1986 cited in AT 2013).

A more prolonged relationship existed between Edward Lord and an Aboriginal man named 'Musquito' whom Lord employed as a stock keeper. In 1816, Musquito accompanied Lord on a cattle-buying mission to Mauritius (AT 2013).

Visits by groups of Aboriginal people to Hobart Town continued into the early 1820s; Robinson records Aboriginal people visiting the Town in both 1824 and 1825.

Between 1804-1824 interactions between Aboriginal and Europeans have been classified as 'uneasy co-existence', however things became much more hostile following 1824. By the 1820s the European population of the town had exploded, resulting in a corresponding increase in the issuing of land grants over the most valuable grass plains. This in-turn caused issues relating to access to native game, hunting grounds and the connection of Aboriginal people with their traditional tribal lands (AT 2013). Attempts to forcibly remove Aboriginal people from the areas settled by Europeans failed and unprecedented violence ensued.

Clashes with Aboriginal communities became more frequent and more violent as European settlement expanded. Lieutenant Governor George Arthur proclaimed Martial Law in November 1828, leading to the active pursuit, capture and death of many Aboriginal people. A bounty was introduced in February 1830 of five pounds for every adult captured and two pounds for each child. In the two years between November 1828 and November 1830 some twenty Aboriginal people were captured and a further sixty lost their lives (Ryan 1996:102).

This violence culminated in the declaration in November 1828 of Martial Law against the Aboriginal people in the 'settled areas' (Ryan 1996:101). A series of six 'roving parties' were established for the purposes hunting and capturing the remaining Aboriginal occupants of the settled areas. This military action resulted in a general increase in the scale of violent conflict between Europeans and Aboriginals, and by 1830 it was decided that a full scale military offensive was required in order to quell the Aboriginal uprising.

This operation, termed the 'Black Line', involved the assembly of 2000 men in October 1830. They formed a human chain that swept through the settled districts over a period of three weeks, with the aim of driving the remnant Aboriginal populations from these areas. The Black Line was Governor Arthur's response to repeated insistence from settlers that Aboriginal people should be removed from the midlands (Alexander 2006:15). This reflects the level which conflict had reached by 1830. Martial Law was finally revoked in 1832 (Ryan 1996:112-113).

The Black Line itself proved to be a dismal failure, with the total capture of two Aborigines and death of another three. However, it was sufficiently distressing to the general Aboriginal community that more than two hundred people subsequently allowed themselves to be persuaded by George Augustus Robinson (the 'Protector of Aborigines') to relocate to Flinders Island in exchange for food, shelter and safety

(Lines 1991:47). They were further promised that they would be returned to their former homes on the Tasmanian mainland as soon as possible.

By 1835 the majority of the 220 Aborigines who arrived with Robinson at the Wybalenna Aboriginal establishment on Flinders Island had died from inadequate shelter, insufficient provisions and introduced disease. Birth rates were extremely low and few children survived infancy. In 1847 six Aborigines at Wybalenna made a petition to Queen Victoria asking that the promises made to them be honoured. In October 1847, the surviving 47 Aborigines were transferred to their final settlement at Oyster Cove. Only forty four people survived the trip (Lines 1991:47).

The Oyster Cove settlement was located just to the north of Kettering. Conditions at Oyster Cove were only marginally better than at Wybalenna and the Aboriginal population continued to experience high mortality rates. However, throughout the 1850s and 1860s the European settlers recorded numerous anecdotes of Aboriginal people at Oyster Cove maintaining elements of their pre-contact lifestyle (AT 2010:26). The best known example is Fanny Cochrane who married ex-convict William Sawyer. She is reputed to have practiced traditional shellfish gathering, basket making, medicine and religious practices (AT 2010:27).

4.0 Background Archaeology

4.1 Regional Studies

The study area is situated within the South-East region of Tasmania. There have been a number of Aboriginal archaeological studies undertaken within the South-East region over the past two decades. The majority of these have been in the form of survey assessments associated with proposed development activities, and have focused on discreet areas (these are summarised in section 4.2) However, there has also been some broader research based investigations undertaken in the region. Probably the most comprehensive of these and the one most pertinent to the present investigations are that of Officer (1980) and Brown (1986).

Officer (1980)

Iain Officer (1980) carried out an extensive survey of the Derwent Estuary region, as part of his thesis works. The areas covered by the survey investigations extended from Blinking Billy Point (west bank of River) and Trywork (east bank of River), upstream to New Norfolk. The survey assessment in this area involved walking a series of survey transects along the shoreline of the River, with transects in some areas extending up to 1km inland from the River.

In the course of his investigations, Officer recorded a total of 416 midden sites. Of these, 298 were located on the east bank of the River and 118 on the west bank (Officer 1980).

The shell midden sites identified by Officer were predominantly comprised of mussel (*Mytilus planulatus, Xenostrobus secures* or *Brachidontes rostratus*) and oyster (*Ostrea angasi*). A wide range of other shell fish species were represented in low numbers at a number of these sites (Officer 1980).

Stone artefacts were observed at 33 of the recorded midden sites (28 artefacts on the east bank and 5 artefacts on the west bank). A wide range of stone material types were represented in these artefact assemblages, including cherty hornfels, silicified breccia, mudstone, chalcedony, quartz, basalt and dolerite (Officer 1980).

Bone material was observed at only four midden site locations, indicating that for whatever reason, bone material in middens on the Derwent River is a rare occurrence (Officer 1980).

One of the areas intensively surveyed by Officer (1980) was Bedlam Walls, which lies on the east side of the Derwent River, between Geilston Bay and Risdon Cove and extends up to 1.2km inland from the shore of the River. Officer (1980) recorded a total of 74 sites in this area (sites AH 1184-1257). The vast majority of sites are classified as middens, however, three stone quarries and one rock shelter was also identified. A large number of the midden sites (28%) are described as being extensive, covering in excess of 1000m², with the largest site being over 8000m² (Officer 1980). The midden sites range from being located immediately on the shore line through to up to 530m inland from the shore. The dominant shell material represented in these midden sites was the black mussel (*Mytilus planulatus*) and oyster (*Ostrea angasi*).

Officer (1980) notes that a local resident (Dr Jacklyn) also recorded a large number of Aboriginal sites in the Bedlam Walls area, in the period between 1965-1973. The sites recorded by Officer (1980) included those site identified by Dr Jacklyn. Officer identified an additional 19 midden sites to those identified by Jacklyn. As part of his recording efforts, Dr Jacklyn carried out an extensive salvage of stone artefacts in the Bedlam Walls area. Jennings (1983) subsequently undertook an analysis of this collection. Jennings (1983) reports that of the 1016 pieces of stone material collected by Dr Jacklyn, 991 pieces are determined as being stone artefacts, giving an average artefact density for the area of 381 artefacts/km^2. The majority of artefacts were collected from the shoreline area between Shag Bay and Geilston Bay (641 artefacts). Of the 991 artefacts, 633 were un-worked and 358 are worked. Stone material types represented in the assemblage include hornfels, quartzites, chalcedony and sub-basaltic hornfels (Jennings 1983).

Brown (1986)

Steve Brown (1986) was engaged to carry out the South East Tasmanian Archaeology Project. This was one of nine regional overview studies, funded through National Estate grants, which were directed at examining the Aboriginal archaeological resources of Tasmania. The aims or duty statement for the South East Tasmanian Archaeology Project was to define the prehistory of the region and to define present and potential future impacts on the Aboriginal heritage resources in the region.

As part of his research design, Brown (1986:49-50) divided the landscape of the south-east region into landform unit types. Five major landform unit divisions were identified. These were;

- small offshore islands,
- Bruny Island,
- coastal and estuarine environments (consisting of coastal margins, coastal plains, river estuaries, lagoons and swamps),
- inland hills, plains and river valleys, and
- inland mountains (alpine plateau).

Brown (1986:49-50) then collated available archaeological data for these landscape units, including the range of site types present, the site components and the distribution and frequency of sites. The data was generated from previous archaeological investigations undertaken in the region, as well as the findings from the field work carried out by Brown.

Of the five landscape units identified by Brown (1986), the most pertinent to the present investigations are the coastal and estuarine environments. The following provides an overview of the findings, as presented by Brown (1986) for this landform unit.

Coastal and Estuarine Regions

The Coastal and Estuarine Regions consists of coastal margins, coastal plains, river estuaries, lagoons and swamps. It encompasses the River Derwent.

Brown (1986:79) notes that shell middens are by far the most common site type occurring within the coastal and estuarine environmental zone. A number of trends were observed in relation to the distribution of this site type within the coastal and estuarine environmental zone, and the composition of materials at these sites. These are summarised as follows.

- Middens are generally not present in areas with steep shore profiles.
- The greatest number of middens was identified on coast lines which contain a mixture of rocky headlands and short sandy beaches (mixed coast areas).
- On long sandy beaches the volume of midden material was found to decline with distance from a rocky coast.
- Middens are essentially comprised of two types; rocky coastal and bay estuarine, reflecting different landscape settings. However, middens with shell species common to both these types occur in intermediate zones such as estuary and lagoon mouths.
- The largest rocky coastal shell middens occur on rocky headlands and points, with associated rock platforms, where abalone, turbo, mussels and limpets occur.
- The bay estuarine type middens are generally composed predominantly of mussel and oyster shellfish species. The largest middens are found immediately adjacent to the shoreline, near to the shell fish resources. A few sizeable middens have been noted up to 500m inland, with smaller middens having been identified up to 1km inland.
- Shell middens in South-east Tasmania are comprised almost entirely of shell, and rarely contain large numbers of stone artefacts or faunal remains (Brown 1986:79-82).

Overview for the South-East Tasmanian Region

In summary, Brown (1986:99-102) has identified the following broad patterns of site type distribution in South-East Tasmania.

- Aboriginal archaeological sites occur in all parts of the landscape.
- The coastal margins (including off shore islands), coastal plains and river estuaries are very rich in archaeological resources and contain a high density of sites with large quantities of archaeological remains. The Derwent Estuary in particular was an area of rich archaeological resources.
- Inland sites are dominated by open artefact scatters and isolated artefacts. Artefact densities are highest along the river, rivulet and creek valley floors and adjacent to lower hill slopes, particularly where the hill slopes are gently inclined, with a north aspect, and have sandy well drained soils.
- Shell middens most frequently occur in close proximity to shellfish resources, particularly on cliff tops or headlands where there is easy access to these resources.
- Stone artefact quarries most frequently occur where there is a surface expression of geological contact zones, in particular between Jurassic dolerite and Triassic or Permian strata.

As a general statement, Brown (1986:102) summarises that site numbers and densities in South-east Tasmania are greatest within 300m of the present coastline and in the immediate vicinity of coastal lagoons.

In terms of environmental factors determining site location, Brown (1986:103) is of the opinion that topography is perhaps the most consistent and important factor. Sites in general, but particularly the larger ones (in terms of artefact numbers) are very seldom found on steep gradient slopes.

In terms of duration of Aboriginal occupation, Brown (1986:99-100) believes that the South-eastern Tasmanian region has probably been occupied by Aboriginal people for the past 20 000 years. However, he acknowledges that there are no conclusive dates for sites beyond 6000 years old for the region. Pleistocene dates have however been obtained for sites in close proximity to the region (Beginners Luck Cave and a cave on the Weld River).

4.2 Registered Aboriginal Sites in the Vicinity of the Study Area

As part of Stage 1 of the assessment process, a search was undertaken of the Aboriginal Heritage Register (AHR) to determine whether any registered Aboriginal heritage sites are located within or in the general vicinity of the UTAS Sandy Bay campus study area.

The search shows that there are a total of 25 registered Aboriginal sites that are located within an approximate 2km radius of the study area (search results provided by Kate Moody from AHT on the 23-8-2019).

Aboriginal shell middens are the most common site type represented (11 sites). These shell midden sites are concentrated along the foreshore margins of the River Derwent, with most of them having been recorded by Officer (1980), as part of his extensive survey assessment of the River Derwent Estuary (see section 4.1 for details). One the shell middens (AH13119) is reported as having stone artefacts in association with the midden deposit.

Aboriginal rock shelters also feature prominently in the AHR search results (6 sites). Five of these rock shelters are classified as Unoccupied, which means that as yet no definitive evidence for Aboriginal occupation has been confirmed, however there is the potential for this evidence to be present. One of the rock shelters (AH6593) is classified as Occupied. Four of the rock shelters are situated within the Knocklofty Reserve, around 2km to the north-west of the study area (sites AH6592 – AH6595). The other two rock shelters are situated within the Waterworks, 1.5km to the west of the study area (sites AH7991 and AH7992). The six rock shelter sites all occur in areas where the bedrock geology is sandstone, which is conducive to the formation of overhang features.

There is one recorded Aboriginal quarry within a 2km radius of the study area (site AH345). The site is located at Blinking Billy point, on the western foreshore margins of the River Derwent, around 2km to the south-east of the study area.

The remaining sites are classified as either Artefact scatters (4 sites) or Isolated artefacts (3 sites).

Table 1 provides the summary details for these 25 sites, with Figure 6 showing the reported location of the 25 sites, in relation to the study area boundaries (based on information generated from the AHR).

None of these 25 sites are situated within or in the immediate vicinity of the UTAS Sandy Bay campus study area. The closest site is AH977 (a shell midden) which is located at Wrest Point, 700m to the east of the study area.

Table 1: Summary details for the 25 registered Aboriginal sites located within a 2km radius of the UTAS Sandy Bay study area (Based on the results of the AHR search dated 23/8/2019)

AH Site Number	Site Type	Locality	Grid Reference (GDA94) Easting	Grid Reference (GDA94) Northing
345	Stone Quarry		529401	5248390
972	Shell Midden	Sandy Bay	529341	5248680
973	Shell Midden	Sandy Bay	528456	5249241
974	Shell Midden	Sandy Bay	528380	5249274
975	Shell Midden	Sandy Bay	528276	5249312
976	Shell Midden	Sandy Bay	528137	5249355
977	Shell Midden	Sandy Bay	527502	5249842
978	Shell Midden		527687	5251250
980	Shell Midden	Battery Point	527512	5251582
11786	Artefact Scatter	South Hobart	524253	5250923
6592	Unoccupied Rockshelter	West Hobart	524753	5251693
6593	Occupied Rockshelter	West Hobart	524754	5251705
6594	Unoccupied Rockshelter	West Hobart	524753	5251719
6595	Unoccupied Rockshelter	West Hobart	524759	5251787
6839	Isolated Artefact	South Hobart	525352	5251082
6974	Shell Midden	Sandy Bay	529312	5248682
6975	Shell Midden	Sandy Bay	529424	5248635
7990	Isolated Artefact	South Hobart	523134	5249699
7991	Unoccupied Rockshelter	Ridgeway	523735	5248933
7992	Unoccupied Rockshelter	Ridgeway	523512	5248982
7993	Artefact Scatter	Ridgeway	522912	5248882
8555	Artefact Scatter	Sandy Bay	529058	5248767
13036	Isolated Artefact	Battery Point	527033	5251664
13037	Artefact Scatter	Battery Point	527047	5251665
13119	Artefact Scatter, Shell Midden	Battery Point	527042	5251662

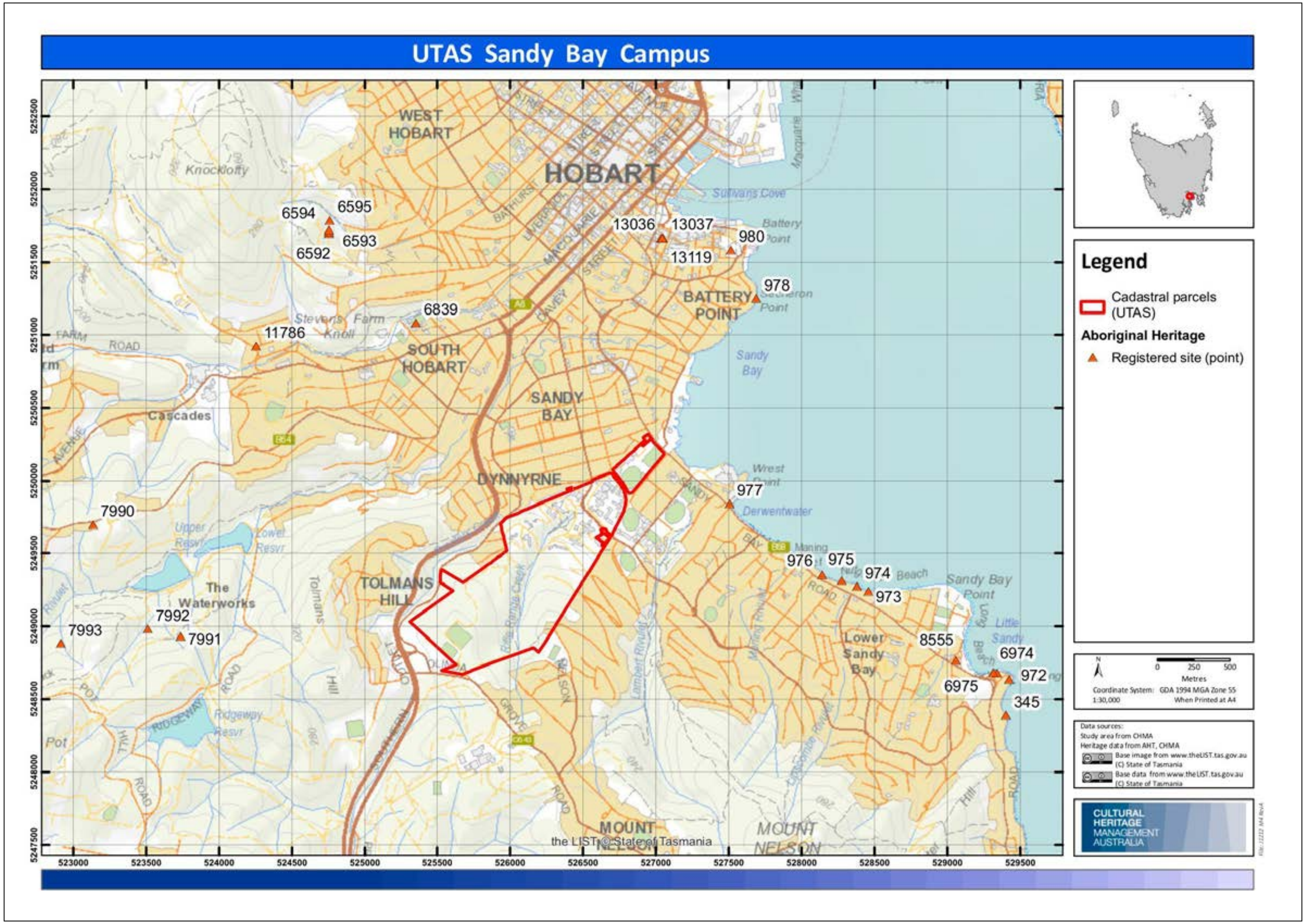


Figure 6: Topographic map showing the location of the 25 registered Aboriginal sites located within a 2km radius of the UTAS Sandy Bay study area (Based on the results of the AHR search dated 23/8/2019)

5.0 Predictive Modelling

5.1 Introduction to Predictive Modelling

Predictive modelling, in an archaeological context, is a fairly straightforward concept and has been utilised by archaeologists in Australia for a number of years as a tool for undertaking research into Aboriginal heritage sites. In summary, predictive modelling involves the collation of information generated from previous archaeological research in a given region, and using this information to establish patterns of Aboriginal site distributions within the landscape of that particular region. On the basis of perceived patterns of site distribution, archaeologists can then make predictive statements regarding the potential for various Aboriginal site types to occur within certain landscape settings, and can make preliminary assessments regarding the potential archaeological sensitivity of landscape types within a given region.

5.2 Predictive Models; Strengths and Weaknesses

It should be acknowledged that most, if not all predictive models have a number of potential inherit weaknesses, which may serve to limit their value. These include, but may not be limited to the following:

1) The accuracy of a predictive model is directly influenced by the quality and quantity of available site data and information for a given region. The more data available and the greater the quality of that data, the more likely it is that an accurate predictive model can be developed.
2) Predictive modelling works very well for certain types, most particularly isolated artefacts and artefact scatters, and to a lesser extent scarred trees. For other site types it is far more difficult to accurately establish distribution patterns and therefore make predictive modelling statements. Unfortunately, these site types are generally the rarer site types (in terms of frequency of occurrence) and are therefore generally the most significant sites.
3) Predictive modelling (unless it is very sophisticated and detailed) will generally not take into account micro-landscape features within a given area. These micro features may include (but is certainly not limited to) slight elevations in the landscape (such as small terraces) or small soaks or drainage depressions that may have held water. These micro features have been previously demonstrated to occasionally be focal points for Aboriginal activity.
4) Predictive modelling to a large extent is often predicated on the presence of watercourses. However, in some instances the alignment of these watercourses has changed considerably over time. As a consequence, the present alignment of a given watercourse may be substantially different to its alignment in the past. The consequence of this for predictive modelling (if these ancient water courses are not taken into account) is that predicted patterns of site distributions may be greatly skewed.

5.3 A Predictive Model of Site Type Distribution for the Study Area

The findings of previous archaeological investigations undertaken in the general vicinity of the study area and the information generated from the AHR search, shows that shell midden sites and Artefact scatters/Isolated artefacts are the most commonly encountered site types in this general area. On this basis, it is assessed that these are the site types that will most likely be encountered within the study area.

Other site types such as Aboriginal stone quarries and Aboriginal rock shelters have also been previously recorded in the broader surrounds of the study area. It is therefore possible, although less likely, that these site types may also be encountered in the study area, given the nature of the underlying geology across the study area and surrounds.

The following provides a description of these site types, and a predictive statement with regards to their possible distribution across the study area.

Shell Midden Sites

Definition

Middens range in thickness from thin scatters to stratified deposits of shell and sediment up to 2m thick. In addition to shell which has accumulated as food refuse, shell middens usually contain other food remains such as bone from fish, birds and terrestrial animals and humus from the decay of plant and animal remains. They also commonly contain charcoal and artefacts made from stone, shell and bone.

Predictive Statement

In the South-East Tasmanian region, the bay estuarine type middens are generally composed predominantly of mussel and oyster shellfish species. The largest middens are found immediately adjacent to the shoreline, near to the shellfish resources, and are on elevated, generally gently sloping or level terrain. A few sizeable middens have been noted up to 500m inland, with smaller middens having been identified up to 1km inland. These shell middens are comprised almost entirely of shell, and rarely contain large numbers of stone artefacts or faunal remains.

The AH register search results show that there are 11 recorded shell midden sites located within a 2km radius of the study area. These sites are clustered along the immediate foreshore margins of the River Derwent.

Based on the site modelling provided above, it is predicted that shell middens would most likely to have been present within the north-east portion of the study area, within 500m of the foreshores of Sandy Bay. However, as noted in section 2 of this report, this north-east part of the UTAS Sandy Bay campus has been extensively developed in the past, with the original landscape entirely modified. This high level of disturbance will mean that there is virtually no possibility for shell midden sites to still survive in this landscape. Further away from the River Derwent, in the central and south-west parts of the study area, the chances of shell midden sites being present decreases significantly.

Artefact Scatters and Isolated artefacts

Definition

Isolated artefacts are defined as single stone artefacts. Where isolated finds are closer than 50 linear metres to each other they should generally be recorded as an Artefact Scatter. Artefact scatters are usually identified as a scatter of stone artefacts lying on the ground surface. For the purposes of this project, artefact scatters are defined as at least 2 artefacts within 50 linear metres of each other. Artefacts spread beyond this can be best defined as isolated finds. It is recognised that this definition, while useful in most instances, should not be strictly prescriptive. On some large landscape features for example, sites may be defined more broadly. In other instances, only a single artefact may be visible, but there is a strong indication that others may be present in the nearby sediments. In such cases it is best to define the site as an Isolated Find/Potential Archaeological Deposit (PAD).

Artefact scatters can vary in size from two artefacts to several thousand, and may be representative of a range of activities, from sporadic foraging through to intensive camping activity. In rare instances, campsites which were used over a long period of time may contain stratified deposits, where several layers of occupation are buried one on top of another.

Predictive Statement:

Previous archaeological research in the region has identified the following pattern of distribution for this site type:

- Stone artefact scatters are numerous within the larger river valley systems;
- The largest open artefact scatters tend to be situated on well-drained sandy soils, in slightly elevated positions above river and creek floodplains, with a north aspect;
- Site and artefact densities on the lower lying flood plains of watercourses tend to be comparatively lower. This may be reflective of the fact these low lying areas were less favoured as camp locations, due to such factors as rising damp and vulnerability to flooding; and
- Site and artefact densities also tend to be comparatively lower in areas away from watercourses, and on moderate to steeply sloping terrain.

The study area is located on the north-east side slopes of the prominent hills and ranges that fringe the western margins of the River Derwent Estuary. The terrain across the majority of the study area is characteristically moderate to steeply sloping, with gradients mostly in excess of 20º. The exceptions are the crest of a knoll in the south west corner of the study area, around Olinda Grove, and the north-east portion of the study area, where the lower hill slope gradients decrease to below 10º. However, these areas of lower slope gradients have been heavily developed. The only water course within the study area is Rifle Range Creek, which is an ephemeral water course that runs through s small, steeply incised valley.

Applying this broad pattern of site distribution described above to the study area, it would be anticipated that site and artefact densities within this type of landscape setting are likely to be generally low to very low. The most likely areas where sites would be encountered would be on any elevated, level and well drained landscape features close to Rifle Range Creek, and on the crests of the knoll and smaller spurs that occur in the study area. Particularly in those areas where the slope gradients on these landscape features reduce to below 5º. However, once again, the heavily disturbed nature of the lower slope gradients in study area means that it is very unlikely that these site types will have survived in this landscape. Elsewhere, across the steeper hill slopes, site and artefact densities would be expected to be very low.

Stone Procurement/Quarry Sites

Definition

A stone procurement site is a place where stone materials were obtained by Aboriginal people for the purpose of manufacturing stone artefacts. Quarry sites on the other hand have some evidence of the stone being actively extracted using knapping and/or digging. Stone procurement sites are often pebble beds in water courses (where there may be little or no evidence of human activity) or naturally occurring lag deposits exposed on the surface. Quarry sites are usually stone outcrops, with evidence of knapping and pits dug to expose the rock. Concentrations of hammer stones and a thick layer of knapping debris are often present.

Predictive Statement

Previous archaeological research in the South East Tasmanian region has shown that the most common source of raw materials for making stone artefacts are outcrops of stone materials such as silcrete, cherty hornfels, quartzites, quartz, and fined grained volcanics. These tend to occur along prominent landscape features, such as the spines of ridges or on hills.

As noted in section 2 of this report, the bedrock geology of the study area is dominated by dolerite and smaller patches of Triassic sedimentary sequences and Undifferentiated Paleogene sequences. These rock types are typically not suited for artefact manufacturing. However, it is possible that discrete patches of suitable stone materials may occur around any geological contact zones that occur in the study area. If this is the case, then Aboriginal stone quarries may be encountered.

Rock Shelters and Rock Art Sites

Definition

As the name implies, these sites are formed under rocky outcrops which may either be escarpments hollowed by erosion, or in the case of rocks such as granite shelters, may be located under boulder overhangs. Such sites may contain deposit and/or art. Rock art consists of paintings, drawings and/or engravings on rock surfaces. Some of the art may have had a ceremonial or ritual purpose, while other art may have been produced for more secular purposes.

Predictive Statement

Obviously, rock shelters will only occur in areas where there are rock formations of a suitable size and scale to provide potential shelter for human habitation. In the River Derwent Valley system, the most common form of rock shelters are sandstone caves/overhangs. The six Aboriginal rock shelter sites that have been recorded within a 2km radius of the study area all occur in areas where sandstone bedrock occurs.

The underlying geology across the study area is dominated by dolerite. There is no sandstone bedrock occurring within the study area. It is therefore very unlikely that rock shelter sites or art sites will be present. However, it may be the case that there are that there are he occasional sizable dolerite boulders present somewhere in the steeper parts of the study area that may be suited for use as a temporary shelter.

6.0 Survey Coverage of the Study Area

Survey Coverage
Survey coverage refers to the estimated portion of a study area that has actually been visually inspected during a field survey.

The study area encompasses a total of approximately 100ha. The field team walked a series 14.2km of survey transects across the study area, with the average width of each transect being 5m. This equates to a survey coverage of 71 000m².

The survey transects were mainly focused in those parts of the study area where natural ground surfaces and original soil deposits were still present. This was in the central and south-west parts of the campus, to the west of Churchill Avenue. This approach was adopted, because it was assessed that these areas had the highest potential for Aboriginal heritage sites to still be present in the landscape.

The field survey largely avoided those areas where there were built surfaces such as carparks, roads, playing fields and existing buildings. This decision was based on the premise that any Aboriginal sites that may once have been present in these areas will have been destroyed by past development activity.

As noted in section 1.3 of this report, the field team was unable to access the UTAS Horticulture research facility on the campus. This area, which encompasses approximately 4ha, and is located on the south-east boundary of the study area, has a security fence around the perimeter of the site.

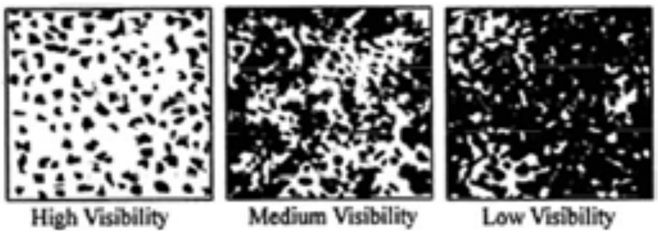
Figure 8 shows the alignment of the transects walked by the field team.

Surface Visibility
Surface Visibility refers to the extent to which the actual soils of the ground surface are available for inspection. Surface visibility across the study area was variable, ranging between 0% - 90%, with the estimated average being 25%. This is in the low range (see Figure 7 for visibility guidelines).

The main constraint to surface visibility was the presence of built surfaces, fill material and vegetation cover. The poorest surface visibility was in the north-east of the study area, where built surfaces in the form of roads, carparks and buildings cover virtually the entire area, obscuring the natural soil deposits (see Plates 12 and 13).

Surface visibility was somewhat approved across the central and south-west parts of the study area, within the University Reserve. There a network of graded vehicle tracks and walking tracks that run through the reserve, and these afforded transects of improved surface visibility (averaging 70% on these tracks). In an effort to improve the effective coverage across the study area, all of these walking tracks and vehicle tracks were inspected by the field team (see Plates 15-17). It is estimated that 8.7km of survey transects were aligned along these tracks. Vegetation cover across some parts of the reserve, particularly around the south-west boundary, was also quite sparse in areas, with numerous erosion scalds present, which provided locales of improved visibility. Once again, these were targeted by the field team. Elsewhere across the reserve surface visibility was restricted to around 10%, due to vegetation cover (see Plate 14).

Visibility



☐Full (100%) ☐High (75%) ☐Medium (50%) ☒Low (24%) ☐None (0%)

Figure 7: Guidelines for the estimation of surface visibility

Effective coverage

Variations in both survey coverage and surface visibility have a direct bearing on the ability of a field team to detect Aboriginal heritage sites, particularly site types such as shell middens, isolated artefacts and artefact scatters. The combination of survey coverage and surface visibility is referred to as effective survey coverage. Table 2 presents the estimated effective survey coverage achieved during the course of the survey assessment of the UTAS Sandy Bay campus study area. The table shows that while the team covered an area of 72 000m² during the survey, the effective coverage was reduced to 31 875m². This level of effective coverage is not ideal, however, it is still deemed to be sufficient for the purposes of generating a general impression as to the potential extent, nature and distribution of Aboriginal heritage sites across the study area.

Table 2: Effective survey coverage achieved within the UTAS Sandy Bay campus study area

Area Surveyed	Total Area Surveyed	Estimated Surface Visibility	Effective Survey Coverage
Transects on vehicle and Walking tracks	8 700m x 5m = 43 500m²	70%	30 450m²
Transects in all other areas	5 500m x 5m = 27 500m²	5%	1 375m²
Total	71 000 m²		31 825m²

Plate 12: View south-west, showing a sealed carpark within the north-east portion of the study area, completely obscuring the natural soils

Plate 13: View north across the playing fields in the north-east part of the UTAS campus, completely obscuring the natural soil deposits

Plate 14: View north-east showing dense vegetation cover in the south-west of the study area, restricting surface visibility to 10%

Plate 15: View south-west along one of the numerous graded vehicle tracks through the reserve in the central and south-west of the study area, providing improved visibility

Plate 16: View north-east along a graded track in the central part of the study area providing a transect of improved visibility

Plate 17: View south-west along a walking track in the reserve in the central part of the study area, providing a narrow transect of improved visibility

Figure 8: Survey transects walked within the boundaries of the UTAS Sandy Bay campus study area

7.0 Survey Results and Discussion

7.1 Summary Survey Results

No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment of the UTAS Sandy Bay campus study area. As noted in section 4.2 of this report, the results of the AHR search shows that there are no registered Aboriginal sites that are located either within or in the immediate vicinity of the study area boundaries. The closest site is AH977 (a shell midden) which is located at Wrest Point, 700m to the east of the study area. On the basis of these negative results, it is determined that there are no known Aboriginal heritage sites that occur within the study area.

The field survey assessment did not identify any evidence for Aboriginal stone quarrying/procurement activity within the study area. The geology of the study area is dominated by Jurassic dolerite. This stone material type is typically not suited for artefact manufacturing. A geological contact zone was noted in the south-west portion of the study area, around Olinda Grove, where the dolerites intersect with Triassic sedimentary sequences. However, no metamorphosed stone material suitable for artefact manufacturing was identified in this area. Given the nature of the geology in the study area, it is assessed that it is very unlikely that any undetected Aboriginal stone quarry or procurement sites would be present.

No potential Aboriginal rock shelter features were identified in the study area. Again, given the nature of the geology across the study area, which is dominated by dolerite, it is highly unlikely that any undetected rock shelter features will be present.

The apparent absence of Aboriginal heritage sites within the study area can most likely be attributed to a combination of three main factors; the nature of the topography and resources of the study area, the extent of very high levels of disturbances in parts of the study area, and poor conditions of surface visibility. These are discussed in more detail below.

7.2 Further Discussions

The regional study undertaken by Brown (1986) for South East Tasmania is still the most comprehensive investigation undertaken in the region to date. Brown (1986:99-102) has identified the following broad patterns of site type distribution in South-East Tasmania.

- Aboriginal archaeological sites occur in all parts of the landscape.
- The coastal margins (including off shore islands), coastal plains and river estuaries are very rich in archaeological resources and contain a high density of sites with large quantities of archaeological remains. The Derwent Estuary in particular was an area of rich archaeological resources.
- Inland sites are dominated by open artefact scatters and isolated artefacts. Artefact densities are highest along the river, rivulet and creek valley floors and adjacent to lower hill slopes, particularly where the hill slopes are gently inclined, with a north aspect, and have sandy well drained soils.

- Shell middens most frequently occur in close proximity to shellfish resources, particularly on cliff tops or headlands where there is easy access to these resources.
- Stone artefact quarries most frequently occur where there is a surface expression of geological contact zones, in particular between Jurassic dolerite and Triassic or Permian strata.

As a general statement, Brown (1986:102) summarises that site numbers and densities in South East Tasmania are greatest within 300m of the present coastline and in the immediate vicinity of coastal lagoons. In terms of environmental factors determining site location, Brown (1986:103) is of the opinion that topography is perhaps the most consistent and important factor. Sites in general, but particularly the larger ones (in terms of artefact numbers) are very seldom found on steep gradient slopes.

If we apply this broad patterning of site distribution to the UTAS Sandy Bay campus, we can generate some informed statements as to the potential distribution and nature of Aboriginal sites across the study area.

The study area is situated on the hill slopes fringing the western edge of the River Derwent valley estuary. The River Derwent estuary is a major resource zone, hosting an abundance of marine and aquatic resources. The ethno-historic evidence clearly indicates that the estuary was a major focal point of seasonal Aboriginal activity. This is supported by the archaeological evidence, with large numbers of Aboriginal sites identified having been recorded around the fringes of the River Derwent Estuary. The highest density of sites is typically situated within a few hundred metres of the estuarine foreshores, in areas where there is easy access to the marine resources. There is a general decrease in site densities further away from the foreshore margins.

The north-east boundary of the study area approaches to within 150m of the foreshore margins of the River Derwent at Sandy Bay, and extends inland for around 1.5km. The terrain across the majority of the study area is characteristically moderate to steeply sloping, with gradients mostly in excess of 20º. The exceptions are the crest of a knoll in the south west corner of the study area, around Olinda Grove, and the north-east portion of the study area, where the lower hill slope gradients decrease to below 10º. The only water course within the study area is Rifle Range Creek, which is an ephemeral water course that runs through s small, steeply incised valley.

Based on the modelling developed by Brown (1986), it would be anticipated that Aboriginal heritage sites would most likely be concentrated within the north-east portion of the study area, in closer proximity to the foreshores of the River Derwent estuary where the hill slope gradients decrease to below 10º. The most likely site types that would be present would be shell midden deposits and artefact scatters. The denser deposits of shell midden deposits would most probably be concentrated along the immediate littoral zone, within 100m of the high tide mark, which is outside the study area. However, moderate concentrations would still be expected to occur along the north east fringes of the study area. The midden material would most likely have comprised mud oyster and mussel, with low densities of stone artefacts also present. The higher concentrations of artefact scatters would most likely be concentrated on any elevated and level landscape features, close to the margins of Rifle Range Creek, close to the confluence with the River Derwent.

Unfortunately, the north-east portion of the study area, where the highest concentration of sites would be predicted to occur, coincides with the areas that have been subject to the highest levels of disturbances. As noted in section 2, this part of the campus has been artificially levelled, and entirely developed either with buildings, roads and infrastructure, or sporting fields. The ramifications of this are that any Aboriginal heritage sites that may once have been present in this area will have been completely destroyed, or at the very least covered in metres of fill. This explains the negative survey results in this area.

Throughout the remainder of the study area, where the hill slope gradients are typically quite steep, site and artefact densities would be expected to be low to very low. with isolated artefacts and low density artefact scatters being the most likely site type to be present. These sites would be representative of more sporadic hunting and foraging activities. The most likely areas where these sites would occur, would be in discrete flatter areas, where the slope gradients decrease to below 5º. The main area is on the south-west boundary of the study area, on the crest of the hill around Olinda Grove. The Olinda Grove sporting fields covers much of this hill crest area. Once again, any Aboriginal sites that may have been present in the area where the sporting fields now exist will have been destroyed. However, there are still some parts of the hill crest that remain relatively undisturbed, and there is the potential for sites to be present in these areas.

Much of the steeper terrain within the study area lies within the University Reserve. As discussed in section 6 of this report, surface visibility throughout the reserve was constrained due to vegetation cover. These constraints in surface visibility will have contributed to some extent to the negative survey results throughout this part of the study area. With this acknowledged, there were a network of vehicle and walking tracks throughout the reserve, which provided transects of improved surface visibility. By focusing in on these areas, the field team were still able to achieve effective coverage of over 30 000m², which is quite reasonable. The negative survey results throughout the reserve can therefore be taken as being a reasonable indication that site and artefact densities in this area are low to very low, in accordance with the predictive statements above. Soil deposits across this part of the study area are generally very shallow, and as such, there is little potential for sub-surface artefact deposits to be present.

As noted previously, there are no stone resources present in the study area that would be suitable for artefact manufacturing. Nor are there any rock shelter features suitable for occupation. Therefore, there would be no areas of more intensive activity expected to occur in this area.

7.3 General Interpretations

Based on the available ethnographic information, it appears that the UTAS Sandy Bay campus study area is situated within the range of the Mouheneenner Band from the South East Nation who occupied the land around present day Hobart. The ethnographic accounts for the region, together with the archaeological evidence indicates that the River Derwent Valley was a major seasonal focal point for the Mouheneenner Band. The lower estuary system provided reliable and easily obtainable marine resources including shell fish were an important part of the traditional diet.

Sandy Bay is a sandy shoreline which is fringed to the north by Secheron Point and to the south by Wrest Point, where there are extensive intertidal rock platforms. This mixed shoreline would have hosted a wide range of marine resources. Added to this, was the presence of a series of reliable fresh water sources, including Rifle Range Creek, Proctors Creek and Lamberts Rivulet, all of which empty into Sandy Bay. This confluence of easily available resources, means that it is very likely that Sandy Bay was a significant focal point of seasonal occupation for the local Mouheneenner people. It is likely that the area was visited on a regular seasonal basis by family groups from the Mouheneenner Band, with the main focus of activity being the shell fish resources (specifically mud oyster and black mussels) that were in abundance along the foreshores, and easily accessible. The presence of reliable sources of fresh water, means that the duration of occupation in this area could have extended out to several days at a time.

The regular seasonal occupation of Sandy Bay over several thousand years would have resulted in the deposition and build up archaeological deposits, including shell midden deposits, stone artefacts and hearths (cooking fires). Given the underlying geology of the study area, there is no potential for other site types such as rock shelters or stone quarries being present. The subsequent historic occupation and development of Sandy Bay, including the north-east portion of the UTAS Sandy Bay campus appears to have resulted in massive impacts to the Aboriginal heritage that once would have been present in this area. The AHR search shows that there are still a number of Aboriginal sites scattered along the lesser disturbed parts of the foreshores of this section of the Derwent. These sites are likely to be the remnant deposits of much more extensive Aboriginal sites that were once present.

The hills fringing the River Derwent would have been frequented for hunting and foraging activities, as well as for obtainable stone materials for artefact manufacturing, from known stone resource areas. There are no stone resources present within the study area that is suitable for artefact manufacturing. Nor are there any rock shelter features suitable for occupation. Nonetheless, the study area still would have been frequented occasionally for hunting and foraging activity. The visits were probably short and intermittent so that large scale cultural deposits do not accumulate. The people would carry the majority of their tool kit with them, as they needed to be highly mobile in order to make the most of the seasonal resources and trade opportunities. Artefacts discarded by such groups are likely to be those that are easily replaced. Rates of discard are expected to be low, resulting in low density archaeological sites and artefacts.

8.0 Consultation with Aboriginal Communities and Statement of Aboriginal Significance

The designated Aboriginal Heritage Officer (AHO) for this project is Rocky Sainty. One of the primary roles of the Aboriginal Heritage Officer is to consult with Aboriginal community groups. The main purpose of this consultation process is:

- to advise Aboriginal community groups of the details of the project,
- to convey the findings of the Aboriginal heritage assessment,
- to document the Aboriginal social values attributed to Aboriginal heritage resources in the study area,
- to discuss potential management strategies for Aboriginal heritage sites, and
- to document the views and concerns expressed by the Aboriginal community representatives.

Aboriginal Heritage Tasmania (AHT) has recently advised that there have been some changes to the accepted approach to Aboriginal community consultation, based on recommendations made by the AHC on 28 April 2017. These changes relate to cases where the AHC consider it may be sufficient for a Consulting Archaeologist (CA) or Aboriginal Heritage Officer (AHO) to consult only with the Aboriginal Heritage Council.

The Council recommended that consultation with an Aboriginal community organisation is not required for a proposed project when:
There are less than 10 isolated artefacts that are not associated with any other nearby heritage; or
The impact of the project on Aboriginal heritage:

- is not significant; or
- will not destroy the heritage; or
- affects only part of the outer approximately 20% of a buffer around a registered site

The CA and AHO will need to demonstrate in Aboriginal heritage reports including map outputs:

- that the proposed impact on the Aboriginal heritage within the project area is not significant and why;
- that the project activity will not destroy the heritage;
- that the proposed impact to the site buffer is not adjacent to a significant component of the registered site polygon.

No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment of the UTAS Sandy Bay campus study area. The results of the AHR search shows that there are no registered Aboriginal sites that are located either within or in the immediate vicinity of the study area boundaries. On the basis of these negative results, it is determined that there are no known Aboriginal heritage sites that occur within the study area.

Given the very high levels of historic disturbances across parts of the study area, and the predictive modelling of site distributions, it is assessed that the archaeological sensitivity of the study area is low. On this basis, the decision has been made not to circulate this report for Aboriginal community consultation. Stuart Huys and Rocky Sainty did meet with Professor Maggie Walter from UTAS do discuss the findings of the assessment (meeting held on the 23/9/2019). The report has been provided to AHT for review. Rocky Sainty (the AHO for this project) has provided a statement of cultural significance for the study area. This is presented below.

Statement of Cultural/Social Significance by Rocky Sainty

Aboriginal heritage provides a direct link to the past, however is not limited to the physical evidence of the past. It includes both tangible and intangible aspects of culture. Physical and spiritual connection to land and all things within the landscape has been, and continues to be, an important feature of cultural expression for Aboriginal people since creation.

Physical evidence of past occupation of a specific place may include artefacts, living places (middens), rock shelters, markings in rock or on the walls of caves and/or rock shelters, burials and ceremonial places. Non-physical aspects of culture may include the knowledge (i.e. stories, song, dance, weather patterns, animal, plant and marine resources for food, medicines and technology) connected to the people and the place. While so much of the cultural landscape that was **lutruwita** *(Tasmania) before invasion and subsequent colonization either no longer exists, or has been heavily impacted on, these values continue to be important to the Tasmanian Aboriginal community, and are relevant to the region of the project proposal.*

There is no doubt in my mind that Sandy Bay would have been a focal point of seasonal occupation for my people. The Bay is situated on the margins of the River Derwent, where there was (and still is) an abundance of marine resources, and there was fresh water available in the form of a nearby rivulet and creeks. This combination of easily available resources would have meant that our people camped in this area on a regular basis. This occupation is likely to have extended into the current Sandy Bay Campus. Particularly the gentler sloping areas, closer to the River. Unfortunately, the archaeological evidence for this occupation now appears to have been destroyed by European occupation and development of the lower campus area. Based on my observations, I believe there is little to no potential for Aboriginal sites to still survive in the developed north-east portion of the campus.

The University Reserve which encompasses the majority of the campus is far less disturbed, and retains a significant amount of bush tucker resources that would have been harvested by my ancestors. This includes the native cherry. We didn't find any Aboriginal sites in the reserve area, and to a large extent I believe that this is due to the steep terrain. It is unlikely that our ancestors would have camped for any duration on these steeper hill slopes. Instead, the hills are likely to have been accessed occasionally for hunting and foraging. There may still be sites representing this activity present in this part of the study area, in the form of artefact scatters. However, site densities are likely to be low.

9.0 Statutory Controls and Legislative Requirements

The following provides an overview of the relevant State and Federal legislation that applies for Aboriginal heritage within the state of Tasmania.

9.1 State Legislation

In Tasmania, the *Aboriginal Heritage Act 1975* (the Act) is the primary Act for the treatment of Aboriginal cultural heritage. The Act is administered by the Minister for Aboriginal Affairs through Aboriginal Heritage Tasmania (AHT) in the Department of Primary Industries, Parks, Water and the Environment (DPIPWE). AHT is the regulating body for Aboriginal heritage in Tasmania and '[n]o fees apply for any application to AHT for advice, guidance, lodgement or permit application'.

The Act applies to 'relics' which are any object, place and/or site that is of significance to the Aboriginal people of Tasmania (as defined in section 2(3) of the Act). The Act defines what legally constitutes unacceptable impacts on relics and a process to approve impacts when there is no better option. Aboriginal relics are protected under the Act and it is illegal to destroy, damage, deface, conceal or otherwise interfere with a relic, unless in accordance with the terms of a permit granted by the Minister. It is illegal to sell or offer for sale a relic, or to cause or permit a relic to be taken out of Tasmania without a permit (section 2(4) qualifies and excludes 'objects made, or likely to have been made, for purposes of sale').

It should be noted that with regard to the discovery of suspected human skeletal remains, the *Coroners Act 1995* takes precedence. The *Coroners Act 1995* comes into effect initially upon the discovery of human remains, however once determined to be Aboriginal the *Aboriginal Relics Act* overrides the *Coroners Act.*

In August 2017, the Act was substantively amended and the title changed from the *Aboriginal Relics Act 1975*. As a result, the AHT *Guidelines to the Aboriginal Heritage Assessment Process* were replaced by the *Aboriginal Heritage Standards and Procedures*. The Standards and Procedures are named in the statutory *Guidelines* of the Act issued by the Minister under section 21A of the Act. Other amendments include:

- An obligation to fully review the Act within three years.
- Increases in maximum penalties for unlawful interference or damage to an Aboriginal relic. For example, maximum penalties (for deliberate acts) are 10,000 penalty unites (currently $1.57 million) for bodies corporate other than small business entities and 5,000 penalty units (currently $785,000) for individuals or small business entities; for reckless or negligent offences, the maximum penalties are 2,000 and 1,000 penalty units respectively (currently $314,000 and $157,000). Lesser offences are also defined in sections 10, 12, 17 and 18.
- Prosecution timeframes have been extended from six months to two years.
- The establishment of a statutory Aboriginal Heritage Council to advise the Minister.

Section 21(1) specifies the relevant defence as follows: “It is a defence to a prosecution for an offence under section 9 or 14 if, in relation to the section of the Act which the defendant is alleged to have contravened, it is proved … that, in so far as is practicable … the defendant complied with the guidelines”.

9.2 Commonwealth Legislation

There are also a number of Federal Legislative Acts that pertain to cultural heritage. The main Acts being; *The Australian Heritage Council Act 2003*, *The Aboriginal and Torres Strait Islander Heritage Protection Act 1987* and the *Environment Protection and Biodiversity Conservation Act 1999*

Australian Heritage Council Act 2003 (Comm)

The *Australian Heritage Council Act 2003* defines the heritage advisory boards and relevant lists, with the Act’s Consequential and Transitional Provisions repealing the Australian Heritage Commission Act 1975. The Australian Heritage Council Act, like the Australian Heritage Commission Act, does not provide legislative protection regarding the conservation of heritage items in Australia, but has compiled a list of items recognised as possessing heritage significance to the Australian community. The Register of the National Estate, managed by the Australian Heritage Council, applies no legal constraints on heritage items included on this list.

***The Aboriginal and Torres Strait Islander Heritage Protection Act 1987*.**

This Federal Act is administered by the Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) with the Commonwealth having jurisdiction. The Act was passed to provide protection for the Aboriginal heritage, in circumstances where it could be demonstrated that such protection was not available at a state level. In certain instances, the Act overrides relevant state and territory provisions.

The major purpose of the Act is to preserve and protect from injury and desecration, areas and objects of significance to Aborigines and Islanders. The Act enables immediate and direct action for protection of threatened areas and objects by a declaration from the Commonwealth minister or authorised officers. The Act must be invoked by, or on behalf of an Aboriginal or Torres Strait Islander or organisation.

Any Aboriginal or Torres Strait Islander person or organization may apply to the Commonwealth Minister for a temporary or permanent 'Stop Order' for protection of threatened areas or objects of significant indigenous cultural heritage.

The Commonwealth Act 'overrides' State legislation if the Commonwealth Minister is of the opinion that the State legislation (or undertaken process) is insufficient to protect the threatened areas or objects. Thus, in the event that an application is made to the Commonwealth Minister for a Stop Order, the Commonwealth Minister will, as a matter of course, contact the relevant State Agency to ascertain what protection is being imposed by the State and/or what mitigation procedures have been proposed by the landuser/developer.

In addition to the threat of a 'Stop Order' being imposed, the Act also provides for the following:

- If the Federal Court, on application from the Commonwealth Minister, is satisfied that a person has engaged or is proposing to engage in conduct that breaches the 'Stop Order', it may grant an injunction preventing or stopping such a breach (s.26). Penalties for breach of a Court Order can be substantial and may include a term of imprisonment;
- If a person contravenes a declaration in relation to a significant Aboriginal area, penalties for an individual are a fine up to $10,000.00 and/or 5 years gaol and for a Corporation a fine up to $50,000.00 (s.22);
- If the contravention is in relation to a significant Aboriginal object, the penalties are $5,000.00 and/or 2 years gaol and $25,000.00 respectively (s.22);
- In addition, offences under s.22 are considered 'indictable' offences that also attract an individual fine of $2,000 and/or 12 months gaol or, for a Corporation, a fine of $10,000.00 (s.23). Section 23 also includes attempts, inciting, urging and/or being an accessory after the fact within the definition of 'indictable' offences in this regard.

The Commonwealth Act is presently under review by Parliament and it is generally accepted that any new Commonwealth Act will be even more restrictive than the current legislation.

Environment Protection and Biodiversity Conservation Act 1999 (Comm)
This Act was amended, through the Environment and Heritage Legislation Amendment Act (No1) 2003 to provide protection for cultural heritage sites, in addition to the existing aim of protecting environmental areas and sites of national significance. The Act also promotes the ecologically sustainable use of natural resources, biodiversity and the incorporation of community consultation and knowledge.

The 2003 amendments to the *Environment Protection and Biodiversity Conservation Act 1999* have resulted in the inclusion of indigenous and non-Indigenous heritage sites and areas. These heritage items are defined as:
'indigenous heritage value of a place means a heritage value of the place that is of significance to indigenous persons in accordance with their practices, observances, customs, traditions, beliefs or history;

Items identified under this legislation are given the same penalty as actions taken against environmentally sensitive sites. Specific to cultural heritage sites are §324A-324ZB.

Environment and Heritage Legislation Amendment Act (No1) 2003 (Comm)
In addition to the above amendments to the *Environment Protection and Biodiversity Conservation Act 1999* to include provisions for the protection and conservation of heritage, the Act also enables the identification and subsequent listing of items for the Commonwealth and National Heritage Lists. The Act establishes the *National Heritage List*, which enables the inclusion of all heritage, natural, Indigenous and

non-Indigenous, and the *Commonwealth Heritage List*, which enables listing of sites nationally and internationally that are significant and governed by Australia.

In addition to the *Aboriginal and Torres Strait Islander Heritage Protection Act 1987*, amendments made to the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* enables the identification and subsequent listing of indigenous heritage values on the Commonwealth and/or National Heritage Lists (ss. 341D & 324D respectively). Substantial penalties (and, in some instances, gaol sentences) can be imposed on any person who damages items on the National or Commonwealth Heritage Lists (ss. 495 & 497) or provides false or misleading information in relation to certain matters under the Act (ss.488-490). In addition, the wrongdoer may be required to make good any loss or damage suffered due to their actions or omissions (s.500).

10.0 Aboriginal Cultural Heritage Management Plan

Heritage management options and recommendations provided in this report are made on the basis of the following criteria.

- Background research into the extant archaeological and ethno-historic record for the study area and the surrounding region (see sections 3 and 4 of the report).
- The results of the investigation as documented in section 7 this report;
- The legal and procedural requirements as specified in the *Aboriginal Heritage Act 1975* (The Act), as presented in section 9; and
- Consultation with Rocky Sainty (Aboriginal Heritage Officer), and the Aboriginal community consultation program, as documented in section 8.

Recommendation 1

No Aboriginal heritage sites were identified during the field survey of the Sandy Bay campus study area. A search of the Aboriginal Heritage Register (AHR) shows that there are no registered Aboriginal sites located either within, or in the immediate vicinity of the study area footprint. On this basis, it is advised that there are no site specific Aboriginal heritage constraints, or legal impediments to the project proceeding.

Recommendation 2

No specific areas of elevated archaeological potential, or suspected Aboriginal cultural features were identified within the study area, and it is assessed that there is generally a low to very low potential for undetected Aboriginal heritage sites to occur within the study area. On this basis it is advised that there are no requirements for any further Aboriginal heritage investigations to be undertaken within the Sandy Bay campus study area.

Recommendation 3

If, during the course of the proposed development works across the UTAS campus, previously undetected archaeological sites or objects are located, the processes outlined in the Unanticipated Discovery Plan should be followed (see Appendix 1). A copy of the Unanticipated Discovery Plan should be kept on site during all ground disturbance and construction work. All construction personnel should be made aware of the Unanticipated Discovery Plan and their obligations under the *Aboriginal Heritage Act 1975* (the Act).

Recommendation 4

Copies of this report should be submitted to Aboriginal Heritage Tasmania (AHT) for review and comment.

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Glossary of Terms

Aboriginal Archaeological Site
A site is defined as any evidence (archaeological features and/or artefacts) indicating past Aboriginal activity, and occurring within a context or place relating to that activity. The criteria for formally identifying a site in Australia vary between States and Territories.

Artefact
A portable object that has been humanly made or modified (see also stone artefact).

Assemblage (lithic)
A collection of complete and fragmentary stone artefacts and manuports obtained from an archaeological site, either by collecting artefacts scattered on the ground surface, or by controlled excavation.

Broken Flake
A flake with two or more breakages, but retaining its area of break initiation.

Chert
A highly siliceous rock type that is formed biogenically from the compaction and precipitation of the silica skeletons of diatoms. Normally there is a high percentage of cryptocrystalline quartz. Like chalcedony, chert was valued by Aboriginal people as a stone material for manufacturing stone tools. The rock type often breaks by conchoidal (shell like) fracture, providing flakes that have hard, durable edges.

Cobble
Water worn stones that have a diameter greater than 64mm (about the size of a tennis ball) and less than 256mm (size of a basketball).

Core
A piece of stone, often a pebble or cobble, but also quarried stone, from which flakes have been struck for the purpose of making stone tools.

Core Fragments
A piece of core, without obvious evidence of being a chunky primary flake.

Cortex
The surface of a piece of stone that has been weathered by chemical and/or physical means.

Debitage
The commonly used term referring to the stone refuse discarded from knapping. The manufacturing of a single implement may result in the generation of a large number of pieces of debitage in an archaeological deposit.

Flake (general definition)
A piece of stone detached from a nucleus such as a core. A complete or substantially complete flake of lithic material usually shows evidence of hard indenter initiation, or occasional bending initiation. The most common type of flake is the 'conchoidal flake'. The flake's primary fracture surface (the ventral or inside surface) exhibits features such as fracture initiation, bulb of force, and undulations and lances that indicate the direction of the fracture front.

Flake fragment
An artefact that does not have areas of fracture initiation, but which displays sufficient fracture surface attributes to allow identification as a stone artefact fragment.

Flake portion (broken flake)
The proximal portion of a flake retaining the area of flake initiation, or a distal portion of a flake that retains the flake termination point.

Flake scraper
A flake with retouch along at least one margin. The character of the retouch strongly suggests shaping or rejuvenation of a cutting edge.

Nodules
Regular or irregular cemented masses or nodules within the soil. Also referred to as concretions and buckshot gravel. Cementing agents may be iron and/or manganese oxides, calcium carbonate, gypsum etc. Normally formed in situ and commonly indicative of seasonal waterlogging or a fluctuating chemical environment in the soil such as; oxidation and reduction, or saturation and evaporation. Nodules can be redistributed by erosion. (See also 'concretion').

Pebble
By geological definition, a waterworn stone less than 64 mm in diameter (about the size of a tennis ball). Archaeologists often refer to waterworn stones larger than this as pebbles though technically they are cobbles.

Quartz
A mineral composed of crystalline silica. Quartz is a very stable mineral that does not alter chemically during weathering or metamorphism. Quartz is abundantly common and was used by Aboriginal people throughout Australia to make light-duty cutting tools. Despite the often unpredictable nature of fracture in quartz, the flakes often have sharp cutting edges.

Quartzite
A hard silica rich stone formed in sandstone that has been recrystallised by heat (metaquartzite) or strengthened by slow infilling of silica in the voids between the sand grains (Orthoquartzite).

Retouch (on stone tools)
An area of flake scars on an artefact resulting from intentional shaping, resharpening, or rejuvenation after breakage or blunting of a cutting edge. In resharpening a cutting edge the retouch is invariably found only on one side (see also 'indeterminate retouched piece', retouch flake' etc).

Scraper
A general group of stone artefacts, usually flakes but also cores, with one or more retouched edges thought to have been used in a range of different cutting and scraping activities. A flake scraper is a flake with retouch along at least one margin, but not qualifying for attribution to a more specific implement category. Flake scrapers sometimes also exhibit use-wear on the retouched or another edge.

Silcrete
A hard, fine grained siliceous stone with flaking properties similar to quartzite and chert. It is formed by the cementing and/or replacement of bedrock, weathering deposits, unconsolidated sediments, soil or other material, by a low temperature physico-chemical process. Silcrete is essentially composed of quartz grains cemented by microcrystalline silica. The clasts in silcrete bare most often quartz grains but may be chert or chalcedony or some other hard mineral particle. The mechanical properties and texture of silcrete are equivalent to the range exhibited by chert at the fine-grained end of the scale and with quartzite at the coarse-grained end of the scale. Silcrete was used by Aboriginal people throughout Australia for making stone tools.

Site Integrity
The degree to which post-depositional disturbance of cultural material has occurred at a site.

Stone Artefact
A piece (or fragment) of stone showing evidence of intentional human modification.

Stone procurement site
A place where stone materials is obtained by Aboriginal people for the purpose of manufacturing stone artefacts. In Australia, stone procurement sites range on a continuum from pebble beds in water courses (where there may be little or no evidence of human activity) to extensively quarried stone outcrops, with evidence of pits and concentrations of hammerstones and a thick layer of knapping debris.

Stone tool
A piece of flaked or ground stone used in an activity, or fashioned for use as a tool. A synonym of stone tool is 'implement'. This term is often used by archaeologists to describe a flake tool fashioned by delicate flaking (retouch).

Use wear
Macroscopic and microscopic damage to the surfaces of stone tools, resulting from its use. Major use-wear forms are edge fractures, use-polish and smoothing, abrasion, and edge rounding bevelling.

Appendix 1

Unanticipated Discovery Plan

Unanticipated Discovery Plan

Procedure for the management of unanticipated discoveries of Aboriginal relics in Tasmania

For the management of unanticipated discoveries of Aboriginal relics in accordance with the *Aboriginal Heritage Act 1975* and the *Coroners Act 1995*. The Unanticipated Discovery Plan is in two sections.

Discovery of Aboriginal Relics other than Skeletal Material

Step 1:
Any person who believes they have uncovered Aboriginal relics should notify all employees or contractors working in the immediate area that all earth disturbance works must cease immediately.

Step 2:
A temporary 'no-go' or buffer zone of at least 10m x 10m should be implemented to protect the suspected Aboriginal relics, where practicable. No unauthorised entry or works will be allowed within this 'no-go' zone until the suspected Aboriginal relics have been assessed by a consulting archaeologist, Aboriginal Heritage Officer or Aboriginal Heritage Tasmania staff member.

Step 3:
Contact Aboriginal Heritage Tasmania on **1300 487 045** as soon as possible and inform them of the discovery. Documentation of the find should be emailed to **aboriginal@heritage.tas.gov.au** as soon as possible. Aboriginal Heritage Tasmania will then provide further advice in accordance with the *Aboriginal Heritage Act 1975*.

Discovery of Skeletal Material

Step 1:
Call the Police immediately. Under no circumstances should the suspected skeletal material be touched or disturbed. The area should be managed as a crime scene. It is a criminal offence to interfere with a crime scene.

Step 2:
Any person who believes they have uncovered skeletal material should notify all employees or contractors working in the immediate area that all earth disturbance works cease immediately.

Step 3:
A temporary 'no-go' or buffer zone of at least 50m x 50m should be implemented to protect the suspected skeletal material, where practicable. No unauthorised entry or works will be allowed within this 'no-go' zone until the suspected skeletal remains have been assessed by the Police and/or Coroner.

Step 4:
If it is suspected that the skeletal material is Aboriginal, Aboriginal Heritage Tasmania should be notified.

Step 5:
Should the skeletal material be determined to be Aboriginal, the Coroner will contact the Aboriginal organisation approved by the Attorney-General, as per the *Coroners Act 1995*.

Guide to Aboriginal site types

Stone Artefact Scatters

A stone artefact is any stone or rock fractured or modified by Aboriginal people to produce cutting, scraping or grinding implements. Stone artefacts are indicative of past Aboriginal living spaces, trade and movement throughout Tasmania. Aboriginal people used hornfels, chalcedony, spongelite, quartzite, chert and silcrete depending on stone quality and availability. Stone artefacts are typically recorded as being 'isolated' (single stone artefact) or as an 'artefact scatter' (multiple stone artefacts).

Shell Middens

Middens are distinct concentrations of discarded shell that have accumulated as a result of past Aboriginal camping and food processing activities. These sites are usually found near waterways and coastal areas, and range in size from large mounds to small scatters. Tasmanian Aboriginal middens commonly contain fragments of mature edible shellfish such as abalone, oyster, mussel, warrener and limpet, however they can also contain stone tools, animal bone and charcoal.

Rockshelters

An occupied rockshelter is a cave or overhang that contains evidence of past Aboriginal use and occupation, such as stone tools, middens and hearths, and in some cases, rock markings. Rockshelters are usually found in geological formations that are naturally prone to weathering, such as limestone, dolerite and sandstone

Quarries

An Aboriginal quarry is a place where stone or ochre has been extracted from a natural source by Aboriginal people. Quarries can be recognised by evidence of human manipulation such as battering of an outcrop, stone fracturing debris or ochre pits left behind from processing the raw material. Stone and ochre quarries can vary in terms of size, quality and the frequency of use.

Rock Marking

Rock marking is the term used in Tasmania to define markings on rocks which are the result of Aboriginal practices. Rock markings come in two forms; engraving and painting. Engravings are made by removing the surface of a rock through pecking, abrading or grinding, whilst paintings are made by adding pigment or ochre to the surface of a rock.

Burials

Aboriginal burial sites are highly sensitive and may be found in a variety of places, including sand dunes, shell middens and rock shelters. Despite few records of pre-contact practices, cremation appears to have been more common than burial. Family members carried bones or ashes of recently deceased relatives. The Aboriginal community has fought long campaigns for the return of the remains of ancestral Aboriginal people.

Further information on Aboriginal Heritage is available from:

Aboriginal Heritage Tasmania
Natural and Cultural Heritage Division
Department of Primary Industries, Parks, Water and Environment
GPO Box 44 Hobart TAS 7001

Telephone: **1300 487 045**
Email: **aboriginal@heritage.tas.gov.au**
Web: **www.aboriginalheritage.tas.gov.au**

Tasmanian Government

UTAS Sandy Bay Masterplan PSA Submission
Assessment of three Additional Properties

Aboriginal Heritage Addendum Report 1A

Final Draft Version 1

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CULTURAL
HERITAGE
MANAGEMENT
AUSTRALIA

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Executive Summary

Project Details
The University of Tasmania (UTAS) is exploring options for the reuse and development of its assets at its Sandy Bay Campus, as part of an overall strategy to relocate infrastructure within Central Hobart. The UTAS Sandy Bay campus encompasses approximately 100ha of land.

CHMA and Rocky Sainty were engaged by UTAS to undertake an Aboriginal heritage assessment for the UTAS Sandy Bay campus. The assessment took place in 2019. Since the completion of the Aboriginal heritage report prepared by CHMA (2019), UTAS has purchased three additional properties that border the western edge of the Sandy Bay Campus. These three properties encompass a sum total of 5.3ha. It is proposed that these three properties will be incorporated into the UTAS Sandy Bay Campus Precinct Plan. The three properties are situated outside the area covered by the CHMA (2019) Aboriginal heritage assessment.

CHMA and Rocky Sainty have now been engaged by UTAS to undertake an Aboriginal heritage assessment for the three additional parcels of land (the study area as shown in Figures 1-3. This report presents the findings of the assessment. The report acts as an addendum to the original report prepared by CHMA (2019).

Registered Aboriginal Sites in the Vicinity of the Study Area
As part of Stage 1 of the assessment process, a search was undertaken of the Aboriginal Heritage Register (AHR) to determine whether any registered Aboriginal heritage sites are located within or in the general vicinity of the three properties that are the focus of this assessment (the study area).

The search shows that there are a total of 27 registered Aboriginal sites that are located within an approximate 2km radius of the study area (search results provided by Paul Parker from AHT on the 8-11-2021). None of these 27 sites are situated within or in the immediate vicinity of the study area. The closest sites are located 1.5km to the west and north. The detailed AHR search results are presented in section 3 of this report.

Summary of Results
No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment of the three additional properties that are the focus of this assessment. As noted above, the results of the AHR search shows that there are no registered Aboriginal sites that are located either within or in the immediate vicinity of the study area boundaries. On the basis of these negative results, it is determined that there are no known Aboriginal heritage sites that occur within the study area.

The negative findings of the current field survey assessment are consistent with the negative survey results reported by CHMA (2019) for the broader UTAS Sandy Bay campus. The indications are that Aboriginal sites are likely to be either entirely absent across the current study area, or present in very low densities. If undetected sites are present they would most likely be isolated artefacts or small artefact scatters representing sporadic activity. These sites are more likely to be encountered within the southern and central properties. Given the very steep nature of the terrain in the northern property and the extremely high levels of disturbances associated with the quarry operation, it is assessed that there is virtually no potential for Aboriginal sites to be present in this property.

Management Recommendations

Recommendation 1
No Aboriginal heritage sites were identified during the field survey of the three additional properties adjoining the UTAS Sandy Bay Campus. A search of the Aboriginal Heritage Register (AHR) shows that there are no registered Aboriginal sites located either within, or in the immediate vicinity of the study area footprint. On this basis, it is advised that there are no site specific Aboriginal heritage constraints, or legal impediments that apply to the study area.

Recommendation 2
No specific areas of elevated archaeological potential, or suspected Aboriginal cultural features were identified within the study area, and it is assessed that there is generally a low to very low potential for undetected Aboriginal heritage sites to occur within the study area. On this basis it is advised that there are no requirements for any further Aboriginal heritage investigations to be undertaken within the study area.

Recommendation 3
If, during the course of any future proposed development works across the study area, previously undetected archaeological sites or objects are located, the processes outlined in the Unanticipated Discovery Plan should be followed (see Appendix 1). A copy of the Unanticipated Discovery Plan should be kept on site during all ground disturbance and construction work. All construction personnel should be made aware of the Unanticipated Discovery Plan and their obligations under the *Aboriginal Heritage Act 1975* (the Act). Under section 10(3) of the Act, a person shall, as soon as practicable after finding a relic, inform the Director or an authorised officer of the find.

1.0 Project Outline

1.1 Project Details

The University of Tasmania (UTAS) is exploring options for the reuse and development of its assets at its Sandy Bay Campus, as part of an overall strategy to relocate infrastructure within Central Hobart. The UTAS Sandy Bay campus encompasses approximately 100ha of land.

CHMA and Rocky Sainty were engaged by UTAS to undertake an Aboriginal heritage assessment for the UTAS Sandy Bay campus. The information generated from the assessment would used to inform future planning decisions for the Precinct Plan. The assessment took place in 2019. No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment of the UTAS Sandy Bay campus study area. A search of the Aboriginal Heritage Register (AHR) showed that there were no registered Aboriginal sites located either within or in the immediate vicinity of the study area boundaries. On the basis of these negative results, CHMA (2019) advised that there were no known Aboriginal heritage sites that occur within the UTAS Sandy Bay campus study area.

Since the completion of the Aboriginal heritage report prepared by CHMA (2019), UTAS has purchased three additional properties that border the western edge of the Sandy Bay Campus. These three properties encompass a sum total of 5.3ha. It is proposed that these three properties will be incorporated into the UTAS Sandy Bay Campus Precinct Plan. Figures 1-3 showing the location and spatial extent of these three properties in relation to the UTAS Sandy Bay Campus.

The three properties are situated outside the area covered by the CHMA (2019) Aboriginal heritage assessment. CHMA and Rocky Sainty have now been engaged by UTAS to undertake an Aboriginal heritage assessment for the three additional parcels of land (the study area as shown in Figures 1-3. This report presents the findings of the assessment. The report acts as an addendum to the original report prepared by CHMA (2019).

1.2 Aims of the Investigation

The principal aims of the current Aboriginal Heritage assessment are as follows.

- To undertake an Aboriginal cultural heritage assessment for the three additional parcels of land (the study area as shown in Figures 1-3). The assessment is to be compliant with the *Aboriginal Heritage Standards and Procedures (June 2018)*
- Search the Aboriginal Heritage Register (AHR) to identify previously registered Aboriginal heritage sites within and in the general vicinity of the study area.
- Undertake relevant archaeological, environmental and ethno-historical background research to develop an understanding of site patterning within the study area.

- To locate, document and assess any Aboriginal heritage sites located within the study area.
- To assess the archaeological and cultural sensitivity of the study area.
- To assess the scientific and Aboriginal cultural values of any identified Aboriginal cultural heritage sites located within the study area.
- Consult with (or ensure the Aboriginal community representative consults with) Aboriginal organisation(s) and/or people(s) with an interest in the study area in order to obtain their views regarding the cultural heritage of the area.
- To develop a set of management recommendations aimed at minimising the impact of any future development plans on any identified Aboriginal heritage values.
- Prepare a report which documents the findings of the Aboriginal heritage assessment, and meets the standards and requirements of the *Aboriginal Heritage Standards and Procedures (June 2018)* prepared by AHT, Department of Primary industries, Parks, Water and Environment.

1.3 Project Limitations

All archaeological investigations are subject to limitations that may affect the reliability of the results. The main constraint to the present investigation was restricted surface visibility due primarily to the presence of vegetation cover. Surface visibility across the study area was estimated to have averaged 30%, which is in the low range. These constraints limited to some extent the effectiveness of the survey assessment. The issue of surface visibility is further discussed in Section 6 of this report.

In addition, the field team was unable to access most of the northern property which encompasses around 1.9ha. This property is the site of a quarry operation. The perimeter of the quarry has been fenced off, preventing access. The field team did walk a series of transects around the perimeter of the fence. The quarry area has been massively disturbed and it is unlikely that this constraint will have any major bearing on the outcomes of this assessment.

1.4 Project Methodology

A three stage project methodology was implemented for this assessment.

Stage 1 (Pre-Fieldwork Background Work)

Prior to field work being undertaken, the following tasks were completed by CHMA staff.

Consultation with Aboriginal Heritage Tasmania

AHT was contacted and informed that CHMA and Rocky Sainty had been engaged to undertake an assessment of the three additional parcels of land adjacent to the UTAS Sandy Bay campus. As part of this initial contact a search request of the Aboriginal Heritage Register (AHR) was submitted to AHT in order to ascertain the presence of any previously registered sites in the vicinity of the study area (search request dated 27-10-2021).

The collation of relevant documentation for the project

As part of Stage 1 the following research was carried out and background information was collated for this project:

- A review of the relevant heritage registers (AHR register) and the collation of information pertaining to any registered heritage sites located within the general vicinity of the study area.
- Maps of the study area;
- Relevant reports documenting the outcomes of previous Aboriginal heritage studies in the vicinity of the study area;
- Ethno-historic literature for the region;
- References to the land use history of the study area;
- GIS Information relating to landscape units present in the study area;
- Geotechnical information for the study area, including soil and geology data.

Consultation with Aboriginal Heritage Officer (AHO)

Rocky Sainty is the AHO for this project. As part of Stage 1 works Stuart Huys (CHMA archaeologist) was in regular contact with Rocky Sainty. The main purpose of this contact was to discuss the scope of the present investigations, to ratify the proposed methodology for the investigations and to co-ordinate the timeframes for implementing field work.

Stage 2 (Field Work)

Stage 2 entailed the field work component of the assessment. The field survey was undertaken over a period of one day (20-11-2021) by Stuart Huys (CHMA archaeologist) and Rocky Sainty (Aboriginal Heritage Officer).

The field team walked a series 3.25km of survey transects across the study area, with the average width of each transect being 5m. The survey transects were mainly focused within the southern and central parcels of land. As noted above, access could not be gained to the northern parcel of land, which meant that survey transects were restricted to the perimeter of this property. The survey coverage achieved as part of the field assessment is discussed in more detail in Section 6 of this report.

The results of the field investigation were discussed by Rocky Sainty and Stuart Huys. This included the potential cultural and archaeological sensitivity of the study area, and possible management options for any identified Aboriginal sites.

Stage 3 (Reporting)

Stage three of the project involves the production of a report that includes an analysis of the data obtained from the field survey, an assessment of archaeological sensitivity and management recommendations. The report has been prepared by Stuart Huys in consultation with Rocky Sainty. The report acts as an addendum to the report prepared by CHMA (2019) for the UTAS Sandy Bay Campus.

Plate 1: Rocky Sainty, the designated AHO for the Project

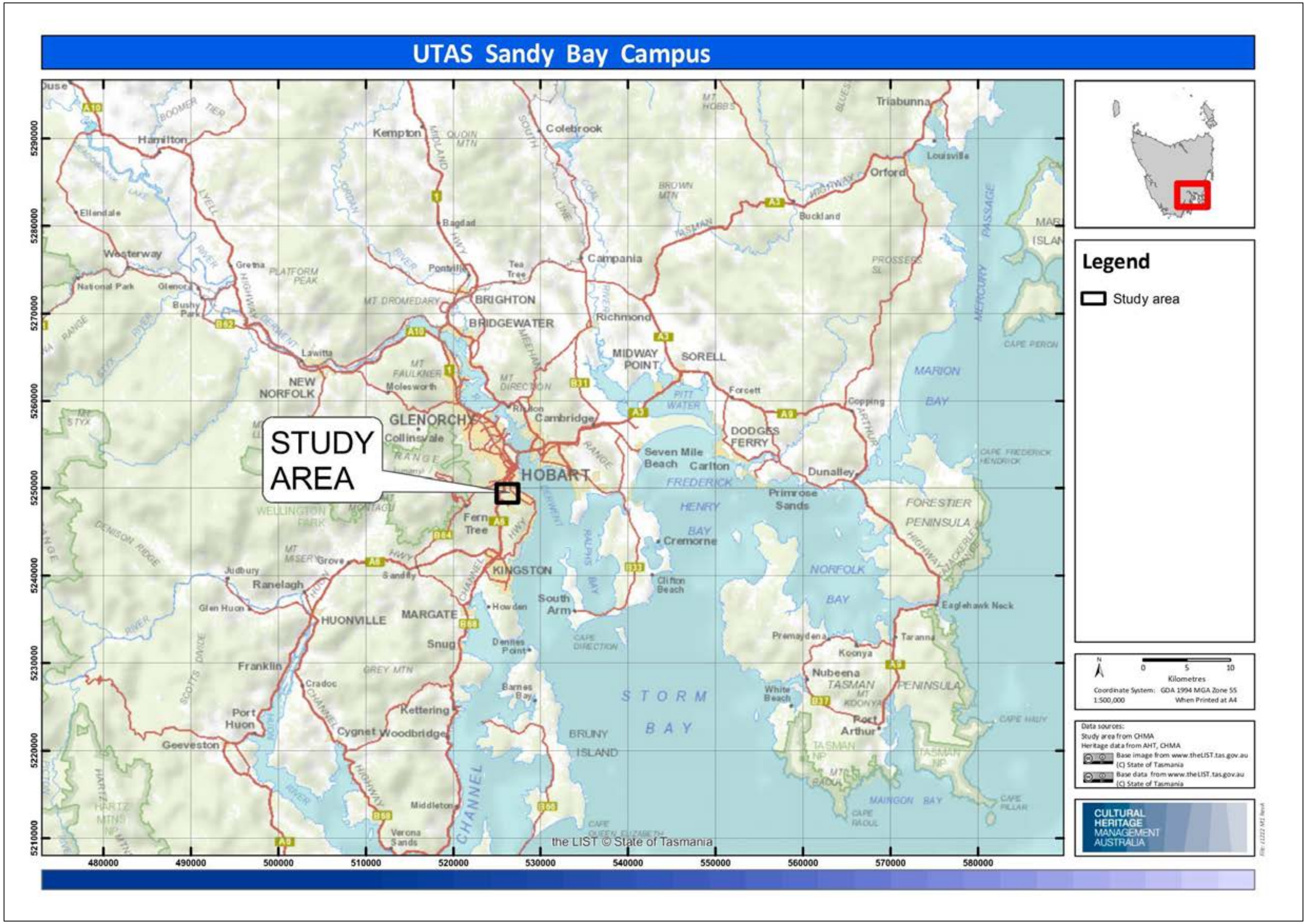


Figure 1: Topographic map showing the general location of the study area

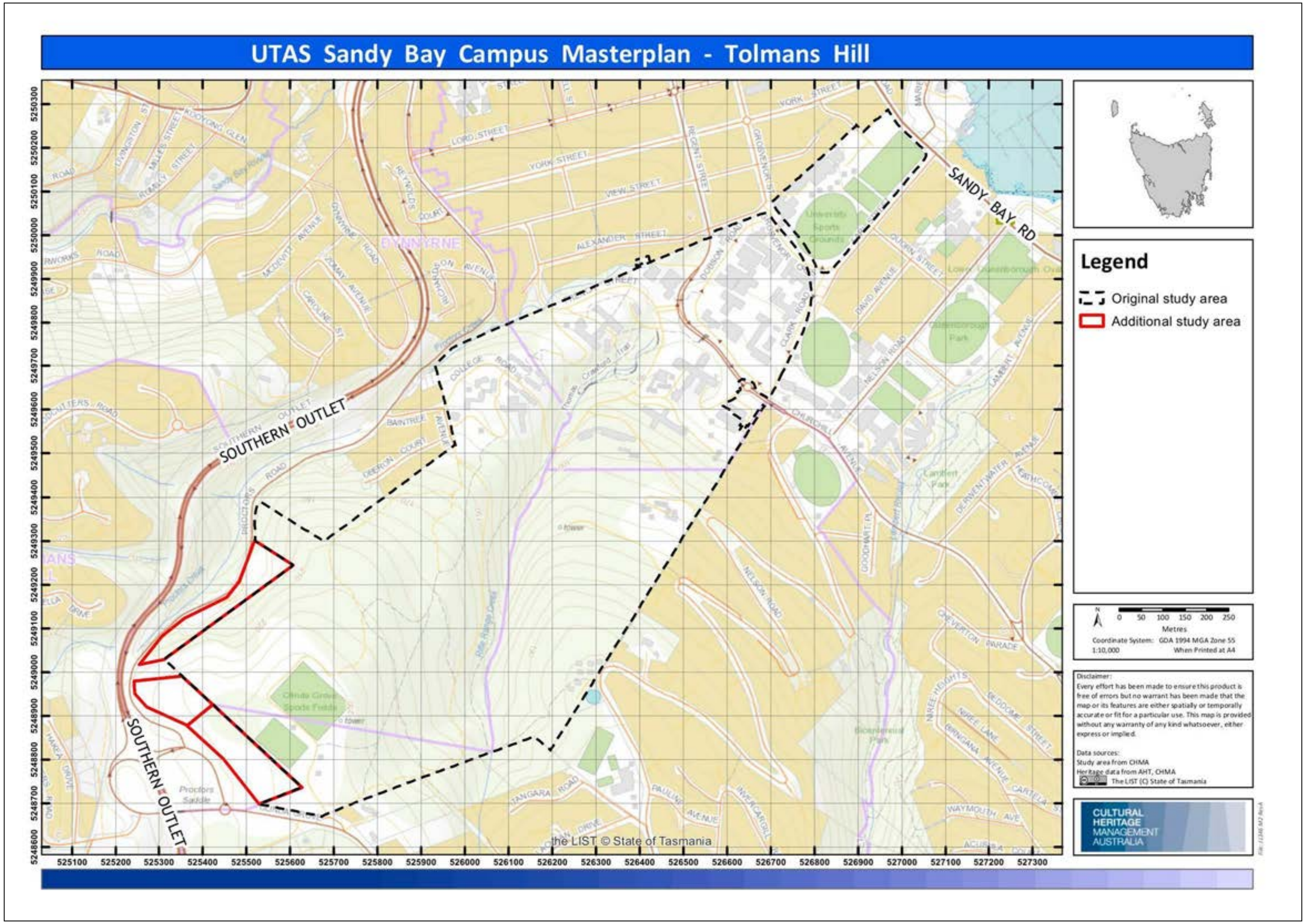


Figure 2: Topographic map showing the boundaries of the three properties (the study area) adjacent to the UTAS Sandy Bay Campus

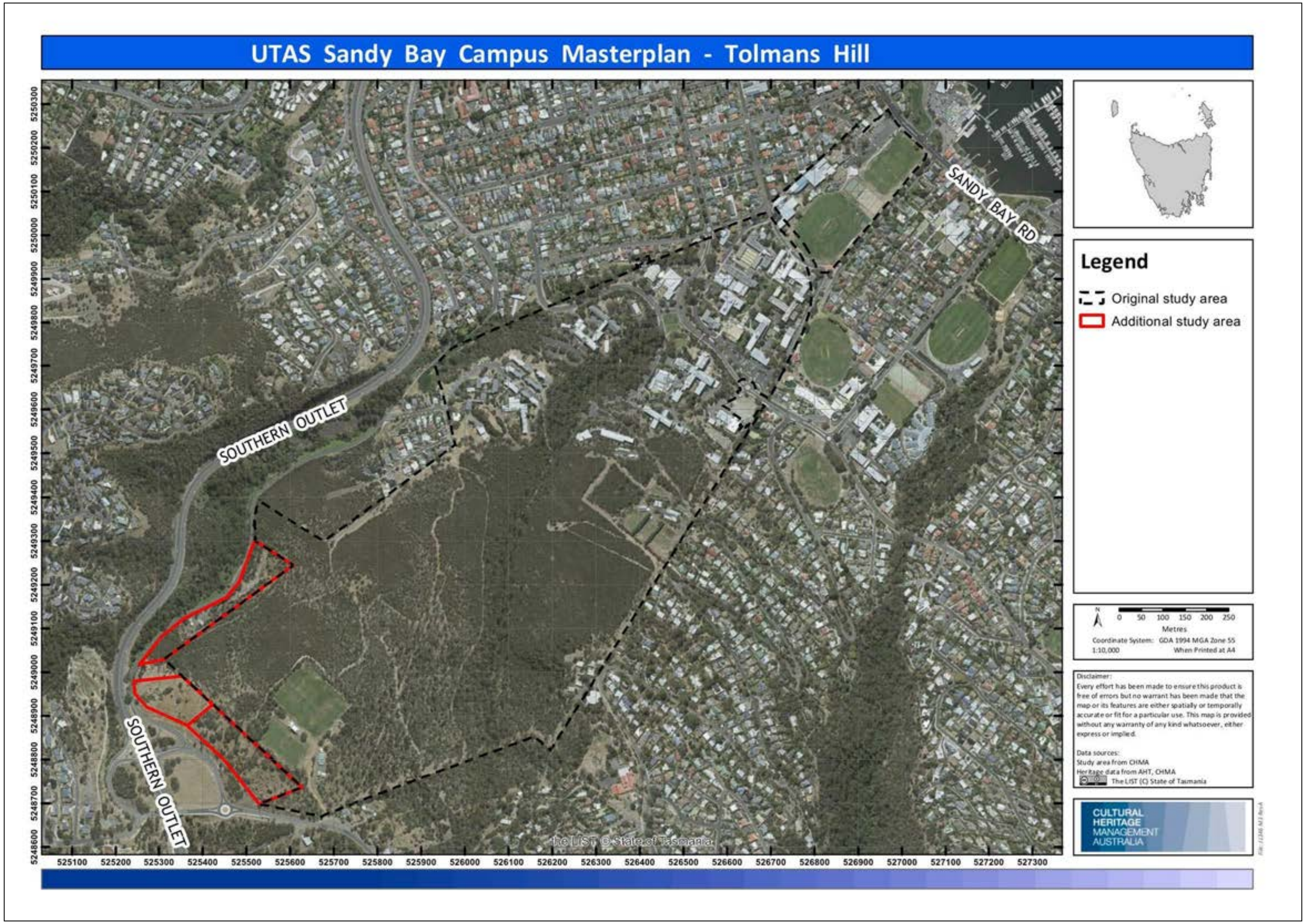


Figure 3: Aerial image showing the boundaries of the three properties (the study area) adjacent to the UTAS Sandy Bay

2.0 Environmental Setting of the Study Area

2.1 Introduction

Prior to undertaking archaeological survey of the study area, it is necessary to characterise the landscape. This includes considering environmental factors such as topography, geology, climate, vegetation and past and current landscape use. An assessment of the environmental setting helps to develop an understanding of the nature of Aboriginal occupation and site patterning that might be expected to occur across the study area. In addition, it must be remembered that in Aboriginal society, the landscape extends beyond economic and technological behaviour to incorporate social geography and the embodiment of Ancestral Beings.

The archaeological context is generally only able to record the most basic aspects of Aboriginal behaviour as they relate to artefact manufacture and use and other subsistence related activities undertaken across the landscape such as raw material procurement and resource exploitation. The distribution of these natural resources occurs intermittently across the landscape and as such, Aboriginal occupation and associated archaeological manifestations occur intermittently across space. However, the dependence of Aboriginal populations on specific resources means that an understanding of the environmental resources of an area accordingly provides valuable information for predicting the type and nature of archaeological sites that might be expected to occur within an area.

The primary environmental factors known to affect archaeological patterning include the presence or absence of water, both permanent and ephemeral, animal and plant resources, stone artefact resources and terrain.

Additionally, the effects of post-depositional processes of both natural and human agencies must also be taken into consideration. These processes have a dramatic effect on archaeological site visibility and conservation. Geomorphological processes such as soil deposition and erosion can result in the movement of archaeological sites as well as their burial or exposure. Heavily vegetated areas can restrict or prevent the detection of sites, while areas subject to high levels of disturbance may no longer retain artefacts or stratified deposits.

The following sections provide information regarding the landscape context of the study area including topography, geology, soils and vegetation. Much of this information is derived from The LIST – the Tasmanian Government Land Information System.

2.2 The Environmental Setting of the Study Area

The UTAS Sandy Bay Campus (the study area) is situated within the suburb of Sandy Bay, in the City of Hobart, in the South East region of Tasmania. The campus encompasses approximately 100ha, and extends from Sandy Bay Road, south-west through to the Olinda Grove sports fields on Mount Nelson.

The campus is situated within the rugged mountain ranges that fringe the western margins of the River Derwent. The two prominent landscape features bordering the study area are Tolmans Hill, and Mount Nelson.

The three parcels of land that are the focus of this assessment encompass a sum total of 5.3ha and are situated on the western edge of the UTAS Sandy Bay Campus, just to the west of the Olinda Grove playing fields (see Figures 1-3). The southern and central properties are situated on the crest and upper west side slopes of a broad, flat north-south trending ridge. This is in the immediate vicinity of Proctors Saddle and around 1km east of Tolmans Hill. The slope gradients across these two properties ranges between 3º to 10º. Both properties have been subject to moderate to high levels of disturbances associated with land clearing and rural occupation. The southern property is probably the least disturbed of the two properties. It has been extensively cleared of native vegetation and replanted with introduced grasses, but there still remnant patches of Eucalypt woodland present across the area (see Plate 2). The central property has been more extensively cleared of native vegetation and there are the foundations of numerous structures across the property and a formed road through the site (see Plate 3). There also numerous areas discrete locations that have been artificially levelled. Despite these disturbances, there is still the potential for Aboriginal heritage sites to still be present within both the southern and central property, albeit in a disturbed context.

The northern property is situated on the verry steep to sheer western side slopes of the ridge. Slope gradients across the entire property are in excess of 30º. This property encompasses what was until recently an operating quarry. As part of this quarrying activity, most of the steep hill slopes within the property have been cut away, and an area at the base of the cliffs, just east of Proctors Road has been levelled out for machinery and quarry operations (see Plate 4). From an Aboriginal heritage perspective, there is very little potential for Aboriginal heritage sites to have survived in this very heavily modified landscape.

The underlying geology across the vast majority of the hills surrounding the UTAS Sandy Bay Campus is dominated by Jurassic dolerites. These dolerites underlay the northern of the three properties. Around Olinda Grove, there is a transition to Triassic sedimentary sequences which include undifferentiated fossiliferous glaciomarine sandstone, siltstone and limestone (Deep Bay Formation). The southern and central properties sit right at the transition zone between the dolerite and the sedimentary sequences (see Plates 5 and 6). From an Aboriginal heritage perspective, these rock types are typically not suited for artefact manufacturing, and it is therefore unlikely that Aboriginal stone quarry or stone procurement sites will be encountered in the study area.

The soils across the three properties largely mirror the underlying geology. Where the dolerites occur, the soils are Podzolic and Black soils developed on dolerite. Undifferentiated soils occur in the areas overlying the Triassic sedimentary sequences. Soil depth across all three properties is typically shallow to skeletal, with bedrock exposed to the surface in many areas.

The closest named water courses to the study area is Proctors Creek. This is an ephemeral water course that flows in a north-east direction through a very narrow, steep sided valley, eventually emptying into the River Derwent at Sandy Bay. The creek flows immediately to the west of the west boundary of the northern property. The River Derwent estuary is situated around 2.5km to the east of the study area. The River Derwent estuary is a 'ria' or drowned river valley formed by coastal submergence about 6,000 years ago. The shoreline of the estuary in the surrounds of Sandy Bay is low-energy, with mudflats, sandy beaches and shoals exposed at low tide. The River is estuarine in this area, and subject to tidal influences. This low energy shoreline hosts a range of low energy shell fish species, including mud oyster and black mussel, which would have been important components of the traditional Aboriginal diet. Much of the foreshore areas around Sandy Bay have been developed, and the foreshore margins landscaped, and fortified against coastal erosion.

Plate 2: View north-west across the southern property showing typical topography and vegetation structure

Plate 3: View north across the central property showing typical topography and vegetation structure and one of numerous building foundations

Plate 4: View south at the quarry within the northern property showing the extent of disturbances

Plate 5: Dolerite bedrock exposed to the surface within the central property

Plate 6: Triassic sedimentary rock exposed to the surface in the southern property

3.0 Registered Aboriginal Sites in the Vicinity of the Study Area

As part of Stage 1 of the assessment process, a search was undertaken of the Aboriginal Heritage Register (AHR) to determine whether any registered Aboriginal heritage sites are located within or in the general vicinity of the three properties that are the focus of this assessment (the study area).

The search shows that there are a total of 27 registered Aboriginal sites that are located within an approximate 2km radius of the study area (search results provided by Paul Parker from AHT on the 8-11-2021).

Aboriginal shell middens are the most common site type represented (11 sites). These shell midden sites are concentrated along the foreshore margins of the River Derwent, with most of them having been recorded by Officer (1980), as part of his extensive survey assessment of the River Derwent Estuary (see section 4.1 for details). One the shell middens (AH13119) is reported as having stone artefacts in association with the midden deposit.

Aboriginal rock shelters also feature prominently in the AHR search results (6 sites). Five of these rock shelters are classified as Unoccupied, which means that as yet no definitive evidence for Aboriginal occupation has been confirmed, however there is the potential for this evidence to be present. One of the rock shelters (AH6593) is classified as Occupied. Four of the rock shelters are situated within the Knocklofty Reserve, around 2km to the north-west of the study area (sites AH6592 – AH6595). The other two rock shelters are situated within the Waterworks, 1.5km to the west of the study area (sites AH7991 and AH7992). The six rock shelter sites all occur in areas where the bedrock geology is sandstone, which is conducive to the formation of overhang features.

There is one recorded Aboriginal quarry within a 2km radius of the study area (site AH345). The site is located at Blinking Billy point, on the western foreshore margins of the River Derwent, around 2km to the south-east of the study area.

The remaining sites are classified as either Artefact scatters (4 sites) or Isolated artefacts (5 sites).

Table 1 provides the summary details for these 27 registered sites, with Figure 4 showing the reported location of the 27 sites, in relation to the study area boundaries (based on information generated from the AHR).

None of these 27 sites are situated within or in the immediate vicinity of the study area. The closest sites are located 1.5km to the west and north.

Table 1: Summary details for the 27 registered Aboriginal sites located within a 2.5km radius of the study area (Based on the results of the AHR search dated 8/11/2021)

AH Site Number	Site Type	Locality	Grid Reference (GDA94) Easting	Grid Reference (GDA94) Northing
345	Stone Quarry	Sandy Bay	529401	5248390
972	Shell Midden	Sandy Bay	529341	5248680
973	Shell Midden	Sandy Bay	528456	5249241
974	Shell Midden	Sandy Bay	528380	5249274
975	Shell Midden	Sandy Bay	528276	5249312
976	Shell Midden	Sandy Bay	528137	5249355
977	Shell Midden	Sandy Bay	527502	5249842
978	Shell Midden		527687	5251250
980	Shell Midden	Battery Point	527512	5251582
10715	Isolated Artefact	Hobart	526725	5252020
11786	Artefact Scatter		524256	5250924
6592	Unoccupied Rockshelter	West Hobart	524753	5251693
6593	Occupied Rockshelter	West Hobart	524754	5251705
6594	Unoccupied Rockshelter	West Hobart	524753	5251719
6595	Unoccupied Rockshelter	West Hobart	524759	5251787
6839	Isolated Artefact	South Hobart	525352	5251082
6974	Shell Midden	Sandy Bay	529312	5248682
6975	Shell Midden	Sandy Bay	529424	5248635
7990	Isolated Artefact	South Hobart	523134	5249699
7991	Unoccupied Rockshelter	Ridgeway	523735	5248933
7992	Unoccupied Rockshelter	Ridgeway	523512	5248982
7993	Artefact Scatter	Ridgeway	522912	5248882
8555	Artefact Scatter	Sandy Bay	529058	5248767
13036	Isolated Artefact	Battery Point	527033	5251664
13037	Artefact Scatter	Battery Point	527047	5251665
13119	Artefact Scatter, Shell Midden	Battery Point	527042	5251662
13264	Isolated Artefact	Wellington Park	521425	5251887

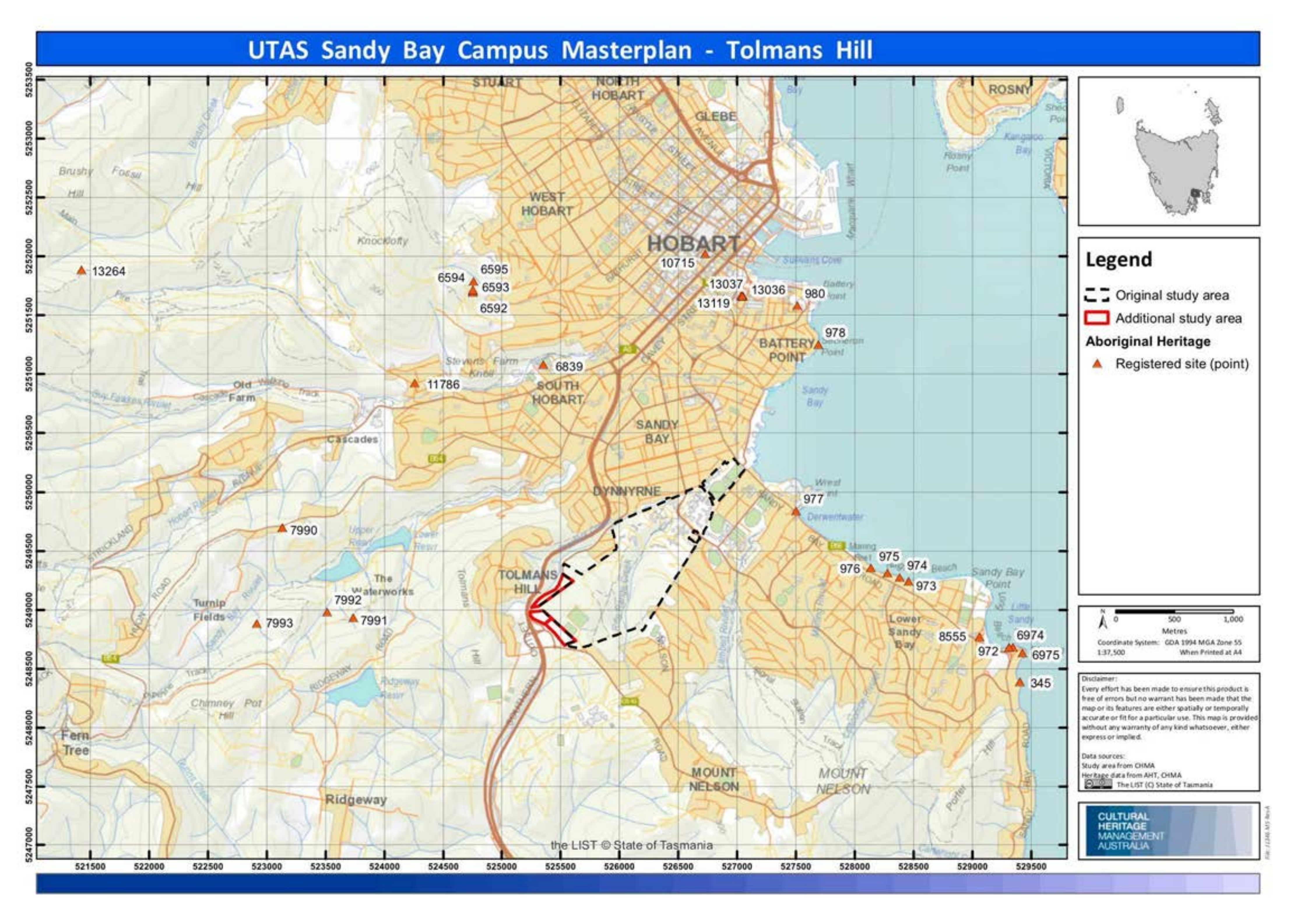


Figure 4: Topographic map showing the location of the 27 registered Aboriginal sites located within a 2.5km radius of the study area (Based on the results of the AHR search dated 8/11/2021)

4.0 Survey Coverage of the Study Area

Survey Coverage
Survey coverage refers to the estimated portion of a study area that has actually been visually inspected during a field survey.

The three properties that are the focus of this assessment encompass a sum total of 5.3ha. The field team (comprising Stuart Huys and Rocky Sainty) walked a series 3.25km of survey transects across the study area, with the average width of each transect being 5m. This equates to a survey coverage of 16 250m². The survey transects were predominantly focused within the southern and central parcels of land. As noted previously, access could not be gained to the northern parcel of land, which meant that survey transects were restricted to the perimeter of this property.

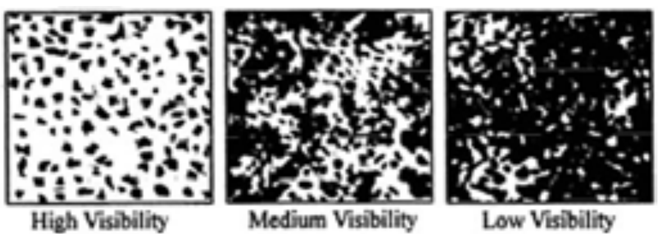
Figure 6 shows the alignment of the transects walked by the field team.

Surface Visibility
Surface Visibility refers to the extent to which the actual soils of the ground surface are available for inspection. Surface visibility across the study area was variable, ranging between 10% - 70%, with the estimated average being 30%. This is in the low range (see Figure 5 for visibility guidelines). The main constraint to surface visibility was the presence of vegetation cover and to a lesser degree, built surfaces (see Plates 7 and 8).

Scattered throughout both the southern and central properties, there were numerous erosion scalds that provided discrete transects of improved surface visibility (see Plate 9). Average surface visibility within the southern property was probably slightly more improved (40%) compared with the central property (30%).

The limited survey transects that were undertaken within and in the immediate vicinity of the northern property were to a large extent confined to existing graded vehicle tracks, with visibility being around 70% on these tracks (see Plate 10). Off the tracks visibility was limited to 20% due to vegetation cover.

Visibility



☐Full (100%) ☐High (75%) ☐Medium (50%) ☒Low (24%) ☐None (0%)

Figure 5: Guidelines for the estimation of surface visibility

Effective coverage

Variations in both survey coverage and surface visibility have a direct bearing on the ability of a field team to detect Aboriginal heritage sites, particularly site types such isolated artefacts and artefact scatters which are the sites most likely to be present in the study area. The combination of survey coverage and surface visibility is referred to as effective survey coverage. Table 2 presents the estimated effective survey coverage achieved during the course of the survey assessment of the study area. The table shows that while the team covered an area of 20 750m² during the survey, the effective coverage was reduced to 6 825m². This level of effective coverage is not ideal, however, it is still deemed to be sufficient for the purposes of generating a general impression as to the potential extent, nature and distribution of Aboriginal heritage sites across the study area.

Table 2: Effective survey coverage achieved within the study area

Area Surveyed	Total Area Surveyed	Estimated Surface Visibility	Effective Survey Coverage
Southern Property	1 200m x 5m = 6 000m²	40%	2 400m²
Central Property	1 150m x 5m = 5 750m²	30%	1 725m²
Northern Property	900m x 5m = 4 500m²	60%	2 700m²
Total	20 750m²		6 825m²

Plate 7: View north-west across the southern property showing typical levels of surface visibility

Plate 8: View west showing typical surface visibility across the central property

Plate 9: View north at erosion scalds in the southern property providing locales of improved visibility

Plate 10: View north along an access track in the northern property providing improved visibility

Figure 6: Survey transects walked within the boundaries of the study area

5.0 Survey Results and Discussion

No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment of the three additional properties that are the focus of this assessment. As noted in section 3 of this report, the results of the AHR search shows that there are no registered Aboriginal sites that are located either within or in the immediate vicinity of the study area boundaries. On the basis of these negative results, it is determined that there are no known Aboriginal heritage sites that occur within the study area.

The field survey assessment did not identify any evidence for Aboriginal stone quarrying/procurement activity within the study area. The geology of the study area is dominated by Jurassic dolerite, which intersects with Triassic sedimentary sequences. Given the nature of the geology in the study area, it is assessed that it is very unlikely that any undetected Aboriginal stone quarry or procurement sites would be present. No potential Aboriginal rock shelter features were identified in the study area. Again, given the nature of the geology across the study area, which is dominated by dolerite, it is highly unlikely that any undetected rock shelter features will be present.

The negative findings of the current field survey assessment are consistent with the negative survey results reported by CHMA (2019) for the broader UTAS Sandy Bay campus. The indications are that Aboriginal sites are likely to be either entirely absent across the current study area, or present in very low densities. If undetected sites are present they would most likely be isolated artefacts or small artefact scatters representing sporadic activity. These sites our more likely to be encountered within the southern and central properties. Given the very steep nature of the terrain in the northern property and the extremely high levels of disturbances associated with the quarry operation, it is assessed that there is virtually no potential for Aboriginal sites to be present in this property.

The reason as to why Aboriginal activity in this area is likely to have been sporadic is most probably linked to the availability of resources. The study area is situated in steep, hilly terrain, away from major resource zones and in an area where there are no stone resources suitable for artefact manufacturing and no outcrop features suited for habitation. Such areas will have been visited infrequently and the archaeological signature of this occasional visitation will be sparse.

6.0 Consultation with Aboriginal Communities and Statement of Aboriginal Significance

The designated Aboriginal Heritage Officer (AHO) for this project is Rocky Sainty. One of the primary roles of the Aboriginal Heritage Officer is to consult with Aboriginal community groups. The main purpose of this consultation process is:

- to advise Aboriginal community groups of the details of the project,
- to convey the findings of the Aboriginal heritage assessment,
- to document the Aboriginal social values attributed to Aboriginal heritage resources in the study area,
- to discuss potential management strategies for Aboriginal heritage sites, and
- to document the views and concerns expressed by the Aboriginal community representatives.

Aboriginal Heritage Tasmania (AHT) has recently advised that there have been some changes to the accepted approach to Aboriginal community consultation, based on recommendations made by the AHC on 28 April 2017. These changes relate to cases where the AHC consider it may be sufficient for a Consulting Archaeologist (CA) or Aboriginal Heritage Officer (AHO) to consult only with the Aboriginal Heritage Council.

The Council recommended that consultation with an Aboriginal community organisation is not required for a proposed project when:
There are less than 10 isolated artefacts that are not associated with any other nearby heritage; or
The impact of the project on Aboriginal heritage:

- is not significant; or
- will not destroy the heritage; or
- affects only part of the outer approximately 20% of a buffer around a registered site

The CA and AHO will need to demonstrate in Aboriginal heritage reports including map outputs:

- that the proposed impact on the Aboriginal heritage within the project area is not significant and why;
- that the project activity will not destroy the heritage;
- that the proposed impact to the site buffer is not adjacent to a significant component of the registered site polygon.

No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment of the three additional properties that were the focus of this assessment. The results of the AHR search shows that there are no registered Aboriginal sites that are located either within or in the immediate vicinity of these three properties. On the basis of these negative results, it is determined that there are no known Aboriginal heritage sites that occur within the study area.

Given the very high levels of historic disturbances across parts of the study area, and the predictive modelling of site distributions, it is assessed that the archaeological sensitivity of the study area is low. On this basis, the decision has been made not to circulate this report for Aboriginal community consultation. The addendum report will be sent out to a select range of Aboriginal organisations in the south for information purposes. The report has also been provided to AHT for review. Rocky Sainty (the AHO for this project) has provided a statement of cultural significance for the study area. This is presented below.

Statement of Cultural/Social Significance by Rocky Sainty

Aboriginal heritage provides a direct link to the past, however is not limited to the physical evidence of the past. It includes both tangible and intangible aspects of culture. Physical and spiritual connection to land and all things within the landscape has been, and continues to be, an important feature of cultural expression for Aboriginal people since creation.

Physical evidence of past occupation of a specific place may include artefacts, living places (middens), rock shelters, markings in rock or on the walls of caves and/or rock shelters, burials and ceremonial places. Non-physical aspects of culture may include the knowledge (i.e. stories, song, dance, weather patterns, animal, plant and marine resources for food, medicines and technology) connected to the people and the place. While so much of the cultural landscape that was **lutruwita** *(Tasmania) before invasion and subsequent colonization either no longer exists, or has been heavily impacted on, these values continue to be important to the Tasmanian Aboriginal community, and are relevant to the region of the project proposal.*

There is no doubt in my mind that Sandy Bay would have been a focal point of seasonal occupation for my people. The Bay is situated on the margins of the River Derwent, where there was (and still is) an abundance of marine resources, and there was fresh water available in the form of a nearby rivulet and creeks. This combination of easily available resources would have meant that our people camped in this area on a regular basis. This occupation is likely to have extended into the current Sandy Bay Campus. Particularly the gentler sloping areas, closer to the River. Unfortunately, the archaeological evidence for this occupation now appears to have been destroyed by European occupation and development of the lower campus area. Based on my observations, I believe there is little to no potential for Aboriginal sites to still survive in the developed north-east portion of the campus.

The three additional properties that we surveyed as part of this assessment encompasses a small portion of land on the crest of the hills around Olinda Grove, inland from the River Derwent. We didn't find any evidence of Aboriginal sites in this area and based on my observations I believe there is a low potential for Aboriginal heritage sites to be present. Given the distance from the River Derwent and other major river valleys, it is unlikely that our ancestors would have focused their activities in this area, although these may have been visited periodically. The areas that we inspected have been heavily disturbed, meaning much of the bush tucker resources that once may have been present in the area has now been destroyed.

7.0 Aboriginal Cultural Heritage Management Plan

Recommendation 1
No Aboriginal heritage sites were identified during the field survey of the three additional properties adjoining the UTAS Sandy Bay Campus. A search of the Aboriginal Heritage Register (AHR) shows that there are no registered Aboriginal sites located either within, or in the immediate vicinity of the study area footprint. On this basis, it is advised that there are no site specific Aboriginal heritage constraints, or legal impediments that apply to the study area.

Recommendation 2
No specific areas of elevated archaeological potential, or suspected Aboriginal cultural features were identified within the study area, and it is assessed that there is generally a low to very low potential for undetected Aboriginal heritage sites to occur within the study area. On this basis it is advised that there are no requirements for any further Aboriginal heritage investigations to be undertaken within the study area.

Recommendation 3
If, during the course of any future proposed development works across the study area, previously undetected archaeological sites or objects are located, the processes outlined in the Unanticipated Discovery Plan should be followed (see Appendix 1). A copy of the Unanticipated Discovery Plan should be kept on site during all ground disturbance and construction work. All construction personnel should be made aware of the Unanticipated Discovery Plan and their obligations under the *Aboriginal Heritage Act 1975* (the Act). Under section 10(3) of the Act, a person shall, as soon as practicable after finding a relic, inform the Director or an authorised officer of the find.

Recommendation 4
Copies of this addendum report should be submitted to Aboriginal Heritage Tasmania (AHT) for review and comment.

References Cited

CHMA 2019 *UTAS Sandy Bay Campus, Hobart, Tasmania. Aboriginal Heritage Assessment Report*. A report to UTAS.

Glossary of Terms

Aboriginal Archaeological Site
A site is defined as any evidence (archaeological features and/or artefacts) indicating past Aboriginal activity, and occurring within a context or place relating to that activity. The criteria for formally identifying a site in Australia vary between States and Territories.

Artefact
A portable object that has been humanly made or modified (see also stone artefact).

Assemblage (lithic)
A collection of complete and fragmentary stone artefacts and manuports obtained from an archaeological site, either by collecting artefacts scattered on the ground surface, or by controlled excavation.

Broken Flake
A flake with two or more breakages, but retaining its area of break initiation.

Chert
A highly siliceous rock type that is formed biogenically from the compaction and precipitation of the silica skeletons of diatoms. Normally there is a high percentage of cryptocrystalline quartz. Like chalcedony, chert was valued by Aboriginal people as a stone material for manufacturing stone tools. The rock type often breaks by conchoidal (shell like) fracture, providing flakes that have hard, durable edges.

Cobble
Water worn stones that have a diameter greater than 64mm (about the size of a tennis ball) and less than 256mm (size of a basketball).

Core
A piece of stone, often a pebble or cobble, but also quarried stone, from which flakes have been struck for the purpose of making stone tools.

Core Fragments
A piece of core, without obvious evidence of being a chunky primary flake.

Cortex
The surface of a piece of stone that has been weathered by chemical and/or physical means.

Debitage
The commonly used term referring to the stone refuse discarded from knapping. The manufacturing of a single implement may result in the generation of a large number of pieces of debitage in an archaeological deposit.

Flake (general definition)
A piece of stone detached from a nucleus such as a core. A complete or substantially complete flake of lithic material usually shows evidence of hard indenter initiation, or occasional bending initiation. The most common type of flake is the 'conchoidal flake'. The flake's primary fracture surface (the ventral or inside surface) exhibits features such as fracture initiation, bulb of force, and undulations and lances that indicate the direction of the fracture front.

Flake fragment
An artefact that does not have areas of fracture initiation, but which displays sufficient fracture surface attributes to allow identification as a stone artefact fragment.

Flake portion (broken flake)
The proximal portion of a flake retaining the area of flake initiation, or a distal portion of a flake that retains the flake termination point.

Flake scraper
A flake with retouch along at least one margin. The character of the retouch strongly suggests shaping or rejuvenation of a cutting edge.

Nodules
Regular or irregular cemented masses or nodules within the soil. Also referred to as concretions and buckshot gravel. Cementing agents may be iron and/or manganese oxides, calcium carbonate, gypsum etc. Normally formed in situ and commonly indicative of seasonal waterlogging or a fluctuating chemical environment in the soil such as; oxidation and reduction, or saturation and evaporation. Nodules can be redistributed by erosion. (See also 'concretion').

Pebble
By geological definition, a waterworn stone less than 64 mm in diameter (about the size of a tennis ball). Archaeologists often refer to waterworn stones larger than this as pebbles though technically they are cobbles.

Quartz
A mineral composed of crystalline silica. Quartz is a very stable mineral that does not alter chemically during weathering or metamorphism. Quartz is abundantly common and was used by Aboriginal people throughout Australia to make light-duty cutting tools. Despite the often unpredictable nature of fracture in quartz, the flakes often have sharp cutting edges.

Quartzite
A hard silica rich stone formed in sandstone that has been recrystallised by heat (metaquartzite) or strengthened by slow infilling of silica in the voids between the sand grains (Orthoquartzite).

Retouch (on stone tools)
An area of flake scars on an artefact resulting from intentional shaping, resharpening, or rejuvenation after breakage or blunting of a cutting edge. In resharpening a cutting edge the retouch is invariably found only on one side (see also 'indeterminate retouched piece', retouch flake' etc).

Scraper
A general group of stone artefacts, usually flakes but also cores, with one or more retouched edges thought to have been used in a range of different cutting and scraping activities. A flake scraper is a flake with retouch along at least one margin, but not qualifying for attribution to a more specific implement category. Flake scrapers sometimes also exhibit use-wear on the retouched or another edge.

Silcrete
A hard, fine grained siliceous stone with flaking properties similar to quartzite and chert. It is formed by the cementing and/or replacement of bedrock, weathering deposits, unconsolidated sediments, soil or other material, by a low temperature physico-chemical process. Silcrete is essentially composed of quartz grains cemented by microcrystalline silica. The clasts in silcrete bare most often quartz grains but may be chert or chalcedony or some other hard mineral particle. The mechanical properties and texture of silcrete are equivalent to the range exhibited by chert at the fine-grained end of the scale and with quartzite at the coarse-grained end of the scale. Silcrete was used by Aboriginal people throughout Australia for making stone tools.

Site Integrity
The degree to which post-depositional disturbance of cultural material has occurred at a site.

Stone Artefact
A piece (or fragment) of stone showing evidence of intentional human modification.

Stone procurement site
A place where stone materials is obtained by Aboriginal people for the purpose of manufacturing stone artefacts. In Australia, stone procurement sites range on a continuum from pebble beds in water courses (where there may be little or no evidence of human activity) to extensively quarried stone outcrops, with evidence of pits and concentrations of hammerstones and a thick layer of knapping debris.

Stone tool
A piece of flaked or ground stone used in an activity, or fashioned for use as a tool. A synonym of stone tool is ‘implement’. This term is often used by archaeologists to describe a flake tool fashioned by delicate flaking (retouch).

Use wear
Macroscopic and microscopic damage to the surfaces of stone tools, resulting from its use. Major use-wear forms are edge fractures, use-polish and smoothing, abrasion, and edge rounding bevelling.

Appendix 1

Unanticipated Discovery Plan

UTAS Sandy Bay Masterplan PSA Submission

Aboriginal Heritage Addendum Report 1B

Final Version 3

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CLIENT: CHC and UPPL

4.12.2021

Strictly Confidential

CULTURAL HERITAGE MANAGEMENT AUSTRALIA

1.0 Project Overview

The University of Tasmania (UTAS) is exploring options for the reuse and development of its assets at the Sandy Bay Campus, as part of an overall strategy to relocate the campus to the Hobart CBD. The UTAS Sandy Bay campus encompasses approximately 100ha of land. Figures 1-3 show the location and boundaries of the UTAS Sandy Bay campus (the study area).

CHMA and Rocky Sainty were engaged by UTAS to undertake an Aboriginal heritage assessment for the UTAS Sandy Bay campus. The information generated from the assessment would used to inform future planning decisions for the Precinct Plan. The assessment took place in 2019. No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment of the UTAS Sandy Bay campus. A search of the Aboriginal Heritage Register (AHR) showed that there were no registered Aboriginal sites located either within or in the immediate vicinity of the study area boundaries. On the basis of these negative results, CHMA (2019) advised that there were no known Aboriginal heritage sites that occur within the UTAS Sandy Bay campus study area.

CHMA (2019) advised that the apparent absence of Aboriginal heritage sites within the UTAS Sandy Bay Campus could most likely be attributed to a combination of three main factors; the nature of the topography and resources of the study area, the extent of very high levels of disturbances in parts of the study area, and poor conditions of surface visibility. CHMA (2019) noted that much of the north-east and south-west parts of the UTAS Sandy Bay Campus had been heavily modified and developed and that any Aboriginal heritage sites that may have been present within these areas were likely to destroyed. Throughout the lesser disturbed central portions of the study area, where the hill slope gradients are typically quite steep, site and artefact densities were expected to be low to very low, with isolated artefacts and low density artefact scatters being the most likely site type to be present.

Based on these findings, CHMA (2019) made the following recommendations.

Recommendation 1
No Aboriginal heritage sites were identified during the field survey of the Sandy Bay campus. A search of the Aboriginal Heritage Register (AHR) shows that there are no registered Aboriginal sites located either within, or in the immediate vicinity of the study area footprint. On this basis, it is advised that there are no site specific Aboriginal heritage constraints, or legal impediments to the project proceeding.

Recommendation 2
No specific areas of elevated archaeological potential, or suspected Aboriginal cultural features were identified within the study area, and it is assessed that there is generally a low to very low potential for undetected Aboriginal heritage sites to occur within the study

area. On this basis it is advised that there are no requirements for any further Aboriginal heritage investigations to be undertaken within the Sandy Bay campus.

Recommendation 3
If, during the course of the proposed development works across the UTAS Sandy Bay campus, previously undetected archaeological sites or objects are located, the processes outlined in the Unanticipated Discovery Plan should be followed (see Appendix 1). A copy of the Unanticipated Discovery Plan should be kept on site during all ground disturbance and construction work. All construction personnel should be made aware of the Unanticipated Discovery Plan and their obligations under the *Aboriginal Heritage Act 1975* (the Act).

Recommendation 4
Copies of this report should be submitted to Aboriginal Heritage Tasmania (AHT) for review and comment.

CHMA (2021a) Assessment
Since the completion of the CHMA (2019) assessment, UTAS has purchased three additional properties that border the western edge of the Sandy Bay Campus. These three properties encompass a sum total of 5.3ha. It is proposed that these three properties will be incorporated into the UTAS Sandy Bay Campus Precinct Plan. The three properties are situated outside the area covered by the CHMA (2019) Aboriginal heritage assessment. CHMA and Rocky Sainty were engaged by UTAS to undertake an Aboriginal heritage assessment for the three additional parcels of land. The findings of the assessment have been presented in a separate report which acts an addendum to the CHMA (2019) report.

No Aboriginal heritage sites, suspected features, or areas of elevated archaeological potential were identified during the survey assessment and the results of the AHR search shows that there are no registered Aboriginal sites that are located either within or in the immediate vicinity of the study area boundaries. On the basis of these negative results, it was determined that there are no known Aboriginal heritage sites that occur within the study area (see CHMA (2021a).

2.0 Current Precinct Plan

A Precinct Plan has now been developed for the UTAS Sandy Bay Campus (see Figure 4). It has been confirmed that the five designated precincts avoids any known Aboriginal heritage values. Furthermore, the designated precincts are all situated in those parts of the UTAS Sandy Bay Campus that have been heavily modified and developed. These are the areas where CHMA (2019 and 2021a) noted that any Aboriginal heritage sites that may have been present within these areas were likely to be either heavily disturbed or destroyed. On this basis it is assessed that there is a very low potential for future development within these five precinct areas to impact on Aboriginal heritage values.

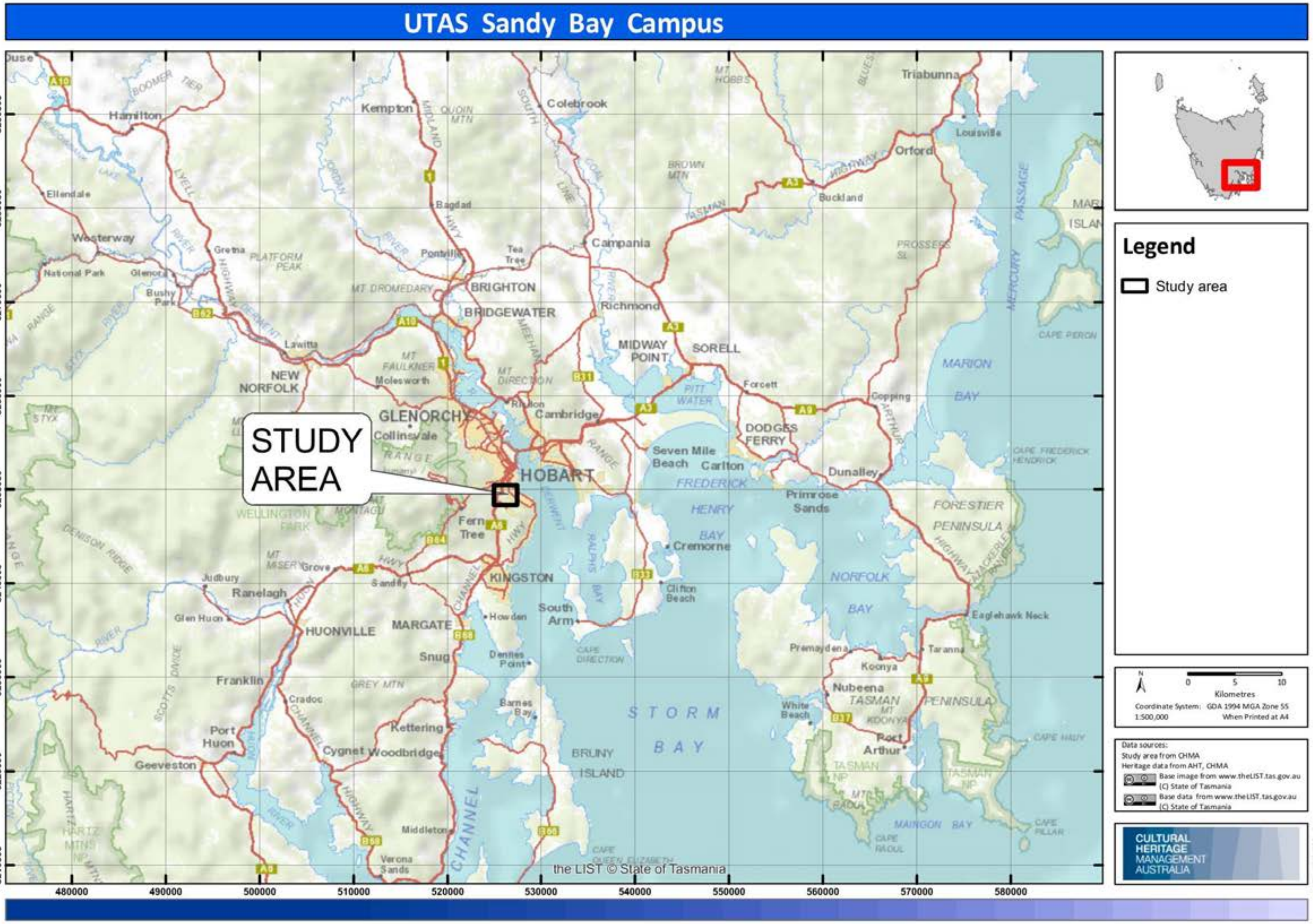

Figure 1: Topographic map showing the general location of the UTAS Sandy Bay campus (the study area)

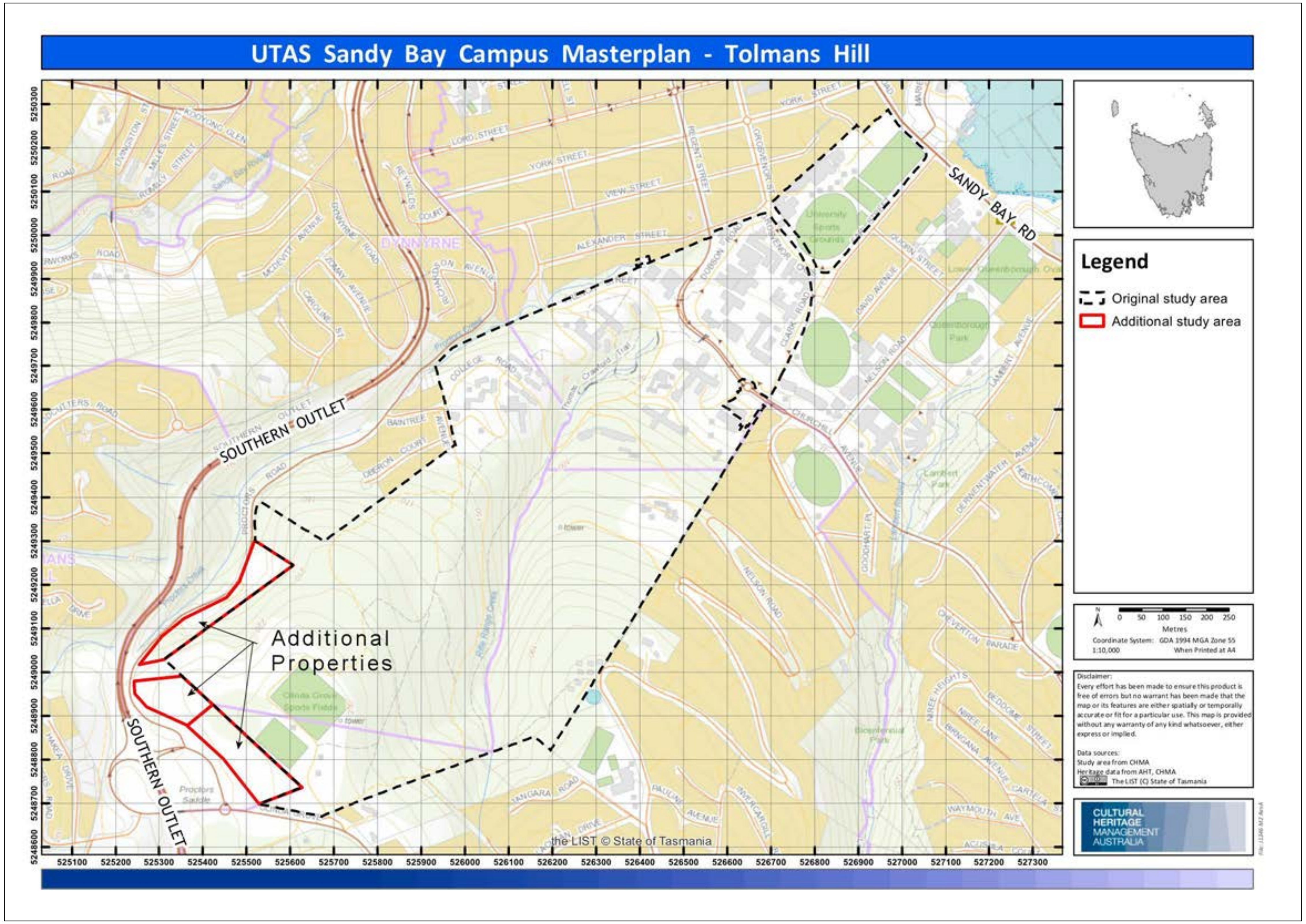

Figure 2: Topographic map showing the boundaries of the UTAS Sandy Bay Campus study area, including the three additional parcels of land

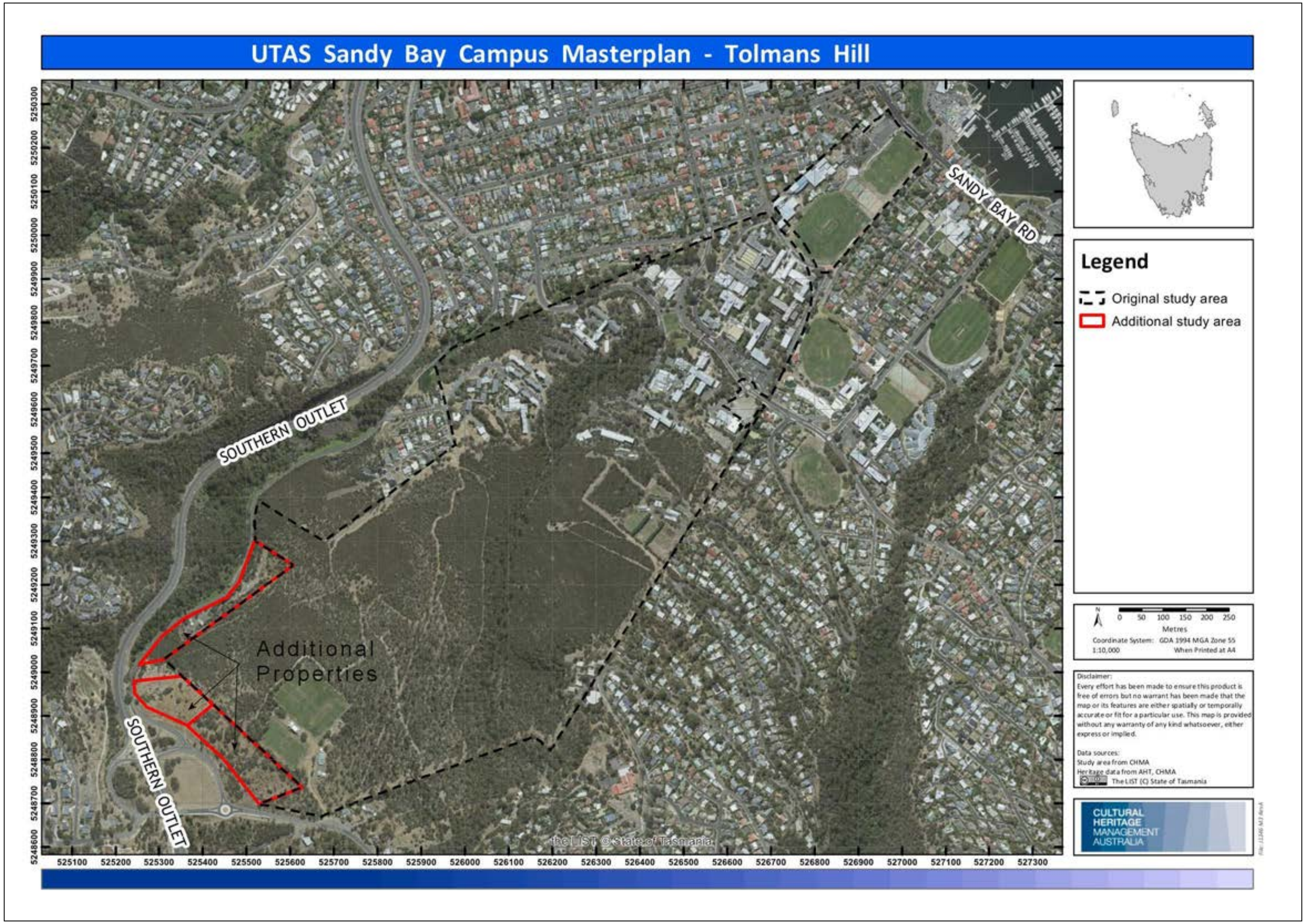

Figure 3: Aerial image showing the boundaries of the UTAS Sandy Bay Campus study area, including the three additional parcels of land

Figure 4: The current proposed Precinct Plan for the UTAS Sandy Bay Campus

References Cited

CHMA 2019 *UTAS Sandy Bay Campus, Hobart, Tasmania: Aboriginal Heritage Assessment.* A report to UTAS.

CHMA 2021a *UTAS Sandy Bay Campus, Hobart, Tasmania Precinct Plan: Aboriginal Heritage Assessment Addendum Report 1B.* A report to CHC and UPPL.

ASSESSING THE MASTERPLAN DESIGN + IMPACTS

Economic Impact Assessment

DeepEnd Services

UTAS Sandy Bay Masterplan for PSA Submission

Economic Impact Assessment

Prepared in association with Clarke Hopkins Clarke
for UTAS Properties Pty Ltd

3 December 2021

Deep End Services
Deep End Services is an economic research and property consulting firm based in Melbourne. It provides a range of services to local and international retailers, property owners and developers including due diligence and market scoping studies, store benchmarking and network planning, site analysis and sales forecasting, market assessments for a variety of land uses, and highest and best use studies.

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Report reliance
This report has been prepared by Deep End Services Pty Ltd for ClarkeHopkinsClarke Architects Pty Ltd and UTAS Properties Pty Ltd (UPPL) and may only be used and relied on by ClarkeHopkinsClarke Architects Pty Ltd and UTAS Properties Pty Ltd (UPPL) for the purpose of a Planning Scheme Amendment Submission or as otherwise set out in this report. Accordingly, any changes to this report will only be notified to that party.

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Executive summary

Background

The purpose of this report is to analyse the economic effects associated with future development of the Sandy Bay Site (Subject Site) of the University of Tasmania (UTAS) in accordance with a Masterplan that has been developed by ClarkeHopkinsClarke (CHC) on behalf of UTAS Properties Pty Ltd (UPPL).

The report has been prepared to assess the land use outcomes envisaged in the Masterplan, as input to the development of new planning controls that ensure that development is strategically justified and in accordance with relevant state, regional and local planning policies

The Masterplan has been prepared to guide future development of the existing campus at Sandy Bay (Subject Site) as the University transitions to the Hobart CBD.

The vision for the Site is for it to be developed as an urban regeneration project that would become a truly mixed-use place with opportunities for commercial offices, residential dwellings, aged care, medical services, sports and recreation along with supporting retail and other uses.

This Economic Impact Assessment is the second of a two-stage process:

1. The Market Assessment Report contains a review of previous work undertaken for UPPL, including a Highest and Best Use Assessment prepared by Macroplan in 2019, and presents detailed market assessments on the type and scale of potential land uses that could be incorporated into the Masterplan.
2. The Economic Impact Assessment Report (this report) adopts the UTAS Sandy Bay Masterplan as an indication of the preferred long-term development outcome for the Subject Site, and presents an examination of the proposed land uses including:
    a. A summary of the market context and support for the indicative scale of uses (drawing on the material contained in the Market Assessment Report)
    b. A review against strategic policy as it relates to the proposed land uses
    c. Analysis of potential implications for other centres and precincts
    d. An assessment of the likely economic outcomes that will arise as the Masterplan is implemented.

Context

The Subject Site is a property of 105ha occupying a strategic position overlooking the Derwent River and situated just 3km from Hobart CBD.

The Site enjoys a range of attributes as a location for urban regeneration, including excellent accessibility, synergies with other nearby uses, views over the Derwent River, an attractive natural setting and regional access via the Southern Outlet.

Precinct-based approach

Development of the Masterplan is being undertaken using a precinct-based approach. Five precincts are identified, broadly delineated by Sandy Bay Road, Grosvenor Crescent, Churchill Avenue, the gully that traverses the Upper part of the Site, and the extent of the landholding to the south at Proctor Road/Olinda Grove.

Land use outcomes

The Masterplan provides a physical indication of the development and land use outcomes that would be facilitated by the proposed planning provisions to be introduced as a planning scheme amendment. The Masterplan is a long-term plan to guide outcomes, recognising that the full implementation of the plan would emerge over approximately 30 years.

The range of land uses proposed for the Site includes:

<u>Residential</u>

- A total of 2,548 residential dwellings catering to the traditional residential market, consisting of:
  - 59 single lot dwellings
  - 134 townhomes
  - 2,355 apartments
- Provision for 81 retirement units (independent living units, or ILUs) and 91 aged care beds.

<u>Commercial office</u>

- 3,060 sqm NLA within Precinct 1 which is anticipated to accommodate sports sciences and sports administrative functions
- 14,900 sqm NLA within Precinct 2 which consists of 11,840 sqm of repurposed space within the Physics, Morris Miller and Social Sciences buildings, and 3,060 sqm of additional built floorspace
- 800 sqm NLA of commercial uses to be built within Precinct 5 in the form of small ground level tenancies under two buildings within a mixed use precinct.

<u>Retail</u>

- 600 sqm within Precinct 1 consisting of convenience uses and food & beverage tenancies serving apartment residents, workers within the sports science and administration uses and visitors to sports and recreation activities.
- 5,300 sqm within Precinct 2 including a supermarket of 3,500 sqm and a range of retail uses configured as part of the retail node or at the base of mixed use buildings (and likely to contain convenience retail, food & beverage and a range of other retail and non-retail service uses).
- 400 sqm within Precinct 3 associated with a small allocation at the base of apartment buildings.
- 5,500 sqm within Precinct 5 which consists of:
  - A small traditional retail component of 2,000 sqm located as small tenancies at the base of mixed-use buildings; and

<u>Accommodation and tourism</u>

- A serviced apartment building within Precinct 1 containing 72 rooms, situated with frontage to Sandy Bay Road

- An eco-resort style hotel within Precinct 5 containing 120 rooms
- An adventure tourism centre within Precinct 5.

Other

- Redevelopment of 'Sports Green' within Precinct 1 to accommodate new multi-sport natural turf and indoor astroturf pitches, introduce seating, and improve facilities for AFL and cricket including the sports pavilion
- Development of a new sports science/sports administration centre within Precinct 1, which would also incorporate new sports social clubrooms and would house the relocated Lady Gowry Childcare centre
- Retention of library and performing arts/cultural activities within Precinct 2, and relocated community house
- Construction of a new medical and wellness centre within Precinct 2, with allocation of 3,200 sqm GFA
- Construction of a new family health services / community centre and childcare centre within Precinct 3
- Development of a health spa and wellness centre of 1,000 sqm within Precinct 5.

Market support

Each of the proposed land uses has been assessed against the recommendations provided in the Market Assessment Report. This analysis demonstrates that:

- The proposed volume of residential development is consistent with the findings of the Market Assessment Report with respect to ongoing demand for residential dwellings of the type likely to be developed on the Site and would be expected to be absorbed over around 25-35 years.
- The typology of housing proposed for the Site would widen the housing choices available for prospective purchasers, and the potential introduction of build-to-rent units would help create an attainable product for a range of demographic groups.
- The scale of commercial office provision is consistent with the Site's lower order role as a location mainly for micro and small businesses and would be absorbed over the 30-year project timeframe.
- The proposed supermarket-based retail component within Precinct 2 responds to a current under provision of supermarket floorspace serving the identified study area, and would provide such services for residents in the study area including on-site residents and workers.
- The proposed scale and type of uses within Precinct 1 reflects an opportunity to deliver a small amount of convenience retail plus some food & beverage and other visitor-oriented retailing that reflects the envisaged role of the precinct for sports, recreation and supporting uses.
- The minor retail uses proposed for Precinct 3 are appropriate.
- The local specialty retailing in Precinct 5 (2,000 sqm) provides an opportunity for convenience retailing for local residents on-site and in Tolmans Hill and Mt Nelson, and would likely also include some specialised tourist-related retail.

- The proposed market hall was not assessed as part of the Market Assessment Report, and its success would depend on securing interest from a wide variety of future stallholders. Nevertheless, this type of use would serve a wider regional role as a 'foodie' destination, and is consistent with the other visitor-oriented uses envisaged in Precinct 5.
- The proposed commercial accommodation uses directly respond to the opportunities identified in the Market Assessment Report.
- A range of other uses include sports administration, sports and recreation uses, medical facilities, specialised health and wellness services, and childcare. The opportunity for these uses is established in the Market Assessment Report.

Strategic assessment

An assessment of the components of the Masterplan against relevant planning policies contained in STRLUS demonstrates that:

- The residential component would be absorbed over a relatively long timeframe, reflecting the fact that the Subject Site would attract only a share of the demand for medium and higher density residential product within Greater Hobart and the inner city region. If development happened more rapidly the share might be higher, but this would not necessarily generate any adverse consequences given that the take up for product at Sandy Bay would reflect community preferences. Moreover, the projections in the Market Assessment Report may be overly conservative if population growth in Hobart occurs at a faster rate, consistent with trends during the three years prior to COVID-19.
- The commercial office component would help to establish the Subject Site as a new mixed-use precinct that integrates living, working, shopping and other activities, with Precinct 2 in particular including local office accommodation serving the needs of the small business sector, and with an opportunity to establish sports science/administrative functions in Precinct 1. However, the scale of office development would be minor when compared against the existing commercial sector in Hobart CBD, and the modelling indicates that it would represent only 10-15% of future demand for office space. Importantly, the Site would be likely to attract micro and small businesses, and would not be an attractive destination for major corporate offices or government departments. Overall, the inclusion of commercial office floorspace would not adversely affect the preeminent role of Hobart CBD as the commercial and administrative hub for the region.
- The retail components would be complementary to the existing activity centre network and would not adversely affect the role of Sandy Bay Town Centre as the main neighbourhood centre serving the Sandy Bay region. The incorporation of a full-line supermarket in Precinct 2 would help to address a significant under-provision of supermarket floorspace in the area, while the inclusion of small amounts of retailing within Precinct 1 and Precinct 5 would respond to local site conditions and opportunities. The proposed market hall would operate as a visitor destination, providing a complementary offer rather than competing for regular shopping trips that are normally directed to supermarkets.

- The accommodation and tourism components are supported by regional policies that aim to further develop and diversify Southern Tasmania's tourism offer while emphasising sustainable and innovative tourism opportunities.
- The range of other uses including health, wellness, community and other uses respond to the need to create a vibrant, successful mixed use precinct, and help to ensure that residents are provided with an array of services to meet their needs.

Economic effects

Successful development of the Site in accordance with the Masterplan would generate a range of economic benefits:

- Significant capital investment, potentially in excess of $1.5 bn, representing approximately $900 m in direct value added
- Employment generated during the construction period, likely to be more than 6,300 direct jobs spread across the life of the project
- Indirect benefits through multiplier linkages, including estimated indirect employment of 11,000 jobs arising from the construction activity
- Total direct ongoing employment of 1,900 employment positions, or 1,520 jobs when measured in full-time equivalent terms
- Indirect employment estimated at 3,000 jobs
- Direct contribution of $150m in value added
- Other benefits associated with the repurposing of the Site as an active mixed use precinct accommodating residents, workers, services and visitors.

Importantly, analysis shows that the Masterplan would not generate significant adverse effects on other centres such as Hobart CBD or Sandy Bay Town Centre.

1

Introduction

1.1 Background

Purpose of the report

The purpose of this report is to analyse the economic effects associated with future development of the Sandy Bay Site (Subject Site) of the University of Tasmania (UTAS) in accordance with a Masterplan that has been developed by ClarkeHopkinsClarke (CHC) on behalf of UTAS Properties Pty Ltd (UPPL).

The report has been prepared as input to a planning scheme amendment submission that will implement new planning controls to facilitate development of the Site.

Study context

The Masterplan provides a long-term visionary plan to guide the staged redevelopment and regeneration of the Sandy Bay campus as the University transitions to the Hobart CBD.

The Sandy Bay property consists of more than 105 hectares overlooking the Derwent River, extending from the frontage on Sandy Bay Road southwards up Mount Nelson towards Southern Outlet. The Site has strategic importance given its physical size, proximity to central Hobart and attractive setting.

The University has developed the following vision for the Subject Site:

> *A vibrant, re-imagined and active place that is a leading example for sustainability, liveability and a diverse well connected mixed use precinct.*

The Site is expected to become a truly mixed-use precinct with opportunities for commercial offices, residential dwellings, aged care, medical services, sports and recreation along with supporting retail and other uses.

The development format will be in the form of adaptive reuse of existing buildings as well as the construction of new built structures for housing and other uses.

1.2 Planning Scheme Amendment

The Site is currently subject to the provisions of the *Particular Purpose Zone 3 – University of Tasmania (Sandy Bay Campus)* within the Hobart Interim Planning Scheme 2015 which requires that use and development of land be primarily for educational purposes. A planning scheme amendment is therefore required to facilitate a greater range of uses as envisaged in the Masterplan.

This report has been prepared to assess the land use outcomes envisaged in the Masterplan, as input to the development of new planning controls that ensure that development is strategically justified and in accordance with relevant state, regional and local planning policies.

1.3 Study process

This economic impact assessment report is the second of two reports that have been prepared on behalf of CHC and UPPL:

1.3.1 Market Assessment Report

The Market Assessment Report contains a review of previous work undertaken for UPPL, including a Highest and Best Use Assessment prepared by Macroplan in 2019, and presents detailed market assessments on the type and scale of potential land uses that could be incorporated into the Masterplan.

The outcome was a technical report that informed preparation of the UTAS Sandy Bay Masterplan.

1.3.2 Economic Impact Assessment Report

The Economic Impact Assessment Report (this report) adopts the UTAS Sandy Bay Masterplan as an indication of the preferred long-term development outcome for the Sandy Bay Site, and presents an examination of the proposed land uses including:

- A summary of the market context and support for the indicative scale of uses (drawing on the material contained in the Market Assessment Report)
- A review against strategic policy as it relates to the proposed land uses
- Analysis of potential implications for other centres and precincts
- An assessment of the likely economic outcomes that will arise as the Masterplan is implemented.

1.4 Report structure

This report is structured as follows:

- Section 2 presents a summary of the Site's geographic context and the applicable planning policies against which the Masterplan will be assessed.
- Section 3 describes the Masterplan including the proposed type and scale of uses adopted as the basis for subsequent analysis.
- Section 4 presents an examination of each of the main land uses proposed to be developed within the Site, including a summary of the market context in each sector, an assessment of the proposed outcomes under the Masterplan to consider whether the proposes uses can be justified in market economic terms, and analysis of the implications if development proceeds as proposed.
- Section 5 analyses the economic outcomes likely to result from development in accordance with the Masterplan including employment generation, economic activity and other benefits, and examines the potential effects on existing centres including the Hobart CBD and the Sandy Bay Town Centre.

As noted in section 1.3.2 above, analysis in this report draws on material contained in the Market Assessment Report that has been prepared to inform preparation of the Masterplan.

2

Context analysis

2.1 UTAS transition to CBD

UTAS currently delivers education services from Sandy Bay and a range of locations within Hobart CBD and elsewhere across Tasmania.

The university has adopted a consolidation strategy that will see the majority of functions operating from the Hobart CBD and Launceston Inveresk campuses in the future.

2.2 Regional context

The Subject Site is situated in the southern Hobart suburbs of Sandy Bay and Mount Nelson, close to the Hobart CBD (3km or around 5 minutes' travel time) and a short 20km (20 minutes) drive from Hobart Airport.

The Site extends from the Mount Wellington foothills to Sandy Bay Road, overlooking the Derwent River.

Sandy Bay Road on the Site's north-eastern boundary provides the main access between central Hobart and the coastal community along the southern shore of the Derwent River and southwards to Taroona along the Channel Highway.

Churchill Avenue bisects the Site in an east-west direction, connecting with Regent Street in the established part of Sandy Bay to the west, and providing the main access into the central part of the Site. To the east, Churchill Avenue generally demarcates the suburbs of Mount Nelson (to the south) and Sandy Bay (to the north).

The Southern Outlet, which is on the Site's south-western boundary, is the major north-south arterial for people travelling into Hobart from Kingston and south-western Tasmania, carrying approximately 36,750 vehicles per day according to RoadsTas (2020). Access to the Site is available via an off-ramp at Proctors Road and Olinda Grove in Tolmans Hill.

Annual traffic data published by RoadsTas shows that traffic along Southern Outlet has grown by an average rate of 1% per annum over the past decade.

2.3 Local context

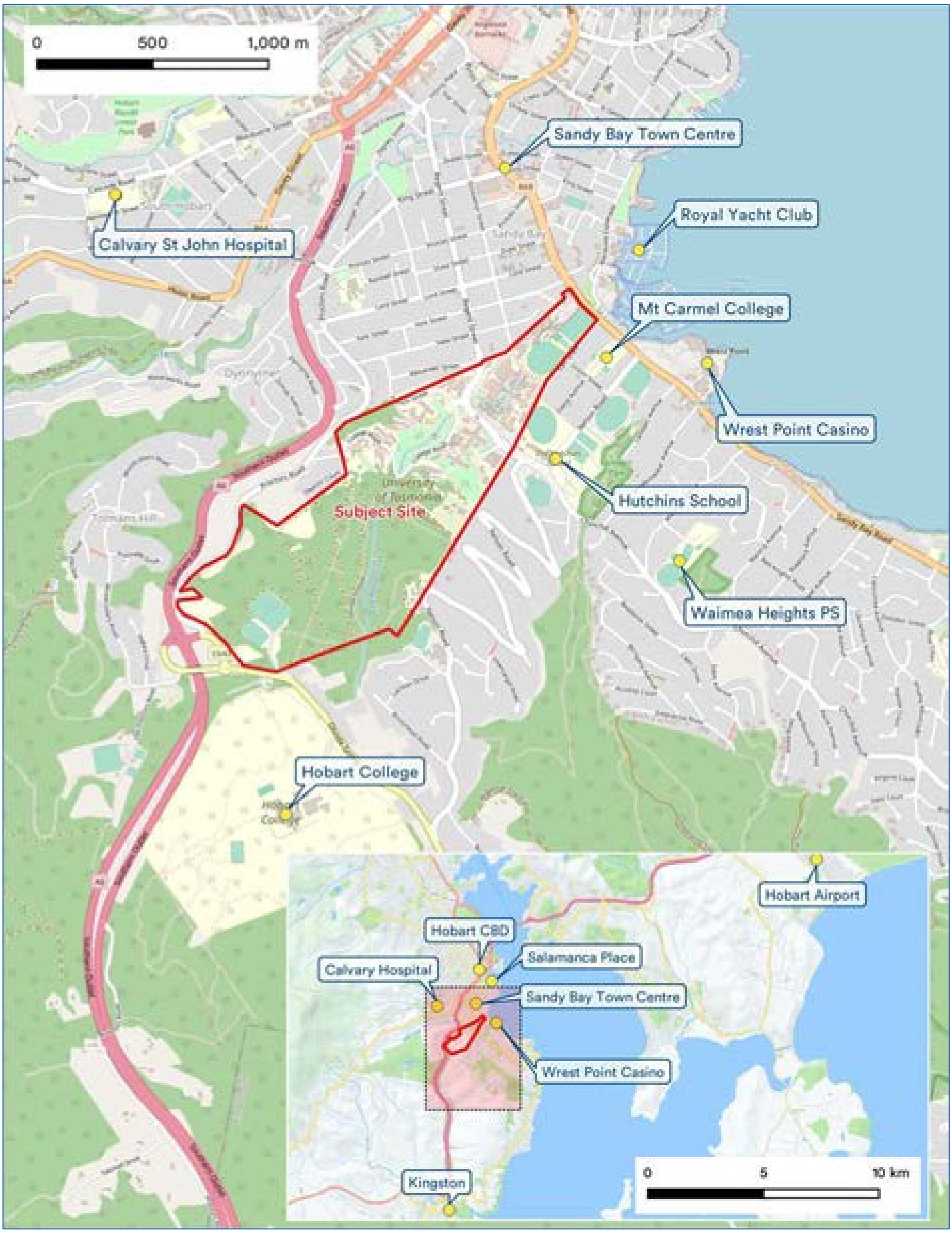
The Site has a total area of approximately 105ha and occupies a strategic position overlooking Hobart and the Derwent River, surrounded by desirable residential communities in Sandy Bay and close to tourist destinations such as Battery Point and Salamanca Place northwards towards central Hobart, and Wrest Point Casino close to the northern part of the Site on Sandy Bay Road.

Surrounding features include:

- Affluent inner-city residential communities to the north between Proctors Road and Sandy Bay Road, and lower density housing to the south-east on the hilly sections of Nelson Road and along the coastline.
- Neighbourhood shopping facilities at Sandy Bay Town Centre which has around 15,000 sqm of occupied floorspace including mid-sized Coles and Woolworths supermarkets.
- A local centre to the east at Long Beach, along with scattered individual shops throughout the surrounding region.
- Tourism and visitor destination uses along the foreshore, including the Royal Yacht Club of Tasmania and Wrest Point Casino.

Figure 1 illustrates the Site in its regional and local context.

Figure 1—Location context



Source: Deep End Services; OSM; HERE; QGIS

2.4 Planning context

The Subject Site is almost entirely within the *Particular Purpose Zone 3 – University of Tasmania (Sandy Bay Campus)* under the Hobart Interim Planning Scheme (2015) where the purposes are:

- To provide for the continued development of the University of Tasmania Sandy Bay campus (UTAS Sandy Bay) as a major tertiary education centre of the State; and
- To provide for a diversity of activities primarily catering for the education, recreation and entertainment of its student population while also encouraging a closer integration with the community.

Small parts of the Site are within the Environmental Management Zone and the Low Density Residential Zone.

A planning scheme amendment will be required to enable redevelopment of the Site for non-educational purposes in accordance with the proposed Masterplan.

Consideration of a planning scheme amendment will have regard to the strategic merit of the proposed uses that would be facilitated by a rezoning, including whether the proposed land uses are supported by market conditions.

2.4.1 Southern Tasmania Regional Land Use Strategy

Also important is whether the proposed outcomes are consistent with state and regional planning policies, primarily the *Southern Tasmania Regional Land Use Strategy 2010-2035* (STRLUS), as amended in February 2020.

STRLUS provides the broad policy overview to facilitate and manage change, growth and development within Southern Tasmania over a 25 year period to 2035, and applies to 12 local government areas that together form the Southern Tasmania planning region. The planning region includes Greater Hobart which is acknowledged as the social, economic and administrative centre for the region and the capital region for Tasmania as a whole.

In the context of the types of development anticipated to be developed on the Site, relevant regional policies are in relation to residential growth and settlement, activity centres and tourism.

Settlement and residential development

STRLUS anticipates that the defined planning region (incorporating Greater Hobart and adjacent areas) will grow from a population of around 246,000 people in 2008 to 327,000 by 2035, necessitating an additional 36,000 new dwellings. Most growth, accounting for an additional 26,500 new dwellings, is projected to occur in Greater Hobart (refer STRLUS, Chapter 3, p10).

Strategic Direction 2 is to holistically manage residential growth, and provides a basis for regional planning of development and land release consistent with sustainable development and infrastructure planning. Associated strategies are intended to "*ensure that residential land supply considers affordability and locational options*", among other things.

Regional strategies are presented in STRLUS under the heading Settlement and Residential Development:

- SRD 1 is to "*provide a sustainable and compact network of settlements with Greater Hobart at its core, that is capable of meeting projected demand*".
- SRD 2 is to "*manage residential growth for Greater Hobart on a whole of settlement basis and in a manner that balances the needs for greater sustainability, housing choice and affordability*".

  Under this policy, SRD 2.1 specifies that 50% of the new dwelling demand in Greater Hobart is expected to occur as infill development, with the remainder as greenfield development in growth areas.
- SRD 2.6 supports increased housing densities within 400-800 metres of integrated transit corridors (which includes the stretch of Sandy Bay Road that extends to the northern boundary of the Site).
- SRD 2.7 specifies that 25% of the growth target, or around 3,300 new dwellings, should occur as infill development within Hobart LGA. This is relevant in the context that around half of this forecast growth for the period to 2035 has already occurred in the City of Hobart, implying that there is only capacity for a further 1,600 new dwellings within the STRLUS growth vision.

  In this regard, it is noted that STRLUS will be reviewed following completion of the Greater Hobart Vision 2050, which forecasts population growth of around 7,900 persons in Hobart LGA to 2040, implying a need for nearly 4,000 new dwellings over the next 20 years.

  Also relevant to the growth forecast under STRLUS is that the projections in the Strategy anticipate average population growth across Southern Tasmania of approximately 3,000 persons per year over the 25-year planning period. However, since 2016 average growth as recorded by the ABS has averaged 3,840 persons per year and peaked at 4,225 persons in 2018-19 (ie pre-COVID).
- SRD 2.9 provides support for a greater mix of dwelling types to meet the needs of demographic change, including housing that is suited to an ageing population.
- SRD 2.11 is to increase the supply of affordable housing.

Activity centres

Strategic Direction 3 is to "*create a network of vibrant and attractive activity centres*" that provides a strong basis for economic growth, establishes a focus for community service delivery and business transactions, maximises the efficient use of infrastructure and assists with integrated transport and land use planning.

Regional policies emphasise the role of an 'Activity Centre Network' which provides a defined hierarchy to ensure "*complementarities and efficiencies, rather than creating unnecessary competition, between centres*".

The adopted network hierarchy has Hobart CBD as a *Primary Centre* and the pre-eminent centre for public administration, financial services and commerce. The role of the CBD is to be the "*primary hub for Tasmania, the region and the Greater Hobart metropolitan area in terms of business, government administration,* *leisure, entertainment and tourism services providing a comprehensive range of services and facilities including public transport. A significant proportion of all employment opportunities within the region is currently and should continue to be focussed in the Primary Activity Centre*".

In terms of its role for commercial and retail uses, STRLUS states that Hobart CBD should be the "*primary location for offices, including corporate headquarters, professional services, government administration. Regional shopping facilities including major department stores with high level of speciality shops, secondary retailing and a focus on the 'high street' shopping experience. Should include at least one major supermarket/food market. Bulky good retailing may be accommodated at the fringe*."

Kingston is the nearest defined *Principal Activity Centre* to the Subject Site. Principal centres are to serve sub-regions and deliver a wide range of services and facilities, with retail a major sector but supported by a range of office and administrative functions.

Sandy Bay is a *Minor or Neighbourhood Centre*, where the role is to "*serve daily needs of surrounding community and provide a focus for day-to-day life within a community*". Retail uses are anticipated to be anchored by at least one supermarket, along with other retail uses, community and health facilities, and some night-time entertainment activities.

STRLUS includes the following regional policies:

- AC 1 is to focus activities such as retail, commercial and community uses in well-planned, accessible and vibrant activity centres that have good transport links with residential areas.

  This policy is supported by sub-clauses that discourage out of centre development, emphasise the role of neighbourhood and local centres as focal points of their local communities, and promote local employment opportunities.

  AC 1.11 specifically mentions the need to provide for 10-15 years of growth at existing activity centres through appropriate zoning.
- AC 2 reinforces the role of Primary and Principal Centres in providing for key employment, shopping, entertainment, cultural and political needs of the region.
- AC 3 aims to promote high levels of amenity through pedestrian-focussed design and measures to promote multi-modal access.

Tourism

Regional policies with respect to tourism acknowledge the importance of the sector as a source of economic activity and growth potential and include measures to encourage sustainable and innovative tourism.

Policy T 1.1 is to protect and enhance local features and landscapes.

Policies T 1.6 and T 1.7 acknowledge that some tourism proposals may not easily fit within local schemes, and identify other approval processes as suitable in some instances.

2.4.2 Central Hobart Precincts Plan

The Central Hobart Precincts Plan (CHPP) is a study currently underway to guide future growth in the central part of the city centre, with the intention to strengthen Hobart as a vibrant, flourishing, sustainable and globally appealing capital city.

A Discussion Paper has been released for public engagement, informed by technical analysis including an *Economic, Demographic and Employment Study* prepared on behalf of the City of Hobart by HillPDA in April 2021.

Key findings and ideas described in the CHPP Discussion Paper are as follows:

- Central Hobart is recognised as the primary activity centre and the hub of commerce, administration and cultural activity for the southern region and a significant driver of Tasmania's economy. It represents the most significant single area of economic activity in the State.
- Employment growth has occurred over the last 5 years at rates higher than population growth, with key industries sectors being those (such as public administration and professional, scientific and technical services) that underpin the commercial office market.
- Hobart's economic resilience has been apparent during the COVID pandemic, and growth in population, dwelling construction and visitator numbers during the recovery phase will underpin key sectors in Central Hobart.
- The UTAS transition to the city centre is expected to have a strong positive effect stimulating learning, teaching and research, and provide an opportunity to facilitate innovative industries and start-up businesses.
- The strategic framework articulated in the Discussion Paper emphasises the continuation of Central Hobart's role as the primary centre for commercial, cultural, political and administrative activities, but with added activity as the night-time economy further develops and as more students and residents live and visit the city centre.
- More liveable outcomes are encouraged, with a wide range of housing options integrated with workplaces, shops and other uses. New housing will need to accommodate projected demand for an additional 7,000 people over the next 20 years.

Key aspects and findings in the Economic, Demographic and Employment Study are as follows:

- The analysis considers the potential economic and demographic effects of the COVID-19 pandemic on Tasmania and the Hobart LGA and uses this information to present updated population, dwelling, employment and floorspace projections applicable to development within the Central Hobart study region.
- COVID-19 caused significant immediate adverse impact on the Tasmanian and Hobart economies through lower population growth, job losses and reduced international visitation. However, the economy quickly recovered once lockdown ended and borders reopened. Overall, Hobart has been more resilient to the effects of the pandemic when compared to the broader state.

- Revised projections have been prepared for population, dwelling, employment and employment space requirements in Central Hobart for the period 2020 to 2041, using base projections from the Centre for Population and developing slow, medium and rapid recovery scenarios. The results indicate:
  - Population growth of between 2,205 and 3,670 residents over the 21 year period, or average annual growth of 105 to 175 persons per annum
  - Dwelling growth of 1,320 to 2,190 new dwellings, or around 62 to 104 per year, with these assumed to be apartments
  - Employment growth of 7,015 to 11,555 new jobs, averaging 335 to 550 new jobs each year
  - Demand for an additional 232,780 sqm to 382,030 sqm of occupied floorspace on top of the existing 1.13 million sqm currently in Central Hobart, representing annual growth of 11,085 sqm to 18,190 sqm over the forecast period.
- The study indicates that an increased preference for working from home could lead to a reduction of up to 15% in commercial office space requirements. The resulting net demand for office-related jobs in knowledge-intensive sectors would reduce by 8,000 sqm to 13,735 sqm over the period 2020 to 2041. This represents one of the key potential longer-term effects arising from COVID-19, with most other adverse effects only occurring for a short period.

2.5 Implications

STRLUS establishes policies in relation to retail, commercial and other ‘centre type’ uses that are relevant in assessing various uses that are proposed in the Sandy Bay Masterplan.

Of particular relevance are provisions in relation to activity centres that aim to ensure that new development outside the Activity Centre Network does not adversely affect the role of existing centres. These provisions are applicable to proposed retail uses and their potential impacts on Sandy Bay Town Centre, and commercial office uses and their effect on the Hobart CBD as the Primary Activity Centre.

Assessments of each proposed use type are set out in Section 4 of this report and then summarised in Section 5.

3

Proposed development outcomes

3.1 Masterplan

The UTAS Sandy Bay Masterplan has been prepared on behalf of UPPL by CHC in collaboration with Playstreet and Dock4 Architects and supported by a range of contributing technical and strategic consultant inputs.

The Masterplan provides a physical indication of the development and land use outcomes that would be facilitated by the proposed planning provisions to be introduced as a planning scheme amendment, and is being adopted as the basis for examining the potential impacts (economic, environment and social) that would arise if these development outcomes eventuated. The Masterplan is a long-term plan to guide outcomes, recognising that the full implementation of the plan would emerge over approximately 30 years.

A depiction of the Masterplan is provided in Figure 2, with the main land use and economic elements described as follows:

3.1.1 Precinct 1

Precinct 1 is the lower part of the Site situated between Sandy Bay Road and Grosvenor Crescent. Proposed land uses include:

- Retention and enhancement of the AFL football ground, and redevelopment of the rugby ground for a natural multi-sport field and second AstroTurf field
- Indoor sports grounds and club facilities
- Introduction of major sports science and sports administrative offices
- Residential apartments and serviced apartments
- Retention/relocation of childcare centre
- Supporting retail and food & beverage uses to cater to new residents and visitors.

3.1.2 Precinct 2

Precinct 2 consists of the Middle part of the Site which extends from Grosvenor Road to Churchill Avenue.

Development within this precinct will include the reuse and adaptation of some existing buildings and the construction of new mixed-use elements.

The Masterplan anticipates the following outcomes within Precinct 2:

- Reuse/adaptation of Engineering, Geology and Chemistry buildings for apartments
- Construction of new apartment buildings
- Reuse/adaptation of Morris Miller and Social Sciences and part redevelopment of Physics Building for commercial offices
- Construction of new aged care building west of Churchill Avenue (north of existing Refectory)
- Construction of vertical retirement living on Refectory site
- Construction of new supermarket and associated retail uses on Dobson Road close to existing Administration building
- Retention of library and arts/cultural activities
- Introduction of new medical centre close to intersection of Churchill Avenue and realigned Clark Road
- Construction of new mixed use buildings (residential apartments with small amount of retail/F&B at ground level) on existing car park.

3.1.3 Precinct 3

Precinct 3 is within the Upper part of the Site and extends southwards up Mount Nelson from Churchill Avenue, south-east of the gully that traverses the Upper Site.

Development outcomes within Precinct 3 will be largely residential, with a mix of apartments, 'townhomes' and single lot residences. A small provision for retail or F&B would provide local services at the base of some of the buildings. A family health services and childcare centre is proposed for the existing Corporate Services building at the rear of Hill Street Grocer.

The existing CSIRO and Hill Street Grocer uses would remain on the Site.

3.1.4 Precinct 4

Precinct 4 extends from Churchill Avenue south-westwards up Tolmans Hill, on the north-western side of the gully that traverses the Upper part of the Site.

The existing student accommodation on this part of the Site would be retained.

Proposed uses under the Masterplan include new residential apartment buildings and 'townhomes', and the introduction of a new education facility.

3.1.5 Precinct 5

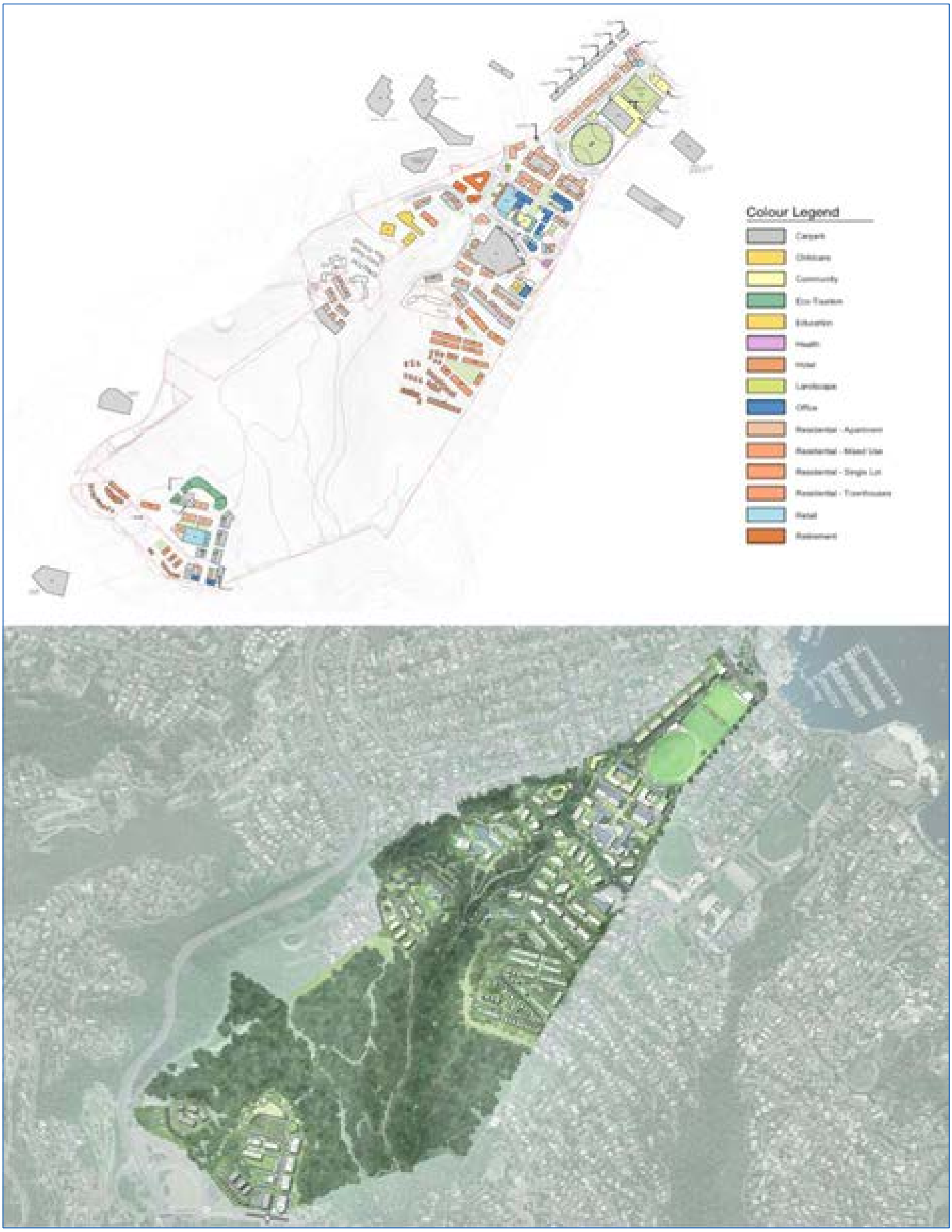
Precinct 5 is situated at the highest point of the Site where access is from Olinda Grove which connects to the Southern Outlet and Proctors Road to the west, and to Nelson Road further to the south. The area is characterised by extensive bushland across this part of the Upper Site, with walking tracks and bicycle paths providing connections north-east to the main part of the campus. A former quarry is located on the northern boundary off Proctors Road.

The precinct is proposed to be developed for a range of tourism-oriented and other destination uses that reflect the surrounding bushland setting and ease of access from Southern Outlet.

Proposed uses comprise:

- An adventure tourism centre with associated eco hotel and spa
- A mixed-use precinct containing a small retail centre and provision for a market hall that is proposed to create opportunities for local providore stallholders and would establish a new ‘foodie’ destination precinct for the region
- A mix of townhomes and single lot dwellings.

Figure 2—UTAS Sandy Bay Masterplan



Source: CHC

3.2 Schedule of uses

Table 1 presents a summary of the development outcomes associated with the UTAS Sandy Bay Masterplan.

The exact uses and scale of development shown in the table represent an indicative development schedule that is consistent with the built form and land uses proposed in the Masterplan. However, actual development outcomes will need to have regard to market conditions at the time, while being consistent with the planning conditions implemented through the planning scheme amendment.

Table 1—Schedule of proposed uses

Use type	Lower site	Middle site		Upper site		Total
	Precinct 1	Precinct 2	Precinct 3	Precinct 4	Precinct 5	
Residential uses						
Residential dwellings	194	755	933	305	360	2,547
Retirement living (ILUs)		81				81
Sub-total dwellings	**194**	**836**	**933**	**305**	**360**	**2,629**
Aged care (beds)		91				91
Commercial accommodation - hotel					120	120
Commercial accommodation - serv. apartments	72					72
Sub-total commercial accommodation (beds/rms)	**72**				**120**	**192**
Student accommodation (existing)				400		400
Non-residential uses (GFA)						
Commercial	3,600	18,400			800	22,800
Supermarket		3,500				3,500
Specialty shops/food & beverage	600	1,800	400		2,000	4,800
Market hall					3,500	3,500
Sub-total retail	**600**	**5,300**	**400**		**5,500**	**11,800**
Health and wellbeing		3,200	1,500		1,000	5,700
Tourism & recreation					500	500
Community & education	6,600	4,970	900		1,000	13,470

Source: CHC

4

Sectoral analysis

4.1 Introduction

This chapter presents an examination of each of the land uses proposed in the Masterplan and includes, for each land use type:

- A summary of the market conditions
- An examination of the need and opportunity for additional development, drawing on the material presented in the Market Assessment Report
- Assessment of the proposed use against the regional policies contained in the STRLUS
- Implications, including an examination of any potential effects such as retail trading impacts on competitive centres.

Assessments have been completed for the following uses:

- Residential dwellings, including product aimed at older residents in the form of retirement living and aged care
- Commercial offices
- Retail uses, underpinned by potential for supermarket-anchored retail centres
- Commercial accommodation and tourism activities
- Sports and recreation uses
- Health and community services.

The analysis in this chapter draws on material contained in the Market Assessment Report prepared as technical input to development of the Masterplan.

4.2 Residential

4.2.1 Market assessment

The approach adopted in the Market Assessment Report to examine residential development opportunities includes:

- Consideration of regional trends in population, including effects of COVID-19
- Definition of a relevant residential study region
- Summary of historic and projected population growth trends and implications in terms of projected underlying dwelling demand
- Summary of demographic features relevant in assessing the residential market opportunity
- Analysis of relevant data to examine the opportunity for different housing typologies, including consideration of:
  - ABS Census data on housing stock changes by type
  - ABS building approval data by location and type
  - Property sales data and median prices for houses and apartments
  - Recent development examples in the local Hobart context for higher density apartments
  - Build to rent case studies and key market segments targeted, with commentary on the opportunity for this sector in Hobart.
- Implications with respect to the scale, type and location of residential development within the Subject Site.

The following sub-sections present a summary of these market assessments for residential development on the Site.

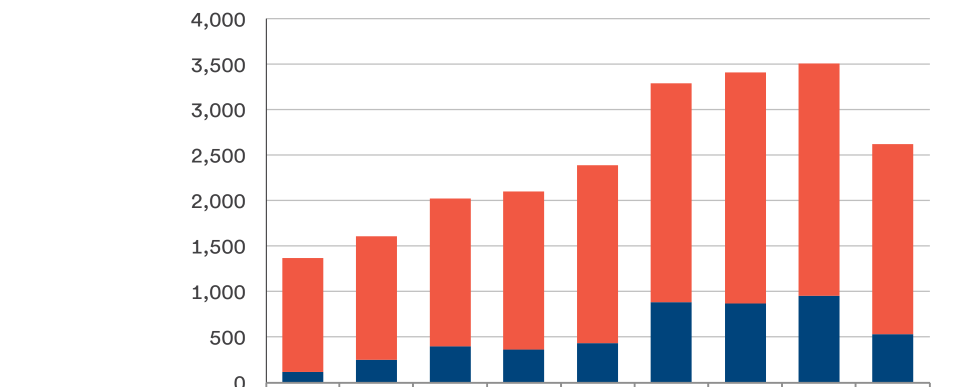
Regional growth trends

Population growth in Hobart LGA and within the other local government areas that constitute the Greater Hobart region had been accelerating in recent years leading up to the COVID-19 pandemic commencing from March 2020, as shown in Figure 3.

Prior to 2020, annual population growth in the City of Hobart peaked at almost 1,000 new residents in 2019, while the population within Greater Hobart increased by 3,500 persons in that year.

Figure 3—Annual population growth

Source: ABS Regional Population Growth



	2012	2013	2014	2015	2016	2017	2018	2019	2020
Other Gr. Hobart LGAs	1,256	1,356	1,625	1,736	1,958	2,406	2,545	2,551	2,089
Hobart (C)	111	246	393	359	427	883	865	953	531

COVID-19 impacts

From 2020 onwards population growth has been significantly impacted by COVID-19, leading to much lower growth since March 2020, as displayed in Figure 4 which shows quarterly changes in population across Tasmania, including the contributions from natural increase, net overseas migration (NOM) and net interstate migration (NIM).

The impact of COVID-19 has been largely on net overseas migration (NOM) which has declined from a peak of +1,773 persons in the December 2019 quarter, to -276 persons in the September 2020 quarter.

The effect has been to reduce quarterly population growth to just +234 persons across Tasmania in the September 2020 quarter, down from the pre-COVID peak of nearly +2,500 persons in December 2019.

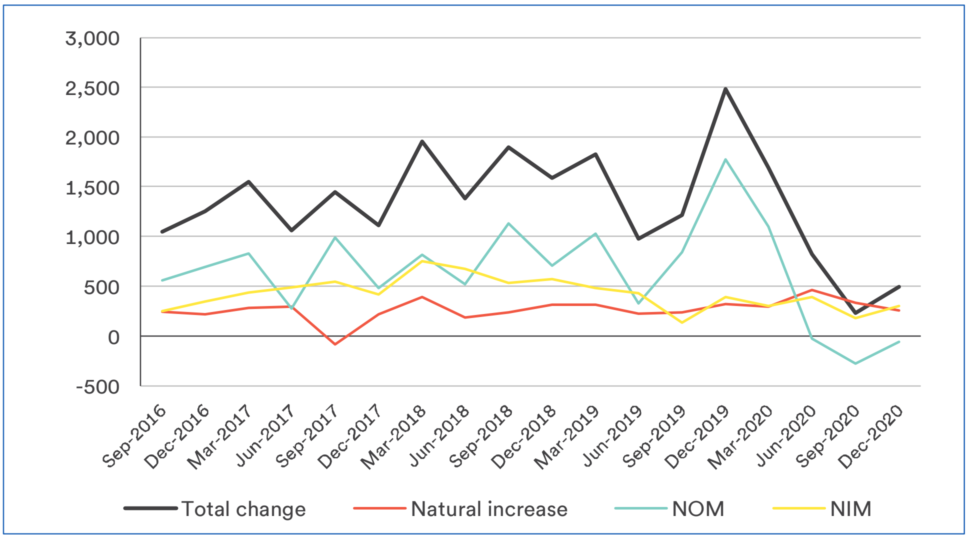
Importantly, interstate migration is holding up relatively strongly compared to pre-COVID levels, assisted by restrictions on interstate travel during parts of this period, and also influenced by strong interest in Tasmania as an alternative lifestyle destination during the pandemic.

Some recovery is already evident in the data for December 2020, however it is generally agreed that a full recovery to pre-COVID population growth will not occur until 2024.

These trends are confirmed in recent work prepared as input to the Central Hobart Precincts Plan (refer section 2.4.2).

Figure 4— Components of annual population growth, Tasmania

Source: ABS, Cat. No. 3101



Population projections

Tasmanian population projections are prepared by the Department of Treasury and Finance (DTF), with the latest set released in 2019. The data is available for individual LGAs and includes low, medium and high scenario projections.

Figure 5 illustrates the implications of the DTF projections for Hobart LGA and for other LGAs within Greater Hobart, noting that the projections shown in the chart have not been adjusted for COVID-19 effects other than by incorporating the ABS base population estimates for 2020.

The chart shows that the Medium series prepared by DTF implies a significant slowing of population growth throughout Greater Hobart when compared against the pre-COVID trends seen over the period 2016 to 2019.

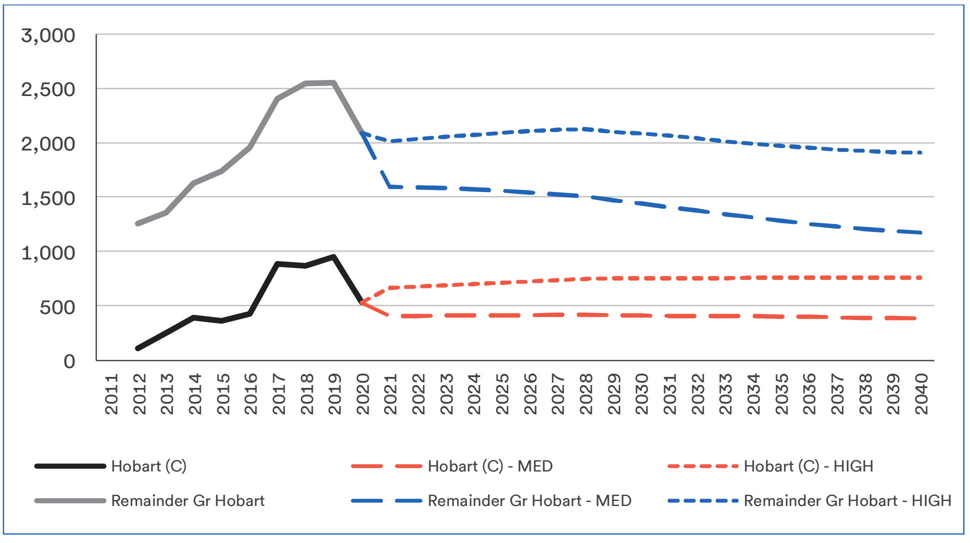
The implication is that the Medium projections may under-state the underlying demand from people willing to move to the region if the pre-COVID trends are any guide.

Study area population forecasts used in the Market Assessment Report adopt the DTF High growth projections as they better reflect the likely underlying dwelling demand evident during the 2016-2019 period. Moreover, the High series is more likely to reflect Tasmania's attractive position as a lifestyle interstate migration destination, especially following COVID and the increased take-up of working from home.

Even so, it is noted that these projections may understate growth prospects given recent trends in the period 2016 to 2019 and potential post-COVID recovery, as shown in Figure 5.

Figure 5—Annual population growth projections, DTF forecasts

Source: ABS (to 2020); DTF LGA projections (rebased to 2020)



Study region analysis

Detailed market assessments have been prepared using a Core Study Region based on Statistical Area 2 (SA2) geographic units that together generally align with the City of Hobart. Data and analysis is also presented for the remaining LGAs within Greater Hobart; however, these areas are mainly characterised by low density separate house development within greenfield growth fronts, rather than medium and high-density development of the kind likely to evolve at the Subject Site.

The study area regions are shown in Figure 6.

Trends across the whole of Greater Hobart have been considered in the context of formulating projections of underlying dwelling demand.

Figure 6— Residential study regions

Source: Deep End Services; ABS

Population and dwelling forecasts

Population forecasts have been prepared for each of the defined study area sectors, with these forecasts generated with reference to recent growth trends and adopting the High forecast scenario prepared by DTF. The effects of COVID-19 have been modelled at the local area level by considering the components of population change within each SA2 (ie NOM, NIM etc) and applying impacts derived from Federal Government assessments of state-level effects on population as published in budget papers and reflected in data from the Centre for Population.

The forecasts have been prepared to 2036, but the trends apparent in the period 2031-2036 would be expected to continue thereafter throughout the 30-year period over which development at Sandy Bay is likely to occur.

Based on this analysis, the study area as a whole has a current population of 236,606 persons (as at June 2021) and is projected to reach 260,607 persons in 2030 and 277,193 persons in 2036.

The Core study area, which aligns with the City of Hobart, has an estimated population of 55,536 persons in 2021 and is forecast to reach 60,958 persons in 2030 and 65,497 persons in 2036.

As noted, these projections may be exceeded if trends revert to their pre-COVID levels during the period 2016-2019. Importantly, the projections are a base case analysis that doesn't factor in development on the Subject Site at the scale envisaged in the Masterplan.

Forecasts of underlying dwelling demand are based on Census data related to the average household size to estimate the number of occupied dwellings (with an assumption that average household size will decline into the future), and to account for unoccupied dwellings.

Overall, the modelling estimates that there are currently 110,810 dwellings within the study area, including 27,525 within the Core study region and 6,100 within the local Sandy Bay SA2.

Recent dwelling demand is estimated at 1,655 dwellings pa across the study area in the period 2016-18, with substantial decline expected in the recent past due to COVID-19.

Over the forecast period post-COVID, underlying dwelling demand across the study area is forecast to recover to reach around 1,450 new dwellings per annum, including demand for 400 within the Core study region and 70-75 dwellings pa within Sandy Bay SA2.

Development within the Subject Site has potential to compete for a share of the local underlying dwelling demand as well as a share of demand that might otherwise be expected to occur elsewhere in the study area, especially within other parts of the Core study region.

Population and dwelling projections are summarised in Table 2 and Table 3.

Table 2—Study area population projections

Source: Deep End Services; Australian Bureau of Statistics; Tasmanian Government population projections – High series (2019)

Study area sector	2016	2018	2021	2024	2027	2030	2036
Population							
Sandy Bay	12,256	12,639	12,845	12,935	13,371	13,775	14,593
Hillside SA2s	11,046	11,550	11,997	12,272	12,852	13,458	14,683
Inner Hobart	28,839	29,723	30,694	31,310	32,491	33,725	36,221
Core study region	52,141	53,912	55,536	56,517	58,714	60,958	65,497
Glenorchy-Brighton	63,012	64,524	66,106	67,950	70,447	73,015	78,151
Clarence-Sorell	69,956	72,191	75,924	78,869	81,508	83,986	88,555
Kingborough	36,516	37,702	39,040	40,093	41,379	42,648	44,990
Total	**221,625**	**228,329**	**236,606**	**243,429**	**252,048**	**260,607**	**277,193**
Population growth (no. per annum)							
Sandy Bay	-	192	69	30	145	135	136
Hillside SA2s	-	252	149	92	193	202	204
Inner Hobart	-	442	324	205	394	411	416
Core study region	**-**	**886**	**541**	**327**	**732**	**748**	**757**
Glenorchy-Brighton	-	756	527	615	832	856	856
Clarence-Sorell	-	1,118	1,244	982	880	826	762
Kingborough	-	593	446	351	429	423	390
Total	**-**	**3,352**	**2,759**	**2,274**	**2,873**	**2,853**	**2,764**
Population growth (% per annum)							
Sandy Bay	-	1.6%	0.5%	0.2%	1.1%	1.0%	1.0%
Hillside SA2s	-	2.3%	1.3%	0.8%	1.6%	1.5%	1.5%
Inner Hobart	-	1.5%	1.1%	0.7%	1.2%	1.3%	1.2%
Core study region	**-**	**1.7%**	**1.0%**	**0.6%**	**1.3%**	**1.3%**	**1.2%**
Glenorchy-Brighton	-	1.2%	0.8%	0.9%	1.2%	1.2%	1.1%
Clarence-Sorell	-	1.6%	1.7%	1.3%	1.1%	1.0%	0.9%
Kingborough	-	1.6%	1.2%	0.9%	1.1%	1.0%	0.9%
Total	**-**	**1.5%**	**1.2%**	**1.0%**	**1.2%**	**1.1%**	**1.0%**

Table 3—Underlying dwelling demand, 2016 to 2036

Source: Deep End Services; Australian Bureau of Statistics; Tasmanian Government population projections – High series (2019)

Study area sector	2016	2018	2021	2024	2027	2030	2036
Dwellings							
Sandy Bay	5,795	5,985	6,100	6,155	6,380	6,590	7,015
Hillside SA2s	5,130	5,370	5,595	5,735	6,025	6,325	6,935
Inner Hobart	14,820	15,300	15,840	16,195	16,850	17,535	18,930
Core study region	**25,745**	**26,655**	**27,535**	**28,085**	**29,255**	**30,450**	**32,880**
Glenorchy-Brighton	28,275	29,000	29,790	30,700	31,905	33,155	35,665
Clarence-Sorell	32,750	33,855	35,695	37,175	38,515	39,785	42,165
Kingborough	16,570	17,135	17,790	18,315	18,950	19,585	20,765
Total	**103,340**	**106,645**	**110,810**	**114,275**	**118,625**	**122,975**	**131,475**
Dwelling growth (no. per annum)							
Sandy Bay	-	95	40	20	75	70	70
Hillside SA2s	-	120	75	45	95	100	100
Inner Hobart	-	240	180	120	220	230	235
Core study region	**-**	**455**	**295**	**185**	**390**	**400**	**405**
Glenorchy-Brighton	-	365	265	305	400	415	420
Clarence-Sorell	-	555	615	495	445	425	395
Kingborough	-	285	220	175	210	210	195
Total	**-**	**1,655**	**1,390**	**1,155**	**1,450**	**1,450**	**1,415**

Market profile

The market context analysis presented in the Market Assessment Report includes consideration of:

- Demographic features of the study area;
- Dwelling typologies shown in Census data for 2011 and 2016;
- Patterns of building approvals;
- House and unit price movements;
- House and unit rental movements and rental affordability;
- A profile of apartment dwellers; and
- A summary of recent developments.

The key outcomes from this analysis can be summarised as follows:

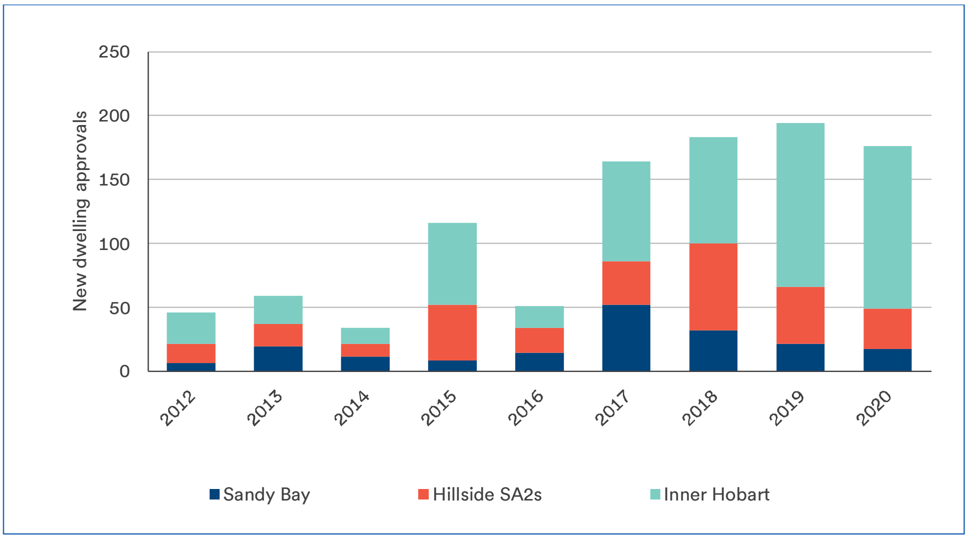
- The demographic profile of the study region displays large differences between different communities, with Sandy Bay characterised by relatively affluent households that include a mix of families and group households, greater cultural diversity, high incomes and a more significant rental market, whereas Inner Hobart has a distinct profile reflecting the role of the CBD for younger professionals with a larger rental market and a higher proportion of lone households. Other parts of Greater Hobart are less affluent and with a more blue-collar focus by comparison.
- In terms of dwelling structure, separate houses account for most dwelling stock in the Core study region, with this proportion not changing significantly between 2011 and 2016. Medium and high-density product is clustered in Inner Hobart and Sandy Bay where this product accounts for around 36% of all dwellings. A large share of high-density product is located in Inner Hobart, with a smaller amount in Sandy Bay.
- A comparison of Census data for 2011 and 2016 shows that Hobart's market for higher density apartments was relatively immature in 2016, with relatively few such apartments being developed in the previous five years.
- Residential building approvals have increased dramatically since 2017, peaking at almost 200 during 2019 in the Core study region (refer Figure 7). Around half of all approvals in Inner Hobart since January 2019 have been for high density apartments, with the remainder for medium density product. Approval numbers in Sandy Bay have been relatively low given the fewer development opportunities, but of these a relatively large share was for medium density product. Overall, almost 35% of approvals in the Core study region were for medium density units or high density apartments.
- Sandy Bay is an affluent suburb, with house prices the 2nd most expensive in Hobart after Battery Point, and the most recent data indicating a median price of $1.2m. Sales volumes for both houses and units have declined appreciably since 2017, reflecting wider trends as well as the fact that Sandy Bay is a tightly held suburb. This is likely contributing to price growth.
- Median unit prices are sold at a significant discount to separate houses, indicating potential to deliver an apartment product at reasonable price differential. House price growth is likely to be pushing home ownership out of

reach of many demographic segments, increasing the opportunity for rental product to be delivered in formats and locations where people trade off location against dwelling size.

- Rental rates for units have generally been on the rise, especially since after the GFC, although there is some flattening evident in Sandy Bay in recent years.
- Rental growth has contributed to a worsening rental affordability gap, as indicated in the Rental Affordability Index mapping prepared on behalf of National Shelter, Bendigo Bank and the Brotherhood of St Laurence, which shows that Greater Hobart is the least affordable metropolitan area in Australia.
- Census data from 2016 shows that the unit stock in Sandy Bay tends to be larger, on average, than in inner Hobart where the market is more focussed on student and young professionals. This indicates that the types of apartments developed in a location such a Sandy Bay may need to be more diverse to be attractive to some family households as well as to smaller lone person and couple households.
- A review of a selection of recent and proposed projects shows that although the high-density apartment sector in Hobart is still somewhat immature, several projects are in various stages of development, bringing a new level of sophistication to the local residential market.

Figure 7—Building approvals (Core study region)

Source: ABS Building Approvals by SA2



Development Opportunity

The key results from the analysis of development opportunity presented in the Market Assessment Report are as follows:

- Residential development at the Subject Site has potential to serve underlying demand generated from the local area, as well as competing for a share of demand generated elsewhere throughout the identified study area.
- The Study area is forecast to generate average dwelling demand of around 1,450 new dwellings per annum in the longer term using the DTF High population scenario, including underlying demand for around 450 dwellings pa in the Core study area and 75 dwellings pa within Sandy Bay.
- In terms of dwelling typology, much of the forecast dwelling demand across the study area will be for affordable detached dwellings located elsewhere across Greater Hobart. A minority of future dwelling requirements will be for the types of homes likely to be suitable for delivery at the Site, which will include:
  - Apartments targeted to younger professional renters willing to trade location against size of residence.
  - Those seeking to enter the Sandy Bay market without being able to afford existing product on offer.
  - Older people wishing to downsize from larger existing homes in the area.
  - Families that may be living in Hobart on shorter-term arrangements and may be seeking high quality residences.
- Although medium and high density residential product has historically only accounted for a small proportion of dwelling development in Sandy Bay and across most of Hobart, there are few opportunities to deliver additional small-scale detached dwellings in Sandy Bay, so that most of the future growth is likely to comprise multi-unit formats.
- A large share of new development in Inner Hobart consists of apartments and medium density developments, and there is strong potential for the Subject Site to compete for a share of this market, emphasising the attractive local aspect.
- With 35% of building approvals in the Core study region for medium and high-density formats, and with potential for this share to increase in the future, the underlying demand for dwellings of the type that may be constructed at the Subject Site is forecast to be approximately 270-290 new dwellings per year across the Core study region.
- The Subject Site has potential to capture a substantial share of this market given its attractive attributes. This is sufficient to support an estimated average 'roll-out' of approximately 70-95 dwellings per year in medium and high density formats.
- In addition to the market opportunity for 'standard' residential housing across a range of formats, the ageing of the population in Greater Hobart, and particularly within the inner region, supports the establishment of other formats to cater for the need for retirement living and aged care.

In summary, the analysis in the Market Assessment Report provides strong support for the introduction of a diversity of residential housing within the Subject Site.

4.2.2 Assessment of Masterplan

As summarised in Table 1 at p21, the Masterplan facilitates the following residential development outcomes:

- A total of 2,547 residential dwellings catering to the traditional residential market, consisting of:
  - 59 single lot dwellings
  - 170 townhomes
  - 2,318 apartments
- Provision for 81 retirement units (independent living units, or ILUs) and 91 aged care beds.

When compared to the absorption rate forecast in the Market Assessment Report (at 70-95 per annum for medium and high density dwellings), the proposed yield of 2,489 apartments and townhouses (ie excluding single lot homes) would cater to projected demand over a period of 25 to 35 years. This is consistent with the indicative 30-year planning horizon adopted for the Masterplan.

A breakdown of the type of residential product is provided below in Table 4, based on the detailed indicative development schedule that underpins the Masterplan. The table shows that the Masterplan proposes a variety of different product types, ranging from single lot homes on small lots, to traditional townhouses, adaptation of existing buildings for terrace homes, and apartments of various sizes. Overall, the proposed product types will provide an important addition to diversity of housing in Hobart, with some of the new formats serving to fill the 'missing middle' typologies that provide an alternative offering to traditional greenfield housing occurring on the city fringe.

The product typology also includes a generous provision for 2-bedroom apartments which can have a multiple role in catering to young professional couples, young families seeking an affordable entry into the housing market, and older downsizers.

The table also provides an estimate of the likely permanent residential population outcomes once full development is achieved. These estimates are based on applying an average household size that reflects current Census results for the Sandy Bay SA2, and using resident occupancy information from the PwC Retirement Census snapshot for 2020.

According to these calculations, the permanent residential population at Sandy Bay at full development would be in the order of 4,665 persons.

Table 4—Dwelling summary and population outcomes

Note: * excludes aged care

Source: CHC, Deep End Services; ABS; PwC Retirement Census Snapshot 2020

Dwelling Type	No. of dwellings	Share of dwellings*	Average household size	Population
Town house	170	6%	1.98	335
Single lot	59	2%	2.47	145
1 bed Apartment	464	17%	1.30	600
2 bed Apartment	1,623	60%	1.74	2,820
3 bed Apartment	232	9%	2.41	560
Retirement living	81	3%	1.42	115
Aged care	91		1.00	91
Total dwellings (rounded)	**2,720**	**100%**	**1.72**	**4,665**

4.2.3 Implications

The residential yield and proposed typology in the Masterplan is consistent with the projected demand for housing presented in the Market Assessment Report, implying that full absorption of the new housing will occur over approximately the next 25-35 years, or within the indicative 30-year planning horizon.

Alternatively, the delivery of diverse and attractive product at Sandy Bay may be absorbed more readily, although this may imply that the project will capture a greater share of the market than would otherwise be the case, potentially delaying competing projects in other parts of Hobart. However, this would not necessarily generate any adverse consequences given that the take up for product at Sandy Bay would reflect community preferences.

Also relevant is that these development timeframes are based on the population and dwelling projections described in the Market Assessment Report. If population growth in Hobart occurs at a faster rate, consistent with trends during the three years prior to COVID-19, this would mean that additional development can be absorbed more rapidly.

4.3 Commercial office

4.3.1 Market assessments

The approach used in the Market Assessment Report to analyse commercial office development opportunities includes:

- A description of the key types of commercial office formats that may or may not represent opportunities at Sandy Bay
- An examination of the attributes of the Site to attract commercial office tenants
- Analysis of the demand for commercial office development, based on:
  - Growth in the office workforce
  - Opportunities to attract office demand from small businesses
  - Opportunities to attract larger corporate offices
- A summary of the pattern of existing office provision in Hobart
- An examination of the opportunity for office development within the Site, having regard to the types of office formats that could be attracted, and the potential scale of future demand.

The following sub-sections present a summary of these market assessments.

Commercial office types

Commercial office development generally comes in the following forms:

- Corporate-style office floorspace, generally involving larger floorplates often over multiple levels, either leased or purchased as strata titles or whole properties
- Government departments and agencies, ranging from local municipal branch offices, state government agencies, federal offices such as ATO or Services Australia, employment agencies, etc
- Smaller floorplates typically made available as strata titles, or leased, and mainly taken up by local or regional firms, often in legal and accountancy sectors
- Micro offices suited to smaller users taking up space in strata developments or as small leased tenancies, typically run by local small business owners.

Opportunities for attracting investment in each of the above office sub-markets in any location depends on factors including:

- The underlying attributes of the Site and surrounding locality for office development, including road and public transport access, connections with other business districts, ability to create synergies with surrounding tenants, etc
- The size of the skilled white-collar workforce in the surrounding region
- The competitive context, including existing established office precincts and approved or planned developments.

In the Hobart context the CBD has a strong competitive advantage as a location for major corporate offices and government administration due to its central position with excellent transport linkages, the availability of a regional workforce, and the ability to be located close to clients and suppliers. The opportunities at the Site are therefore more likely to be for smaller offices of the type that would otherwise be distributed across commercial zones in Hobart.

Site attributes

The Subject Site has the following attributes as a location for office development:

- An attractive precinct in a mixed use setting that might suit small businesses seeking boutique local offices
- New businesses created as the local population grows and people move into the Site and seek to live and work in proximity
- Firms relocating from shop-top or street-front tenancies or expanding out of a home-based location
- Mid-sized organisations attracted by the local environment and the style of offer likely to be presented
- Firms seeking lower-cost entry into refurbished space as an alternative to CBD corporate leases.

Having regard to these attributes, the opportunities at Sandy Bay are likely to be limited to small and micro businesses and organisations across professional, technical and scientific sectors. The precinct is unlikely to attract corporate style offices, which are better suited to a CBD location, and would certainly not be chosen by government departments and agencies as a location for sub-regional offices.

Commercial office demand

An examination of the underlying future demand for new floorspace to accommodate white collar workers is presented in the Market Assessment Report adopting the following inputs:

- Population projections prepared by DTF (High scenario, refer section 4.2.1)
- Expected decline in the 'crude' participation rate (employed workforce as a proportion of population) as the population ages
- Expected increase in the share of the workforce employed in white collar industry sectors.

According to the analysis, the white-collar workforce in the study region (Greater Hobart LGAs) is forecast to increase by nearly 5,000 people over the period 2021 to 2036 at a rate of around 300 new white-collar workers per year.

If the growth in the white-collar workforce is translated into office floorspace requirements, using a broad average of 20 sqm per worker, this implies an average requirement for around 6,000 sqm of office floorspace per year, or a cumulative total of 94,000 sqm from 2021 to 2036.

These projections for office floorspace compare with forecasts presented in the CHPP technical report which anticipate demand for 11,085 sqm to 18,190 sqm of occupied commercial floorspace (including office and other commercial uses such as retail) each year.

Development on the Subject Site has potential to compete for a share of this market, although mainly limited to the small business sector.

Research conducted by Deep End Services on behalf of other clients has found that the majority of demand for small-scale commercial offices (including leased and strata titled product) comes from small businesses employing fewer than 20 workers and operating in particular industry sectors (finance, real estate, professional and technical services, etc). These people usually seek premises within around 10-15 minutes travel time from their residential address.

Figure 8 (refer p37) shows the numbers of owners of small businesses operating in the key industry sectors that generate most demand for commercial office space, presented by SA2 geography across metropolitan Hobart, and highlights the fact that Sandy Bay has the largest concentration of these key small business owners in the Greater Hobart region.

These business owners represent an opportunity to provide well-located small office premises close to their residence.

The Site's prominence and attractive features means that it also has potential to attract office demand from prospective small business tenancies from a wider region surrounding the Site.

Figure 9 (p37) shows the location of work for small business owners in the identified key industry sectors. The relatively small number of business owners that work in Sandy Bay and surrounding areas outside the CBD indicates that few suitable office tenancies are being provided locally to meet the needs of such businesses, with office space within the Hobart CBD the only option for these prospective tenants.

Although a location within the CBD may be appropriate for many businesses, it is likely that a share of small businesses would prefer to secure modern office space closer to where they live, especially if it can be provided within an attractive, vibrant mixed-use precinct.

Overall, these businesses, and future businesses in similar sectors, represent a key opportunity to fill office space at the Subject Site over the next 30 years.

This analysis confirms that the Site is likely to be an attractive office sub-market for a small business sector seeking well-appointed premises in a mixed-use precinct with a range of amenities nearby and potential to live and work locally.

Figure 8—Residential location of key small business owners (2016)

Source: Deep End Services; ABS

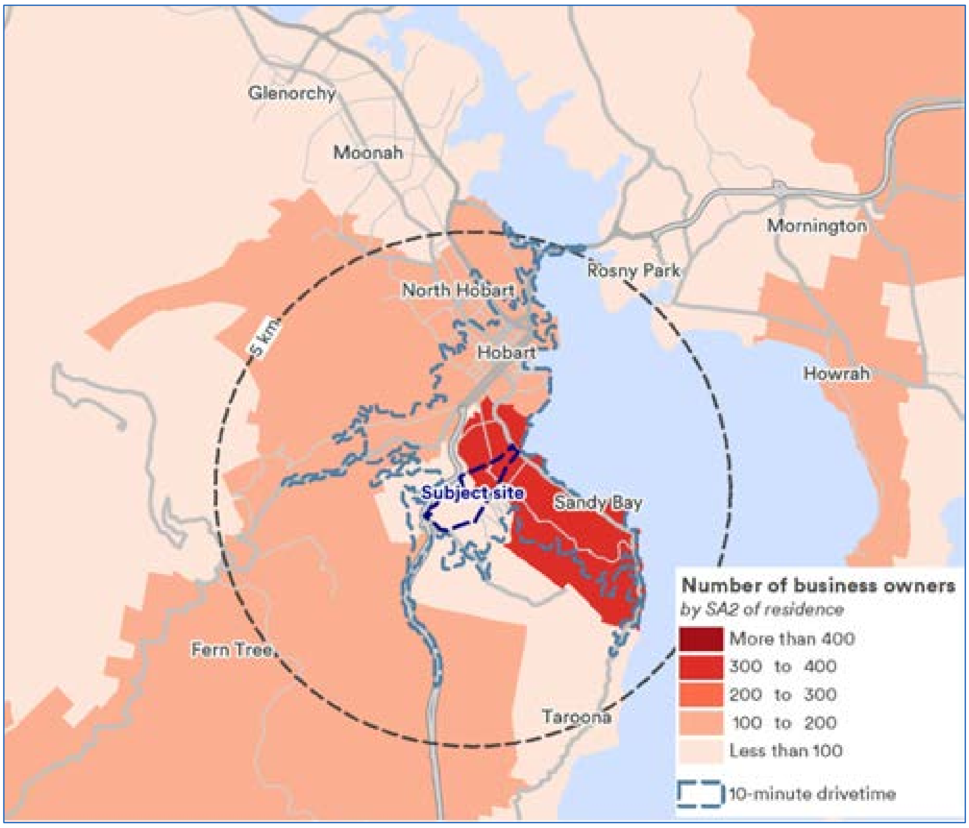
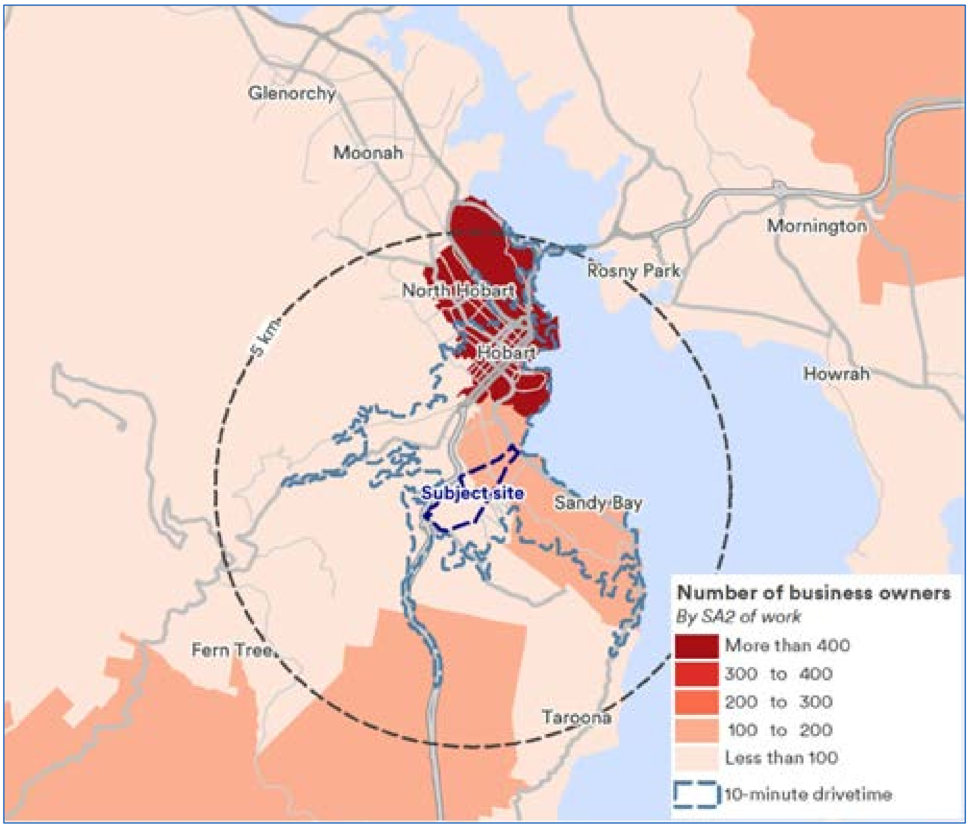


Figure 9—Location of work for key small business owners (2016)

Source: Deep End Services; ABS



Commercial office provision

Commercial office provision is concentrated within the Hobart CBD where total available office space is in the order of 360,000 sqm (noting that this figure does not include smaller premises that do not fall within the Property Council of Australia Office Market Report coverage).

Hobart's office sector is heavily weighted towards government departments and agencies, with the recent completion of Parliament Square (around 17,000 sqm of floorspace) the main addition to supply in recent years.

The lack of recent supply has led to a significant tightening of occupancy rates, with vacancies at just 5.1% in 2021, the tightest CBD market in the country according to PCA.

Notwithstanding these low vacancy rates, no significant additional supply is identified other than a range of refurbishments, although approval was previously granted for 20,000 sqm of office space at 155-167 Liverpool Street (this project is now being reformulated with input from Mona and DarkLab).

Future commercial office space will also be delivered within the Macquarie Point precinct, although this is expected to have a focus on Antarctic research and science organisations.

Development opportunity

The main commercial office opportunity for the Subject Site will be for small and micro business owners that are seeking more attractive suburban locations rather than a position within lower grade CBD offices, and who might value the attractive mixed-use campus setting on offer within the Site.

Potential formats could include:

- Co-work premises
- Individual small leased offices
- Innovative mixed use models such as SOHO product
- Potential incorporation of a research or innovation hub, especially early on while University functions are still present on the Site.

Workforce forecasts suggests that there is an ongoing opportunity for in excess of 6,000 sqm per annum of new office floorspace across various geographies and formats in Greater Hobart over the forecast period. This is equivalent to around 180,000 sqm over the next 30 years.

Given the limited role that the Site would have for most traditional office types, the volume of development to be incorporated into the Masterplan over that period might be in the order of 10-15% of the total market, which is equivalent to approximately 18,000 sqm to 27,000 sqm of floorspace over the 30-year delivery period.

The actual delivery of floorspace would be 'lumpy' as it would be delivered in stages, with the scale of office floorspace within each stage limited by the nature of the adapted and refurbished buildings and reflecting the market context at the time of development.

The preferred location of commercial office development is in Precinct 2 where office workers are provided with a range of amenities including local retail services, community facilities and other uses that help to support the attractiveness of the location for small office businesses. There may also be a minor office element within Precinct 1 as part of a mix of potential uses in that part of the Site with an emphasis on sports administration.

4.3.2 Assessment of Masterplan

The Masterplan provides for a total of 22,800 sqm of commercial office development in Gross Leasable Area terms (refer Table 1, p21) but delivered in various formats across the Site.

In terms of Net Leasable Area (NLA), which is the normal measure for office floorspace, the Masterplan would facilitate a total of 18,760 sqm NLA, comprising:

- 3,060 sqm NLA within Precinct 1 which is anticipated to accommodate sports sciences and sports administrative functions
- 14,900 sqm NLA within Precinct 2 which consists of 11,840 sqm of repurposed space within the Physics, Morris Miller and Social Sciences buildings, and 3,060 sqm of additional built floorspace
- 800 sqm NLA of commercial uses to be built within Precinct 5 in the form of small ground level tenancies under two buildings within a mixed use precinct.

This proposed scale and distribution of commercial office uses is consistent with the recommendations from the Market Assessment Report, with the overall scale of office development within Precinct 2 (14,900 sqm) well within the projected office floorspace absorption over the 30-year development period. The other elements respond to site-specific opportunities as follows:

- The introduction of 3,060 sqm of commercial office within Precinct 1 is supported by the planned development of a range of sports and recreation related uses including potential to accommodate sports administration and sports science functions. Some of this space could also be taken up by sports medical consultancies and other uses. These uses are specific to the precinct and represent additional demand over and above the modelling in the Market Assessment Report.
- The proposed 800 sqm of commercial office within Precinct 5 is in the form of ground floor activation at the base of two mixed use buildings, and would likely attract a range of shopfront-type uses such as financial services, real estate and property firms, medical insurance, etc.

4.3.3 Implications

The Masterplan is consistent with the identified development opportunity described in the Market Assessment Report.

If successfully implemented, the Subject Site will emerge as a new mixed-use precinct that integrates living, working, shopping and other activities, with Precinct 2 in particular including local office accommodation serving the needs of the small business sector, and with an opportunity to establish sports science/administrative functions in Precinct 1.

When assessed in the context of activity centre policies set out in STRLUS, the following matters need to be considered:

- Sandy Bay is unlikely to be an attractive option for corporate tenants and other regional and state head offices which will continue to seek office space within the Hobart CBD where they can serve a regional labour force and create synergies with their clients and suppliers.
- Government at all levels will continue to favour Central Hobart for state, regional and sub-regional departments and agency offices.
- As a result, the successful implementation of the Masterplan will not adversely impact on the primacy of the Hobart CBD as the preeminent location for commercial office and government administration.
- The proposed scale of uses is consistent with the scale of office development that was envisaged in the Market Assessment Report, which was calculated on the basis that Sandy Bay would attract a relatively small 10-15% of the future additional demand for office floorspace within the study region over the longer term.
- The major sub-sector likely to be served at Sandy Bay will be small businesses across a range of professional and technical disciplines, many of which would be owned by small business owners who live in the local area.
- With a cluster of small business owners living locally, and a lack of attractive modern office accommodation available, the Subject Site represents an opportunity to deliver community benefits by meeting the needs of these business owners locally.
- The Masterplan proposes that some innovation-related businesses could be established within part of the Site. This opportunity would be most significant in the short to medium term while University functions remain within the Site, and would probably be restricted to small start-ups owned by local residents. Over the longer term it is likely that most creative and technology-related businesses would be attracted to the CBD where the presence of UTAS will act as a catalyst for local business development.

Overall, the proposed outcomes are consistent with the Market Assessment Report recommendations in terms of the broad scale of development that is facilitated (approximately 15,000 sqm NLA of office floorspace within the core of Precinct 2) and would be expected to accommodate a relatively small share of the future development opportunity across Hobart. For example, development of this scale would represent less than 5% of the commercial office floorspace within the Hobart

CBD (noting that this estimate only includes larger floorplates monitored by the Property Council of Australia), and is a minor amount of development in the context of the 230,000 sqm to 380,000 sqm of additional occupied commercial floorspace projected to be accommodated within Central Hobart over the period 2020 to 2041 (refer *Economic, Demographic and Employment Study,* HillPDA, April 2021).

There may be some potential for existing businesses to move premises from existing lower grade office space within the CBD or from existing shop-top offices in centres such as Sandy Bay Town Centre, but any adverse effect would be outweighed by the community and economic benefits associated with providing local small business owners with a modern, well-located and attractive tenancy option.

The conclusion to be drawn is that the Masterplan, if developed, would lead to a range of community and economic benefits (including employment generation as assessed in Section 5), and would not adversely affect the primary role that Hobart CBD enjoys as the commercial and administrative hub for the State.

4.4 Retail

4.4.1 Market assessments

The approach adopted in the Market Assessment Report to examine retail development opportunities includes:

- Definition of an appropriate study area on which to examine the retail demand and supply context
- Summary of existing retail provision including the role and components of centres in the area
- Analysis of study area population growth
- Estimates and forecasts of retail spending by study area residents
- Analysis of the supermarket sector, which is critical in establishing the type and scale of development that might occur within the Site
- Review of the attributes of the Subject Site and the individual precincts as locations for retail development
- Estimates of supportable retail floorspace across the Site as a whole and within individual precincts.

Examination of the existing provision and potential need for new supermarket floorspace is an important component of the analysis because the attraction of a supermarket would help to establish a local grocery shopping node, with a larger supermarket anchor providing support for a wider range of complementary retail and non-retail activities. In the absence of a supermarket the retail opportunity across most of the Site would be relatively small, limited to local convenience stores, food and dining establishments and other services supported by local residents and workers.

The following sub-sections present a summary of these market assessments.

Study region

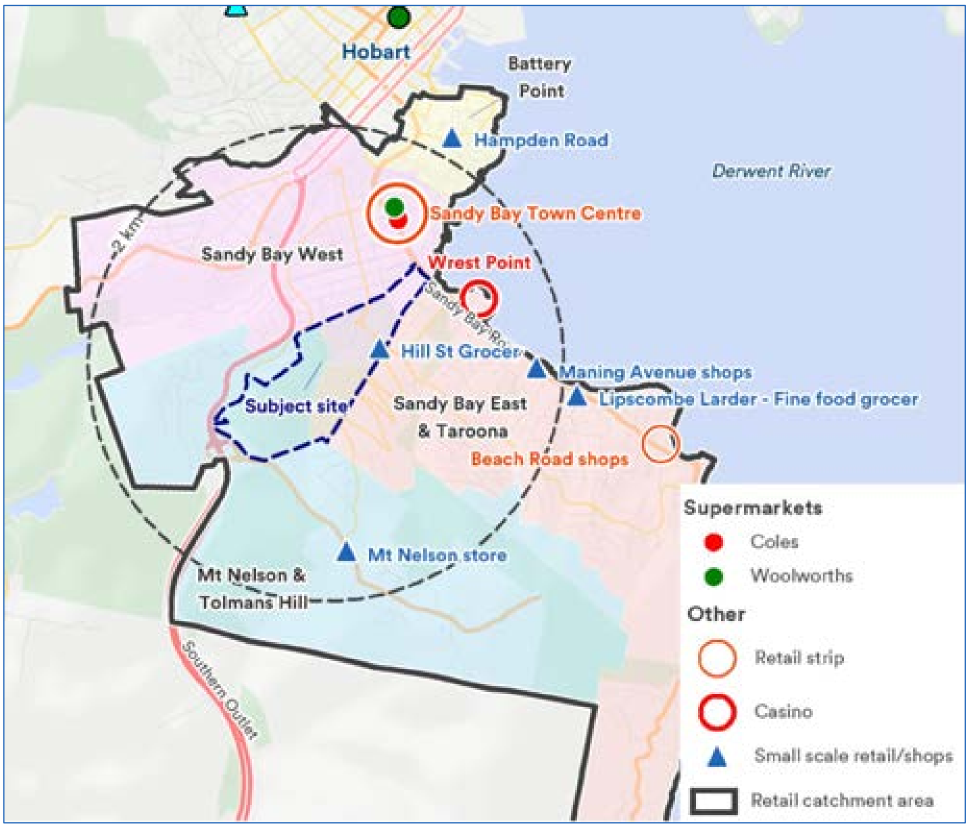
The study area adopted for the purpose of analysing retail development on the Site describes a region in which the local residential population, along with tourists and other visitors, supports existing retail provision at Sandy Bay Town Centre and in the other smaller shopping strips and scattered individual stores within the area. The study area, which is illustrated in Figure 10, extends from the southern edge of the Hobart CBD southwards to include all or parts of Battery Point, South Hobart, Sandy Bay, Dynnyrne, Tomans Hill and along Channel Highway to Taroona.

This region is relevant because it represents the geographic area from which retail spending may be directed to existing or new retail businesses within the Sandy Bay Site, and also because it represents an appropriate region to assess existing provision rates and to determine significant gaps in retail provision, particularly for supermarket floorspace.

Any retail development within the Site would also be supported by other sources of spending, including by workers and other incoming visitors.

Figure 10—Retail study area

Source: Deep End Services



Retail provision

The main provision of retail floorspace serving the identified study area is at Sandy Bay Town Centre, which is identified as a Minor or Neighbourhood Centre within the Activity Centre Network established in STRLUS. The role of this type of centre is to serve the daily needs of the surrounding community, with uses including supermarkets and other retail, along with commercial, community health and other services, and night-time dining.

Total occupied retail provision at Sandy Bay Town Centre is estimated at approximately 15,000 sqm based on floorspace surveys conducted during preparation of the Market Assessment Report. The main retail components comprise:

- Woolworths supermarket, estimated at 2,900 sqm which means that it is slightly smaller than would normally be expected for a full-line supermarket (the typical requirement is around 3,200-4,000 sqm for a modern full-line store). The supermarket achieves very high average sales levels from this size store, notwithstanding the poor provision of at-grade parking, which is provided in basement and rooftop format.
- Coles supermarket of 1,800 sqm, which is a small format store with a mix of at-grade, undercroft and basement parking. The store is also understood to be trading well-above average from an under-sized box.
- Several other retail businesses in the food & groceries sector including small Asian supermarkets/grocers and a bulk discount drygoods store. In total, businesses in the food and groceries sector account for 7,800 sqm, or more than 50% of total occupied retail floorspace, emphasising the convenience retail role of the centre.
- A large café and dining sector which extends across a range of cuisine types, accounting for almost 30% of all occupied floorspace (4,230 sqm).
- A relatively limited non-food sector with few national branded outlets, accounting for just 2,400 sqm.
- A total of around 675 sqm of vacant shopfront floorspace, representing a very low vacancy rate of around 4% indicating that the centre is operating at a healthy level notwithstanding the effects of COVID.

Overall, Sandy Bay presents as a relatively healthy neighbourhood centre anchored by two under-sized but very high-performing supermarkets, both of which have limited expansion opportunity.

The vacancy rate is low, although it is likely that some of the shops are under stress given the effects of the COVID-19 pandemic on spending patterns in some retail segments.

The centre has total estimated retail sales of around $125m, including more than $90m associated with the two supermarkets and other stores within the food, liquor and grocery sector.

In addition to Sandy Bay Town Centre, other concentrations of retailing include:

- A small collection of businesses on Hampden Road, Battery Point, which serve local residents, tourists staying in hotels, motels, inns and rental accommodation in surrounding streets, and other visitors to the area.
- A small local centre at Little Sandy Bay (Beach Road), which consists of an estimated 1,250 sqm of occupied floorspace, with a vacant premises (former convenience store 'Fresco') of 500 sqm.
- The Hill Street Grocer on Churchill Avenue within the Subject Site, which is an attractive and successful local supermarket of around 800 sqm which stocks a wide variety of quality fresh foods and dry goods and is considered to trade well above the average for a typical supermarket of this size.
- Lipscombe Larder, a small grocery store of around 400 sqm which specialises in 'fine foods' including cakes and bakery items, deli products and pre-prepared meals, wines and a limited range of groceries.
- The Mt Nelson Store, which is a small general store of around 250 sqm on Nelson Road.
- A collection of shops in South Hobart containing Hill Street Grocer store (250 sqm), a butchers, newsagent and small group of shops with around 2,000 sqm of floorspace.

Most of the retailing described above serves a more localised role, other than some particular businesses such as Hill Street Grocer Sandy Bay and Lipscombe Larder which are well-known as attractive destinations for high quality groceries and are likely to attract shoppers from a wider area.

Population and spending

The retail study area has a total residential population of nearly 27,000 people in 2021, with the largest concentration (11,865 persons or 44%) living in Sandy Bay East stretching along the coastline to Taroona.

Population forecasts are based on the High series produced by DTF, noting that these are consistent with the base-line projections described in section 4.2.1 and do not account for the Subject Site attracting a share of residential dwelling demand for medium and high-density housing that might otherwise occur elsewhere in the region.

The study area population is projected to increase by around 4,000 people over the next 15 years to be nearly 31,000 people in 2036. However, as noted above this reflects a Base population scenario that does not fully account for residential development within the Subject Site itself. The net effect of housing development within the Subject Site is likely to be an increase of approximately an additional 3,000 to 4,000 persons above the baseline projections that are described in section 4.2.2.

Table 5—Retail study area population, 2016-2036

Note: base case projections do not fully account for on-site population

Source: Deep End Services

Study area sector	2016	2021	2024	2028	2032	2036
Population						
Sandy Bay East & Taroona	11,273	11,865	12,000	12,480	13,005	13,545
Sandy Bay West	9,170	9,705	9,734	10,064	10,434	10,834
Mt Nelson & Tolmans Hill	2,791	3,142	3,268	3,548	3,828	4,108
Battery Point	2,110	2,252	2,246	2,329	2,411	2,473
Total	**25,344**	**26,963**	**27,248**	**28,421**	**29,679**	**30,961**
Population growth (no. per annum)						
Sandy Bay East & Taroona	-	118	45	120	131	135
Sandy Bay West	-	107	10	83	93	100
Mt Nelson & Tolmans Hill	-	70	42	70	70	70
Battery Point	-	28	-2	21	21	16
Total	**-**	**324**	**95**	**293**	**314**	**321**
Population growth (% per annum)						
Sandy Bay East & Taroona	-	1.0%	0.4%	1.0%	1.0%	1.0%
Sandy Bay West	-	1.1%	0.1%	0.8%	0.9%	0.9%
Mt Nelson & Tolmans Hill	-	2.4%	1.3%	2.1%	1.9%	1.8%
Battery Point	-	1.3%	-0.1%	0.9%	0.9%	0.6%
Total	**-**	**1.2%**	**0.4%**	**1.1%**	**1.1%**	**1.1%**

Residents within the study area generate a total of $523.6m in spending on retail goods and services in 2021, of which a large share ($172.2m or 38%) is associated with food & groceries and liquor categories. Spending on non-food items accounts for a larger share of total spending but is less relevant for convenience-related retail development.

Although retail spending is projected to remain depressed until 2024 (largely as a result of a reaction to the high spending on certain goods associated with the imposition of lockdowns on travel), over the longer-term retail spending is projected to increase to $628.8m in 2028 and reach $814.6m in 2036.

The growth in spending over this period is equivalent to an additional $290m in annual expenditure, which has potential to support a large increase in retail provision. Note that these figures are in nominal dollars and therefore incorporate inflation.

Table 6—Study area retail spending 2016-2036

Source: Deep End Services; ABS; Market Data Systems; Deloitte Access Economics

	Spending market ($m)					
Spending category	**2016**	**2021**	**2024**	**2028**	**2032**	**2036**
Sandy Bay East & Taroona						
Food & groceries	60.0	77.5	78.2	90.5	100.5	113.7
Liquor	9.6	12.3	14.1	17.6	21.3	26.1
Dining out/takeaway	28.4	29.8	36.4	41.6	47.7	54.8
Non-food	89.4	106.4	104.3	119.9	133.1	152.5
Retail services	9.0	11.0	12.4	14.7	17.1	20.2
Total	**196.3**	**237.0**	**245.4**	**284.3**	**319.8**	**367.4**
Sandy Bay West						
Food & groceries	46.5	60.7	60.2	69.1	76.1	85.6
Liquor	7.6	9.8	11.2	13.8	16.6	20.3
Dining out/takeaway	23.1	24.4	29.6	33.6	38.3	43.9
Non-food	66.4	79.7	77.6	88.9	98.3	112.4
Retail services	6.1	7.6	8.4	10.0	11.5	13.5
Total	**149.7**	**182.2**	**187.0**	**215.3**	**240.9**	**275.8**
Mt Nelson & Tolmans Hill						
Food & groceries	13.8	19.2	19.7	23.8	27.3	31.7
Liquor	2.2	3.0	3.6	4.7	5.8	7.4
Dining out/takeaway	6.2	6.9	8.7	10.4	12.3	14.6
Non-food	20.2	25.7	25.9	30.9	35.4	41.7
Retail services	1.8	2.4	2.7	3.4	4.1	5.0
Total	**44.2**	**57.2**	**60.6**	**73.2**	**85.0**	**100.4**
Battery Point						
Food & groceries	11.2	14.8	14.6	16.8	18.5	20.5
Liquor	2.3	2.9	3.3	4.1	4.9	6.0
Dining out/takeaway	6.4	6.8	8.2	9.3	10.6	12.0
Non-food	16.8	20.4	19.8	22.8	25.2	28.6
Retail services	1.8	2.3	2.5	3.0	3.4	4.0
Total	**38.5**	**47.2**	**48.3**	**56.0**	**62.7**	**71.0**
Total catchment						
Food & groceries	131.4	172.2	172.7	200.1	222.4	251.6
Liquor	21.8	28.1	32.2	40.1	48.7	59.7
Dining out/takeaway	64.0	68.0	82.9	94.9	109.0	125.4
Non-food	192.8	232.2	227.5	262.6	292.1	335.2
Retail services	18.7	23.2	26.1	31.1	36.2	42.6
Total	**428.6**	**523.6**	**541.4**	**628.8**	**708.4**	**814.6**

Of most importance for future development within the Site is that the volume of retail spending on Food & groceries and Liquor is forecast to increase by a combined $111m in annual terms over the period 2021 to 2036. This has potential to support a significant expansion in provision for supermarkets and grocery stores serving the study area, particularly if the same growth trends occur throughout the 30-year planning horizon.

As noted above, these projections do not fully account for the additional residential population living within the Subject Site itself, which could introduce an additional 3,000-4,000 residents above the baseline projections.

Applying the average retail spending rate across the study area to the new residents living on the Subject Site, the additional spending generated by on-site residents could be in the order of $79m to $105m in 2036, of which $24-32m would be associated with spending on Food & groceries and Liquor.

Supermarket demand analysis

An assessment of demand for supermarket floorspace has been conducted by examining supermarket floorspace provision rates and comparing to typical averages across Hobart.

Adopting this approach, and allowing for some incoming demand to serve workers and visitors (and, currently, students), demand for supermarket floorspace within the study area is estimated at 9,450 sqm in 2021, increasing to 12,400 sqm in 2036 (ie an increase of around 3,000 sqm).

Existing supermarket floorspace provision within the study area is estimated at 6,850 sqm, indicating that there is already an undersupply of 2,600 sqm of supermarket floorspace provision to serve the needs of study area residents and incoming visitors. The undersupply of supermarket floorspace is projected to widen; by 2036 the undersupply is estimated to be equivalent to around 5,500 sqm and will widen thereafter with ongoing population and spending growth.

Table 7— Supermarket demand analysis

Source: Deep End Services

Study area	Unit	2021	2026	2031	2036
Supermarket floorspace demand					
Population	no.	26,960	27,840	29,350	30,960
Hobart average provision rate	sqm/1,000 pop	316	324	332	340
Study area demand for supermarket floorspace	sqm	8,500	9,000	9,750	10,550
Incoming demand (workers, students, visitors)		10.0%	11.6%	13.1%	15.0%
Total effective demand	**sqm**	**9,450**	**10,200**	**11,200**	**12,400**
Supermarket floorspace supply					
Coles Sandy Bay	sqm	1,900	1,900	1,900	1,900
Woolworths Sandy Bay	sqm	2,900	2,900	2,900	2,900
Hill St Grocer	sqm	800	800	800	800
Lipscombe Larder	sqm	400	400	400	400
Shiploads	sqm	850	850	850	850
Total supermarket supply	**sqm**	**6,850**	**6,850**	**6,850**	**6,850**
Total supermarket provision rate	sqm/1,000 pop	254	246	233	221
Undersupply(-ve)/oversupply(+ve)	**sqm**	**-2,600**	**-3,350**	**-4,350**	**-5,550**

The implication from this undersupply is that local residents direct their spending to under-sized stores in Sandy Bay Town Centre which subsequently achieve average sales performance that are very substantially higher than the typical average, with indirect effects such as traffic congestion and difficulty in finding car parks. Alternatively, shoppers are required to undertake supermarket shopping elsewhere, possibly in combination with travel to work and other trips, for example to supermarkets within or on the edge of the CBD or in New Town.

On-site retail demand

As noted in section 4.2.2, the Subject Site is likely to have a permanent residential population of approximately 4,665 persons at full development, based on the anticipated outcomes envisaged in the Masterplan.

Some of this additional population base might otherwise have moved into the retail study area and be incorporated in the base case population projections set out in Table 5 (refer p45). However, it is estimated that at least around 3,000 residents are likely to be net additional study area residents who would not otherwise be living there.

A residential population of this size would generate demand for approximately 6,600 sqm of retail floorspace based on the typical Australian average provision rate of 2.2 sqm per capita.

If a supermarket-anchored retail node were established within the Site, it could potentially capture up to around 20-25% of the retail demand generated by these residents, consistent with the normal trading patterns for a supermarket-based centre. The remaining retail demand would be directed to existing centres such as Sandy Bay Town Centre and Hobart CBD, among others. This implies that the residential population within the Site itself has potential to support in the order of 1,650 sqm of retail floorspace at full development, mostly associated with the types of goods sold in supermarkets and other convenience stores.

A supermarket-based shopping node within the Site would also be supported by incoming spending from residents elsewhere within the study area, reflecting the current under-provision of supermarket floorspace identified in Table 7.

Further retail provision would be supported by the local workforce. Based on estimates presented in Section 5, total ongoing employment within the Subject Site could be close to 2,000 people. Although retail spending by workers is not as significant as that generated by residents, and usually only accounts for a relatively small share of retail demand associated with lunch-time purchases, their contribution would help to support the food dining and related shops, as well as adding to supermarket purchases.

Precinct attributes for retail uses

Different sub-precincts within the Subject Site are more suitable for accommodating retail development.

In terms of a supermarket-based concentration of shops with a local or neighbourhood convenience function, the most appropriate location is the central part of the Site at Precinct 2 where it can leverage the existing role of the Hill Street Grocer on the south side of Churchill Avenue and provide a key node for the delivery of local services for surrounding residents and workers.

Precinct 1 is also an attractive location for retail development given the exposure from Sandy Bay Road, and location close to visitor uses including the Wrest Point Casino. This precinct has potential to accommodate a range of retail that provides services to local users within the precinct, including apartment residents, office workers associated with sports and recreation functions, and people working in health and community uses (including the retention of the existing childcare centre).

Precinct 5 also has potential to support a small retail node for a surrounding catchment in Mount Nelson and Tolmans Hill with a population base of around 4,500 persons. This excludes any opportunity that may arise from visitor-oriented development.

Development opportunity

Overall, the Market Assessment Report provides support for the following retail outcomes:

- Precinct 1 could contain a small range of retail uses consisting of convenience shopping and food, beverage and other entertainment-related tenancies. These businesses would serve local residents as well as people visiting this area for sports and recreation functions or to visit medical centres and community services, and people travelling along Sandy Bay Road. An allocation of 500 sqm to 1,250 sqm is suggested, although the actual outcomes would depend on the scale and type of other uses within the precinct.
- Precinct 2 could contain a supermarket-based retail node of approximately 4,000 sqm to 5,000 sqm consisting of a full-line supermarket (in the order of 3,500 sqm), a range of complementary businesses focussing on convenience retail (chemist, newsagent, bakery, hairdresser, etc), and a collection of eateries that serve residents and workers within the precinct and surrounds.
- Precinct 3 should continue to have a retail role with the retention of the Hill Street Grocer and medical centre on the south side of Churchill Avenue.
- Precinct 5 may support retail tenancies associated with a tourism role in the Upper part of the Site and to serve the local population base within Mount Nelson and Tolmans Hill.

4.4.2 Assessment of Masterplan

The Masterplan provides for a total of 11,800 sqm (GLA) of retail floorspace consisting of:

- 600 sqm within Precinct 1 consisting of convenience uses and food & beverage tenancies serving apartment residents, workers within the sports science and administration uses and visitors to sports and recreation activities.
- 5,300 sqm within Precinct 2 including a supermarket of 3,500 sqm and a range of retail uses configured as part of the retail node or at the base of mixed use buildings (and likely to contain convenience retail, food & beverage and a range of other retail and non-retail service uses).
- 400 sqm within Precinct 3 associated with a small allocation at the base of apartment buildings.
- 5,500 sqm within Precinct 5 which consists of:
    - A small traditional retail component of 2,000 sqm located as small tenancies at the base of mixed-use buildings; and
    - A market hall and adjacent market square (3,500 sqm) that envisages a collection of local providores and other specialty stallholders that can showcase local producers and establish a new ‘foodie’ destination for Hobart and the southern region.

Precinct 1

The proposed scale of retail uses within Precinct 1 is supported by the analysis presented in the Market Assessment Report, reflecting an opportunity to deliver a small amount of convenience retail plus some food & beverage and other visitor-oriented retailing that reflects the envisaged role of the precinct for sports, recreation and supporting uses.

Precinct 2

The proposed scale of retail floorspace within Precinct 2 is consistent with the Market Assessment Report that identifies a current under provision of supermarket floorspace serving the identified study area, and an opportunity for a new retail node to be accommodated in the central part of the Subject Site to provide access to such services for residents in the study area, particularly those living on-site and to the east within the identified Sandy Bay East & Taroona sector.

Precinct 3

The proposed uses within Precinct 3 are minor in nature and intended to provide some ground level activity to mixed use buildings. Some of these spaces may be difficult to let given the position away from the centre of residential and visitor activity, and could accommodate secondary commercial and personal services tenancies.

Precinct 5

The proposed allocation of 2,000 sqm for specialty retailers within Precinct 5 is consistent with the limited opportunity that the Site has as a regular shopping location for residents in the immediate area.

With a population base of just 4,500 persons, the retail opportunity at this location would consist of the following elements:

- A large grocery store or small supermarket, with an indicative floorspace of approximately 500-750 sqm based on parameters relating to the catchment size, total supermarket floorspace demand, the proportion retained locally, and contributions from people who live outside the catchment
- A collection of specialty shops typically found associated with a small supermarket, such as bakery and other food shops, cafés and takeaway food shops, hairdresser, etc. The standard provision for these uses would be around 750 sqm or so.
- The remaining space (around 500 sqm) would be likely filled by specialist retailers serving a tourist role, for example bicycle store or outdoor gear shop.

The Masterplan also includes an allowance of 3,500 sqm for a market hall that would leverage the proposed visitor destination function of the precinct as a result of the proposed adventure tourism and eco-hotel. The market would build on Tasmania's reputation for high quality local produce to create a destination that would be appealing to locals and people from a wider regional catchment, and to tourists from elsewhere in Tasmania, interstate and overseas.

The Market Assessment Report did not specifically examine the opportunity for this type of retail use; in any case, this type of use is difficult to assess with a high degree of confidence because the success of the format depends on securing interest from a wide variety of future stallholders.

In the context of assessing the Masterplan, the market hall represents a use that is consistent with the intended visitor-focus for Precinct 5. However, its financial feasibility and potential success would require more detailed analysis at a later date.

4.4.3 Implications

When examined in terms of the market opportunity for retail development, the proposed retail elements accommodated in the Masterplan are generally consistent with the recommendations in the Market Assessment Report.

The proposed retail component in Precinct 2 incorporates a supermarket to provide a local shopping focus for the precinct and to alleviate a current undersupply of supermarket floorspace serving study area residents.

The retail elements in Precinct 1 and Precinct 3 are relatively minor and provide local services to reflect the other uses within each part of the Site.

The proposed traditional retail component in Precinct 5, consisting of 2,000 sqm of retail floorspace including a large general store or small supermarket, would serve a local retail role for a limited population base in Mount Nelson and Tolmans Hill, while also providing some specialist shops for people accessing the adventure tourist facility or staying at the hotel.

The proposed market hall within Precinct 5 was not identified in the Market Assessment Report, but represents a visitor-oriented destination use that is consistent with the tourism-related used within the precinct. If successful, the market would help expand Tasmania's 'foodie' destination brand, and would be expected to attract visits from residents throughout Hobart and the southern region as well as from tourists.

When examined in terms of consistency with strategic planning presented in STRLUS, the relevant issues are whether the introduction of new retailing at the Subject Site would represent complementary development to the existing activity centre network, or whether such development would represent undue competition. Also relevant is whether the Masterplan outcomes would generate adverse impacts on existing centres such that they could not continue to fulfil their designated roles.

These issues are examined below in relation to the Masterplan outcomes.

Complementary or competitive development

The following factors are relevant with regard to the role and provision of retailing at Sandy Bay Town Centre and elsewhere in the study area:

- Sandy Bay Town Centre is performing well in the current COVID context, as demonstrated by a relatively low vacancy rate, albeit with some tenants likely to be financially stressed in 2020 and 2021.
- The centre is anchored by two under-sized supermarkets (of 2,900 sqm and 1,800 sqm) that are constrained on their sites and unable to expand.
- Existing performance by these supermarkets is estimated to be well above the typical average for size-constrained stores such as these (probably by more than +25%), and this is leading to traffic congestion in their car parks and in surrounding streets.
- Other than these supermarkets, the other relevant store is the Hill Street Grocer, which presents an attractive alternative to a 'standard' supermarket such as Coles or Woolworths. Other shops such as Lipscombe Larder or Mount Nelson Store have their own distinctive clientele or local catchments and do not directly compete with supermarkets.
- The supermarket floorspace provision rate in the identified study area is well under the typical average and represents an undersupply of around 2,600 sqm of supermarket floorspace in 2021, widening to 5,550 sqm in 2036.

In the above contest, the introduction of a full-line supermarket offer within Precinct 2 at the Subject Site would inevitably involve a new Coles or Woolworths store, given that these are the only major supermarket operators in the Australian context likely to open stores of 3,500 sqm on the Site.

Even if one of these major operators were to establish a new full-line supermarket on the Site, they would continue to operate their existing stores at Sandy Bay Town Centre, as the removal of their presence at that centre would effectively 'give up' the western part of the study area to their competitor.

Thus, the outcome would be that residents in the study area would have the option of visiting the existing Sandy Bay Town Centre with its smaller supermarkets plus a wide range of retail and other businesses, or could visit the Subject Site to shop at a full-line supermarket (along with the existing Hill Street Grocer) and the much smaller supporting range of shops proposed in the Masterplan.

The commentary above provides support in a strategic sense for the introduction of a new supermarket-based retail node within Precinct 2 at the Site, to fulfill a latent and emerging need for additional supermarket floorspace provision, and to introduce a complementary offer that incorporates a full-line supermarket.

Other proposed uses within Precinct 1 and Precinct 3 also represent complementary development that is supported mainly by the on-site residential, worker and visitor populations.

With respect to the proposed retail uses within Precinct 5, there are two components to examine:

- The proposed inclusion of a small retail node of 2,000 sqm, underpinned by a small supermarket or large grocery store of 500-750 sqm and serving a local retail role for a catchment of around 4,500 people living in Mount Nelson and Tolmans Hill.
- A proposed market hall that would operate as a local produce shopping destination for a much wider regional catchment that extends across much of the metropolitan area and into the southern region as well attracting visits from tourists.

The small retail node of 2,000 sqm would represent a new local centre that complements the more significant retail role within Precinct 2 and in other centres such as Sandy Bay Town Centre, and is considered to be consistent with regional policies.

The proposed market hall is a different style of development. If successful, the trading role of this component would attract less frequent visits but from a much wider catchment, and would act as a visitor destination in its own right, consistent with the role of the adventure tourist centre and eco-hotel. In terms of the type of use, a market style development would not replicate the range of retail available at other supermarket-anchored centres, and therefore should be considered as complementary rather than competitive to other activity centres in the region.

Retail trading impacts

The need for an examination of potential retail trading impacts is largely confined to the supermarket-anchored centre within Precinct 2 and the proposed market in Precinct 5. The smaller allocations of retail floorspace in Precincts 1 and 3, and the local retail role in Precinct 5, will be supported by their local population and visitor base rather than attracting shopping visits away from centres such as Sandy Bay Town Centre.

Trading impacts arising from the introduction of a new supermarket of 3,500 sqm within Precinct 2 would mainly fall on similar types of uses – ie the two existing supermarkets in Sandy Bay, and to a lesser extent those further away that may be capturing some supermarket spending by study area residents. A competitive impact may also be felt at individual shops such as Hill Street Grocer, but these impacts are likely to be outweighed by the positive effect on sales generated by the additional spending base introduced by residential development on-site.

The two existing supermarkets at Sandy Bay Town Centre are estimated to be achieving existing sales of around $70-75m in 2021. If sales performance were to continue to increase in line with the size of the spending market in the study area, these stores would achieve combined sales in excess of $95m in 2032 (noting that these figures are presented in current dollar terms – ie excluding inflation), which has been adopted as a potential year for development of the new retail centre in Precinct 2.

Of these sales, an estimated 94%, or $89.3m, would be in Food & grocery merchandise, with the remainder associated with general merchandise items commonly sold by supermarkets.

An estimated 80% of sales at the two supermarkets in Sandy Bay, or $71.4m in Food & grocery merchandise, is derived from spending by catchment residents, with the remainder accounted for by incoming spending from local workers and other people who live beyond the study area.

With catchment spending on Food & groceries forecast to be $222.4m in 2032 (refer Table 6), this indicates that the existing Sandy Bay supermarkets currently achieve a combined market share of 32% of the available spending on relevant merchandise.

This is a relatively low market share given the presence of the two major brands and provides further indication of the opportunity for additional supermarket provision to serve the area. In the absence of additional local provision, residents will continue to direct a large proportion of supermarket spending outside the study area.

A new supermarket of 3,500 sqm at Precinct 2 would likely require sales of around $55m in 2032 to be an attractive opportunity for one of the major operators. Of these sales, 94%, or $51.7m, would be in Food & grocery merchandise.

Given the location of the store close to where the major office workforce will be located, an estimated 70% of supermarket sales, or $36.2m, would be derived from spending by catchment residents, with the remainder accounted for by spending from local workers and other visitors to the Site.

Importantly, as indicated in section 4.4.1 in relation to on-site retail demand, the introduction of new residents at the Subject Site is likely to generate around $22m to $30m of additional spending on Food & groceries, on top of the study area retail spending identified in Table 6.

In broad terms, the sales achieved by a new supermarket within Precinct 2 would be derived from:

- Capturing a share of grocery spending by on-site residents
- Retaining a share of spending that is otherwise directed outside the study area (ie increasing the market share of grocery spending from study area residents)
- Capturing sales that would otherwise have been directed to the existing supermarkets at Sandy Bay Town Centre (ie impacts on these stores).

Given the low current market shares and the opportunity to capture spending by on-site residents, these sources of sales are expected to account for the proportions of sales at a new supermarket within Precinct 2 as shown in Table 8.

Table 8—Source of sales at Supermarket in Precinct 2

Source of sales	Proportion %	Sales $m	FLG sales, $m
From new residents	25.0%	$13.75	$12.93
Retained market share	50.0%	$27.50	$25.85
Impacts on Sandy Bay TC supermarkets	25.0%	$13.75	$12.93
Total	**100.0%**	**$55.00**	**$51.70**

Based on the distribution of sales shown above, Table 9 summarises the trading impacts and other effects arising from the introduction of a new supermarket in Precinct 2. The key features and interpretation of this analysis are as follows:

- Existing supermarkets would achieve total sales of $81.3m rather than $95.0m, representing a reduction of $13.8m or around 14.5% of sales.
- Average sales at these stores would still be close to $17,000/sqm, which is significantly higher than the current typical trading level of around $12,000/sqm, therefore providing for strong growth on current sales performance.
- At these sales levels, the existing supermarkets would continue to operate at Sandy Bay Town Centre.
- The introduction of the new supermarket would have the effect of increasing the Food & grocery sales to study area residents from $71.4m to $87.0m, thereby increasing the combined market share to 39.1%.
- Given the continued operation of the supermarkets at Sandy Bay Town Centre, and the relatively low provision of non-supermarket tenancies within Precinct 2 that might compete with existing stores in the Town Centre, the trading effects on other components of Sandy Bay Town Centre would be minimal.
- Trading effects on other centres such as the collection of shops at Little Sandy Bay would be minimal and indeed could be positive given the injection of additional population base.
- As noted above, Hill Street Grocer would also be likely to experience a positive impact arising from the additional population and spending brought to the area. For example, the analysis in Table 9 assumes that the new supermarket would only capture around 55% of the additional grocery spending from new on-site residents, with the remainder potentially captured by the Hill Street Grocer and other shops.

Overall, the analysis described above and presented in Table 9 shows that a supermarket-based centre could be accommodated at Precinct 2 within the Subject Site without generating undue trading impacts on existing activity centres.

Table 9—Trading impact analysis of supermarket in Precinct 2

	Sales	Food & grocery (F&G) sales	F&G sales from study area	F&G sales from on-site residents	Catchment spending on F&G	Market share
Existing supermarkets: pre-impact	$95.0	$89.3	$71.4		$222.4	32.1%
New supermarket Precinct 2	$55.0	$51.7	$25.9	$12.9	$222.4	11.6%
Existing supermarkets: post-impact	$81.3	$76.4	$61.1		$222.4	27.5%
All supermarkets post-impact	**$136.3**	**$128.1**	**$87.0**		**$222.4**	**39.1%**
Impacts						
In dollar terms $m	-$13.8		-$12.9			
Percentage impacts %	-14.5%					

Source: Deep End Services

With respect to the proposed market hall concept in Precinct 5, there are several relevant considerations:

- The proposed market hall would not be viable if it were only to attract a share of grocery shopping trips from people living within the study area. This is because a large share (typically at least 75%) of grocery purchases made by most households in Australia is directed to traditional supermarkets rather than to the sorts of stallholder formats that would be accommodated at a market.
- The Site is also not particularly convenient for residents living in Sandy Bay who would need to drive up the Nelson Road switchbacks to visit the market, or indeed travel via Proctors Road (which is indicated as the fastest route from the coastal part of Sandy Bay according to Google Maps).
- This means that the market hall would need to attract customers from a wide regional catchment, extending through much of Hobart (albeit with a focus on the central and southern suburbs) and from the townships to the south where access via Southern Outlet is relatively convenient.
- A large share of sales at the market would be from tourist visitors that would be attracted to a new 'foodie' destination offering local produce at a visitor-oriented node that also accommodates an adventure tourist centre and commercial accommodation.
- The market would therefore have a very distinctive role as a location for shopping for regional produce, attracting fairly infrequent trips from a wide geographic area and also serving a tourist visitor customer base. This can be distinguished from the role of other centres in the region.
- Markets tend to have much lower sales performance compared to a supermarket, reflecting the focus on particular types of produce, the more infrequent visitation patterns, and the seasonality of trade.

Overall, these factors indicate that a market would attract a low share of spending from a wide regional catchment and would therefore have limited competitive trading impacts on other centres in the region.

4.5 Commercial accommodation / tourism

4.5.1 Market assessments

The approach adopted in the Market Assessment Report to examine commercial accommodation and tourist development opportunities includes:

- A summary of the Tasmania tourism market, examining visitor numbers, visitor nights, purpose of trip, expenditure and activities undertaken
- Historical trends and indicative visitation forecasts, taking into account potential impacts from COVID-19
- Information on existing commercial accommodation throughout Hobart and in the area surrounding the Subject Site
- Analysis and commentary on opportunities for a range of accommodation types (including eco-resort style facilities) and other adventure tourism facilities.

The following sub-sections present a summary of these market assessments.

Tourism trends

Tasmania has historically had a very strong tourism market, with domestic and international passengers visiting year-round to experience a wide range of attractions including, world heritage areas, national parks, food and wine destinations and a thriving art culture.

The tourism industry is a vital component of the Tasmanian economy, with the latest data published by Tourism Tasmania for the year ending December 2020 showing that tourism employment is the highest of any state in Australia, accounting for almost 8.5% of total employment. The data also highlights that Tasmanian tourism directly and indirectly supports almost 37,500 jobs and contributes around $3 billion annually (or 9%) to Gross State Product.

Tourist visitation has been increasing up to the end of 2019, at which time a total of 1.35 million visitors spent a total of 10.9 million visitor nights in the State.

COVID-19 has had a significant effect on visitor numbers with the introduction of border restrictions for non-essential domestic travel, the halting of cruise ship visitation and international holiday travel suspended. According to data for March 2021 from Tourism Tasmania, visitation levels are just 25% of pre-COVID levels.

Impacts on tourism are expected to continue until travel restrictions ease once vaccination levels are much higher, but the long-term forecast is uncertain, especially with regard to international visitor numbers.

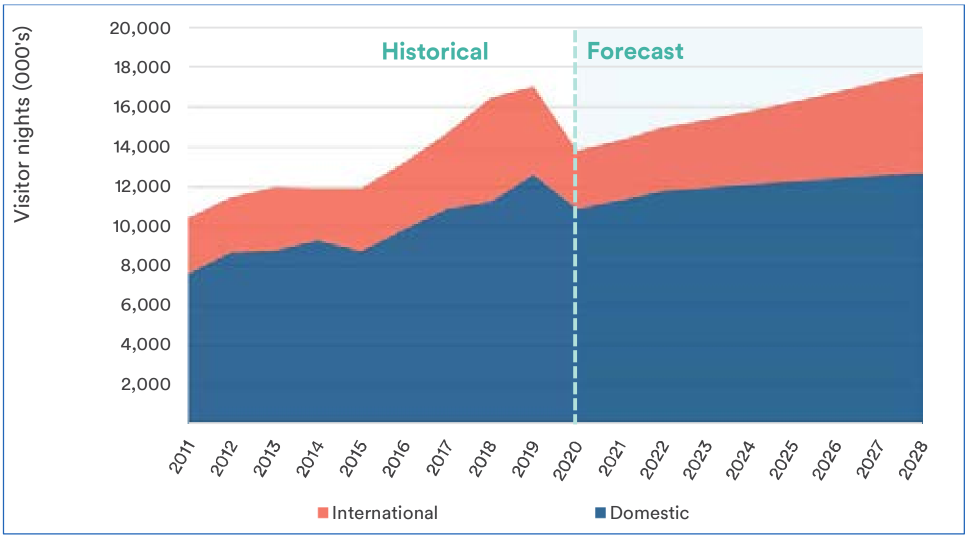
Southern Tasmania including Hobart is the most visited location by tourists, attracting almost half of all visitors to the State.

Analysis of the potential recovery in tourism visitation post-COVID has been prepared by Deep End Services, drawing on visitor numbers and forecasts published by Tourism Research Australia. The modelled recovery in tourism is based on indicative estimates of the recovery period over the next few years.

According to this broad analysis, tourism numbers in Tasmania are likely to recover to pre-Covid levels by around 2025 or 2026, as indicted in Figure 11.

Figure 11—Project recovery in visitor nights

Source: Deep End Services; Tourism Research Australia



Information on the types of visitor activities undertaken by tourists is contained in data from the Tourism Tasmania visitor survey, and highlights the importance of activities that fit within the Tasmanian tourism brand that encapsulates bushwalking, visiting areas of scenic beauty, visiting national parks, and undertaking other outdoor activities.

In terms of activities that might reflect the nature of the Subject Site (and particularly the Upper part of the Site), the data identifies the following numbers of visitors undertaking outdoor-related activities:

- Visit National parks – 503,000
- Short bushwalks – 495,000
- View wildlife – 245,000
- Long bushwalks – 113,000
- Cycle or mountain bike – 45,000
- Overnight bushwalk – 45,000

The total number of visitors undertaking some kind of outdoor activities was 864,000 in 2019, with most of these visiting Hobart and surrounds (82%) and almost half staying in standard commercial accommodation (hotels or motels).

Tourism accommodation

Data published by the ABS in 2016 (last available) shows that at the time there were 151 commercial accommodation establishments in Tasmania that offer 15 or more rooms, with the majority being hotels and motels, comprising 118 establishments, or 78% of the total. Serviced apartments account for the remaining 22% of accommodation supply.

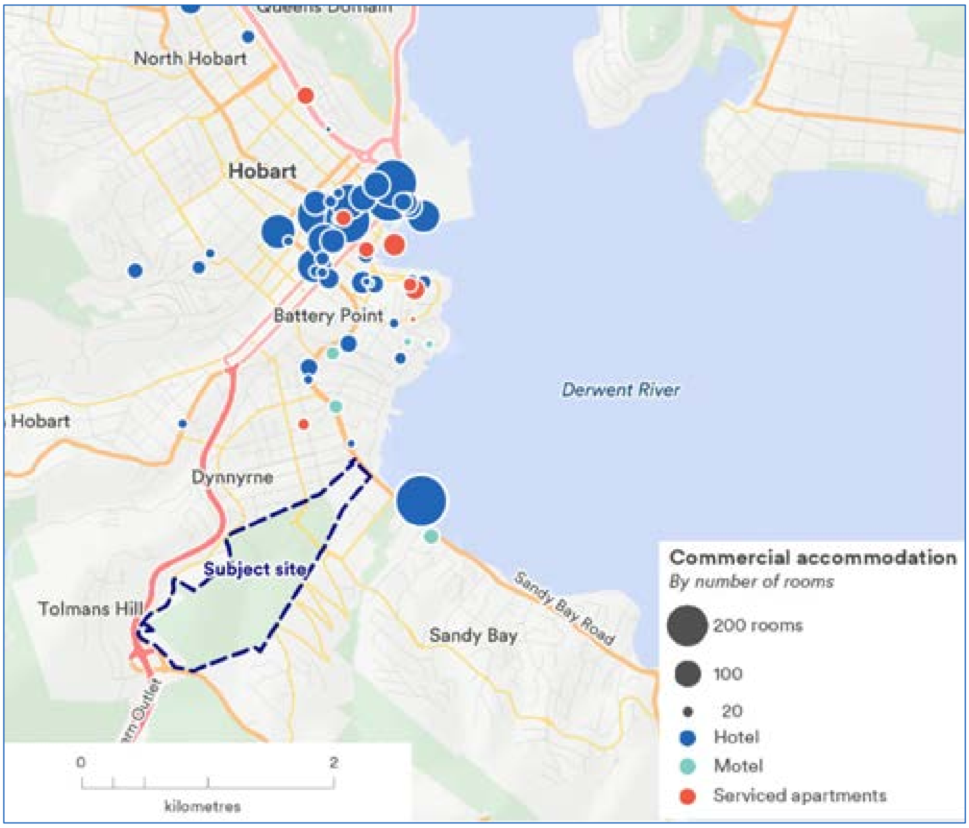
The majority of the establishments (94, or 62%) were classified in the Budget/Midscale category, with only 2 establishments classified as Luxury. The highest available room nights available was within the Upscale category, with over 1.2 million available nights (or 71% of the total). Subsequent room occupancy rates result in a healthy 76% for across both hotels/motels and serviced apartments, with a lower occupancy rate (52%) seen in the Budget/Midscale category.

More detailed information at the SA2 geography level show that average room occupancy rates within Hobart and Sandy Bay were 83% and 76% respectively.

As shown in Figure 12, the main concentration of accommodation facilities is in or on the edge of the CBD. A scattering of smaller scale hotels and motels are situated throughout Battery Point and along Sandy Bay Road.

Figure 12— Commercial accommodation distribution

Source: Deep End Services



The largest establishment in proximity to the Subject Site is the Wrest Point Casino which has approximately 270 available rooms.

Several new hotel developments are in various stages of planning, including:

- An application for 175 rooms in a 14-storey development at 79 Collins Street in CBD east
- A nine-storey 206-room hotel at 179 Macquarie Street, currently under development
- Approval for a 68-room hotel at 125 Bathurst Street
- Serviced apartment project of 57 rooms under development in North Hobart.

In addition, the Mac Point precinct would be expected to include a new hotel.

Notwithstanding these new projects, the map shows that there are relatively few accommodation options in and around Sandy Bay, where the emphasis is on Airbnb and private rentals.

Eco tourism

Tasmania's tourism strategies provide strong support for an expansion in environmentally responsible tourism development, which complement the overarching focus on natural environment and outdoor settings.

In addition, the T21 priorities for recovery after COVID emphasise the need to growth visitation associated with Tasmania's natural environment and 'clean & green' image.

Much of the existing ecotourism accommodation on offer is situated in more remote areas and consists of smaller-scale facilities within wilderness areas.

In this context, the Upper part of the Site provides an opportunity to establish environmentally responsible commercial accommodation within a bushland setting that is close to the wider tourism offer in Hobart's metropolitan area, while also being within relatively comfortable access to the Tasmanian Wilderness World Heritage Area.

Adventure tourism

With a strong focus on outdoor and adventure activities, there is potential to establish an adventure tourism precinct within Precinct 5, taking advantage of the bushland setting and the existing use of the Site for bushwalking, cycling and rock-climbing at the quarry on Proctors Road.

The likely opportunity would be similar to that provided at Hollybank Wilderness Adventures in Launceston, which offers ziplining, mountain biking, Segway tours, and a tee rope course.

It is understood that the City of Hobart has expressed interest in facilitating the establishment of a similar facility. In this context the Subject Site represents an attractive opportunity given its characteristics and the potential to complement an eco-resort commercial accommodation offer.

Development opportunity

The market assessments highlight the current stress in Tasmania's tourism sector due to the COVID-19 pandemic, with recovery likely to take some years, particularly with regard to international visitors.

At the same time, there are several new hotels proposed or under construction that are likely to absorb demand over the next few years.

Nevertheless, the market assessments provide support for the following tourism accommodation outcomes within the Subject Site:

- An eco-tourism resort in Precinct 5, reflecting the bushland setting of the Upper Campus and opportunity to co-locate with adventure tourism uses.
- Possible inclusion of a mid or higher budget offer within Precinct 1 in the medium to long-term, which would have a role in serving an expanded sports and recreation precinct and introduce additional tourism product for the coastal area along the Derwent River frontage.

In addition to these accommodation options, the market assessments provide support for an adventure tourism offer within Precinct 5, similar to the Hollybank Wilderness Adventure park in Launceston. This is an opportunity that has been previously identified, and the Site represents a suitable location for this type of use.

4.5.2 Assessment of Masterplan

The Masterplan provides for the following tourism-related outcomes:

- A serviced apartment building within Precinct 1 containing 72 rooms, situated with frontage to Sandy Bay Road
- An eco-resort style hotel within Precinct 5 containing 120 rooms
- An adventure tourism centre within Precinct 5.

These elements directly respond to and are consistent with the opportunities identified in the Market Assessment Report. The visitor-oriented focus in Precinct 5 is also supported by the proposed market hall concept which, if successful, would attract visitation by residents throughout the region as well as tourist visitors.

4.5.3 Implications

The proposed accommodation and other tourism elements contained in the Masterplan are supported by regional policies that aim to further develop and diversify Southern Tasmania's tourism offer while emphasising sustainable and innovative tourism opportunities.

The eco-resort would establish a new accommodation offer that would complement the more traditional types of hotels and motels currently on offer within and on the edge of the CBD.

The proposed serviced apartments would have a strong role in meeting the needs of visitors to the Subject Site, including those visiting Precinct 1 for sports, recreation and sports administrative activities.

4.6 Other uses

4.6.1 Market assessments

The Market Assessment Report includes consideration of a range of other uses that might be developed within the Subject Site, including:

- Sports and recreation, sports science and sports administrative uses, and allied uses such as sports medicine
- Medical centres and specialist health services
- Childcare.

The key results from these assessments are summarised in the following sections.

Sports recreation and related uses

Precinct 1 already operates as a focus for sports and recreational activities. Consideration of future redevelopment opportunities has already been undertaken internally by UPPL, with identified opportunities including:

- Conversion of the rugby fields with the relocation of the soccer facilities from the Upper Campus
- Upgrades to the AFL/cricket pitch so that it meets the specifications in case the ground might become available for a future AFL and/or Premier League cricket club
- Significant improvement in associated club rooms, amenities, sports viewing stands, and other requirements to support an expanded sports role
- Expansion and improvements in sports-excellence infrastructure such as dedicated synthetic cricket practise nets, etc
- Expanded/improved gym facilities
- Potential expansion of the sports hall into a home for an NBL team and to introduce other indoor activities.

An improved and expanded range of sports and recreation activities within Precinct 1 could also attract sports science education and research facilities.

Discussions are also underway with major state and national sporting bodies to establish a new sports administrative precinct within Precinct 1 which might include the need for office/administrative space to house some functions undertaken by these organisations.

With an improved and expanded array of sports and recreation activities, potentially including sports administrative functions, Precinct 1 is likely to generate demand for a wide range of allied health functions including:

- Wellness uses such as yoga, Pilates, acupuncture, spa
- Allied health functions such as physio, sports rehab, etc housed in professional suites.

These allied uses could generate demand for a range of tenancy opportunities within Precinct 3, including dedicated facilities as well as more generic office-style consulting suites.

Health services

Existing medical centres are clustered at Sandy Bay Town Centre and further west into inner Hobart, and in particular close to the Calvary St Johns Hospital in South Hobart.

The closest medical centre is above the Hill Street Grocer, with an estimated 13 GPs. Another centre is on Grosvenor Street just to the north-west of the Site.

The introduction of a new permanent residential population base of around 4,665 persons, plus an emerging office workforce, along with the creation of a new sports science precinct in the lower part of the Site, would support additional provision of general practise medical facilities.

Precinct 1 is likely to attract some health services, but these are likely to be mainly specialist services associated with a sports and recreation precinct.

Precinct 2 represents a suitable opportunity to accommodate an expanded general practice offer, given its location close to the central part of the Site.

There may be some opportunity for limited provision of medical services within Precinct 5 but this would be a smaller opportunity given the limited local residential catchment.

In terms of specialist medical services, other than the pathology lab at the Churchill Avenue Medical Centre and one or two physiotherapists in the local area, the majority of specialist health services are located at Sandy Bay Town Centre or further north close to the CBD.

The opportunity for specialist health services at the Subject Site is likely to comprise a range of sports-related health services that have been identified for Precinct 1, and the possibility of a small number of opportunities for professional suites to be provided as part of a medical centre in Precinct 2.

Childcare

The prospects for additional childcare services are somewhat limited given the relatively low future growth in the younger age cohorts within the surrounding area, and a fairly strong provision of places within the area.

Nevertheless, future childcare demand will also be generated as a result of ongoing increases in the rate of participation, with this potentially accelerating post-COVID depending on policy support.

The introduction of a new residential base of 4,665 persons (albeit with a focus on smaller households), along with an office workforce, will also lead to increased demand for places.

Overall the market assessments support a medium to long-term opportunity for additional childcare provision, provided through the introduction of a new centre within Precinct 2 or 3, and/or the expansion of the Lady Gowrie centre in Precinct 1 as part of the redevelopment of this part of the Site.

4.6.2 Assessment of Masterplan

The Masterplan provides for the following sports, recreation, health and community uses:

- Redevelopment of 'Sports Green' within Precinct 1 to accommodate new multi-sport natural turf and indoor astroturf pitches, introduce seating, and improve facilities for AFL and cricket including the sports pavilion
- Development of a new sports science/sports administration centre within Precinct 1, which would also incorporate new sports social clubrooms and would house the relocated Lady Gowry Childcare centre
- Retention of library and performing arts/cultural activities within Precinct 2, and relocated community house
- Construction of a new medical and wellness centre within Precinct 2, with allocation of 3,200 sqm GFA
- Construction of a new family health services / community centre and childcare centre within Precinct 3
- Development of a health spa and wellness centre of 1,000 sqm within Precinct 5.

Most of these planned uses directly respond to and are consistent with the analysis presented in the Market Assessment Report. In particular, the proposed development of Precinct 1 as a sports and recreation hub with a strong sports science and health role is consistent with UTAS' vision for this part of the Site, and has strong merit.

Other health-related services are proposed to consist of a relatively large medical and wellness centre of 3,200 sqm within Precinct 2, close to the existing node of activity at Hill Street Grocer. Given the assessments of demand for additional GPs likely to arise from the new population base within the Subject Site, and the existing community east of the Site along Churchill Avenue, there is certainly demand for additional medical services at this location. However, the requirement for GP-related medical uses may be less than 3,200 sqm, with the remaining space accommodating a range of wellness and allied health uses.

In terms of childcare, the Masterplan reflects the findings of the market assessments, with an opportunity for a new facility established at Precinct 3, centrally positioned to serve local residents and workers.

4.6.3 Implications

The inclusion of a range of sports, recreation, health, wellness, and community services is consistent with the proposed mixed-use nature of development envisaged within the Subject Site.

Successful delivery of these elements of the Masterplan will generate positive outcomes for the local community in terms of the choice, range and convenience of personal and community services available in the area.

The sports and recreation uses proposed for Precinct 1 has potential to generate a range of positive community outcomes for the local area, the wider region and Hobart as a whole, including:

- Improvements in existing sports infrastructure, creating potential to host sporting events
- Improved facilities that better serve local members of sporting clubs and visitors
- An opportunity to develop a modern focus for sports administration in Hobart
- Opportunities to cater for organisations involved in sports science, sports research and sports health.

5

Economic impact analysis

5.1 Introduction

This chapter presents analysis of the economic outcomes likely to result from the successful completion of the Masterplan, and includes consideration of:

- Economic outcomes during the construction period, principally in terms of employment generation and contribution to the economy as measured by additions to industry value-add
- Ongoing economic effects including employment growth and contributions to value-add
- Effect on Hobart CBD and Sandy Bay Town Centre associated with competitive impacts in the commercial office, retail and commercial accommodation sectors
- Other potential effects.

The analysis presented in this section is based on the indicative schedule of uses set out in section 3.2 of this report, as well as the commentary and analysis presented in Chapter 4.

5.2 Construction period effects

Detailed estimates of construction costs associated with delivery of the Masterplan are not available for the purposes of this assessment. However, based on the range and scale of uses contemplated, it is likely that the total construction cost will be more than $1.5bn.

Based on an indicative labour cost component of approximately 40%, or $600m, and applying a broad average ware of $95,000 per full-time equivalent employee, this implies that the construction period will directly generate around 6,300 jobs over the life of the project (approximately 30 years).

Applying an employment multiplier of 1.752 which is relevant for construction of non-residential buildings and for high density apartments, approximately a further 11,000 jobs would be generated nationally as a result of upstream and downstream industry linkages (industry effects) and through expenditure of wages (consumption effects). Many of these indirect jobs would be generated in Hobart and elsewhere in Tasmania, but some will occur elsewhere in Australia, for example associated with financial and insurance industry sectors, etc.

Based on typical industry performance data for the construction sector derived from the ABS Australian Industry 2019-20 publication, the indicative $1,500 million direct investment in construction activity would generate total value added of approximately $900 million across the life of the project. This economic activity would occur throughout the Australian economy, with perhaps half generated within Tasmania.

In summary this analysis shows that delivery of the Masterplan represents a very significant construction project that will generate employment opportunities during the 30-year timeframe for a wide range of businesses directly and indirectly involved in the construction industry.

5.3 Ongoing employment

Ongoing employment will be generated as a result of a range of commercial and community activities proposed to be accommodated on the Site. These outcomes have been estimated based on typical employment generation ratios (eg sqm per job or similar measures) for each type of use, applied to the detailed development schedule associated with the Masterplan.

An allowance is also made for home-based work undertaken by residents within the Subject Site, by applying a ‘working from home’ factor of 10%.

Detailed calculations are provided in Table 10, with estimates of full-time equivalent (FTE) employment based on the anticipated mix of full-time, part-time and casual positions.

Indirect employment has been estimated by applying typical FTE employment multipliers for each industry sector based on ABS data.

A broad estimate of industry value added has also been provided, based on average industry performance data contained in the ABS Australian Industry publication. Note that this estimate applies average value added per job at the Australian level, and is not based on detailed input-output modelling at the local level.

The results show that:

- A total of approximately 1,840 jobs would be created within the Site when full development is reached
- This represents an estimated 1,470 full-time equivalent jobs having regard to typical mix of full-time, part-time and casual staff in each sector
- Approximately a further 2,955 FTE jobs would be created indirectly through industry production linkages and consumption effects (expenditure of wages)
- Total direct value added would be an estimated $147m based on typical industry performance averages.

Overall this assessment shows that successful delivery of the Masterplan will generated significant employment opportunities for the local community in Sandy Bay and the surrounding area.

Table 10—Ongoing employment estimates

Source: Deep End Services, CHC

Use	Direct employment (positions)	Estimated direct full-time equivalent	Estimated indirect full-time equivalent	Estimated industry value added ($m)
Precinct 1				
Sports science - offices	60	54	117	$2.7
Clubs/community	21	11	13	$0.6
Childcare	24	20	23	$1.7
Retail	7	4	5	$0.2
Serviced apartments (management)	5	4	7	$0.3
Retail	15	11	14	$0.6
Retail/F&B	8	5	9	$0.2
Indoor sports - allowance for manage/admin	5	5	11	$0.3
Sub-total Precinct 1	**145**	**114**	**199**	**$6.6**
Precinct 2				-
Commercial office	745	633	1,495	$77.0
Education	21	17	19	$1.4
Library	12	8	12	$0.7
Aged care	55	28	39	$1.5
Retail (F&B)	25	15	28	$0.5
Retail - supermarket	140	105	130	$5.9
Retail - specialty	13	10	12	$0.6
Arts/culture	20	12	17	$0.8
Mixed use (retail/other)	18	14	17	$0.8
Medical centre	53	42	58	$4.7
Community house	2	1	1	$0.1
Retirement living - admin	8	6	12	$0.3
Sub-total Precinct 2	**1,112**	**891**	**1,840**	**$94.2**
Precinct 3				-
Mixed use (retail, F&B)	10	8	10	$0.4
Health	25	20	28	$2.2
Child care	20	17	19	$1.5
Sub-total Precinct 3	**55**	**45**	**57**	**$4.2**
Precinct 4				-
Education		0		
Sub-total Precinct 4	**0**	**0**	**0**	**$0.0**
Precinct 5				-
Adventure tourism centre	10	6	13	$0.3
Eco-hotel	38	23	43	$1.6
Spa	13	8	6	$0.5
Retail – supermarket/grocery	16	12	15	$0.7
Retail - specialty	33	25	31	$1.4
Retail - market hall	78	62	77	$3.5
Commercial office	40	34	80	$4.1
Eco-learning centre	8	7	8	$0.3
Sub-total Precinct 5	**236**	**177**	**273**	**$12.3**
TOTAL - employment uses	**1,548**	**1,227**	**2,370**	**$117.2**
Home-based work (@ 10% of working population)	290	247	585	$30.0
TOTAL employment on Site	**1,838**	**1,474**	**2,955**	**$147.3**

5.4 Centre impacts

An assessment of the Masterplan against relevant regional planning polices has been presented in Section 4 of this report. The key outcomes are summarised below.

5.4.1 Impacts on Hobart CBD

Impacts on the Hobart CBD are relevant mainly in the context of regional policies that seek to ensure that the CBD remains the preeminent commercial and administrative centre in Southern Tasmania.

The main potential impact on the role and function of the Hobart CBD economy would occur because of the proposed accommodation of around 14,900 sqm NLA of commercial office floorspace within Precinct 2 at Sandy Bay.

However, as described in section 4.3.3 the likelihood that the CBD would experience a significant impact arising from development within Sandy Bay is low, having regard to the anticipated source of demand, which will be mainly from small and micro businesses otherwise seeking leasable space in suburban and CBD office buildings.

Importantly, the Subject Site is unlikely to be an attractive location for corporate office users or major government departments, which will continue to locate in the CBD where they can serve a regional labour force and create synergies with clients and suppliers.

Moreover, the scale of development within the Site, with 14,900 sqm delivered over around 30 years, represents a small share of the total projected office demand throughout Greater Hobart, with the large majority of future demand accommodated within the CBD as forecast in the technical report prepared as input to the CHPP Discussion Paper.

Other potential impacts could occur because of the proposed commercial accommodation delivered on the Site. In this regard, however, it is relevant that the eco resort would serve a very different function to existing or planned hotels and motels in the CBD. With regard to the proposed serviced apartments, these would mainly serve as a convenient location for visitors to the sports precinct (Precinct 1) and would be unlikely to compete with other better-located accommodation providers in the CBD and surrounds that serve a mainstream tourism market.

5.4.2 Impacts on Sandy Bay Town Centre

The relevance of impacts on Sandy Bay Town Centre is in the context of regional policies that seek to ensure that new retail developments are complementary to existing centres in the hierarchy and do not represent undue competition.

A detailed examination of the strategic context and potential for trading impacts on Sandy Bay Town Centre is set out in section 4.4.3, with the main findings as follows:

- A new supermarket-based centre within the Subject Site can be supported in strategic terms due to the opportunity to fulfill a latent and emerging need for additional supermarket floorspace provision, and to introduce a complementary offer that incorporates a full-line supermarket.

- Other proposed uses within Precinct 1 and Precinct 3 also represent complementary development that is supported mainly by the on-site residential, worker and visitor populations.
- The proposed allocation of 2,000 sqm for a grocery store or small supermarket and other small retail tenancies within Precinct 5 is consistent with the potential role in providing local shopping services to a small catchment living on the Site and in Mount Nelson and Tolman Hill.
- The proposed market hall concept for Precinct 5 is consistent with the visitor-oriented role of that precinct and would attract shoppers from throughout Hobart and the southern region on infrequent trips to buy local produce, as well as capturing spending from tourists.
- The need for an examination of potential retail trading impacts is largely confined to the supermarket-anchored centre within Precinct 2 and the proposed market in Precinct 5. The smaller allocations of retail floorspace in Precincts 1 and 3, and the local retail role in Precinct 5, will be supported by their local population and visitor base rather than attracting shopping visits away from centres such as Sandy bay Town Centre.
- Trading impacts arising from the introduction of a new supermarket of 3,500 sqm within Precinct 2 would mainly fall on similar types of uses – ie the two existing supermarkets in Sandy Bay, and to a lesser extent those further away that may be capturing some supermarket spending by study area residents.
- Analysis of these impacts indicates that the existing Sandy Bay supermarkets may experience a decline in sales of approximately 14% if a new supermarket were established in Precinct 2. However, the impacts at the centre level would be much lower, and in any case the existing supermarkets would continue to trade at or above typical industry averages. There would be no change to the role or performance of Sandy Bay as a Minor or Neighbourhood centre in the hierarchy.
- Trading effects on other centres such as the collection of shops at Little Sandy Bay would be minimal and indeed could be positive given the injection of additional population base.
- In relation to the proposed market in Precinct 5, the nature of this use means that a successful market would attract customers from a wide geographic region as well as from tourists. Residents in the local area are unlikely to transfer a significant share of their grocery spending away from more convenient shopping locations, and so the potential for trading impacts is low.

In summary, the analysis indicates that trading impacts on Sandy Bay would not adversely affect the role and performance of the centre, and would be unable to lead to changes in the existing mix of tenants. Vacancies are unlikely to occur due to any additional competition.

5.5 Other effects

A range of other, generally non-measurable, effects are likely to arise due to successful completion of the Masterplan:

- Creation of a new, sustainable community served by a range of business, shopping, community and personal services and providing an opportunity for a live, work and play precinct.
- Opportunity to co-locate intensive employment outcomes within a site where major infrastructure is already present, thereby creating economic efficiencies and environmental benefits associated with reduced travel to work.
- Opportunity to serve the significant and growing cohort of pre-retired and retirement-age residents as well as families, first home buyers and investors that are largely un-catered-for in the Greater Hobart property market.
- Creation of a much more diverse range of housing options, including apartments and townhomes, that may be attractive to young families otherwise priced out of an attractive inner-city suburb.

5.6 Summary

In summary, this analysis of the UTAS Sandy Bay Masterplan shows the project will generate significant positive economic effects, including:

- Significant capital investment, potentially in excess of $1.5 bn, representing approximately $900m in direct value added
- Employment generated during the construction period, likely to be more than 6,300 direct jobs spread across the 30-year life of the project
- Indirect benefits through multiplier linkages, including estimated indirect employment of 11,000 jobs arising from the construction activity
- Total direct ongoing employment of 1,900 employment positions, or 1,520 jobs when measured in full-time equivalent terms
- Indirect employment estimated at 3,000 jobs
- Direct contribution of $150m in value added
- Other benefits associated with the repurposing of the Site as an active mixed use precinct accommodating residents, workers, services and visitors.

ASSESSING THE MASTERPLAN DESIGN + IMPACTS

Traffic Impact Assessment

GTA Stantec

UTAS Sandy Bay Masterplan for PSA Submission

Planning Scheme Amendment
Transport Impact Assessment

Prepared by: Stantec Australia Pty Ltd for ClarkeHopkinsClarke Architects
on 02/12/2021
Reference: 301401291
Issue #: A

UTAS Sandy Bay Masterplan for PSA Submission

Planning Scheme Amendment
Transport Impact Assessment

Client: ClarkeHopkinsClarke Architects

on 02/12/2021

Reference: 301401291

Issue #: A

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	02/12/2021	Final	Jordan Smith	Tim De Young	Tim De Young	T.D.Y.

This report has been commissioned by ClarkeHopkinsClarke Architects Pty Ltd, on behalf of UTAS Properties Pty Ltd (UPPL) to perform 'preparation of a Transport Impact Assessment' scope of works pertaining to and in support of the development of the UTAS Sandy Bay Masterplan for the purpose of a Planning Scheme Amendment or as otherwise set out in this report. This report may only be used and relied on by ClarkeHopkinsClarke Architects Pty Ltd and UTAS Properties Pty Ltd (UPPL) for this purpose or as otherwise set out in this report."

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The University of Tasmania (UTAS) is seeking to relocate its existing Sandy Bay Campus (the existing Campus) into the Hobart CBD over the next decade.

The relocation will unlock an urban renewal opportunity for the Sandy Bay Site to be developed into a mixed-use activity centre, with a variety of dwelling types and land uses. To guide the planning for the Site and support an associated Planning Scheme Amendment, the UTAS Sandy Bay Masterplan (The Masterplan) has been prepared by ClarkeHopkinsClarke, in collaboration with Playstreet and Dock4 Architects and with the support of a range of technical and strategic consultants, for the overall Site.

The Masterplan has been informed by the Transport Strategy prepared by Complete Streets (with MR Cagney) to align it with industry best practice with respect to transport planning for large urban renewal projects. The Transport Strategy seeks to encourage sustainable transport trips and reduce the quantum and impact of traffic movements as far as practicable and includes recommendations with respect to

- car parking provisions,
- pedestrian and cycling connections, and
- alternate transport options (e.g., on-demand public transport services and mobility hubs with e-bikes).

The Transport Strategy also outlines means by which the car parking supply can be further reduced over time, should demands decline, such as by "de-coupling" car parking from buildings to allow improved opportunities for sharing between uses and/or re-use in the future.

The Site is in close proximity to the Hobart CBD, is surrounded by numerous existing land uses (including a variety of schools), and benefits from a range of active travel, public transport, and road network connections and services. However, there are also clear opportunities for improvements and enhancements to these connections and services. Likewise, the proposed diversification of land use at the Site as is proposed in the Masterplan provides an opportunity to encourage more trips to occur locally, and by walking, cycling and public transport modes, such that traffic generation and traffic impacts are minimised, particularly to/from the CBD.

The report sets out an assessment of the transport impacts of the proposed development and how they are to be addressed. Key findings include:

Site Layout & Access (Section 4)

- The redevelopment of the UTAS Sandy Bay Site is proposed to draw upon and enhance the existing road network that currently services the University. This includes various intersection and corridor works to the existing road network to improve the internal permeability and accessibility for all modes of transport.
- Pedestrian interconnectivity within the Site will also be enhanced through the provision of signalised crossing points, shared paths, and low speed traffic environments that seek to create a highly walkable precinct and maximise trip containment to the Site. In addition, public transport infrastructure will be improved through the provision of bus super stops along Churchill Avenue and new bus stops on Sandy Bay Road. The UTAS Site currently has bus accessibility that exceeds much of Hobart and continuing to enable this level of accessibility with the Sites redevelopment will reduce the reliance on private vehicle use.

- The Masterplan will also improve and enhance vehicle access arrangements to abutting roads, particularly Sandy Bay Road, Churchill Avenue and Olinda Grove. The design of these intersections will be reviewed and finalised in subsequent planning permit applications.

Car Parking Assessment (Section 5)

- The above analysis has provided justification to the provision of a reduced car parking supply within the redeveloped UTAS Site.
- This redevelopment will result in an activated and mixed-use precinct, where multi-purpose trips will enable a sharing of car parking resources amongst the various land uses.
- Notwithstanding the above, appropriate car parking rates have been recommended to provide a car parking supply that will meet the future needs of the precinct.

Traffic Impacts (Section 6)

- The traffic impacts of the redevelopment of the UTAS Sandy Bay Site have been assessed using a mix of strategic and operational modelling undertaken in tandem and cross referenced to ensure consistency.
- The strategic modelling using the Greater Hobart Urban Travel Demand Model (GHUTDM) indicates that the traffic impacts of the proposed development at a macro perspective are relatively minor, particularly on the road network close to the Site. Closer to the CBD, there are select road linkages where congestion occurs at present and is expected to experience some increase in the future with or without the development of the Site.
- In closer proximity to the Site, the SIDRA analysis finds that the intersections providing access to the proposed development can be expected to operate satisfactorily under ultimate post-development conditions subject to the intersection works outlined in this report. It is expected that these intersections works, together with the potential need for mitigating works at other nearby intersections (such as at Olinda Grove / Proctors Road), will be further analysed and addressed in subsequent planning permit application stages.

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E. Intersection Design Plans

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1. INTRODUCTION

01

1.1. Background

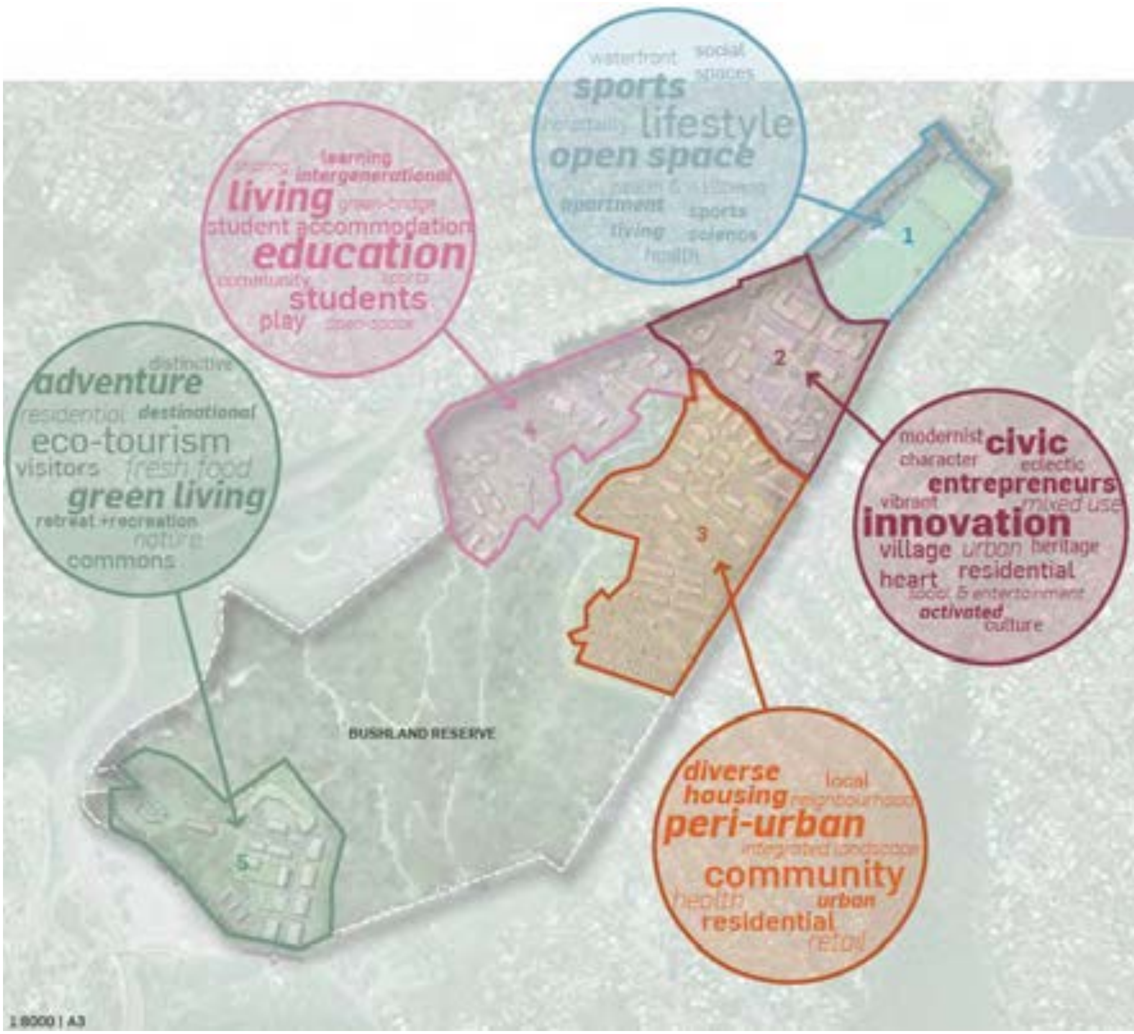
The University of Tasmania (UTAS) is seeking to relocate its existing Sandy Bay Campus (the existing Campus) into the Hobart CBD over the next decade.

The relocation will unlock a significant urban renewal opportunity for the Sandy Bay Site to be developed into a mixed-use activity centre, with a variety of dwelling types and land uses. To guide the planning for the Site and support an associated Planning Scheme Amendment, the UTAS Masterplan has been prepared by ClarkeHopkinsClarke, in collaboration with Playstreet and Dock4 Architects and with the support of a range of technical and strategic consultants, for the overall Site.

The aims of the Masterplan are to *"guide the development of this significant urban renewal Site into a dynamic, ecologically sensitive, innovative and future-ready collection of locally distinctive precincts."* (UTAS Sandy Bay Masterplan Report)

The location of these precincts relative to the overall Site is shown in Figure 1.1, with a description provided in Figure 1.2.

Figure 1.1: Sandy Bay Masterplan Precincts



Source: UTAS Masterplan Report, Urban Renewal Masterplan, December 2021, CHC

Figure 1.2: Description of Precincts

Source: UTAS Masterplan Report, Urban Renewal Masterplan, December 2021, CHC

The Masterplan has been informed by the Transport Strategy prepared by Complete Streets (with MR Cagney) to align it with industry best practice with respect to transport planning for large urban renewal projects. The Transport Strategy seeks to encourage sustainable transport trips and reduce the quantum and impact of traffic movements as far as practicable and includes recommendations with respect to:

- car parking provisions,
- pedestrian and cycling connections, and
- alternate transport options (e.g., on-demand public transport services and mobility hubs with e-bikes).

The Transport Strategy also outlines means by which the car parking supply can be further reduced over time, should demands decline, such as by "de-coupling" car parking from buildings to allow improved opportunities for sharing between uses and/or re-use in the future.

1.2. Purpose & Structure of this Report

In September 2021, GTA, now Stantec, was commissioned by ClarkeHopkinsClarke to undertake a Transport Impact Assessment for the proposed Planning Scheme Amendment (PSA) submission, including consideration of the Transport Strategy that informed the preparation of the Masterplan.

The report sets out an assessment of the transport impacts of the proposed development and how they are to be addressed, including consideration of the following:

1. The existing conditions pursuant the transport network in the vicinity of the Site including relevant transport or planning policy for the area – *refer to Section 2 of this report*
2. An overview of the proposed development – *refer to Section 3 of this report*
3. A description of the accessibility and internal permeability of the proposed Site layout, including the identification of likely transport infrastructure (road and public transport) works on key road frontages – *refer to Section 4 of this report*

4. The adequacy of the proposed car parking provision to meet the future demands of residents, staff, and visitors of the proposed development – *refer to Section 5 of this report*
5. The anticipated traffic generation of the proposed development and the acceptability of this generation on the operation and safety of the surrounding road network – *refer to Section 6 of this report*

The analysis presented in this report is underpinned by a mix of strategic and operational transport modelling that informs decisions and outcomes through this process. This modelling includes consideration of the changes in the movement of people to/from Sandy Bay as a result of the relocation of the Campus to the CBD and the addition of new land uses on the Site.

1.3. References

In preparing this report, reference has been made to the following:

- Hobart Interim Planning Scheme 2015
- ClarkeHopkinsClarke, UTAS Masterplan Report, Urban Renewal Masterplan, December 2021
- ClarkeHopkinsClarke, UTAS Masterplan Rev6b, December 2021 and other plans for the proposed development prepared by ClarkeHopkinsClarke
- Australian Standard / New Zealand Standard, Parking Facilities (AS2890)
- Howarth Fisher & Associates Traffic Engineering Report for UTAS Sandy Bay Campus dated November 2019
- Complete Street and MR Cagney Transport Strategy of the UTAS Sandy Bay Campus Redevelopment dated November 2021
- City of Hobart Transport Strategy 2018-2030
- City of Hobart Capital City Strategic Plan 2019-2029
- ATC Tube Counts conducted by UTAS in 2014

2. EXISTING CONDITIONS

02

2.1. Context

2.1.1. Location

The Site is located 2km south of the Hobart CBD. The Site is approximately 105ha within the suburb of Sandy Bay.

The location of the Site and the surrounding environs is shown in Figure 2.1.

Figure 2.1: Subject Site and its Environs

Source: UTAS Concept Masterplan Report, Urban Renewal Masterplan, November 2021, CHC

2.1.2. Existing Land Use

Car Parking Supply

The campus contains approximately 1,250 car parking spaces that are provided through a variety of off-street and on-street spaces within the existing internal road network.

Review of NearMap aerial photographs for March 2018 and March 2021 indicate this car parking is highly utilised (with appropriate consideration of demands prior to the COVID-19 pandemic). This is consistent with mode split data presented in the Complete Streets Transport Strategy which indicates modes splits to car driver for university students and staff of approximately 30% and 50% respectively.

It is noted that advice provided by City of Hobart indicates that university car parking can also occur on surrounding residential streets, despite that parking being limited to a 2-hour limit. This is particularly observed in the aerial photographs for Earl Street.

Traffic Generation

The existing traffic generation of the UTAS Campus is difficult to quantify given the number of access roads and the dispersed location of the car parking.

Notwithstanding this, a number of traffic survey counts undertaken by the University have been compiled to gain an understanding of the existing traffic generation of the Campus. The most comprehensive of these surveys were undertaken in 2014, where a number of car park Site access points were surveyed using weeklong ATC tube counts.

The surveys indicates that the campus generates a significant volume of vehicle activity across the day, both during and outside of the typical weekday AM and PM peak periods. This is again consistent with the mode split data contained within the Complete Streets Transport Strategy i.e., 30% and 50% reliance on car (as driver) for university students and staff respectively.

The survey data analysis is presented in greater detail in Appendix A, which indicates that the existing traffic generation of the Campus is approximately 1,200 vehicle movements during the AM peak hour and 860 vehicle movements during the PM peak hour. In the context of this report, it is important to note that the development of the Site will remove this traffic generation from the Site which will effectively create a “traffic generation credit” for the PSA.

2.1.3. Nearby Land Uses

The surrounding environs consist mostly of residential suburban properties, including schools and local sporting fields. Most notably in the immediate surrounds of the Site are:

- The Hutchins School to the immediate south, as well as a number of primary schools.
- On the other side of Sandy Bay Road is the Harbour and waterfront, with the Wrest Point Hotel / Casino.
- Further to the north of the Site, located around the Sandy Bay Road / King Street intersection is the Sandy Bay Town Centre, containing supermarkets and mixed-use shopping.
- Towards the south and west, the density of housing decreases and the majority of the land accommodated by open bush land

A summary of the Site and surrounding land uses is shown in Figure 2.2

Figure 2.2: UTAS & Surrounding Land Uses

Source: UTAS Masterplan Report, Urban Renewal Masterplan, December 2021, CHC for PSA submission

2.2. Pedestrian Network

2.2.1. Existing Infrastructure

The UTAS Campus has a well-connected network of pedestrian paths that meets the accessibility needs of the current student population.

Within the main core of the Campus, a series of off-road paths are scattered throughout the urban realm, connecting the various buildings. This area contains a one-way circulation road that circumnavigates the core of the Campus that contains pedestrian footpaths and zebra crossings. Given the low speed, narrow lanes and car parking, this area operates as a pedestrianised space, where it is easy to cross and navigate.

In the broader vicinity of the Site, the following is noted:

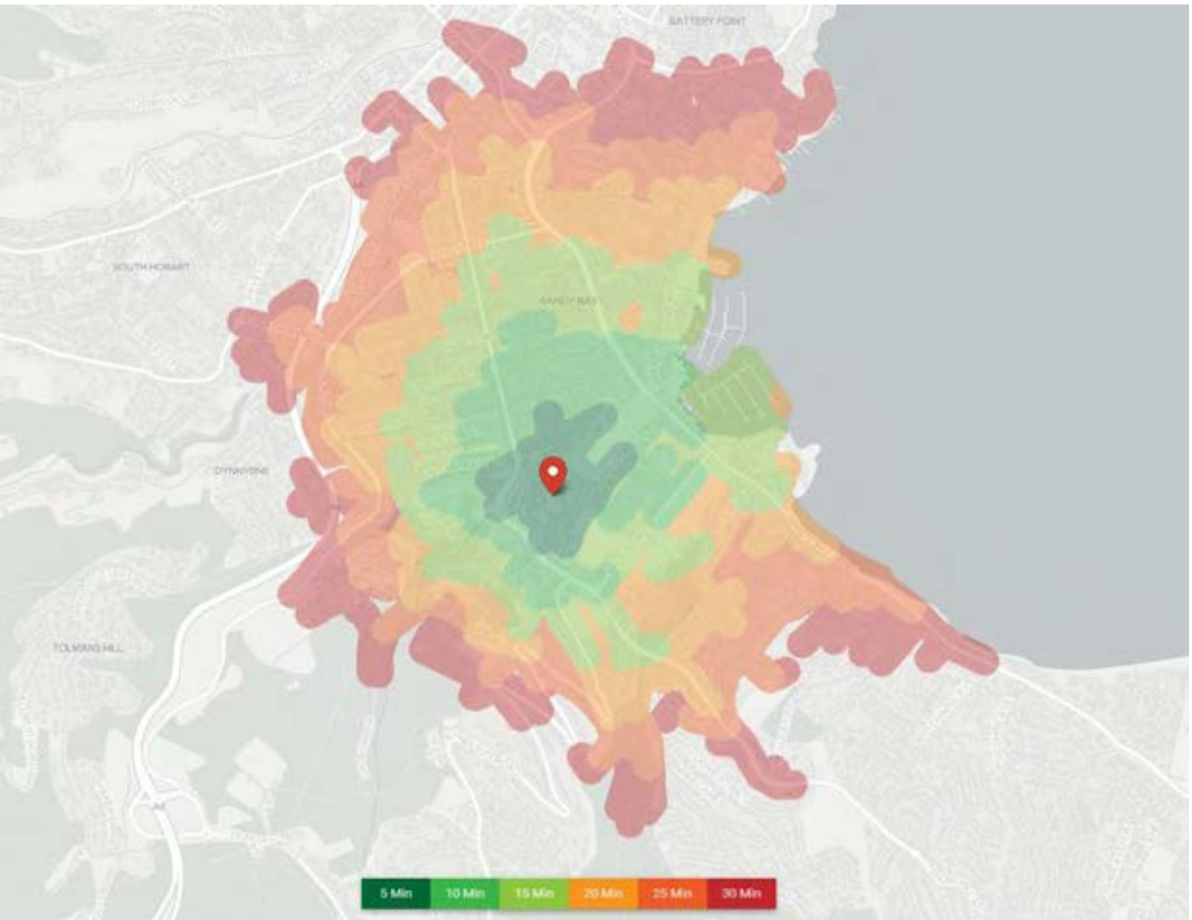
- The majority of surrounding roads have pedestrian footpaths on both sides of the road.
- The major roads abutting the Site provide some barriers to the movement of pedestrians given the relatively high traffic volumes and absence of formal or signalised pedestrian crossings. This includes:
  - Sandy Bay Road which has only unsignalized crossings in the immediate vicinity of the Site (with the nearest signalised intersection located at the Sandy Bay Road / Nelson Road intersection),
  - Churchill Avenue which has few crossing opportunities, although is benefited from the existing pedestrian bridge and tunnel that provide connections across this road.

Overall the pedestrian network and infrastructure within and immediately adjacent the site is well established and caters to the accessibility needs of pedestrians. However, there are also clear opportunities for improvement by providing a more permeable network through the Site and improved crossings of major roads. These opportunities are also identified in the Complete Street Transport Strategy which have informed the Masterplan.

2.2.2. Accessibility & Catchment Mapping

The available walking catchment within 30 minutes of the Site is shown in Figure 2.3. This figure indicates a walking catchment of approximately 1.5km in all compass directions from the centre of the UTAS Campus and that the Hobart CBD is just beyond the 30-minute walking catchment.

Figure 2.3: Walking Catchment Surrounding Site



2.2.3. Walk Score

The accessibility of the Site via walking can be measured by assessing the "Walk Score" of the suburb. The Walk Score of a suburb is calculated by determining the distance required to walk from an origin to nearby amenities, whilst also assessing block sizes and intersection density to determine the permeability of an area.

The Campus and suburb of Sandy Bay achieve a 'walk score' of 73 and 60 respectively, which infers that that the Site is "Very Walkable" and that "most errands can be accomplished on foot". As a point of comparison, the walk score of the Hobart CBD is 92, Battery Point is 92 and West Hobart is 77. These higher scores result not only from the quality of pedestrian connections but also the presence of land use which is accessible by walking.

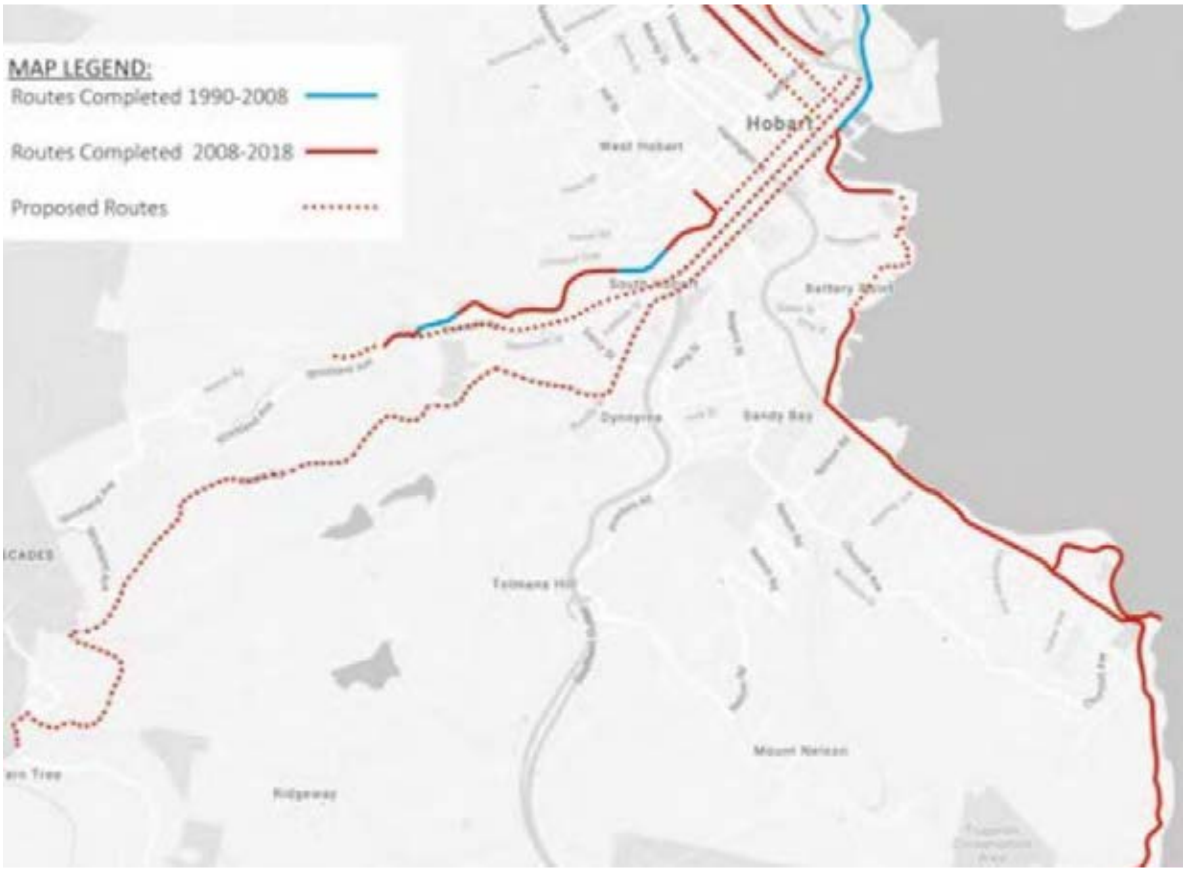
2.3. Cycling Network

2.3.1. Existing Infrastructure

There is currently limited cycling infrastructure provided along roads in the vicinity of the Site, other than on-road cycling lanes on Sandy Bay Road to the east of the Site.

However, the Site is well positioned to accommodate and encourage cycling as a significant mode of transport given its proximity to the Hobart CBD, particularly after proposed improvements as identified in the City of Hobart's Transport Strategy, as shown in Figure 2.4, are completed.

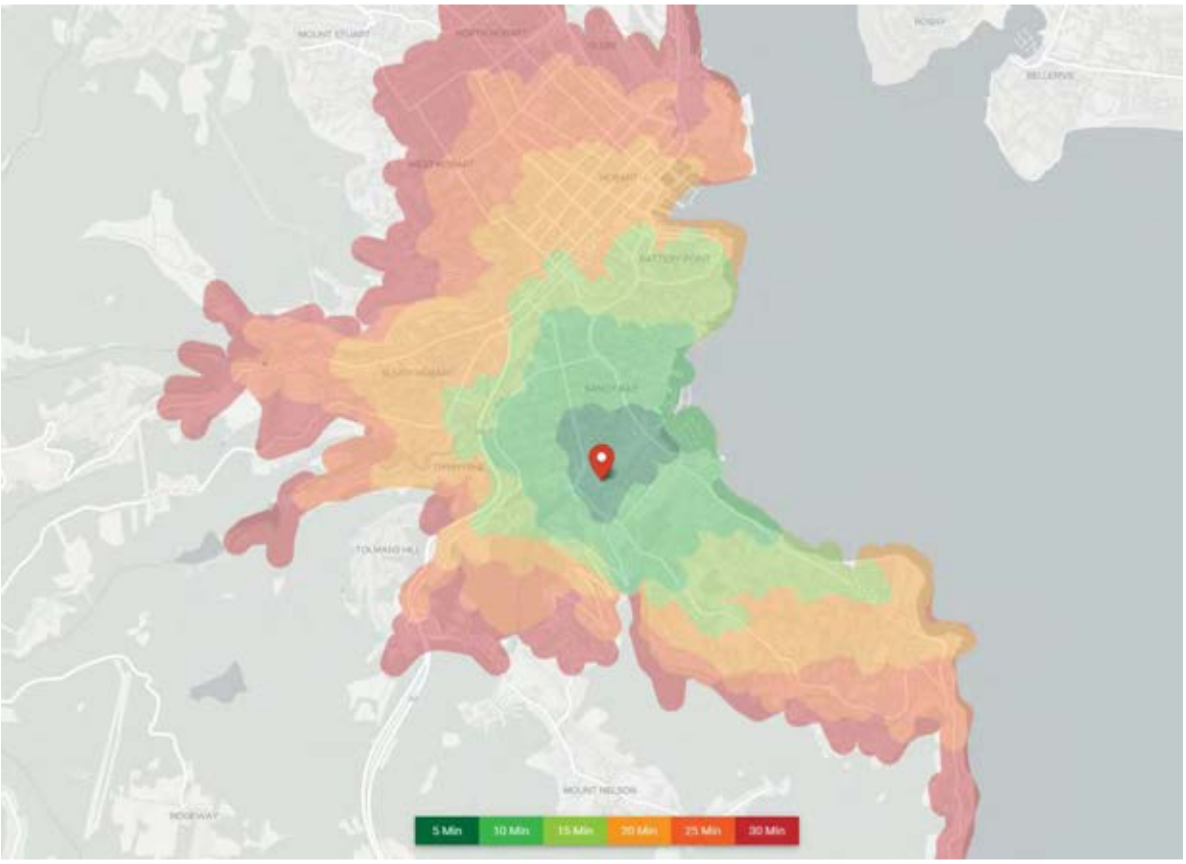
Figure 2.4: Current and Proposed Cycling Infrastructure – City of Hobart Transport Strategy 2018-2030



2.3.2. Accessibility & Catchment Mapping

The available cycling catchment within 30 minutes of the Site is shown in Figure 2.5. This figure indicates a walking catchment of approximately 3-4km to the north and east, with reduced distances to the west and south. Importantly, the Hobart CBD is well within the 30-minute walking catchment which means that cycling will be a feasible means of travel to many persons travelling to that location (e.g., residents travelling to work).

Figure 2.5: Cycling Catchment Surrounding Site



2.4. Public Transport Network

2.4.1. Existing Infrastructure & Routes

The Site (and existing Campus) is well serviced by numerous bus routes, with the closest bus stops located at the frontage of Sandy Bay Road and Churchill Avenue.

The key bus routes servicing the area include Routes 401,402, 422 .426, 427, 428 and 429. These services provide frequent and convenient access to surrounding suburbs and Hobart CBD. Routes 501 and 601 are serviced at the campus, with the bus stop located in Churchill Avenue.

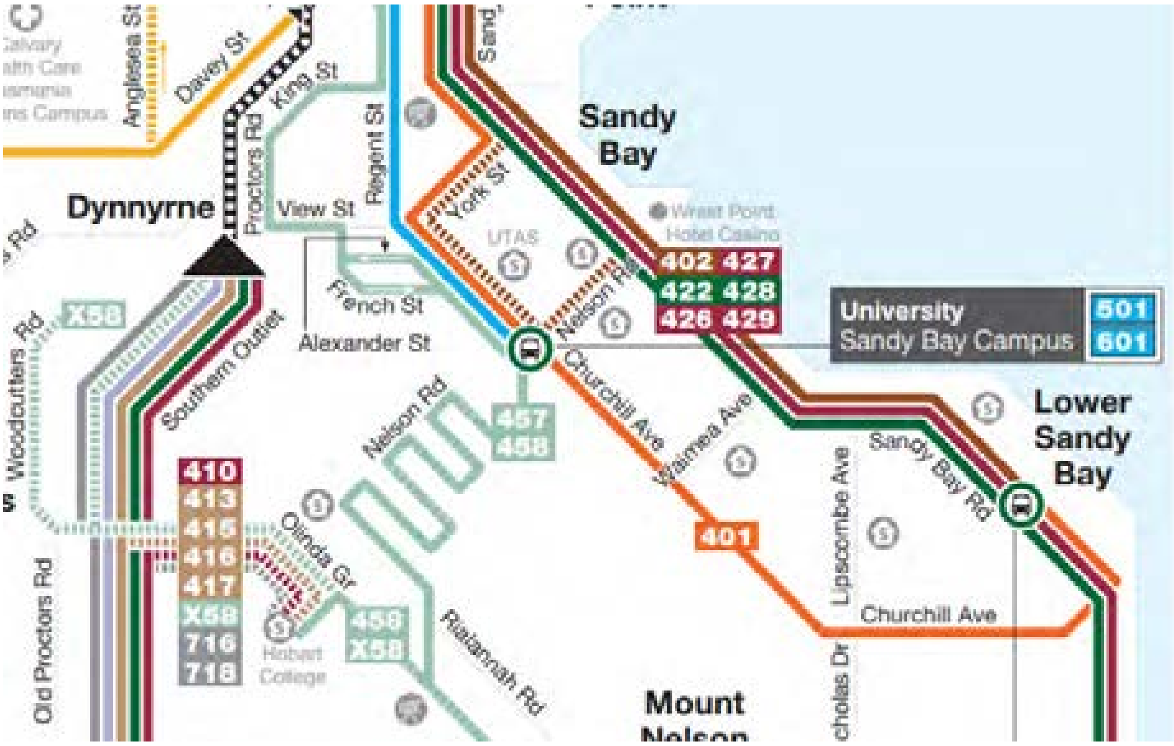
However, the frequency of these bus services is currently average, with the routes operating at 30 to 45-minute intervals during peak periods (or worse). It is expected that these frequencies will improve over the coming decades and therefore the planning for the Site will need to allow for expanded stops to cater the increased demands.

The existing bus routes are summarised in Table 2.1 and shown in Figure 2.6.

Table 2.1: Existing Bus Routes Surrounding the Site

Bus Route Number	Travel Route	Distance to nearest stop	Frequency
401	Lower Sandy Bay via University, Churchill Ave	120m - less than 2 minutes walk - Sandy Bay Road	Every 30 minutes during peak
402	Lower Sandy Bay via Sandy Bay Rd	120m - less than 2 minutes walk - Sandy Bay Road	Every 30 minutes during peak
422	Margate via Sandy Bay Rd, Kingston Central, Huntingfield	120m - less than 2 minutes walk - Sandy Bay Road	Every 15-30 minutes during peak
426	Taroona via Sandy Bay Rd	120m - less than 2 minutes walk - Sandy Bay Road	Every 1 hour
427	Blackmans Bay via Sandy Bay Rd, Kingston Central, Kingston Beach	120m - less than 2 minutes walk - Sandy Bay Road	Every 2 hours
428	Blackmans Bay via Sandy Bay Rd, Kingston Central, Maranoa Heights	120m - less than 2 minutes walk - Sandy Bay Road	Every 2 hours
429	Summerleas via Sandy Bay Rd, Kingston Central, Summerleas Rd	120m - less than 2 minutes walk - Sandy Bay Road	Every 2 hours

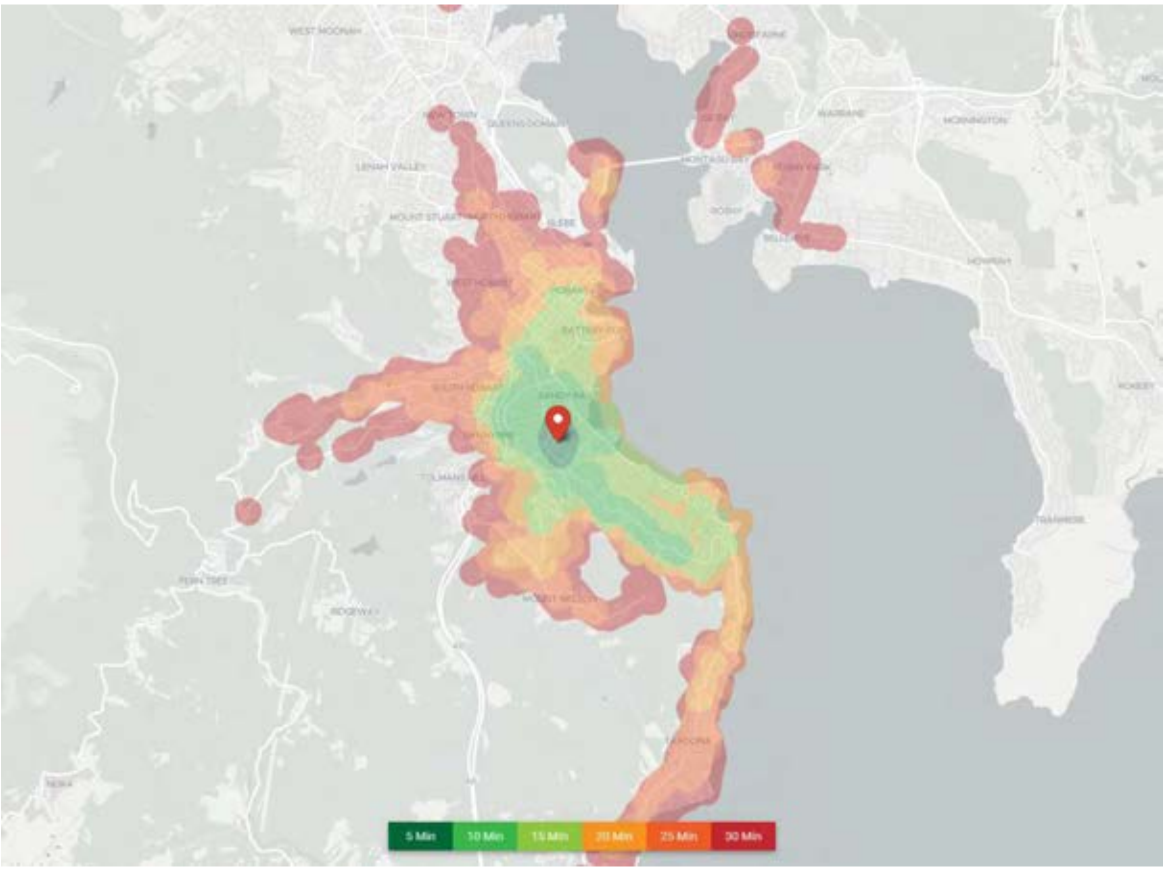
Figure 2.6: Existing Bus Routes Surrounding the Site including Stop Locations



2.4.2. Accessibility & Catchment Mapping

The available bus (public transport) catchment within 30 minutes of the Site is shown in Figure 2.7. This figure indicates that the majority of Greater Hobart, including the CBD, is accessible within a 30-minute journey of the Site.

Figure 2.7: Bus (Public Transport) Catchment Surrounding Site



2.5. Road Network

2.5.1. Overview

The UTAS existing Campus primary access points to the external road network are via Sandy Bay Road and Churchill Avenue.

Sandy Bay Road is the primary arterial road for Sandy Bay and the surrounds, connecting the south and south-east suburbs into Hobart CBD. This road carries the highest traffic volumes during peak periods, with some congestion experienced along the corridor at signalised intersections near the CBD.

Churchill Avenue is a lower order connector level street, running parallel with Sandy Bay Road through the residential suburbs of Sandy Bay. It operates in a similar function to Sandy Bay Road, albeit with a narrower cross section and a mixture of roundabouts and signalised intersections.

There are a number of minor local access roads that service the campus. College Road and French Street are the primary access routes to the southern section of the campus, including the majority of the student accommodation further up Mount Nelson. Dobson Road, Clark Road, Grosvenor Crescent and TT Flynn Street all operate as internal access roads for the campus. Olinda Grove and Proctors Road are utilised to access the top of Mount Nelson and as an access point to the Southern Outlet.

A description of key roads is provided in Table 2.2.

Table 2.2: Road Network Description

Road	Description	Photo
Sandy Bay Road	o Aligned in a north-west to south-east direction o Dual lane carriageway with centre median accommodating right turn lanes throughout length o Peak hour no standing zones. Kerbside parking permitted outside of peak hours	
Churchill Avenue	o Aligned in a north-west to south-east direction o Single carriageway with two-way traffic separated by median o No standing zones on either side of the road. Kerbside parking is not allowed	
Proctors Road	o Aligned in a north-south orientation o Single carriageway with two-way traffic separated by line marking o No parking is permitted along this road o Provides a connection between Sandy Bay and to the South towards the Southern Outlet	
Olinda Grove	o Aligned in an east-west direction o Single carriageway with two-way traffic separated by line marking o No parking is permitted along this road o Provides a connection to the Southern Outlet	

Road	Description	Photo
Earl Street	o Aligned in a north-east to south-west direction o Single width carriageway with parking on one side of the road o Residential connection between the UTAS Campus and Sandy Bay Road	
Grosvenor Street	o Aligned in a north-west to south-east direction o Single width carriageway with parking on either side of the road o Residential connection between the UTAS Campus and up to the Sandy Bay Town Centre	
Alexander Street	o Aligned in a north-east to south-west direction o Single width carriageway with parking on one side of the road o Residential road in the immediate vicinity to the UTAS Campus	
French Street / College Road	o Winding road internal to the UTAS Campus o Large supply of on-street car parking utilised by the UTAS Campus students o Provides a connection to university campus buildings and student accommodation	

2.5.2. Network Performance

The traffic impact assessment presented later in this report includes modelling completed using the Greater Hobart Urban Transport Demand Model (GHUTDM), Version 5.

The GHUTDM is a four-step model executed in the Cube Voyager software platform which allows the ability to assess changes in travel demand as result of changed land use or traffic conditions (e.g., a new set of demographics and land uses that will be present on the Campus).

The GHUTDM estimates travel across the entire day with four separate time periods:

- AM peak (AM) 7am – 9am
- Off Peak (OP) 9am – 4pm
- PM peak (PM) 4pm – 6pm
- Night time (EV) 6pm – 7am

The GHUTDM was developed and validated by consultants AECOM for the Department of State Growth. The calibration and validation process ensures that the model can satisfactorily reproduce current day traffic conditions through a comparison of model results and observed data. The validation year for GHUTDM is 2019, which was utilised as an existing conditions or baseline scenario. Further discussion regarding this strategic model is contained in Section 6 of the report.

One of the most commonly used metrics to utilise network performance from strategic models is the 'Volume-to-Capacity (VC) ratio'. The VC ratio measures the anticipated traffic volume on a road linkage against its traffic capacity. In this regard, it is similar to a 'Degree of Saturation' (DOS) which is commonly used for intersection analysis with the notable exception that it relates to midblock capacities on roads, not movements at intersections. (Notwithstanding this, the VC ratio considers the capacity of the midblock with regard to nearby intersection constraints.)

The VC ratio for the 2019 existing conditions during the AM and PM peak periods are shown in Figure 2.8 and Figure 2.9. These figures indicates that there is generally a low level of congestion in the vicinity of the Site at present, although there are sections of the road network closer to the CBD that experience congestion (where the VC ratio is approaching or exceeds 1 i.e., traffic volume exceeds the traffic capacity). These sections include the Eastern Outlet towards Macquarie Street during the AM peak period and Davey Street towards the Eastern Outlet during the PM peak period.

Figure 2.8: Existing Road Network Performance – VC Ratio – AM Peak Period

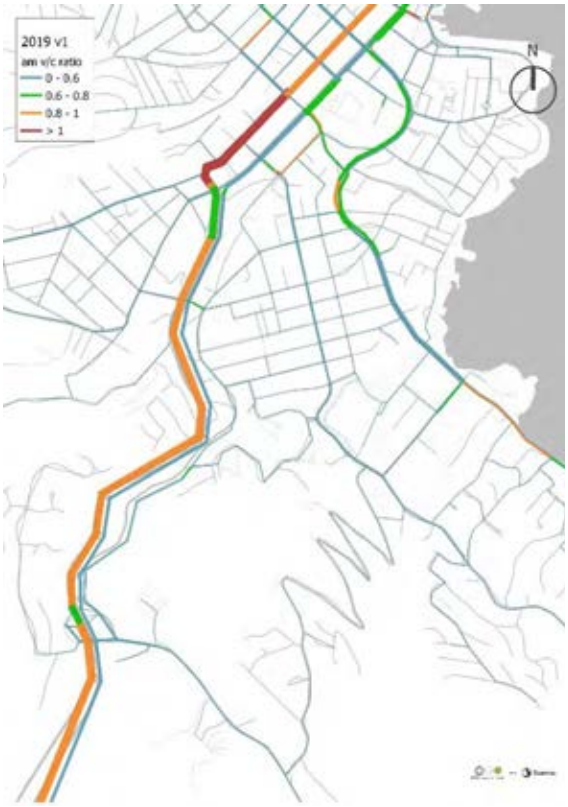
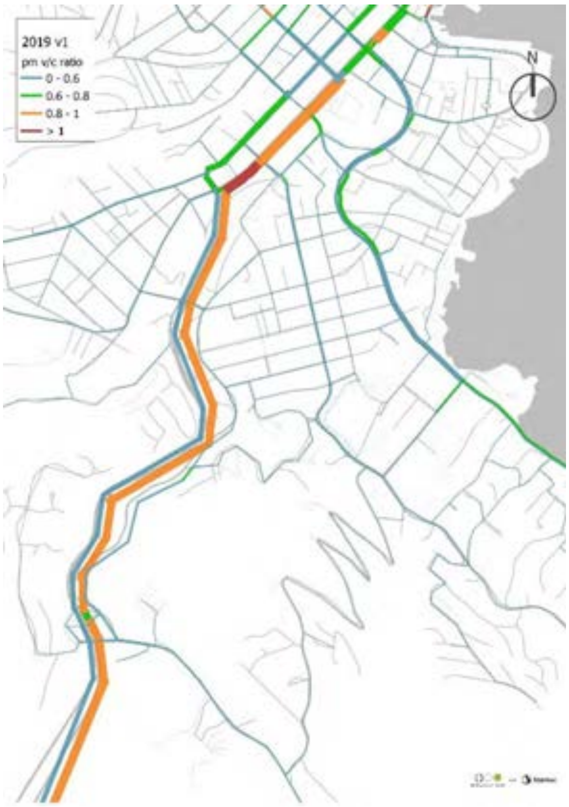


Figure 2.9: Existing Road Network Performance – VC Ratio –PM Peak Periods



2.5.3. Accident Statistics

Reference to the Howarth Fisher and Associates report (2019) prepared for UTAS outlined the following accident history in the vicinity of the Site:

- *"Seven accidents occurred at the Sandy Bay Road and York Street intersection. Three were right near, one right near, one cross traffic, one other-curve and one other-pedestrian*
- *Six accidents occurred at the Sandy Bay Road and Churchill Avenue intersection. Three were cross traffic, one right turning, one right far and one described as same direction*
- *Four accidents occurred on Mount Nelson Road. All four accidents involved a collision with a parked car*
- *The four remaining accidents occurred where Earl, Clark and View Street intersect Sandy Bay Road. One cross traffic, one left near, one other pedestrian and one other-curve"*

The above data indicates a trend of crashes occurring on the unsignalised T-intersections to Sandy Bay Road, with seven occurring at the York Street intersection. This trend suggests that a greater level of vehicle control is required for access onto Sandy Bay Road, either through turning movement restrictions at dangerous locations and/or through the provision of traffic signals.

2.6. City of Hobart Transport Strategy 2018-2030

The City of Hobart has published a transport strategy that is applicable for the Site and its environs which provided guidance on land use and development. This is transport strategy is to be implemented by the year of 2030. Encouraging the use of public transport, walking, and cycling as modes of transport, and reducing the reliance on private car use are central to achieving the aims of the various policy documents affecting the area and directing how it develops into the future.

INTRODUCTION AND OUTLINE OF THE STRATEGY

STRATEGIC FOCUS THEMES

- **THEME 1** | MAKING DECISIONS BASED ON UP-TO-DATE, RELEVANT DATA
- **THEME 2** | INTEGRATING TRANSPORT AND LAND USE PLANNING TO DELIVER THE BEST ECONOMIC, SOCIAL AND ENVIRONMENTAL OUTCOMES
- **THEME 3** | RECOGNISING WALKING AS THE MOST FUNDAMENTAL MODE OF TRANSPORT
- **THEME 4** | SUPPORTING MORE PEOPLE TO RIDE BICYCLES
- **THEME 5** | INCREASE PARTICIPATION IN GREAT PUBLIC TRANSPORT AND REDUCING CONGESTION IN THE CITY
- **THEME 6** | SMART PARKING FOR RESIDENTS, VISITORS AND BUSINESSES
- **THEME 7** | FREIGHT BY ROAD, PORT AND AIR
- **THEME 8** | MANAGING OUR TRANSPORT NETWORK
- **THEME 9** | DEVELOPING PARTNERSHIPS WITH STAKEHOLDERS

An overview of the key policies is provided below:

"Integration Transport and land use planning to deliver the best economic, social and environmental outcomes"

Collaborated studies by the Council with UTAS highlights the impact the land use planning has on sustainable mode of transportations. Improvement of street scapes and public realms of the shopping precincts would further support and be more attractive to the general public to use sustainable mode of transportation without any reserves. City of Hobart is focusing on the greater impact of economy, social and environmental in the coming years.

"*Recognising walking as the most fundamental mode of transport"*

The desire to walk depends on the distance between the pedestrian's home and destination, safety and quality of the pedestrian infrastructure and public spaces, time required, desire to exercise, saving money and other factors. ABS statistics shows that in all of Australia, Hobart residents preferred mode of transportation to work is walking. City of Hobart understanding this has been providing improved and extended footpaths, road crossing points, local area traffic calming schemes and parks and reserve tracks. This initiative by the City of Hobart has prompted a pilot project, where Elizabeth Street/New Town Road corridor was audited and provided with walkability analysis, to develop a targeted walking plan and associated work program.

"Support more people to ride bicycle"

City of Hobart has adopted a Principal Bicycle Network Plan since 2008, and has been incrementally developing cycling infrastructure on three important key corridors. Currently, two major bridges with provision for cycling and walking is being constructed, to connect Queens Domain area and the city of Cenotaph. Recently, in the year of 2017, City of Hobart reaffirmed a positive cycling policy. The speed limits on the main streets have been amended to support a safer cycling network. End of trip facilities are under further considerations, to promote more cyclist friendly city.

"Increase participation in great public transport and reducing congestion in the city"

Public transport usage rates have fallen in Hobart over many years as a result of road development in the 1970s and 1980s. However, in 2018 Infrastructure Tasmania published the Hobart Transport Vision, which would prioritise and structure public transport to promote and reinvigorate sustainable mode of transport.

"Smart parking for residents, visitors and businesses"

The provision of appropriate levels and management of the car parking supply in the municipality is a key aspect in managing the use of private vehicles and encouraging alternative modes of transport. The transport strategy recognises the importance of the provision of car parking for the appropriate functionality of the city more broadly.

2.7. Summary

The Site is in close proximity to the Hobart CBD, is surrounded by numerous existing land uses (including a variety of schools), and benefits from a range of active travel, public transport, and road network connections and services.

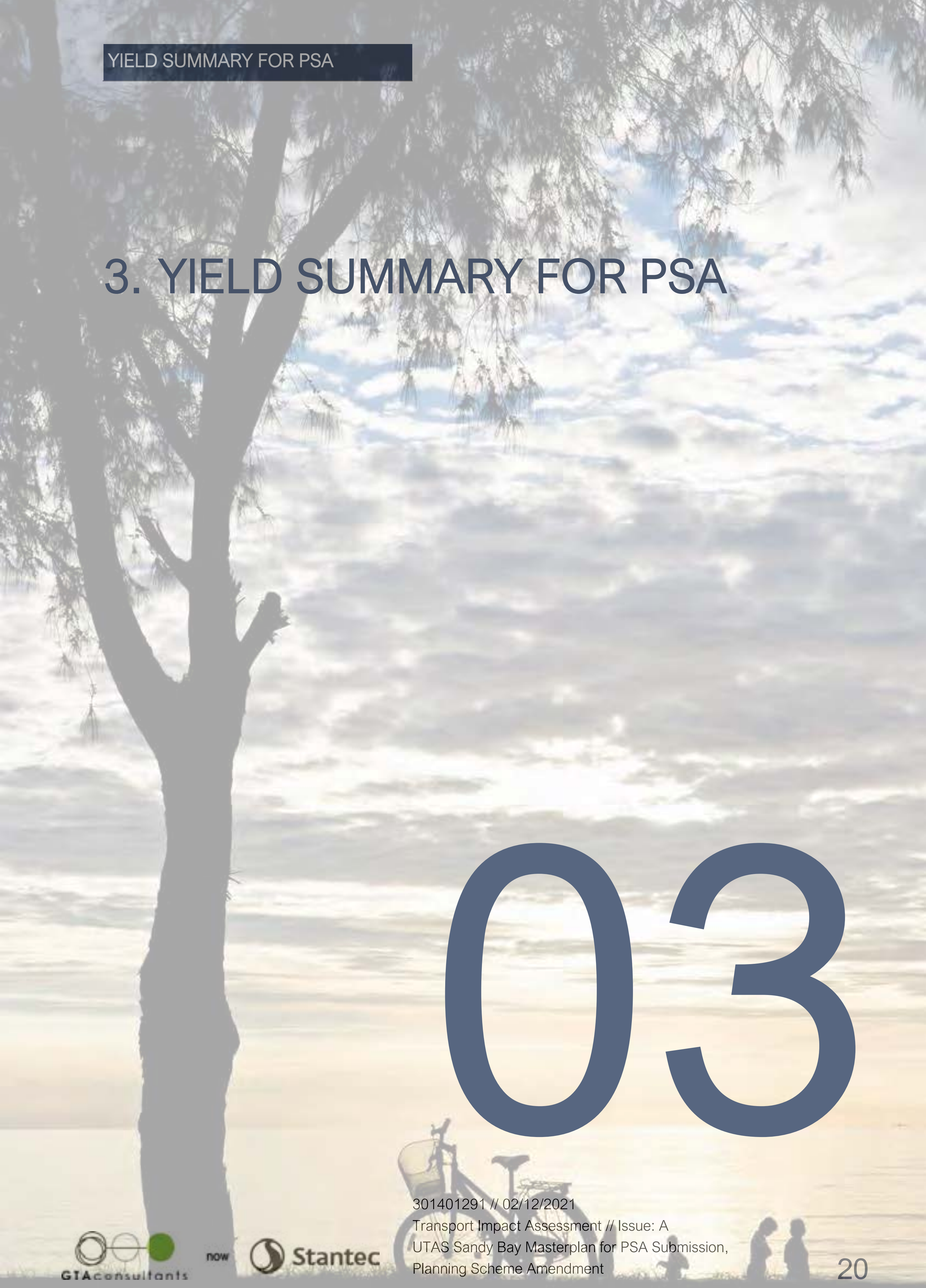
However, there are also clear opportunities for improvements and enhancements to these connections and services. For example, at Site interfaces, pedestrian, cycling and vehicle access can be improved and bus stop infrastructure enhanced. As improvements to the frequency of public transport services also occurs, and active travel connections to/from the CBD are created per Council's plans, the role and importance of active and public transport for movement to and from the Site will become increasingly important. This is consistent with the City of Hobart's Transport Strategy.

Likewise, the proposed diversification of land use at the Site as is proposed in the PSA submission provides an opportunity to encourage more trips to occur locally, and by walking, cycling and public transport modes, such that traffic generation and traffic impacts are minimised, particularly to/from the CBD where some congestion occurs at peak hours.

The following sections of this report assess the transport impacts of the proposed Masterplan in the context of these existing conditions (and opportunities). It includes consideration of the net traffic impact of the new land uses, which will replace the existing university land use (and car parking and traffic generation) over the coming decades.

The following sections of this report assess:

- The current operating conditions of the road network surrounding the existing campus
- The impacts of the future development of the Site in 2040



3. YIELD SUMMARY FOR PSA

03

3.1. Overview

The indicative development yield anticipated across the five precincts is summarised below in Table 3.1.

Table 3.1: Yield Summary

Land Use	Description		Precinct 1	Precinct 2	Precinct 3	Precinct 4	Precinct 5
Residential	Townhouse			37 dwellings	89 dwellings	7 dwellings	37 dwellings
	Single lot				42 dwellings		17 dwellings
	Apartments	1 bedroom	39 dwellings	144 dwellings	160 dwellings	60 dwellings	61 dwellings
		2 bedrooms	136 dwellings	503 dwellings	561 dwellings	209 dwellings	214 dwellings
		3 bedrooms	19 dwellings	72 dwellings	80 dwellings	30 dwellings	31 dwellings
		Total	194 dwellings	718 dwellings	802 dwellings	298 dwellings	306 dwellings
	Serviced Apartments	1 bedroom	14 apartments				
		2 bedrooms	50 apartments				
		3 bedrooms	7 apartments				
		Total	72 apartments				
	Retirement Living	1 bedroom		16 dwellings			
		2 bedrooms		57 dwellings			
		3 bedrooms		8 dwellings			
		Total		81 dwellings			
	Aged Care			91 rooms			
	Hotel						120 rooms
	Student Accommodation [1]					*484 rooms*	
Commercial	Office		3,600sqm GFA	18,400 sqm GFA			1,300 sqm GFA
Retail	Supermarket			3,500 sqm GFA			
	Market						3,500 sqm GFA
	Specialty		600 sqm GFA	1,800 sqm GFA	400 sqm GFA		2,000 sqm GFA
Health & Wellbeing	Family Health / Medical Centre			3,200 sqm GFA	1,500 sqm GFA		
Community	Sport		4,900 sqm GFA				
	Other Community			4,970 sqm GFA			1,500 sqm GFA
Education	Childcare Centre		900 sqm GFA		900 sqm GFA		

[1] Existing Student Accommodation to be retained

3.2. Design Principles & Modal Hierarchy

The Masterplan has been prepared with consideration of the Complete Streets Transport Strategy which seeks to encourage sustainable transport trips and reduce the quantum and thus impact of traffic movements as far as practicable.

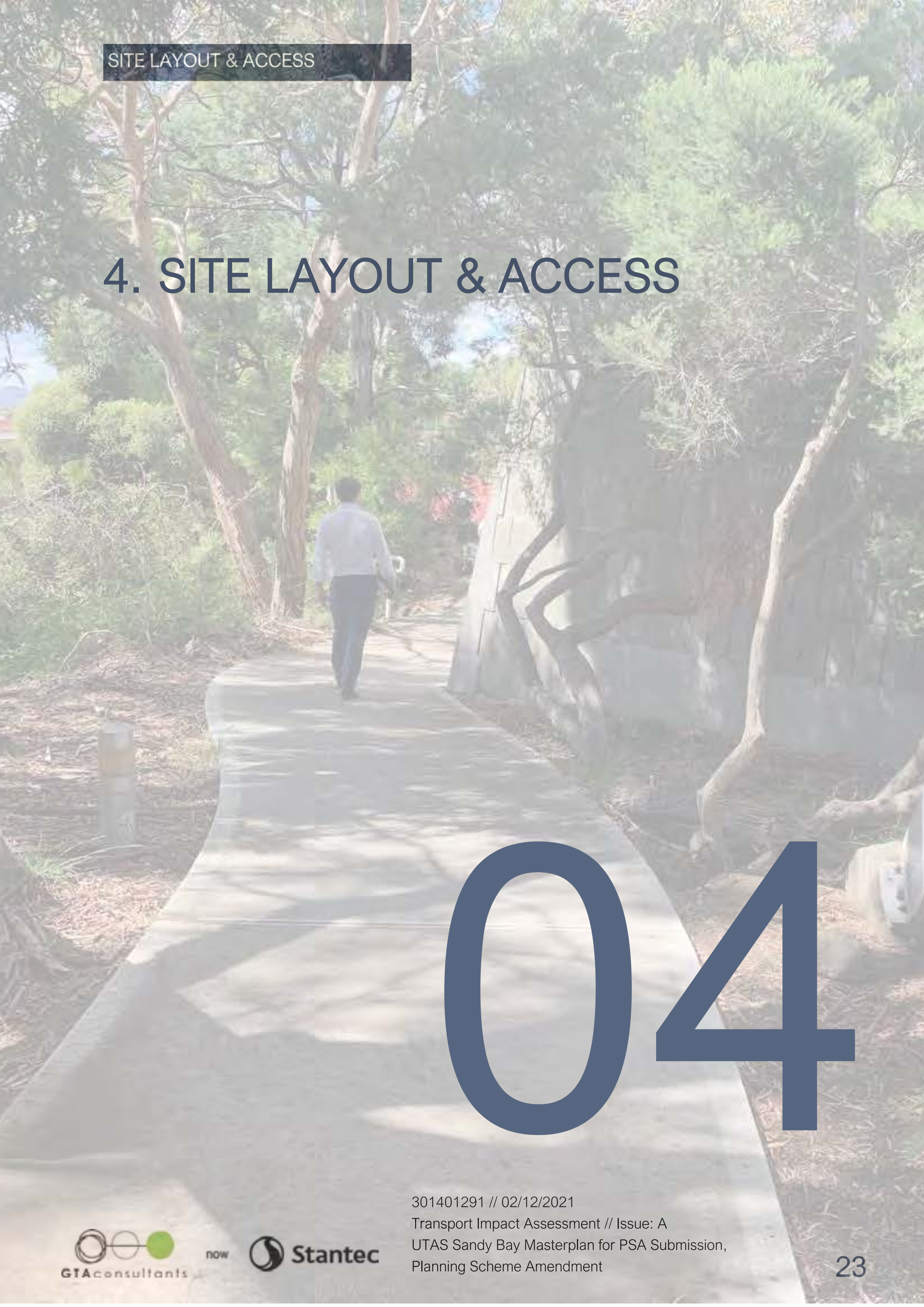
The key principles of the Transport Strategy are shown in Figure 3.1. These principles are considered appropriate and have embodied into the Masterplan via the prioritisation of walking, cycling and public transport over private motor vehicles, as well as proposed reductions to on-Site car parking provision (as measured against statutory requirements).

Figure 3.1: Key Principles of Transport Strategy

1.1 PRINCIPLES:

To deliver on the goals for the site, transport targets for implementation are the following:

- Road space that facilitates movement and access from a variety of modes without adding unnecessary private vehicle trips to the network;
- The right amount of parking in the right place at the right price;
- Quality on site active transport infrastructure as well as develop improved active transport to/from the site;
- Improved public transport options servicing the site;
- Provide high quality demand responsive public transport on site.



4. SITE LAYOUT & ACCESS

04

4.1. Preamble

The Masterplan provides a Movement Network which enhances pedestrian permeability through the Site and strengthens connections to surrounding land uses and other desired destinations.

These land uses / destinations are described in Section 2.1.3 and include (from) the Hutchins School to the immediate south, as well as other nearby primary schools, and the harbour and waterfront on the northern side of Sandy Bay Road. The intention of the Masterplan is not to isolate the development and open spaces from its surrounds but, to the contrary, integrate the two as far as practicable. Ultimately, the aim of this integration is to encourage walking and cycling to be the preferred modes of transport for local trips and increase the use of these modes (and public transport) for travel to the Hobart CBD.

With respect to vehicle access, the Masterplan proposes the concentration of these accesses onto the major roads in its immediate vicinity which are best designed to accommodate this traffic. This includes Sandy Bay to the north, Churchill Avenue in the middle of the Site, and Olinda Drive to the south.

This Movement Network is shown below in Figure 4.1 and highlights the alignment of key active travel linkages and vehicle access modifications.

Figure 4.1: Masterplan Movement Network

Source: UTAS Masterplan Report, Urban Renewal Masterplan, December 2021, CHC

4.2. Site Layout

4.2.1. Active Travel Network

The Masterplan provides a series of active travel connections through the Site to encourage walking and cycling as the preferred transport modes for local trips, such as residential trips to convenience retail tenancies, and therefore reduce the quantum of internal traffic movements.

By signalising pedestrian crossings across Sandy Bay Road and Churchill Avenue), walking and cycling will also be encouraged for external trips, including residential work trips to the CBD and other recreational trips. These crossings will also be supplemented by the enhanced grade separated crossing over Churchill Avenue.

In addition to these active travel connections, the Masterplan also proposes bicycle parking and e-bike hubs across the Site, with additional end-of-trip facilities to be provided. This infrastructure will further encourage cycling as a preferred mode of transport.

The active travel connections and associated infrastructure are shown in Figure 4.2 and are considered appropriate for the scale of the proposed development and its desired modal targets.

Figure 4.2: Masterplan Active Travel Network

Source: UTAS Masterplan Report, Urban Renewal Masterplan, December 2021, CHC

4.2.2. Public Transport Infrastructure

The Masterplan proposes enhanced bus stops on Sandy Bay Road and Churchill Avenue at the approximate locations of the existing bus stops on these roads.

The indicative design of these bus stops is detailed in the concept intersection designs presented in Section 4.3 of this report, noting that the designs will be subject to further consultation with the City of Hobart and the Department for State Growth. (The concept designs currently show the bus stops as being indented so that impacts to potential on-road cycling infrastructure is minimised. However, it is acknowledged that kerbside bus stops could be adopted if deemed to be preferable).

At the new bus stops, it is expected that verge / pedestrian path widths will be widened (as far as practicable) and the shelters and seating be improved to enhance the user experience. This is particularly recommended for the Churchill Avenue bus stops which are likely to become the primary stop for the precinct after the development of the adjacent precinct. The design of this infrastructure is yet to be considered in detail and will be advanced as part of the ongoing discussions with authorities.

Figure 4.3: Masterplan Public Transport Infrastructure

Source: UTAS Masterplan Report, Urban Renewal Masterplan, December 2021, CHC

4.2.3. Road Network (and Cross-sections)

In accordance with the Complete Street's Transport Strategy, the Masterplan proposes an internal / Site road network that favours active travel modes over private motor vehicles as far as practicable. This is achieved via three approaches:

1. The adoption of road cross-sections that minimise road widths and maximise widths for active modes.
2. The design of internal roads where dual pedestrian and vehicle movements are expected as 'shared environments' such that vehicle speeds are minimised and pedestrian amenity and safety is maximised. In the context of the proposed Masterplan, this consideration is most applicable to Precinct 2 where a 'shared zone' is provided through the precinct.
3. The configuration of a road network across the precincts which provides convenient vehicle access to/from key car parks from the abutting roads but without the need for vehicles to pass through primary pedestrian areas or result in external vehicle rat-running.

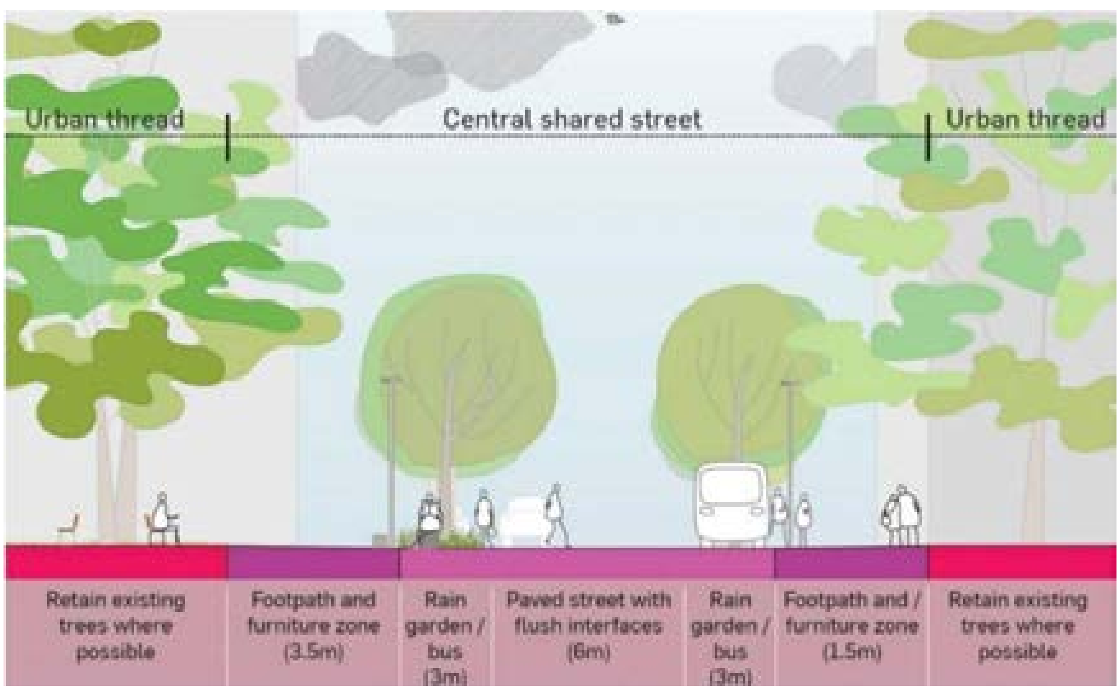
These approaches are discussed in further detail below.

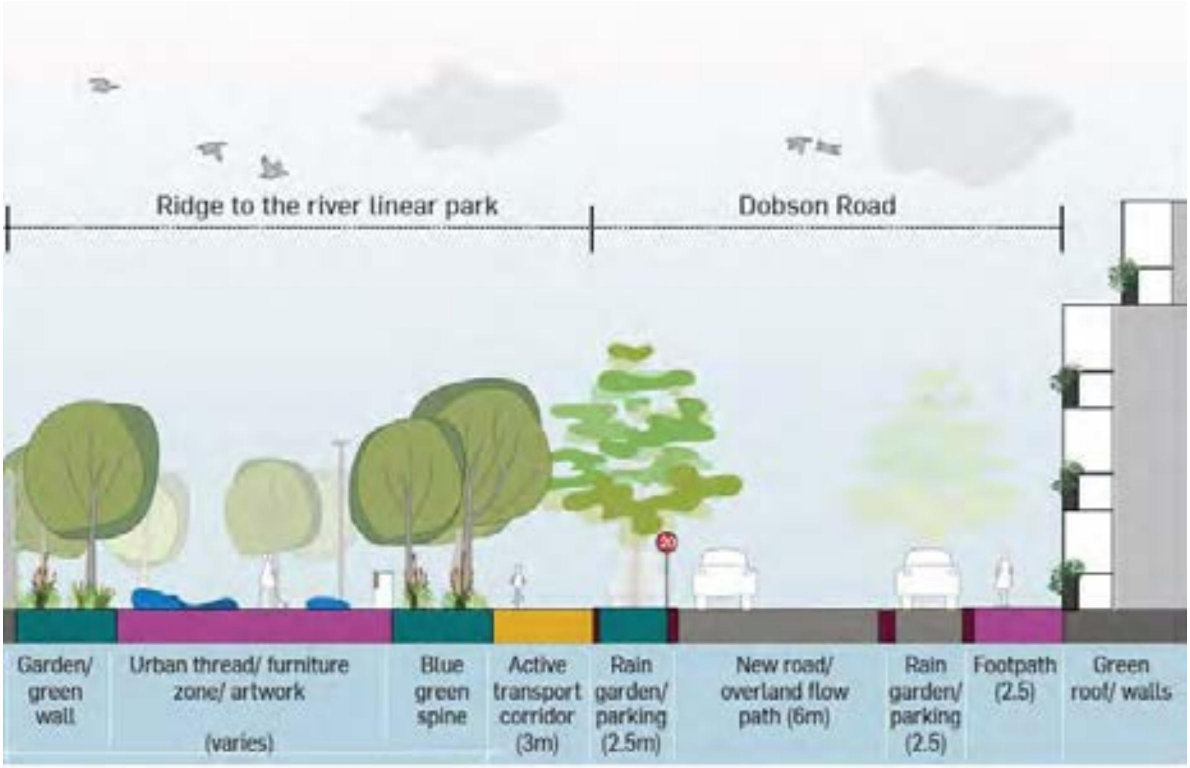
Internal Cross-sections

Select examples of the proposed internal cross-sections within the Site are shown in Figure 4.4. This figure highlights the intent to design roads with trafficable widths of 5.5m to 6.0m, with kerbside parking widths at 2.5m, to maximise the verge widths for pedestrians and cyclists and landscaping / WSUD requirements.

These cross-sections are considered appropriate, other than at key intersections where greater width will be required to facilitate the turning of vehicles. (Designs for the PSA Submission for these intersections are presented in Section 4.3 of this report).

Figure 4.4: Masterplan Internal Road Cross-sections - Examples





Shared Zones

The central roadway through Precinct 2 is proposed to be designed as a shared zone to enhance the amenity and safety of pedestrians moving north-south (and east-west) across the road. This is shown conceptually in Figure 4.5 and is considered an appropriate treatment for this roadway.

The design of this roadway will be subject to further design development in the town planning stage and will likely feature a raised and contrasting pavement / surface to ensure that drivers of vehicles are aware they are entering a different space with greater pedestrian priority.

Figure 4.5: Masterplan Internal Shared Zone (Precinct 2)

Road Network Configuration

The proposed internal road network is generally consistent with the existing arrangements at the existing Campus with the following exceptions noted[1]:

- Grosvenor Crescent, which is currently one-way eastbound, is to be converted into a two-way road.
- Clark Road, which is currently one-way southbound running from Grosvenor Crescent to Churchill Avenue, is to be converted into a two-way road.

These road network changes are considered appropriate as they will enable more convenient vehicle access to/from key car parks from the abutting roads without the need for vehicles to pass through primary pedestrian areas. Most notably, these changes will allow vehicle access to/from the car parking in Precinct 2 from Sandy

[1] Other changes that relate to intersection designs are discussed in Section 4.3 of this report.

Bay Road, Churchill Avenue and Grosvenor Street without vehicles needing to pass through the shared zone described above.

With respect to the potential for vehicle rat-running from external vehicles passing through the Site without having a destination within it, it is noted that this outcome is considered unlikely given the internal roads will be designed with slow speeds and provide pedestrian priority crossings at numerous locations. These design features will naturally slow the movement of vehicles through the Site and make rat-running less attractive. Notwithstanding, if this were to be deemed a potential issue, it is expected that it could be remedied by altering the design of select internal intersections to preclude certain rat-runs.

4.3. Vehicle Access

4.3.1. Overview

The Masterplan proposes alternations to vehicle access on Sandy Bay Road, Churchill Avenue and Olinda Grove. The appropriateness of the proposed alterations is discussed below, noting that traffic analysis for the intersections in contained in Section 6 of this report.

4.3.2. Sandy Bay Road

The Masterplan proposes the signalisation of the Sandy Bay Road / Precinct 1 Vehicle Access Road (Dobson Road) / Realigned Marieville Esplanade intersection, as shown in the concept functional layout plan presented in Figure 4.6 and Appendix E.

The signalisation of this intersection is considered appropriate for the following reasons:

- The signalisation improves active travel connections between the Site and the harbour on the northern side of Sandy Bay Road, as well as bus stops on both sides of the road.
- The signalisation improves the safety of vehicle movements exiting onto Sandy Bay Road, noting that the existing accident statistics for the area (as summarised in Section 2.5.3) indicate a trend of accidents at such intersections.
- The signalisation and alignment with the New Access Road (Dobson Road) will reduce the amount of traffic needing to utilise the abutting residential streets, particularly Earl Street and York Street.

Figure 4.6: Sandy Bay Road Vehicle Access Arrangements – Concept Functional Layout Plan

It is understood that consideration has previously been given by City of Hobart for the signalisation of the Sandy Bay / Earl Street intersection. Whilst this intersection could potentially be signalised rather than at the proposed location, it is considered less desirable for the following reasons:

- It would not align as well with the key active travel connections.
- It would result in the generation of higher traffic volumes along residential streets, particularly Earl Street.
- It would not be possible to provide a five-lane cross-section with additional allowance for bicycle lanes (as is possible at the proposed location) given the constrains of existing properties at this intersection.
- It would result in a far closer signalised intersection spacing on Sandy Bay Road (230m to the Nelson Road signals), which is less desirable from an intersection operation perspective. (By contrast, the proposed location provides 330m between the signalised intersection which means vehicle queues from one will less likely impact the operation of the other).

4.3.3. Churchill Avenue

The Masterplan proposes changes to the design of Churchill Avenue through the Site, as shown in the concept functional layout plan presented in Figure 4.7 and Appendix E, including:

1. The provision of a signalised intersection onto Churchill Avenue at the western end of Precinct 2 approximately 100m east of Alexander Street.
2. The provision of a roundabout at the Churchill Avenue / French Street intersection.
3. The provision of enhanced of enhanced bus stops on Churchill Avenue near TT Flynn Street.

The proposed works are considered appropriate as they will improve active travel, public transport and vehicle access arrangements to the adjacent precincts without unreasonably impacting through movements along Churchill Avenue.

Figure 4.7: Churchill Avenue Vehicle Access Arrangements – Concept Functional Layout Plan

4.3.4. Olinda Grove

The Masterplan proposes the provision of a new roundabout on Olinda Grove to provide access to Precinct 5. The roundabout is to be located approximately 160m east of the existing roundabout at the Southern Outlet interchange with Olinda Grove and will be designed with a single circulating lane. (It is noted that subject to further analysis, a stagger cross-intersection may represent a suitable alternative intersection treatment).

4.4. Summary

The redevelopment of the UTAS Site is proposed to draw upon and enhance the existing road network that currently services the University. This includes intersection and corridor works to the existing road network to improve the internal permeability and accessibility for all modes of transport.

Pedestrian interconnectivity within the proposed Masterplan will also be enhanced through provision of signalised crossing points, shared paths, and low speed traffic environments that seek to create a highly walkable precinct and maximise trip containment to the Site. In addition, public transport infrastructure will be improved through the provision of bus super stops along Churchill Avenue and new bus stops on Sandy Bay Road. The UTAS Campus currently has bus accessibility that exceeds much of Hobart and continuing to enable this level of accessibility with the Sites redevelopment will reduce the reliance on private vehicle use.

The Masterplan will also improve and enhance vehicle access arrangements to abutting roads, particularly Sandy Bay Road, Churchill Avenue and Olinda Grove. The design of these intersections will be reviewed and finalised in subsequent planning permit applications.

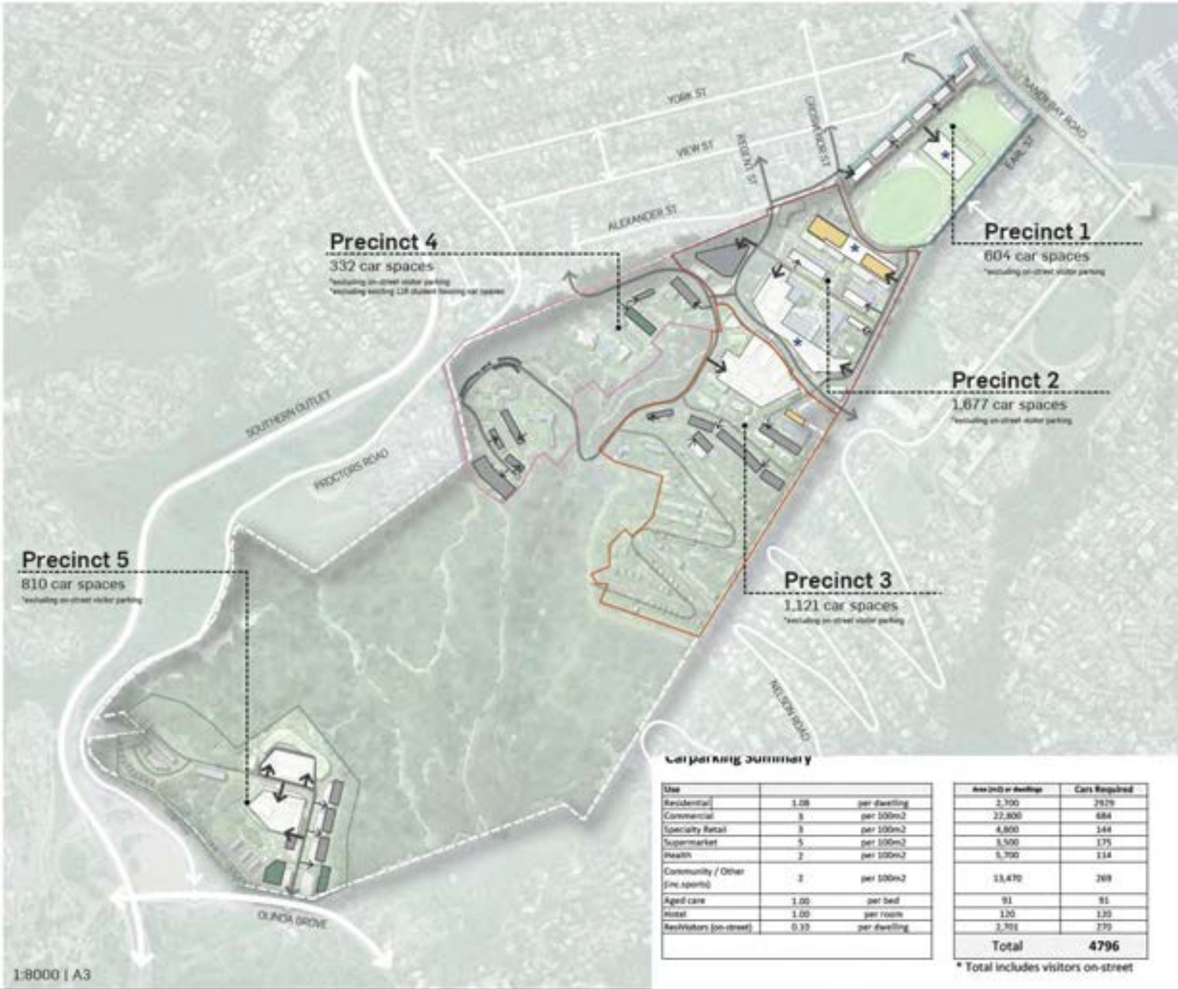
5. CAR PARKING ASSESSMENT

05

5.1. Preamble

The proposed PSA Masterplan will include approximately 5,016 on-Site car spaces across the five precincts within private car parks that form part of proposed or existing buildings and shared / public car parks that are to be decoupled from buildings. The location and split of this car parking are shown in Figure 5.1.

Figure 5.1: Masterplan Car Parking Strategy



The proposed car parking provision is less than the statutory requirements as outlined in the Hobart Planning Scheme. In this context, the following sections of this report include considerations of:

- Section 5.1 – the statutory car parking requirements of the proposed Masterplan
- Section 5.2 – the anticipated car parking demand likely to be generated by the proposed Masterplan having regard to a range of factors as outlined in the Planning Scheme
- Section 5.3 – the appropriateness of the proposed car parking provision and matters to consider as part of future development approvals with respect to this provision, and
- Section 5.4 – the design requirements for the car parking provision, which will be detailed as part of the future development approvals.

5.2. Statutory Car Parking Requirement

The statutory car parking requirements for the proposed development are set out in Provision E6 of the Hobart Planning Scheme.

Specifically, the statutory car parking rates for development on the Site are contained in Provision E6.6 and Table E6.1 of the Planning Scheme. Adopting these rates, an assessment of the statutory car parking requirements for the proposed development is presented in Table 5.1.

Table 5.1: Statutory Car Parking Requirement

Description	Land Use	No. / Size	Statutory Parking Rate	Statutory Parking Requirement
Residential	1 bedroom dwelling	478	1 for each dwelling	478 spaces
	2+ bedroom dwelling	2,141	2 for each dwelling	4,282 spaces
	Retirement village dwelling	81	1 for each dwelling	81 spaces
	Residential visitor	2,700	1 per 4 dwellings	675 spaces
Aged Care	Residential aged care facility or respite centre	91 rooms	3 for every 10 licensed beds and 1 space for emergency Services	28 spaces
Hotel	Residential Hotel	120 rooms	1 for each bedroom	120 spaces
Specialty Retail	Convenience Store	3,840sqm [1]	1 for each 20sqm	192 spaces
Supermarket	Convenience Store	2,800sqm [1]	1 for each 20sqm	140 spaces
Market		2,800sqm [1]	1 for each 20sqm	140 spaces
Commercial	Office	18,640sqm [1]	1 for each 30sqm	621 spaces
	Medical Centre	41 practitioners [2]	5 for each person providing health services	205 spaces
	Childcare Centre	120 children [4]	0.25 for each child the centre is licensed to accommodate	30 spaces
Community	Community meeting & entertainment [3]	12,170sqm	1 for each 15sqm	811 spaces
Total				7,803 spaces

[1] NLA assumed to be 80% of GFA
[2] Based on employment assessment conducted by Deep End
[3] General 'community' land use applied to various community-based developments across the Site.
[4] Assumed

Table 5.1 indicates the proposed development generates a statutory car parking requirement of approximately 8,500 car spaces.

This statutory car parking provision would be inconsistent with the Transport Strategy for the Site as it would likely encourage the overuse of the private motor vehicle and reduce the use of active travel and public transport modes, and place unreasonable and unnecessary pressure on the operation of the surrounding road network. Rather, the Masterplan proposes a total of approximately 5,016 on-site car spaces (which is equal to approximately 60%, or 3,394 spaces less than the statutory requirement).

The appropriateness of this provision is discussed in the following sections of this report having regard to the 'Performance Criteria' of Provision E.6.6.1.

5.3. Assessment of Proposed Car Parking Provision

5.3.1. Decision Guidelines

Notwithstanding the above assessment, the Hobart Planning Scheme outlines a range of factors to consider in assessing the appropriateness of a lesser car parking provision than the statutory requirement. These factors are detailed in the 'Performance Criteria' of Provision E.6.6.1, which is reproduced as follows:

"The number of on-Site car parking spaces must be sufficient to meet the reasonable needs of users, having regard to all of the following:

- *(a) car parking demand;*
- *(b) the availability of on-street and public car parking in the locality;*
- *(c) the availability and frequency of public transport within a 400m walking distance of the Site;*
- *(d) the availability and likely use of other modes of transport;*
- *(e) the availability and suitability of alternative arrangements for car parking provision;*
- *(f) any reduction in car parking demand due to the sharing of car parking spaces by multiple uses, either because of variation of car parking demand over time or because of efficiencies gained from the consolidation of shared car parking spaces;*
- *(g) any car parking deficiency or surplus associated with the existing use of the land;*
- *(h) any credit which should be allowed for a car parking demand deemed to have been provided in association with a use which existed before the change of parking requirement, except in the case of substantial redevelopment of a Site;*
- *(i) the appropriateness of a financial contribution in lieu of parking towards the cost of parking facilities or other transport facilities, where such facilities exist or are planned in the vicinity;*
- *(j) any verified prior payment of a financial contribution in lieu of parking for the land;*
- *(k) any relevant parking plan for the area adopted by Council;*
- *(l) the impact on the historic cultural heritage significance of the Site if subject to the Local Heritage Code; and*
- *(m) whether the provision of the parking would result in the loss, directly or indirectly, of one or more significant trees listed in the Significant Trees Code."*

In combination, these factors also allow for the consideration of the appropriateness of car parking provision with respect to the overall strategic function of car parking in terms of its ability to proactively encourage the use of walking, cycling and public transport and/or discourage the use of private motor vehicle to reduce peak hour traffic congestion.

The most relevant of the above factors are discussed below.

5.3.2. Car Parking Demand

Residential Dwellings

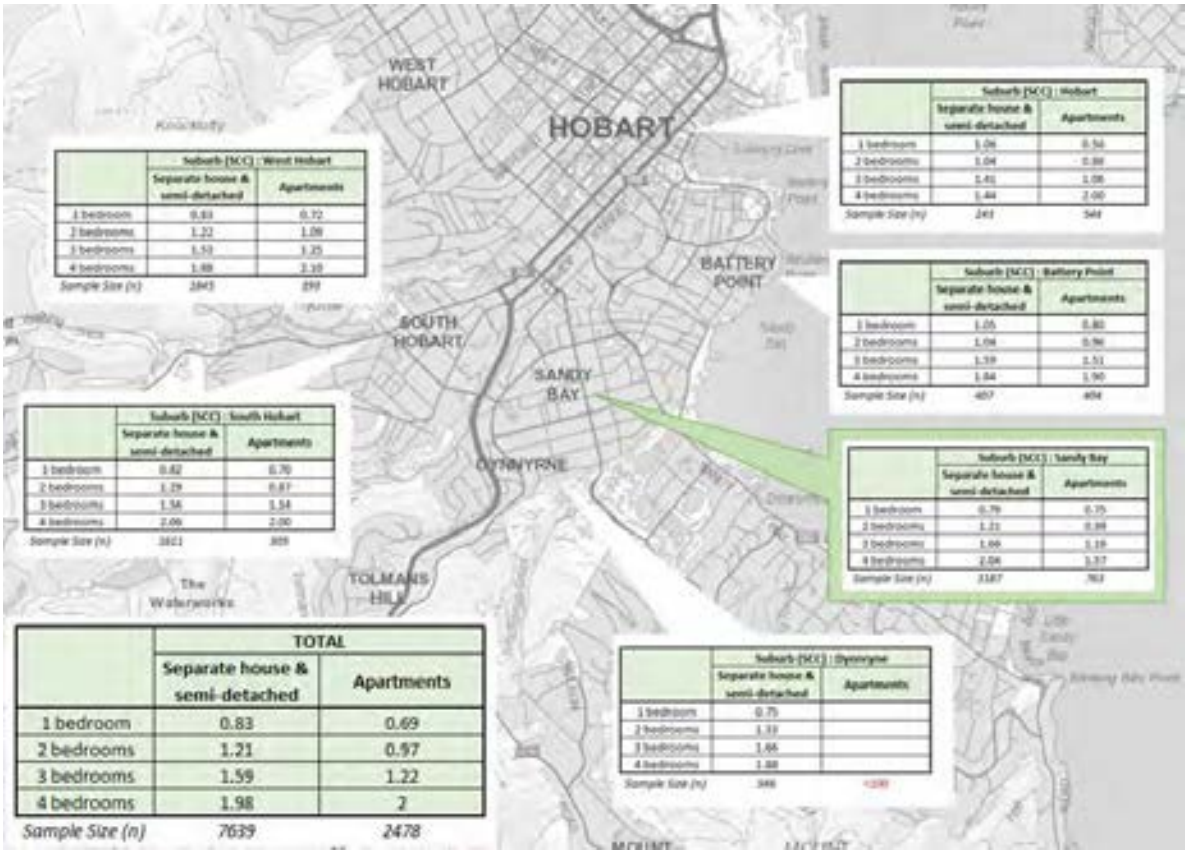
The 2016 Census by the Australian Bureau of Statistics (ABS) provides an indicator of the typical resident car parking demands in Sandy Bay, and other suburbs of Greater Hobart. The data is arguably the best available source of empirical evidence to assess existing car parking demands for residents given its breadth (sample size) and ability to be disaggregated to report average rates by dwelling type and size and by suburb.

A summary of the ABS data[2] for Sandy Bay and other nearby suburbs for houses and semi-detached dwellings and apartments by size is presented in Figure 5.2, outlined in Table 5.2 to Table 5.5 and summarised in Figure 5.3 and Figure 5.4. The data indicates that the average car ownership rates in inner Hobart suburbs including Sandy Bay as follows:

- For separate houses and semi-detached dwellings, approximately 0.8, 1.2, 1.6 and 2.0 car spaces for one-, two-, three- and four-bedroom dwellings respectively.
- For apartments, approximately 0.7, 1.0, 1.2 and 2.0 car spaces for one-, two-, three- and four-bedroom apartments respectively. (This data highlights that apartment car ownerships rates are approximately 20% lower than the equivalent rates for separate houses and semi-detached dwellings, other than for four-bedroom dwellings where the rates are aligned at 2 car spaces per dwelling or apartment).

Overall, this data confirms that the statutory car parking rates in the Hobart Planning Scheme are well higher than actual car parking ownership levels in Sandy Bay and nearby area, and the existing rates of car parking ownership are closer to 0.7. 1.0 and 1.2 spaces per one-, two- and three-bedroom apartments and 1.6 to 2 car spaces per three to four-bedroom separate dwelling.

Figure 5.2: 2016 ABS Average Car Ownership Rates for Dwelling and Apartments in Hobart



2 It is noted that in order to ensure that individuals are not able to be identified using census data, the ABS deliberately introduces random errors into some data sets (refer to http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/2901.0Chapter38202011). As such, the data should be viewed as providing approximate rates.

Table 5.2: 2016 ABS Average Car Ownership Rates for Dwelling and Apartments (Hobart and West Hobart)

Bedrooms	Hobart		West Hobart	
	House	Apartment	House	Apartment
1-bedroom	1.06	0.56	0.83	0.72
2-bedrooms	1.04	0.86	1.22	1.09
3-bedrooms	1.41	1.06	1.53	1.25
4+ bedrooms	1.44	2.00	1.88	2.10

Table 5.3: 2016 ABS Average Car Ownership Rates for Dwelling and Apartments (Battery Point and South Hobart)

Bedrooms	Battery Point		South Hobart	
	House	Apartment	House	Apartment
1-bedroom	1.05	0.80	0.82	0.70
2-bedrooms	1.04	0.96	1.29	0.87
3-bedrooms	1.59	1.51	1.56	1.14
4+ bedrooms	1.84	1.90	2.06	2.00

Table 5.4: 2016 ABS Average Car Ownership Rates for Dwelling and Apartments (Sandy Bay and Dynnyrne)

Bedrooms	Sandy Bay		Dynnyrne	
	House	Apartment	House	Apartment
1-bedroom	0.79	0.75	0.75	
2-bedrooms	1.21	0.99	1.33	
3-bedrooms	1.66	1.16	1.66	
4+ bedrooms	2.04	1.57	1.88	

Table 5.5: 2016 ABS Average Car Ownership Rates for Dwelling and Apartments (Combined)

Bedrooms	Total	
	House	Apartment
1-bedroom	0.83	0.69
2-bedrooms	1.21	0.97
3-bedrooms	1.59	1.22
4+ bedrooms	1.98	2.00

Figure 5.3: Comparison of 2016 ABS Average Car Ownership Rates by Hobart suburbs for Dwellings

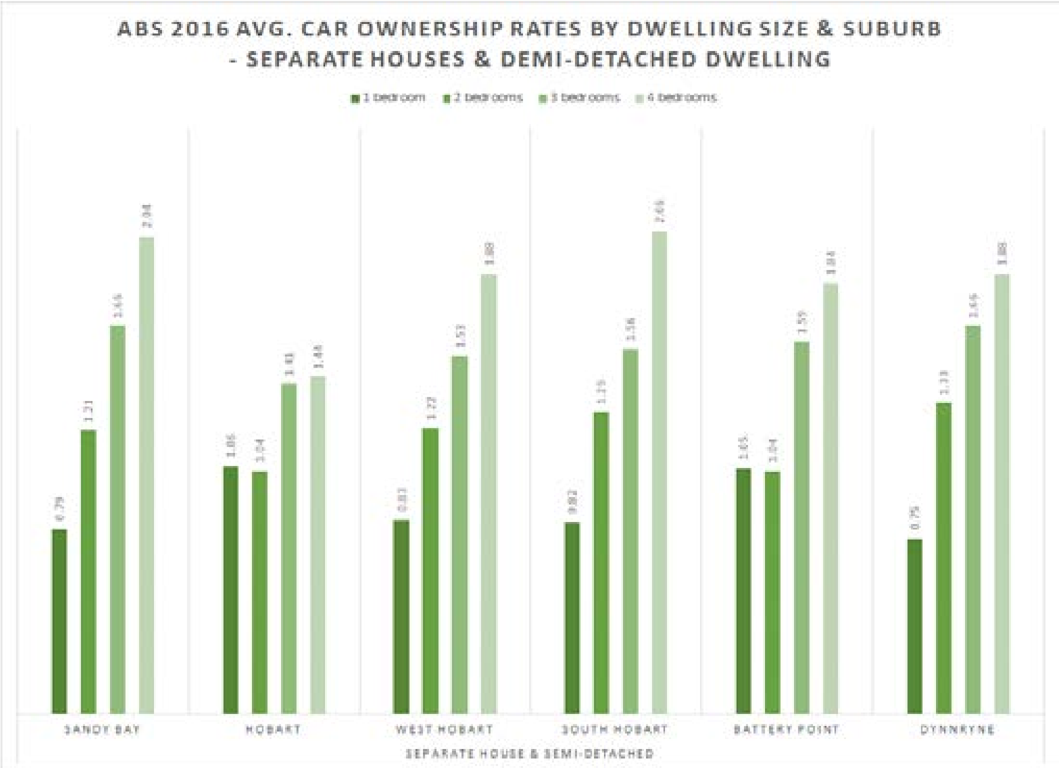
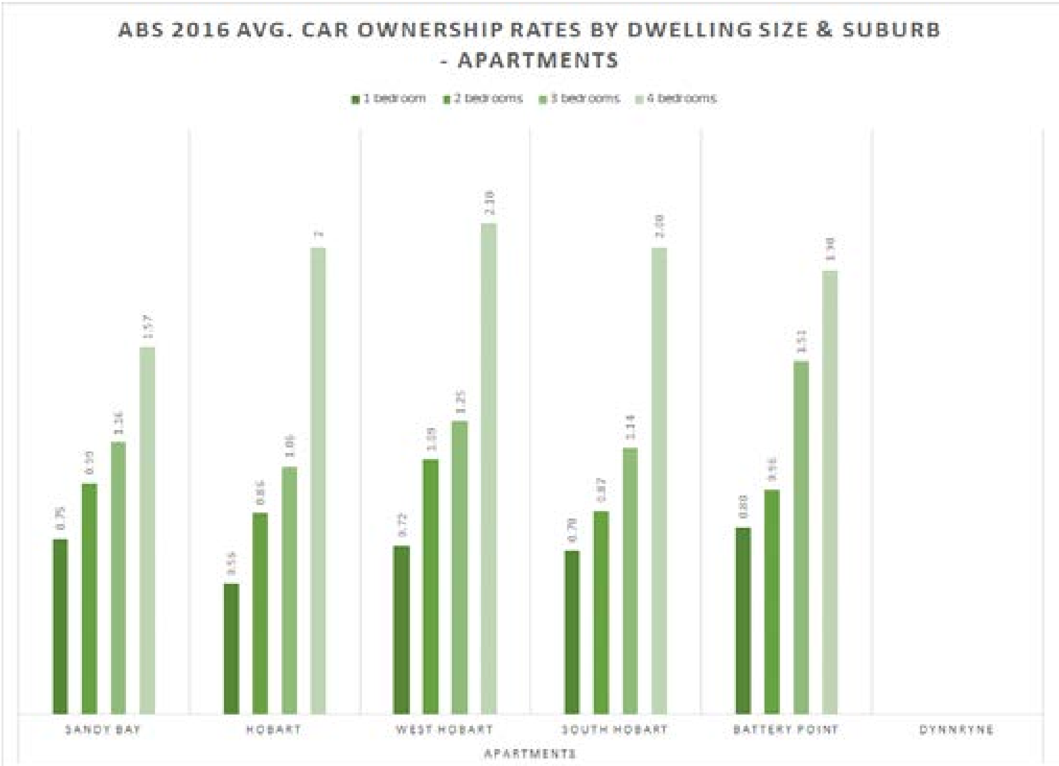


Figure 5.4: Comparison of 2016 ABS Average Car Ownership Rates by Hobart suburbs for Apartments



Other Land Uses

For the purposes of estimating approximate car parking rates for other land uses, guidance has been sought from the car parking rates contained in the RTANSW Guide to Traffic Generating Developments (October 2002) and the RMS Guide to Traffic Generating Developments, Updated Traffic Surveys, (2013/14).

This guide outlines the following parking rates for key land uses:

- Residential:
  - Visitors: 1 visitor space for every 5 dwellings (sub-regional rate)
  - Aged care (independent): 0.67 spaces per dwelling plus 1 visitor space for every 5 dwellings
- Retail:
  - Supermarket: 4.2 spaces per 100sqm
  - Specialty shops: 4.5 spaces per 100sqm

For all other land uses, the Hobart Planning Scheme rates have been adopted for the purposes of assessing the likely car parking demand.

5.3.3. Availability and Frequency of Public Transport

As outlined earlier in this report, the Site is well serviced by public transport (bus) services and infrastructure improvements are proposed as part of the vehicle access works included in the Masterplan.

The Complete Streets Transport Strategy also outlines other alternative public transport services that could become feasible at the Site over time, such as on-demand bus and ferry services. Moreover, it is also expected that bus service frequencies will improve over time, as demand for the services increases and additional State funding is provided to improve service frequencies and reliability.

These factors will place downward pressure on required car parking provisions by making travel by public transport more attractive to more people living, working, or visiting the Site.

5.3.4. Availability and Likely Use of Other Transport Modes

As outlined earlier in this report, the Masterplan provides a series of active travel connections through the Site to encourage walking and cycling as the preferred transport modes for local trips, such as residential trips to convenience retail tenancies.

In addition, it also proposes significant bicycle parking and e-bike hubs around the Site and improvements to connections to surrounding land uses and destinations. This infrastructure will make active travel modes more attractive for trips broader from the Site (e.g., work trips to the CBD), particularly once external connections to/from the CBD are also improved over the course of the next two decades.

The impact of technology advancements including (most notably) the rise of Mobility of a Service (MaaS) and car sharing providers in Hobart will also provide alternate ways for persons to travel to/from the Site and reduce the need for car parking.

These factors will also place downward pressure on required car parking provisions, particularly for the more locally focused speciality retail shops, as alternative transport modes become more feasible and attractive.

5.3.5. Sharing of Car Parking Provisions due to Variations in Demand

The mixed-use nature of the land use will create significant opportunities for the sharing of car parking across the Site as the peak car parking demands for many land uses will not coincide with others. For example:

- Community land use car parking demands will generally occur during the evening and on weekdays, at which time office car parking demands will be at their lowest.
- Retail car parking demands will generally be at their highest on weekday afternoons and on weekends during the day, at which time residential visitor parking demands will be far lower than the normal peaks during evening periods.

The extent to which the sharing of car parking can be expected to reduce the overall parking demand will be explored in further detail at the planning permit application stage for developments on the Site. However, for this assessment, it is considered appropriate to assume that the community land uses can share the car parking to be provided for the office land uses and that a lesser residential visitor parking rate can be adopted given the expected availability of retail parking during evening periods.

5.3.6. Existing Car Parking Deficiency

The Masterplan does not seek to rely on any car parking on surrounding residential streets. In this context, the car parking demands on surrounding residential streets can be expected to reduce after the development of the Site as university car parking demands will no longer be generated off the Site.

5.3.7. Combination of Factors

The combination of the factors outlined above indicates that the rate of car parking demand for the Masterplan is likely to be materially lower than specified in the Hobart Planning Scheme, particularly in the context that the full development is not expected for at least 20 years to 30 years.

Based on the discussions and analysis presented above and the strategic function of car parking in terms of its ability to encourage sustainable transport modes, the following car parking rates are considered appropriate for the PSA submission:

- Residential:
  - One-bedroom apartment: 0.5 spaces per dwelling
  - Two-bedroom apartment: 1.0 space per dwelling
  - Three-bedroom apartment: 2.0 spaces per dwelling *(assumed for conservatism)*
  - Separate houses / lots: 2.0 spaces per dwelling *(assumed for conservatism)*

    Weighted Average: 1.08 spaces per dwelling
  - Retirement living dwelling: 0.67 spaces per dwelling
  - Visitor parking: 1 visitor space per 10 dwellings
- Aged care: Per Planning Scheme rates
- Hotel: 1 space per room
- Supermarket & Market: 5 spaces per 100sqm *(assumed for conservatism)*
- Specialty shops: 3 spaces per 100sqm
- Commercial:
  - Office: 3 spaces per 100sqm
  - Medical Centre: 5 spaces per practitioner *(assumed for conservatism)*
  - Childcare: 0.20 spaces per child
- Community Nil (shared with other provisions e.g., office)

A comparison of the car parking rates adopted for the residential apartments with the existing 2016 ABS data for the surrounding area is outlined in Table 5.6 below

Table 5.6: Comparison of Car Parking Rates

Bedrooms	2016 ABS Rates for Surrounding Area		UTAS Sandy Bay Masterplan	
	House	Apartment	House	Apartment
1-bedroom	0.83	0.69	-	0.5
2-bedrooms	1.21	0.97	-	1.0
3-bedrooms	1.59	1.22	2.00	2.0
4+ bedrooms	1.98	2.00	-	-

5.4. Ultimate Car Parking Demand

Adopting these empirical rates, an assessment of the anticipated car parking requirements for the proposed development is presented in Table 5.7.

Table 5.7: Anticipated Car Parking Requirement – Empirical Assessment

Description	Land Use	No. / Size	Parking Rate	Parking Requirement
Residential	Apartments and houses	2,619	1.08 for each dwelling	2,829 spaces
	Retirement village dwelling	81	0.67 for each dwelling	54 spaces
	Residential visitor	2,700	0.1 for each dwelling	270 spaces
Aged Care	Residential aged care facility or respite centre	91 rooms	3 for every 10 licensed beds and 1 space for emergency Services	28 spaces
Hotel	Residential Hotel	120 rooms	1 for each room	120 spaces
Specialty Retail	Convenience Store	3,840sqm [1]	3 spaces per 100sqm	115 spaces
Supermarket	Super Market	2,800sqm [1]	5 spaces per 100sqm	140 spaces
Market	Market	2,800sqm [1]	5 spaces per 100sqm	140 spaces
Commercial	Office	18,640sqm [1]	3 spaces per 100sqm	559 spaces
	Medical Centre	41 practitioners [2]	5 for each practitioner	205 spaces
	Childcare Centre	120 children [2]	0.2 for each child	24 spaces
Total				4,484 spaces

[1] NLA assumed to be 80% of GFA
[2] Based on employment assessment conducted by Deep End

Table 5.7 indicates that the proposed development could be expected to generate a car parking requirement of approximately 4,484 car spaces. This anticipated requirement is broadly equal to the car parking provision proposed in the PSA submission.

5.5. Short Term Car Parking Demands (5- Year Development)

The final car parking demands outlined in Section 5.4 represent the demand for car parking that is expected to be generated by the Site once it has been *fully developed*. The current understanding of the development time frames of the Site is that the Universities operations will be fully transitioned into the Hobart CBD by approximately the year 2030. Within this time period, the initial development of the Masterplan is expected to occur.

An assessment has been undertaken of the demand for car parking generated by the Site after 5-years of development and is shown in Table 5.8. This time frame approximately correlates with the Universities relocation.

Table 5.8: Anticipated Car Parking Requirement – 5-Year Development Horizon

Description	Land Use	No. / Size	Parking Rate	Parking Requirement
Residential	Apartments and houses	324	1.08 for each dwelling	350 spaces
	Residential visitor		0.1 for each dwelling	32 spaces
Specialty Retail	Convenience Store	320sqm [1]	3 spaces per 100sqm	10 spaces
Market	Market	2,800sqm [1]	5 spaces per 100sqm	140 spaces
Commercial	Medical Centre	28 practitioners [2]	5 for each practitioner	140 spaces
	Childcare Centre	60 children [2]	0.2 for each child	12 spaces
Total				684 spaces

[1] NLA assumed to be 80% of GFA
[2] Based on employment assessment conducted by Deep End

The results shown in Table 5.8 indicate that the Site will generate a demand for 684 car parking spaces in the first 5 years of development. This is a significant reduction when compared to the Universities current operations, where activity is generated by the existing 1,250 on-site car parking spaces. Beyond this stage, it will be a number of years of continuous development of the site before the demands for car parking, and resultant traffic generation, matches the current level of activity generated by the University.

5.6. Summary

The above analysis has provided justification to the provision of a reduced car parking supply within the Site. This has been conducted consistent with the goals and objectives of the Sustainable Transport Strategy completed by Complete Streets. The strategy aims to encourage a more environmentally friendly development that encourage alternative modes of transport such as buses, cycling and walking, provides electric car charging spaces and other measures to teed into the opportunity to reduce the reliance on car parking.

This redevelopment will result in an activated and mixed-use precinct, where multi-purpose trips will enable a sharing of car parking resources amongst the various land uses.

Notwithstanding the above, appropriate car parking rates have been recommended to provide a car parking supply that will meet the future needs of the precinct.

6. TRAFFIC IMPACTS

06

6.1. Preamble

As outlined earlier in this report, the redevelopment of the Site will result in changes in the movement of people and vehicles in Sandy Bay and adjacent suburbs. This will include the removal of a significant quantum of vehicle and public transport movements by students and staff that access the existing Campus and the addition of new movements to/from the diversified land uses.

In the context of these complex changing transport conditions (traffic subtractions and additions) and given the anticipated timeframe for the delivery of the project (20 to 30 years), the traffic impacts of the Masterplan have been assessed at two-levels:

1. A macro assessment focusing on traffic conditions and congestion in the Greater Hobart area
2. And a micro assessment focusing primarily on local intersections, including new intersections, in the immediate vicinity of the Site.

In undertaking this assessment, it is noted that the inputs, assumptions, and results of both modelling works were cross referenced with one another to ensure an appropriate level of consistency. For the purposes of this assessment, a modelling horizon for the year 2040 was also assessed. This design year was chosen the Site is expected to be redeveloped over an extended period of time. In the interim, however, the university will relocate to the CBD. In this case, it is expected that the net traffic impact will be reduced, when compared to the existing use.

An illustration of the scope of each approach is outlined in Figure 6.1

Figure 6.1: Modelling Scope

6.2. Strategic Modelling for External Traffic Impacts

6.2.1. Overview

Transport modelling is used around the world to forecast the number of users (demand) that will travel on a transport system at a given point in time.

There are generally three layers of models: strategic, tactical, and operational. As part of this project, strategic transport modelling has been completed using the Greater Hobart Urban Travel Demand Model (GHUTDM). The use of this model is considered to provide the most accurate assessment of macro level impacts given its ability to assess future conditions and the demographic changes associated with the relocation of the existing university campus to the CBD and addition of the new development on the Site.

The traditional approach to strategic transport modelling is undertaken through the following four-step process:

1. Trip Generation – how many users are travelling
2. Trip Distribution – where users are travelling to and from
3. Mode Choice – what form of transport users choose to make a trip
4. Route Assignment – what routes users take.

It is noted that one key advantage of using GHUTDM is that there are no subjective assumptions used to inform it. That is, the model automatically determines the trip generation, distribution, mode choice and assignment based on the development yield, Site location and year of assessment.

6.2.2. Model Process & Limitations

An overview of the model process is presented in Figure 6.2

Figure 6.2: GHUTDM Modelling Process Chart

Strategic models are based on mathematical modelling which provides a simplification of travel behaviour for a given network and time period. The main limitations in using strategic models vary. For this model, limitations include:

- Level of detail – strategic models cannot model detailed characteristics of traffic behaviour, such as lane changing, queuing, signal timings or other operational aspects. Detail in land use and demographics are also lost in the aggregation of zones.
- Accuracy of input assumptions – strategic models require inputs relating to land use and the road network and cannot produce outputs that are more accurate than the data used. For example, population, employment, and enrolment numbers are all inputs into the model for the trip generation component of the model.
- Estimation of real-world behaviours – the model relies on mathematical modelling which aims to estimate real world behaviours. However, it does not consider other factors that influence travel behaviour such as user perception and driver awareness.

It is for the above reasons that the two-level analysis approach has been conducted, utilising both the strategic modelling software, as well as a more typical traffic engineering land use based assessment, with local area SIDRA assessments.

6.2.3. Trip Generation

Two future case Year 2040 scenarios have been modelled and assessed utilising the strategic model. These are outlined below, with the results shown in Table 6.1.

- Base Case: The Base Case scenario represents the default inputs as found in the GHUTDM. This includes the University of Tasmania as it currently operates. The model contains inbuilt assumptions on the how the population of Tasmania is expected to change and grow into the future, including the University, Sandy Bay and the surrounding area.
- Project Case: The Project Case removes the university campus and relocates it into Hobart CBD and adds the new development on the Sandy Bay Site as proposed in the PSA submission.

Table 6.1: Traffic Generation of "Base Case" and "Project Case" from Strategic Model

Precinct	Base Case Traffic Generation		Project Case		Comparison	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Precinct 1	75	67	81	85	+6	+18
Precinct 2	312	284	425	421	+113	+137
Precinct 3	63	66	215	228	+152	+162
Precinct 4	66	71	120	134	+54	+63
Sub Total	516	488	841	868	+325	+380
Precinct 5	1	0	267	306	+266	+306
Total	517	488	1,108	1,174	+591	+686

Table 6.1 indicates the development of the Site will result in an increase in traffic volumes onto the external road network. It also demonstrates that the traffic that will be removed from the road network as a result of the campus relocation is a material volume of traffic. The following sections of this report assess the impact of the proposed uplift in traffic.

6.2.4. Trip Distribution & Assignment

The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, including the:

1. configuration of the arterial road network in the immediate vicinity of the Site
2. existing operation of intersections providing access between the local and arterial road network
3. surrounding employment centres, retail centres and schools in relation to the Site
4. likely distribution of employee's residences in relation to the Site
5. configuration of access points to the Site.

Through the use of the GHUTDM, the trip distribution and assignment is determined and calibrated by the strategic modelling software, through the assumptions that have been determined and input in its creation.

Figure 6.3 and Figure 6.4 have been produced to show the *difference* in traffic distribution when comparing the base case and the project case.

Figure 6.3: AM Peak Hour Difference Plots

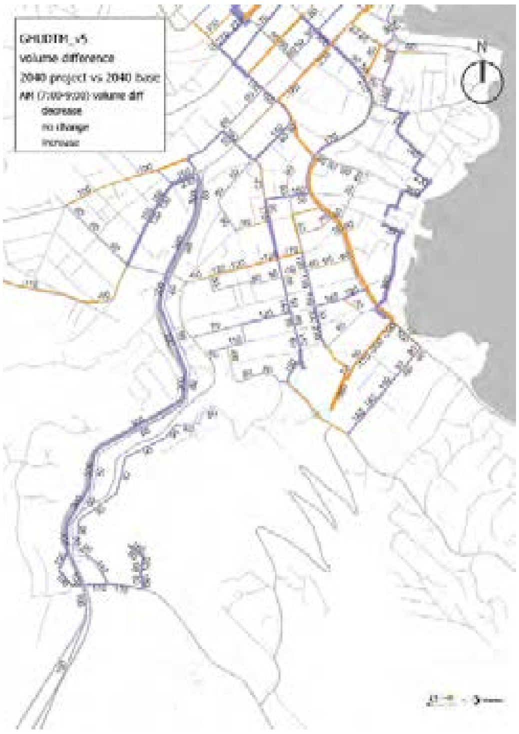
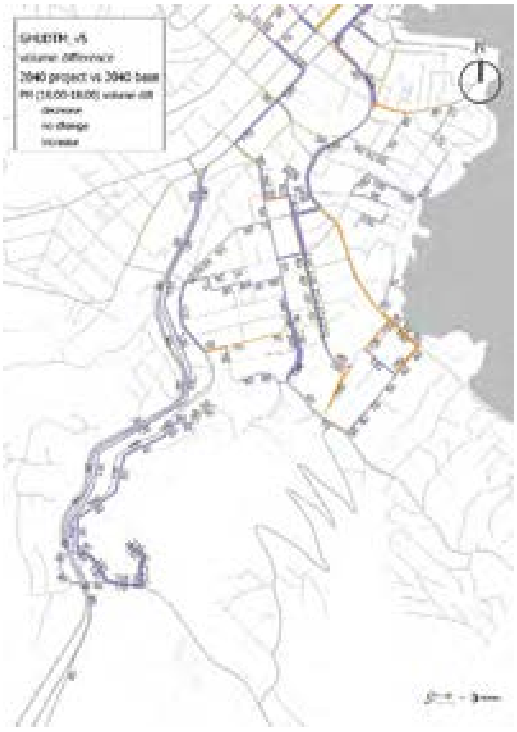


Figure 6.4: PM Peak Hour Difference Plots



A review of the above outputs indicates the following:

- Traffic has distributed throughout the road network in all directions, including to the south-east, south-west and west. Notwithstanding, the primary vehicle desire is to / from the Hobart CBD.
- The existing Sandy Bay Campus is a significant traffic generator. The new development will broadly replace these traffic volumes, resulting in a modest increase in traffic on the road network.
- The increase in traffic volumes experienced on Olinda Grove near Precinct 5 is more substantive than the roads around Precincts 1-4 as this location does not experience a reduction in traffic volumes as a result of the campus relocation.

6.2.5. Network Results

The strategic modelling results can be interpreted by comparing Volume-to-Capacity (VC) ratios.

The VC ratio effectively represents a measure of the average level of congestion during the 7am to 9am and 4pm to 6pm peak periods, where “red coloured” linkages represent locations where traffic demand exceeds the traffic capacity and other coloured linkages represent locations where traffic demand is less than the traffic capacity.

It is important to note that as the VC ratio represents average conditions across the peak period, it may not necessarily show road linkages as being congested or above capacity even if there are short periods of the two hours where such congestion occurs. For example, a road linkage that experience high congestion for (say) 15 minutes but then low or moderate congestion of the remainder of the period will likely be represented with having moderate congestion on average. **For this reason, some care needs to be taken in reviewing the VC ratios and the primary focus should be on the level of change in the congestion i.e., change of colouring of the road linkages.**

The results of the strategic modelling assessment are shown in Figure 6.5 to Figure 6.8 as follows.

2019 Existing Conditions Vs 2040 Base Case

Figure 6.5: Average VC Plots for 2019 Existing Conditions vs 2040 Base Case – 7-9 AM

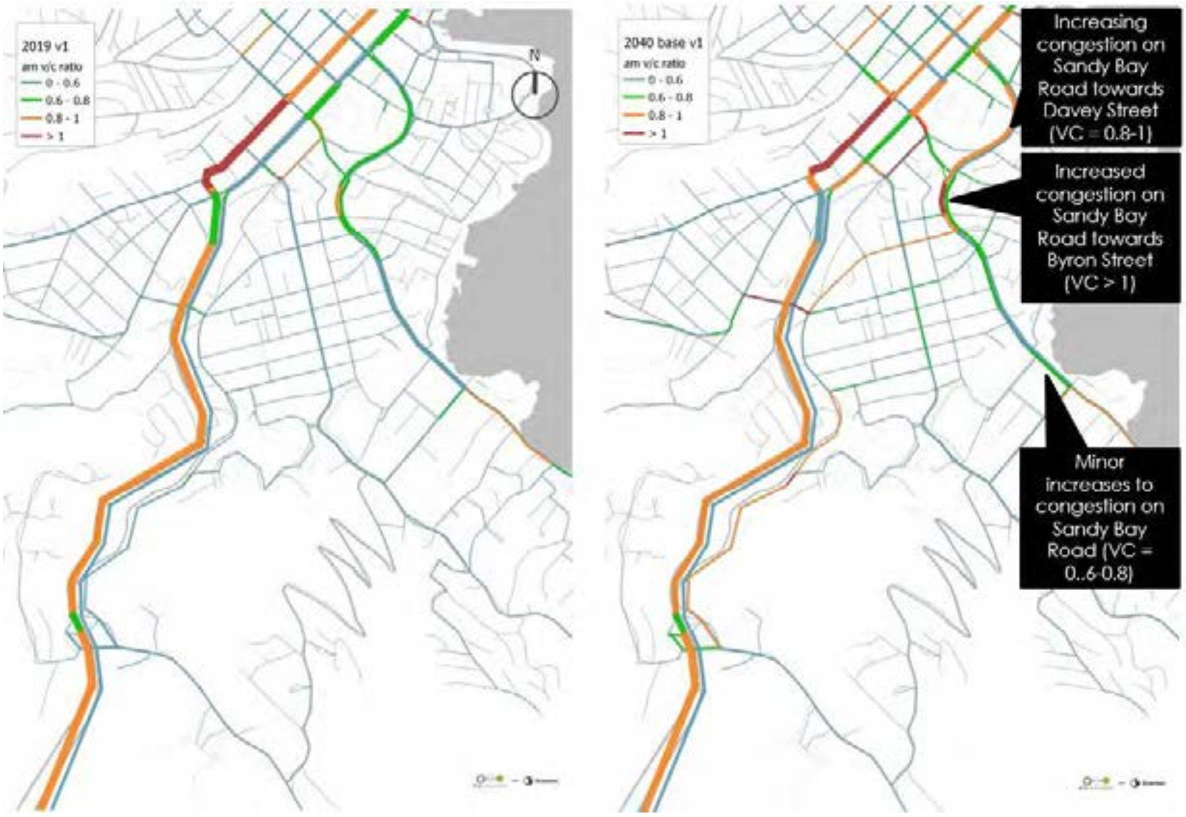
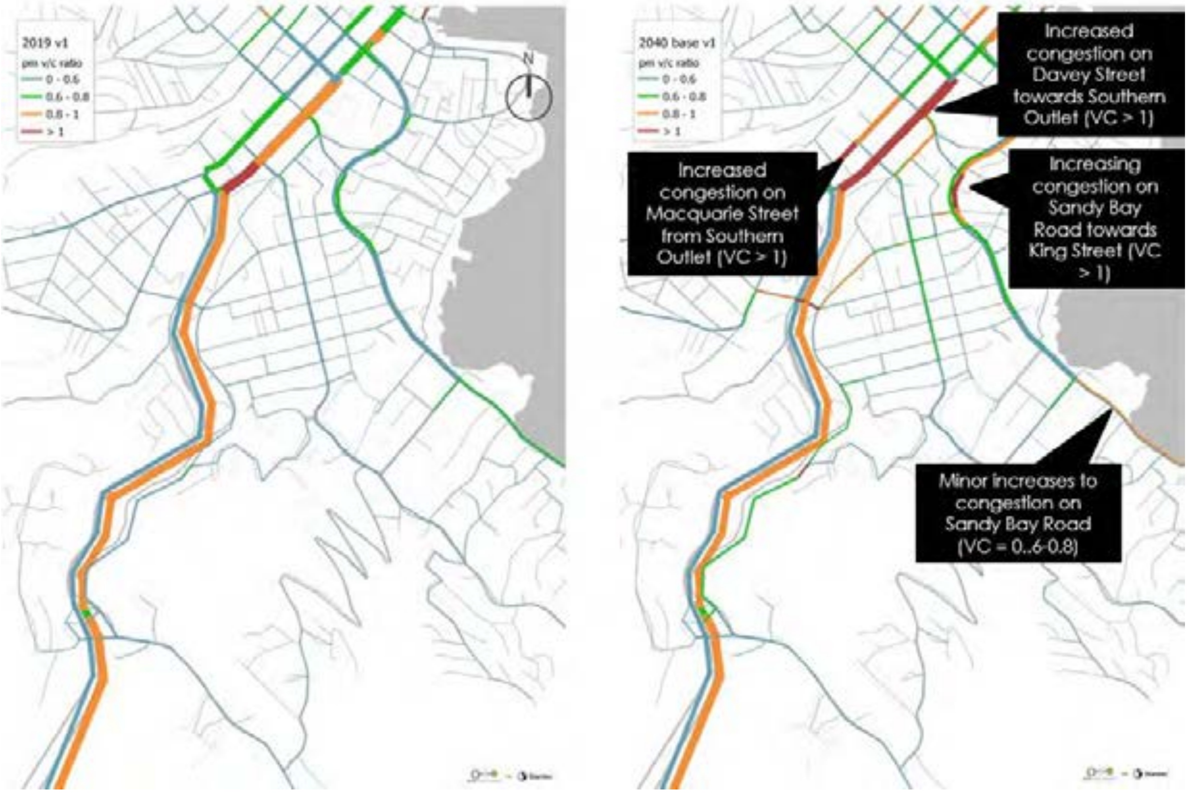


Figure 6.6: Average VC Plots for 2019 Existing Conditions vs 2040 Base Case – 4-6 PM



2040 Base Case Vs 2040 Project Case

Figure 6.7: Average VC Plots for 2040 Base Case vs 2040 Project Case– 7-9 AM

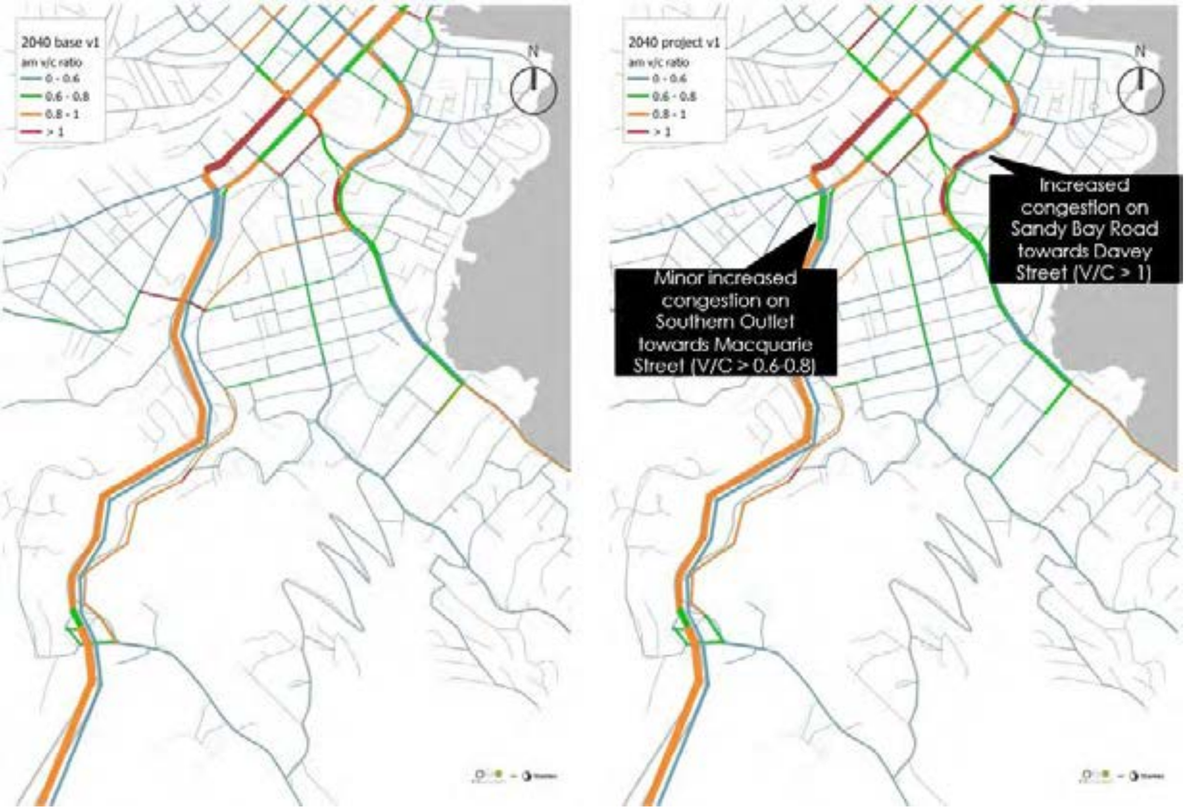


Figure 6.8: Average VC Plots for 2040 Base Case vs 2040 Project Case – 4-6 PM

6.2.6. Key Findings and Implications

The strategic (macro) modelling has been completed using the Greater Hobart Urban Travel Demand Model. Analysis and interpretation have been undertaken by GTA now Stantec with consent provided by DSG on behalf of UPPL.

This model has been used as it represents the best modelling platform to assess the macro / city-level impacts of the Masterplan including consideration of future land use and transport changes envisaged in Greater Hobart up to 2040. This includes the development of the Sandy Bay Site but also broader incremental growth across Greater Hobart.

In this context, the modelling indicates:

- There are relatively low levels of traffic congestion across Greater Hobart under existing (2019) conditions during the peak periods. However, there are some areas where congestion occurs during peak periods, such as at the exit from the Southern Outlet and on Macquarie Street and Davey Street at their southern ends.
- Under future (2040) base case conditions without the development, the level of congestion across Greater Hobart is expected to increase on select road linkages but not materially alter. The modelling indicates there are some increases in congestion on Macquarie Street, Davey Street and Sandy Bay Road. However, the extent of added congestion is relatively minor in the context of the overall network.
- With the development of the Site (which adds new traffic to/from the Site but also removes existing university traffic to/from the Site), the future (2040) conditions are not expected to materially alter, particularly on the road network close to the Site. This is an indication that the traffic impacts of the development are relatively minor. Near the CBD, there are some minor increases in congestion, but the expected VC changes are relatively minor.

Overall, the modelling indicates that the traffic impacts of the proposed development at a macro perspective are relatively minor, particularly on the road network close to the Site. Closer to the CBD, there are select road linkages where congestion occurs at present and is expected to experience some increase in the future with or without the development of the Site.

6.3. Local Intersection Traffic Impacts

6.3.1. Overview

As outlined in the above sections, the strategic modelling that has been undertaken was utilised to assess the macro scale impact of the development of the Site.

To assess the micro level traffic implications, such as local area Site access points and adjacent intersections, transport modelling package *SIDRA Intersection 9* has been utilised. Figure 6.9 below outlines the Site access points and internal intersections that have been assessed.

Figure 6.9: Site Access Points and Internal Intersections Assessed Utilising SIDRA

6.3.2. Model Process & Limitations

The future operation of the surrounding intersections has been assessed using *SIDRA INTERSECTION 9*[3], a computer-based modelling package which calculates intersection performance.

It is noted that SIDRA is a micro scale modelling software, utilised to assess intersections or small networks in isolation. This differs from the strategic model in that it has no consideration for the immediate surrounding road network, assessing each location on its own. SIDRA has no consideration for the complex nature of traffic and congestions, such as the redistribution of traffic due to localised congestion. It is also not a four-step model, which means it relies on more subjective inputs on traffic generation, distribution, and assignment[4].

SIDRA is typically utilised to assess Site access points, and the immediate road network surrounding a development. The benefits of utilising SIDRA as an assessment tool in this instance are more detail oriented, considering inputs such as:

- Signal phasing arrangements
- Length of short turn lanes at intersections
- Queuing at individual intersections
- General performance of a Site access point.

3 Program used under license from Akcelik & Associates Pty Ltd.

4 For this project, this subjectivity has been mitigated by cross-checking the strategic modelling and SIDRA traffic generations and relying on the distribution and assignment of traffic from the strategic modelling for the SIDRA modelling.

6.3.3. Baseline Traffic Volumes

Baseline traffic volumes for the proposed development have been compiled from a number of sources, such as traffic surveys found in previous traffic assessments conducted by the university, as well as volumes from the strategic model.

When considering the future 2040 design years, the traffic volumes compiled have not had a background growth rate applied to them. This is because this analysis has not considered the removal of through traffic volumes generated by the existing UTAS Campus. The university is a significant traffic generator, and not removing this traffic from the background through volumes is considered a conservative assumption for the future design year. It is additionally noted that few opportunities exist within the surrounding areas for significant infill development to increase the population of the area, and therefore increase traffic (excluding the UTAS Site). Any background growth on the network in this location is expected to be modest at most.

The baseline traffic volumes are presented in Table 6.3.

Table 6.2:Baseline Traffic Volumes

Road	Direction	AM Peak	PM Peak
Sandy Bay Road	Northbound	1,008 vph	884 vph
	Southbound	902 vph	935 vph
Churchill Avenue	Northbound	586 vph	403 vph
	Southbound	586 vph	470 vph
Olinda Grove	Westbound	464 vph	292 vph
	Eastbound	292 vph	464 vph

In addition to the above, a number of other assumptions were made in the preparation of the baseline traffic volumes. These are outlined below

- Turning movements into the minor roads of the following intersections were sourced from the university's traffic reports.
- A standard supermarket traffic generation rate was assumed for the Hill Street Grocer, which was not developed at the time of the traffic surveys
- Directional distribution of traffic volumes was informed from the strategic model

6.3.4. Traffic Generation

Adopted Traffic Rates

The following Section outlines the traffic generation rates that have been assumed for the development of the Sandy Bay Masterplan. These rates have been sourced from the RMS Technical Direction 'Guide to Traffic Generating Developments Updated Traffic Surveys' (August 2013). These rates are an industry standard used throughout Australia, and are recommended as a source to be utilised by the Traffic Impact Assessment Guidelines from the Department of State Growth:

"*Trip generation rates derived from surveys of a wide variety of land use developments are contained in the Roads and Maritime Services (New South Wales), Guide to Traffic Generating Developments, Version 2.2, October 2002, and the Roads and Maritime Services (New South Wales), Guide to Traffic Generating Developments, Updated traffic surveys, August 2013.* "

In conducting this analysis, the raw survey data has been interrogated and analysed to refine the traffic generation rates that were ultimately utilised. This exercise involved excluding Sites located within inner city Sydney, as well as omitting outlier results and refining based on traffic engineering judgment.

Ultimately, this analysis was utilised to determine a traffic generation rate per car parking space. This approach is considered appropriate for the assessment given the proposed reduction in car parking provision compared to more 'standard' rates is quite significant and intentionally proposed as part of the Masterplan to encourage other transport modes and reduce traffic generation.

A summary of the anticipated traffic generation from the Site, based on rates obtained from various sources is presented below in Table 6.3. Further information regarding the adopted traffic generation rates is provided in Appendix C.

Table 6.3: Traffic Generation Rates

Land Use		Traffic Generation Rate	
		AM Peak	PM Peak
Residential	• Detached House • Townhouse • Apartment • Hotel	0.3 movements per car parking space	0.3 movements per car parking space
	• Retirement Living • Aged Care	0.22 movements per car parking space	0.22 movements per car parking space
Retail	• Specialty Retail	0.5 movements per car parking space	1 movement per car parking space
	• Supermarket	1 movement per car parking space	2 movements per car parking space
Commercial	• Office	0.4 movements per car parking space	0.4 movements per car parking space

Traffic Generation

Application of the above rates to the proposed development schedule is outlined for the full development in Table 6.4, alongside Table 6.5 and Table 6.6 which are broken down by precinct.

The tables indicate that the full development of the proposed Site is expected to generate in the order of 1,530 vehicle movements during the AM Peak Hour and 1,800 vehicle movements during the PM peak hour.

Table 6.4: Traffic Generation for Full Sandy Bay Masterplan

Land Use			Size	Car parking Rate	Traffic Generation Rate Per Car Parking Space		Traffic Generation	
					AM Peak	PM Peak	AM Peak	PM Peak
Residential	Townhouse		170	1.5	0.3	0.3	77	77
	Detached House		59	2	0.3	0.3	35	35
	Apartment	1 bedroom [1]	962	0.5	0.3	0.3	144	144
		2 bedroom	1,674	1	0.3	0.3	502	502
		3 bedroom	239	1.5	0.3	0.3	108	108
	Retirement Living	1 bedroom	16	0.5	0.22	0.22	2	2
		2 bedroom	57	1	0.22	0.22	12	12
		3 bedroom	8	1.5	0.22	0.22	3	3
	Visitor		3,185	0.1	0.3	0.3	96	96
	Aged Care		91	1	0.22	0.22	20	20
	Hotel		120	1	0.3	0.3	36	36
Retail	Specialty Retail		3,840 sqm [2]	2.4	0.5	1	46	92
	Supermarket		2,800 sqm [2]	4	1	2	112	224
	Market		2,800 sqm [2]	4	1	2	112	224
Commercial	Office		18,640 sqm [2]	3	0.4	0.4	224	224
Total							1,530	1,800

[1] Includes student accommodation for assessment purposes
[2] 20% reduction factor from GFA to NLA

Table 6.5: Traffic Generation by Precinct – AM Peak

Land Use		Precinct 1	Precinct 2	Precinct 3	Precinct 4	Precinct 5	Total
Residential	• Detached House • Townhouse • Apartment • Hotel	84	247	322	186	162	1,001
	• Retirement Living • Aged Care	0	37	0	0	0	37
Retail	• Specialty Retail	6	18	4	0	19	47
	• Supermarket • Market	0	112	0	0	112	224
Commercial	• Office	34	177	0	0	12	223

Table 6.6: Traffic Generation by Precinct – PM Peak

Land Use		Precinct 1	Precinct 2	Precinct 3	Precinct 4	Precinct 5	Total
Residential	• Detached House • Townhouse • Apartment • Hotel	84	247	322	186	162	1,001
	• Retirement Living • Aged Care	0	37	0	0		37
Retail	• Specialty Retail	12	35	8	0	38	93
	• Supermarket • Market	0	224	0	0	224	448
Commercial	• Office	34	177	0	0	12	223
Total		130	720	330	186	436	1,802

It is noted that the above assessment has not had consideration for the "Community", "Childcare" or "Health" land uses for the following reasons:

- As outlined earlier in this report, the parking for the community land uses is to be shared from other car parking provisions (e.g., office car parking). This sharing is proposed as the community land uses are not expected to generate parking or traffic activity during road network peak periods.
- It is expected that the childcare and health land uses will principally service the local area, with the majority of trips likely to be completed by walking or cycling, be completed contained in the precinct, or completed as part of another trip already on the network (i.e., linked trips).

Comparison against Strategic Modelling Trip Generation

The traffic generation estimated in the above assessment has then been compared with the generation forecast from the GHUTDM model. This comparison is shown in Table 6.7.

Table 6.7: Comparison of Traffic Generation Volumes

Precinct	GHUTDM Traffic Generation		Traffic Engineering Rates Generation		Difference	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Precinct 1	83	87	124	130	150%	149%
Precinct 2	432	426	591	720	137%	169%
Precinct 3	219	231	326	330	149%	143%
Precinct 4	122	137	186	186	152%	136%
Precinct 5	271	307	305	436	113%	142%
Total	1,126	1,189	1,532	1,802	136%	152%

The above comparison highlights that the traffic volumes estimated for the micro level SIDRA assessment are approximately 150% of the strategic model volumes and are therefore conservative on the high side.

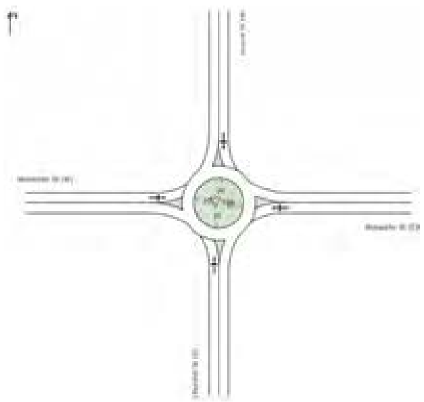
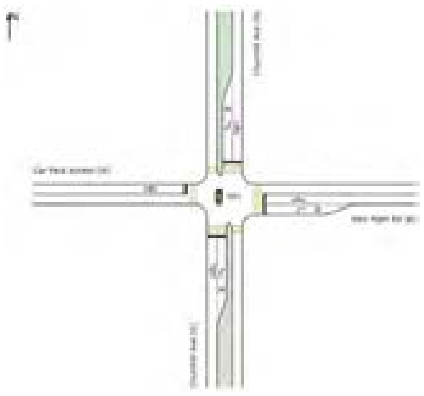
6.3.5. Traffic Distribution & Assignment

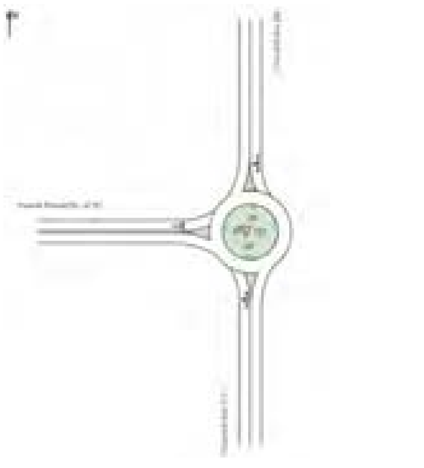
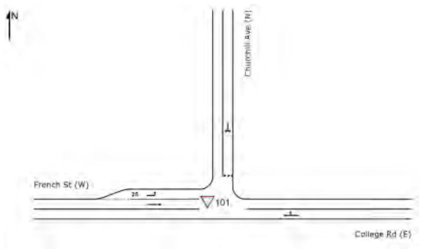
The above traffic generation volumes have been distributed onto the road network in the immediate surrounds of the Site. This traffic distribution was guided by the distribution generated by the strategic modelling. Details of the assumptions made as a part of this assessment are outlined in Appendix D.

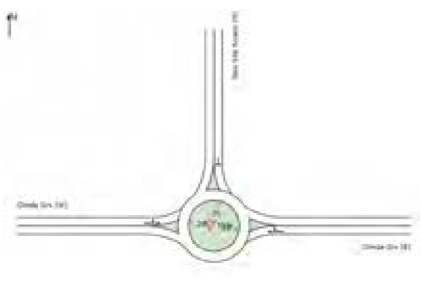
6.3.6. Intersection Layouts

The Masterplan includes intersection works at a number of locations throughout the Site. Concept designs for these intersections are outlined in Section 4.3 of this report, with the SIDRA assumed configurations also shown in Table 6.8.

Table 6.8: Layouts of Intersections Analysed in SIDRA

Ref	Intersection	Layout	Comment
1	Sandy Bay Road / Marieville Esplanade / New Site Access Point		• Sandy Bay Road will broadly remain in its current arrangement, with the peak hour no standing zones extended to cover both peak hours in both directions • Provision of separated right turn lane and left turn lane into the new Site access point • Relocation of Marieville Esplanade to the north to align with the new signalised X-intersection • New Site Access Point with separated right and left turn lanes
2	Churchill Avenue / Alexander Street		• Retain existing arrangements
3	Churchill Avenue / Car Park Access / New Access Road		• New signalised intersection on Churchill Avenue • Signals to provide a greater level of pedestrian amenity to Precinct 2 • Churchill Avenue will remain largely unchanged, with the provision of separated right turn lanes. • Split phasing assumed for minor road approaches • Lead and lag assumed for Churchill Avenue approaches

Ref	Intersection	Layout	Comment
4	Churchill Avenue / French Street Access		• Build roundabout in replacement of existing intersection to alleviate safety concerns • Roundabout design consistent with roundabouts along Churchill Avenue
5	French Street / College Road / Churchill Avenue Access		• Retain existing arrangements
6	Churchill Avenue / Clark Road / T T Flynn Street		• Roundabout arrangement broadly consistent with existing conditions • It is noted that the north approach will be reoriented as a more 'standard' approach
7	Olinda Grove / Proctors Road		• Retain existing arrangements

Ref	Intersection	Layout	Comment
8	Olinda Grove / Site Access Point		• Provide new roundabout access point to Precinct 5

6.3.7. Intersection Results

The future operation of the surrounding intersections has been assessed using *SIDRA INTERSECTION 9,* a computer based modelling package which calculates intersection performance.

The commonly used measure of intersection performance is referred to as the *Degree of Saturation (DOS)*. The DOS represents the flow-to-capacity ratio for the most critical movement on each leg of the intersection. For signalised intersections, a DOS of around 0.95 has been typically considered the 'ideal' limit, beyond which queues and delays increase disproportionately[5].

A summary of the intersections operating performance in the post development design year (2040) is provided below. Extracts of the SIDRA modelling results are shown in Appendix F, alongside the traffic volumes and distributions that were assumed.

Sandy Bay Road

All traffic distributed to access Sandy Bay Road was assumed to utilise the new signalised intersection that is proposed, linking to the relocated Marieville Esplanade. The results of this analysis are shown in Table 6.9.

Table 6.9: Sandy Bay Road SIDRA Intersection Results

Ref	Intersection	Peak Hour	Degree of Saturation	Average Delay (sec)	95th %ile Queue Length (m)
1	Sandy Bay Road / Marieville Esplanade / New Site Access Point	AM Peak	0.63	27 sec	173m
		PM Peak	0.71	32 sec	176m

The results of this analysis indicate queuing in the order of 170m during peak periods along Sandy Bay Road, with minor delays of in the order of 30 seconds. These results show the intersection operating with capacity to spare on all approaches.

5 SIDRA INTERSECTION adopts the following criteria for Level of Service assessment:

Level of Service		Intersection Degree of Saturation (DOS)		
		Unsignalised Intersection	Signalised Intersection	Roundabout
A	Excellent	<=0.60	<=0.60	<=0.60
B	Very Good	0.60-0.70	0.60-0.70	0.60-0.70
C	Good	0.70-0.80	0.70-0.90	0.70-0.85
D	Acceptable	0.80-0.90	0.90-0.95	0.85-0.95
E	Poor	0.90-1.00	0.95-1.00	0.95-1.00
F	Very Poor	>=1.0	>=1.0	>=1.0

Churchill Avenue

A number of intersections along Churchill Avenue were assessed, with various intersection improvements proposed along the corridor. The results of this analysis are shown in Table 6.10.

Table 6.10: Churchill Avenue SIDRA Intersection Results

Ref	Intersection	Peak Hour	Degree of Saturation	Average Delay (sec)	95th %ile Queue Length (m)
2	Churchill Avenue / Alexander Street	AM Peak	0.65	5 sec	56m
		PM Peak	0.53	5 sec	36m
3	Churchill Avenue / Car Park Access / New Access Road	AM Peak	0.70	12 sec	170m
		PM Peak	0.71	16 sec	159m
4	Churchill Avenue / French Street Access	AM Peak	0.53	6 sec	36m
		PM Peak	0.51	6 sec	34m
5	French Street / College Road / Churchill Avenue Access	AM Peak	0.19	5 sec	7m
		PM Peak	0.17	4 sec	5m
6	Churchill Avenue / Clark Road / TT Flynn Street	AM Peak	0.65	7 sec	51m
		PM Peak	0.58	6 sec	42m

The above analysis indicates that all intersections operate within their theoretical capacity. The unsignalised intersections and roundabouts experience minor levels of queuing and delay.

The newly proposed signalised intersection will experience queuing greater than 150m during peak periods. The queuing experienced outlined in this location is the 95th percentile, and will only occur during peak events. The more standard operating conditions during peak periods will see lesser queuing.

The provision of a signalised intersection at this location has been included as a pedestrian accessibility measure, providing a signalised opportunity to cross Churchill Avenue

Olinda Grove

Two intersections were assessed on Olinda Grove that will experience on uplift in traffic as a result of the development of precinct 5. The results of this analysis are shown in Table 6.11.

Table 6.11: Olinda Grove SIDRA Intersection Results

Ref	Intersection	Peak Hour	Degree of Saturation	Average Delay (sec)	95th %ile Queue Length (m)
7	Olinda Grove / Proctors Road	AM Peak	1.4	228 sec	1,939m
		PM Peak	*Insufficient Data Available*		
8	Olinda Grove / Site Access Point	AM Peak	0.49	6 sec	31m
		PM Peak	0.51	5 sec	39m

The above results indicate that the proposed roundabout Site access point operates well within its capacity during both peak periods.

However, the analysis also indicates that the intersection of Olinda Grove / Proctors Road is expected to exceed its capacity during the AM Peak hour. This intersection has a significant volume of left turn vehicles from the western approach, travelling north up Proctors Road. To improve the roundabout, an additional left turn lane could be provided on the western approach.

This potential mitigation treatment is shown in Figure 6.10, with the updated modelling results outlined in Table 6.12. The analysis indicates that the provision of an additional left turn lane rectifies the delay caused by the proposed development. It is expected that this will be further analysed and addressed in the permit application stage for Precinct 5.

Figure 6.10:Proposed Mitigating Works to Olinda Grove / Proctors Road Intersection

Table 6.12: Revised Olinda Grove / Proctors Road SIDRA Intersection Results

Ref	Intersection	Peak Hour	Degree of Saturation	Average Delay (sec)	95th %ile Queue Length (m)
7	Olinda Grove / Proctors Road	AM Peak	0.87	13 sec	132m
		PM Peak	*Insufficient Data Available*		

6.3.8. Key Findings and Implications

The results of the above assessment indicate that the intersections and Site access points generally operate comfortably and within capacity, noting the following commentary:

- The proposed signalised intersection to Sandy Bay Road can accommodate the traffic demands distributed towards it from the Site, whilst still operating with minimal delay
- The existing and proposed roundabouts to Churchill Avenue will operate within their capacity, with minimal delay.
- The proposed signalised intersection to Churchill Avenue will result in queue lengths of ~150m, with minimal delay
- The proposed roundabout treatment for the access point on Olinda Grove to Precinct 5 will operate comfortably within its capacity
- The adjacent intersection of Olinda Grove / Proctors Road will be pushed over its capacity and require mitigating works to accommodate the future traffic volumes.

6.4. Summary

The traffic impacts of the redevelopment of the Sandy Bay Masterplan have been assessed using a mix of strategic and operational modelling undertaken in tandem and cross referenced to ensure consistency.

The strategic modelling indicates that the traffic impacts of the proposed development at a macro perspective are relatively minor, particularly on the road network close to the Site. Closer to the CBD, there are select road linkages where congestion occurs at present and is expected to experience some increase in the future with or without the development of the Site.

In closer proximity to the Site, the SIDRA analysis finds that the intersections providing access to the proposed development can be expected to operate satisfactorily under ultimate post-development conditions subject to the intersection works outlined in this report. It is expected that these intersections works, together with the potential need for mitigating works at other nearby intersections (such as at Olinda Grove / Proctors Road), will be further analysed and addressed in subsequent planning permit application stages.

7. CONCLUSION

07

CONCLUSION

Based on the analysis and discussions presented within this report, the following conclusions are made:

- The University of Tasmania is proposing to relocate their Sandy Bay Campus into the Hobart CBD, unlocking a development opportunity of the current Campus.
- This report has been written to support the Masterplan PSA submission for the proposed mixed-use precinct and associated planning scheme amendment
- The current University Campus is a busy and activated precinct with a significant level of activity generated. The relocation of the campus will relocate the current traffic demands
- The proposed Site layout will draw upon the strengths of the existing road network, with a mixed-use precinct that encourages alternative modes of transport, multipurpose trips and trip containment
- A reduced car parking supply is proposed on-Site that will encourage the shared use of car parking as a resource by the various proposed land uses
- A multi-tiered modelling approach, consisting of a mixture of high-level strategic modelling and detailed operational modelling was undertaken to assess the impact of the proposed development on the surrounding road network.
- The results of the traffic modelling exercise indicate that the road network is expected to continue to operate within its capacity into the road network, accounting for the various road works that are proposed within the Masterplan.
- It is expected that road network capacity and traffic impacts will be further explored as part of the next planning phase for the project.

A. EXISTING UTAS TRAFFIC GENERATION

A

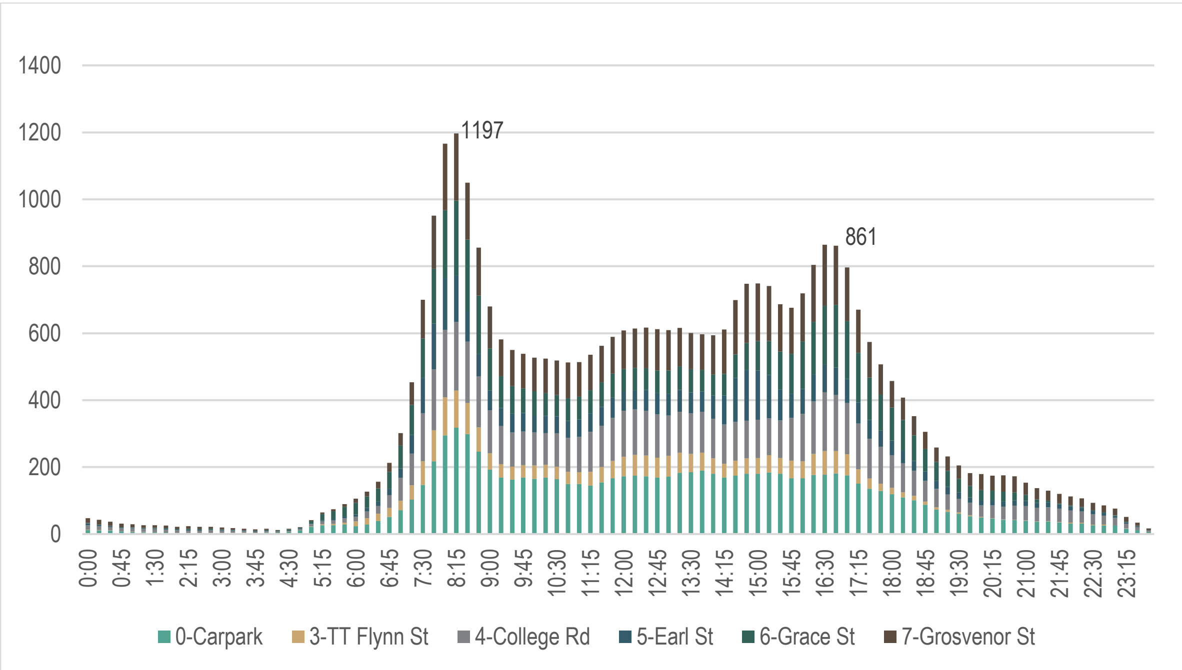
A.1. Summary of 2014 Tube Count Data

To determine the existing traffic volumes that are generated by the UTAS Site, GTA was provided with a number of week-long ATC tube counts that were conducted by the university in 2014. Whilst the data is aged, it is considered probable that the survey still provide a good proxy of the traffic generated by the University.

The traffic surveys were undertaken at the locations outlined in Figure A.1 with a summary of the approximate cumulative traffic counts (excluding potential double counting) shown in Figure A.2.

Figure A.1: Tube Count Survey Locations

Figure A.2: Summary of Tube Count Surveys



The above data analysis indicates found a combined traffic volume of 1,197 vehicle movements during the AM Peak Hour and 861 vehicle movements during the PM peak hour. It is reiterated that this traffic data is not comprehensive and would exclude traffic to/from the locations shown in Figure A.3.

Figure A.3: Car Parking Demands not Captured by Tube Counts

For reference, a summary of the survey results for all locations is outlined in Figure A.4 to Figure A.11.

Figure A.4: Survey Results at 0-Carpark

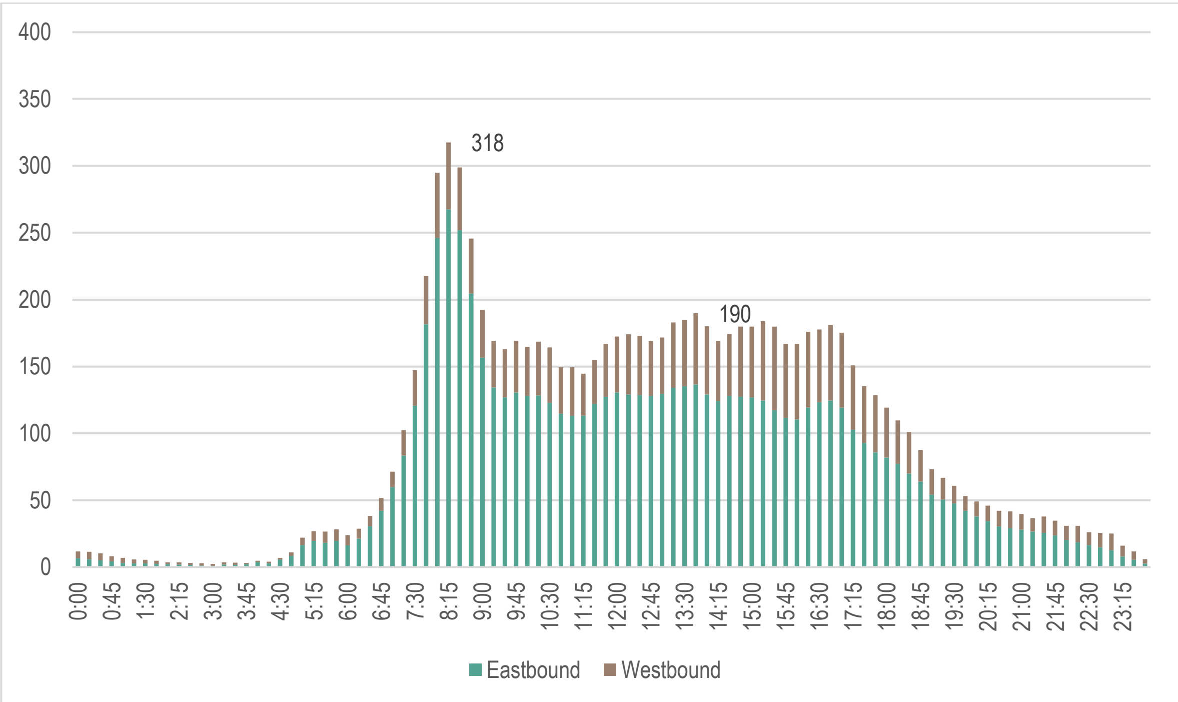


Figure A.5: Survey Results at 1-Clark Rd

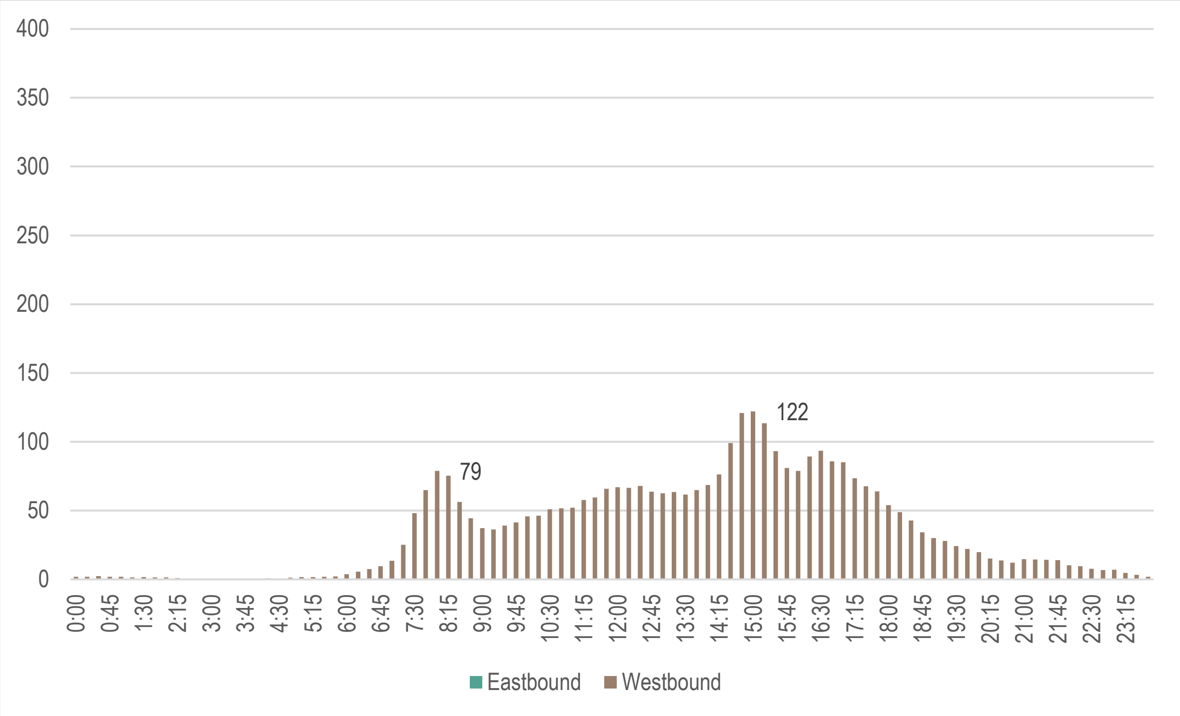


Figure A.6: Survey Results at 2-Dobson

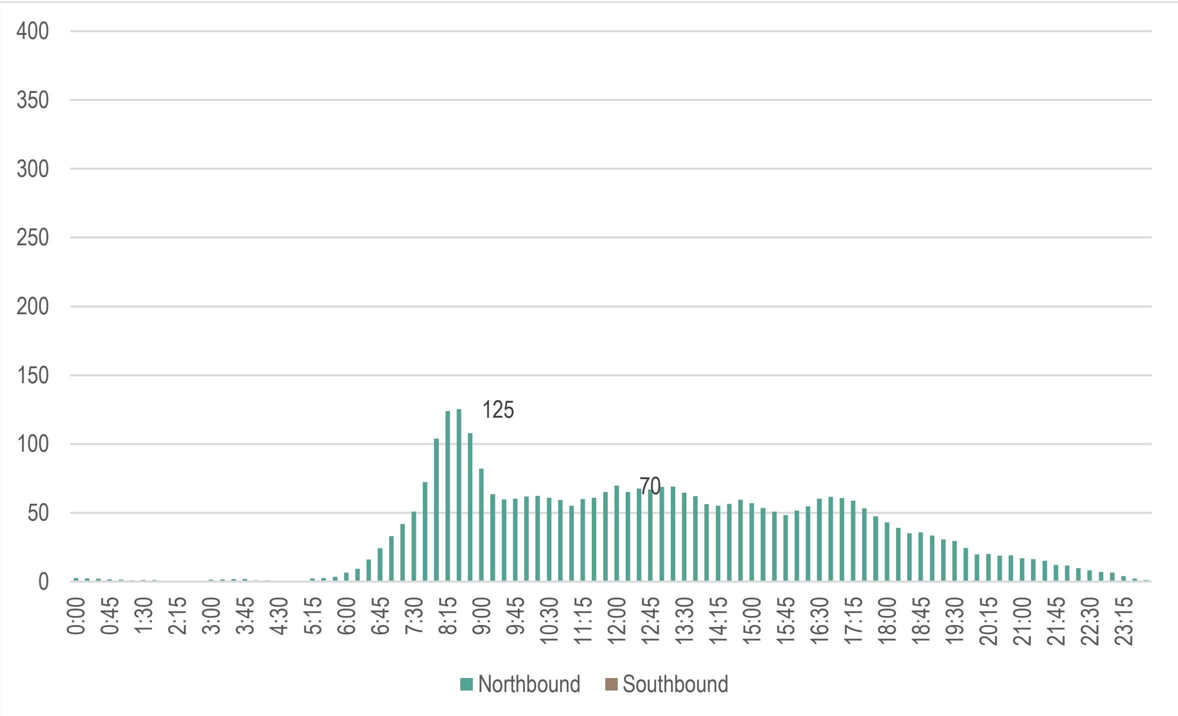


Figure A.7: Survey Results at 3-T T Flynn St

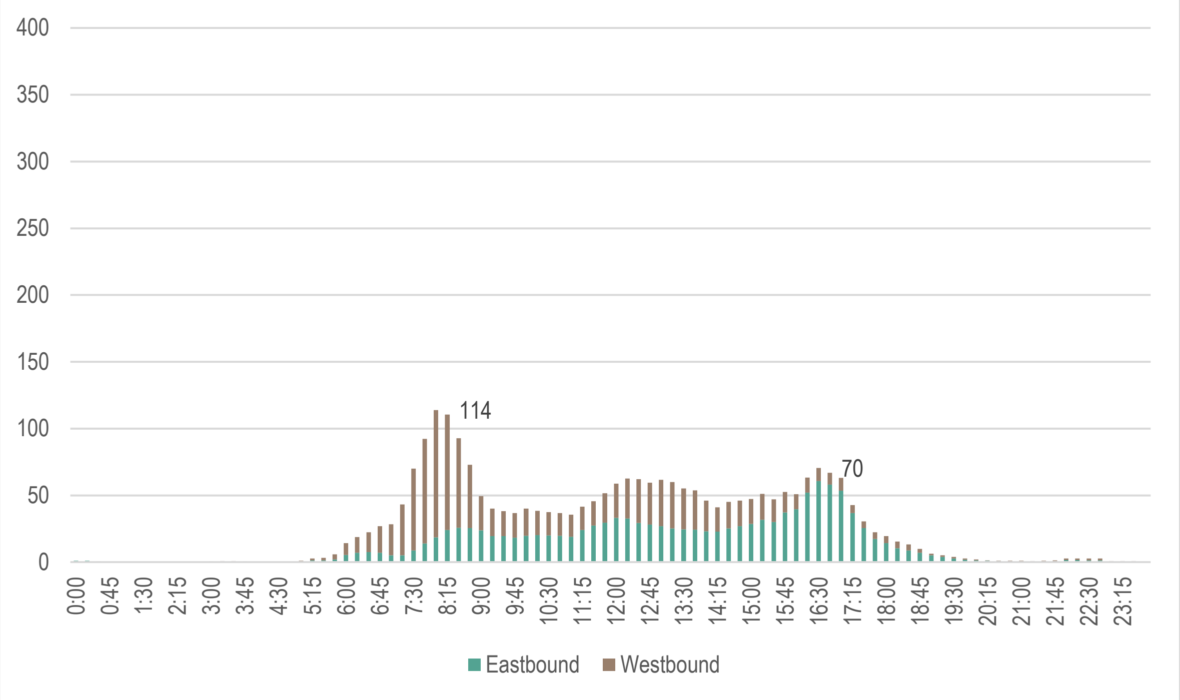


Figure A.8: Survey Results at 4-College Rd

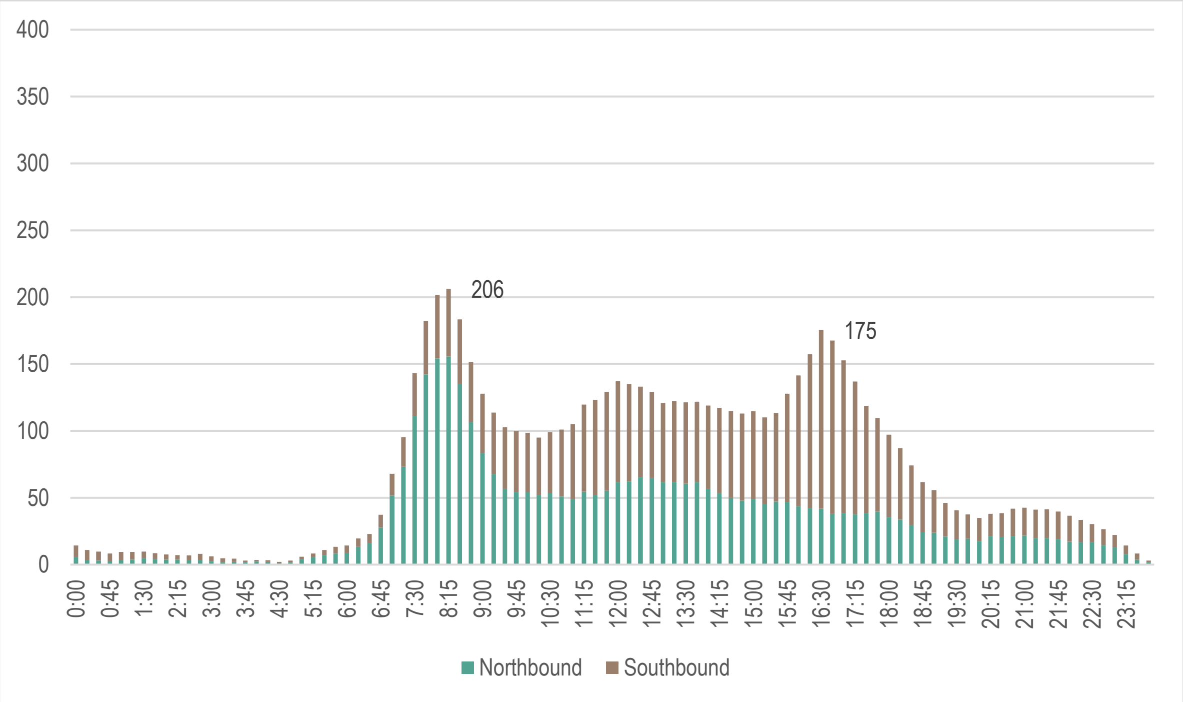


Figure A.9: Survey Results at 5-Earl St

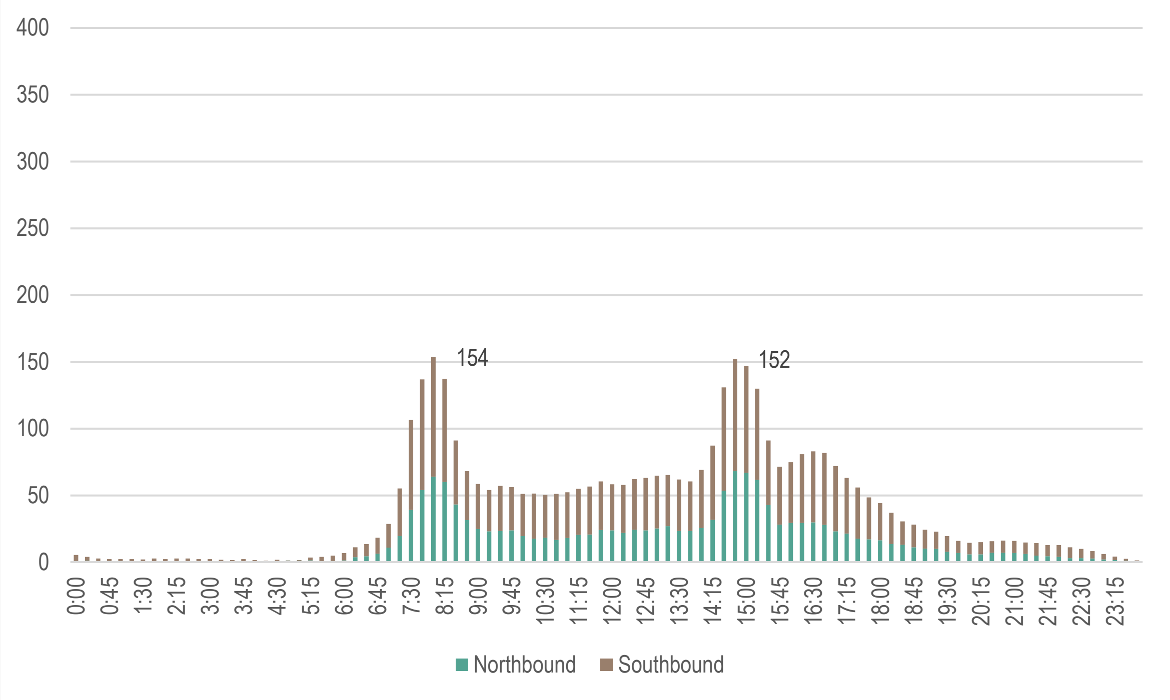


Figure A.10: Survey Results at 6-Grace St

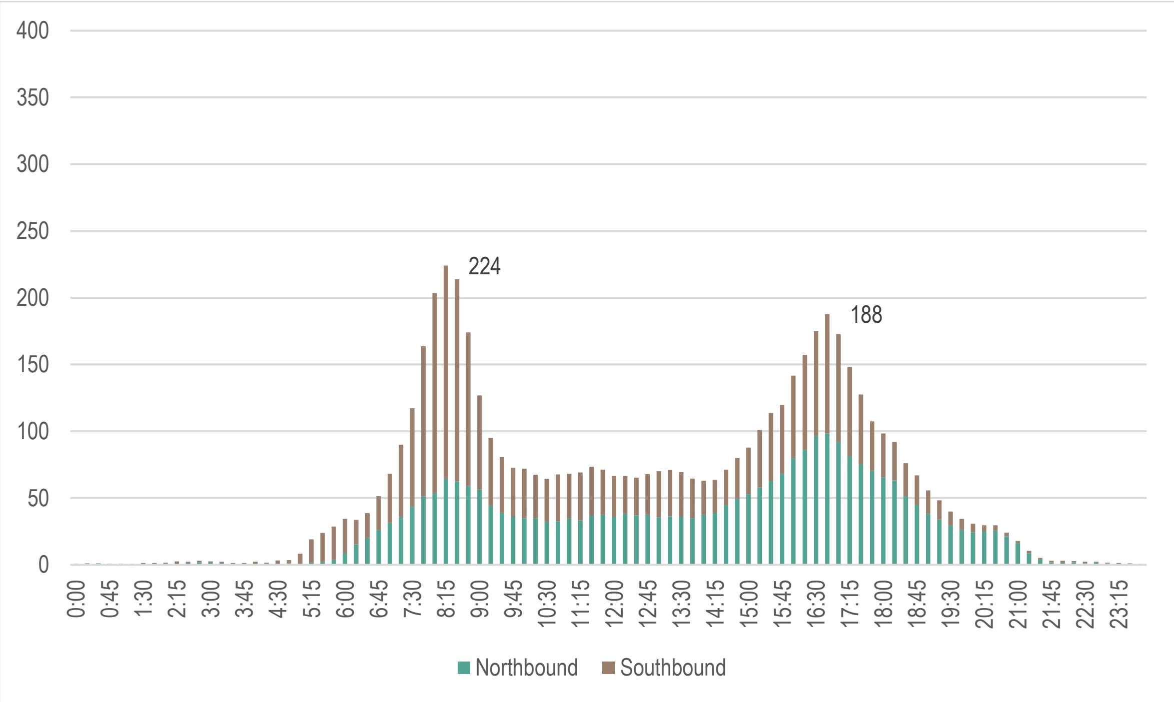
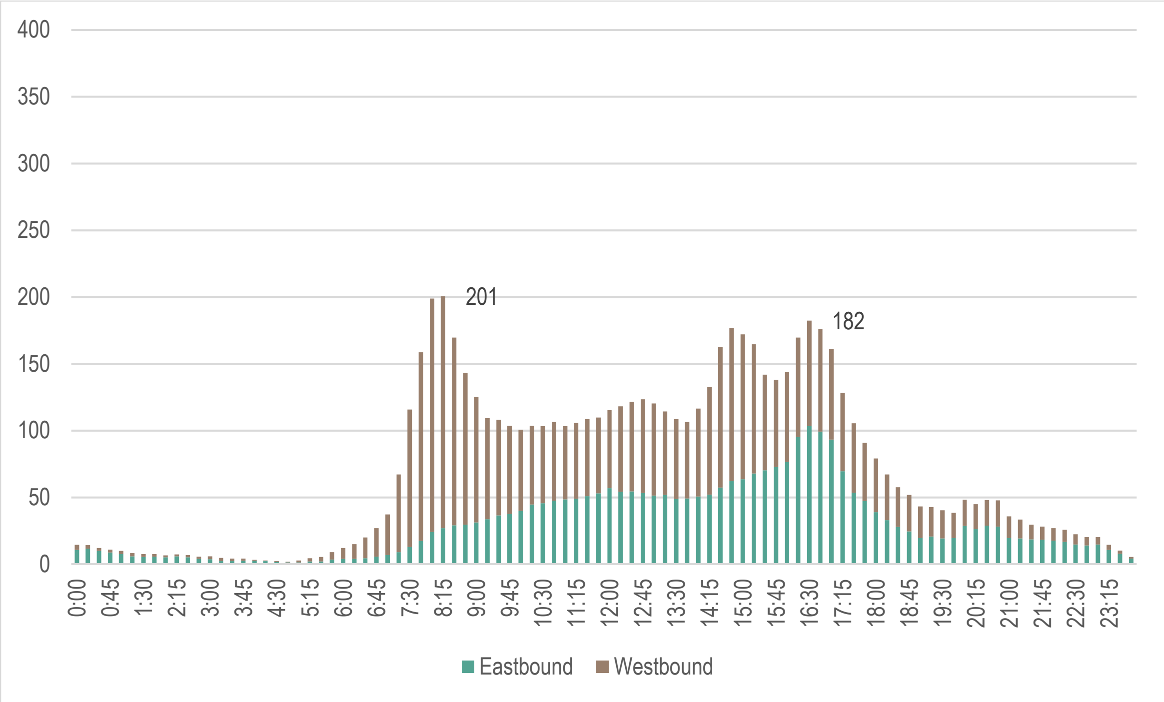


Figure A.11: Survey Results at 7-Grosvenor



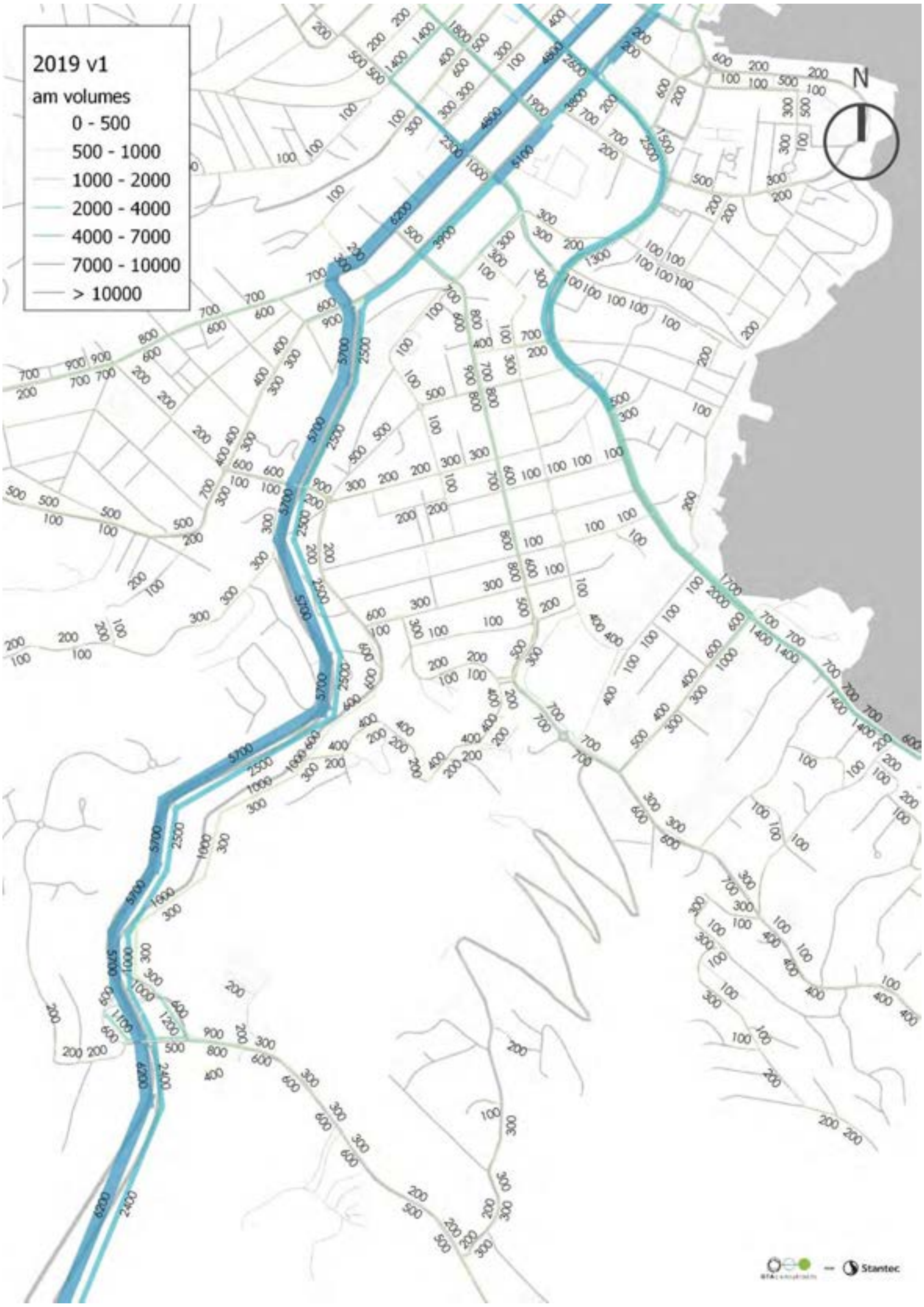
B. OVERVIEW OF GREATER HOBART URBAN TRAVEL DEMAND MODEL RESULTS

B

APPENDIX: OVERVIEW OF GREATER HOBART URBAN TRAVEL DEMAND MODEL RESULTS

7.1. 2019 Base Case

Figure B.1: 2019 AM Volumes



APPENDIX: OVERVIEW OF GREATER HOBART URBAN TRAVEL DEMAND MODEL RESULTS

Figure B.2: 2019 PM Volumes

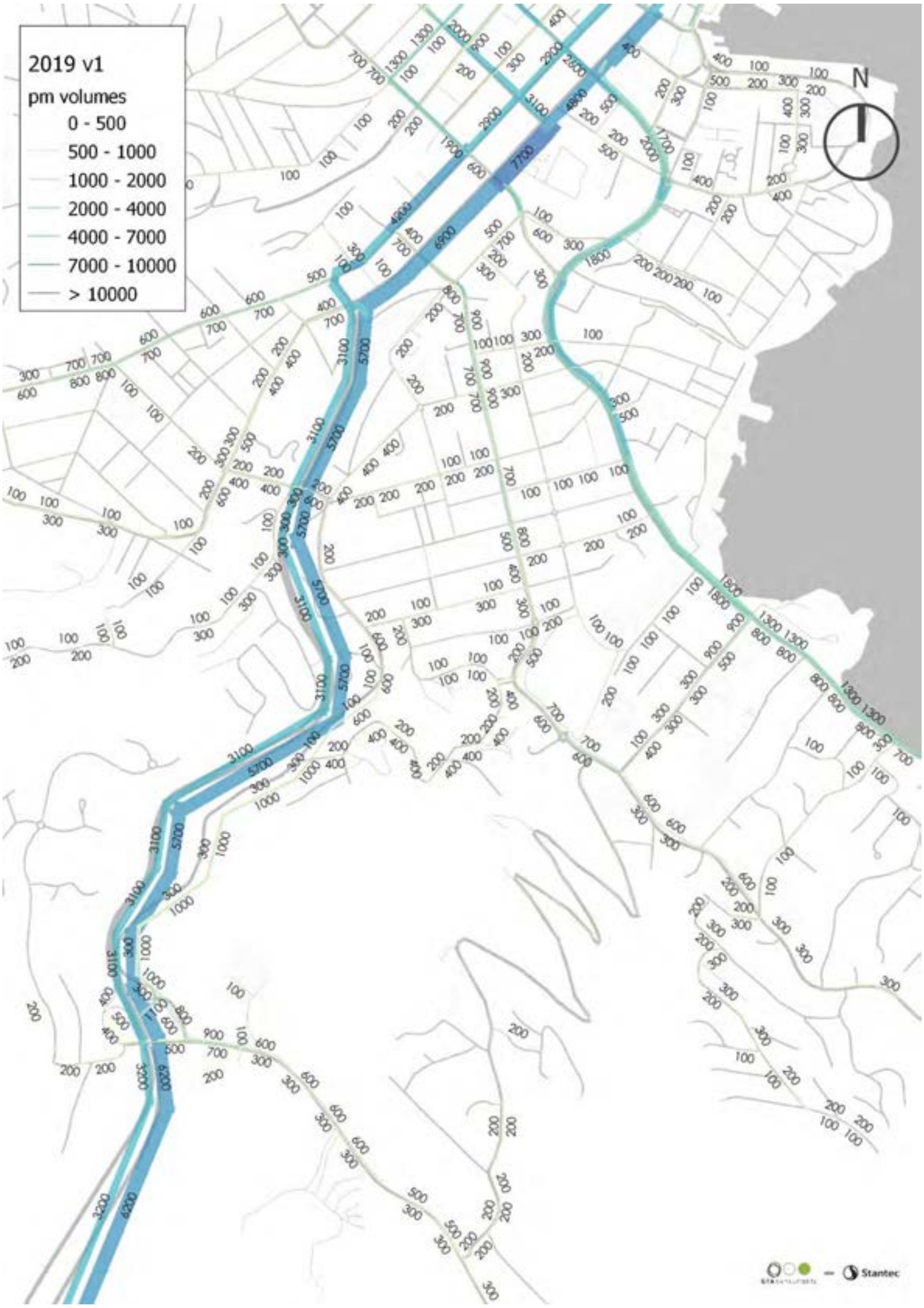


Figure B.3: 2019 Daily Volumes

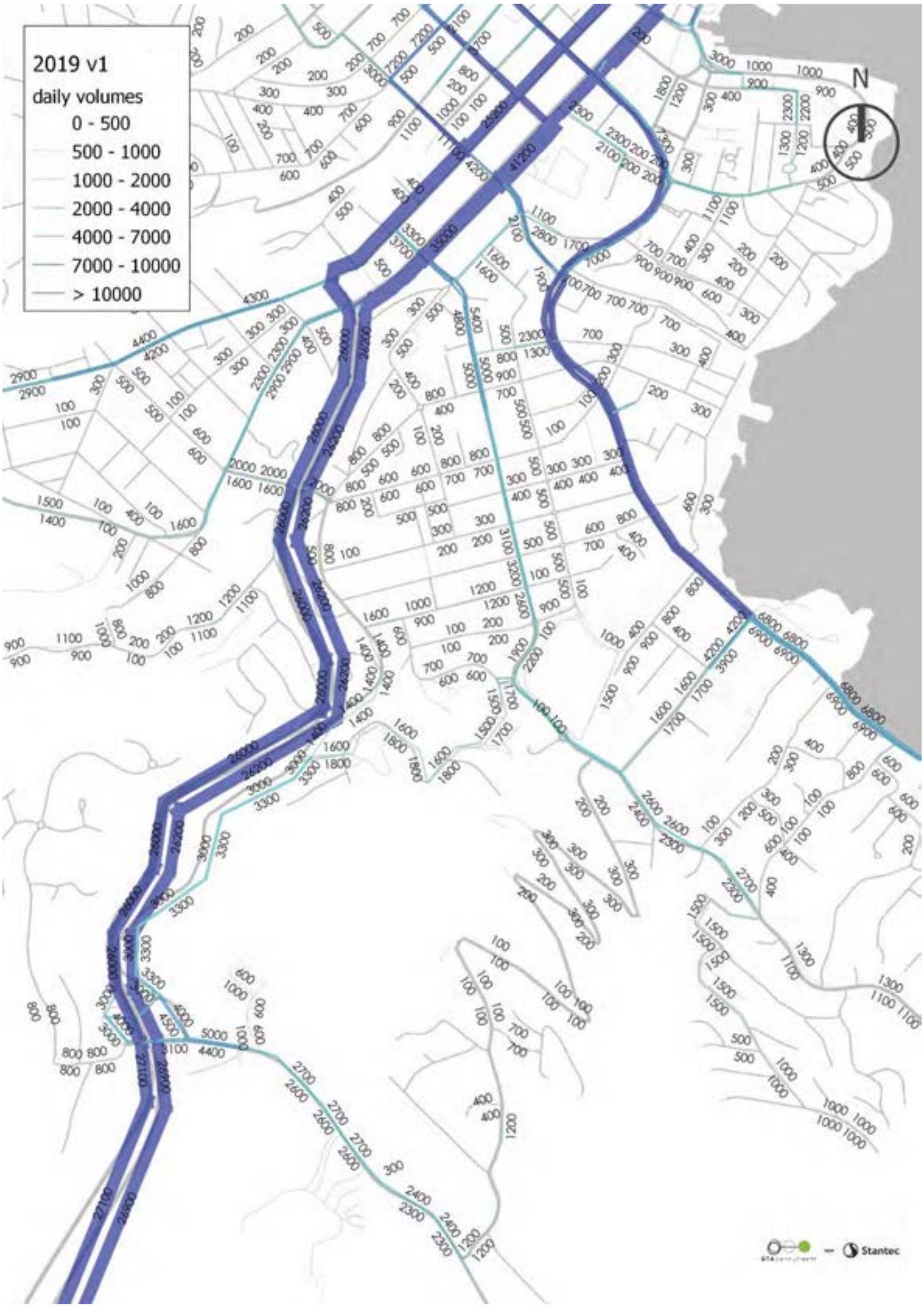


Figure B.4: 2019 AM V/C

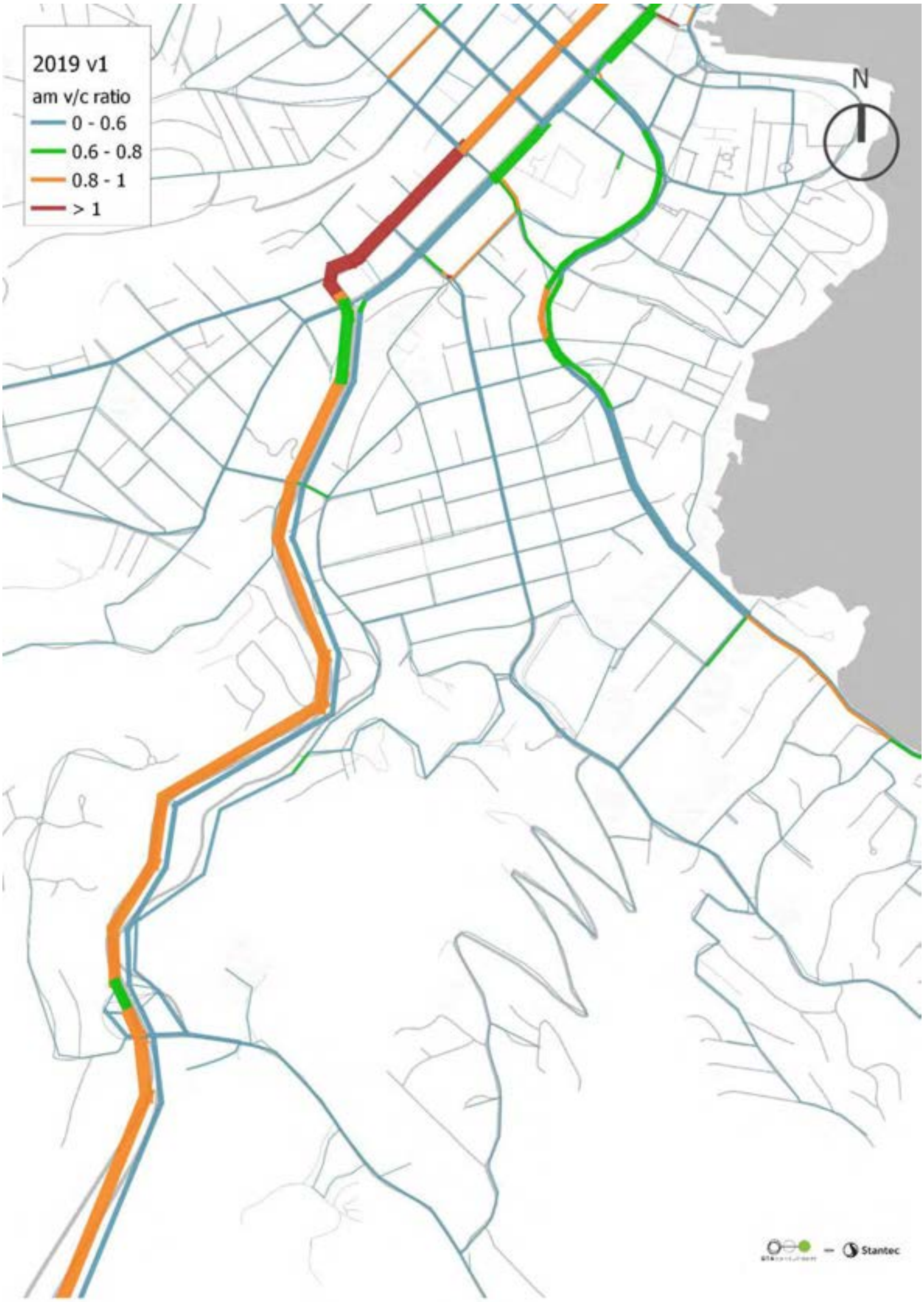
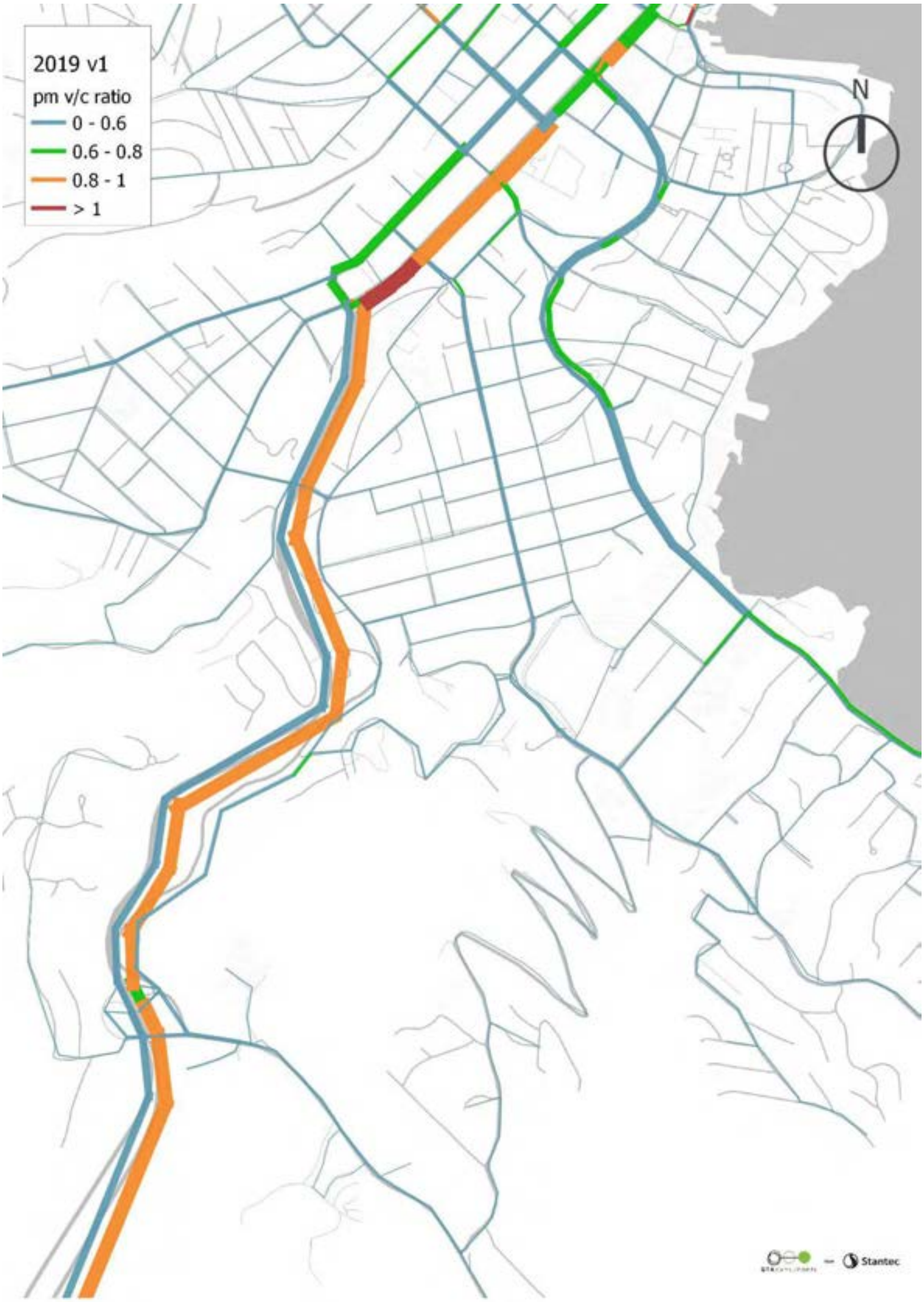


Figure B.5: 2019 PM V/C



B.1. 2040 Base Case

Figure B.6: 2040 Base Case AM Volumes

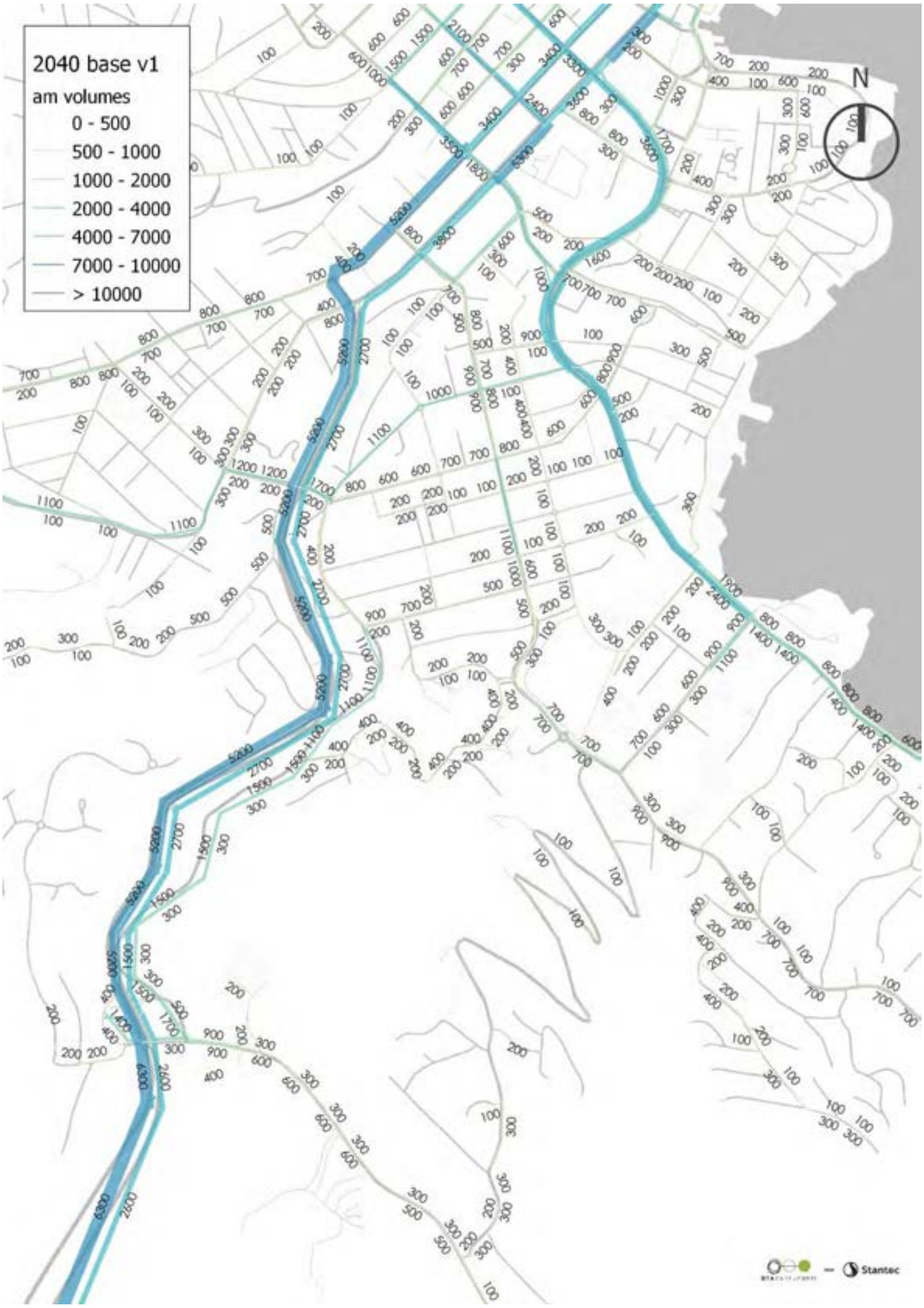


Figure B.7: 2040 Base Case PM Volumes

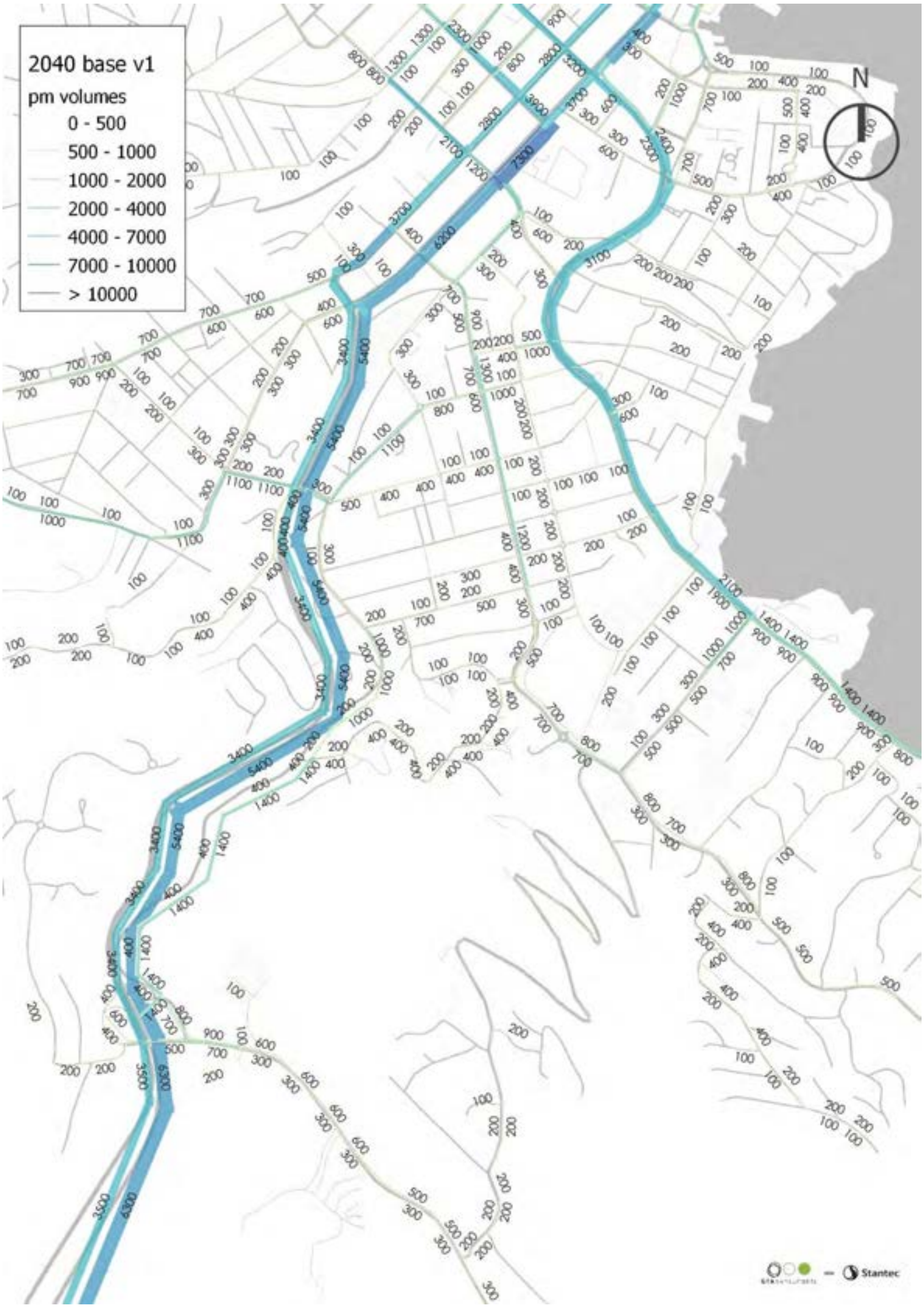


Figure B.8: 2040 Base Case Daily Volumes

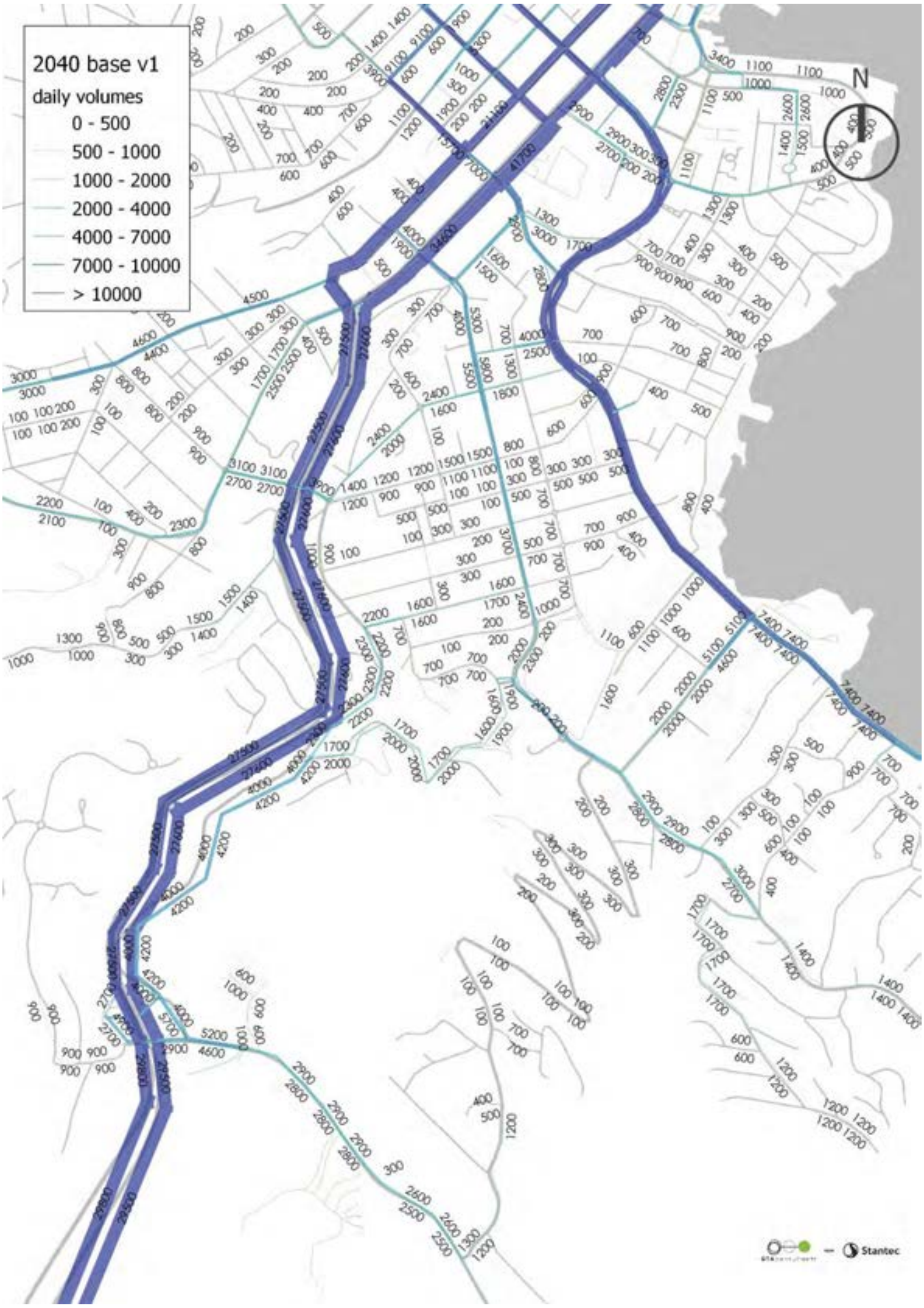


Figure B.9: 2040 Base Case AM V/C

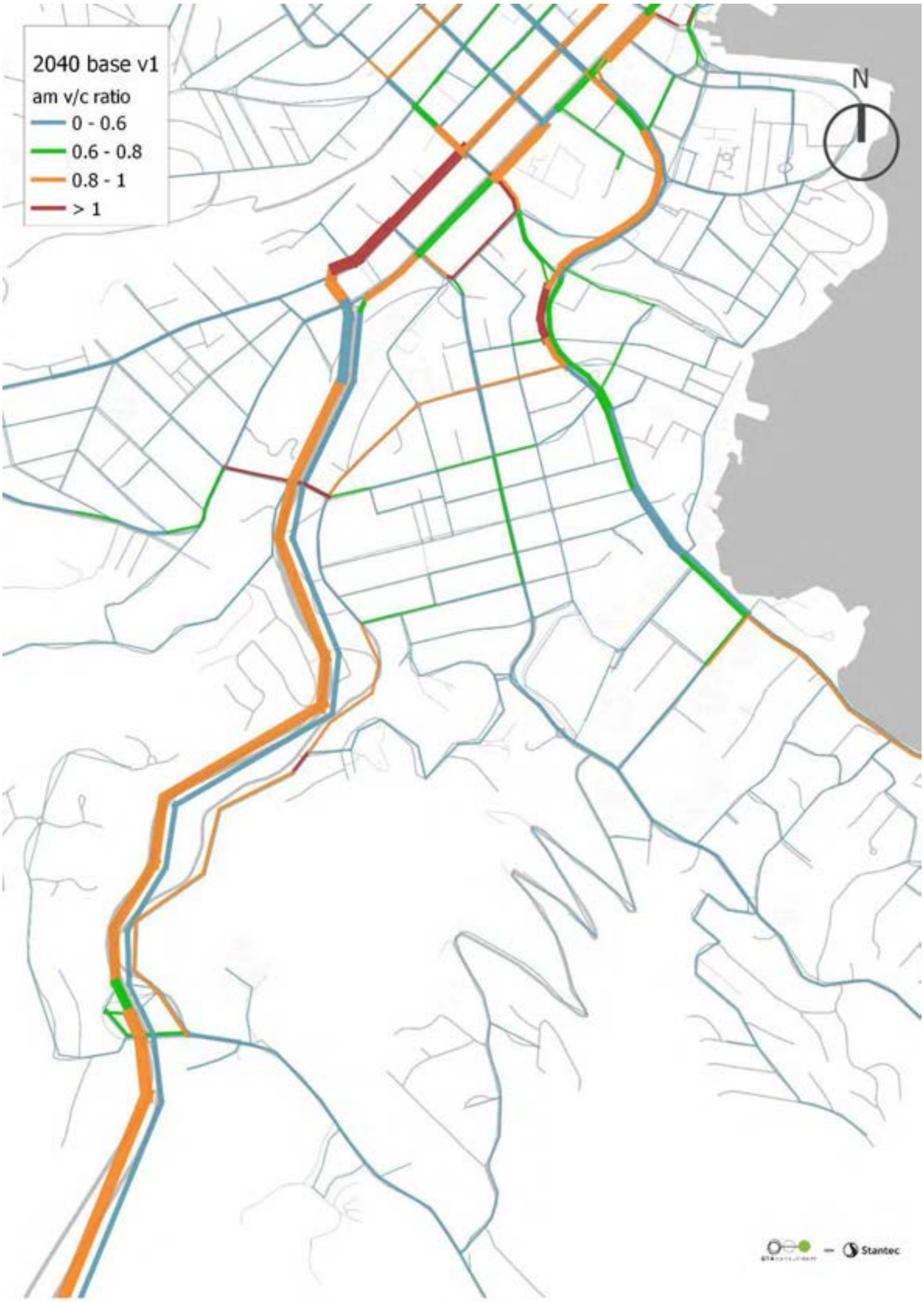
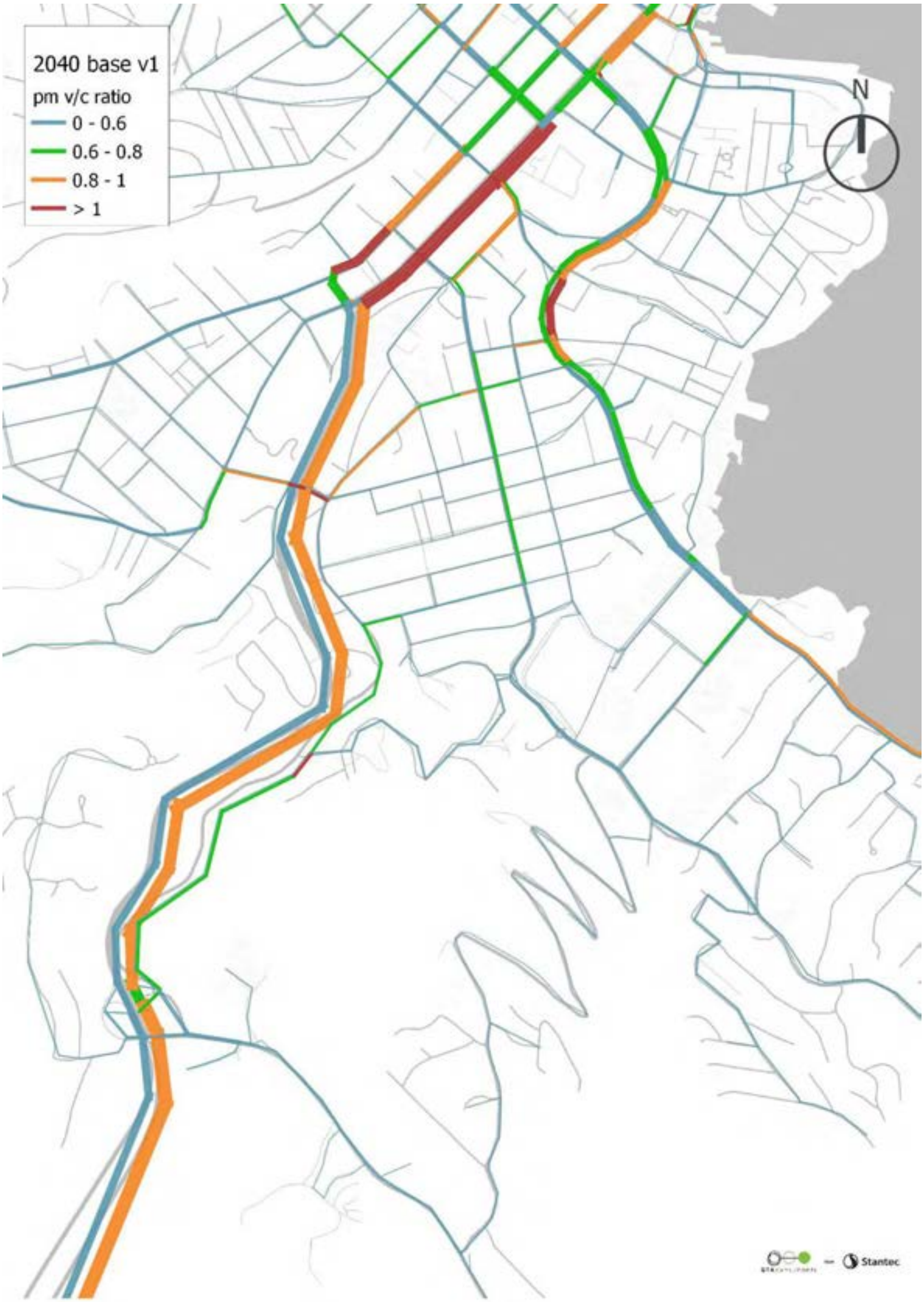


Figure B.10: 2040 Base Case PM V/C



B.2. 2040 Project Case

Figure B.11: 2040 Project Case AM Volumes

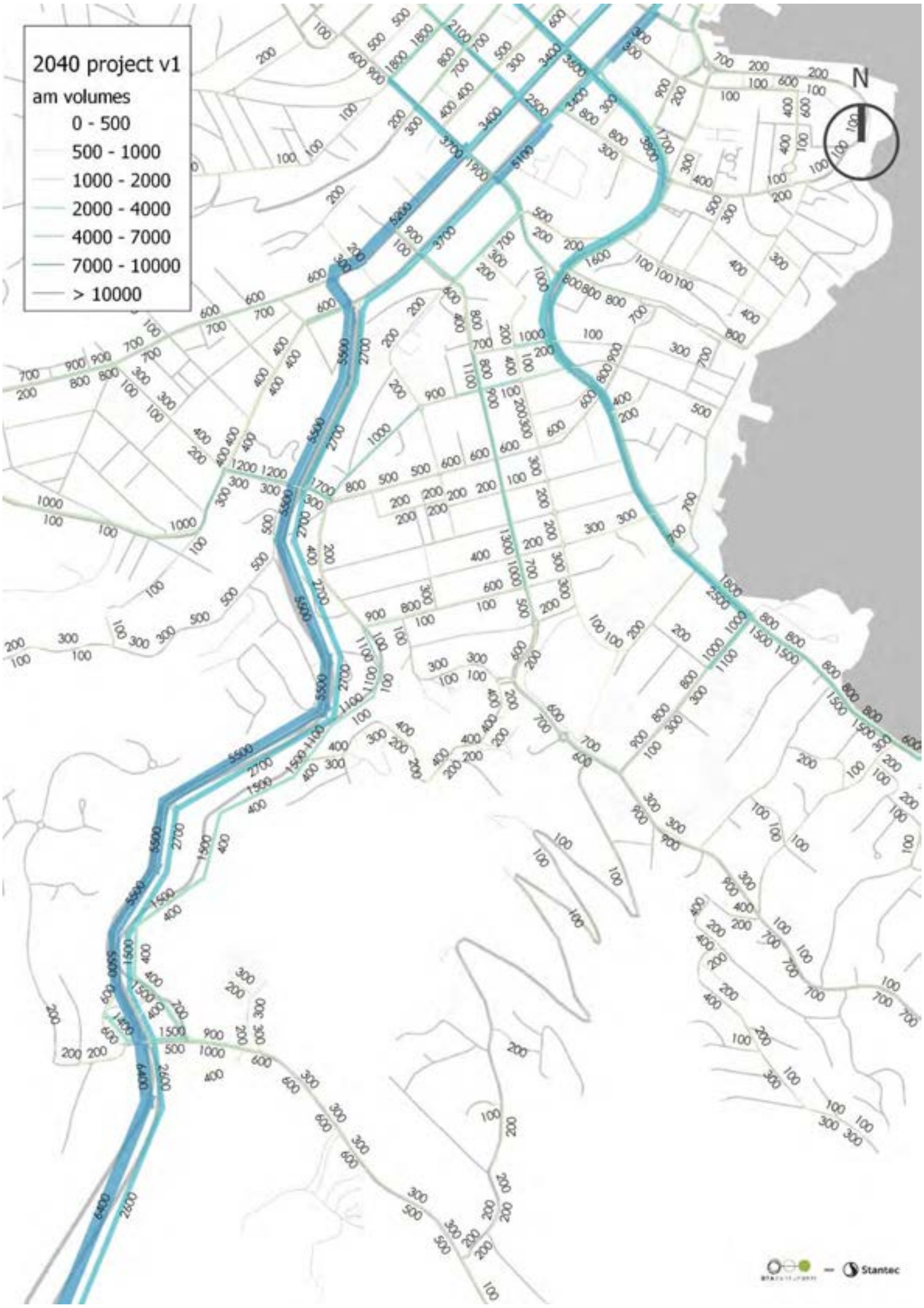


Figure B.12: 2040 Project Case PM Volumes

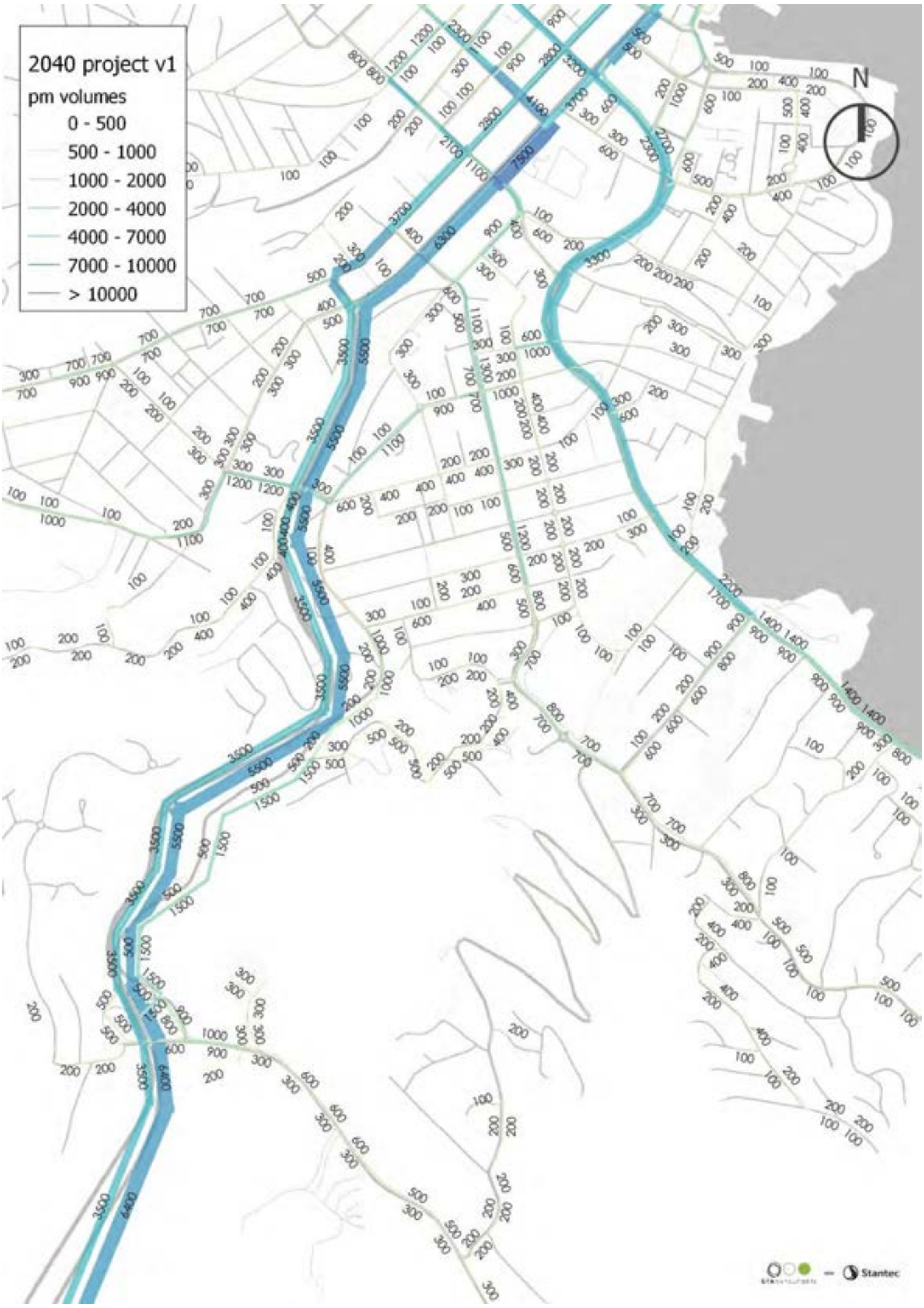


Figure B.13: 2040 Project Case Daily Volumes

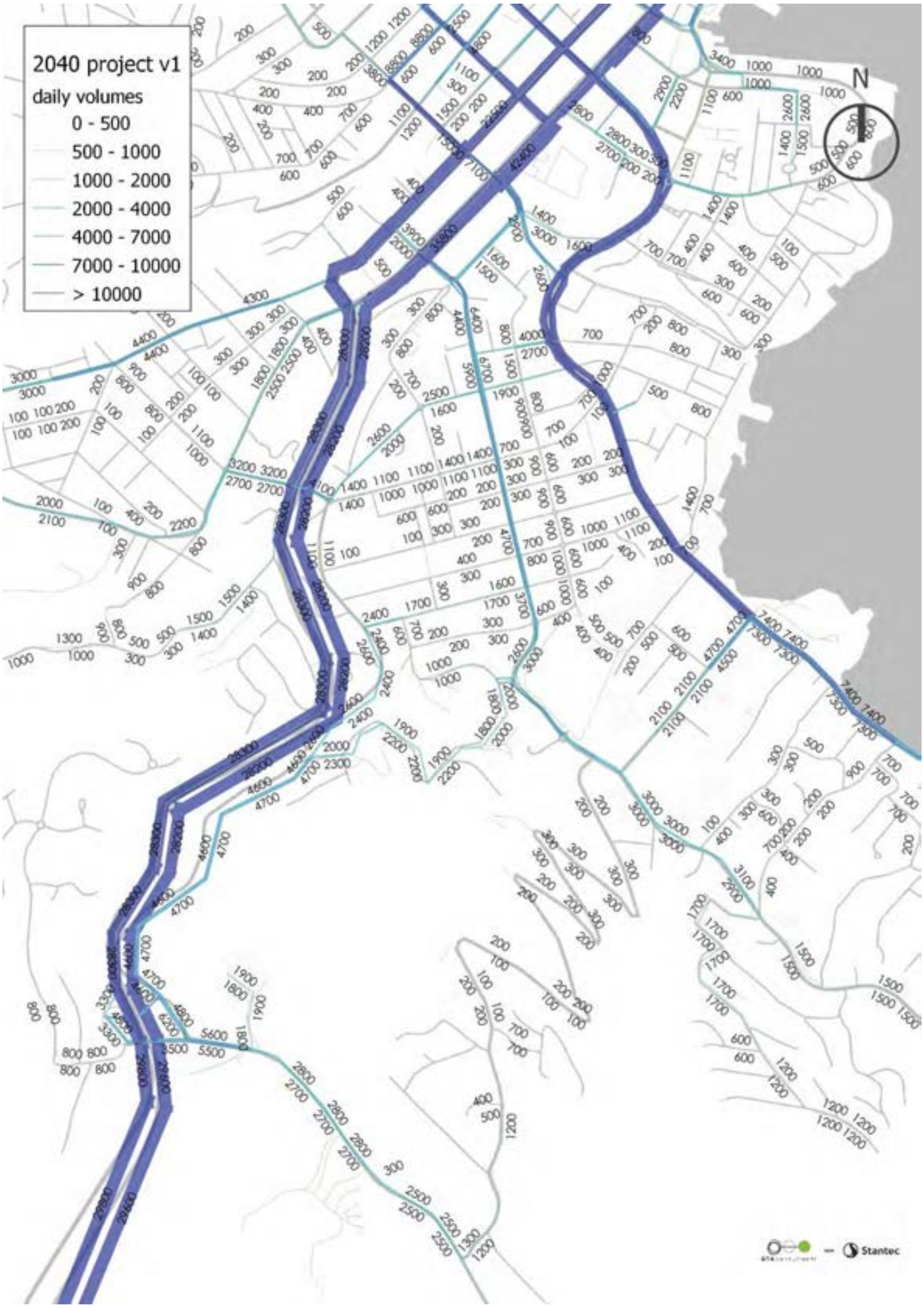


Figure B.14: 2040 Project Case AM V/C

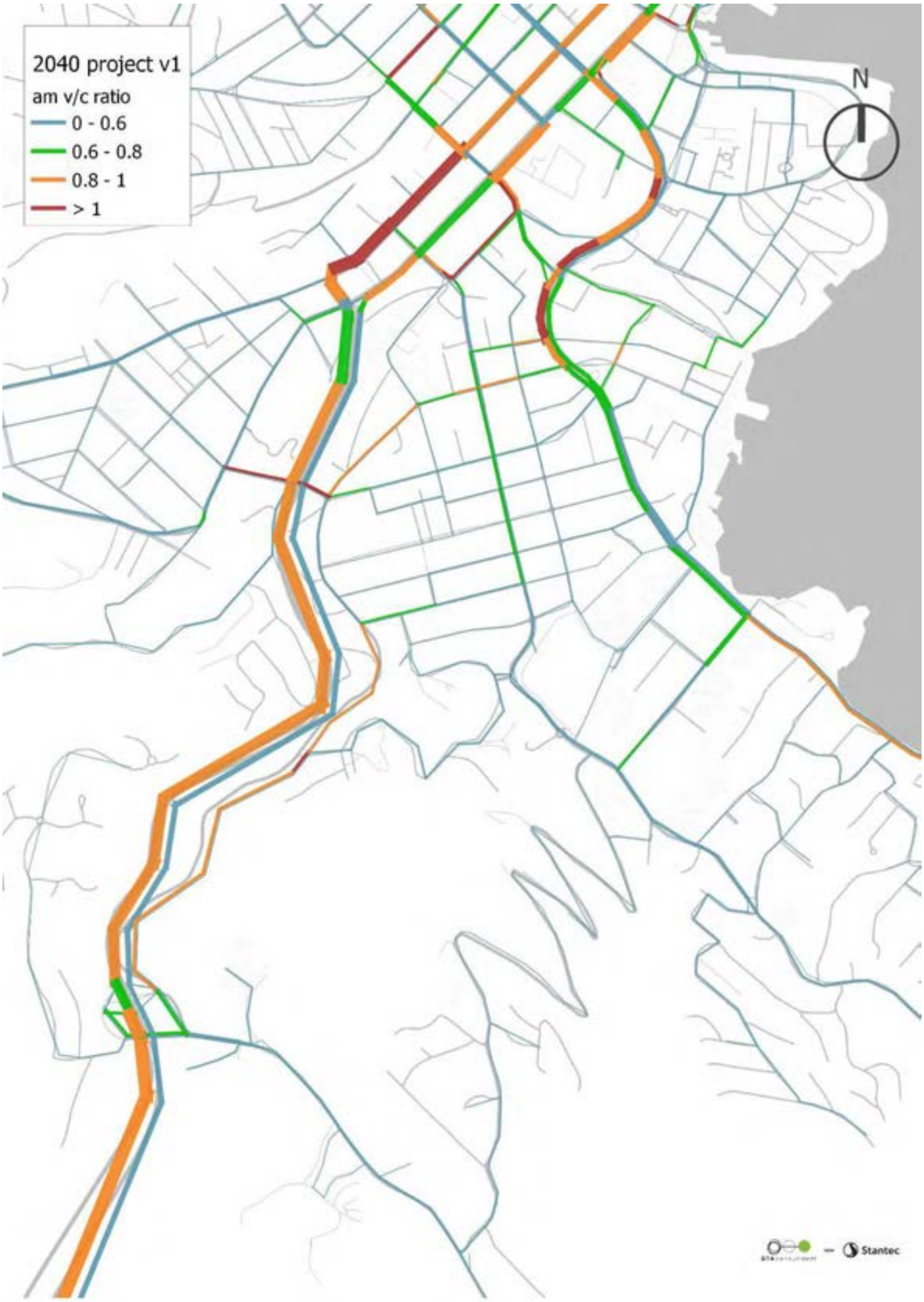
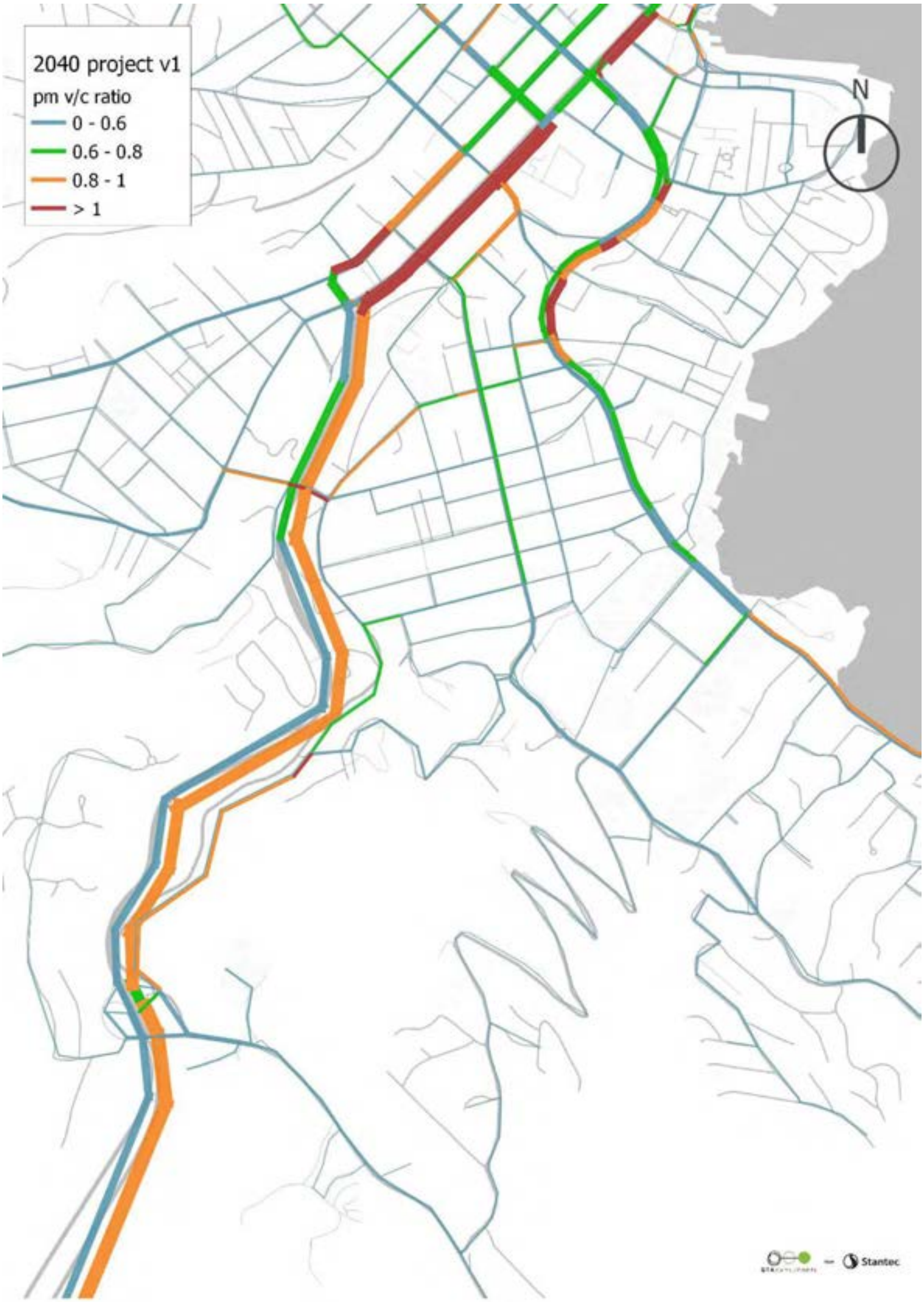


Figure B.15: 2040 Project Case PM V/C



B.3. Traffic Distribution Plots

Figure B.16: Precinct 1 Traffic Distribution Inbound

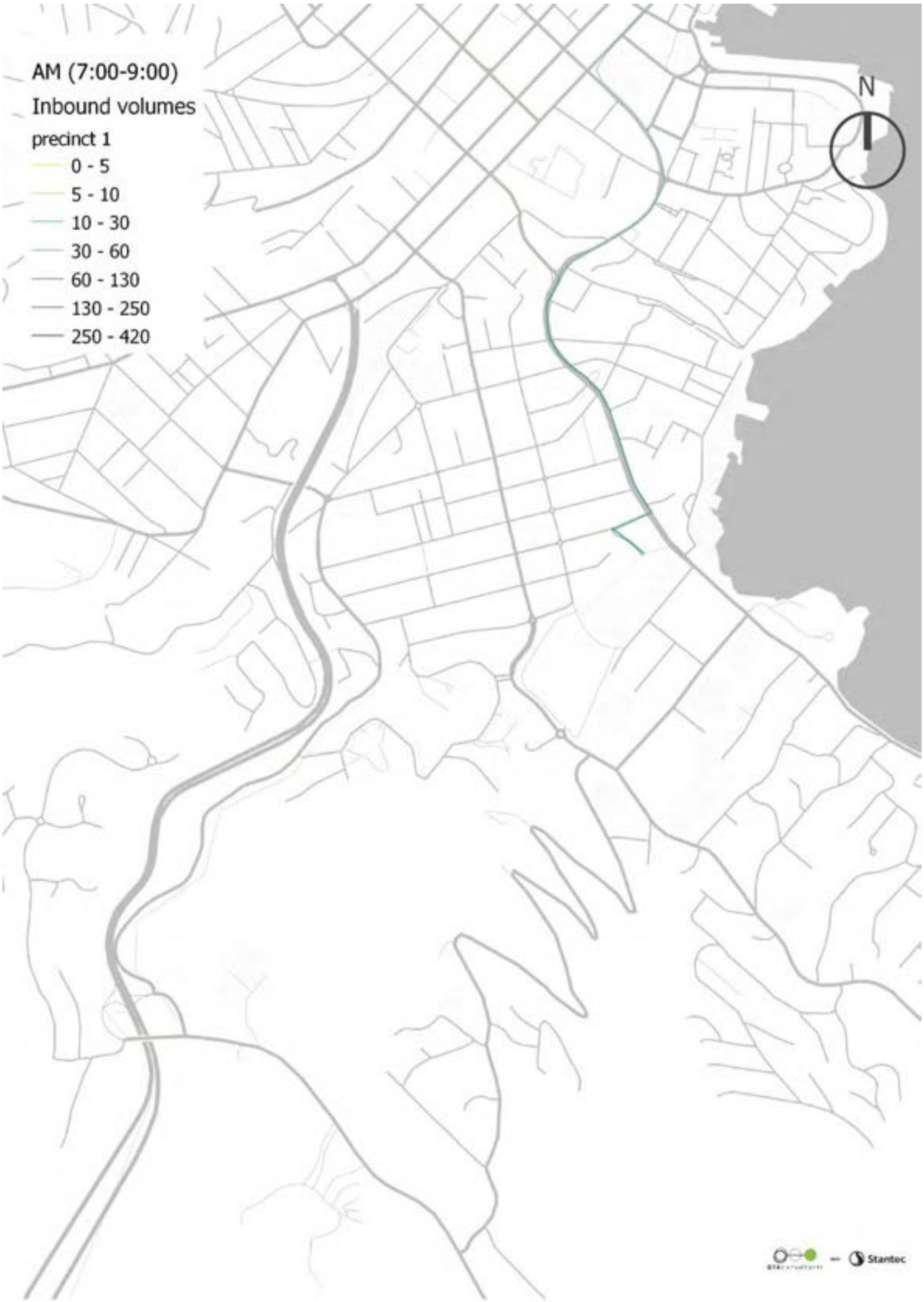


Figure B.17: Precinct 1 Traffic Distribution Outbound

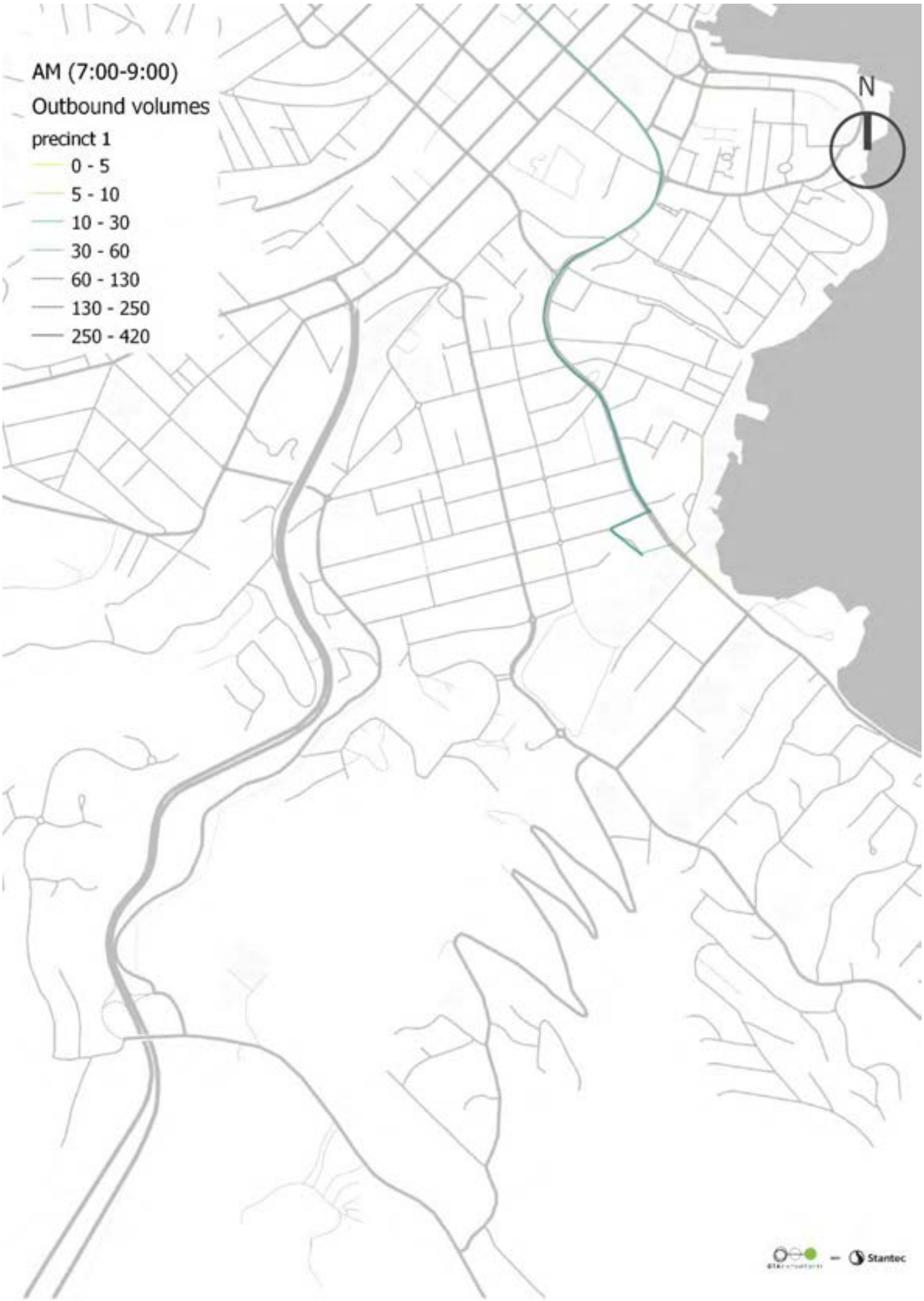


Figure B.18: Precinct 2 Traffic Distribution Inbound

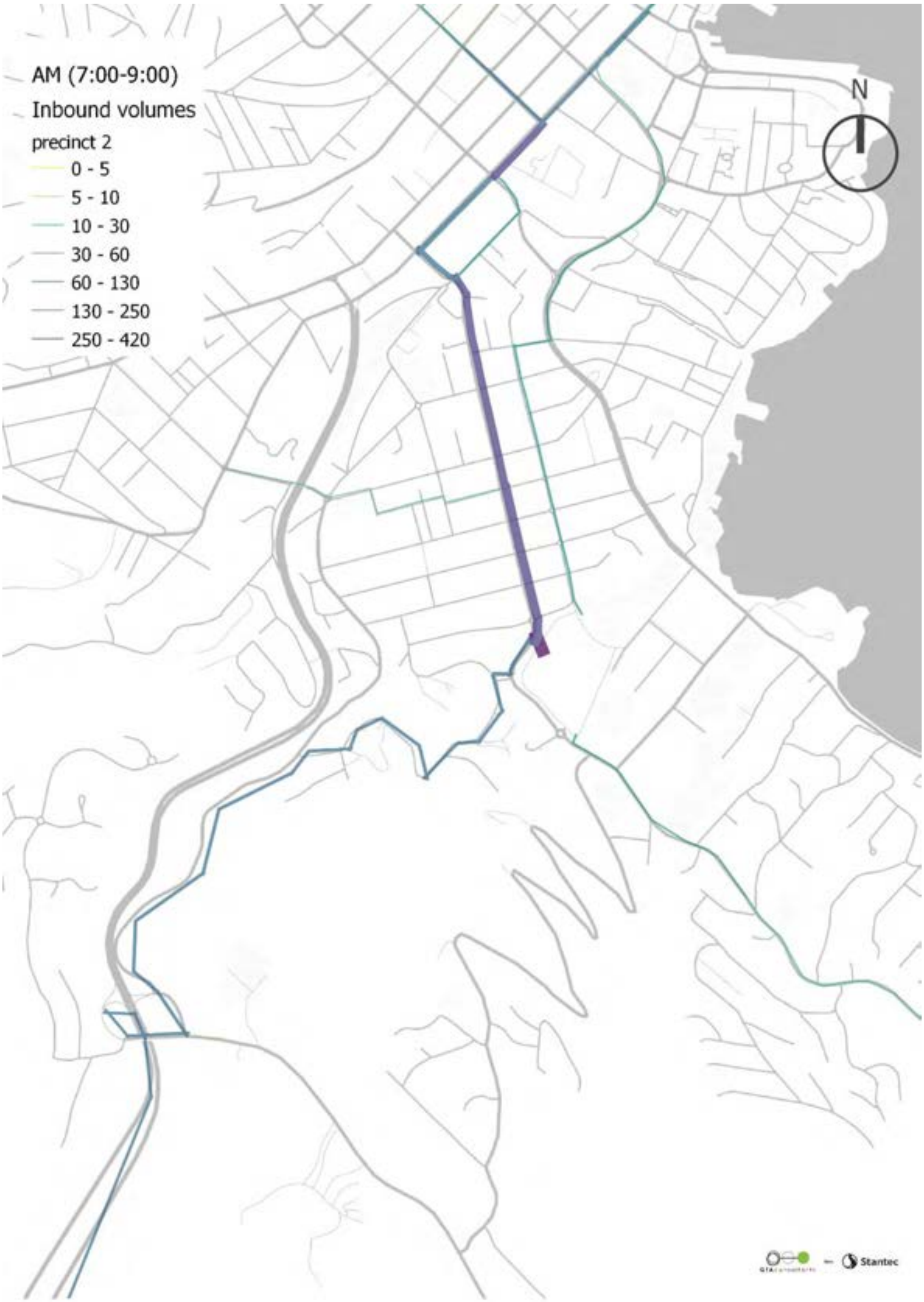


Figure B.19: Precinct 2 Traffic Distribution Outbound

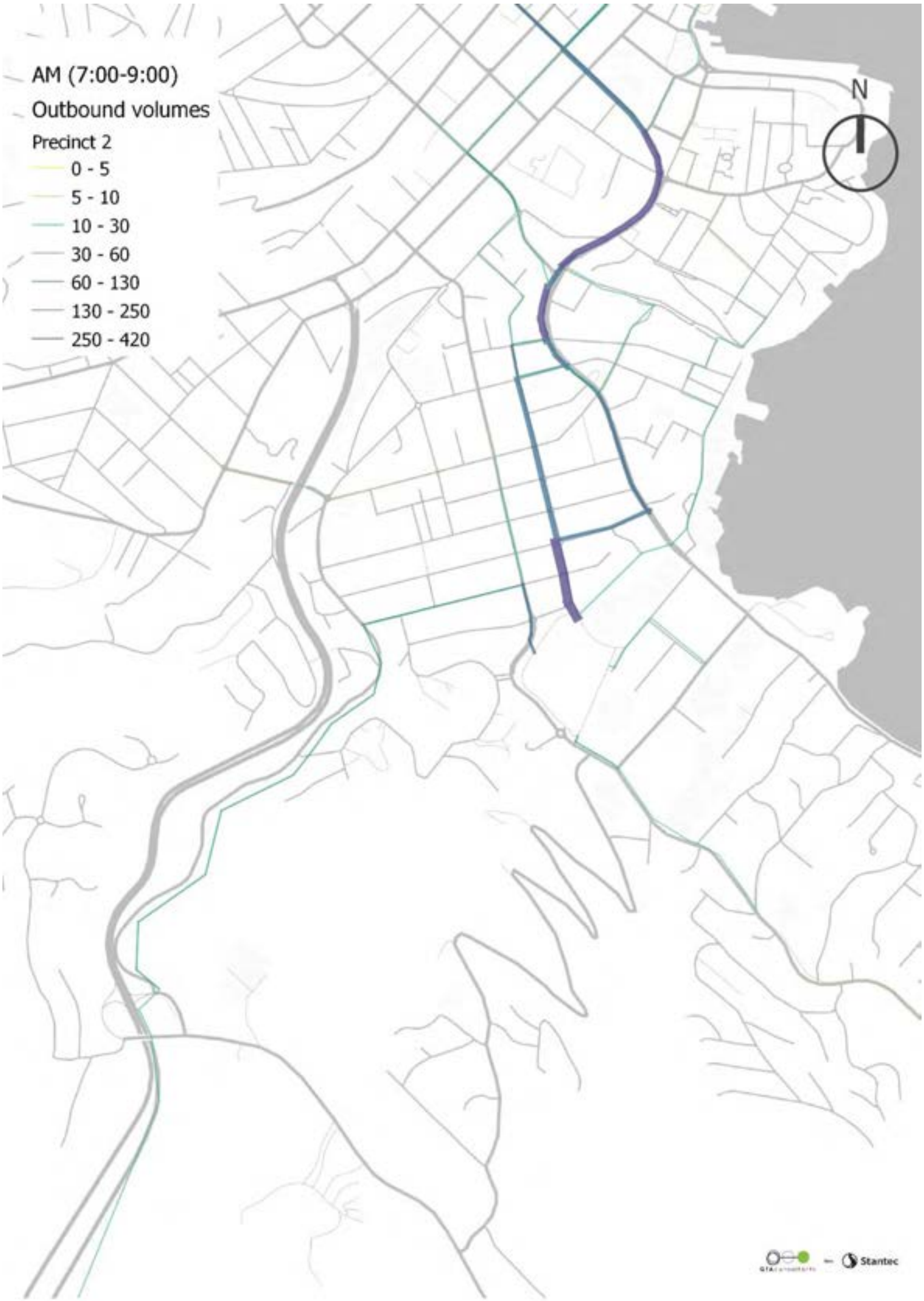


Figure B.20: Precinct 3 Traffic Distribution Inbound

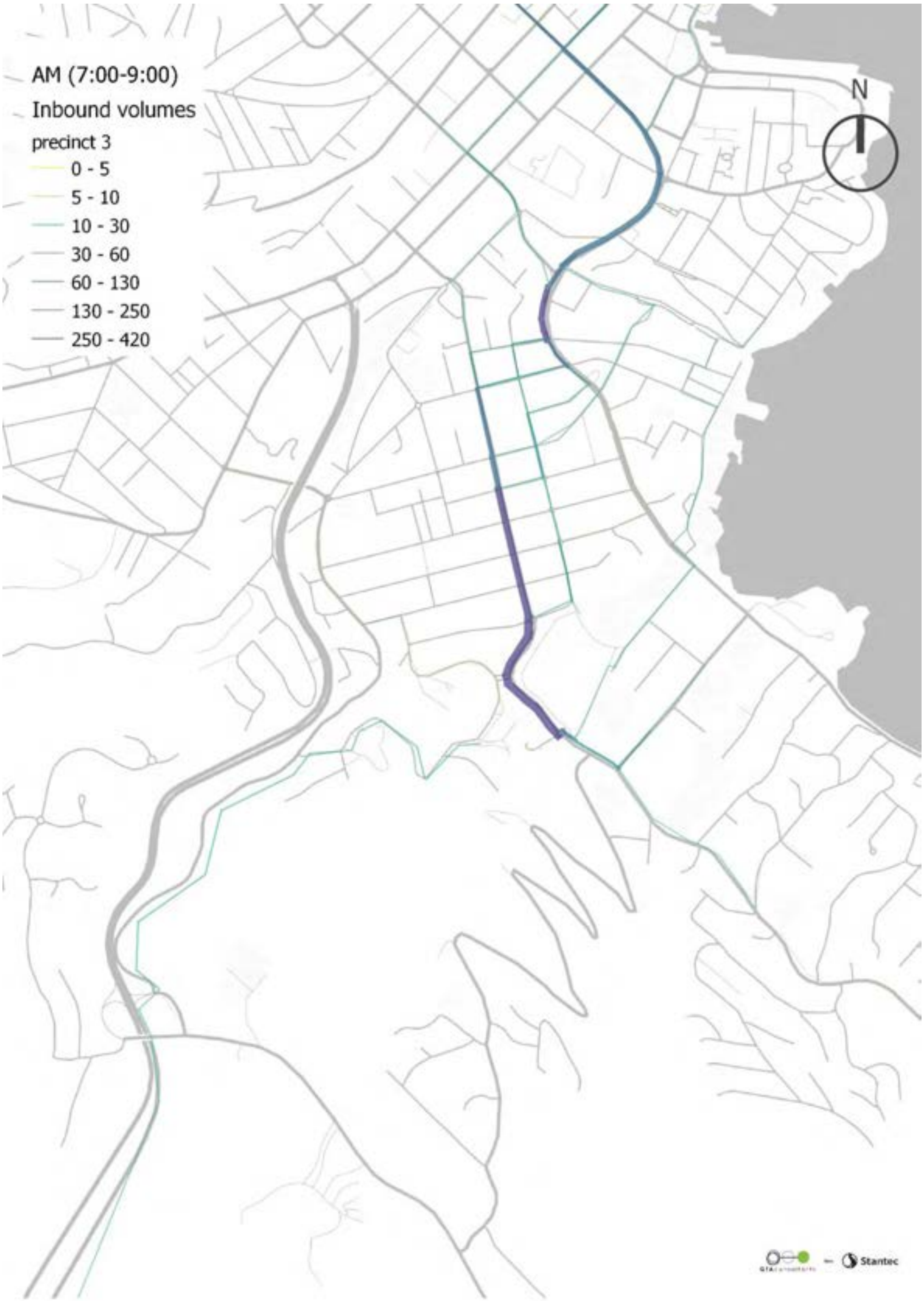


Figure B.21: Precinct 3 Traffic Distribution Outbound

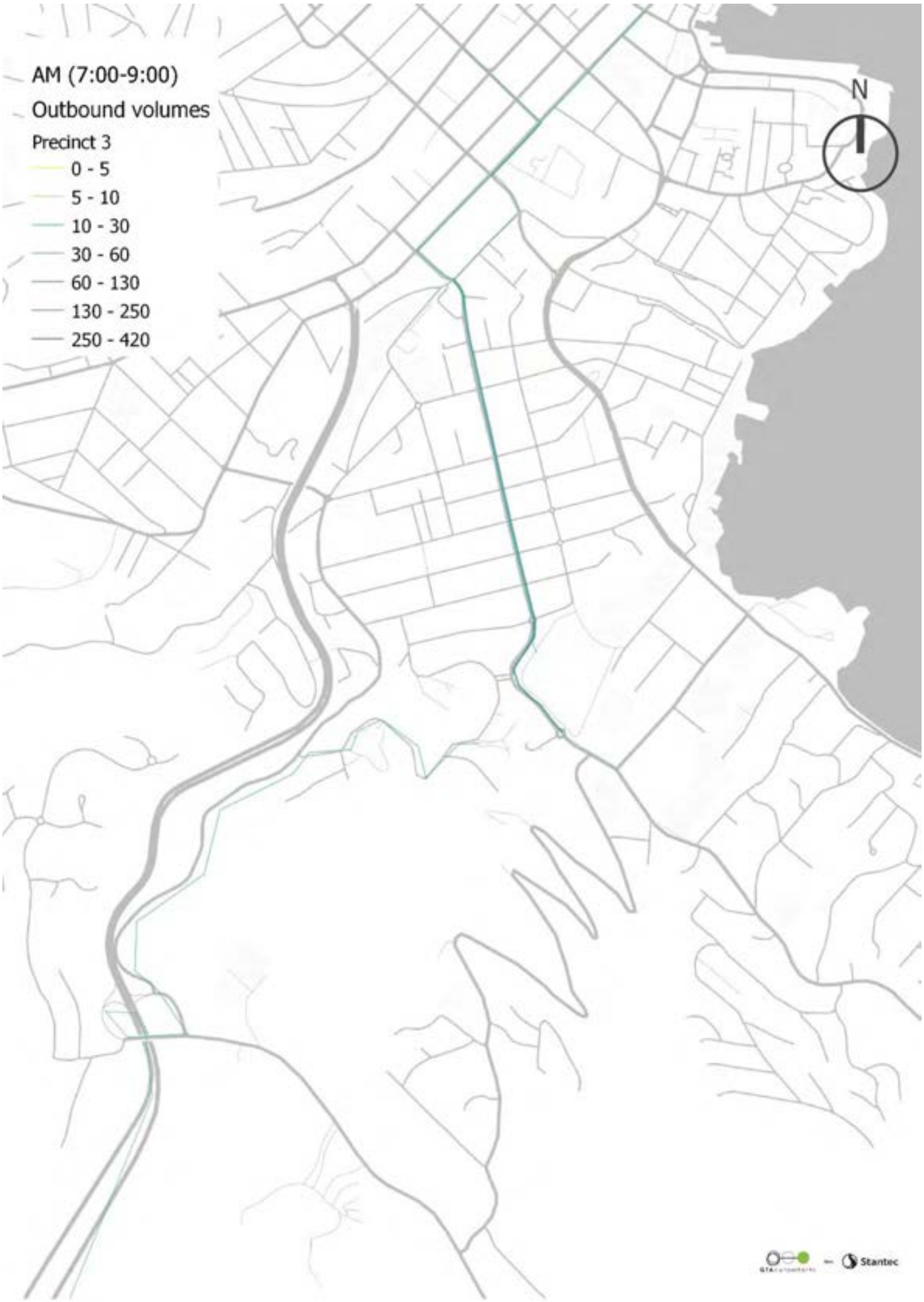


Figure B.22: Precinct 4 Traffic Distribution Inbound

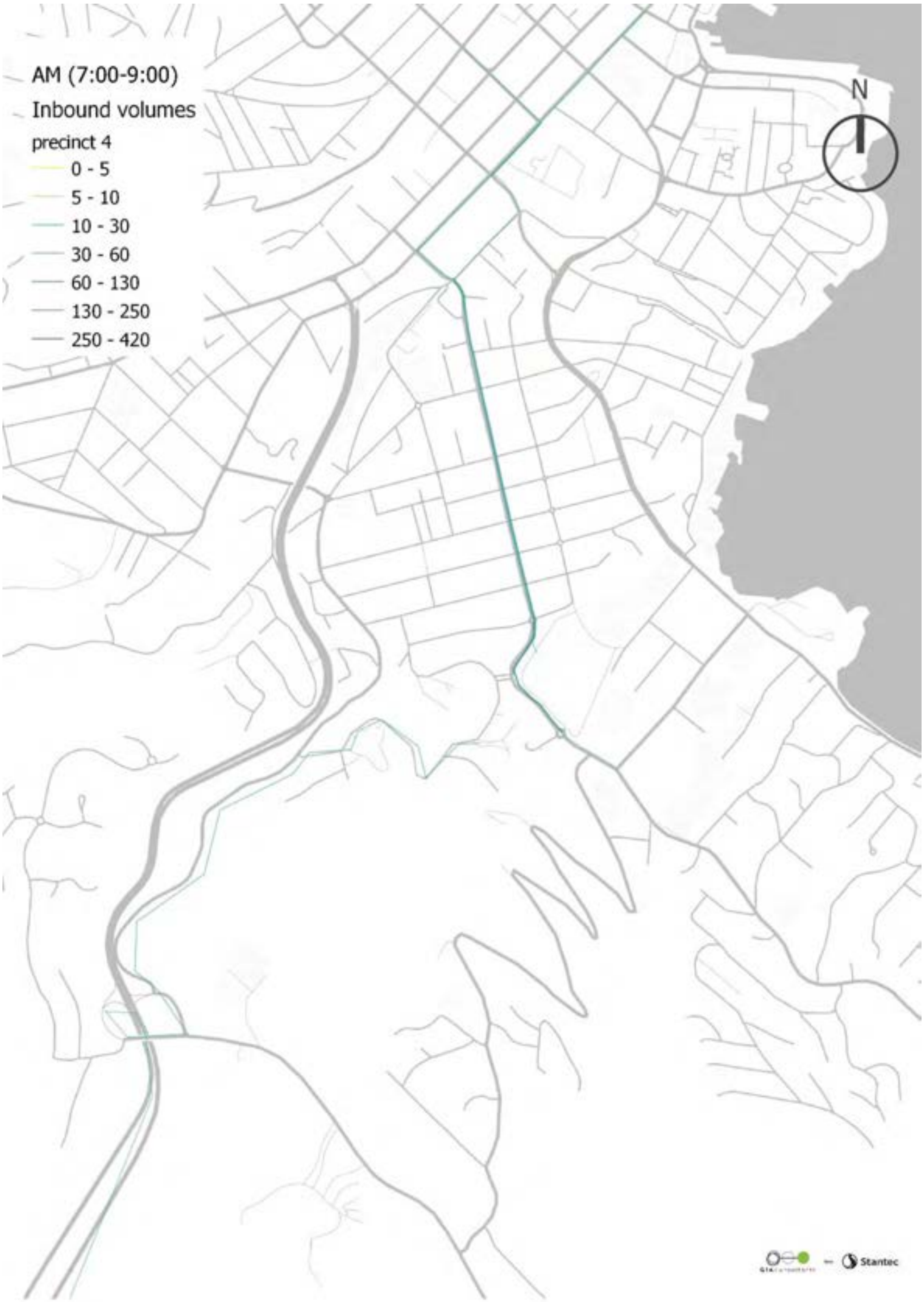


Figure B.23: Precinct 4 Traffic Distribution Outbound

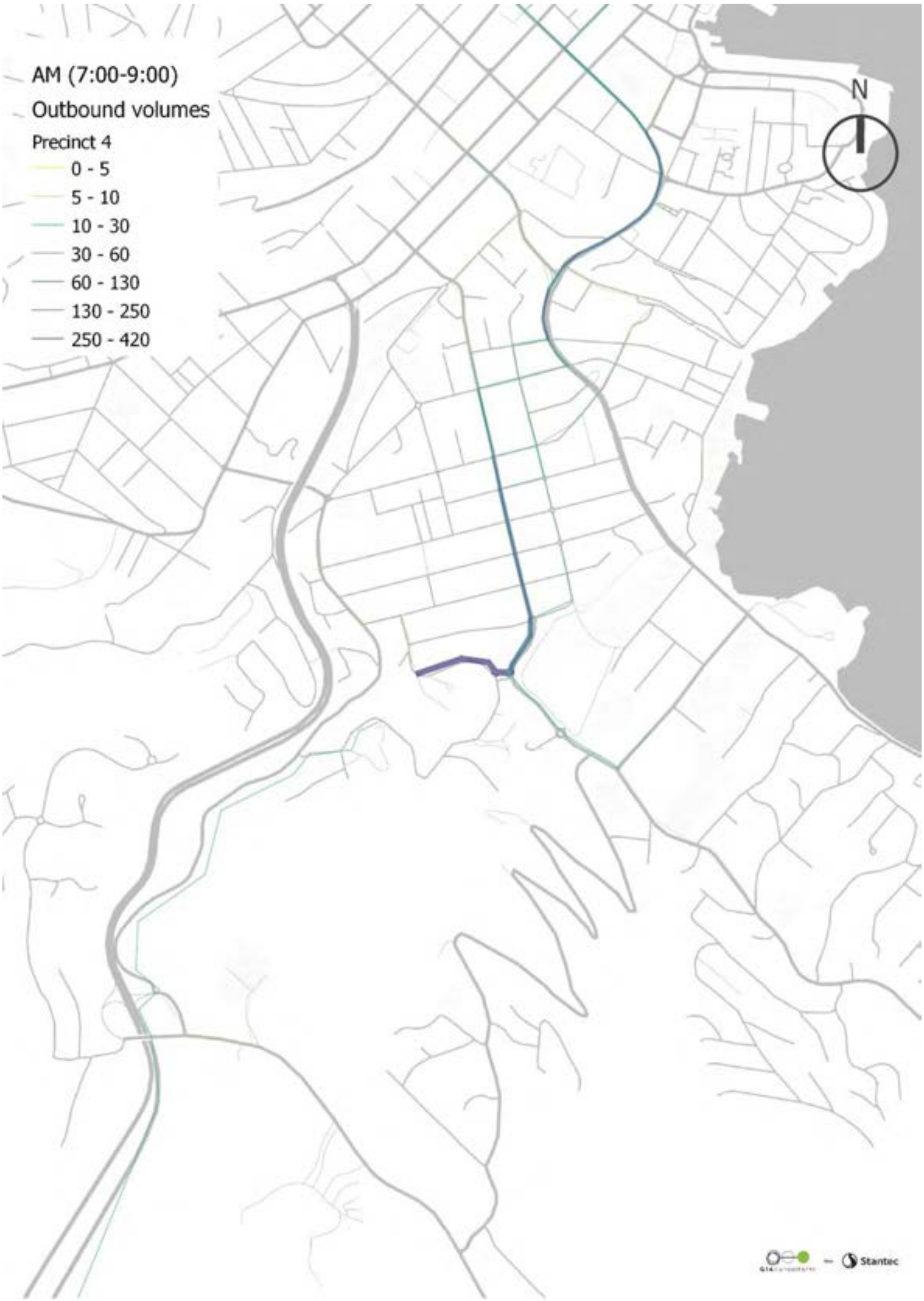


Figure B.24: Precinct 5 Traffic Distribution Inbound

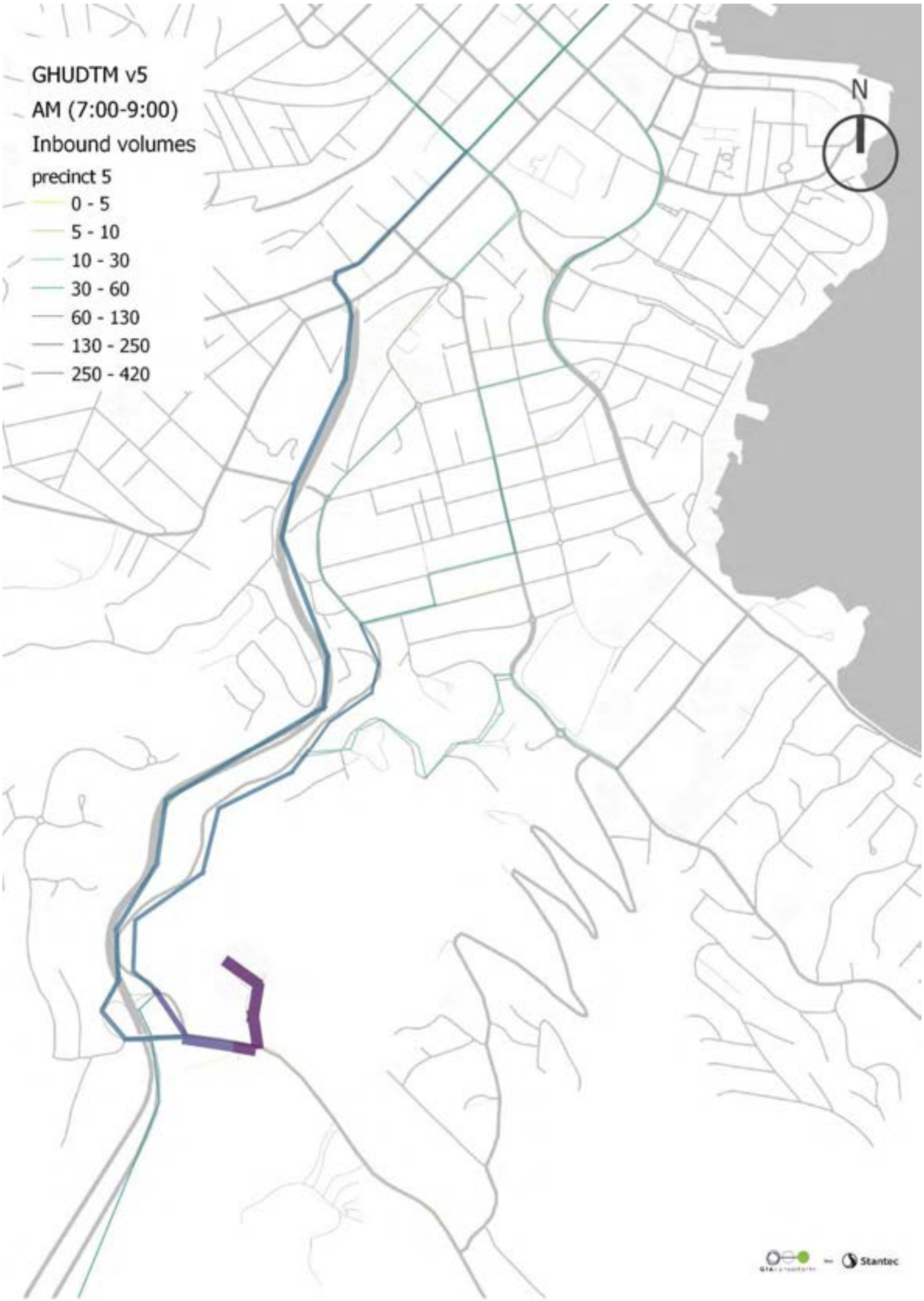
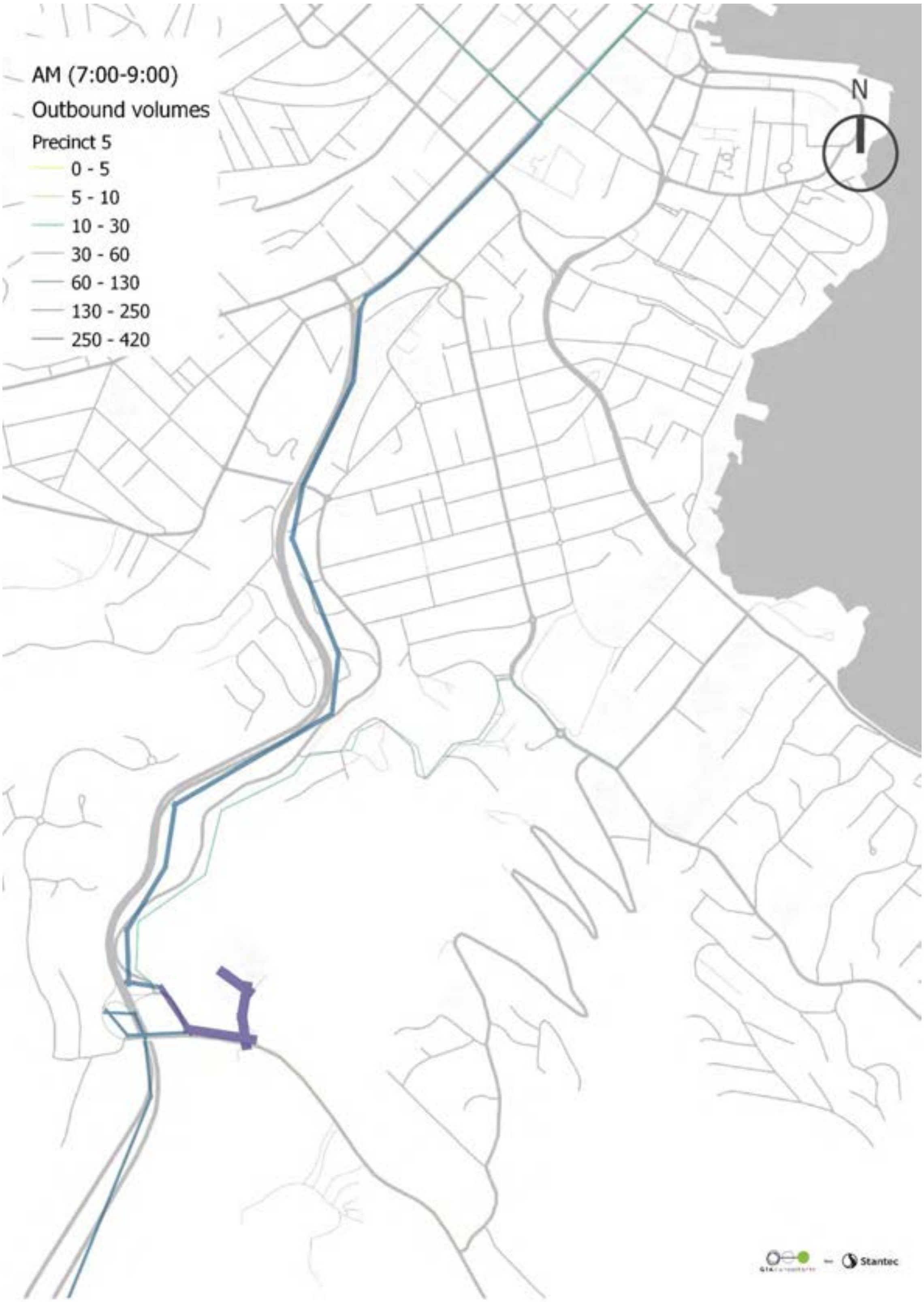


Figure B.25: Precinct 5 Traffic Distribution Outbound



C. TRAFFIC GENERATION RATES

C

C.1. Preamble

The following Section outlines the traffic generation rates that have been assumed for the development of the UTAS Campus Site. These rates have been sourced from the RMS Technical Direction ‘Guide to Traffic Generating Developments Updated Traffic Surveys’ (August 2013).

These rates are an industry standard used throughout Australia, and are recommended as a source to be utilized by the Traffic Impact Assessment Guidelines from the Department of State Growth:

“*Trip generation rates derived from surveys of a wide variety of land use developments are contained in the Roads and Maritime Services (New South Wales), Guide to Traffic Generating Developments, Version 2.2, October 2002, and the Roads and Maritime Services (New South Wales), Guide to Traffic Generating Developments, Updated traffic surveys, August 2013.* “

In conducting this analysis, reference has been made to the raw survey results within the Appendices of the RMS Guide. This was utilised to determine a traffic generation rate per car parking space. A per space rate has been utilised as sensitivity tests were conducted throughout the analysis on differing car parking rates. The supply of car parking can be utilised as a traffic demand management tool, which was iteratively assessed throughout the lifecycle of the project.

It is noted that when completing this assessment, Sites located within inner city Sydney were omitted from the analysis for conservatism. The following section outlines a summary of the raw survey data from the RMS guide, and the conclusions drawn upon interpretation of this data.

Finally, and as stated elsewhere, the resultant traffic generation for each precinct was compared to the results of the strategic modelling that was undertaken, to ensure the final traffic generated by the Site is broadly comparable with both approaches.

C.2. Traffic Generation Rates

C.2.1. Residential

Table C.1: RMS Traffic Survey Results – Low Density Residential

Description		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Average
Number of Dwellings		956	1495	669	1235	1335	509	556	697	554	905	
Car Parking Spaces [1]		1912	2990	1338	2470	2670	1018	1112	1394	1108	1810	
Vehicle trips	AM Peak	1170	297	649	1625	790	384	368	591	372	543	
	PM Peak	1070	653	744	1271	808	334	446	552	460	485	
Vehicle Trips Per Dwelling	AM Peak	1.22	0.20	0.97	1.32	0.59	0.75	0.66	0.85	0.67	0.60	0.78
	PM Peak	1.12	0.44	1.11	1.03	0.61	0.66	0.80	0.79	0.83	0.54	0.79
Vehicle Trips Per Car Parking Space	AM Peak	0.61	0.10	0.49	0.66	0.30	0.38	0.33	0.42	0.34	0.30	0.39
	PM Peak	0.56	0.22	0.56	0.51	0.30	0.33	0.40	0.40	0.42	0.27	0.40

[1] Two car parking spaces assumed

Table C.2: RMS Traffic Survey Results – High Density Residential

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Average
Number of Dwellings		28	234	83	64	31	108	9	
Car Parking Spaces		18	260	108	93	30	113	19	
Vehicle trips	AM Peak	2	76	22	18	3	42	6	
	PM Peak	3	43	10	26	2	45	2	
Vehicle Trips Per Dwelling	AM Peak	0.07	0.32	0.27	0.28	0.10	0.39	0.67	0.30
	PM Peak	0.11	0.18	0.12	0.41	0.06	0.42	0.22	0.22
Vehicle Trips Per Car Parking Space	AM Peak	0.11	0.29	0.20	0.19	0.10	0.37	0.32	0.23
	PM Peak	0.17	0.17	0.09	0.28	0.07	0.40	0.11	0.18

On this basis, a rate of 0.3 movements per car parking space was assumed for all residential dwellings on the Site (excluding retirement living / aged care as outlined below).

Table C.3: RMS Traffic Survey Results – Housing for Seniors

Description		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Average
Number of Dwellings		272	83	276	174	214	250	62	76	42	86	272
Car Parking Spaces		142	44	139	78	194	579	73	139	59	90	142
Vehicle trips	AM Peak	AM Peak hour Outside of Survey Periods										
	PM Peak	74	5	12	41	36	54	16	16	1	27	
Vehicle Trips Per Dwelling	PM Peak	0.27	0.06	0.04	0.24	0.17	0.22	0.26	0.21	0.02	0.31	0.18
Vehicle Trips Per Car Parking Space	PM Peak	0.52	0.11	0.09	0.53	0.19	0.09	0.22	0.12	0.02	0.30	0.22

On this basis, a rate of 0.22 movements per car parking space was applied for both housing for seniors and aged care. This was deemed to be a conservative assessment as these land uses typically generate a lower traffic generation rate during the AM peak hour.

C.2.2. Commercial Office

Table C.4: RMS Traffic Survey Results – Office

Description		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Average
Office Floor Area (sqm)		3254	5748	27000	2817	1200	12182	12921	
Car Parking Spaces		66	269	402	28	83	220	133	
Vehicle trips	AM Peak	65	119	185	57	30	126	123	
	PM Peak	60	72	75	46	10	137	100	
	AM Peak	2.00	2.07	0.69	2.02	2.50	1.03	0.95	1.61

Description		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Average
Vehicle Trips Per 100sqm	PM Peak	1.84	1.25	0.28	1.63	0.83	1.12	0.77	1.11
Vehicle Trips Per Car Parking Space	AM Peak	0.98	0.44	0.46	2.04	0.36	0.57	0.92	0.83
	PM Peak	0.91	0.27	0.19	1.64	0.12	0.62	0.75	0.64

The above analysis found a traffic generation rate of 0.8 and 0.6 movements per car parking space in the AM and PM peak hours respectively, but with some significant variation in the dataset. Ultimately, for the purposes of this assessment, a reduced rate of 0.4 movements per car parking space was applied for both peak periods. This was deemed to be appropriate due to a number of factors:

- A cross reference with the strategic modelling suggests that the RMS rates would be overly conservative
- As cities become more congested over time, the duration of peak periods become longer as people travel earlier and later. This impacts the travel characteristics of numerous land uses but most notable offices which are more able to have flexible starting and ending hours (i.e., compared to schools which have more fixed start and end times).
- The rate is adopted assuming the full occupancy / use of the office car parking, which is proposed at a rate of 3 spaces per 100sqm. In practice, it is considered unlikely that the office floor area will consistently generate a demand at this rate.

C.2.3. Supermarket / Retail

Table C.5: RMS Traffic Survey Results – Shopping Centres

Description		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Average
Floor Area (sqm)		61,424	63,404	91,115	100,134	49,898	69,000	22,143	15,552	41,040	87,162	
Car Parking Spaces		2,836	3,033	3,514	3,552	1,886	3,136	1,024	764	1,724	3,257	
Vehicle trips	AM Peak	1,130	609	920	2,123	1,437	987	496	635	1,666	1,630	
	PM Peak	2,285	1,629	2,023	3,144	2,475	2,877	1,149	897	2,019	2,885	
Vehicle Trips Per 100sqm	AM Peak	1.84	0.96	1.01	2.12	2.88	1.43	2.24	4.08	4.06	1.87	2.25
	PM Peak	3.72	2.57	2.22	3.14	4.96	4.17	5.19	5.77	4.92	3.31	4.00
Vehicle Trips Per Car Parking Space	AM Peak	0.40	0.20	0.26	0.60	0.76	0.31	0.48	0.83	0.97	0.50	0.53
	PM Peak	0.81	0.54	0.58	0.89	1.31	0.92	1.12	1.17	1.17	0.89	0.94

The above traffic generation rates from the RMS guide are applicable to a large, mixed-use shopping centre, containing various retail land uses.

Given the nature of the mixed-use development, with various small scale retail offerings throughout the precincts, it is expected that there will be a large degree of sharing of traffic demands generated by these uses. It was therefore deemed that the rates as outlined above are applicable to the 'specialist retail' land uses proposed on Site.

Ultimately, for the purposes of this assessment, a reduced rate of 0.5 movement per car parking space in the AM Peak hour and 1 movement per car parking space in the PM peak hour were applied

C.2.4. Supermarket / Market

Description		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Average
Floor Area (sqm)		8,142	3,445	4,976	6,394	4,740	9,700	4,027	4,831	5,028	4,933	5,000	9,505	
Vehicle Trips Per 100sqm	AM Peak	8.03	10.04	8.28	5.68	6.35	10.78	9.37	9.85	6.44	9.91	7.70	8.15	8.38
	PM Peak	9.55	9.35	15.49	6.58	7.11	10.21	14.90	12.30	6.54	16.44	9.80	7.83	10.51
Vehicle Trips Per Car Parking Space	AM Peak	2.07	2.12	1.75	1.3	1.13	1.82	2.17	2.11	1.64	2.25	2.94	1.57	1.91
	PM Peak	2.46	1.98	3.27	1.51	1.26	1.72	3.47	2.63	1.66	3.74	3.74	1.51	2.41

The above traffic generation rates are sourced from a report commissioned by RMS, for retail supermarkets (Roads and Maritime Trip Generation Surveys, NSW Small Suburban Shopping Centres, Bitzios Consulting for RMS (2018)).

The rates contained within these traffic surveys are generally considered to be conservative as they often include traffic generated by retail offerings in the immediate surrounds of the main anchor supermarket. Ultimately, for the purposes of this assessment, a reduced rate of 1 movement per car parking space in the AM Peak hour and 2 movements per car parking space in the PM peak hour were applied. This was deemed to be appropriate due to a number of factors:

- A cross reference with the strategic modelling suggests that the RMS rates would be overly conservative
- Given the mixed-use nature of the proposed precinct, it is expected a level of trip containment will occur when considering the other land uses, such as the retail and residential. This is likely to reduce the traffic demands of the office floor area as more people arrive by other modes.
- The supermarket / market land uses are generally contained with a number of other retail offerings, all of which have a traffic generation associated with them. It is expected that a mixing of traffic demands will occur between the supermarkets and all other land uses on the Site.
- The RMS surveys include peak hour rates which represent the peak hour in the AM and PM and not the AM and PM road network peak hours. Application of the normal RTA averages would yield particularly conservative analysis.

C.2.5. Other Land Uses

A number of Additional Land uses are proposed within the development that have not been outlined below. These have generally not been incorporated into the traffic generation of the Site for a number of reasons:

- The “Community” land uses are not expected to be significant traffic generators during peak hour time periods
- There will be a sharing of traffic demands generated by the various land uses within the precincts
- The local area land uses will be generators to the residential developments that form a part of the Site. The vast majority of which are within a comfortable walking distance

D. TRAFFIC DISTRIBUTION

D

D.1. Strategic Modelling Traffic Distribution

Table D.1: Traffic Distribution Results From Strategic Model – AM Peak Hour

Direction of Travel	Precinct 1		Precinct 2		Precinct 3		Precinct 4		Precinct 5	
	To	From	To	From	To	From	To	From	To	From
North of the Site	55%	67%	55%	65%	48%	63%	45%	62%	41%	60%
Sandy Bay	4%	4%	3%	4%	4%	4%	5%	5%	2%	3%
South-East Hobart	17%	17%	15%	18%	21%	20%	20%	17%	14%	13%
South	14%	5%	16%	6%	14%	7%	16%	9%	30%	15%
West	6%	3%	6%	4%	5%	3%	7%	4%	7%	5%
Internal	5%	3%	5%	3%	7%	3%	7%	3%	5%	4%

Table D.2: Traffic Distribution Results From Strategic Model – PM Peak Hour

Direction of Travel	Precinct 1		Precinct 2		Precinct 3		Precinct 4		Precinct 5	
	To	From	To	From	To	From	To	From	To	From
North of the Site	63%	51%	61%	49%	61%	51%	60%	50%	54%	35%
Sandy Bay	4%	4%	4%	3%	4%	4%	5%	5%	3%	2%
South-East Hobart	17%	18%	17%	17%	19%	19%	16%	16%	13%	15%
South	7%	15%	9%	17%	8%	13%	11%	16%	20%	35%
West	4%	6%	4%	6%	3%	5%	4%	6%	5%	7%
Internal	4%	6%	5%	6%	5%	8%	5%	7%	5%	6%

D.2. Traffic Distribution Assumed for SIDRA Modelling

Figure D.1: Precinct 1 Assumed SIDRA Model Traffic Distribution

Figure D.2: Precinct 2 Assumed SIDRA Model Traffic Distribution

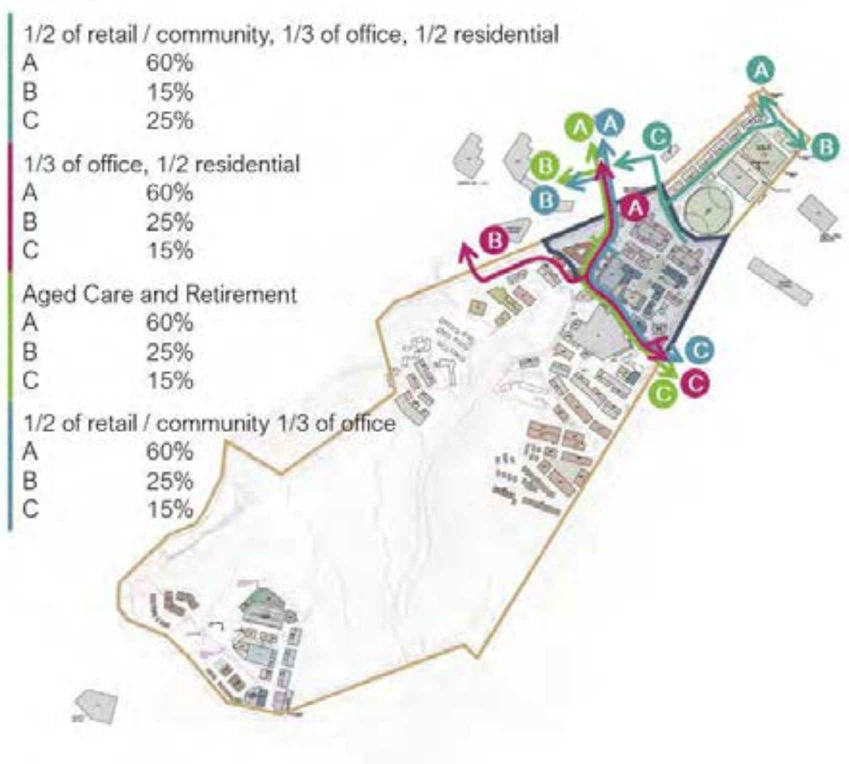


Figure D.3: Precinct 3 Assumed SIDRA Model Traffic Distribution

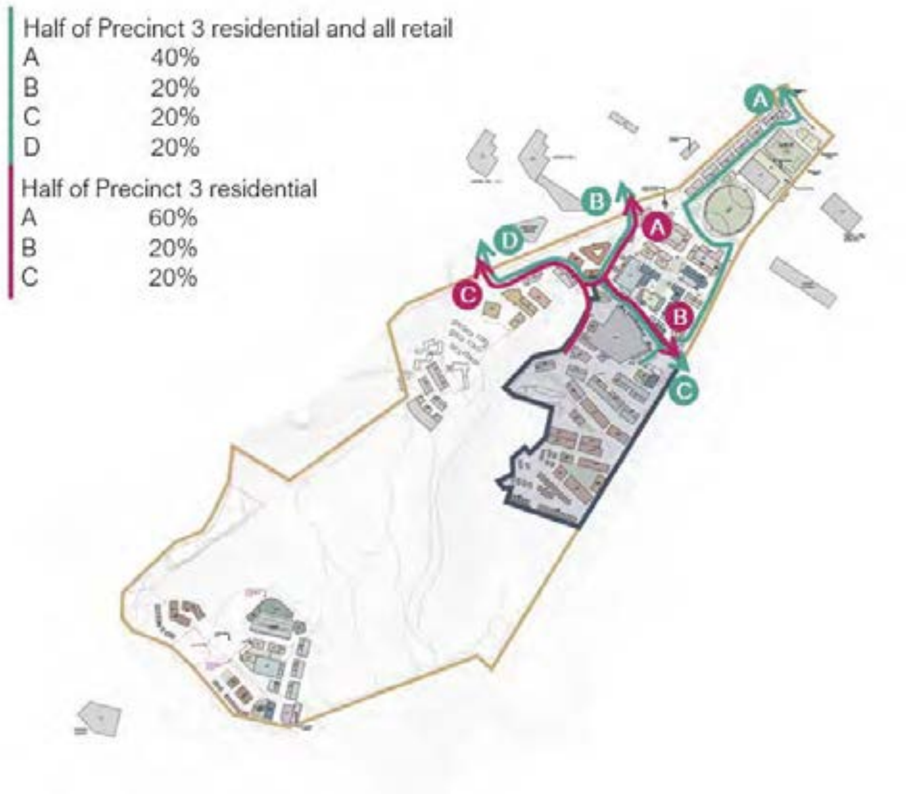


Figure D.4: Precinct 4 Assumed SIDRA Model Traffic Distribution

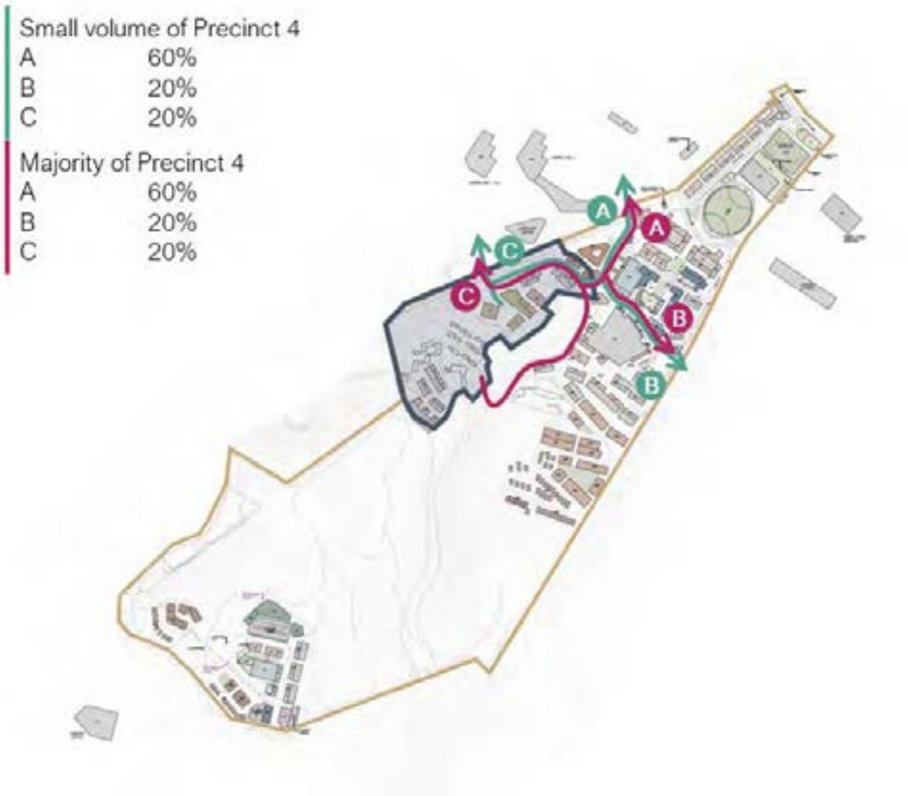
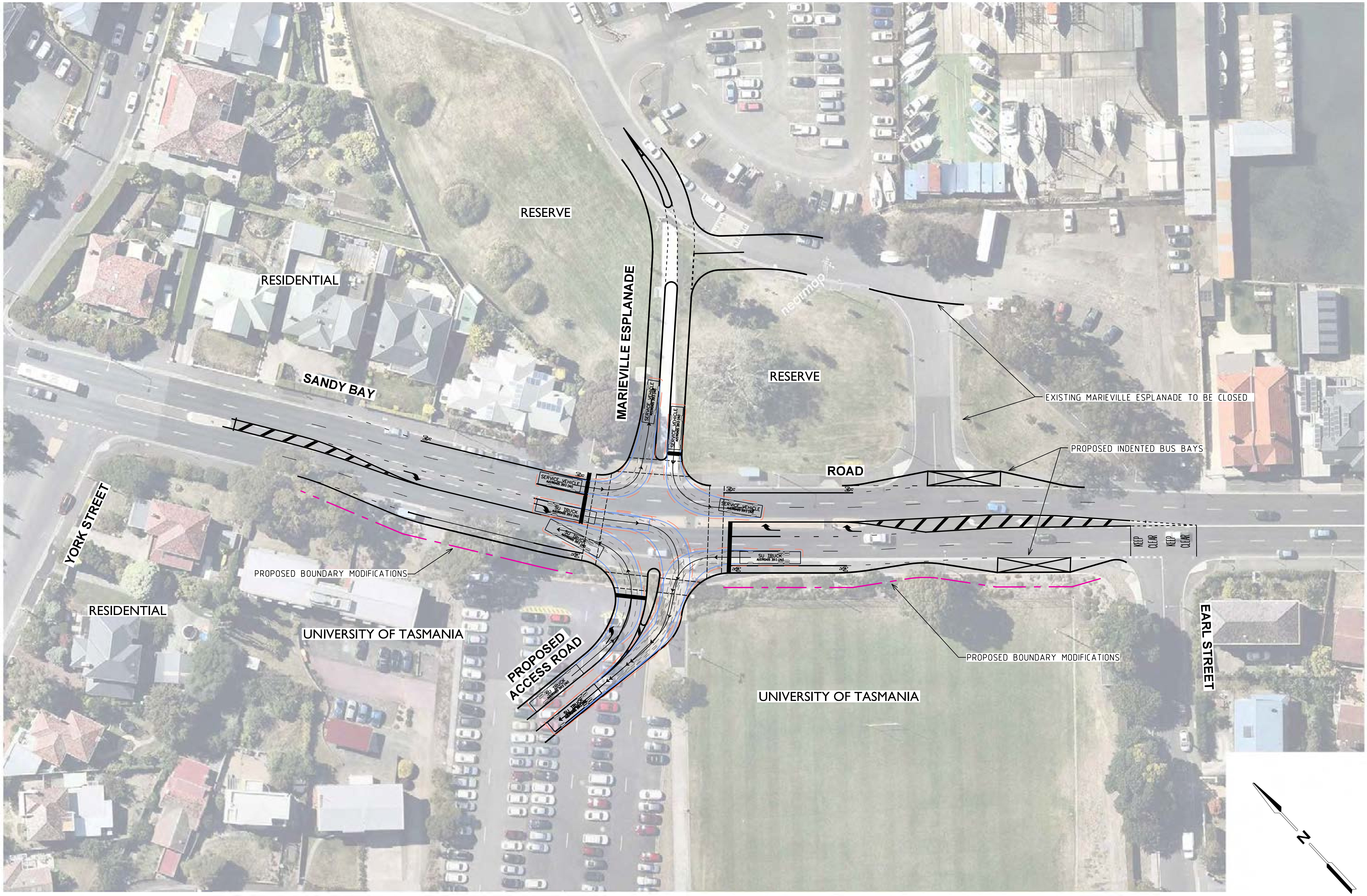


Figure D.5: Precinct 5 Assumed SIDRA Model Traffic Distribution

E. INTERSECTION DESIGN PLANS

E



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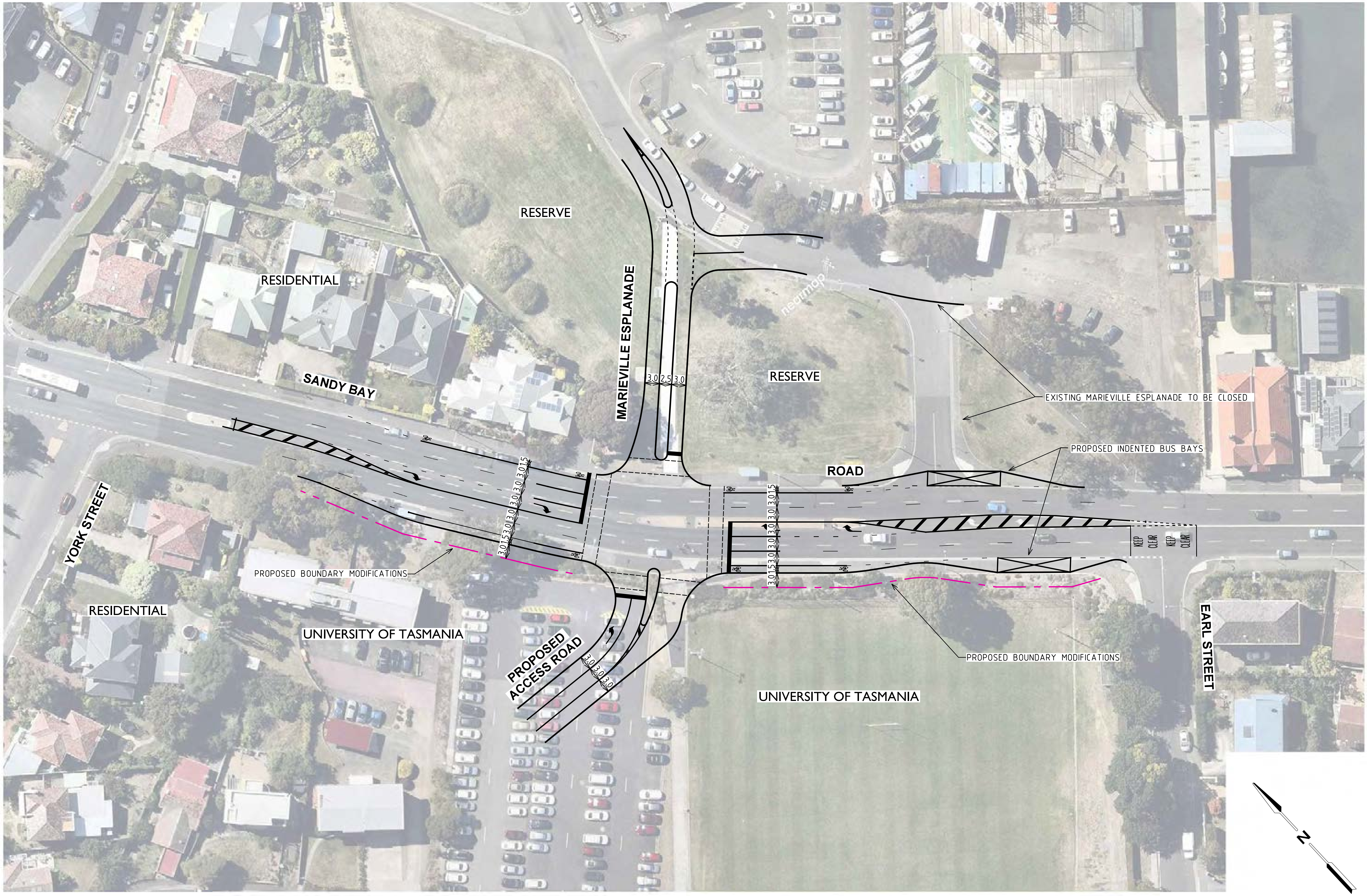
APPROVED BY T. DE YOUNG	DATE ISSUED 1 DECEMBER 2021

SCALE A3 0 7.5 15 1:750

CAD FILE NO. 301401291-DESIGN002.dgn

UTAS SANDY BAY MASTERPLAN
SANDY BAY RD / MARIEVILLE ESPLANADE / PROPOSED ACCESS RD, SANDY BAY
CONCEPT LAYOUT

DRAWING NO. 301401291-01-01 ISSUE P2



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APPROVED BY	DATE ISSUED	CAD FILE NO.
T. DE YOUNG	1 DECEMBER 2021	301401291-DESIGN002.dgn

UTAS SANDY BAY MASTERPLAN
SANDY BAY RD / MARIEVILLE ESPLANADE / PROPOSED ACCESS RD, SANDY BAY
CONCEPT LAYOUT

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DESIGNED B. KLINKO	DESIGN CHECK A. DELL'ISOLA	SCALE A3 0 7.5 15 1:750	UTAS SANDY BAY MASTERPLAN CHURCHILL AVENUE BETWEEN ALEXANDER ST & CLARK ST, SANDY BAY CONCEPT LAYOUT
APPROVED BY T. DE YOUNG	DATE ISSUED 1 DECEMBER 2021	CAD FILE NO. 301401291-DESIGN002.dgn	DRAWING NO. 301401291-01-02 ISSUE P2

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APPROVED BY T. DE YOUNG	DATE ISSUED 1 DECEMBER 2021

SCALE A3 0 7.5 15 1:750

CAD FILE NO. 301401291-DESIGN002.dgn

UTAS SANDY BAY MASTERPLAN
CHURCHILL AVENUE BETWEEN ALEXANDER ST & CLARK ST, SANDY BAY
CONCEPT LAYOUT

DRAWING NO. 301401291-01-02 ISSUE P2

F. SIDRA MODELLING RESULTS

F

USER REPORT FOR SITE

All Movement Classes

Project: 211122-3014001291UTAS

Template: Default Site User Report

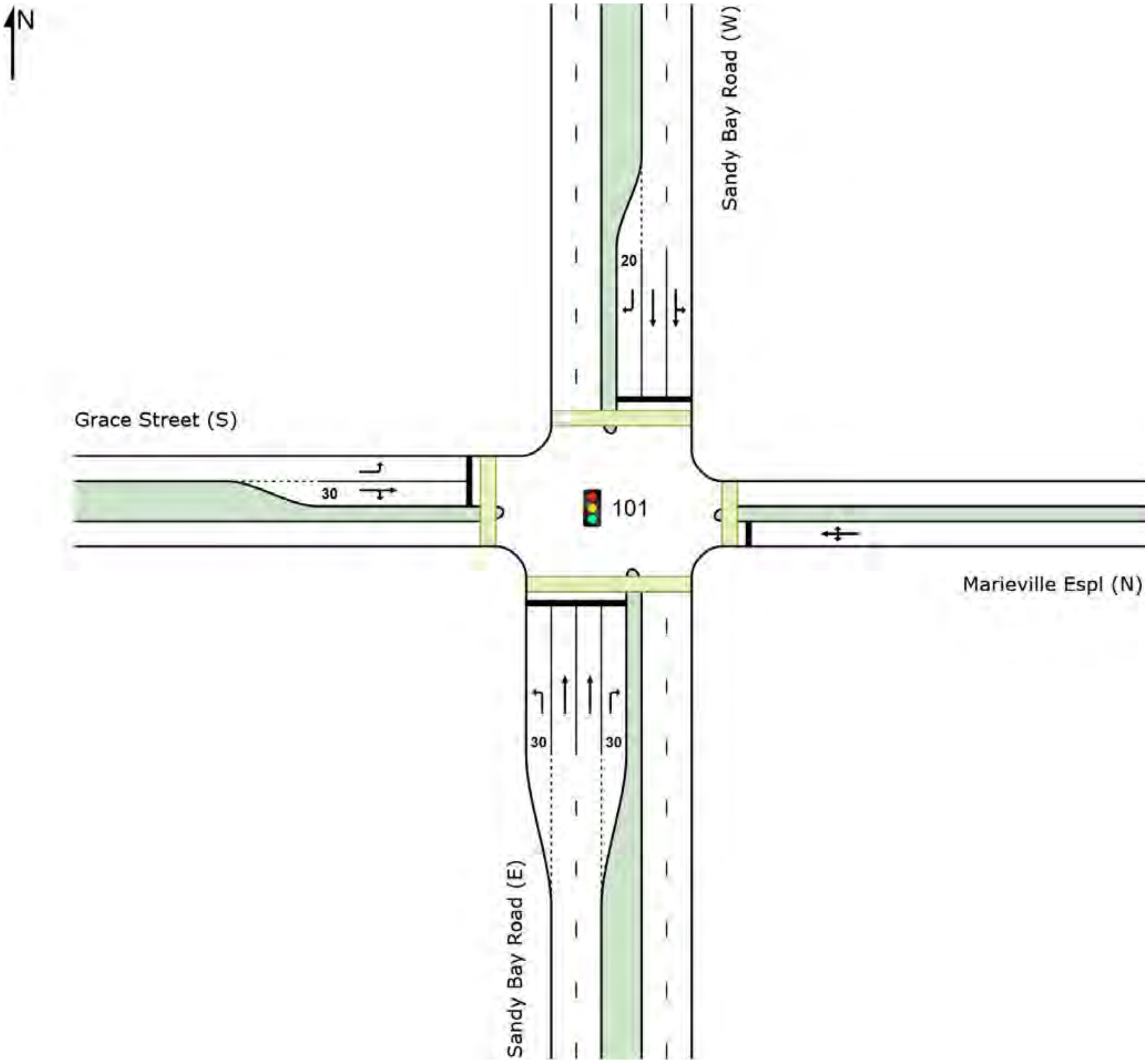
Site: 101 [Proposed Grace St - Sandy Bay Rd - Marieville Espl - 2040 - AM Clearway (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 120 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C, A1*, A2*
Output Phase Sequence: A, B, C, A1*
(* Variable Phase)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



N
Sandy Bay Road (W)
20
Grace Street (S)
30
101
Marieville Espl (N)
30
30
Sandy Bay Road (E)

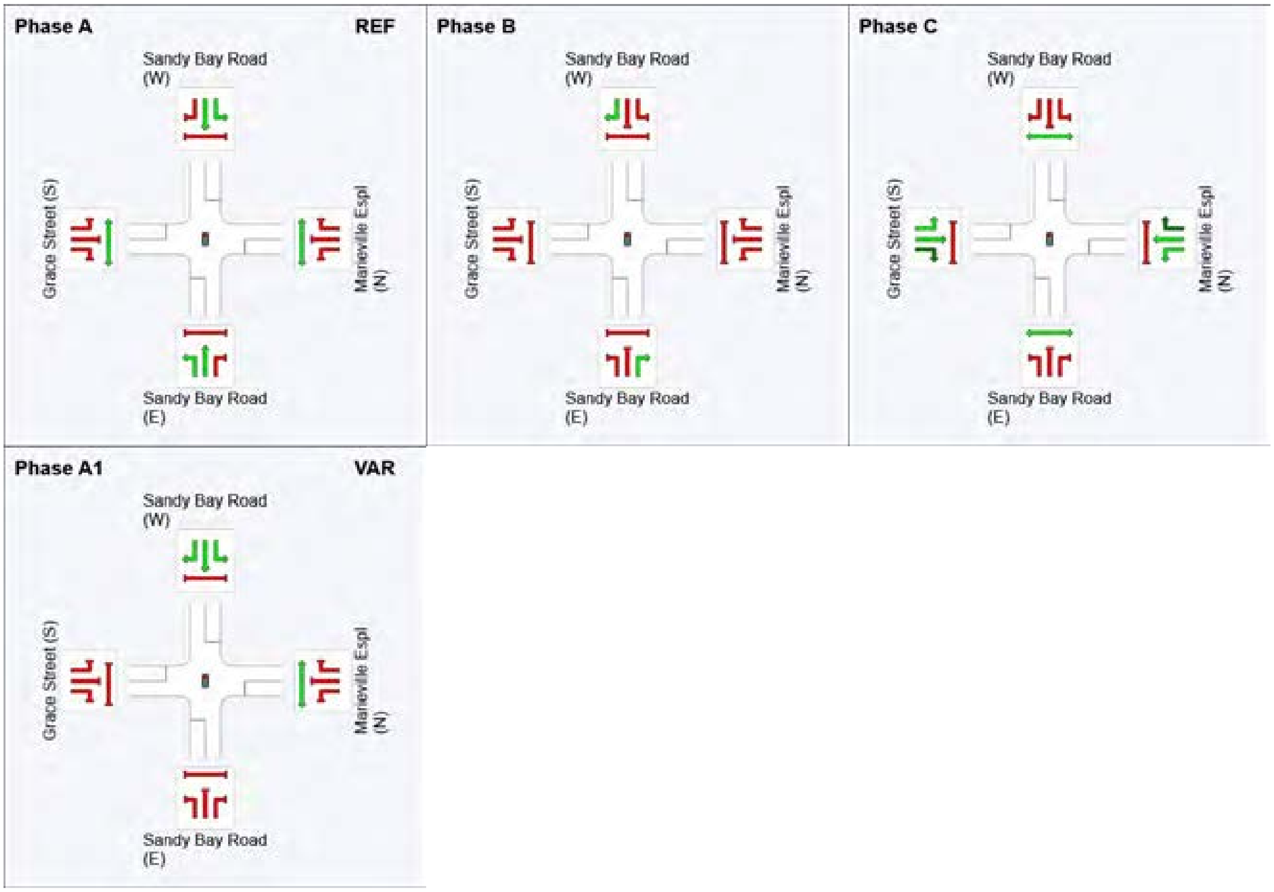
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Sandy Bay Road (E)													
Lane 1	14	2.0	778	0.018	100	26.5	LOS C	0.5	3.2	Short	30	0.0	NA
Lane 2	529	5.0	834 [1]	0.634	100	26.9	LOS C	23.4	171.0	Full	500	0.0	0.0
Lane 3	532	5.0	840 [1]	0.634	100	26.9	LOS C	23.6	172.6	Full	500	0.0	0.0
Lane 4	7	2.0	137	0.054	100	62.6	LOS E	0.4	2.9	Short	30	0.0	NA
Approach	1082	4.9		0.634		27.1	LOS C	23.6	172.6				
East: Marieville Espl (N)													
Lane 1	31	2.0	212	0.144	100	55.1	LOS E	1.6	11.4	Full	500	0.0	0.0
Approach	31	2.0		0.144		55.1	LOS E	1.6	11.4				
North: Sandy Bay Road (W)													
Lane 1	567	4.7	1029	0.551	100	19.1	LOS B	21.1	153.8	Full	500	0.0	0.0
Lane 2	445	5.0	807 [1]	0.551	100	16.8	LOS B	15.1	110.0	Full	500	0.0	0.0
Lane 3	138	2.0	229	0.602	100	36.1	LOS D	5.1	36.4	Short	20	0.0	NA
Approach	1149	4.5		0.602		20.3	LOS C	21.1	153.8				
West: Grace Street (S)													
Lane 1	211	2.0	338 [1]	0.623	100	53.0	LOS D	11.3	80.5	Full	500	0.0	0.0
Lane 2	43	2.0	322	0.134	100	47.5	LOS D	2.1	14.8	Short	30	0.0	NA
Approach	254	2.0		0.623		52.0	LOS D	11.3	80.5				
Intersection	2516	4.4		0.634		26.8	LOS C	23.6	172.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Phase Timing Summary

Phase	A	B	C	A1
Phase Change Time (sec)	0	60	75	108
Green Time (sec)	54	9	27	6
Phase Time (sec)	60	15	33	12
Phase Split	50%	13%	28%	10%

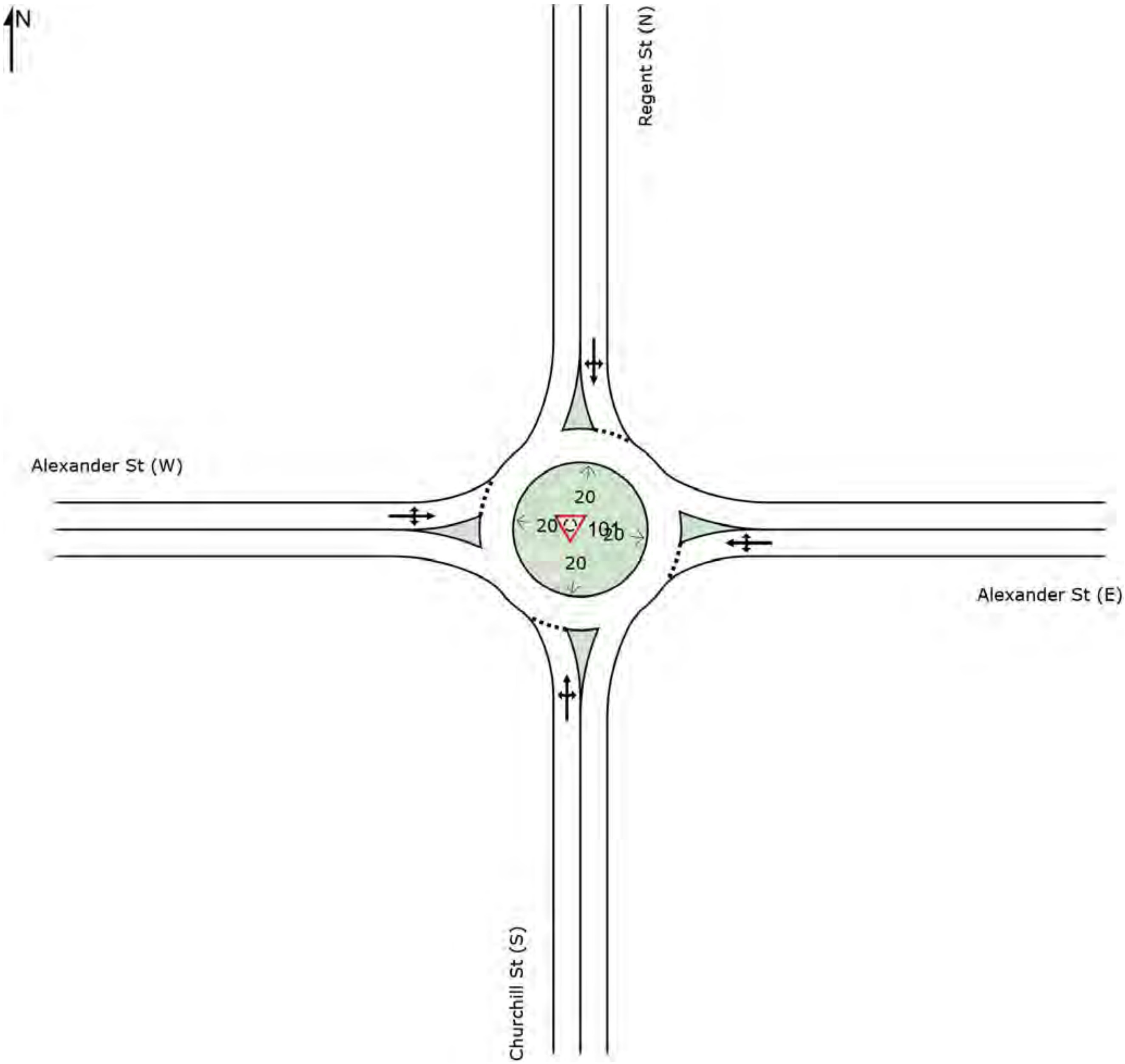
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Site: 101 [Regent St - Alexander St - Churchill St - 2040 - AM (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Churchill St (S)													
Lane 1[d]	989	2.0	1517	0.652	100	4.7	LOS A	7.9	56.1	Full	500	0.0	0.0
Approach	989	2.0		0.652		4.7	LOS A	7.9	56.1				
East: Alexander St (E)													
Lane 1[d]	73	2.0	649	0.112	100	12.0	LOS B	0.7	5.0	Full	500	0.0	0.0
Approach	73	2.0		0.112		12.0	LOS B	0.7	5.0				
North: Regent St (N)													
Lane 1[d]	844	2.0	1486	0.568	100	4.6	LOS A	5.9	41.8	Full	500	0.0	0.0
Approach	844	2.0		0.568		4.6	LOS A	5.9	41.8				
West: Alexander St (W)													
Lane 1[d]	79	2.0	543	0.145	100	14.3	LOS B	1.0	6.9	Full	500	0.0	0.0
Approach	79	2.0		0.145		14.3	LOS B	1.0	6.9				
Intersection	1985	2.0		0.652		5.3	LOS A	7.9	56.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

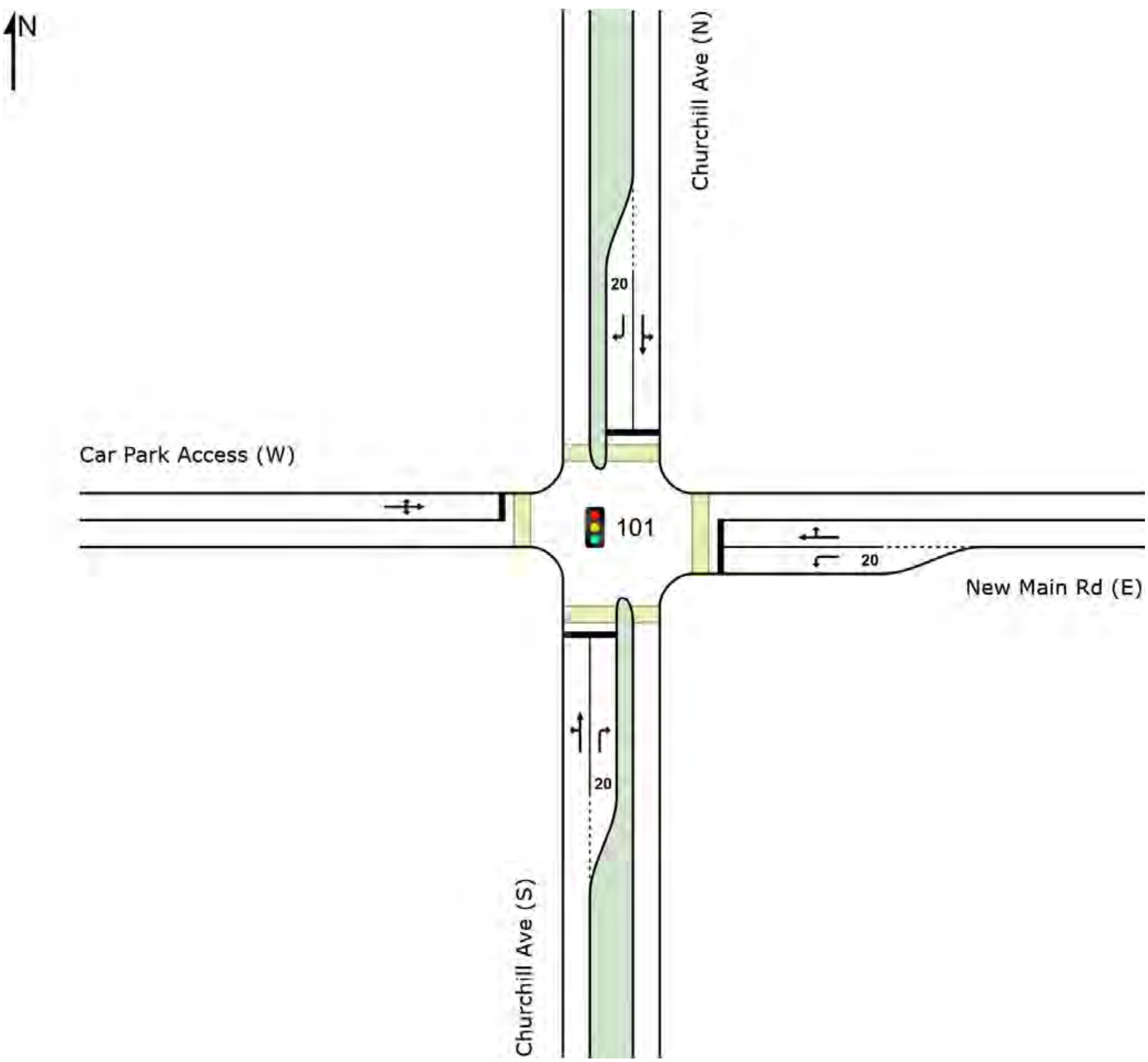
Site: 101 [Churchill Ave - Unamed new Rd - AM 2040 (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 90 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A1, A, A3, B
Output Phase Sequence: A1, A, A3, B

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



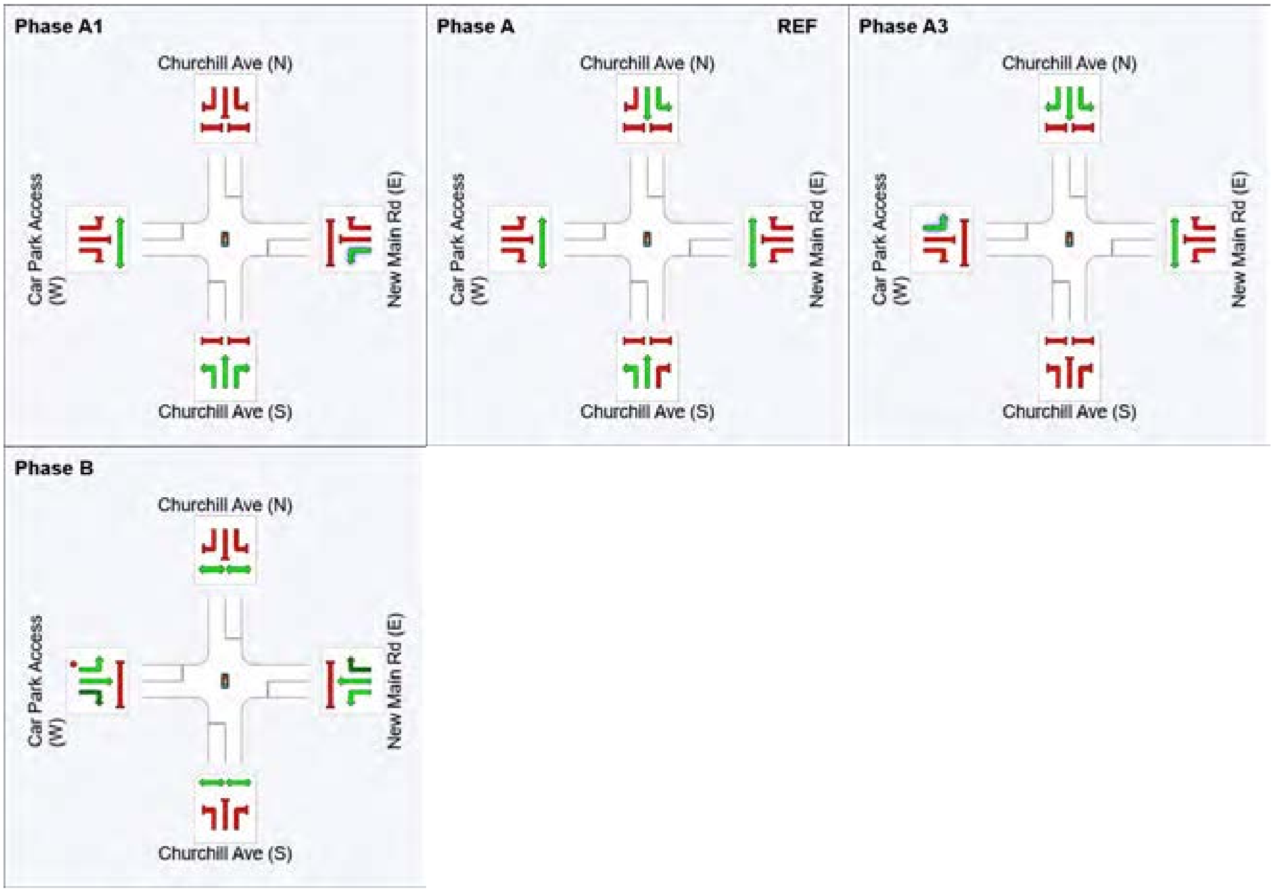
Lane Use and Performance

	DEMAND FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Churchill Ave (S)													
Lane 1	888	2.0	1262 [1]	0.704	100	9.9	LOS A	23.9	170.2	Full	500	0.0	0.0
Lane 2	16	2.0	122	0.129	100	50.7	LOS D	0.7	4.9	Short	20	0.0	NA
Approach	904	2.0		0.704		10.6	LOS B	23.9	170.2				
East: New Main Rd (E)													
Lane 1	8	2.0	366	0.023	100	36.7	LOS D	0.3	2.1	Short	20	0.0	NA
Lane 2	48	2.0	131	0.370	100	51.7	LOS D	2.2	15.5	Full	500	0.0	0.0
Approach	57	2.0		0.370		49.5	LOS D	2.2	15.5				
North: Churchill Ave (N)													
Lane 1	809	2.0	1262 [1]	0.641	100	9.9	LOS A	20.4	145.1	Full	500	0.0	0.0
Lane 2	6	2.0	122	0.052	100	49.9	LOS D	0.3	1.9	Short	20	0.0	NA
Approach	816	2.0		0.641		10.2	LOS B	20.4	145.1				
West: Car Park Access (W)													
Lane 1	32	2.0	250	0.126	100	42.5	LOS D	1.2	8.9	Full	500	0.0	0.0
Approach	32	2.0		0.126		42.5	LOS D	1.2	8.9				
Intersection	1808	2.0		0.704		12.2	LOS B	23.9	170.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Phase Timing Summary

Phase	A1	A	A3	B
Phase Change Time (sec)	78	0	54	66
Green Time (sec)	6	48	6	6
Phase Time (sec)	12	54	12	12
Phase Split	13%	60%	13%	13%

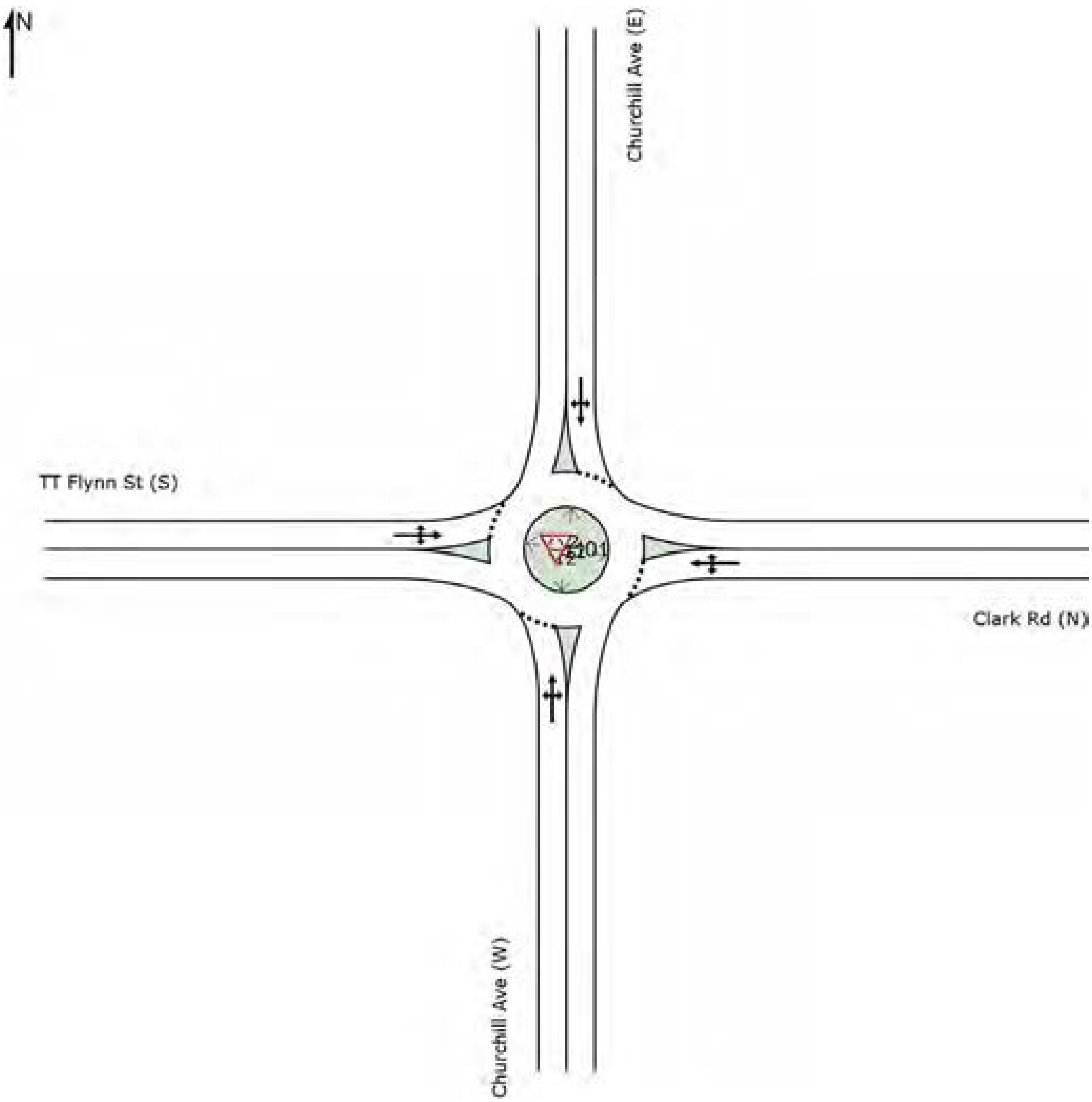
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Site: 101 [Churchill Ave - TT Flynn St - Clark Rd - AM 2040 (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Churchill Ave (W)													
Lane 1[d]	682	2.0	1161	0.588	100	6.2	LOS A	5.3	37.7	Full	500	0.0	0.0
Approach	682	2.0		0.588		6.2	LOS A	5.3	37.7				
East: Clark Rd (N)													
Lane 1[d]	129	2.0	586	0.221	100	13.1	LOS B	1.4	10.1	Full	500	0.0	0.0
Approach	129	2.0		0.221		13.1	LOS B	1.4	10.1				
North: Churchill Ave (E)													
Lane 1[d]	824	2.0	1277	0.645	100	6.0	LOS A	7.2	51.1	Full	250	0.0	0.0
Approach	824	2.0		0.645		6.0	LOS A	7.2	51.1				
West: TT Flynn St (S)													
Lane 1[d]	207	2.0	615	0.337	100	11.1	LOS B	2.2	16.0	Full	500	0.0	0.0
Approach	207	2.0		0.337		11.1	LOS B	2.2	16.0				
Intersection	1843	2.0		0.645		7.1	LOS A	7.2	51.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

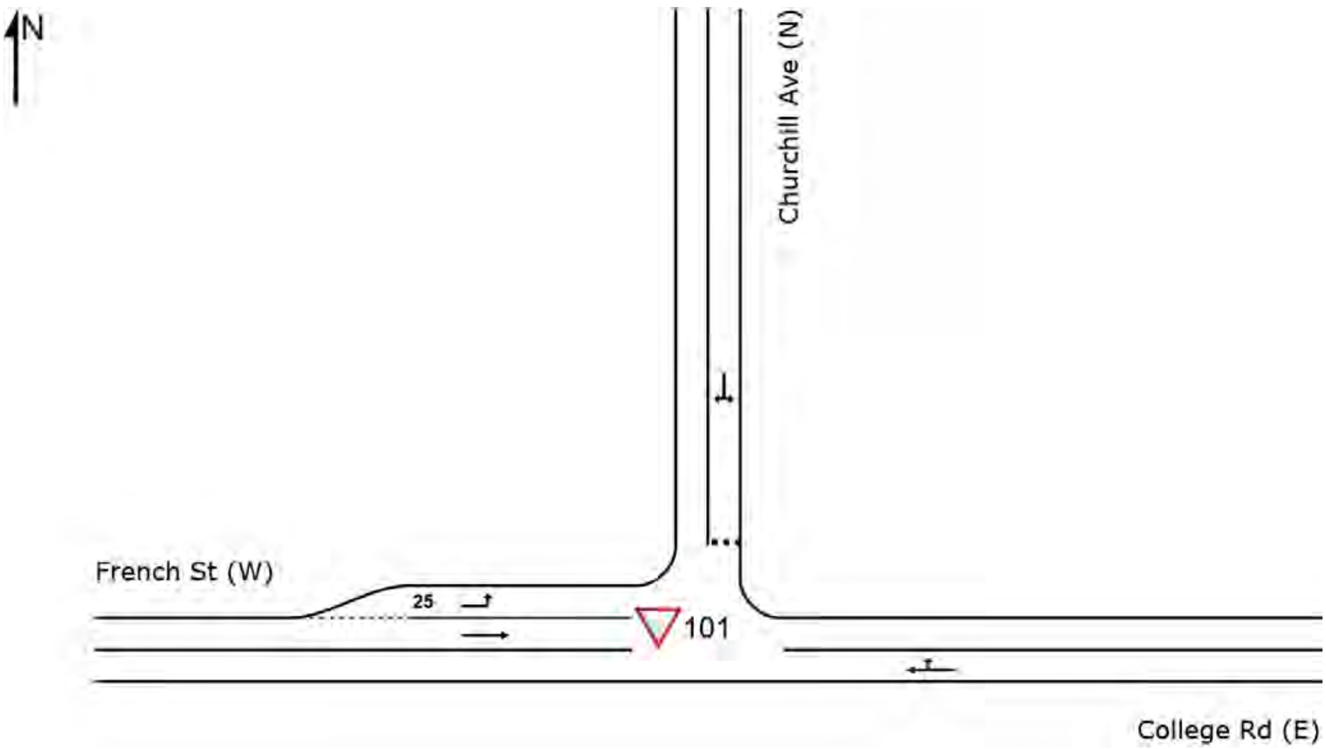
d Dominant lane on roundabout approach

Site: 101 [French St - College Rd - Churchill Ave - 2040 - AM (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: College Rd (E)													
Lane 1	273	2.0	1427	0.191	100	4.6	LOS A	0.9	6.6	Full	500	0.0	0.0
Approach	273	2.0		0.191		4.6	NA	0.9	6.6				
North: Churchill Ave (N)													
Lane 1	116	2.0	1067	0.108	100	4.8	LOS A	0.4	3.1	Full	45	0.0	0.0
Approach	116	2.0		0.108		4.8	LOS A	0.4	3.1				
West: French St (W)													
Lane 1	45	2.0	1831	0.025	100	5.6	LOS A	0.0	0.0	Short	25	0.0	NA
Lane 2	14	2.0	1925	0.007	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	59	2.0		0.025		4.3	NA	0.0	0.0				
Intersection	447	2.0		0.191		4.6	NA	0.9	6.6				

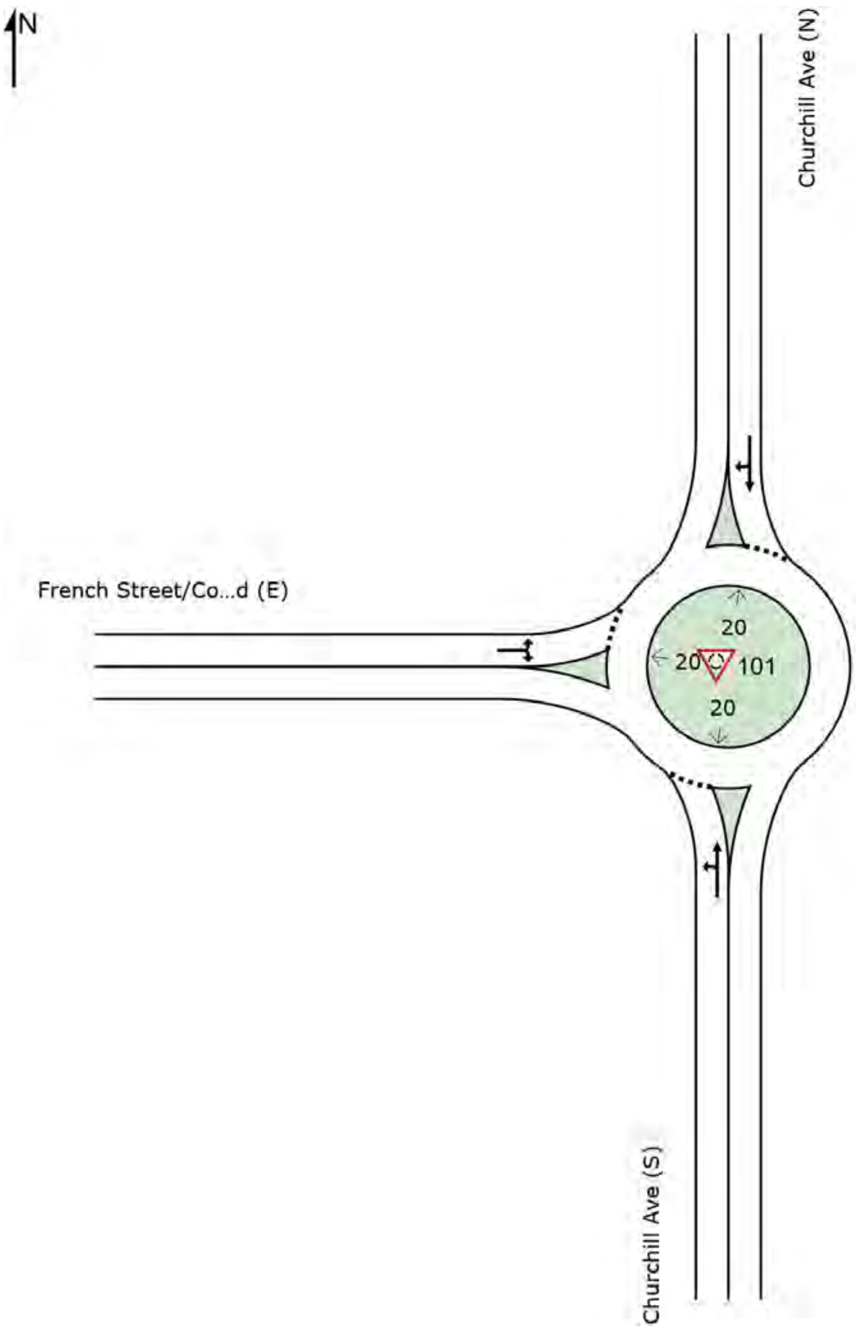
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site: 101 [Churchill Ave - French Street/College Road - 2040 - AM (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Churchill Ave (S)													
Lane 1[d]	801	2.0	1532	0.523	100	4.4	LOS A	4.8	34.2	Full	250	0.0	0.0
Approach	801	2.0		0.523		4.4	LOS A	4.8	34.2				
North: Churchill Ave (N)													
Lane 1[d]	733	2.0	1396	0.525	100	5.0	LOS A	5.1	36.0	Full	100	0.0	0.0
Approach	733	2.0		0.525		5.0	LOS A	5.1	36.0				
West: French Street/College Road (E)													
Lane 1[d]	263	2.0	758	0.347	100	10.7	LOS B	2.3	16.3	Full	500	0.0	0.0
Approach	263	2.0		0.347		10.7	LOS B	2.3	16.3				
Intersection	1797	2.0		0.525		5.6	LOS A	5.1	36.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

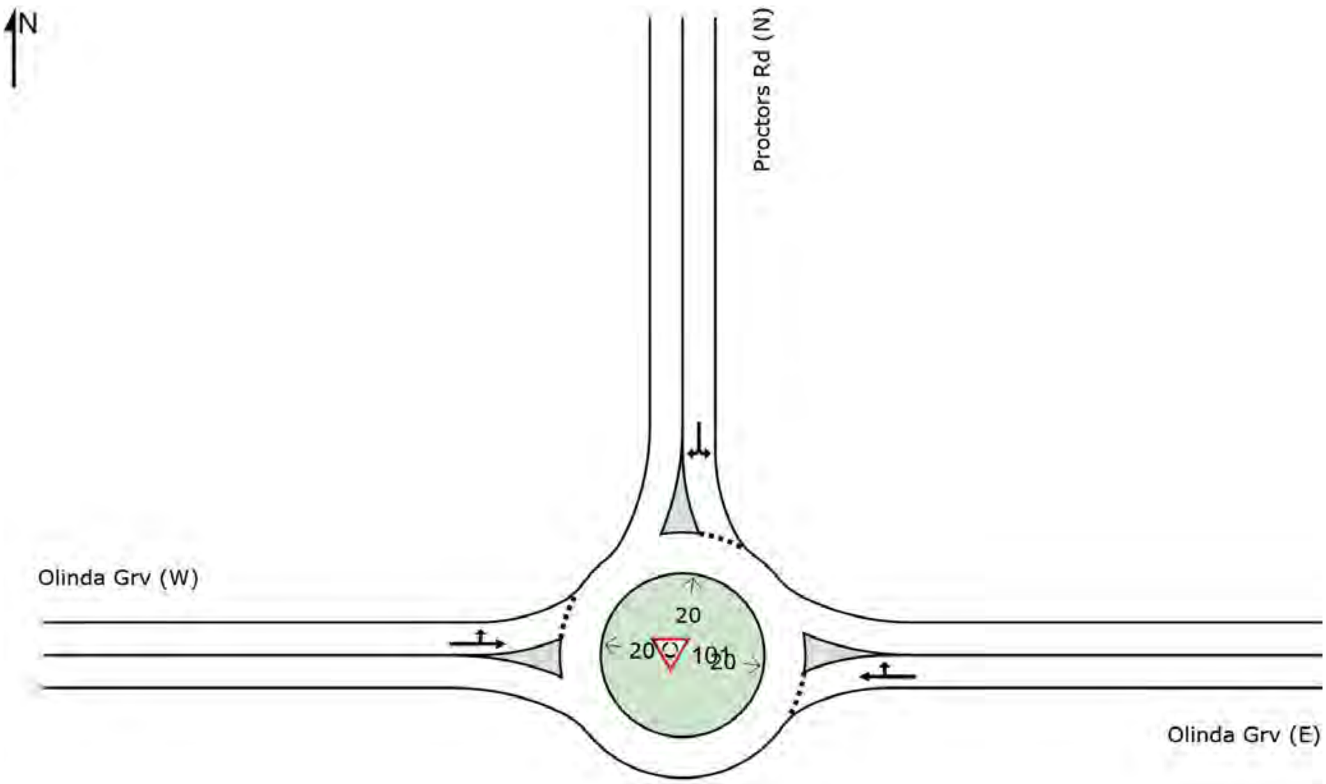
d Dominant lane on roundabout approach

Site: 101 [Proctors Rd - Olinda Grv - 2040 - AM (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Olinda Grv (E)													
Lane 1[d]	761	2.0	1532	0.497	100	7.1	LOS A	4.5	32.1	Full	500	0.0	0.0
Approach	761	2.0		0.497		7.1	LOS A	4.5	32.1				
North: Proctors Rd (N)													
Lane 1[d]	151	2.0	1051	0.143	100	6.5	LOS A	0.9	6.3	Full	500	0.0	0.0
Approach	151	2.0		0.143		6.5	LOS A	0.9	6.3				
West: Olinda Grv (W)													
Lane 1[d]	1401	2.0	1002	1.398	100	371.4	LOS F	272.3	1938.8	Full	500	0.0	100.0
Approach	1401	2.0		1.398		371.4	LOS F	272.3	1938.8				
Intersection	2313	2.0		1.398		227.8	LOS F	272.3	1938.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

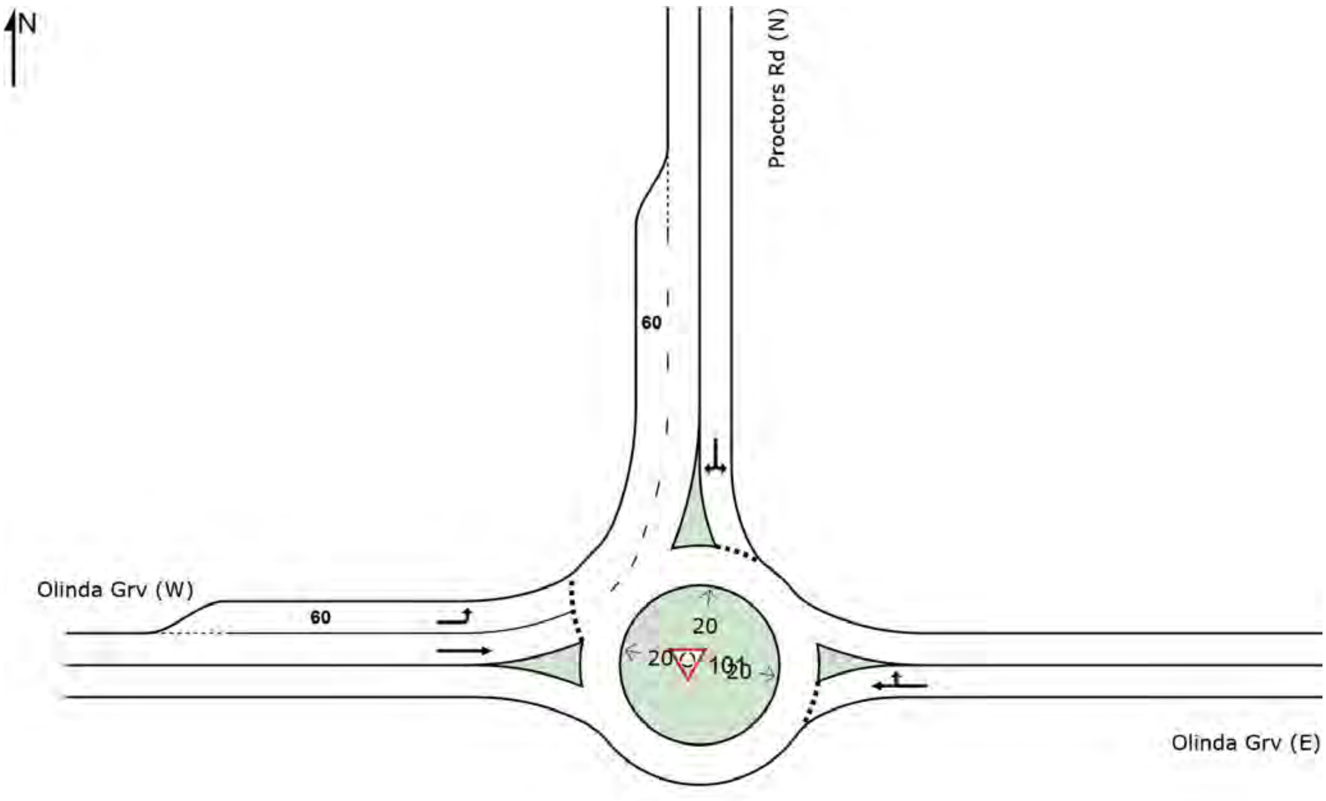
d Dominant lane on roundabout approach

Site: 101 [Proctors Rd - Olinda Grv - 2040 - AM - Extra Lane (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Olinda Grv (E)													
Lane 1[d]	761	2.0	1532	0.497	100	7.1	LOS A	4.6	32.5	Full	500	0.0	0.0
Approach	761	2.0		0.497		7.1	LOS A	4.6	32.5				
North: Proctors Rd (N)													
Lane 1[d]	151	2.0	986	0.153	100	7.1	LOS A	0.9	6.5	Full	500	0.0	0.0
Approach	151	2.0		0.153		7.1	LOS A	0.9	6.5				
West: Olinda Grv (W)													
Lane 1[d]	1043	2.0	1199	0.870	100	19.5	LOS B	18.5	131.6	Short	60	0.0	NA
Lane 2	358	2.0	841	0.425	100	7.7	LOS A	2.8	19.7	Full	500	0.0	0.0
Approach	1401	2.0		0.870		16.5	LOS B	18.5	131.6				
Intersection	2313	2.0		0.870		12.8	LOS B	18.5	131.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

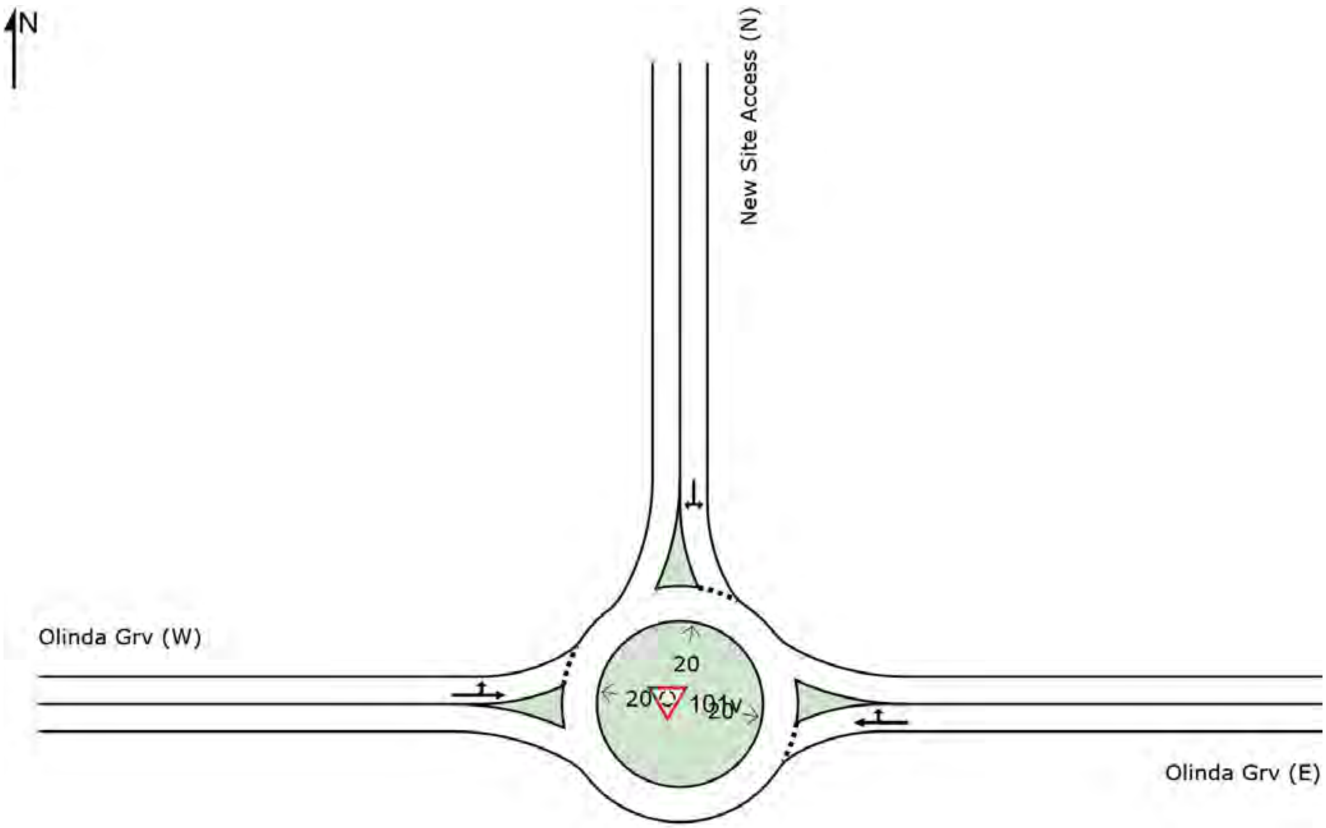
d Dominant lane on roundabout approach

Site: 101v [Olinda Grv - New Site Access - 1 lane N approach - 2040 - AM - Conversion (Site Folder: AM Post Development)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance													
	DEMAND FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Olinda Grv (E)													
Lane 1[d]	600	2.0	1226	0.489	100	5.8	LOS A	4.4	31.3	Full	500	0.0	0.0
Approach	600	2.0		0.489		5.8	LOS A	4.4	31.3				
North: New Site Access (N)													
Lane 1[d]	211	2.0	983	0.214	100	10.5	LOS B	1.3	9.4	Full	500	0.0	0.0
Approach	211	2.0		0.214		10.5	LOS B	1.3	9.4				
West: Olinda Grv (W)													
Lane 1[d]	466	2.0	1614	0.289	100	4.2	LOS A	2.3	16.7	Full	500	0.0	0.0
Approach	466	2.0		0.289		4.2	LOS A	2.3	16.7				
Intersection	1277	2.0		0.489		6.0	LOS A	4.4	31.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

USER REPORT FOR SITE

All Movement Classes

Project: 211122-3014001291UTAS

Template: Default Site User Report

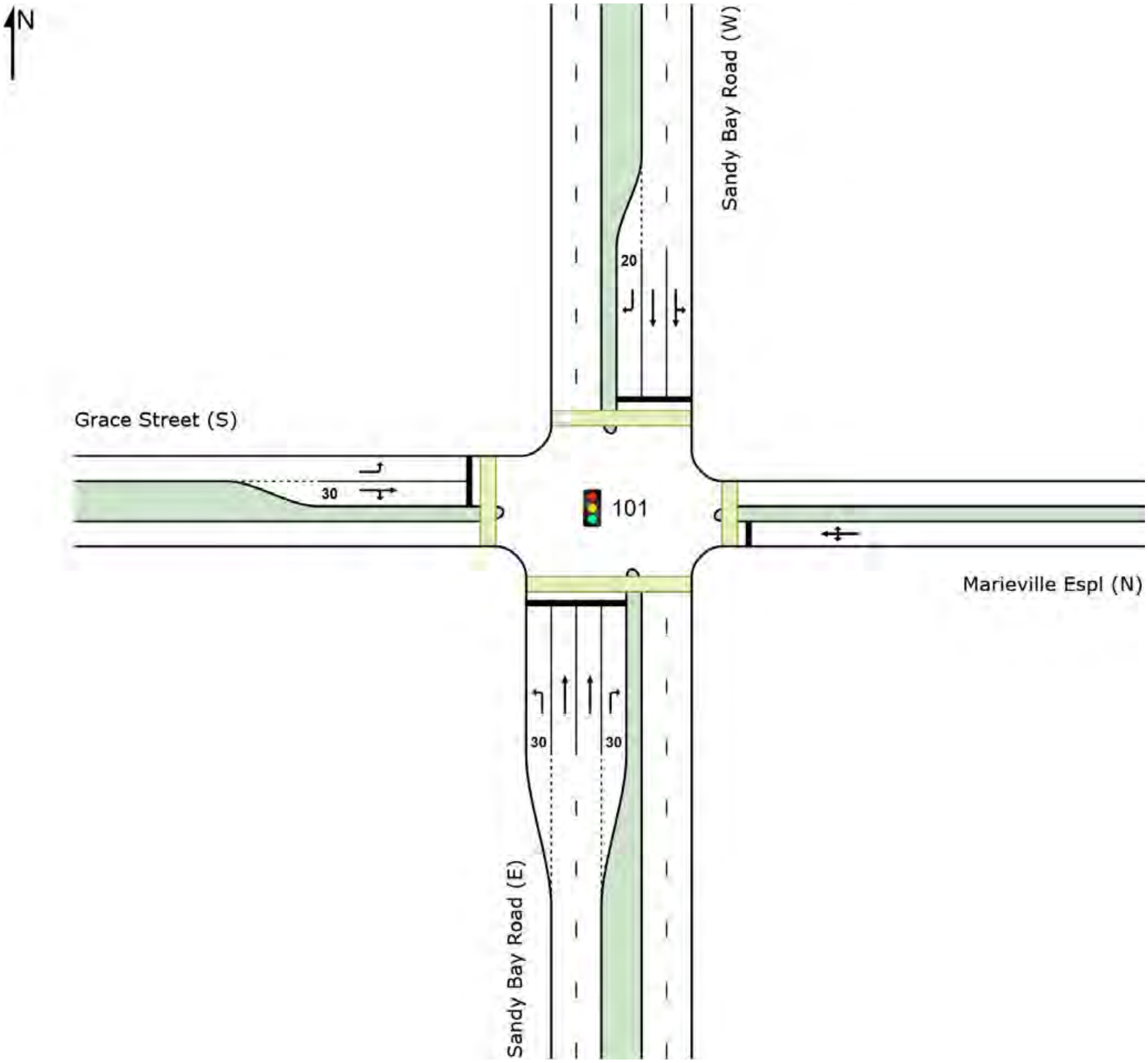
Site: 101 [Proposed Grace St - Sandy Bay Rd - Marieville Espl - 2040 - PM Clearway (Site Folder: PM Post Development - By SP - Copy)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 120 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C, A1*, A2*
Output Phase Sequence: A, B, C, A1*
(* Variable Phase)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.


N
Sandy Bay Road (W)
20
Grace Street (S)
30
101
Marieville Espl (N)
30
30
Sandy Bay Road (E)

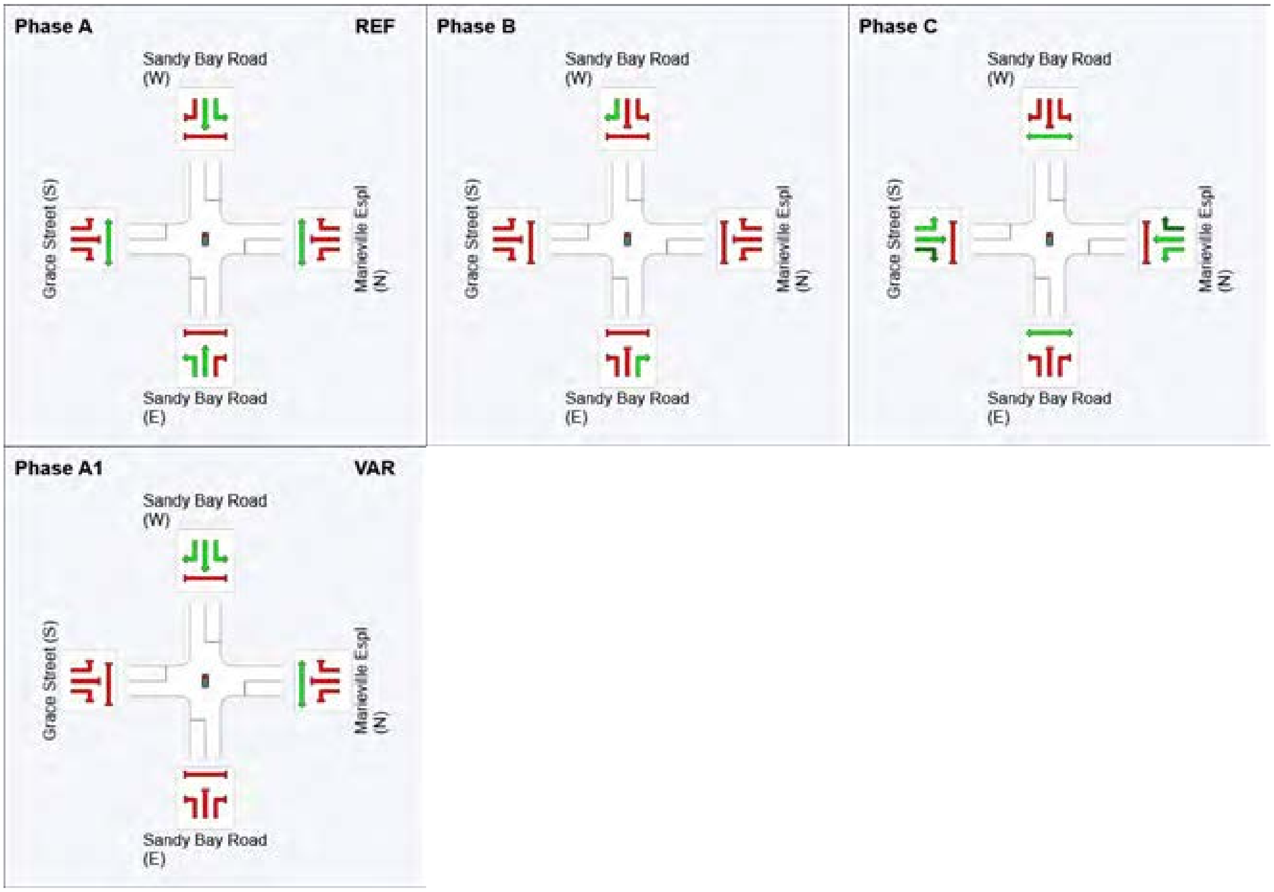
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Sandy Bay Road (E)													
Lane 1	18	2.0	610	0.029	100	34.0	LOS C	0.7	4.9	Short	30	0.0	NA
Lane 2	465	5.0	659 [1]	0.706	100	35.2	LOS D	23.1	168.7	Full	500	0.0	0.0
Lane 3	465	5.0	659 [1]	0.706	100	35.2	LOS D	23.1	168.9	Full	500	0.0	0.0
Lane 4	15	2.0	229	0.064	100	56.0	LOS E	0.8	5.5	Short	30	0.0	NA
Approach	963	4.9		0.706		35.5	LOS D	23.1	168.9				
East: Marieville Espl (N)													
Lane 1	71	2.0	157	0.450	100	62.1	LOS E	4.1	28.9	Full	500	0.0	0.0
Approach	71	2.0		0.450		62.1	LOS E	4.1	28.9				
North: Sandy Bay Road (W)													
Lane 1	598	2.0	976	0.612	100	22.5	LOS C	24.7	175.5	Full	500	0.0	0.0
Lane 2	401	2.0	656 [1]	0.612	100	19.4	LOS B	14.4	102.4	Full	500	0.0	0.0
Lane 3	216	2.0	320 [1]	0.675	100	29.8	LOS C	6.9	49.3	Short	20	0.0	NA
Approach	1215	2.0		0.675		22.8	LOS C	24.7	175.5				
West: Grace Street (S)													
Lane 1	223	2.0	318 [1]	0.701	100	55.4	LOS E	12.4	88.5	Full	500	0.0	0.0
Lane 2	52	2.0	324	0.159	100	48.6	LOS D	2.5	17.9	Short	30	0.0	NA
Approach	275	2.0		0.701		54.1	LOS D	12.4	88.5				
Intersection	2523	3.1		0.706		32.1	LOS C	24.7	175.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Phase Timing Summary

Phase	A	B	C	A1
Phase Change Time (sec)	0	49	70	102
Green Time (sec)	43	15	26	12
Phase Time (sec)	49	21	32	18
Phase Split	41%	18%	27%	15%

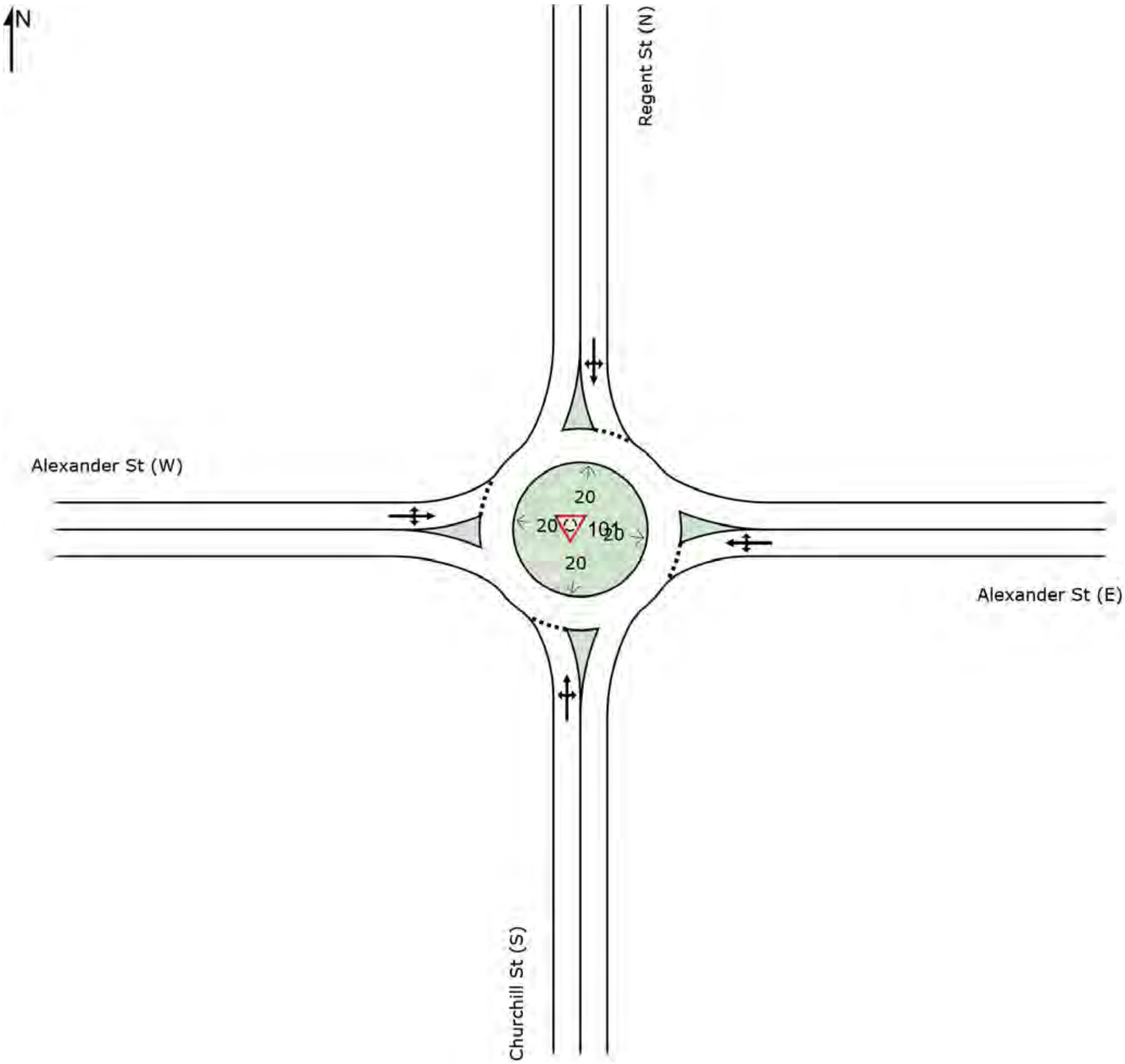
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Site: 101 [Regent St - Alexander St - Churchill St - 2040 - PM (Site Folder: PM Post Development - By SP - Copy)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance														
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Churchill St (S)													
Lane 1[d]	756	2.0	1586	0.477	100	4.3	LOS A	4.3	30.5	Full	500	0.0	0.0
Approach	756	2.0		0.477		4.3	LOS A	4.3	30.5				
East: Alexander St (E)													
Lane 1[d]	38	2.0	693	0.055	100	11.3	LOS B	0.3	2.3	Full	500	0.0	0.0
Approach	38	2.0		0.055		11.3	LOS B	0.3	2.3				
North: Regent St (N)													
Lane 1[d]	827	2.0	1575	0.525	100	4.4	LOS A	5.1	36.1	Full	500	0.0	0.0
Approach	827	2.0		0.525		4.4	LOS A	5.1	36.1				
West: Alexander St (W)													
Lane 1[d]	41	2.0	748	0.055	100	10.8	LOS B	0.3	2.2	Full	500	0.0	0.0
Approach	41	2.0		0.055		10.8	LOS B	0.3	2.2				
Intersection	1662	2.0		0.525		4.7	LOS A	5.1	36.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

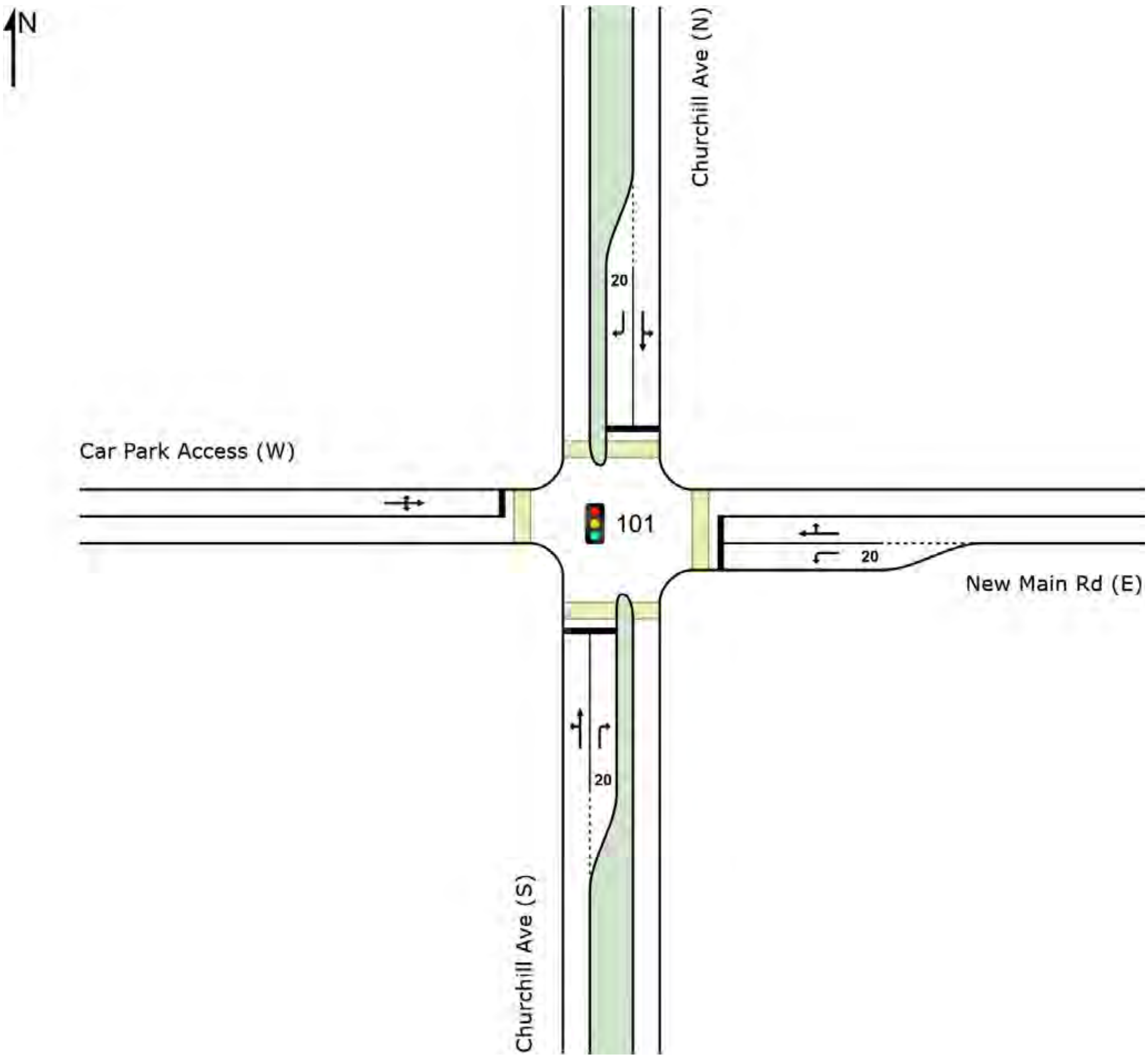
Site: 101 [Churchill Ave - Unamed new Rd - PM 2040 (Site Folder: PM Post Development - By SP - Copy)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 90 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A1, A, A3, B
Output Phase Sequence: A1, A, A3, B

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



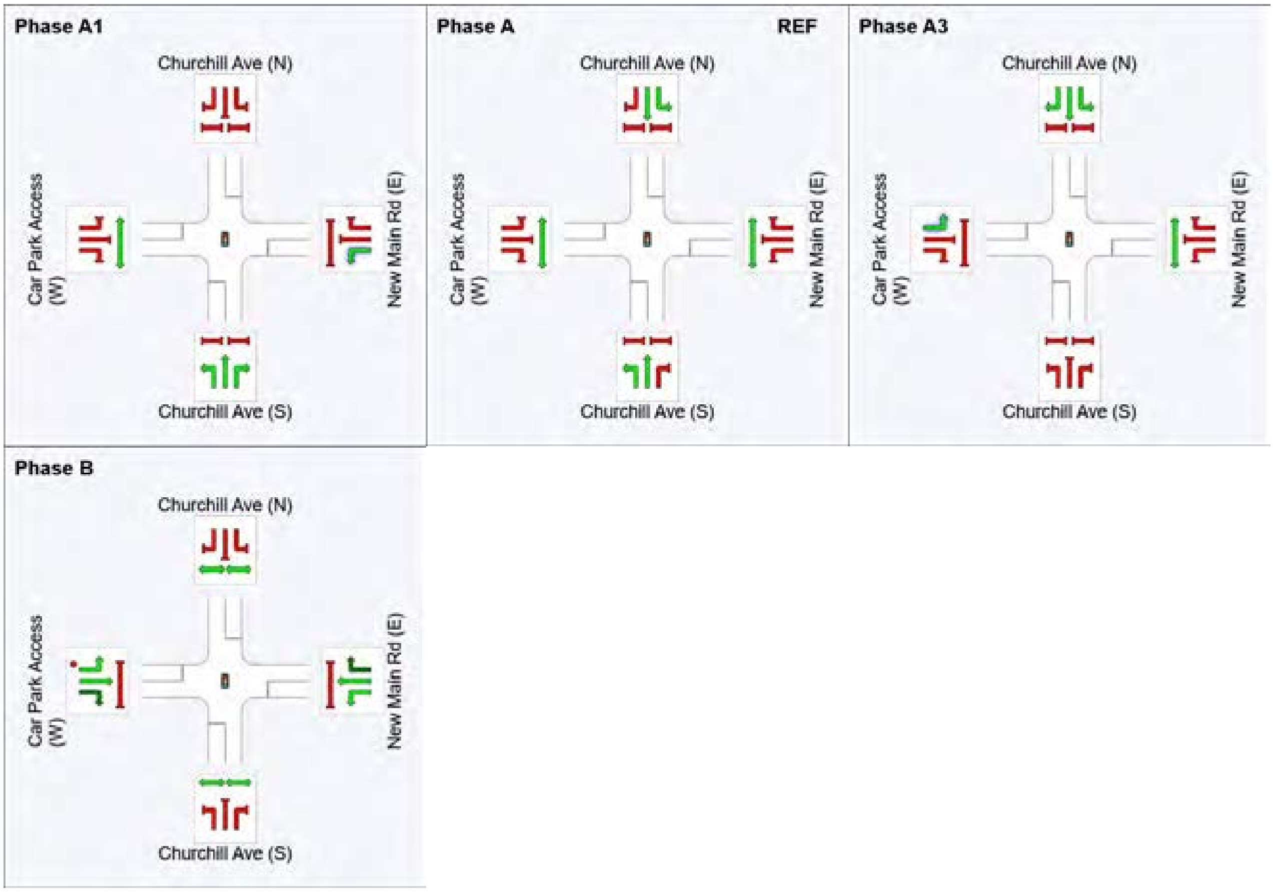
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Churchill Ave (S)													
Lane 1	600	2.0	1168[1]	0.514	100	10.0	LOS A	14.3	101.9	Full	500	0.0	0.0
Lane 2	16	2.0	122	0.129	100	49.8	LOS D	0.7	4.9	Short	20	0.0	NA
Approach	616	2.0		0.514		11.0	LOS B	14.3	101.9				
East: New Main Rd (E)													
Lane 1	23	2.0	448	0.052	100	32.6	LOS C	0.8	5.5	Short	20	0.0	NA
Lane 2	133	2.0	188[1]	0.705	100	49.9	LOS D	6.1	43.4	Full	500	0.0	0.0
Approach	156	2.0		0.705		47.3	LOS D	6.1	43.4				
North: Churchill Ave (N)													
Lane 1	792	2.0	1159[1]	0.683	100	12.2	LOS B	22.3	158.6	Full	500	0.0	0.0
Lane 2	20	2.0	122	0.164	100	50.0	LOS D	0.9	6.3	Short	20	0.0	NA
Approach	812	2.0		0.683		13.2	LOS B	22.3	158.6				
West: Car Park Access (W)													
Lane 1	17	2.0	317	0.053	100	36.9	LOS D	0.6	4.4	Full	500	0.0	0.0
Approach	17	2.0		0.053		36.9	LOS D	0.6	4.4				
Intersection	1600	2.0		0.705		15.9	LOS B	22.3	158.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Phase Timing Summary

Phase	A1	A	A3	B
Phase Change Time (sec)	78	0	50	62
Green Time (sec)	6	44	6	10
Phase Time (sec)	12	50	12	16
Phase Split	13%	56%	13%	18%

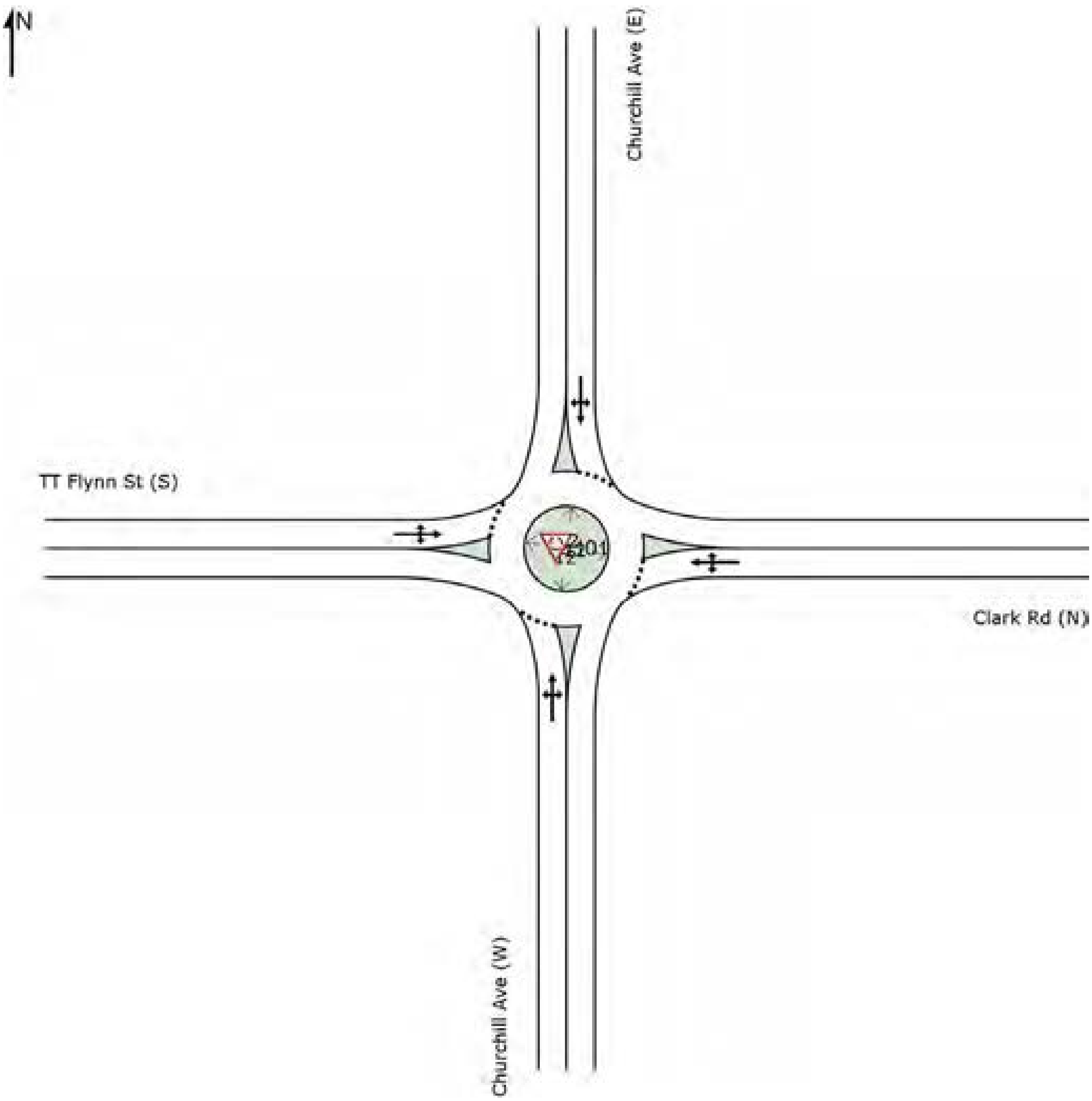
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Site: 101 [Churchill Ave - TT Flynn St - Clark Rd - PM 2040 (Site Folder: PM Post Development - By SP - Copy)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Churchill Ave (W)													
Lane 1[d]	548	2.0	1013	0.541	100	6.0	LOS A	4.2	30.0	Full	500	0.0	0.0
Approach	548	2.0		0.541		6.0	LOS A	4.2	30.0				
East: Clark Rd (N)													
Lane 1[d]	160	2.0	648	0.247	100	10.9	LOS B	1.6	11.1	Full	500	0.0	0.0
Approach	160	2.0		0.247		10.9	LOS B	1.6	11.1				
North: Churchill Ave (E)													
Lane 1[d]	766	2.0	1321	0.580	100	4.9	LOS A	5.8	41.5	Full	250	0.0	0.0
Approach	766	2.0		0.580		4.9	LOS A	5.8	41.5				
West: TT Flynn St (S)													
Lane 1[d]	213	2.0	728	0.292	100	8.3	LOS A	1.9	13.3	Full	500	0.0	0.0
Approach	213	2.0		0.292		8.3	LOS A	1.9	13.3				
Intersection	1687	2.0		0.580		6.3	LOS A	5.8	41.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

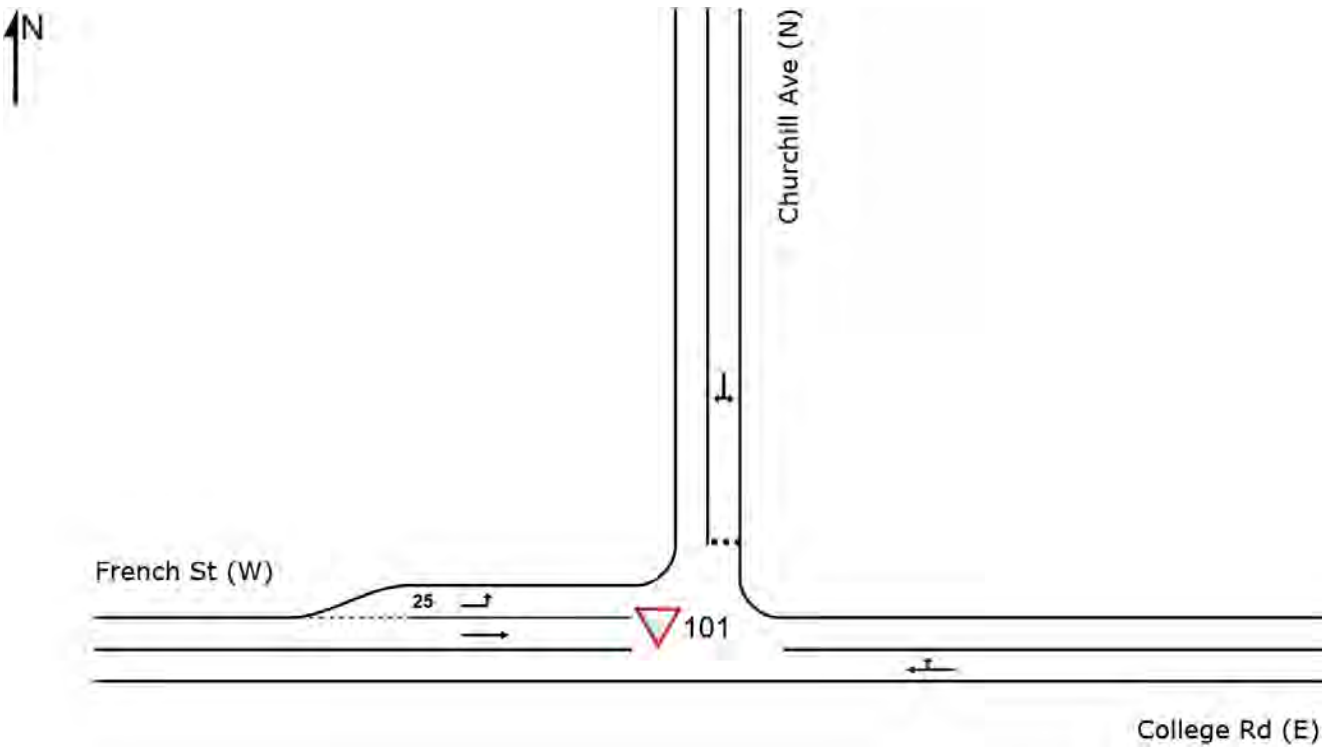
d Dominant lane on roundabout approach

Site: 101 [French St - College Rd - Churchill Ave - 2040 - PM (Site Folder: PM Post Development - By SP - Copy)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: College Rd (E)													
Lane 1	137	2.0	1384	0.099	100	4.0	LOS A	0.4	3.1	Full	500	0.0	0.0
Approach	137	2.0		0.099		4.0	NA	0.4	3.1				
North: Churchill Ave (N)													
Lane 1	222	2.0	1334	0.166	100	4.1	LOS A	0.7	5.3	Full	45	0.0	0.0
Approach	222	2.0		0.166		4.1	LOS A	0.7	5.3				
West: French St (W)													
Lane 1	55	2.0	1831	0.030	100	4.6	LOS A	0.0	0.0	Short	25	0.0	NA
Lane 2	41	2.0	1925	0.021	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	96	2.0		0.030		2.6	NA	0.0	0.0				
Intersection	455	2.0		0.166		3.8	NA	0.7	5.3				

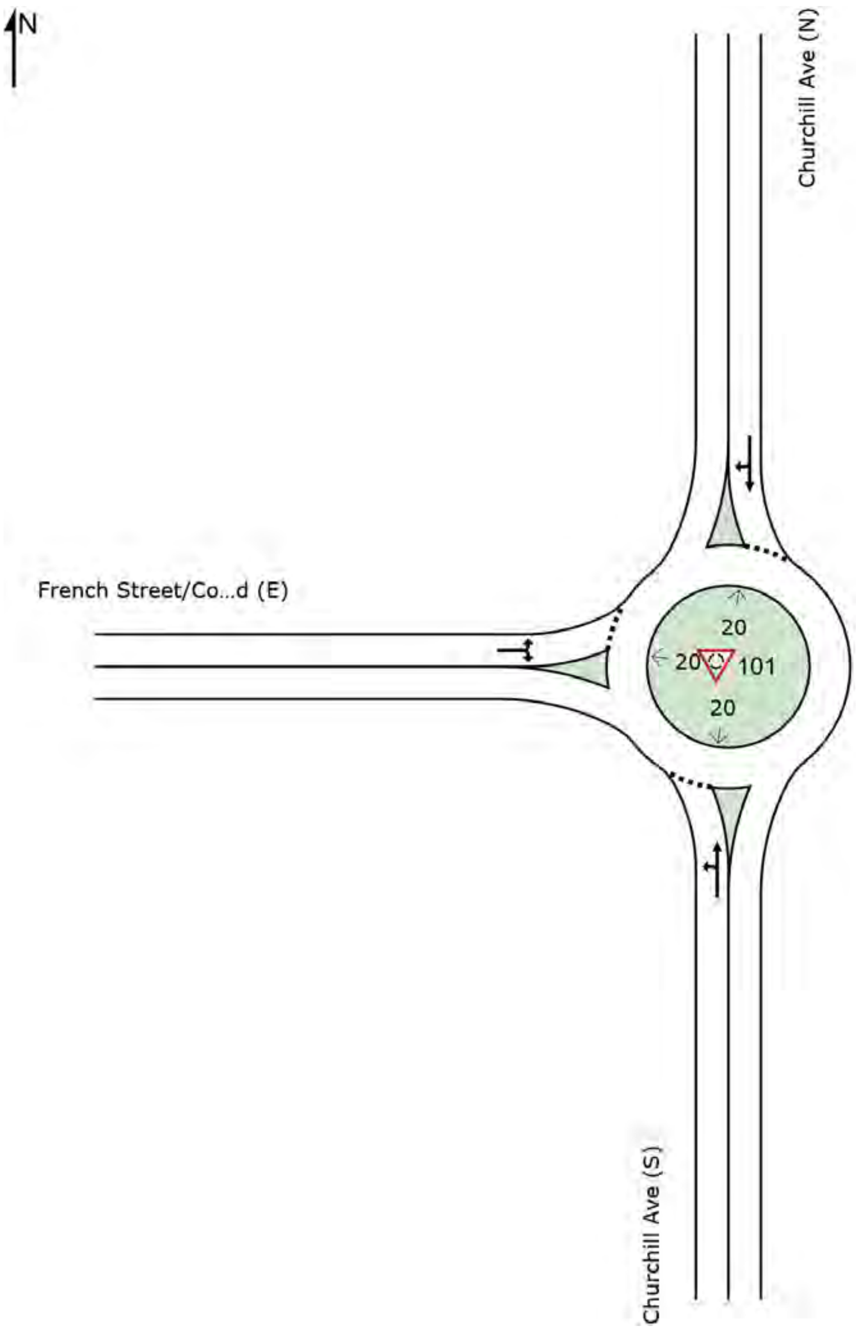
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site: 101 [Churchill Ave - French Street/College Road - 2040 - PM (Site Folder: PM Post Development - By SP - Copy)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance														
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Churchill Ave (S)													
Lane 1[d]	618	2.0	1319	0.468	100	5.0	LOS A	3.7	26.0	Full	250	0.0	0.0
Approach	618	2.0		0.468		5.0	LOS A	3.7	26.0				
North: Churchill Ave (N)													
Lane 1[d]	727	2.0	1431	0.508	100	5.5	LOS A	4.7	33.4	Full	100	0.0	0.0
Approach	727	2.0		0.508		5.5	LOS A	4.7	33.4				
West: French Street/College Road (E)													
Lane 1[d]	164	2.0	877	0.187	100	9.1	LOS A	1.1	8.0	Full	500	0.0	0.0
Approach	164	2.0		0.187		9.1	LOS A	1.1	8.0				
Intersection	1509	2.0		0.508		5.7	LOS A	4.7	33.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

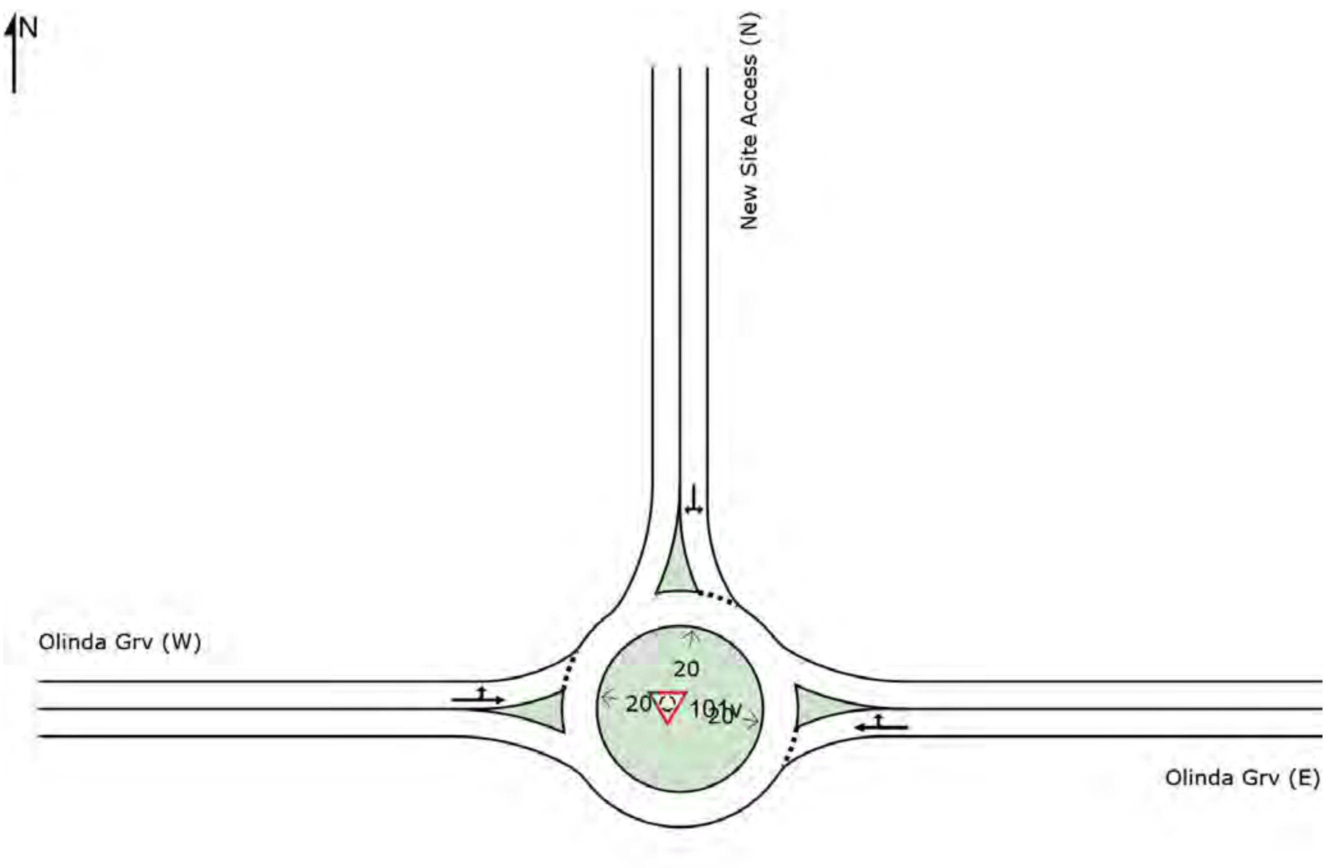
d Dominant lane on roundabout approach

Site: 101v [Olinda Grv - New Site Access - 1 lane N approach - 2040 - PM (Site Folder: PM Post Development - By SP - Copy)]

New Site
Site Category: (None)
Roundabout

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Lane Use and Performance														
	DEMAND FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Olinda Grv (E)													
Lane 1[d]	403	2.0	1147	0.351	100	4.6	LOS A	2.8	19.7	Full	500	0.0	0.0
Approach	403	2.0		0.351		4.6	LOS A	2.8	19.7				
North: New Site Access (N)													
Lane 1[d]	224	2.0	805	0.279	100	11.0	LOS B	1.8	13.2	Full	500	0.0	0.0
Approach	224	2.0		0.279		11.0	LOS B	1.8	13.2				
West: Olinda Grv (W)													
Lane 1[d]	793	2.0	1545	0.513	100	3.1	LOS A	5.5	38.8	Full	500	0.0	0.0
Approach	793	2.0		0.513		3.1	LOS A	5.5	38.8				
Intersection	1420	2.0		0.513		4.8	LOS A	5.5	38.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

ASSESSING THE MASTERPLAN DESIGN + IMPACTS

Landscape Visual Impact Assessment

Orbit Solutions

VISUALIZATION
Orbit Solutions Pty Ltd
PO BOX 736, Port Melbourne, VIC 3207
p: +61 3 9690 4418
orbitsolutions.com.au

LANDSCAPE & VISUAL IMPACT ASSESSMENT

UTAS SANDY BAY MASTERPLAN FOR PSA SUBMISSION

UTAS, SANDY BAY, TASMANIA

06 December 2021

VERSION CONTROL			
VERSION	DATE	AUTHORISED SIGNATURE	Name of signatory
PSA Submission	6-Dec-21		Christopher Goss

As signatory to this report, I certify that, pursuant to Section 55(1) of the Local Government Act 1993, I hold no interest, as referred to in Section 49 of the Local Government Act 1993, in matters contained in this report.

AUTHOR: Christopher Goss
Director of Orbit Solutions Pty Ltd

QUALIFICATIONS:
Bachelor of Environmental Design (1993), University of Tasmania, Faculty of Architecture and Engineering
Bachelor of Architecture (1995), University of Tasmania, Faculty of Architecture and Engineering

REGISTRATION:
Architecture Registration Board Victoria
Architecture Registration Board New South Wales,

ASSOCIATIONS:
Victorian Planning and Environmental Law Association (Fellow citation 2014)
Australian Institute of Architecture (A+ Member)

This report has been commissioned by ClarkeHopkinsClarke Architects Pty Ltd, on behalf of UTAS Properties Pty Ltd (UPPL) to assess and report on the landscape and visual impacts pertaining to and in support of the development of the UTAS Sandy Bay Masterplan for the purpose of a Planning Scheme Amendment or as otherwise set out in this report. This report may only be used and relied on by ClarkeHopkinsClarke Architects Pty Ltd and UTAS Properties Pty Ltd (UPPL) for this purpose or as otherwise set out in this report

NOTE: At the time of authoring this report Travel Restrictions relating to the COVID-19 Pandemic restricted access to Tasmania from Victoria where this report has been authored. Direction was provided to a local Tasmanian Photographer and to a Licensed Land Survey Company to undertake the field works relied upon as part of this LVIA.

The Author was born and raised in Hobart and has since worked locally, nationally and internationally. He returns often, when travel restrictions are not in place, for professional and personal visits. He remains familiar with the context and has relied in part upon that familiarity as well as the interrogation of the most current digital information datasets, tools and processes to undertake this work. He has been ably assisted by the professional team at Orbit Solutions Pty Ltd who have assisted in the preparation of the works.

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1. EXECUTIVE SUMMARY

This Report has been prepared by Orbit Solutions Pty Ltd for Clark Hopkins Clark on behalf of UTAS Properties Pty Ltd. The brief was to prepare a Landscape and Visual Impact Assessment ('LVIA') for the UTAS Sandy Bay Masterplan ('Masterplan') for PSA Submission. The LVIA contemplates the acceptability to the Masterplan in terms of the effects of the proposed developments on views and on the landscape itself. These different effects are interrelated and have been considered as part of this report.

The Masterplan is based on 5 distinct precincts with built form ranging from single storey to eight storeys across the site. An extensive area of Bushland Reserve is also preserved as part of the Masterplan. Overall finding are as follows; (ie acceptable level of landscape and visual impact)

Precinct 1; "Lifestyle and Sporting Precinct" - Acceptable, subject to recommendations relating to minor modifications to permissible height of Building 1.1
Precinct 2; "Innovation and Civil Quarter" - Acceptable, subject to recommendations relating to minor modifications to permissible height of Building 2.3
Precinct 3; "Peri-Urban Neighbourhood" – Acceptable
Precinct 4; "The Learning Precinct" - Acceptable
Precinct 5; "Mt Nelson Eco-Tourism + Residential Neighbourhood" - Acceptable, subject to recommendations relating to minor modifications to permissible height of Buildings 5.1,5.2,5.3,5.13

This report contemplates the siting and nominated heights of the building envelopes that have been prepared by CHC. It assesses these against the criteria set out in the following report that provides the levels of landscape and visual sensitivity and the overall visual absorption capability for the site and surrounds.

As the Masterplan only contemplates the building envelopes there are Critical Visual Influences that have not yet been assessed. These include the architectural detailing such as building articulation, textures and colour, materials, lighting and reflectivity. The architectural and landscape design resolution will ultimately have a significant influence on the acceptability of a proposal that is contemplated for approval by the Responsible Authority. It is noted that the position and siting of buildings provides future opportunities beyond height alone as a means to achieve the objective to avoid breaking valued ridgelines from significant viewpoints.

Notwithstanding these other factors, this early and important stage of the Masterplan has been able to establish that the proposal will have a high magnitude of change due to the scale of works proposed. Having noted that it is also relevant to note that this report, having evaluated the Masterplan, makes relatively few recommendations and these are focused on the ensuring that the preservation of view lines to the surrounding ridgelines and key features are maintained. That is to say, that the performance criteria of any scheme would still allow for development beyond the permissible heights recommended in line with Performance criteria that is set out in the relevant Planning Scheme.

2. INTRODUCTION

2.1 The Scope of this Landscape and Visual Impact Assessment

2.1.1 Orbit Solutions Pty Ltd is engaged by Clark Hopkins Clark Architects on behalf of UTAS to prepare a Landscape and Visual Impact Assessment for the proposed UTAS Sandy Bay Masterplan in Tasmania. This project is seeking to develop the land held currently held by UTAS.

2.1.2 CHC Architects have, in conjunction with Dock4 Architects and ERA Planning, prepared a Masterplan in response to the UTAS client brief. The documentation that has been relied upon in preparation of this report is appended. The that proposes to develop five distinct precincts within the subject land.

2.1 The Proposal

2.1.1 The proposed Masterplan is located within the UTAS Sandy Bay land holding (founded 1890). The proposal is for five precincts to be developed on Land generally between Sandy Bay Road to Olinda Grove, Mount Nelson.

2.1.2 The proposal for the Masterplan has five contiguous components that for the purpose of the LVIA are consistent with the application material. These are:

- Precinct 1: Located to the east of the subject site. This precinct is proposed as the "Lifestyle and Sporting Precinct".
- Precinct 2: Located at the centre of the existing Site on the eastern side of Churchill Avenue. This precinct is proposed as the "Innovation and Civil Quarter".
- Precinct 3: Located in the upper Site on the western side of Churchill Avenue and adjacent to the steeply sloping established Nelson Road Subdivision. This precinct is proposed as a "Peri-Urban Neighbourhood."
- Precinct 4: Located in the upper Site on the western side of French Street and east of Baintree Avenue. This precinct is proposed as "The Learning Precinct".
- Precinct 5: Located in the upper sports field accessed from Olinda Road, Mount Nelson and to the west of the upper most ridge of the site in the Bushland Reserve. This precinct is proposed as the "Mt Nelson Eco-Tourism and Residential Neighbourhood".

2.2 The Process

2.2.1 For this Landscape & Visual Impact Assessment, the following review process has been undertaken:

- Relevant Application Submission documentation reviewed.
- A desktop review and fieldwork of the site by the project team, investigating areas that may be impacted within the surrounding visual catchment areas in effected Municipalities. The range of views considered for the purpose of this study being limited to a 5km radius from the centre of the subject site.

2.2.2 An analysis of the relevant parts of the Masterplan has been undertaken that examine the visual implications of the proposal through a framework that examines the Form, Line, Scale and Spatial Character of the proposal in its various parts.

2.2.3 Also adopted, as is consistent with the *"The Guidance for Landscape and Visual Impact Assessment (GLVIA)"*, Third Edition (2013) prepared by the Landscape Institute and Institute of Environmental Management (United Kingdom) are standard sequential steps for visual impact assessment of development proposals:

Step 1: Determine the Visual Sensitivity Levels; landscape and receptor.
Step 2: Determine the Visual Conditions; qualities and quantities.
Step 3: Determine the Visual Effects.
Step 4: Determine the potential Visual Impacts.
Step 5: Determine the overall significance of the Visual Impact.

2.3 SCOPE AND LIMITATIONS

2.3.1 This report: has been prepared by Orbit Solutions Pty Ltd for UPPL and may only be used and relied on by them for the purpose agreed between them for assessment at the time of preparation.

2.3.2 Orbit Solutions Pty Ltd otherwise disclaims responsibility to any person arising in connection with this report. Orbit Solutions Pty Ltd also excludes implied warranties and conditions, to the extent legally permissible.

2.3.3 The services undertaken by Orbit Solutions Pty Ltd in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

2.3.4 The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. Orbit Solutions Pty Ltd has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

2.3.5 The opinions, conclusions and any recommendations in this report are based on assumptions made by Orbit Solutions Pty Ltd described in this report. Orbit Solutions Pty Ltd disclaims liability arising from any of the assumptions being incorrect.

3. DOCUMENTS REVIEWED:

3.1 Building Height Standards Review Project – Leigh Wooley June 30 2018

3.1.1 The principles and strategies that are adopted by Wooley provide an articulation of the experience of the Greater Hobart. His general way of describing the landform that generate the Sullivans Cove Amphitheatre have been extended for the purpose of this report to define the Sandy Bay Amphitheatre . It is the case that they are not only adjacent to each other sharing the western shoreline of the River Derwent but they are also dominated by Mount Wellington/ kunanyi.

3.1.2 "Topography underpins and informs settlement. In Hobart the terms : Ridge, Cove, Hillside, Domain…etc. are references to landforms that underpin the experience and knowledge of the place. Orientation within the dwelling region is provided by landform and water-plane references, more than by built form. Movement within and across the surface of the city (across its landform) will continue to inform its planning and urban design, not only in terms of the orientation and alignment it offers, but in seeking an intelligible topography that includes the evolving built form." P.9

3.1.3 Where the Amphitheatre experience does differ to a greater or lesser extent is in the closer proximity of the skyline in the Sandy Bay Amphitheatre. This defining ridgeline extends from Porters Hill at the south, up to Mount Nelson and across to the north of Proctors Hill. Beyond that to the north the highly valued Mount Wellington/kunanyi dominates the skyline.

4. PLACE:

4.1 GEOGRAPHY: THE LOCATION

4.1.1 The UTAS Sandy Bay Site is an expansive site that climbs from the waterfront along Sandy Bay Road to the top of Proctors Hill.

4.1.2 When viewed from the Marieville reserve and the waterfront area of Sandy Bay the amphitheatre form of the topography is legible and further reinforced by the wedge shape of the site as it climbs to the crown of Proctors Hill.

4.1.3 The natural topographic boundary of Proctors Creek forms the visual edge to the northwest and the settlement of Nelson Road the majority the southeastern edge.

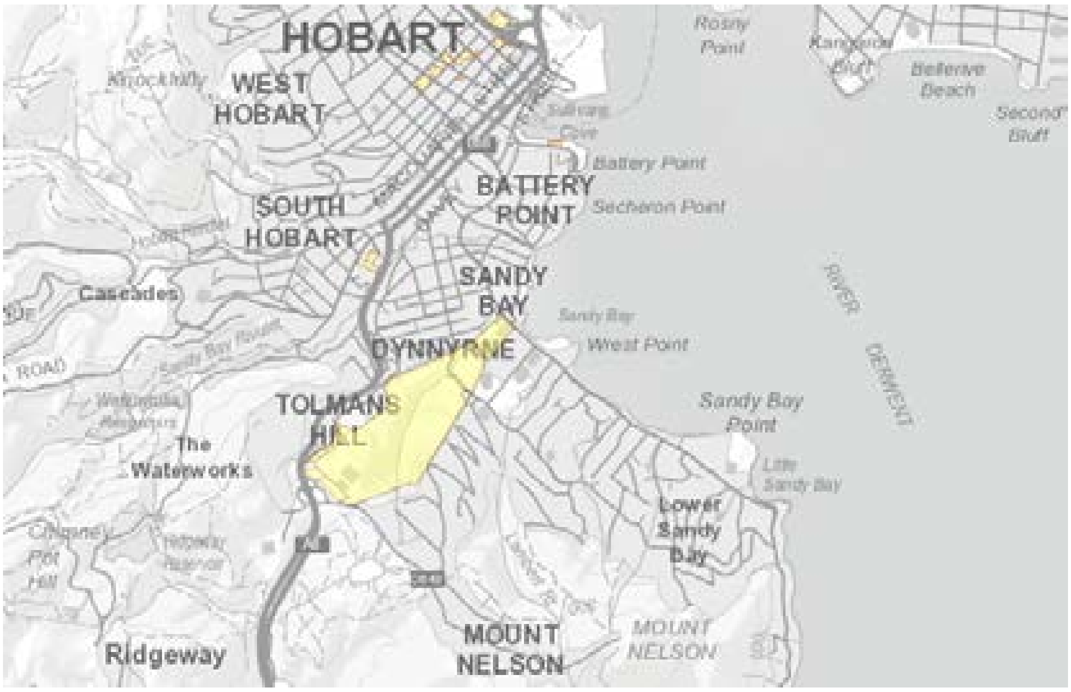

Figure 2 https://maps.thelist.tas.gov.au/listmap/app/list/map

Measured Area	993900

4.2 GEOLOGICAL AND TOPOGRAPHICAL CONTEXT

Figure 3 Imagery copyright2021 Google; Aerial view of the subject site and surround of Sandy Bay and Mount Nelson

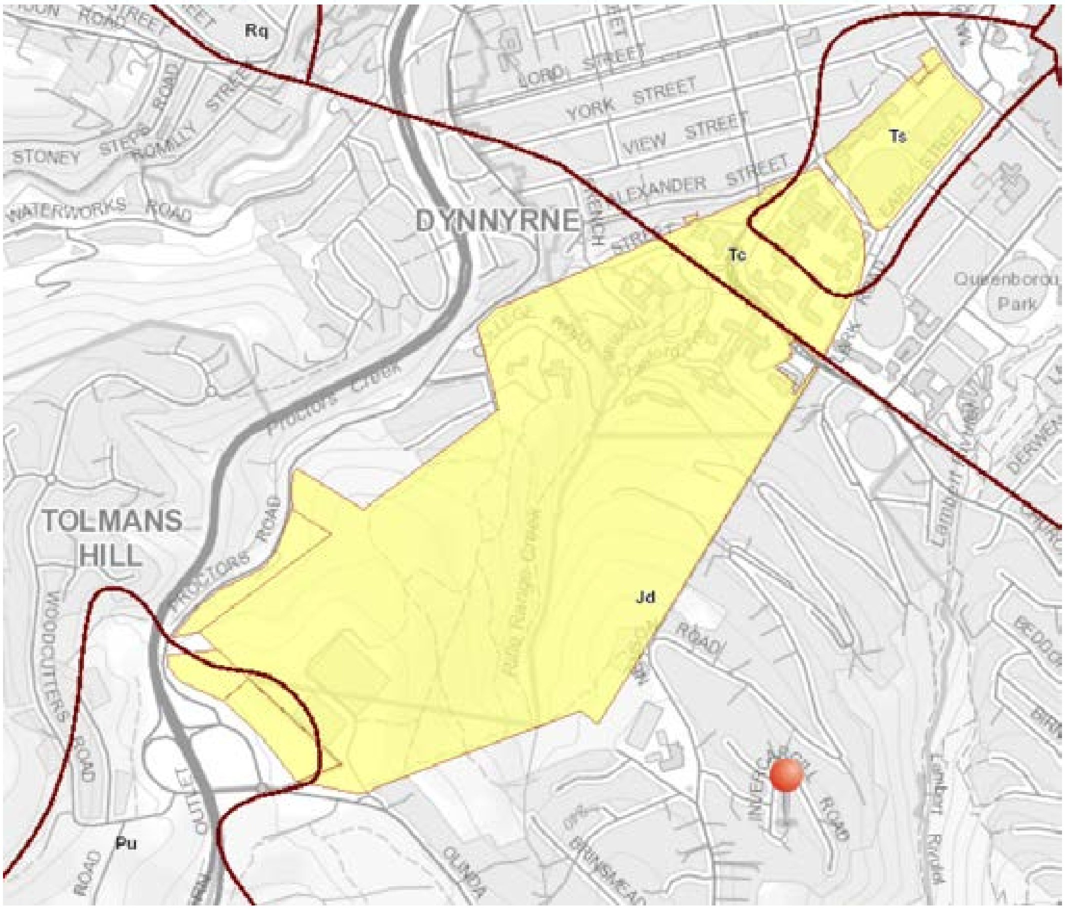

Figure 4 [*https://maps.thelist.tas.gov.au/listmap/app/list/map*](https://maps.thelist.tas.gov.au/listmap/app/list/map)

Precinct 1 :	Ts; Dominantly non-marine sequence of gravel, sand, silt, clay and regolith.
Precinct 2 :	Ts; Dominantly non-marine sequence of gravel, sand, silt, clay and regolith, Tc; Conglomerate, gravel and grit.
Precinct 3 :	Jd; Dolerite (tholeiitic) with locally developed granophyre.
Precinct 4:	Jd; Dolerite (tholeiitic) with locally developed granophyre.
Precinct 5 :	Jd; Dolerite (tholeiitic) with locally developed granophyre. Pu; Upperglaciomarine sequences of pebbly mudstone, pebbly sandstone and limestone.

4.3 LOCAL CONTEXT

4.3.1 The development of the Sandy Bay area began as early as 1805 when 100 acres of land behind the beach and beside the Sandy Bay Rivulet was granted to Captain William Sladden. Most of the land at Sandy Bay was granted to Norfolk Islanders when the colonial authorities forced them to relocate to Van Diemen's Land in 1808.[1]

4.3.2 Sandy Bay Post Office opened on 22 April 1852. It was named *Queenborough* between 1859 and 1878. In the south of the suburb a *Lower Sandy Bay* office opened in 1885. It was renamed *Sandy Bay Lower* in 1895, *Beachside* in 1921 and *Sandy Bay Lower* in 1968.[2]

4.3.3 In 1959 the new University of Tasmania Site at Sandy Bay was officially opened. Prior to that during the construction period part of the University had already moved to Sandy Bay, and was being housed in hastily constructed wooden huts, while the old Site at the Hobart Domain was becoming grossly overcrowded and falling into disrepair.[3]

4.4 CULTURAL CONTEXT

4.4.1 The land called present day Sandy Bay and Mount Nelson post-European settlement is Muwinina country.

4.4.2 The post-European landscapes can be broadly categorised into four types for the purpose of this assessment, the following uses have been identified as relevant to the VCZ's;

- URBAN
- PERI URBAN
- RURAL
- WATERFRONT

[1] https://www.ourtasmania.com.au/hobart/sandy-bay.html.
[2] Premier Postal History. "Post Office List". Premier Postal Auctions. Retrieved 16 June 2012.
[3] https://125timeline.utas.edu.au/timeline/1950/

4.4.3 Mount Nelson was originally named 'Nelson's Hill' by Captain William Bligh in 1792 in honour of David Nelson, the botanist of the Bounty mission.

4.4.4 Nelson Road extends up the Mount Nelsons steep slope adjacent to the UTAS site. It consists of seven very sharp corners created as the road winds its way up the mountain. Nelson Road was built in 1908 for improved access to the Mount Nelson signal station.

4.4.5 Most of the modern suburban development in Mount Nelson has taken place after 1945 when the government encouraged settlement of immigrants escaping the destruction that took place in Europe after World War II. During this same period the section of hill face north of the bends on Nelson Road, which used to be a firing range, was converted into university farm land for the University of Tasmania.

4.4.6 In 1967 a large number of houses were destroyed by the Black Tuesday Bushfires.[3]

4.5 VISUAL CHARACTER ZONES [VCZ]

4.5.1 Best practice is to identify one or more areas that have similar topographic, vegetation and land use features that create areas of similar visual character. These areas are referred to as visual character zones (VCZ). Visual character units (VCU) are then identified within each VCZ to determine the range; quantitative and qualitative effects that may result in any change caused by the proposal to these views.

4.5.2 In determining the extent of the potential visual catchment, consideration has been given to the theoretical capacity for proposed elements of this scale to be seen from the surrounding contexts. This broad area has been further described in this assessment.

4.5.3 The VCZ are distinct areas that have theoretical lines of sight to the proposed development as identified in the '*View Shed Mapping*' exercise.

4.5.4 Each VCZ considers designations for their scenic and/or landscape qualities based upon national, regional, or local significance.

Figure 5 Visual Character Zones identified

4.5.5 Four Visual Character Zones were identified following based on the quadrants that are reflective of the grouping of the dominant visual characteristics surrounding the UTAS site. These include:

- Northeastern VCZ: Lower Urban, Waterfront
- Southeastern VCZ: Elevated Urban, Peri Urban
- Southwestern VCZ: Urban, Elevated Rural, Bushland
- Northwestern VCZ: Elevated Urban

4.5.6 Twenty (20) potential Viewing Locations were investigated through field work photography with five (5) of these to be developed into AlignView Photomontages for further assessment.

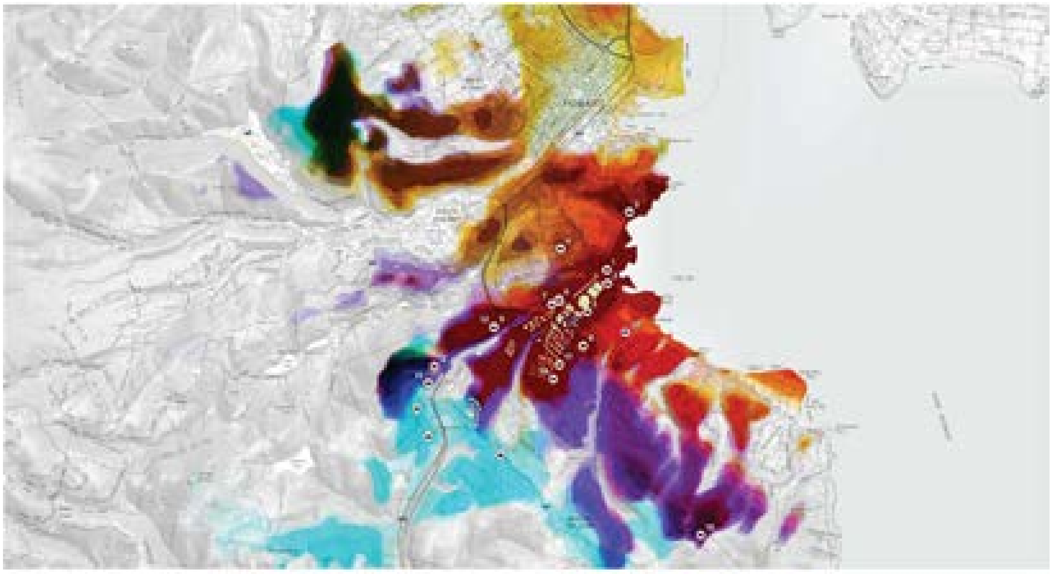

Figure 6 View Shed Analysis UTAS MASTERPLAN Precincts 1-5

4.5.1 Further viewing opportunities were investigated through Google Maps and with the benefit of Taslist data and a 3D massing and topography model was further developed by orbit Solutions from TASLIST GIS info. The Masterplan building forms were provided by the Masterplan's Architects ClarkeHopkinsClarke.

Figure 7 Masterplan Overview

Figure 8 VCZ Northeast

Figure 9 VCZ Southeast

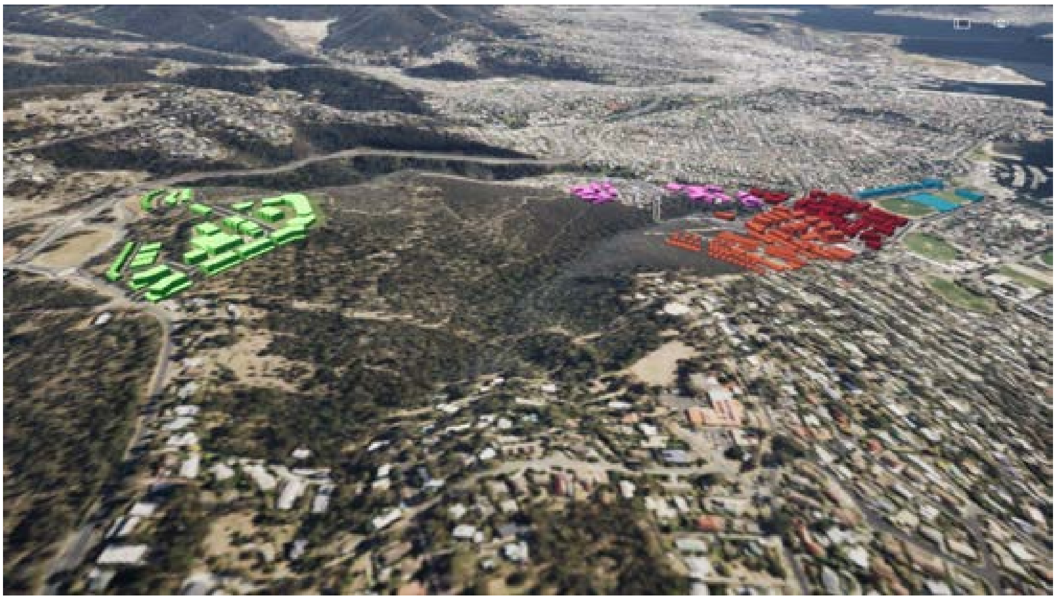

Figure 10 VCZ Southwest

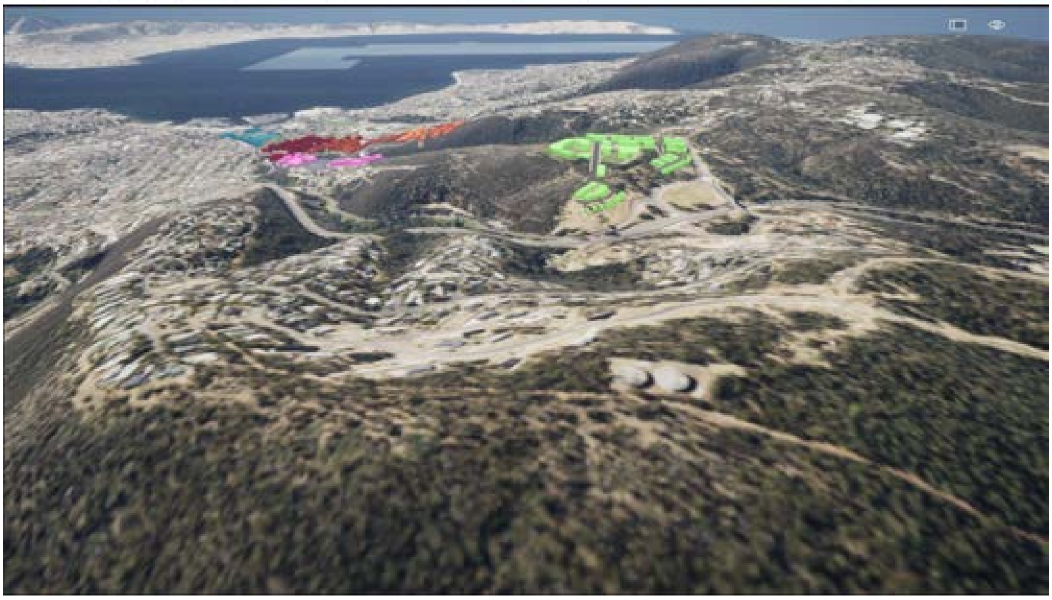

Figure 11 VCZ Northwest

4.5.2 The visual catchment affords an array of viewing opportunities looking toward the site from static positions, in dynamic situations on approach including from below and from above. The number and range of viewing opportunities provide a cumulative set of phenomenal experiences and are layered over the cultural and natural values identified with the place.

4.5.3 Over the lifecycle of the proposed development there will be various stages where the level of contrast will vary. The construction period will have the highest period of visual impact though there are existing buildings in this area that will be replaced albeit with more substantial buildings. Once the relatively short period of construction is completed there will be a longer period while vegetation grows and the building and surrounds are fully established.

4.5.4 Seasonal variations through the winter period see frost on the sporting fields and the deciduous canopies change. Within this ephemeral context, when visibility is available to view the proposed buildings consideration of the mitigation strategies related to texture and colour should be given priority.

4.6 ENVIRONMENTAL CONDITIONS

4.6.1 The Visual Character Units are generally seen together as a scene creating the visual diversity and interest that establishes the local visual setting. These are the Environmental Conditions.

4.6.2 Empirical evidence is the information received by means of the senses, particularly by observation and documentation of patterns and behavior through experimentation.

4.6.3 Various studies have been undertaken through research programs by others and these have been relied upon in part for the practice of professional LVIA's to assist in aggregating subjective values of larger numbers of the wider public whose responses to surveys deal with a broad cross section of the community.

4.6.4 Visual Character Unit [VCU] Classes have been adopted for this analysis;

- VCU1: Sky; skyline/ ridgeline/ horizon
- VCU2: Water; sea/offing/lake/river/stream/dam
- VCU3: Terrain; grade/geology [rock (type), soil, sand]
- VCU4: Vegetation; pasture/orchard/ tree/shrub/understory/grass
- VCU5: Built Form; typology/form/materiality
- VCU6: Infrastructure; roads/paths/utilities

4.6.5 In any scenario the view is the sum of the VCU's and it is the compositional makeup of these units that determines the value placed upon it by the receptors. The qualities of a discreet VCU can be valued at varying levels regardless of the quantity, indeed the scarcity of a particular VCU may indeed be inherent with the perceived value. This perceived value is a subjective consideration.

4.6.6 Prevailing Visual Character Level of Scenic Interest are assessed using the following Qualitative Scale:

- VERY HIGH National /International Significance/Exemplary/ Iconic/ Scarce
- HIGH State Significance
- MODERATE Regional Significance
- LOW Local (immediate context only) Significance
- VERY LOW Frequent or commonly found
- NA Negligible

4.6.7 An analysis of the quantities of the discreet VCU's is an objective process in so far as the quantum of each can be determined and if desired expressed as a ratio or percentage. This can assist in determining how the introduction of a proposal that is made up of new VCU's may contrast or integrate and by extension of this objectively assess its level of effect. This is one step in the process and needs to be considered in relation to the arrangement of the elements.

4.6.8 Prevailing Visual Character Level of Scenic Interest assessed using the following Quantitative Scale to determine dominance and/or frequency within the scene of interest:

- VERY HIGH It is the predominant VCU in the scene
- HIGH It shares dominance with other VCU's in the scene
- MODERATE It is secondary to more dominant VCU's in the scene
- LOW It is a tertiary VCU to other more dominant VCU's in the scene including secondary VCU's
- VERY LOW It is a tertiary VCU to other more dominant VCU's in the scene including secondary VCU's
- NA Imperceptible in comparison to other VCU's in the scene

4.6.9 The VCU's are the ingredients of the scene, how these ingredients are mixed together determines how they are served and ultimately how pleasant or otherwise this is to the receptor. As we can see the pleasantness of the view is a type of amenity that has an element of subjectivity that forms part of the analysis process. This subjectivity is found in empirical evidence, by tempering this with the objective framework consistency is provided between the views in this assessment and more broadly.

4.6.10 Edges and Contrast include the point of intersection between visual character units within the scene. The existence of edges or contrasts in the landscape provides visual diversity, a quality associated with scenic value. The interruption of prevailing edges and contrasts that provide value to the scene are considered as adverse effects. The provision of edges and contrasts that provide enhanced value to the scene are considered as positive effects.

4.7 LANDSCAPE SENSITIVITY

4.7.1 Landscape features have been analyzed as part of this assessment and organized utilising the framework articulated above in the Visual Character Units section.

Figure 12 [*https://maps.thelist.tas.gov.au/listmap/app/list/map*](https://maps.thelist.tas.gov.au/listmap/app/list/map) *Tree Canopy Height, Authority Land, ESRI Imagery*

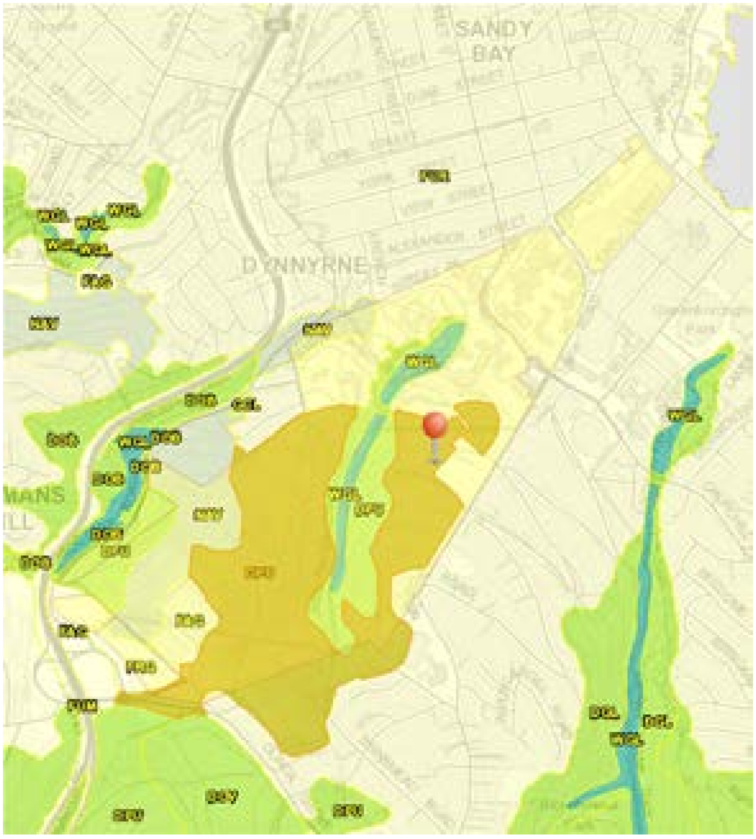

Figure 13 Vegetation Community Group : Dry eucalypt forest and woodland (DPU) Eucalyptus pulchella forest and woodland

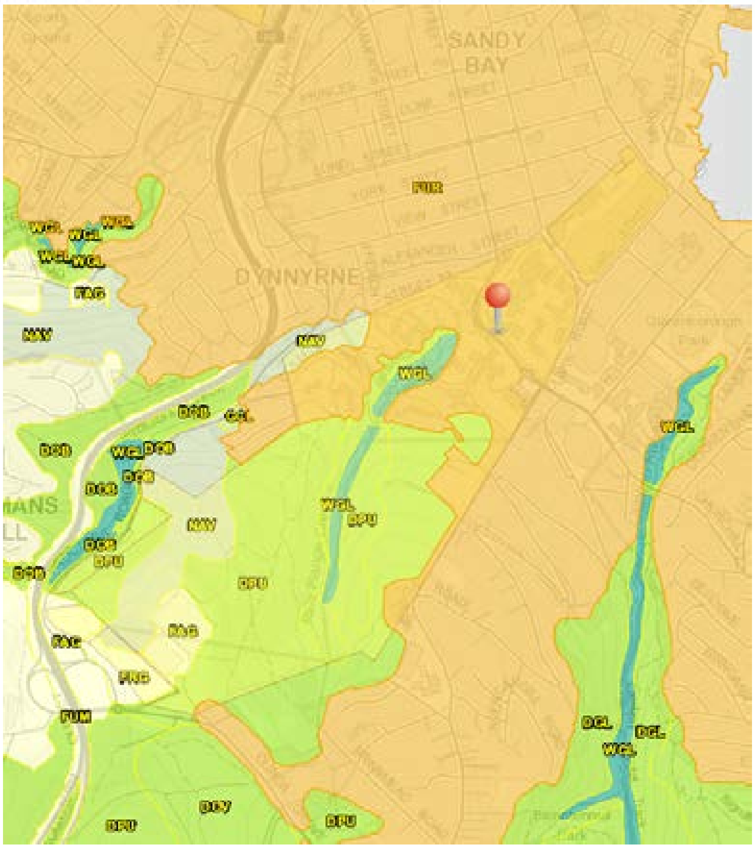

Figure 14 Vegetation Community Group : *Modified land (FUR) Urban areas*

Figure 15 Vegetation Community Group: *Modified land (FAG) Agricultural land*

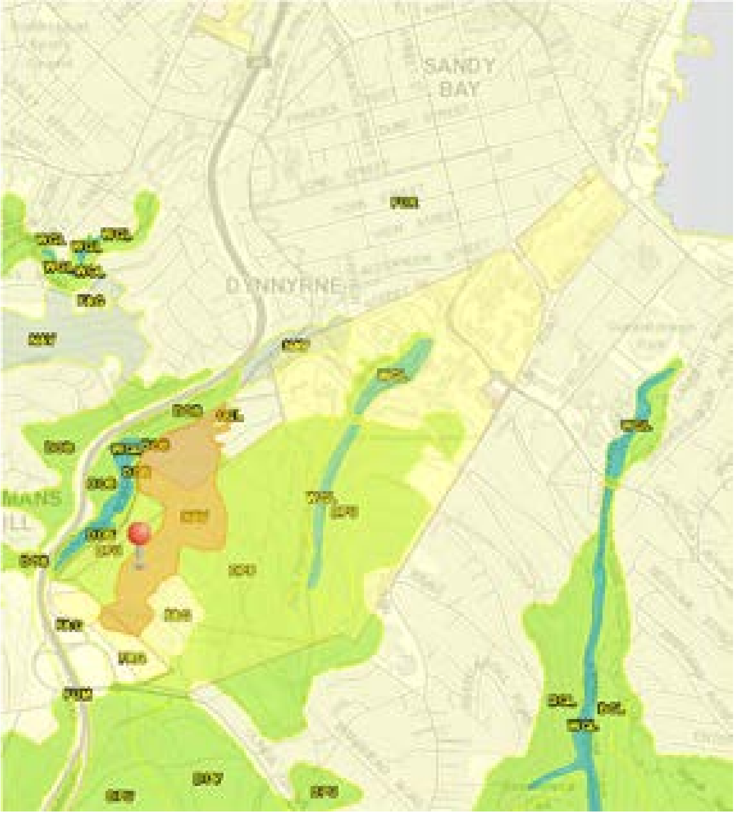

Figure 16 Vegetation Community Group : *Non eucalypt forest and woodland (NAV) Allocasuarina 23erticillate forest*

xf

Figure 17 Vegetation Community Group : *Wet eucalypt forest and woodland (WGL) Eucalyptus globulus wet forest*

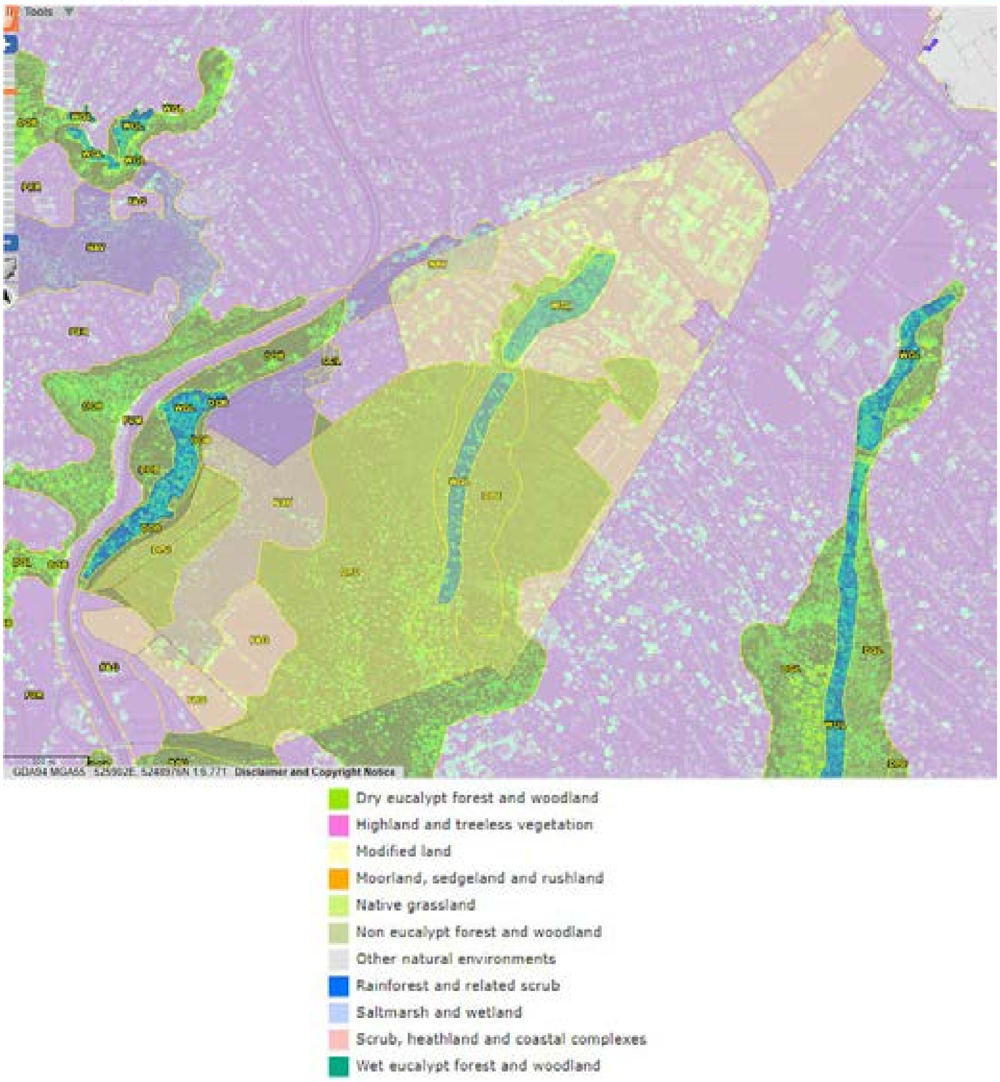

Figure 18 https://maps.thelist.tas.gov.au/listmap/app/list/map Tree Canopy Height, Authority Land, TASVEG 4.0 Groups

4.7.2 The landscape mapping exercise provides an overview of the Sandy Bay Site and surrounding context. Because the very large site extends from the waterfront area of Sandy Bay Road to the top of Proctors Hill where Olinda Grove leads from the Southern Outlet to Mount Nelson it is graded as being a HIGH Sensitivity Landscape. This is due to both the extent of the area that it covers and the types of uses; bushland, sport and recreation and built form that have facilitated Tasmania's public university Site since it was relocated in the Mid-Twentieth Century.

5. PEOPLE

5.1 VALUES RELATING TO RECEPTORS

5.1.1 In undertaking the analysis of the existing situation, a consideration of prevailing and evolving values is important. For the purpose of this LVIA, 'values' means the prevailing beliefs that have been drawn upon, based on what is deemed important to people. In this context, these 'values' are things that have become standards by which people in these places order their experiences and through which they perceive and evaluate their environment. In this sense it is not so much the quantum of something, where the thing of greatest value is seen to be most important, but the qualities of internalized systems that may be expressed as preferences and behaviors.

5.1.2 The UTAS Site in Sandy Bay has been a valued higher education center three kilometers from the Metropolitan Center of Hobart. The UTAS Sports Fields at Mount Nelson are five kilometers from the Center of Hobart Established Arterial Routes take receptors directly past the subject site and along road networks that have been identified as being within the Theoretical View Shed for the proposed Masterplan.

5.1.3 There are publicly accessible scenic outlooks within the zone of theoretical viewshed that required specific study as part of this assessment. Desktop evaluation (further fieldwork evaluation may be required to confirm) of the lookout at Mount Nelson Signal Station determined that these views would not be significantly impacted.

5.2 NATURE OF RECEPTORS

5.2.1 In the context of this Visual Impact Assessment, the prevailing appreciation of the Urban and Peri-Urban landscape is articulated in terms of the types of receptor values typically experienced from the environments that view the proposed development. The 'Visual Sensitivity' is objectively assessed through a professional lens and seeks to avoid subjectivity by taking account of the extended regional context and through the adoption of a framework that is broadly accepted as applicable. So, the determination of the nature of the receptors and their categorical sensitivity is deemed as dependent upon their location; the importance of their view; their activity (i.e. working, recreational or transit); expectations; available view; and the extent of screening in the view.

5.2.2 The nature or type of receptor relates to the use or activity that is being undertaken by those persons. In this context this includes Residents, Commuters and Workers.

5.2.3 Receptor values are derived from qualitative analysis. Objective consideration of the line of inquiry is framed through asking; how, where, when, and why?

5.2.4 The nature of a Receptors sensitivity within a particular landscape is determined by the reason for them being in the viewing location, the type of viewing experience that they are expecting when at the location and the duration of that viewing experience. The frequency of individual visits to the viewing location and the overall numbers or receptors also influences consideration of the significance or otherwise of determining of a type of receptor group are considered as significant.

5.2.5 In selecting the view locations for photomontages consideration is afforded to the surrounding area use. For example, an area that has a residential use may consider the effects of a proposed development on habitable spaces within surrounding dwellings and open spaces within allotments; with judgement derived from that photomontage viewing position when it is from a public area the findings may be extrapolated to determine probable effects from adjacent or in the immediate surrounding area having regard to that particular context.

5.2.6 Because a viewing location may have a variety of receptor categories that have varying levels of sensitivity for the purpose of this LVIA the highest level of sensitivity that is considered significant is adopted. That is to say, there is not an aggregated outcome of the various levels of sensitivity from multiple receptor categories.

5.2.7 The area of the subject site to the south and west of Churchill Avenue has numerous walking tracks that connect the upper sports fields (Precinct 5) with Churchill Avenue (via Precincts 3 & 4). These walking tracks are in modified land, “Rainforest and related scrub and Dry eucalypt and woodland.” (TheList)

Figure 19 https://maps.thelist.tas.gov.au/listmap/app/list/map , Walking Tracks on the Subject Site

5.3 RECEPTOR QUANTITIES

5.3.1 Viewing locations are utilised in varying ways. The type of receptor is a determining factor and this reason for being at a location is a good guide for the duration of viewing.

5.3.2 The number and duration of viewings is a factor that is given regard to in determining the sensitivity of a viewing position. For example, the level of visual sensitivity decreases where there are fewer people able to view the proposed Masterplan Precincts. Alternatively, the level of visual impact increases where views are from a recognized vantage point. Viewer numbers from a recognized scenic vantage point destinations would be rated higher while vantage points that are transitory in nature may be rated lower even though there is a high frequency of use.

5.4 RECEPTOR SENSITIVITY

5.4.1 The visual catchments identify the variety of uses and contexts that are affected by potential changes to the site. The site itself has a variety of existing landscape settings the primary types being:

- Urban,
- Peri-Urban,
- Rural
- Bushland
- Waterfront

5.4.2 Receptor Sensitivity is expected to vary in relation to the receptor location, type and the scene.

5.4.3 The site has three legible visual zones that are stratified generally with the topographic elevation:

- Lower mostly urbanized areas that are long established residential and commercial and institutional uses.
- Middle mostly Peri Urban transition from urban to rural land uses located between the outer limits of Hobart's urban centres and the rural environment. The boundaries of peri-urban areas are porous and transitory as urban development extends into rural and bushland zones.
- Upper mostly bushland with low density residential and institutional uses.

5.5 PREVAILING VISUAL CHARACTER LEVEL OF SCENIC INTEREST

5.5.1 The following rating table is used to rate the Scenic Interest of the site and surrounds of the proposed Masterplan:

PREVAILING VISUAL CHARACTER LEVEL OF SCENIC INTEREST (Qualitative)					
VERY HIGH	**HIGH**	**MODERATE**	**LOW**	**VERY LOW**	**NA**
National, International, Significance. Exemplary, Iconic, Scarce	State Significance	Regional Significance	Local Significance (immediate context only)	Frequent or commonly found elsewhere	Not Applicable
PREVAILING VISUAL CHARACTER LEVEL OF SCENIC INTEREST (Quantitative)					
VERY HIGH	**HIGH**	**MODERATE**	**LOW**	**VERY LOW**	**NA**
It is the predominant VCU in the scene	It shares dominance with other VCU's in the scene	It is secondary to more dominant VCU's in the scene	It is a tertiary VCU to other more dominant VCU's in the scene including secondary VCU's	It is a tertiary VCU to other more dominant VCU's in the scene including secondary VCU's	Not Applicable

5.5.2 The qualitative prevailing level of scenic interest is rated as MODERATE.

5.5.3 The quantitative prevailing level of scenic interest is rated as HIGH.

5.5.4 The overall prevailing level of scenic interest is rated as HIGH.

6. VISUAL ABSORBTION CAPABILITY

6.1.1 "Visual absorption capacity" is defined as the landscape's ability to absorb physical changes without transformation in its visual character and quality. The method utilised evaluates the visual absorption capacity on the basis of two groups of factors: the first includes physical changes that are caused by development features such as earthworks, buildings and structures, linear development (pipelines, etc.), outdoor recreation facilities and forest plantations. The second is concerned with biophysical characteristics of the area, renewal potential of vegetation and the visual exposure of the area to observers.[4]

6.1.2 Visual Absorption Capacity (VAC) of the terrain denotes its ability to absorb new elements, without any loss in its visual integrity. It indicates if given types of changes are possible within the area, regarding its configuration, covering, natural illumination and visibility.[5]

6.1.3 VAC is an analytical process which identifies the landscape's susceptibility to visual change. It is a measure of the land's ability to absorb alteration yet retain its visual integrity.[6]

6.1.4 For the purpose of this Landscape and Visual Impact Assessment the VAC is determined through the analysis of the characteristics and qualities that define the 'Place'; both biotic and built form.

6.1.5 This analysis considers these factors from the perception of the 'People' who are potentially impacted with particular focus on their values, sensitivity and quantities.

6.1.6 In the conclusion these will be brought together to assess the projects level of Visual Compatability.

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4 Expert-based method for the evaluation of visual absorption capacity of the landscape, Journal of Environmental Management
Volume 30, Issue 3, April 1990, Pages 251-263, S.Amir E.Gidalizon

5 Computer-Aided Method of Visual Absorption Capacity Estimation
January 2008
Planning spaces with high scenic values by means of digital terrain analyses and economic evaluation
Authors: Agnieszka Ozimek, Paweł Ozimek of Cracow University of Technology
6 Visual Absorption Capability1 Lee Anderson2a/ Jerry Mosier2b/ Geoffrey Chandler2

7. THE PROPOSED FACILITIES; SANDY BAY MASTERPLAN

Figure 20 Illustrated Masterplan [CHC 05 Nov 2021]

Figure 21 Masterplan Precincts [CHC 05 Nov 2021]

Figure 22 CHC ARCHITECTS UPPL SANDY BAY MASTERPLAN

Figure 23 CHC ARCHITECTS UPPL SANDY BAY MASTERPLAN

7.1 PRECINCT ONE [1]

7.1.1 Precinct 1 is described in the Sandy Bay Masterplan as a "Lifestyle and Sporting Precinct".

Figure 24 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

7.1.1 The surrounding Land Use is an Urban Context and Landscape Class is Modified Land.

Figure 25 https://maps.thelist.tas.gov.au/listmap/app/list/map PRECINCT 1 Topographic /State Aerial Photo Basemap/Authority Land

7.1.1 The application provides an indication of the landscape concept design. Precinct one retains existing perimeter planting. This established landscaping will mitigate visual effects of the lower elements of the development through construction and once the proposed buildings are completed.

Figure 26 Illustrated Masterplan: Precinct 1 [CHC 05 Nov 2021]

7.1.2 The application nominates the following uses for Precinct One[1]; Car parking, Residential Apartment, Retail, Community, Landscape.

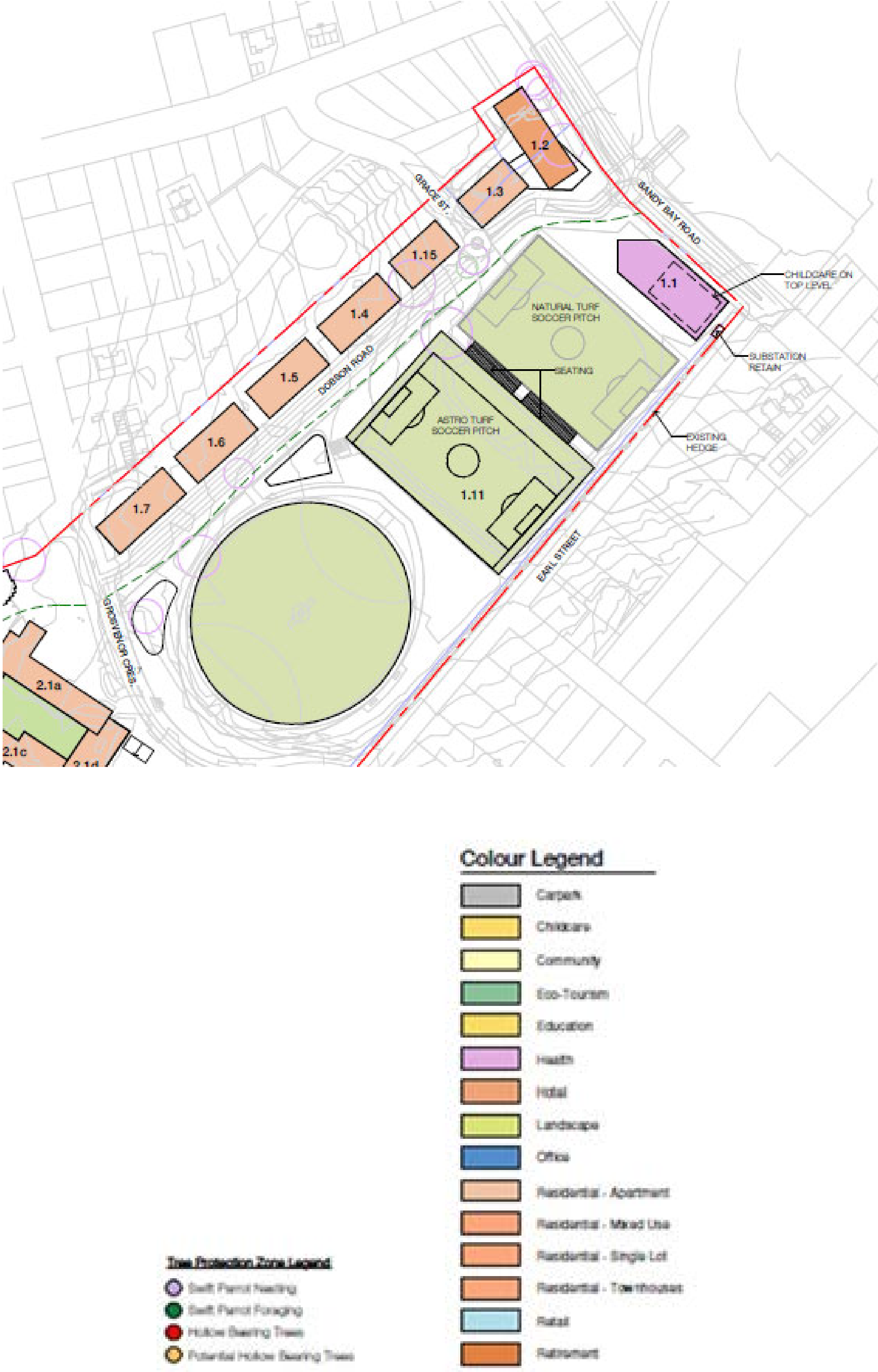

Figure 27 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

7.1.3 The application nominates the following building heights and typical floor areas for Precinct One[1];

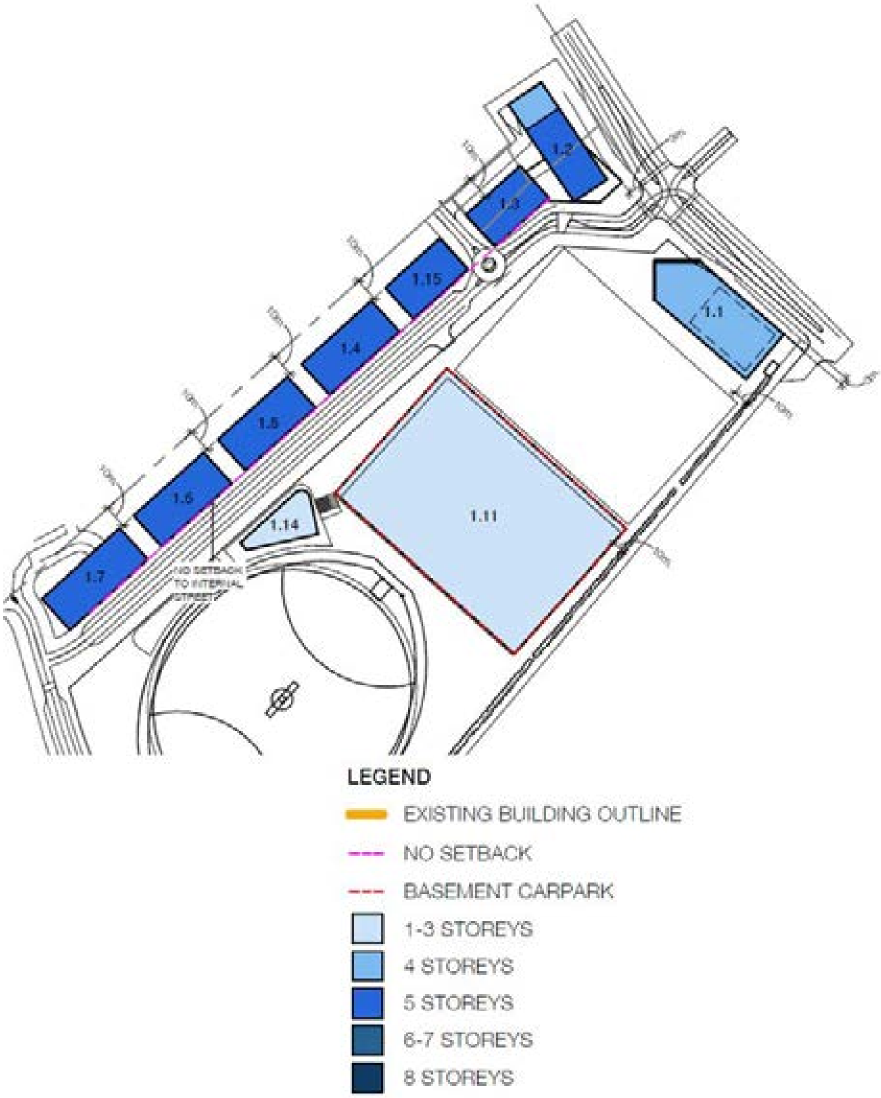

Figure 28 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

Existing Building name	Masterplan Building Number: Precinct	Masterplan Building Number: Building	USE	CATEGORY	DESCRIPTION	LEVELS	TYPICAL FLOOR AREA (m2)

Precinct 1

	1	1	Commercial	Office	Commercial - Sports science / Community: Sports Social Clubs and Childcare on top floor	4	1800
	1	2	Residential	Serviced Apartments	Serviced Apartments with small retail on ground floor	5	1000
	1	3	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	5	770
	1	4	Residential	Multi-unit	Residential Apartments	5	800
	1	5	Residential	Multi-unit	Residential Apartments	5	800
	1	6	Residential	Multi-unit	Residential Apartments	5	800
	1	7	Residential	Multi-unit	Residential Apartments	5	1000
	1	9	Community	Sports	Indoor Sports: Soccer clubs 200m2 / Changing rooms 300m2 / Indoor Gym 400m2 / 2x Basketball Courts (2x32x20) 1300m2 / indoor cricket nets(4x3.6x27) 400m2 / Multipurpose Studios (dance/yoga/etc) 900m2	1	3500
	1	10	Carparking	Undercroft carpark	Above ground under new astro-turf soccer field	2	5250
	1	11	Community	Sports	Soccer Field 1 (astro turf)		
	1	12	Community	Sports	Soccer Field 2 (natural turf)		
	1	14	Community	Sports	Sports Pavillion - Footy Club	1	500
	1	15	Residential	Multi-unit	Residential Apartments	5	600

7.1.4 The northeastern interface is the Sandy Bay residential neighbourhood area. Given the residents are in close proximity they are regarded as high sensitivity receptors. The public realm within this area has axial views toward the proposed Precinct 1. The intersection of View Street across the axial view along Grosvenor exemplifies this relationship.

7.1.5 Immediately affected allotments with rear abutting boundaries include 13 dwellings:

- 2 YORK ST SANDY BAY TAS 7005
- 6 YORK ST SANDY BAY TAS 7005
- 2 GRACE ST SANDY BAY TAS 7005
- 4 GRACE ST SANDY BAY TAS 7005
- 9 GRACE ST SANDY BAY TAS 7005
- 2 VIEW ST SANDY BAY TAS 7005
- 4 VIEW ST SANDY BAY TAS 7005
- 6 VIEW ST SANDY BAY TAS 7005
- 8 VIEW ST SANDY BAY TAS 7005
- UNIT 2 10 VIEW ST SANDY BAY TAS 7005
- 12 VIEW ST SANDY BAY TAS 7005
- 14 VIEW ST SANDY BAY TAS 7005
- UNIT 3 59-61 GROSVENOR ST SANDY BAY TAS 7005

7.1.1 The setbacks to the York Street allotments at ground level to the proposed Precinct building [1.2] are >5m from the shared boundary with these allotments. The building heights are proposed at 3 storeys at the northern most end, and then 4 and 5 stories above ground along this interface.

7.1.2 The remaining 11 allotments on Grace, View and Grosvenor Streets have setback at ground level to the proposed Precinct buildings [1.3, 1.15, 1.4, 1.5, 1.6 and 1.7] are >10m from the shared boundary with these allotments. The building heights are proposed at three to five storeys above ground along this interface.

7.1.3 The northeastern interface is to Sandy Bay Road and across to the waterfront of the River Derwent via Marieville Esplanade. This area is generally a public area with the five dwellings on the northern side of Sandy Bay Road having high street fences and canopy trees.

Figure 29 Image Capture Google Street View Nov 2019, shows the context along the dual lane Sandy Bay Road viewing toward 310 to 320 Sandy Bay Road.

Figure 30 Image Capture Google Street View Nov 2019, shows the rear context from 310 to 320 Sandy Bay Road taking advantage of views away from the subject site over Marieville Reserve toward the River Derwent.

7.1.4 The southeastern interface is to Earl Street. The Commercial/Childcare building [1.1] is the only significant interfacing proposed built form, the remaining works being works to the proposed reconfiguration of the existing Rugby Pitch into Soccer Pitches, one of which is set above the proposed Indoor Sports[1.9] and two level Carpark[1.10]. The residential receptors level of sensitivity is high, however with the exception of building [1.1] the majority of the built form is located over 150 meters across the sporting fields. Substantial canopy tree vegetation is proposed along the proposed road connecting Sandy Bay Road and Grovenor Crescent, these will provide significant mitigation of potential visual bulk. Existing established deciduous canopy trees and hedging along Earl Street provides screening to the proposed works to the sporting fields and beyond. Seasonal variations in canopy will vary the level of screening. Management of the existing hedge height and bulk will also provide opportunity for further screening mitigation.

7.1.5 The southwestern interface of the proposed built form is to the northwestern end of Grosvenor Crescent. This interface is an internal relationship between the lower topography and proposed built form of Precinct One and the higher topography and existing and proposed built form of Precinct 2. This interface is not assessed as part of this LVIA as it does not have external visual amenity impacts.

7.2 PRECINCT TWO [2]

7.2.1 Precinct 2 is described in the Sandy Bay Masterplan as an “Innovation and Civic Quarter”.

Figure 31 Extract from “The Masterplan Precincts” [CHC 05 Nov 2021]

7.2.2 The surrounding Land Use is an Urban Context and Landscape Class is Modified Land.

Figure 32 https://maps.thelist.tas.gov.au/listmap/app/list/map PRECINCT 2 Topographic /State Aerial Photo Basemap/Authority Land

7.2.1 The application provides an indication of the landscape concept design. Precinct Two [2] retains existing perimeter planting. This established landscaping will mitigate visual effects of the lower elements of the development through construction and once the proposed buildings are completed.

Figure 33 Illustrated Masterplan: Precinct 2 [CHC 05 Nov 2021]

7.2.2 The application nominates the following uses for Precinct Two[2]; Car parking, Residential Apartment, Office, Retirement, Health, Community, Landscape.

Figure 34 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

7.2.3 The application nominates the following building heights for Precinct Two[2];

Figure 35 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

Existing Building name	Masterplan Building Number: Precinct	Masterplan Building Number: Building	USE	CATEGORY	DESCRIPTION	LEVELS	TYPICAL FLOOR AREA (m2)
PRECINCT 2							
Engineering Building	2	1a	Residential	Terraces	Residential terraces within Engineering Bldg.. - Reuse	3	1200
	2	1b	Residential	Multi-unit	Residential Apartments	6	900
	2	1c	Residential	Multi-unit	Residential Apartments	7	900
	2	1d	Residential	Multi-unit	Residential Apartments	6	900
Geology Building	2	2a	Residential	Terraces	Residential Terraces within Geology Bldg.. - Reuse	3	1050
	2	2b	Residential	Multi-unit	Residential Apartments	6	650
	2	2c	Residential	Multi-unit	Residential Apartments	6	800
	2	t	Residential	Multi-unit	Residential Apartments	7	800
Chemistry Building	2	3	Residential	Multi-unit	Residential Apartments - Chemistry Blg Ruse	4 to 8	2300

Physics Building	2	4	Commercial	Commercial	Commercial / Education / makers space - Physics Blg. Reuse	4	1800
Morris Miller Library	2	5	Commercial	Office	Commercial / Co-work - Morris Miller Blg. Reuse	4	1500
Morris Miller Library	2	5	Commercial	Office	Community Library - Morris Miller Blg. Reuse	1	
	2	6	Residential	Aged Care	Residential Aged Care facility	4	2300
Phycology/Social Sciences	2	8	Commercial	Office	Commercial -- Social Sciences Blg. Reuse	5	1100
	2	9	Retail	Supermarket and Specialty	Retail Centre with full line supermarket and specialty shops	3	
	2	9a	Residential	Multi-unit	Residential townhome / Soho	2	700
	2	9b	Residential	Multi-unit	Residential Apartments	6	700
	2	9c	Residential	Multi-unit	Residential Apartments (over 2.9a)	6	1000
	2	9d	Residential	Multi-unit	Residential Apartments	6	900
Stanley Burbery	2	10	Community	Arts and Culture	Pref Arts Theatre - Stanley Burbery Blg. Reuse	1	1500
Arts Lecture Theatre	2	11	Community	Arts and Culture	Church / Theatre - Arts Theatre Blg. Reuse	1	500

	2	12	Residential	Multi-unit	Residential Apartments	5	1000
	2	13			New Pedestrian Bridge		
	2	14	Carpark	Undercroft	Basement carpark along Churchill Rd		
	2	15	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	5	900
	2	16	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	5	800
	2	18	Residential	Multi-unit	Residential Apartments	5	1500
	2	19	Commercial	Health	Medical Centre	4	800
Rifle Range Cottage -	2	20	Community	Community House	Relocated Cottage		
	2	21	Residential	Multi-unit	Retirement Living (apartments)	5	1800

7.2.1 The northwestern interface is the Sandy Bay residential neighbourhood area. Given the residents are in close proximity they are regarded as high sensitivity receptors. The public realm within this area has axial views toward the proposed Precinct 2 along Regent Street and the intersection of View Street across the axial view along Grosvenor exemplifies this relationship. There are also views from public and residential interfaces at French Street and along Alexander Street.

7.2.2 Publicly accessible axial views at the intersection of Regent and Alexander Street have views to the skyline that are unbroken by intermediate existing built form. This view line is consistent with Hobart's valued viewlines[7] and reinforces the prevailing character of the visual character zone.

Figure 36 Image Capture Google Street View Nov 2019, shows the context from Regent Street looking toward Churchill Avenue Sandy Bayand Poerters Hill to the south.

7.2.3 Immediately affected allotments with street front adjacent to boundaries include 6 dwellings:

- 94 GROSVENOR ST SANDY BAY TAS 7005
- 1A ALEXANDER ST SANDY BAY TAS 7005
- 1 ALEXANDER ST SANDY BAY TAS 7005
- 3 ALEXANDER ST SANDY BAY TAS 7005
- 5 ALEXANDER ST SANDY BAY TAS 7005
- 7 ALEXANDER ST SANDY BAY TAS 7005

[7] Building Height Standards Review Project – Leigh Wooley June 30 2018

Figure 37 Image Capture Google Street View Nov 2019, shows the context from Alexander Street looking toward View Street Sandy Bay to the east.

7.2.1 The northeastern interface is to the interface with Precinct 1. Given the amphitheatre form of the site topography this edge also needs to have regard to the viewing opportunities and receptor uses and values of the waterfront area. The existing Site infrastructure is at its most dense in this Precinct. The proposed building heights are for works up to 8 storeys.

7.2.2 The southeastern interface is to the upper end of Earl Street with the following street front adjacent to boundaries including 3 dwellings;

- 30 EARL ST SANDY BAY TAS 7005
- 32 EARL ST SANDY BAY TAS 7005
- 34 EARL ST SANDY BAY TAS 7005

7.2.3 The Hutchins School'. The sports fields of the school as well as the Early Learning Centre are adjacent to Precinct 2:

- 71 NELSON RD SANDY BAY TAS 7005

7.2.4 Tas Networks has utilities located adjacent to this precinct:

- 189 CHURCHILL AV SANDY BAY TAS 7005

7.2.5 The southwestern interface of the proposed built form is to the Churchill Avenue and French Street. This interface is an internal relationship between the lower topography and proposed built form of Precinct 2 and the higher topography and existing and proposed built form of Precincts 3 and 4. This interface is not assessed as part of this LVIA as it does not have external visual amenity impacts.

7.3 PRECINCT THREE [3]

7.3.1 Precinct 3 is described in the Sandy Bay Masterplan as a "A Peri-Urban Neighbourhood".

Figure 38 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

7.3.2 The surrounding Land Use is an Urban Context and Landscape Class is Modified Land, Wet eucalypt forest and woodland (WGL) Eucalyptus globulus wet forest.

Figure 39 https://maps.thelist.tas.gov.au/listmap/app/list/map PRECINCT 2 Topographic /State Aerial Photo Basemap/Authority Land

7.3.3 The application provides an indication of the landscape concept design. Precinct Three [3] retains some existing on site and perimeter planting. This established landscaping will mitigate visual effects of the lower elements of the development through construction and once the proposed buildings are completed. There will be clearing of vegetation to accommodate the proposed building and infrastructure works.

Figure 40 Illustrated Masterplan: Precinct 2 [CHC 05 Nov 2021]

7.3.4 The application nominates the following uses for Precinct Three [3];
Car parking, Residential Apartment, Retail, Community, Landscape.

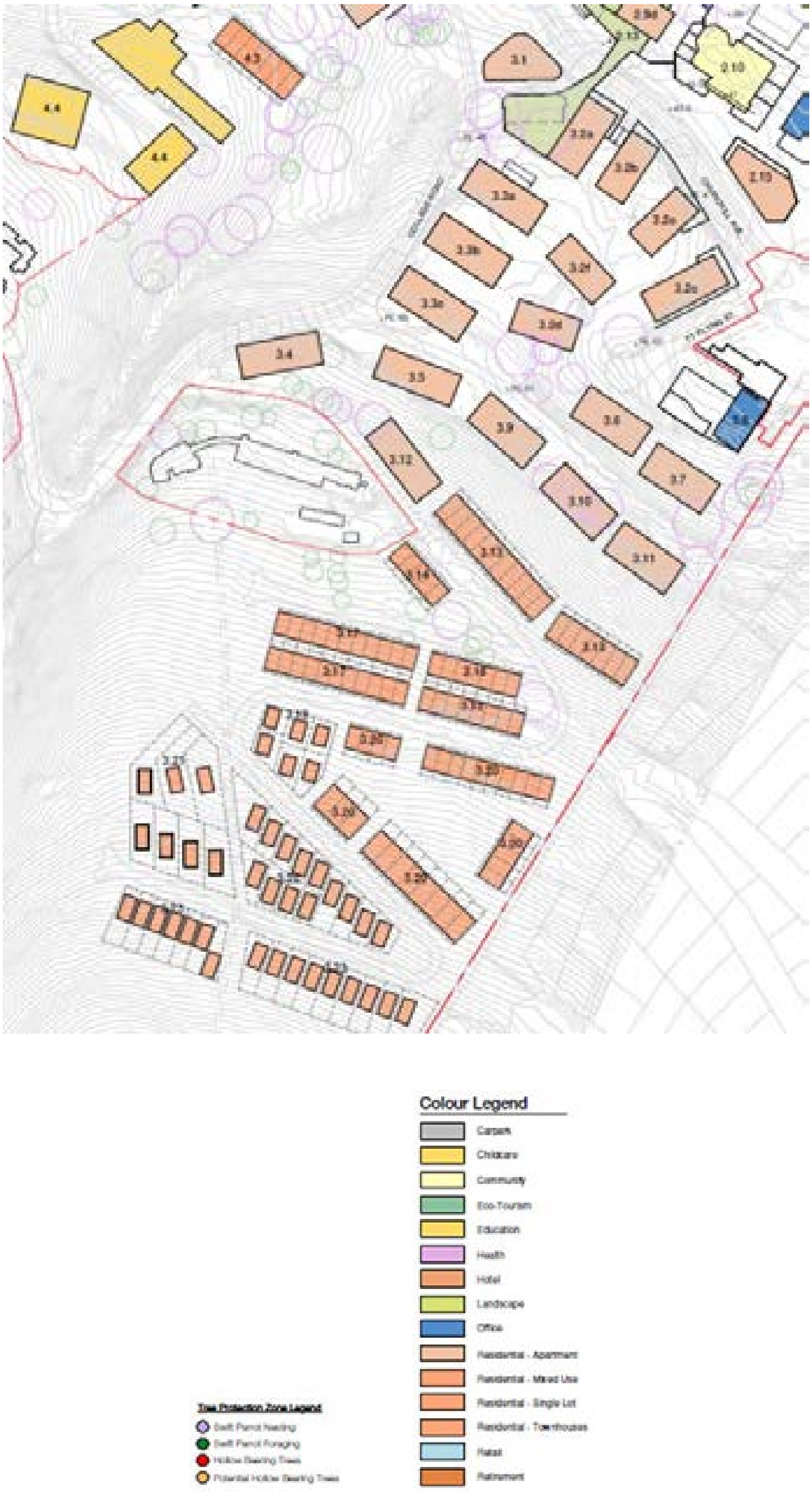

Figure 41 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

7.3.5 The application nominates the following building heights and typical floor areas for Precinct Three [3];

Figure 42 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

Existing Building name	Masterplan Building Number		USE	CATEGORY	DESCRIPTION	LEVELS	TYPICAL FLOOR AREA (m2)
	Precinct	Building					

PRECINCT 3

	3	1	Residential	Multi-unit	Residential Apartments	6	900
	3	2a	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	5	1000
	3	2b	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	5	1000
	3	2c	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	5	1000
	3	2d	Residential	Multi-unit	Residential Apartments	6	800
	3	2e	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	5	1000
	3	2f	Residential	Multi-unit	Residential Apartments	6	800
	3	3a	Residential	Multi-unit	Residential Apartments	6	1200
	3	3b	Residential	Multi-unit	Residential Apartments	6	1200

	3	3c	Residential	Multi-unit	Residential Apartments	6	1200
	3	4	Residential	Multi-unit	Residential Apartments	4	1000
	3	5	Residential	Multi-unit	Residential Apartments	4	1000
	3	6	Residential	Multi-unit	Residential Apartments	4	1000
	3	7	Residential	Multi-unit	Residential Apartments	4	1000
Corporate Services	3	8	Commercial	Health	Family Health Services - existing in Corporate Services Bldg.	2 to 3	
Corporate Services	3	8	Community	Childcare	Proposed Childcare - in existing Corporate Services building	2 to 3	
	3	9	Residential	Multi-unit	Residential Apartments	4	1000
	3	10	Residential	Multi-unit	Residential Apartments	4	1000
	3	11	Residential	Multi-unit	Residential Apartments	4	1000
	3	12	Residential	Multi-unit	Residential Apartments	4	1000
	3	13	Residential	Attached housing	Residential - Townhomes [*6]	2	90

	3	14	Residential	Attached housing	Residential - Townhomes *6	2	90
	3	17	Residential	Attached housing	Residential - Townhomes *6	2	90
	3	18	Residential	Attached housing	Residential - Townhomes *6	2	90
	3	19	Residential	Detached Housing	Residential - Single Lot	2	120
	3	20	Residential	Attached housing	Residential - Townhomes *6	2	90
	3	21	Residential	Detached Housing	Residential - Single Lot *6	2	120
	3	22	Residential	Detached Housing	Residential - Single Lot *6	2	120
	3	23	Residential	Detached Housing	Residential - Single Lot *6	2	120

7.3.6 The northwestern interface is the Thomas Crawford BBQ Area and walking tracks that climb up from College Road. This gully is a sensitive landscape with established Wet Eucalypt Forest and Rainforest

Figure 43 Google Maps Imagery copyright 2021

7.3.7 Also to the northwest of Precinct 3 is Precinct 4. This interface is not assessed as part of this LVIA as it does not have external visual amenity impacts.

7.3.8 The northeastern interface of Precinct 3 is along Churchill Avenue and across to Precinct 2. Precinct 3 proposes different responses to the upper and lower topographical context. This is also a considered and appropriate response to the prevailing bult form and landscaped context. The lower area is currently dominated by the 'Life Science Building' at five stories at the eastern end and seen as a prominent built form when viewed from the busy Churchill Avenue thoroughfare.

Figure 44 Image Capture Google Street View Nov 2019, shows the context from Churchill Avenue, Sandy Bay to the south.

7.3.9 The southeastern interface is the residential area that is services via Nelson Road. There are 10 residential allotments that are abutting Precinct 3:

- 72 NELSON RD SANDY BAY TAS 7005
- 74 NELSON RD SANDY BAY TAS 7005
- 76 NELSON RD SANDY BAY TAS 7005
- 78 NELSON RD SANDY BAY TAS 7005
- 78A NELSON RD SANDY BAY TAS 7005
- 140 NELSON RD SANDY BAY TAS 7005
- 142 NELSON RD SANDY BAY TAS 7005
- 194 NELSON RD SANDY BAY TAS 7005
- 198 NELSON RD SANDY BAY TAS 7005
- 200 NELSON RD SANDY BAY TAS 7005

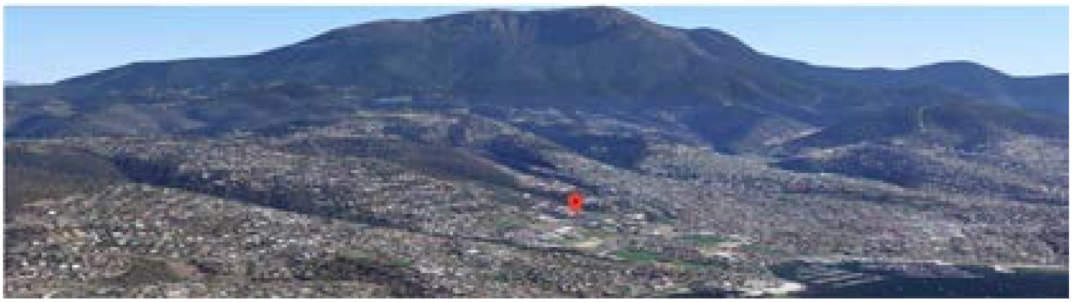

Figure 45 The site location shown with the red tag and Mount Wellington/kunanyi to the north west.

7.3.10 The southwestern interface of Precinct 3 is to the Bushland Reserve within the subject site. This interface is not assessed as part of this LVIA as it does not have external visual amenity impacts.

7.4 PRECINCT FOUR [4]

7.4.1 Precinct 4 is described in the Sandy Bay Masterplan as "The learning Precinct".

Figure 46 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

7.4.2 The surrounding Land Use is an Urban Context and Landscape Class is Modified Land(DPU), Non, Eucalypt forest and woodland(NAV) Allocasuarina verticillata forest, Wet eucalypt forest and woodland (WGL) Eucalyptus globulus wet forest.

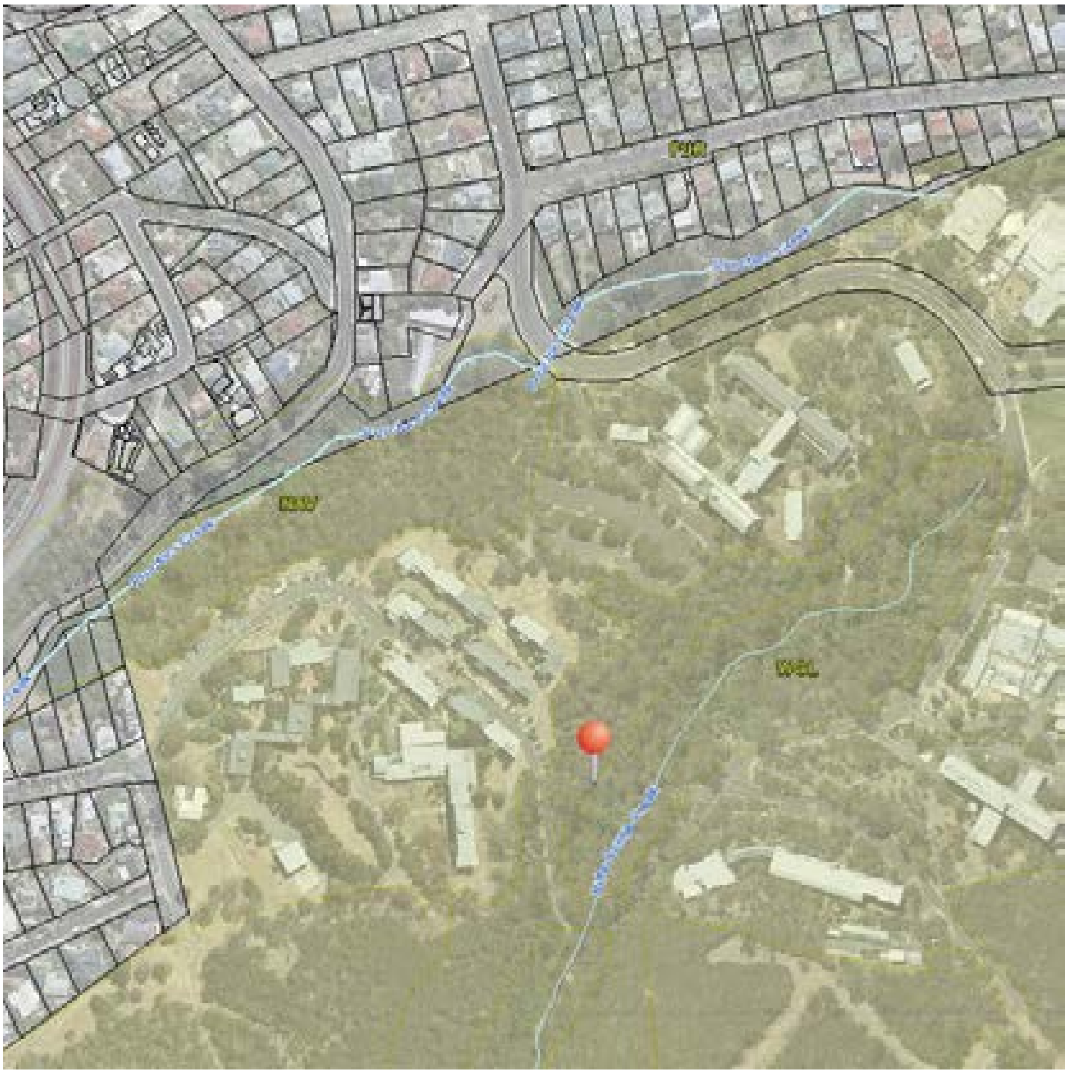

Figure 47 https://maps.thelist.tas.gov.au/listmap/app/list/map PRECINCT 2 Topographic /State Aerial Photo Basemap/Authority Land

7.4.3 The application provides an indication of the landscape concept design. Precinct Four [4] retains existing perimeter planting. This established landscaping will mitigate visual effects of the lower elements of the development through construction and once the proposed buildings are completed.

Figure 48 Illustrated Masterplan: Precinct 4 [CHC 05 Nov 2021]

7.4.4 The application nominates the following uses for Precinct Four[4]; Car parking, Residential Apartment, Retail, Community, Landscape.

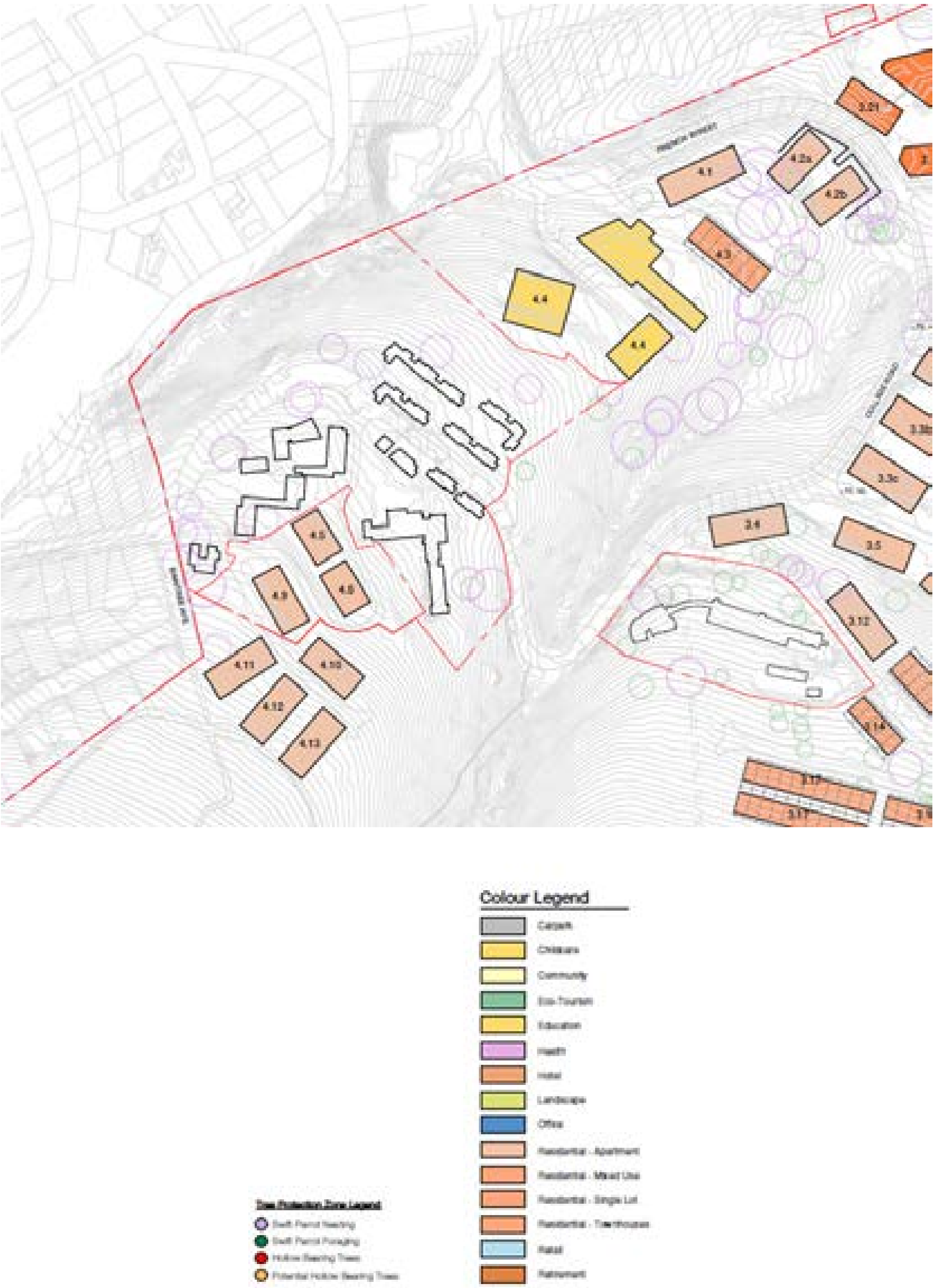

Figure 49 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

7.4.5 The application nominates the following building heights for Precinct Four[4];

Figure 50 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

Existing Building name	Masterplan Building Number		USE	CATEGORY	DESCRIPTION	LEVELS	TYPICAL FLOOR AREA (m2)
	Precinct	Building					

PRECINCT 4

Existing Building name	Precinct	Building	USE	CATEGORY	DESCRIPTION	LEVELS	TYPICAL FLOOR AREA (m2)
	4	1	Residential	Multi-unit	Residential Apartments	4	1100
	4	2	Residential	Multi-unit	Residential Apartments	4	1600
	4	3	Residential	Attached housing	Residential - Townhomes *6	2	90
Old Commerce	4	4	Education	School	Education / School (Old Commerce building reuse)		
	4	5	Residential	Multi-unit	Residential Apartments	4	700
	4	8	Residential	Multi-unit	Residential Apartments	4	700
	4	9	Residential	Multi-unit	Residential Apartments	4	900
	4	10	Residential	Multi-unit	Residential Apartments	4	800
	4	11	Residential	Multi-unit	Residential Apartments	3	900

	4	12	Residential	Multi-unit	Residential Apartments	4	900
	4	13	Residential	Multi-unit	Residential Apartments	4	900

7.4.6 The northwestern interface is across the gully through which Proctors Creek flows. The steepness of the gully forms a natural delineation and the steep vegetated slopes and creek form a physical as well as visual edge between the suburbs of Sandy Bay and Dynnyrne .

7.4.7 Immediately affected allotments with rear abutting boundaries include 16 dwellings the closet being approximately 55m from the subject site boundary:

- 52 ALEXANDER ST SANDY BAY TAS 7005
- 54 ALEXANDER ST SANDY BAY TAS 7005
- 56 ALEXANDER ST SANDY BAY TAS 7005
- 58 ALEXANDER ST SANDY BAY TAS 7005
- 60 ALEXANDER ST SANDY BAY TAS 7005
- 62 ALEXANDER ST SANDY BAY TAS 7005
- 64 ALEXANDER ST SANDY BAY TAS 7005
- 66 ALEXANDER ST SANDY BAY TAS 7005
- 2/68 ALEXANDER ST SANDY BAY TAS 7005
- 70 ALEXANDER ST SANDY BAY TAS 7005
- 72 ALEXANDER ST SANDY BAY TAS 7005
- 74 ALEXANDER ST SANDY BAY TAS 7005
- 56 ALEXANDER ST SANDY BAY TAS 7005
- 58 ALEXANDER ST SANDY BAY TAS 7005

7.4.8 Immediately affected allotments with rear abutting boundaries include 2 dwellings the closet being approximately 5m from the subject site boundary:

- 17-19 FRENCH STREET SANDY BAY TAS 7005
- 50 PROCTORS RD DYNNYRNE TAS 7005

7.4.9 Immediately affected allotments with adjacent front boundaries include 6 dwellings the closet being approximately 95m from the subject site boundary:

- 51 PROCTORS RD DYNNYRNE TAS 7005
- 18A RICHARDSON AV DYNNYRNE TAS 7005
- 2/20 RICHARDSON AV DYNNYRNE TAS 7005
- 22 RICHARDSON AV DYNNYRNE TAS 7005
- 24 RICHARDSON AV DYNNYRNE TAS 7005
- 24 A RICHARDSON AV DYNNYRNE TAS 7005

Figure 51 Google Images Nov 2019 View looking southeast from the intersection of View Street and French Street

Figure 52 Google Images Nov 2019 View looking southeast from the intersection of Alexander Street and French Street

7.4.10 The seven buildings 4.5, 4.8,4.9,4.10,4.11'4.12 and 4.13 are proposed as 4 storey Multi-Unit Residential Apartments.

7.4.11 The north eastern interface to French Street. Buildings 4.1, 4.2a&b are proposed at 4 storeys. These are sited down hill from the existing UTAS Commerce Building which is of a similar height Another low rise residential element is proposed as two levels at Building 4.5. Due to the steep terrain potential for views

7.4.12 Precinct 2 is adjacent to this north eastern boundary. This interface is not assessed as part of this LVIA as it does not have external visual amenity impacts.

7.4.13 The southeastern boundary of Precinct 4 abuts the Bushland Reserve and Precinct 3 on the other side of the gully through which the Thomas Crawford Trail runs. This sensitive landscape provides a natural buffer consistent with the pattern of vegetated gullies that are a strong identity of Greater Hobart's periurban amphitheatre .

7.4.14 The southwestern interface of the proposed built form is to the Bushland reserve and an existing subdivision at The broader surrounding context has most dwellings designed with their aspects to the river and optimally oriented to the north for solar access. In situations where there are elevated views from Dynnyrne there is significant existing built form in this Precinct and in the established subdivision (approx.. 30 lots with substantial double storey dwellings) that is to the west of Baintree Avenue.

7.4.15 Affected allotments with elevated street frontage directly facing boundaries include 3 dwellings :

- 47 DYNNYRNE RD DYNNYRNE TAS 7005
- 38 ZOMAY AV. DYNNYRNE TAS 7005
- 27 ZOMAY AV. DYNNYRNE TAS 7005

7.4.16 The southwestern interface is across the gully through which Proctors Creek flows. The steepness of the gully forms a natural delineation and the steep vegetated slopes and creek form a physical as well as visual edge between the suburbs of Sandy Bay and Dynnyrne .

Figure 53 Google Images Aerial View from above Tolmans Hill looking east

7.5 PRECINCT FIVE [5]

7.5.1 Precinct 5 is described in the Sandy Bay Masterplan as a "Mt Nelson Eco-Tourism and Hilltop Neighbourhood".

Figure 54 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

7.5.2 The surrounding Land Use is a PeriUrban Context with the following Landscape Classes;

- (DPU) Dry eucalypt forest and woodland
- (FRG) Regenerating cleared land
- (FAG) Agricultural Land
- (WGL) Eucalyptus globulus wet forest
- (NAV) Allocasuarina verticillata forest
- (FUR) Urban areas
- (DOB) Eucalyptus obliqua dry forest

Figure 55 https://maps.thelist.tas.gov.au/listmap/app/list/map PRECINCT 2 Topographic /State Aerial Photo Basemap/Authority Land

7.5.3 The application provides an indication of the landscape concept design. Precinct Five [5] retains existing perimeter planting. This established landscaping will mitigate visual effects of the lower elements of the development through construction and once the proposed buildings are completed.

Figure 56 Illustrated Masterplan: Precinct 5 [CHC 05 Nov 2021]

7.5.4 The application nominates the following uses for Precinct Five[5]; Car parking, Residential Apartment, Retail, Community, Landscape.

Figure 57 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

7.5.5 The application nominates the following building heights for Precinct Five[5];

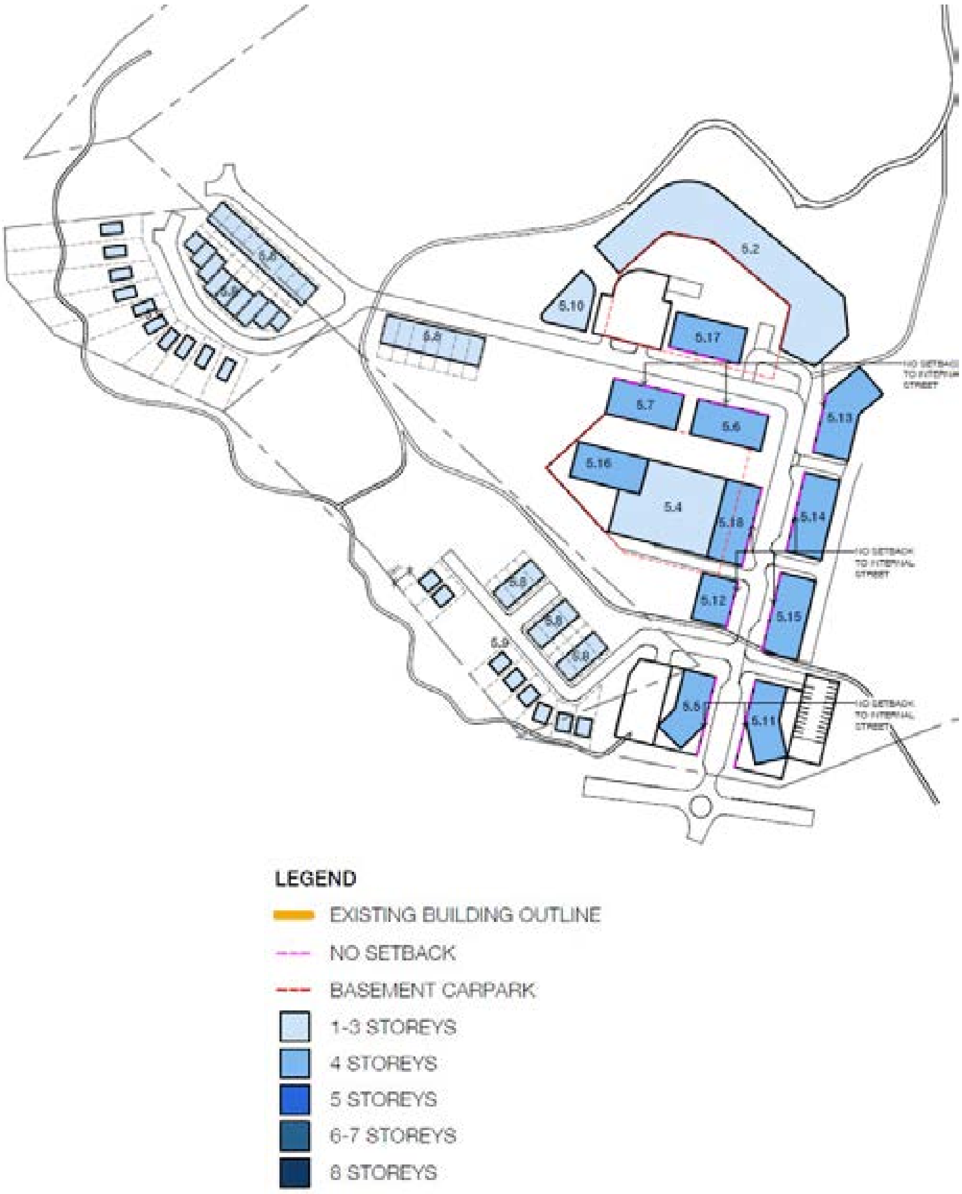

Figure 58 CHC ARCHITECTS UTAS SANDY BAY MASTERPLAN

Existing Building name	Masterplan Building Number – Precinct	Masterplan Building Number – Building	USE	CATEGORY	DESCRIPTION	LEVELS	TYPICAL FLOOR AREA (m2)

PRECINCT 5

	5	1	Commercial	Tourism	Adventure Tourism Centre	1	500
	5	2	Commercial	Hotel	Eco-Hotel	3	2000
	5	3	Commercial	Health	Spa	1	1000
	5	4	Retail	Market and Specialty	Retail Centre with market hall	1 to 2	5500
	5	5	Residential	Multi-unit	Residential - Mixed Use - Commercial on ground floor	4	1000
	5	6	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	4	1000
	5	7	Residential	Multi-unit	Residential Apartments	4	1000
	5	8	Residential	Attached housing	Residential - Townhomes *6		90
	5	9	Residential	Detached Housing	Residential - Single Lot *6		100
	5	10	Community	Education	Eco-Learning Centre		500
	5	11	Residential	Multi-unit	Residential - Mixed Use - Commercial on ground floor	4	1000
	5	12	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	4	500
	5	13	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	4	1000
	5	14	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	4	900
	5	15	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	4	900
	5	16	Residential	Multi-unit	Residential - Mixed Use - small retail on ground floor	4	900
	5	17	Residential	Multi-unit	Residential Apartments	4	1000
	5	18	Residential	Multi-unit	Residential - Over Retail (5.4)	4	900

7.5.6 The northwestern interface of Precinct 5 is to the elevated residential subdivision of Tolmans Hill and the lower transit corridors of the Southern Outlet and Proctors Road. Immediately affected allotments with rear abutting boundaries include 13 dwellings :

- 32 PULCHELLA DR TOLMANS HILL TAS 7007
- 19 PULCHELLA DR TOLMANS HILL TAS 7007
- 17 PULCHELLA DR TOLMANS HILL TAS 7007
- 15 PULCHELLA DR TOLMANS HILL TAS 7007

7.5.7 The northeastern interface is the Bushland Reserve. From the lower River Derwent aspect this Precinct sits back from the ridge line. While there may be a theoretical line of site to the proposed buildings the established canopies of the Allocasuarina verticillata forest will continue to dominate the skyline from the lower reaches.

7.5.8 The southeastern interface is to the Urban Land zoned as residential with allotments along Olinda Grove and Tanangara Road, Mount Nelson. The Mount Nelson Fire Station is a community hub that is within viewing range and it is of note that the nearby Hobart College has high receptor numbers. Mount Nelson Look Out is a recognized tourist destination that is commonly accessed along Olinda Grove so these Receptors pass this Precinct. Immediately affected allotments with rear abutting boundaries include 5 allotments :

- 131 OLINDA GR MOUNT NELSON TAS 7007
- 129 OLINDA GR MOUNT NELSON TAS 7007
- 129A OLINDA GR MOUNT NELSON TAS 7007
- 30-32 TANGARA RD MOUNT NELSON TAS 7007
- 'MOUNT NELSON FIRE STATION' - 40 OLINDA GR MOUNT NELSON TAS 7007

Figure 59 Image Capture Google Street View Nov 2019, shows the context along Olinda Road viewing toward the west, the access to the Mount Nelson Fire Station on the left of image and the cross over to 131 Olinda Grove on the right of image. The existing UTAS sport field access road is seen to the right of center. Mount Wellington/kunanyi is seen on the skyline with Tolman Hill's residential neighbourhood below.

7.5.9 The southwestern interface of Precinct 5 interfaces with Tolmans Hill, Proctors Road and the Southern Outlet. Immediately affected allotments with rear adjoining boundaries include 12 dwellings:

- 13 WOODCUTTERS RD TOLMANS HILL TAS 7007
- 2 HAKEA DR TOLMANS HILL TAS 7007
- 2A HAKEA DR TOLMANS HILL TAS 7007
- 6 HAKEA DR TO8 HAKEA DR TOLMANS HILL TAS 7007
- 8 HAKEA DR TOLMANS HILL TAS 7007
- 10 HAKEA DR TOLMANS HILL TAS 7007
- 12 HAKEA DR TOLMANS HILL TAS 7007
- 14 HAKEA DR TOLMANS HILL TAS 7007
- 16 HAKEA DR TOLMANS HILL TAS 7007
- 18 HAKEA DR TOLMANS HILL TAS 7007
- 20 HAKEA DR TOLMANS HILL TAS 7007
- 22 HAKEA DR TOLMANS HILL TAS 7007

7.5.10 Allotments beyond those listed above that are not directly adjacent but effected include allotments that are along Hakea Drive and Woodcutters Road as well as public recreation receptors who utilize Tolmans Hill Park accessed from Old Proctors Road.

8. VISUAL COMPATIBILITY OF THE FIVE PRECINCTS OF THE DEVELOPMENT:

PERCEPTUAL CONSTANCIES: Familiar objects that allow a viewer to compare the shape, size, colour or location of objects in context regardless of changes in angle of perspective, distance or lighting are known as perceptual constancies.

SCALE; Scale assists the viewer to assess visual bulk. This is a direct correlation of height, footprint, articulation of form and mitigation through texture and colour.

FORM: The form is perceived by receptors as the distinguishable elements of the proposed buildings. Even when individual elements are partially occluded from a receptor viewing position, the contiguous nature of the form is still understood as a whole because of the cognitive ability to recognise structure, logic and pattern.

LINE; As the human eye is attuned to the recognition of lines as a primary identifier, constructed linear elements can easily be discerned in contrast to the organic patterns and shapes of vegetation and the contours of geological forms. The human eye has developed a capability to distinguish lines and can recognise a straight line as limited in length to 30' (minutes of angular measurement) when contrasted against other perceptual constancies present in recognisably distinct visual units. The general ease by which existing linear built forms with planar delineation can be identified is testament to this phenomenon.

TEXTURE & COLOUR; The palette of the proposed built forms are not under consideration as part of this LVIA. The selection of material texture are colours will have an effect on the visual impact of any resolved design.

Deviation from prevailing character (Critical Visual Influences)				
VERY HIGH	HIGH	MODERATE	LOW	VERY LOW
dominates with contrasting critical visual influences	introduces contrasting critical visual influences	interprets critical visual influences	continues critical visual influences	Subordinate to critical visual influences

8.1 PRECINCT 1 VISUAL COMPATABILITY

Figure 60 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

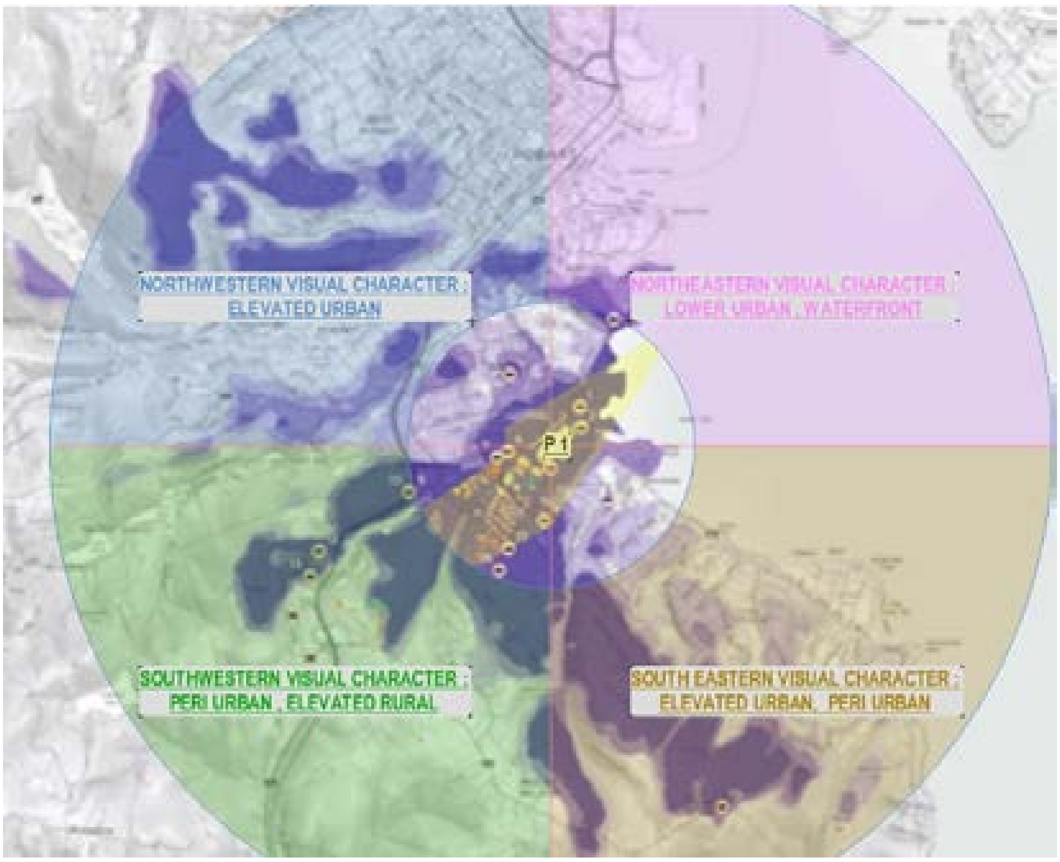

Figure 61 View Shed Analysis and Visual Character Zones for Precinct 1

8.1.1 Photomontage

Figure 62 Extract from Photomontage PM02.2

Figure 63 Extract from Photomontage PM04A.2

8.1.2 SCALE;

Northwest;
The existing university Site buildings to the northwest are of a commensurate scale as the proposed buildings of Precinct 1.

Northeast;
The existing built scale along the waterfront has residential apartment buildings up to 8 stories as well as single dwellings of single and double storey. Along this part of Sandy Bay Road there are existing 3 storey buildings interspersed with large dwellings. This mixture of scales is consistent within the established area. The majority of single dwellings are single storey.

Figure 64 Google Images Capture Nov 2019 Marieville Esplanade

Southeast; The existing built scale along the waterfront includes residential apartment buildings up to 3 stories and the dominant Wrest Point Casino (19 stories) and Convention Centre. Along this part of Sandy Bay Road there are existing 4 storey buildings interspersed with large dwellings. This mixture of scales is consistent within the established area. The majority of single dwellings are single storey.

Figure 65 Figure 66 Google Images Capture Nov 2019Sandy Bay Rd and Derwent Water Av

Southwest;
The scale to the southeast is dominated by the schools though the majority of residential buildings are substantial single or double storey dwellings.

Figure 67 Google Images Capture Jun 2015 Earl Street Sandy Bay looking north east toward Battery Point.

❖ The scale contrast of Precinct 1 would be MODERATE.

8.1.3 FORM

Precinct 1 has two typologies, the first adopts a visually integrated solution with the landscape by cutting into the site and covering the structures with the sporting fields. The other typology adopts a podium form with recessive upper levels.
The Podium forms are commensurate with the prevailing residential apartment building heights and the upper elements are provided with further setbacks to make them visually recessive and reduce the visual bulk of the upper form.

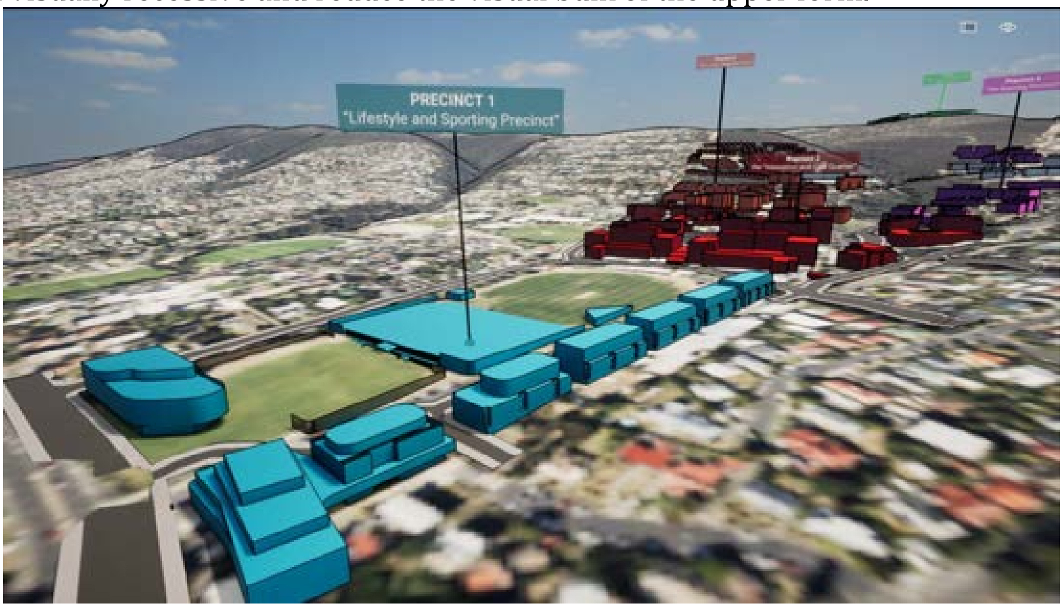

Figure 68 Aerial View of Precinct 1 of the proposed Masterplan with digital model of existing terrain mapped with Google Aerial imagery.

Siting of the proposed built forms is at the perimeter of Precinct 1. This results in the large expanse of open sporting fields, that were previously the rifle range, to be retained and enjoyed. The linear arrangement of the forms with the breaks between provide ample space for substantial landscaping of canopied trees to mitigate visual bulk through screening and articulation of the parts.
The configuration of Precinct 1 responds well to the topographical character through the arrangement of the building elements on the more urbanized north eastern edge of the precinct. The substantial setbacks to the adjacent properties allow for the capacity for acceptable provision of amenity protection with appropriate design resolution.

- Form contrast level would be MODERATE.

8.1.4 **LINE**;

The proposed Precinct 1 design has adopted a strategy that provides building forms that respond to changing site levels and seek to step the building with the topography in this locale. This approach somewhat ameliorates the visual effect of the line in silhouette and in delineation of a plane and assisted further by the material delineation so that the proposed forms are identifiable from most distant observer positions.
In this context, the skyline silhouette needs to be considered.
Line may also be perceptible as shadows thrown by forms onto planes, both built and at grade. This phenomenon will be mitigated as there is substantial existing and proposed landscape vegetation and the undulations of the proposed and existing topography that 'frays the edges' of the planes.

- Line contrast level would be HIGH due to some incursions above the ridgelines. Adoption of low building heights or siting adjustments or reduction in the quantum of penetration above ridgelines may assist in a reduction of line contrast.

8.1.5 **MAGNITUDE OF CHANGE;**

PRECINCT	VCZ	PROXIMITY	CHANGE	CVI DEVIATION	MAGNITUDE OF CHANGE
1 ONE	NE	Foreground Middle ground Background	MODERATE LOW NA	MODERATE	MODERATE
	SE	Foreground Middle ground Background	HIGH MODERATE LOW	HIGH	HIGH
	SW	Foreground Middle ground Background	NA MODERATE LOW	MODERATE	MODERATE
	NW	Foreground Middle ground Background	MODERATE MODERATE LOW	MODERATE	MODERATE

- The Magnitude of change for this Precinct upon the surrounding Visual Catchment Zones is HIGH. **It is possible to mitigate the VCI deviation achieve to a lower level.*

8.2 PRECINCT 2 VISUAL COMPATABILITY

Figure 69 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

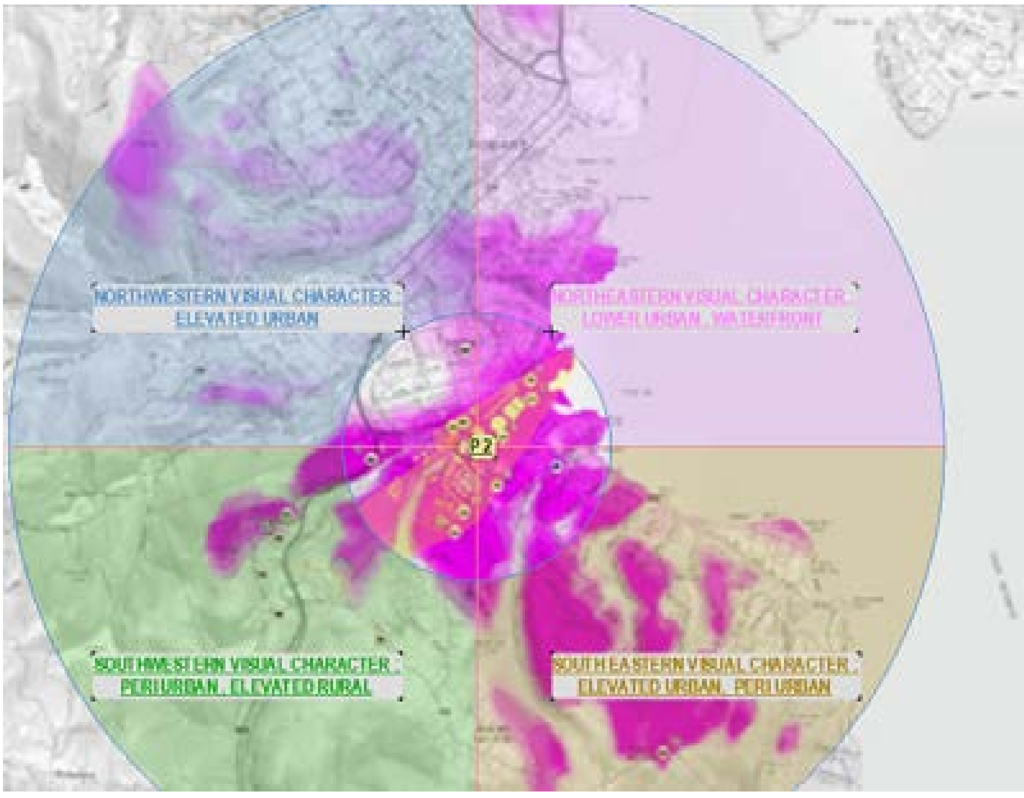

Figure 70 View Shed Analysis and Visual Character Zones for Precinct 2

8.2.1 PHOTOMONTAGES

Figure 71 Extract from Photomontage PM01.2

Figure 72 Extract from Photomontage PM03.2

Figure 73 Extract from Photomontage PM04A.1

8.2.2 SCALE;

Northwest;
The existing university Site buildings to the northwest are of a commensurate scale as the proposed buildings of Precinct 2.

Figure 74 Google Images Capture Nov 2019 Regent Street Sandy Bay looking south toward Mount Nelson.

Northeast; The existing built scale of the University Site buildings in Precinct 2 is up to 5 stories.


Figure 75 Google Images Capture Nov 2019 Grosvenor Cres Sandy Bay

Southeast; Along this part of Earl Street there are existing 3 storey buildings interspersed with large dwellings. This mixture of scales is consistent within the established area. The majority of single dwellings are single storey.


Figure 76 Figure 77 Google Images Capture Nov 2019 Earl Street Sandy Bay

Southwest;
The scale to the southeast is dominated by the large footprints of the school buildings though the majority of residential buildings are substantial single or double storey dwellings.

Figure 78 Google Images Capture Jun 2015 Churchill Avenue Sandy Bay looking northeast toward Battery Point.

- The scale contrast of Precinct 2 would be LOW.

8.2.3 FORM

Precinct 2 has two typologies, the first adapts the existing building forms and the second provides infill buildings that increase the density of the Precinct. The prevailing visual character of this precinct is of institutional building forms with interspersed landscape and expanses of vehicle parking and road and pedestrian networks. The form of the existing and proposed buildings responds to the gentle stepping of the site in this lower part of the topographical amphitheatre.
The building heights are arranged so that the taller structures are located in the middle of the subject site. This provides a transition down toward the edges of the site and the interface with adjacent building forms that are lower predominantly single and double storey forms.


Figure 79 Aerial View of Precinct 2 of the proposed Masterplan with digital model of existing terrain mapped with Google Aerial imagery.

Siting of the proposed built forms is throughout the areas around the existing buildings of Precinct 2. This results in the clustered forms of the buildings being occluding

elements when seen from adjacent to the site and from the waterfront and Sandy Bay Road. When viewed from higher ground the variety in building heights, footprint sizes and shapes that create the upper visible forms of the buildings will break up the visual bulk and avoid a dominating monolithic precinct. The linear arrangement of the forms with the breaks between provide ample space for substantial landscaping of canopied trees to mitigate visual bulk through screening and articulation of the parts.
The configuration of Precinct 2 responds well to the topographical character through the arrangement of the building elements on the existing Site' more densely developed public accessway along Churchill Avenue. The transitions in height and setbacks to the adjacent properties allow for the capacity for acceptable provision of amenity protection with appropriate design resolution.

- ❖ Form contrast level would be LOW.

8.2.4 **LINE**;

The proposed Precinct 2 design has adopted a strategy that provides building forms that respond to transitions in site contour levels and seek to step the building with the topography in this locale. This approach somewhat ameliorates the visual effect of the line in silhouette and in delineation of a plane and assisted further by the material delineation so that the proposed forms are identifiable from most distant observer positions. In this context, the skyline silhouette needs to be considered.
Line may also be perceptible as shadows thrown by forms onto planes, both built and at grade. This phenomenon will be mitigated as there is substantial existing and proposed landscape vegetation and the undulations of the proposed and existing topography that 'frays the edges' of the planes.

- ❖ Line contrast level would be HIGH* due to some incursions above the ridgelines.
  **Adoption of low building heights or siting adjustments or reduction in the quantum of penetration above ridgelines may assist in a reduction of line contrast.*

8.2.5 **MAGNITUDE OF CHANGE;**

PRECINCT	VCZ	PROXIMITY	CHANGE	CVI DEVIATION	MAGNITUDE OF CHANGE
2 TWO	NE	Foreground Middle ground Background	LOW LOW NA	LOW	LOW
	SE	Foreground Middle ground Background	LOW LOW NA	LOW	LOW
	SW	Foreground Middle ground Background	NA MODERATE LOW	LOW	MODERATE
	NW	Foreground Middle ground Background	MODERATE MODERATE LOW	HIGH*	HIGH*

- ❖ The Magnitude of change for this Precinct upon the surrounding Visual Catchment Zones is HIGH. **It is possible to mitigate the VCI deviation achieve to a lower level.*

8.3 PRECINCT 3 VISUAL COMPATABILITY

Figure 80 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

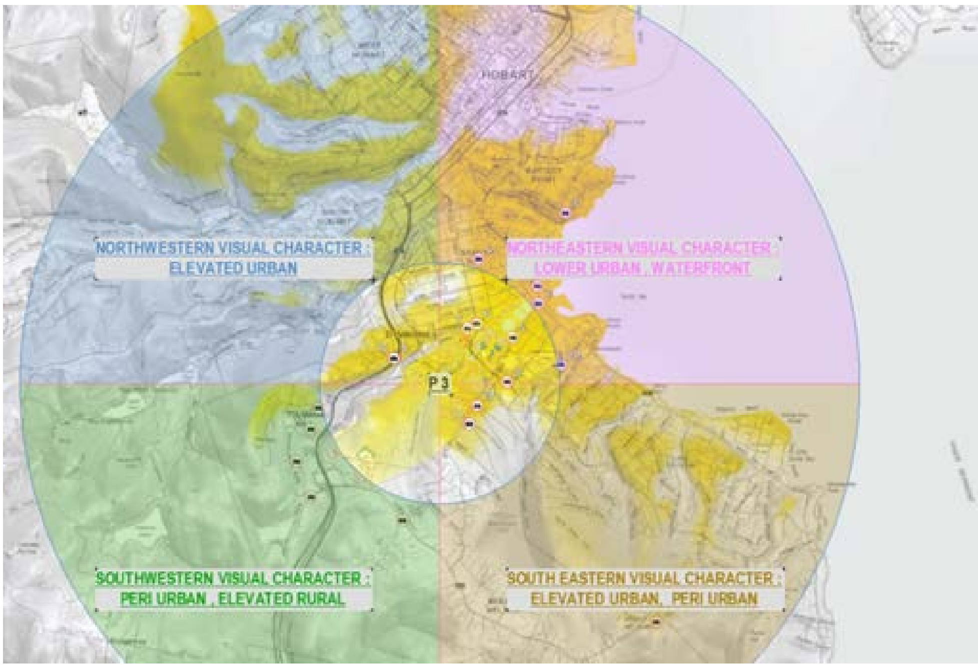

Figure 81 View Shed Analysis and Visual Character Zones for Precinct 3

8.3.1 PHOTOMONTAGES

Figure 82 Extract from Photomontage PM01.2

Figure 83 Extract from Photomontage PM03.2

Figure 84 Extract from Photomontage PM04B.2

Figure 85 Extract from Photomontage PM02.2

8.3.2 SCALE;

Northwest;
The northwest interface is primarily an internal one that addresses the Bushland Reserve and Precinct 4.

Northeast;
The northeastern interface is primarily an internal one that addresses Precinct 2. As Churchill Avenue is a public thoroughfare it is noted that the established condition of the UTAS Site buildings and 'Hill Street' shops will be added to with further built form that will be located in areas that are currently landscaped.

Figure 86 Google Images Capture Jun 2015 Churchill Avenue looking west

Southeast;
The proposed primary road that services Precinct 3 is of a similar switchback configuration as Nelson Road resulting in. a pattern of built form and landscape ratio that is consistent with the prevailing peri-urban context of Nelson Road. Due to the topographic amphitheatre this relationship will be apparent from the waterfront and adjacent areas that view the slopes of Mount Nelson as part of the visual catchment zone that defines this part of greater Hobart. With the exception of the proposed buildings adjacent to 142 Nelson Road the footprints of the proposed conjoined residential dwelling follow with the longer edges along the natural contours providing maximum opportunity for canopy vegetation to provide mitigating screening that reduces potential visual bulk

Figure 87 Google Maps (Imagery 2021) view from the east looking from the River Derwent west toward Nelson Road.

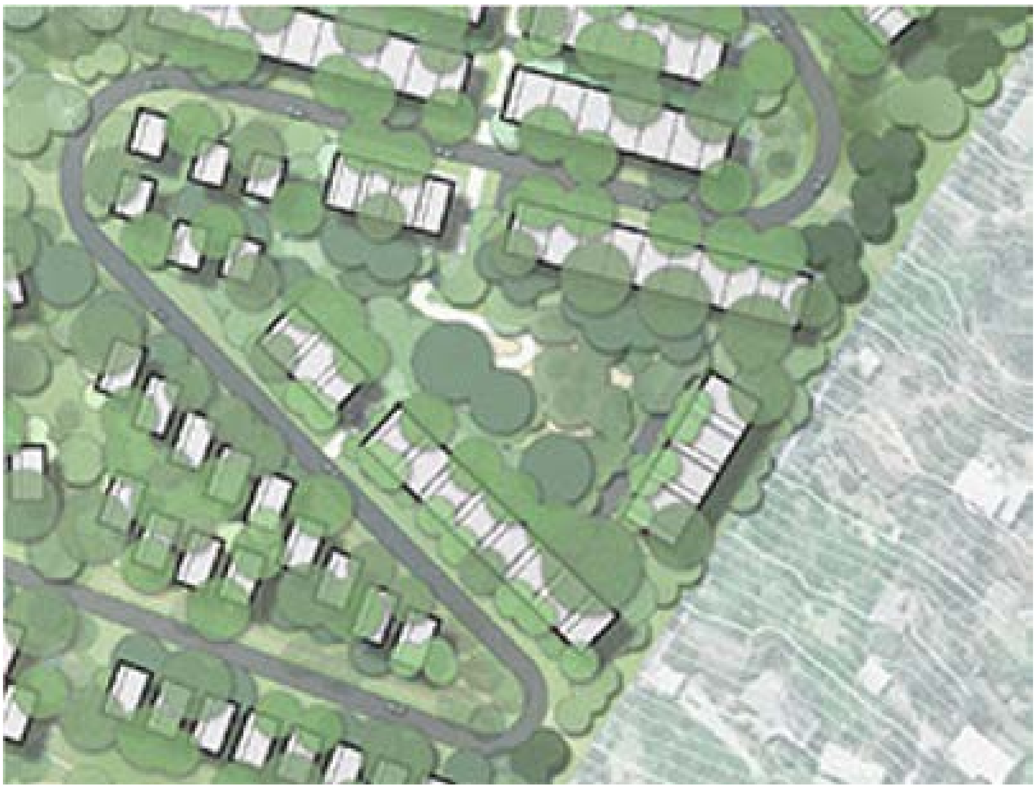

Figure 88 Precinct 3 has a variety of building footprint configurations. This diversity assists in reducing the perceptual phenomenon known as grouping thus mitigating potential visual impact

Southwest;
The southwest interface is primarily an internal one that addresses the Bushland Reserve and Precinct 4.

- The scale contrast of Precinct 3 would be LOW.

8.3.3 FORM

Precinct 2 has three typologies, the first of the forms are the existing building forms and the second provides infill buildings that increase the density of the lower part of this Precinct. The prevailing visual character of this lower part of Precinct 3 is of a

institutional building forms with interspersed landscape and expanses of vehicle parking and road and pedestrian networks. The form of the existing and proposed buildings responds to the stepping of the site in this middle part of the topographical amphitheatre.
The building heights are arranged so that these taller structures are located toward the middle of the subject site. This provides a screening from Churchill Avenue of the third typology for Precinct 3 that is the low-rise residential forms. These are arranged in a pattern that is consistent with the established pattern of Nelson Road.

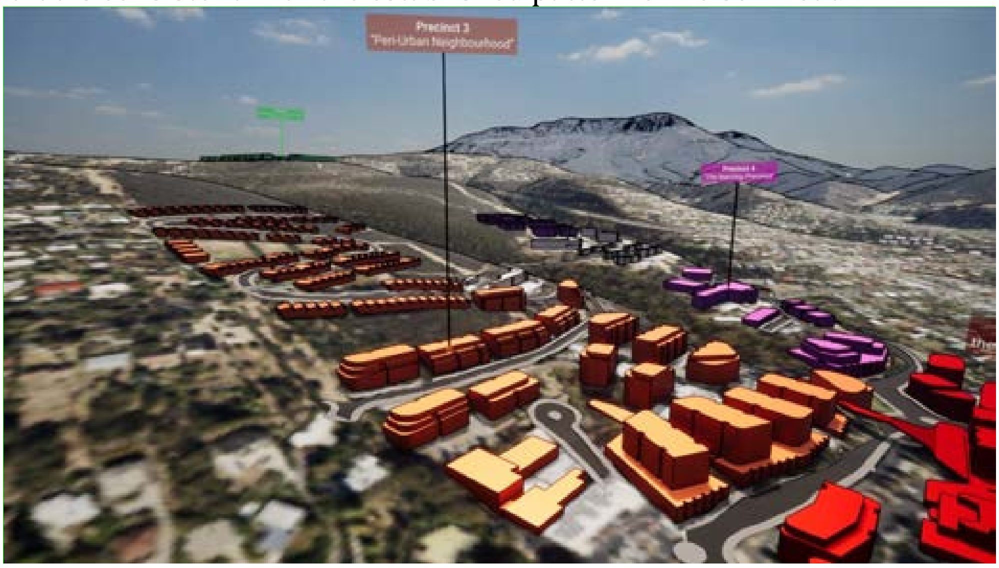

Figure 89 Aerial View of Precinct 2 of the proposed Masterplan with digital model of existing terrain mapped with Google Aerial imagery.

Siting of the proposed bult forms is throughout the areas around the existing buildings of Precinct 3. This results in the clustered forms of the buildings being occluding elements when seen from adjacent to the site and from the waterfront and Sandy Bay Road. When viewed from higher ground the variety in building heights, footprint sizes and shapes that create the upper visible forms of the buildings will break up the visual bulk and avoid a dominating monolithic precinct. The linear arrangement of the forms with the breaks between provide ample space for substantial landscaping of canopied trees to mitigate visual bulk through screening and articulation of the parts.
The configuration of Precinct 3 responds well to the topographical character through the arrangement of the building elements on the existing Site' more densely developed public accessway along Churchill Avenue. The transitions in height and setbacks to the adjacent properties allow for the capacity for acceptable provision of amenity protection with appropriate design resolution.

- ❖ Form contrast level would be MODERATE.

8.3.4 **LINE**;

The proposed Precinct 3 design has adopted a strategy that provides building forms that respond to changing site levels and seek to step the building with the topography in this locale. This approach somewhat ameliorates the visual effect of the line in silhouette and in delineation of a plane and assisted further by the material delineation so that the proposed forms are identifiable from most distant observer positions.
In this context, the skyline silhouette needs to be considered.
Line may also be perceptible as shadows thrown by forms onto planes, both built and at grade. This phenomenon will be mitigated as there is substantial existing and proposed

landscape vegetation and the undulations of the proposed and existing topography that 'frays the edges' of the planes.

❖ Line contrast level would be LOW.

8.3.5 MAGNITUDE OF CHANGE;

PRECINCT	VCZ	PROXIMITY	CHANGE	CVI DEVIATION	MAGNITUDE OF CHANGE
3 THREE	NE	Foreground Middle ground Background	MODERATE MODERATE LOW	MODERATE	MODERATE
	SE	Foreground Middle ground Background	LOW LOW NA	LOW	LOW
	SW	Foreground Middle ground Background	NA MODERATE LOW	MODERATE	MODERATE
	NW	Foreground Middle ground Background	NA NA NA	NA	NA

❖ The Magnitude of change for this Precinct upon the surrounding Visual Catchment Zones is MODERATE.

8.4 PRECINCT 4 VISUAL COMPATABILITY

Figure 90 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

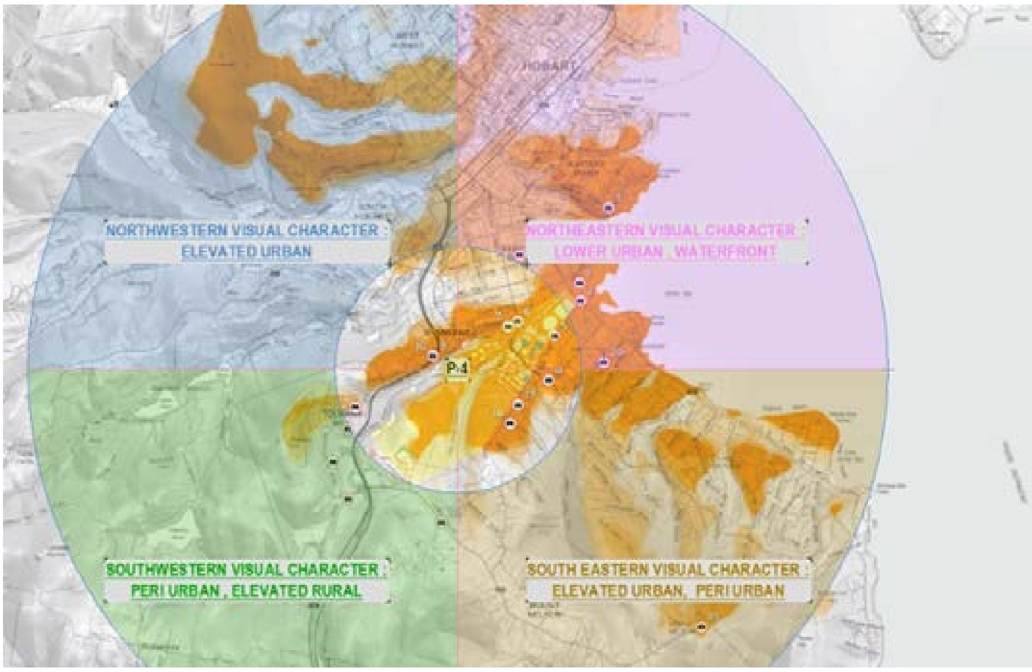

Figure 91 View Shed Analysis and Visual Character Zones for Precinct 4

8.4.1 PHOTOMONTAGES


Figure 92 Extract from Photomontage PM04B.2


Figure 93 Extract from Photomontage PM04C.2

8.4.2 **SCALE**;

Northwest;
The existing adjacent residential subdivisions of Dynnyrne and Tolmans Hill are of a commensurate scale as the proposed buildings of the upper part of Precinct 4 that has the interface with this aspect.

Northeast;
The existing university Site buildings to the northeast are of a commensurate scale as the proposed buildings of the lower part of Precinct 4.

Figure 94 Google Images Capture Nov 2019 French Street looking south

Southeast;
The southwest interface is primarily an internal one that addresses the Bushland Reserve and Precinct 3.

Southwest;
The northwest interface is both an internal one that addresses the Bushland Reserve and an existing residential subdivision.

Figure 95 Google Images Capture Nov 2019 French Street looking east toward Tasman Bridge.

❖ The scale contrast of Precinct 4 would be LOW.

8.4.3 FORM

Precinct 4 has two typologies, the first of the forms are the more substantial building forms in the lower part of the Precinct and the second provides smaller and finer grain building forms that transition to the neighbouring residential subdivision. The proposed building forms are interspersed amongst existing and proposed landscape with road and pedestrian networks. The form of the existing and proposed buildings responds to the stepping of the site in this middle part of the topographical amphitheatre.

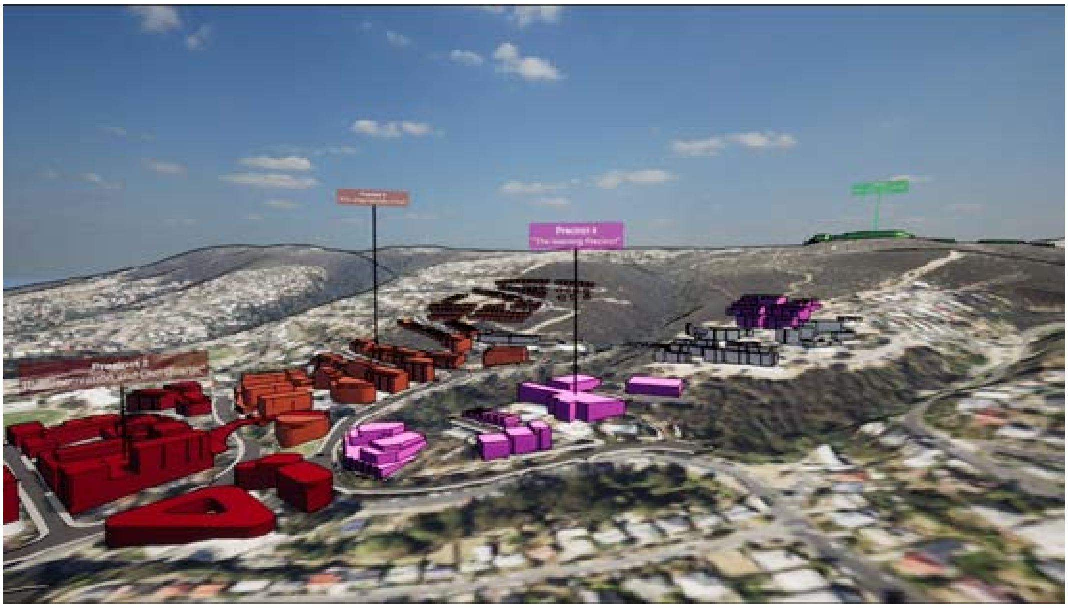

Figure 96 Aerial View of Precinct 4 of the proposed Masterplan with digital model of existing terrain mapped with Google Aerial imagery.

Siting of the proposed bult forms is amongst existing built form and infrastructure in Precinct 4. The clustering arrangement of the forms with the breaks between provide ample space for substantial landscaping of canopied trees to mitigate visual bulk through screening and articulation of the parts.
The configuration of Precinct 4 responds well to the topographical character through the arrangement of the building elements on the adjacent residential subdivision. The substantial setbacks to the adjacent properties allow for the capacity for acceptable provision of amenity protection with appropriate design resolution.

- ❖ Form contrast level would be LOW.

8.4.4 LINE;

The proposed Precinct 4 design has adopted a strategy that provides building forms that respond to changing site levels and seek to step the building with the topography in this locale. This approach somewhat ameliorates the visual effect of the line in silhouette and in delineation of a plane and assisted further by the material delineation so that the proposed forms are identifiable from most distant observer positions.

- ❖ Line contrast level would be LOW.

8.4.5 **MAGNITUDE OF CHANGE;**

PRECINCT	VCZ	PROXIMITY	CHANGE	CVI DEVIATION	MAGNITUDE OF CHANGE
4 FOUR	NE	Foreground Middle ground Background	LOW LOW LOW	LOW	LOW
	SE	Foreground Middle ground Background	NA NA NA	LOW	LOW
	SW	Foreground Middle ground Background	NA NA NA	LOW	LOW
	NW	Foreground Middle ground Background	LOW LOW LOW	LOW	LOW

- The Magnitude of change for this Precinct upon the surrounding Visual Catchment Zones is LOW.

8.5 PRECINCT 5 VISUAL COMPATABILITY

Figure 97 Extract from "The Masterplan Precincts" [CHC 05 Nov 2021]

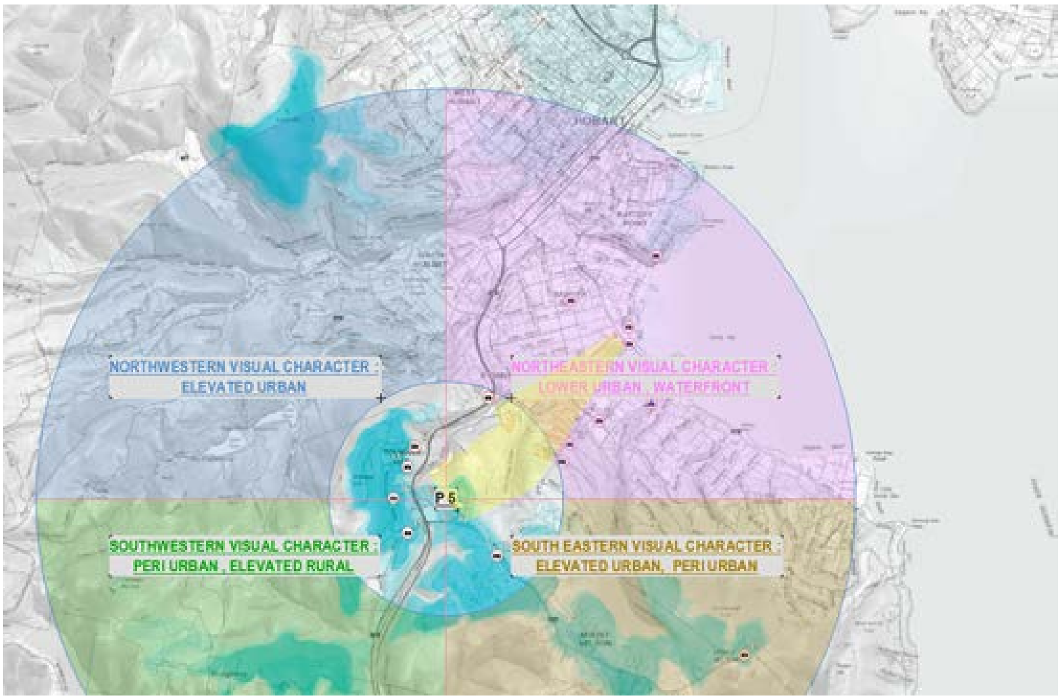

Figure 98 View Shed Analysis and Visual Character Zones for Precinct 5

8.5.1 PHOTOMONTAGES

Figure 99 Extract from Photomontage PM05.2

Figure 100 Extract from Photomontage PM02.2

8.5.2 **SCALE**;

Northwest;
The existing subdivision of Tolmans Hill to the north west is of a commensurate scale as the proposed buildings of Precinct 5.

Northeast;

The existing subdivision of Tolmans Hill and Dynnyrne to the northeast is of a commensurate scale as the proposed buildings of Precinct 5. For the majority of the proposed Precinct 5 the built form will be screened by the Bushland Reserve. Over time the proposed landscaping will establish itself around the built form and infrastructure further integrating the Precinct 5 into the established Bushland.

Figure 101 Google Images Capture June 2015 Hakea Drive, Tolmans Hill Looking east.

Southeast;
The existing built scale along Olinda Grove is residential dwellings on large lots. Along Olind Grove there is two storey apartment building. Hobart College is within this VCZ though it is sited well within the boundaries of the college grounds in a bushland setting so is not visually apparent from Olinda Grove.

Figure 102 Google Images Capture Nov 2019 Olinda Grove, Mount Nelson looking north

Southwest;
The northwest interface is both an internal one that addresses Bushland and an existing residential subdivision of Tolmans Hill.

Figure 103 Google Images Capture May 2021 Above Tolmans Hill Park, looking east toward Precinct 5

❖ The scale contrast of Precinct 5 would be HIGH*.

8.5.3 FORM

Precinct 5 has four typologies;
The first of the forms are the four storey building located to the southeast of the Precinct. These forms are on the highest part of the UTAS site. It is anticipated that these buildings have potential to break the ridgeline when viewed from the southern approach along Olinda Grove though the density of existing and proposed vegetation along this interface may mitigate significant visual intrusion.
The second provides the Hotel forms that are located close to the highest ridgeline of the site. This ridgeline is the uppermost ridge that defines the skyline of the Sandy Bay amphitheatre and is an important contributor to the valued visual character of Greater Hobart. The Masterplan for Precinct five proposes forms along this ridgeline which have a theoretical line of site when regard is given to topography though the density of existing and proposed vegetation along this interface may mitigate significant visual intrusion.
The prevailing visual character of the northwestern part of Precinct 5 is modified land with limited existing canopied tree vegetation. The third typology is semi-detached housing and the fourth is detached housing in this area with proposed landscape and expanses of road and pedestrian networks.

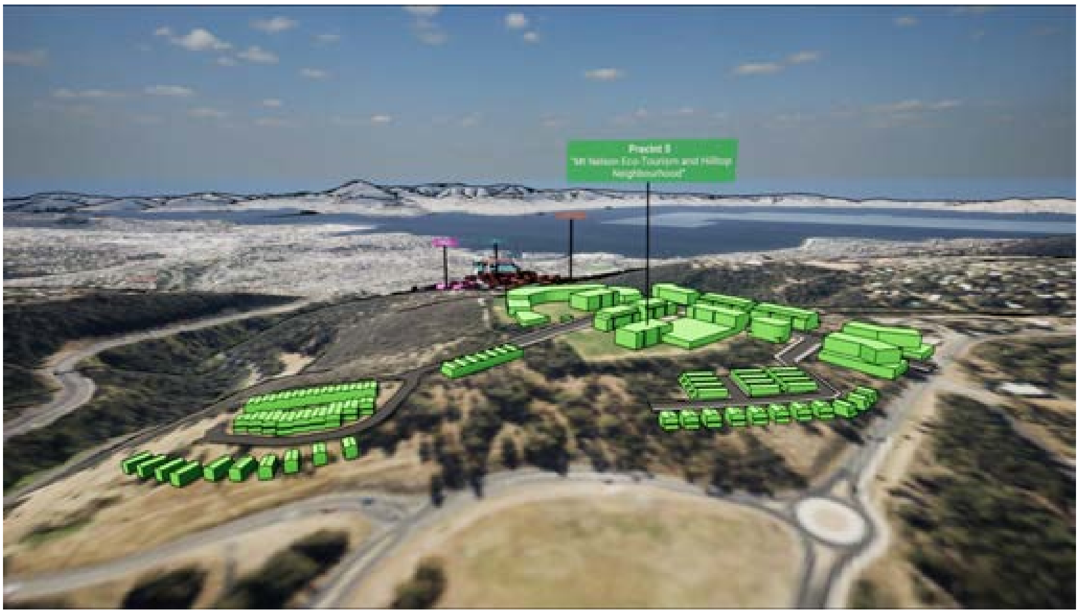

Figure 104

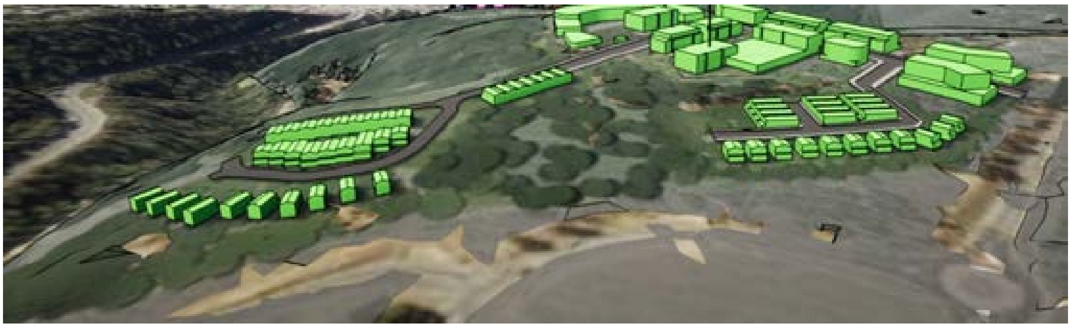

Figure 105

Siting of the proposed built forms is throughout the areas around the existing Sports Fields and accessed from the established connection to Olinda Grove. The busy arterial Southern Outlet, Proctors Road and Olinda Grove provide dynamic viewing opportunities for commuters and the residential subdivisions of Tolmans Hill and Mount Nelson will have views affected by the proposed forms.

When viewed from higher ground the variety in building heights, footprint sizes and shapes that create the upper visible forms of the buildings will break up the visual bulk and avoid a dominating monolithic precinct. The linear arrangement of the forms with the breaks between provide ample space for substantial landscaping of canopied trees to mitigate visual bulk through screening and articulation of the parts.

The configuration of Precinct 5 could be better arranged to address topographical character through the arrangement of the building elements 5.1 & 5.2 further away from the upper ridgeline and relocating buildings 5.9 further away from the southwestern edge.

Otherwise transitions in height and setbacks to the adjacent properties allow for the capacity for acceptable provision of amenity protection with appropriate design resolution.

- Form contrast level would be MODERATE.

8.5.4 LINE;

The proposed Precinct 5 design has adopted a strategy that provides building forms that vary across the flatter terrain at the apex of the site. The current siting has potential line impacts on the ridgeline when viewed from the east of the site around the Sandy Bay waterfront area, from the south of the site along Olinda Grove and from the areas to the north where the proposed built form extends beyond the existing line of vegetation.
In this context, the skyline silhouette needs to be considered as a priority.
Line may also be perceptible as shadows thrown by forms onto planes, both built and at grade. This phenomenon will be mitigated as there is substantial existing and proposed landscape vegetation and the undulations of the proposed and existing topography that 'frays the edges' of the planes.

❖ Line contrast level would be HIGH*.

8.5.5 MAGNITUDE OF CHANGE;

PRECINCT	VCZ	PROXIMITY	CHANGE	CVI DEVIATION	MAGNITUDE OF CHANGE
5 FIVE	NE	Foreground Middle ground Background	LOW MODERATE HIGH	HIGH	HIGH*
	SE	Foreground Middle ground Background	NA LOW HIGH	HIGH	HIGH*
	SW	Foreground Middle ground Background	HIGH NA NA	HIGH	HIGH*
	NW	Foreground Middle ground Background	HIGH MODERATE LOW	HIGH	HIGH*

❖ The Magnitude of change for this Precinct upon the surrounding Visual Catchment Zones is HIGH. **It is possible to mitigate the VCI deviation achieve to a lower level.*

9. CONCLUSION

9.1 VISUAL COMPATABILITY SUMMARY

9.1.1 To determine if the proposal is an acceptable outcome, the key question needs to be addressed through the examination of the detailed analysis provided in the submission. This assessment examines each of the Precincts as parts and then together.

9.1.2 This table is a summary that outlines the analysis results for the Magnitude of change:

CONTRAST LEVEL	Precinct 1	Precinct 2	Precinct 3	Precinct 4	Precinct 5
Scale	Moderate	Low	Low	Low	High
Form	Moderate	Low	Moderate	Low	Moderate
Line	High	High	Low	Low	High
MAGNITUDE OF CHANGE	**High**	**High**	**Moderate**	**Low**	**High**

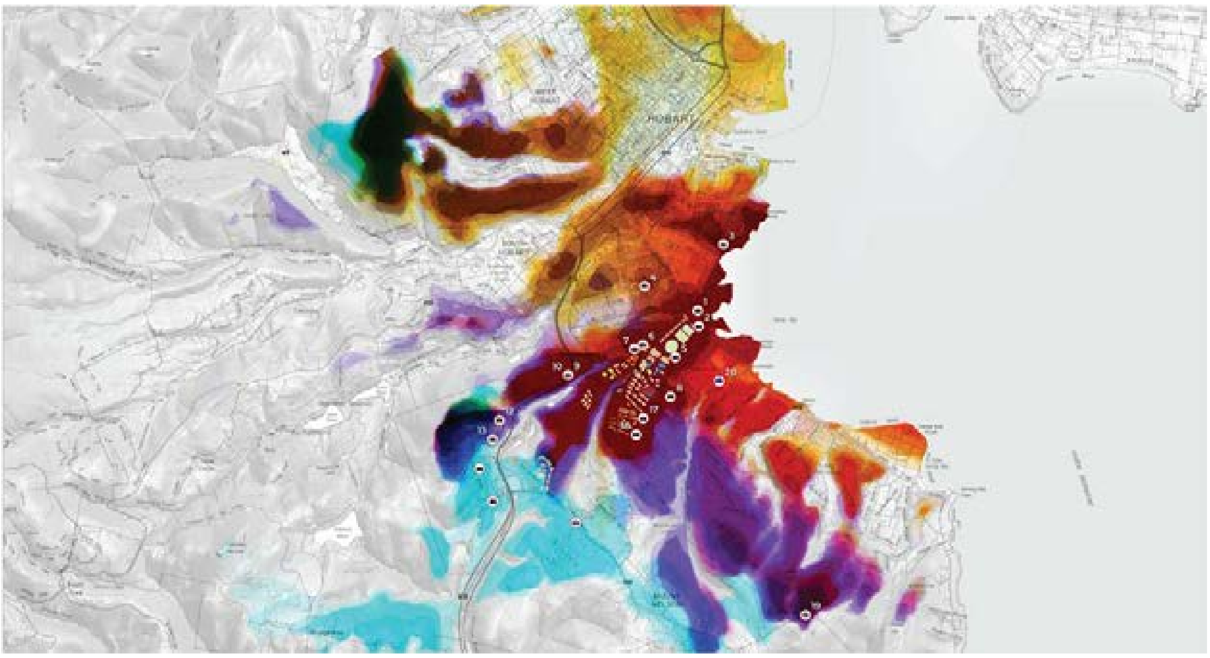

Figure 110 Cumulative View Shed Analysis; the overlapping colours show darker area that have the greatest potential (theoretical view) to the most Precincts.

9.2 CUMMULATIVE IMPACT

9.2.1 The method of analysis that has been adopted in this LVIA draws on Gestalt Principles as a framework by which human perception group similar elements, recognise patterns and simplify complexity when perceiving visual information. The principles of Form, Line, Texture and Colour, Scale and Spatial Character that have been chosen for this analysis are selected for their relevance and draw on the broader framework as a result of their overlapping nature. These have been utilised in determining the visual compatibility of each part against the selected criteria.

9.2.2 The cumulative impacts of each of the analysed Precincts are brought together for consideration. In this regard 'sense of place' becomes a relevant criteria as this is generated from within the site, beyond it's boundaries and through time.

9.2.3 Consideration of these interrelated factors, including consideration of built form, visual impact, integration with the landscape and the proposed response to character and values that are to be preserved and protected under the WPMP is imperative.

9.2.4 We perceive and interpret an object in context through our interaction with it; both as a participant in and viewer of the spatial characteristics. Perceptual Realism considers the various ways we interpret an object in space, in their baseline application in a Visual Impact Assessment the purpose of considering this aspect is to raise awareness that our perceptions of an object is based on our personal experience, our comprehension (memory) of the context outside of the current view and our interpretation of the information through both the laws of optics and perceptual constancies.

9.2.5 This assessment takes into consideration the spatio-temporal perception of the receptors; being their capacity to move between viewing locations, have regard for a myriad of viewpoints and hold a perception of the various effects caused by this proposal that impact their visual perception of the site from surrounding locations.

9.2.6 Spatiotemporal awareness informs the viewers comprehension of an object in space. Our understanding of distance is derived from the relative size, shape, scale, and patterning phenomenon. It is generally understood how perspective impacts on diminishing size and that varying lighting levels impact acuity; accordingly, we adjust our interpretation on a varying spectrum as conditions change and we gain more information (input data). These spatial characteristics are the specific cues that provide the receptor inputs in that time and place.

9.2.7 The number and range of viewing opportunities provide a cumulative set of phenomenal experiences and are layered over the cultural and natural values identified with the place. Given the high profile of the site and its historical, contemporary and future values, the level of scrutiny on the UTAS site is justifiably high as are the standards by which an acceptable level of change is to be held.

9.2.8 The accumulation of the impacts on such a vast array of viewing locations and the people who are enjoying the amenity of views to the site and surrounds should be considered. Separate to views from the public realm, but also important, are the views from the homes, streets, gardens that have been planned and designed to enjoy the visual amenity of this area. Receptors in these locations will typically value their existing views. Given the natural beauty of the River Derwent and the majestic views of the Organ Pipes and Mount Wellington/kunanyi the views toward the UTAS site are secondary for the majority of dwellings that have an aspect to the primary features. For those in closer proximity to the site and without these aspects the UTAS site has provided visual amenity. The retention and planned enhancements to the extensive Bushland Reserve on the site are a substantial mitigation to any perceived loss in visual amenity of the works that are proposed.

9.2.9 The overall expanse of visual catchment of the Sandy Bay UTAS site affords an array of viewing opportunities looking toward the site from static positions, in dynamic situations on approach including from below and from above. The number and range of viewing opportunities provide a cumulative set of phenomenal experiences and are layered over the cultural and natural values identified with the place. Given the high profile of the site and its historical, contemporary and future values, the level of scrutiny on the UTAS site is justifiable as are the standards by which an acceptable level of change is to be held.

9.2.10 Considerations of site rejuvenation aspects of the lifecycle should works eventually be removed are not specifically considered as part of this assessment as they are regarded as remedial and recessive in terms of their visual impact.

- The CUMULATIVE IMPACT with consideration of the prevailing Spatial Characteristics of the Visual Catchment Zones is HIGH.

10. VISUAL AMENITY ASSESSMENT EXPERT REPORT RECOMMENDATION

The various parts of the proposal made relevant to this Visual Impact Assessment have been assessed against the Visual Absorption Capability of the context.

10.1 PRECINCT 1 RECOMMENDATION

10.1.1 It is recommended that the Precinct 1 is an acceptable component. Subject to:

- The Infrastructure and General Recommendations.

Figure 111

- Building 1.1 being modified to having a permissible height of three stories. Additional height may be acceptable if it can be demonstrated that skyline views above the ridge are substantially retained above Mount Nelson from Marieville Esplanade, Sandy Bay.

10.2 PRECINCT 2 RECOMMENDATION

10.2.1 It is recommended that the Precinct 2 is an acceptable component. Subject to:

- The Infrastructure and General Recommendations.
- Building 2.3 being modified to having a permissible height of seven stories. Additional height may be acceptable if it can be demonstrated that skyline views above the ridge are substantially retained above Porters Hill from the intersection of Regent Street and View Street, Sandy Bay.

Figure 112 The Orange Line shows the Ridgeline from the viewing position at the intersection of Regent Street and View Street Sandy Bay. BULDING 2.3 extrudes beyond the ridgeline of Porters Hill

10.2.2 The landform dropping away to the east of the Porters Hill is not considered as a defining ridgeline for this purpose from this viewing position, so it is acceptable that proposed bult form might extrude above the lower ridgeline.

10.2.3 The illustrative modelling exercise has the topographic data only. In reality tree lines extend above the ridge to create the perception of the skyline. Considering it is this landscape that is the valued characteristic of the Sandy Bay and Greater Hobart amphitheatre utilizing the ridgeline as the view line generator provides a visual margin for retaining views to the tree line, therefore maintaining the visual connection with the valued character.

10.3 PRECINCT 3 RECOMMENDATION

10.3.1 It is recommended that the Precinct 3 is an acceptable component. Subject to:

- The Infrastructure and General Recommendations.

10.4 PRECINCT 4 RECOMMENDATION

10.4.1 It is recommended that the Precinct 4 is an acceptable component. Subject to:

- The Infrastructure and General Recommendations.

10.5 PRECINCT 5 RECOMMENDATION

10.5.1 It is recommended that the Precinct 5 is an acceptable component. Subject to:

- The Infrastructure and General Recommendations.

Figure 113

- Buildings 5.1, 5.2 and 5.3 being modified to having a permissible height of two stories. Additional height may be acceptable if it can be demonstrated that skyline views above the ridge are substantially retained above Proctors Hill from Marieville Esplanade, Sandy Bay.

- Building 5.13 being modified to having a permissible height of three stories. Additional height may be acceptable if it can be demonstrated that skyline views above the ridge are substantially retained above Proctors Hill from Marieville Esplanade, Sandy Bay.

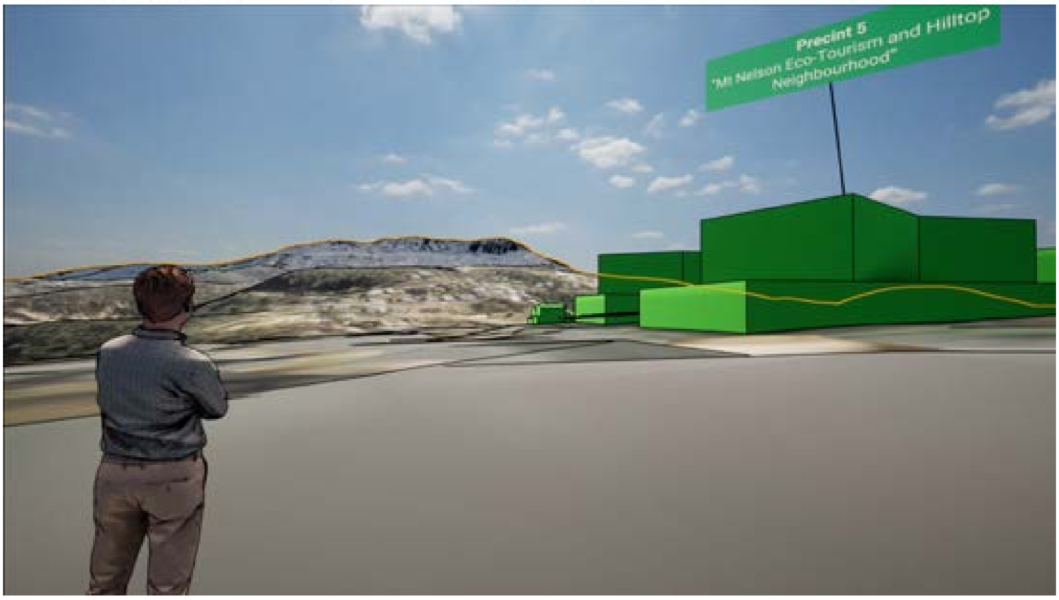

Figure 114

- Buildings 5.5 and 5.11 being modified to having a permissible height of three stories. Additional height may be acceptable if it can be demonstrated that the proposed building form is not unacceptably visually dominant within the Olinda Grove streetscape and that where views are available to Mount Wellington the proposed built form does block the view or unreasonably dominate the scene to the detriment of the visual amenity provided by the mountain and skyline views.

10.6 INFRASTRUCTURE & GENERAL RECOMMENDATION

10.6.1 It is recommended that the overall UTAS Sandy Bay Masterplan is an acceptable outcome. Subject to:

10.6.2 Roads and Paths:

- The construction of Roads and paths should be undertaken with best practice guidelines having regard to providing the minimal visual incursion where practicable and provide for landscaping that mitigates visual impact from foreground, middle ground and distant(background) views toward the site.
- Where existing connections and roads and paths are visible remedial works be undertaken to mitigate cumulative visual effects generated by the new works.

10.6.3 Lighting

- A lighting strategy that provides for the safe operation of the Precinct. Consideration of 'dark sky thinking' into the design, so that artificial lighting and resulting light spill is no brighter than necessary for the safe operation of the Precinct.

10.6.4 Landscape

- A developed Landscape Plan that resolves issues related to Civil Works, Urban Design, Landscape Design and Architectural Design.
- Schedules of Planting and Materials to be used on a Precinct basis.

10.6.5 A construction management plan that provides:

- Protection of identified landscape that is valued for retention.
- A Construction Heritage Management Plan.

10.6.6 A Bushland Reserve Management Plan.

10.6.7 A Recreational and Sporting Landscapes Management Plan.

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Align-View Photomontages

Revision:
–

LVIA Sandy Bay Masterplan

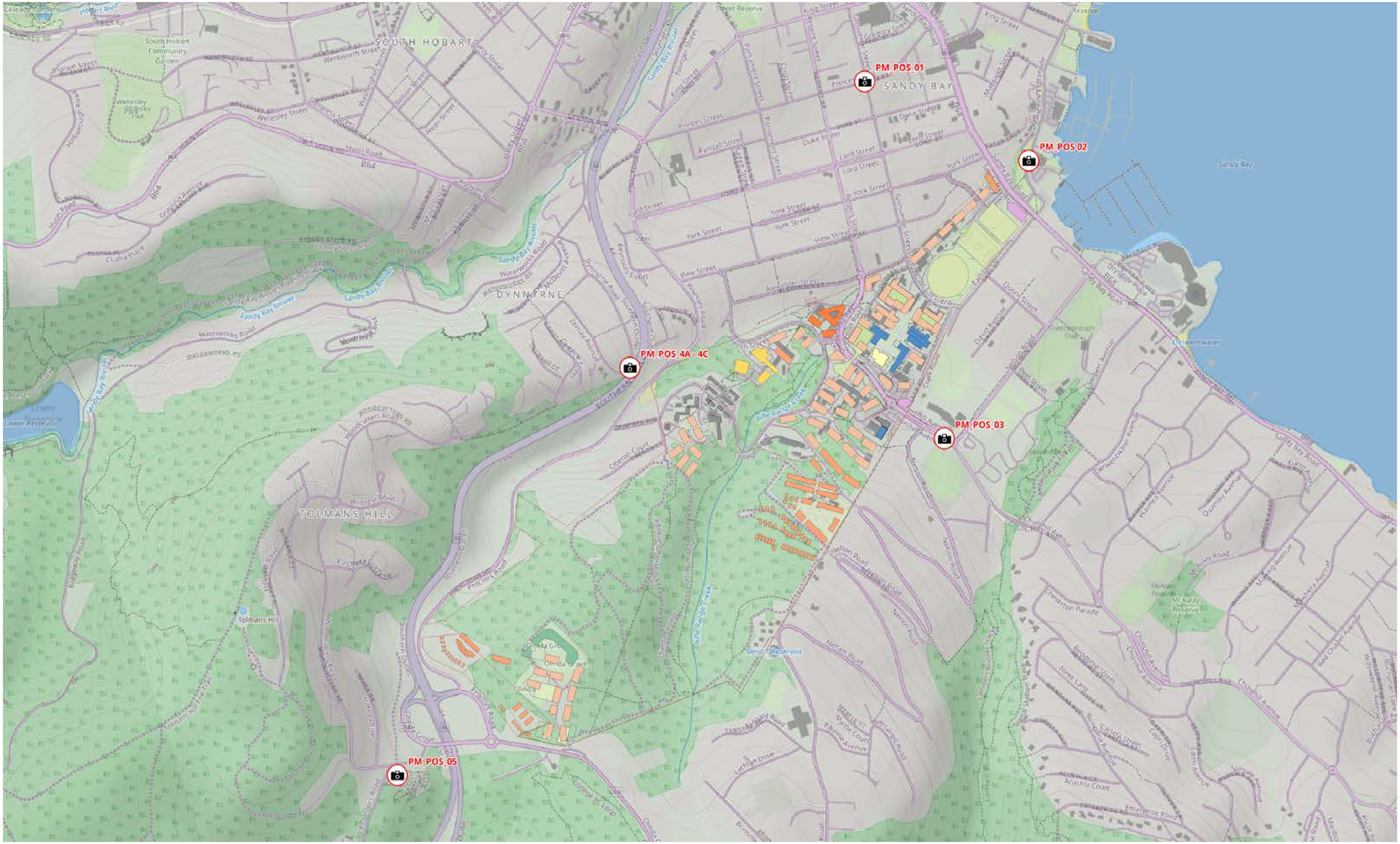
Project #:
V21040

Prepared For:
ClarkeHopkinsClarke Architects

Instructions Received From:
ClarkeHopkinsClarke Architects

Author:
Chris Goss
Registered Architect (ARBV)
BArch, BEnvDes

Date:
05/12/21



Section:

VIEWPOINTS &
PHOTOMONTAGE LOCATIONS

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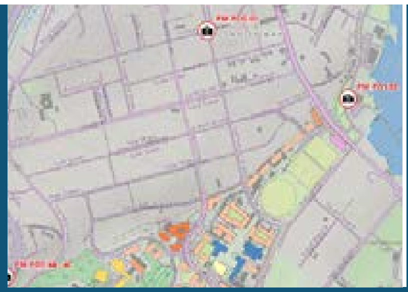

Section:
PM_1.0 PHOTOMONTAGE 01:
ORIGINAL PHOTOGRAPH @20MM

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PM_1.1 PHOTOMONTAGE 01:
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PM_1.2 PHOTOMONTAGE 01: PROPOSED BUILT FORM WITH BUILDING OUTLINE

Unoccluded silhouette of proposed built form (excludes vegetation)

Silhouette of proposed built form that is occluded by existing built form (excludes vegetation)

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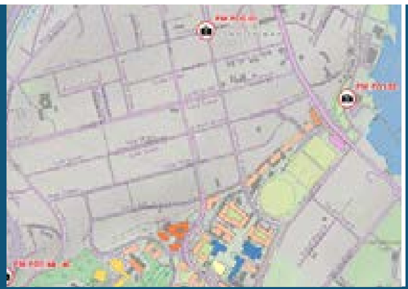

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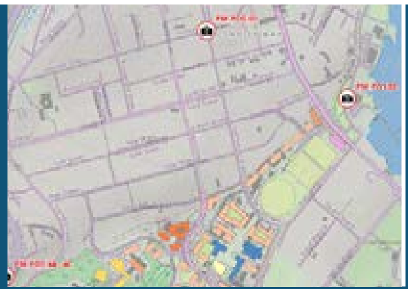

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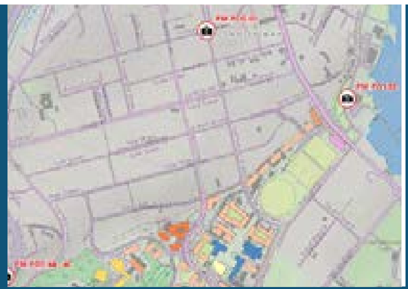

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PM_3.2 PHOTOMONTAGE 03: PROPOSED BUILT FORM WITH BUILDING OUTLINE

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PM_4A.2 PHOTOMONTAGE 4A: PROPOSED BUILT FORM WITH BUILDING OUTLINE

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PM_4B.1 PHOTOMONTAGE 4B: PROPOSED BUILT FORM

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Section:

PM_4B.2 PHOTOMONTAGE 4B: PROPOSED BUILT FORM WITH BUILDING OUTLINE

Unoccluded silhouette of proposed built form (excludes vegetation)

Silhouette of proposed built form that is occluded by existing built form (excludes vegetation)

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PM_5.0 PHOTOMONTAGE 05:
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PM_5.1 PHOTOMONTAGE 05:
PROPOSED BUILT FORM

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PM_5.2 PHOTOMONTAGE 05:
PROPOSED BUILT FORM WITH LANDSCAPING

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PM_5.3 PHOTOMONTAGE 05: PROPOSED BUILT FORM WITH BUILDING OUTLINE

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ASSESSING THE MASTERPLAN DESIGN + IMPACTS

Heritage Impact Assessment

Paul Davies Architect

UTAS Sandy Bay Masterplan for PSA Submission

Heritage Impact Statement

December 2021

for UTAS Properties Pty Ltd

by Paul Davies Pty Ltd

Revision	Date	Issued By
A	29/10/2021	PD – draft for team review
B	12/11/2021	PD – for issue
C	1/12/2021	PD – revised for issue

Report reviewed by:	Paul Davies Director B Arch MB Env ARIA Reg. No. 6653

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Table 17: Vistas, Views and Setting Policy 67

Executive Summary

This Heritage Impact Assessment considers the UTAS Sandy Bay Masterplan proposal in relation to the heritage values of the Site that were developed in the UTAS Sandy Bay Site Conservation Management Plan. An important aspect of the project brief has been an investigation of Site heritage values that in turn has informed the development of the Masterplan.

At the present time the Site has three specific elements that have statutory heritage listing: the Arts Theatre; the Christ College Group and; the Earl Street Hedge. There are no other heritage overlays or listings on the Site.

Prior to the current project being undertaken, UTAS undertook a preliminary heritage review of the Site (prepared by Paul Davies Pty Ltd) that identified the potential for other aspects of the existing campus to have heritage value. Based on that preliminary assessment a Conservation Management Plan (CMP) for the Site was commissioned to further explore possible heritage values. That document forms part of the UTAS sandy Bay Masterplan submission and it has been directive in the overall masterplanning approach.

The Sandy Bay site presents particular issues in relation to heritage assessment as, apart from the early farmhouse building that remains, the site was developed from the 1950 period and is essentially a Site containing modernist buildings and elements. There are heritage listings of modernist buildings in Hobart and the State more generally, but it is an area of heritage that has not attracted the same level of interest as the extensive collection of nineteenth and early twentieth century sites. Consequently, the CMP considers the campus buildings in relation to other modernist buildings in the State, particularly those that have attracted heritage listing.

The CMP also assessed potential heritage significance in a critical way, that is, simply being a 'Modernist' building, however that may be defined, is not sufficient for something to have heritage value. There have to be thresholds where elements stand out or are exceptional to be considered for heritage protection in some form. That approach determined that a small group of buildings and elements, in addition to the currently listed elements, have sufficient heritage value to be considered for heritage protection, most likely through a formal listing process.

A range of other elements were assessed as having potential moderate heritage significance and the CMP concluded that they had a collective value in relation to the overall structure and development of the site which could be reflected in selective retention and re-purposing. There were no specific buildings recommended for retention, rather a consideration in masterplanning of the value of retaining elements of the site that reflected its early form.

A final group of site elements was assessed as not having any potential heritage significance. Consequently, there is no purpose in considering them within this HIS.

Heritage Significance is not restricted to buildings or built elements. This can be seen in the heritage listing of the hedge. The CMP considered the overall spatial arrangement of the site and concluded that the central campus layout had some significance as the setting for the significant buildings and also in relation to how the site was originally planned. This was not assessed as of such high significance that it required heritage listing but, where it forms the setting for buildings and features that are to be retained it does have significance. This is also responded to in the Masterplan.

The HIS considers two possible ways to address heritage values. The first is to simply respond to the current listings as the statutory framework for heritage on the site. The second has been to undertake a detailed study to understand if other values exist and if they do how to retain them.

UPPL adopted the second approach to ensure that heritage consideration formed part of the overall master planning process.

The UTAS Sandy Bay Masterplan has been developed around this heritage understanding of the site and that is set out in the HIS. The key outcomes are:

- The three existing heritage listings are retained and respected in the proposal.
- Five additional Campus Buildings are recommended for heritage listing along with sufficient settings to retain the central and upper campus forms in relation to those built elements. This will form the largest group of 'Modernist' buildings in Tasmania to be recognized for their heritage values. The additional buildings are:

  - Chemistry

  - The Morris Miller Library

  - Psychology

  - St John's College

  - The original farmhouse
- A further ten campus buildings are retained in the Masterplan, allowing for various forms of adaptation. While there will be change to these buildings there is also the potential to retain key features, facades and forms.
- Significant internal features of significant buildings to be retained are identified and are to be retained and incorporated into any adaptation works that are planned.
- The central area of the site that forms the core campus area is retained with both existing, adapted and new built elements but around the spatial logic of the original site layout.
- The area around the university colleges is retained as the setting for both Christ and St John Colleges.
- Several of the key recent buildings are retained including CSIRO and the Herbarium.
- The bushland setting is retained across large areas of the Site. While this is not a specific heritage requirement and addresses other issues such as environmental matters, it retains a balance between a developed and natural site that has characterized the Site for most of its history.
- The interface of the Site with adjoining residential areas has been considered in how future development is proposed to ensure that the heritage values of adjoining and nearby Heritage Conservation Areas are protected.

The UTAS Sandy Bay Masterplan has responded to the heritage values of the site while planning for a major change across the whole of the Site area.

1.0 Introduction

1.1. The Brief

This heritage impact statement (HIS) has been prepared on behalf of the UTAS Properties Pty Ltd (UPPL) to accompany a Planning scheme amendment for the UTAS Sandy Bay Campus (Site).

This document has been prepared for ClarkeHopkinsClarke Architects Pty Ltd and UTAS Properties Pty Ltd (UPPL) and may only be used and relied on by ClarkeHopkinsClarke Architects Pty Ltd and UTAS Properties Pty Ltd (UPPL) for the purpose of a Planning Scheme Amendment or as otherwise set out in this report.

1.2. Approach and Methodology

This HIS reviews the relevant statutory heritage controls, assesses the impact of the proposal, makes recommendations as to the level of heritage impact and provides recommendations to mitigate any heritage impacts that may arise.

The methodology used in this report is in accordance with the principles and definitions set out in the Australia ICOMOS Burra Charter 2013 and its Practice Notes, and in accordance with the latest version of The Heritage Tasmania, Department of Primary Industries, Parks, Water and Environment Assessing Historic Heritage Significance guidelines.

1.3. Limitations

The Site was visited by Paul Davies and Wendy Crane of Paul Davies Pty Ltd in early 2021. The Site was inspected and photographed. The inspection was undertaken as a visual inspection only. There was no demolition, opening up or clearing.

The historical outline provides background information to provide a broad understanding of the development of the Site sufficient to assess the impact of the proposal. Research is sourced from a mix of primary and secondary sources.

An archaeological assessment has not been included, as the proposed work does not involve excavation of any original ground levels.

1.4. Author Identification

This report was prepared by Paul Davies Pty Ltd, Architects and Heritage Consultants, 7 Broughton Street, Drummoyne NSW 2047 and 11/17 Margaret St Sandy Bay Tasmania.

This report was authored by Paul Davies.

1.5. Ownership

The Site is managed by UTAS and has been the main campus containing administration and property services.

1.6. Definitions

For the purposes of this report

Local	Refers to the Hobart Council area.
State	Refers to Tasmania

The following definitions used in this report and are from *Article 1: Definitions* of The Burra Charter 2013, the Australian ICOMOS Charter for the Conservation of Places of Cultural Significance.

Place	means a geographically defined area. It may include elements, objects, spaces and views. Place may have tangible and intangible dimensions.
Cultural significance	means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Places may have a range of values for different individuals or groups
Fabric	means all the physical material of the place including elements, fixtures, contents and objects.
Conservation	means all the processes of looking after a place so as to retain its cultural significance.
Maintenance	means the continuous protective care of a place, and its setting. Maintenance is to be distinguished from repair which involves restoration or reconstruction.
masterplan	refers to the original campus masterplan developed during the 1950s
UTAS Sandy Bay Masterplan	refers to the current Masterplan (2021) being developed for the Site.
Preservation	means maintaining a place in its existing state and retarding deterioration.
Restoration	means returning a place to a known earlier state by removing accretions or by reassembling existing elements without the introduction of new material.
Reconstruction	means returning a place to a known earlier state and is distinguished from restoration by the introduction of new material.
Adaptation	means changing a place to suit the existing use or a proposed use
Use	means the functions of a place, including the activities and traditional and customary practices that may occur at the place or are dependent on the place.
Compatible use	means a use which respects the cultural significance of a place. Such a use involves no, or minimal, impact on cultural significance.
Setting	means the immediate and extended environment of a place that is part of or contributes to its cultural significance and distinctive character.
Site	means the land that forms the Sandy Bay UTAS campus
Related place	means a place that contributes to the cultural significance of another place.
Related object	means an object that contributes to the cultural significance of a place but is not at the place.
Associations	mean the connections that exist between people and a place.
Meanings	denote what a place signifies, indicates, evokes or expresses to people.
Interpretation	means all the ways of presenting the cultural significance of a place.

2.0 Background

2.1. Site Location

The UTAS Sandy Bay Campus is located on the south-western side of Sandy Bay Road. The Site occupies approximately 105 hectares of land (1,049,135m^2) and extends in a south-west direction approximately 2km past Churchill Avenue. It is bounded by residential development and Proctors Road to the north and west, Earl Street to the south-east and further residential development continuing up the hill to the west. The street frontage to Sandy Bay Road extends for approximately 180m. The campus contains a large number of buildings, mostly built as part of the university development, playing fields fronting Sandy Bay Road and at the upper end of the Site near Proctors Road, extensive areas of bushland and a setting that moves from the urbanized residential developments around the lower campus to a bushland campus on the upper slopes.

The main campus development occupies gently rising land above the playing fields terminating at Churchill Avenue with three separate areas of development on the steeper land beyond Churchill Avenue.

The Site is located within the Hobart City Council local government area.

Table 1: Property information based on LISTMap.

Street address	Real property description
2 Churchill Avenue Sandy Bay	176312/1
2 Churchill Avenue Sandy Bay (this is also referred to as 306 Sandy Bay Road)	167420/1
2 Churchill Avenue Sandy Bay (this is also referred to as 6 Grace Street)	167420/2
60 Proctors Road Dynnyrne	28772/1
66 Proctors Road Dynnyrne	119071/1
Proctors Road Dynnyrne	119071/2

Figure 1: Location of UTAS Sandy Bay Site. Source: LISTMap – Land Information Services Tasmania

Figure 2: Site Plan of UTAS Sandy Bay Site. Source: LISTMap – Land Information Services Tasmania

2.2. Statutory Listings and Controls

Commonwealth Heritage List & National Heritage List

The Site is not listed on either the Commonwealth Heritage List (which can only apply to sites in Commonwealth government ownership) or the National Heritage List (which applies to sites of National heritage significance).

Tasmanian Heritage Register (THR)

UTAS Sandy Bay Campus contains the following buildings listed on the Tasmanian Heritage Register.

Table 2: Details of Heritage Listings in Tasmanian Heritage Register

Place ID	Item Name	Address	Suburb	Postcode	Municipality	Heritage Place Status
7500	Christ College	2 Churchill Ave	Sandy Bay	7005	Hobart City Council	P.Reg

Hobart Interim Planning Scheme 2015

The Hobart Interim Planning Scheme 2015 includes the heritage listings affecting the Site outlined in Table 3 below.

Table 3: Details of Heritage Listings in Hobart Interim Planning Scheme Table E13.1 Heritage Places

Ref No.	Name	Street No.	Street/Location	C.T.	General Description	Specific extent
185	Christ College		Baintree Avenue	127402/1	Part of 2 Churchill Avenue	
609	Arts Lecture Theatre,		Churchill Avenue	167424/1	Arts Lecture Theatre only, including the grounds within 3m of the building	
	Hedge		Earl Street			

Figure 3: Extract from the LISTMap overlay within the Hobart Interim Planning Scheme 2015. Note: Christ College is shown (circled red), as is the Earl Street hedge, however the plan does not include the Arts Lecture Theatre (circled blue). LISTMap appears to only show items that are on the Tasmanian Register.

Source: LISTMap – Land Information Services Tasmania'

2.3. Non- Statutory Listings

National Trust of Australia (Tasmania)

There are no National Trust of Australia (Tasmania) listings on the Site.

Australian Institute of Architects (Tasmania)

The Tasmanian chapter of the Institute of Architects commenced awards around 1963 with 'triennial' awards and established annual awards in 1982.

The following buildings have received an Institute of Architects (Tasmania) Award noting that they are architecture awards and not heritage awards:

1966	Dirk Bolt (in relation to Christ College) but an individual award
1988	Sports Pavilion (Building 5)
1989	Herbarium, Tasmanian (Building 36)
1991	Centenary Building (Building 10)
1993	CSIRO Building (Building 45)
1994	Old Commerce Building (Building 40a)

1995 University Apartments (Building 47c)

2000 Staff Club additions (18)

2003 Life Science Entry addition (34)

2004 Union Bar addition (21)

2008 Corporate Services Building addition (Building 31).

2.4. Previous Studies

There have been no previous heritage studies or assessments of the campus apart from the individual listings prepared for State and Councill registers and the recently completed Conservation Management Plan.

This plan is based on the following documents, which contain more detailed historical background than is included herein; they should be read in conjunction with this report.

- Sandy Bay A Social History - Nicola Goc
- The Rifle Range Estate, a History - Gwenda Lord
- The Golf Club Estate, a History - Gwenda Lord

The study has used the extensive archive of university drawings as a source of base information on architects, periods of development and how change has taken place across the campus.

3.0 Historical Outline

The following history has been taken from the 2021 Conservation Management Plan for the Site prepared by Paul Davies Pty Ltd. The history does not include Aboriginal heritage which is addressed in the CHMA study. The two reports should be read in conjunction with each other.

3.1. The Site until 1951

1813-1880

The area was not formally occupied until 1813 when Governor Macquarie made a land grant of 25 acres to George Brown from Norfolk Island. The holding was owned by John Eddington by 1825, presumably following Brown's death. Eddington was recorded as the owner in 1868 of 25 acres with "cottage and land". John Eddington died in 1869 and the property passed to his wife and then son. The farm was leased in 1872 to a William Cooper in 1872 and then Michael Kelly in 1879. Kelly's lease only survived a year as the government became the lessee in 1880 establishing a rifle range.[1]

1880-1951

The rifle range was established around 1880 but the land was not acquired by the government until 1890 following the death of Elizabeth Eddington. However, some improvement works took place including an upgrade of the farm house that had been built on the Site, including additions, to provide accommodation for a caretaker. Details of that work are not known, neither is the earlier history of the house.

In 1901 as a result of Federation, defense became a National concern and the rifle range was taken over by the Commonwealth.

When the range was established, the area contained farms with little residential development in the area. By 1901, there was increasing development in the surrounding area and plans for sub-division that were seen, at least by local land owners, to be in conflict with the rifle range use with its potential for stray bullets to stray onto adjoining land.

In 1906, partially it would appear to address the issue of separation of the rifle range from adjoining properties as well as the increasing range of weapons, four additional parcels of land were added to the Site. In 1908 a further area to the east and in 1915 a long narrow strip of land to the west of the Site were added, extending the Site from Sandy Bay Road to Proctors Road. These acquisitions form the basis of what is now the UTAS Sandy Bay campus and substantially increased the Site area.

1 The information on grants is based on information set out in Gwenda Lord's publication "A History of the Rifle Range Site Sandy Bay".

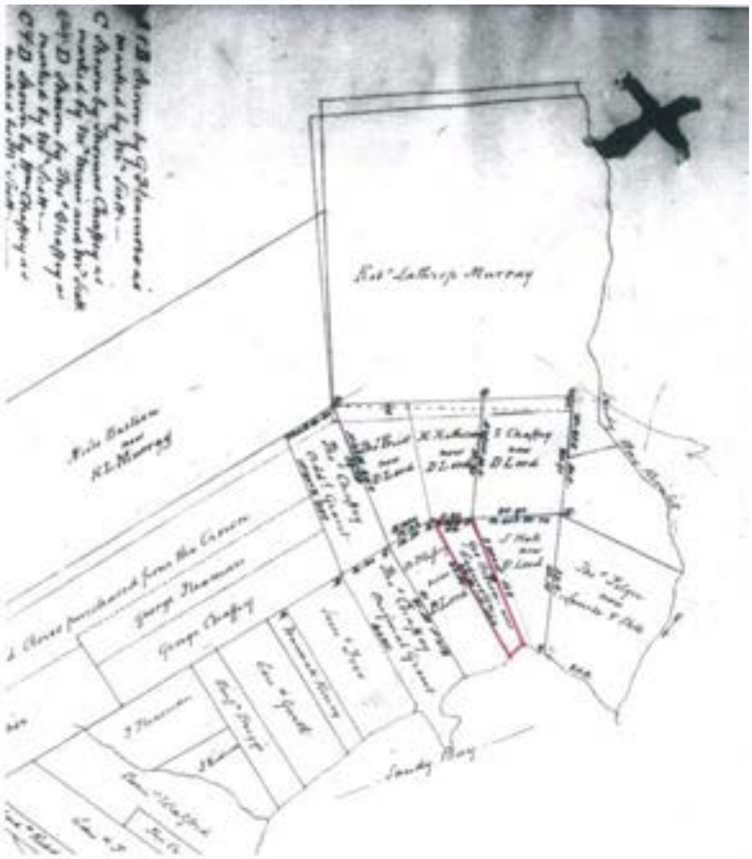

Figure 4: 1837 map of Sandy bay grants to Norfolk Island Settlers. The Site is overlaid approximately on the grants to Brown and DL Lord.

Source: SC285/32 Archives Office of Tasmania

Figure 5: Aerial photo from that shows the elevated Sandy Bay Road, Grace Street, the former farm residence and the rifle range club house with the development of the adjacent Golf Links Estate. The original golf club house can be seen set back and above Grace Street.

Figure 6: The amended sub-division plan, showing the Commonwealth acquisition of land between the then rifle range site and the new estate. The former golf club house can be seen at the end of View Street. Lot 7 (in the detail plan) was acquired by the University and forms part of the site of the Temporary Administration Building.

Source: History of the Rifle Range Site - Lord.

There was continuing agitation from the local community for the rifle range to close but the army was resistant and it was not until after the first world war that pressure increased with Hobart City Council making representations to the Commonwealth to relocate the facility and for them to acquire the site.

At the same time, the University were facing problems with insufficient land and facilities at the Glebe and were looking for a new site for a campus. It identified the rifle range as a suitable site and approached the State Government who, while supportive of the idea, would not intervene in Hobart Council's negotiations.

By the outbreak of the second world war, Hobart City Council ceased its negotiations with the Commonwealth to acquire the land and the premier, Edmund Dwyer-Gray, urged the vice Chancellor, Edmund Morris Miller, to work on a submission to the Commonwealth that involved transferring the site from the Commonwealth to the State Government for use as the University campus. Negotiations progressed with the condition that an alternative rifle range be secured.

1941 saw the Commonwealth acquire land at Brighton for a new rifle range and in 1943 an agreement was reached to relocate the range and for the Sandy Bay site to transfer to the State. The transfer did not take place however until 1948 and the site was vested in the University in 1951.

3.2. UTAS - Post 1951

1951-1959

The initial use of the Site by the University was very low key with the huts that had been built during the war for army use becoming temporary facilities to alleviate the over-flowing Glebe campus. Work progressed on master-planning the Site and a first masterplan was developed by Professor Leslie Wilkinson from Sydney University. It was not adopted and on reflection, Wilkinson who was by this time 70 years old, proposed an arcane plan with a strong Mediterranean character.

The campus works were overseen by the Chief Architect of the Public Works Department but most of the individual buildings were designed by consultant architects and often several firms or architects in collaboration.

It is not clear how that masterplan was actually developed but the earliest site plan discovered from 1957 was prepared by the Public Works Department under CB Rose as chief architect. It was used as the site plan for the soon to be built engineering and engineering workshop buildings (1957-1959). The plan shows both the state of the campus at the time and the masterplan intent that Rose, the chief Architect, laid out. The masterplan is ordered and regular and is a quite utilitarian approach to the site.

The layout responds to site constraints: the eastern and lower land, which was relatively flat was most suited to playing fields with a fringe of buildings and the central campus area which has a gentler slope than the upper campus allowed a regular building arrangement around a spine. The upper campus layout set potential buildings onto long narrow platforms that extended along contours to minimize site works and vehicle access generally fed into each building off new access roads that wound up the hillside with often steep driveways to individual sites.

The central campus arrangement is a relatively tight grid form with relatively easy circulation even with the considerable rise in topography. The upper campus has always had difficult access from the lower campus areas but also in relation to each building where there are considerable level changes.

The infrastructure elements that were established early in the development of the Site were the extension of Grosvenor Street and the creation of Churchill Avenue as crossing points in the Site that separated the campus into lower, middle and upper areas. The plan shows an intended layout for the middle and lower part of the upper campus but does not show much proposed development on the lower campus.

The buildings constructed up to 1959 are: * Buildings coloured in blue are in the central campus area.

	Building	Architect	Bldg No
1957			
•	Administration (temporary)	SWT Blythe + Roderick W Cooper	(1)
•	6 Grace Street	SWT Blythe+ Roderick W Cooper	(2)
•	Hytten Hall	John F Scarborough	(40)
1959			
•	Engineering	Public Works	(8)
•	Engineering Workshop	Public Works	(11)
•	Vic-Chancellor's Residence	Public Works	(38)
•	Warden's Lodge	Public Works	(40b)
•	Rugby Changerooms and clubhouse	Public Works	(50)
•	Students Union Building Stage 1	Blythe and Blythe	(21)
•	Morris Miller Library	John F Scarborough	(23)

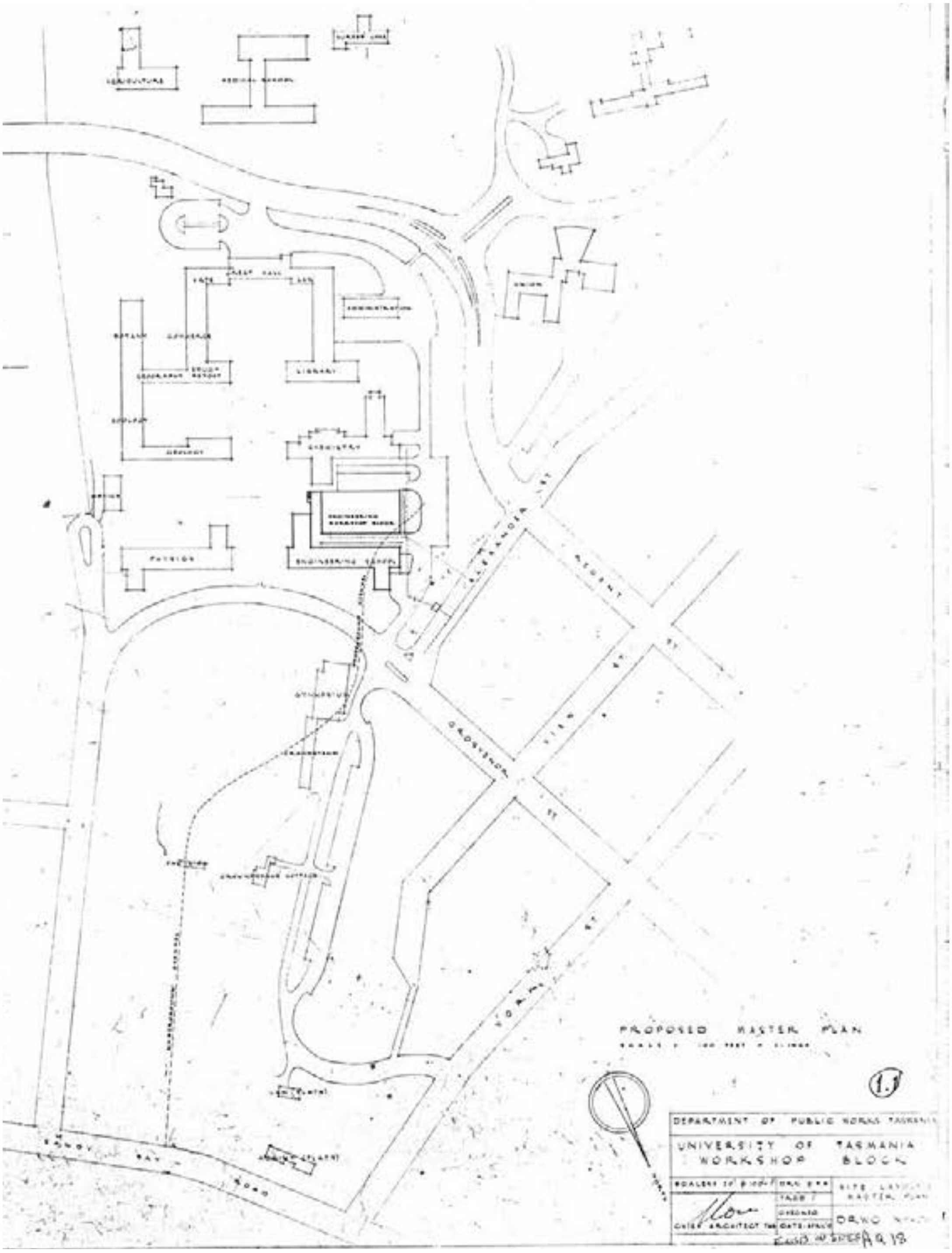

Figure 7: Proposed Masterplan - CB Rose Chief Architect 1957. While this plan shows the set out for the Engineering Workshop, it would appear that the Master Plan was already extant and probably did not include the workshop building. The symmetry of the central spine is continued in the plan above Churchill Avenue with the Medical School, however while the general form was retained the uses of buildings changed. Topography can be seen to affect the planning also with Hytten Hall and the VC residence aligned to contours and not the regular grid and the Union Building set into the arc of the new road network and quite separated from the main campus.

Source: University Archives.

By 1957 two buildings had been built, the temporary Administration Building (1) fronting Sandy Bay Road and a staff accommodation building at 6 Grace Street on the lower end of the campus to serve the faculties that had located into the existing huts and to establish the universitys presence on the Site.

These two buildings were designed by SWT Blythe in association with Roderick W Cooper. Blythe had been chief architect of Public Works and was shortly after this in private practice with his son and Cooper had an influential practice particularly in residential and church work.

Cooper worked on several other significant buildings on the campus including the Arts Theatre (27) and John Fisher College (47) and Blythe in combination with his son designed the original building beneath Lady Gowrie childcare (3), the first Uni Gym (4), the first University Club building, (18) the first Union Building (21) and Stage 1 of the Administration Building (22).

There would seem little doubt that Blythe's role as a former chief architect along with an impressive record of public buildings across the State placed him in a good position to undertake much of the early work on the campus. McNeal and Woolley[2] observe that Blythe's significant work took place in the 1940s and is epitomised in the many school buildings that he designed and, in particular, Ogilvie High in New Town. The temporary Administration Building, now somewhat altered, is his most cohesive design on the campus.

The 1957 site plan shows a clear intent on the form of the Site. The central campus was to have an open and spacious central avenue with large open spaces to each side with narrow buildings, geometrically arranged with wings to enclose courtyard areas. The upper end of the central campus featured a great hall that overlooked the buildings beneath and with an outlook to the Derwent across the landscaped forecourts.

Around this time, it is also noted that the former caretaker's cottage was relocated down the slope to its present Site.

The following analysis drawings show the built and spatial arrangements of the Master Plan and how they now manifest on the Site.

2 Architecture from the Edge: Barry McNeill, Leigh Woolley, 2002. Montpelier Press

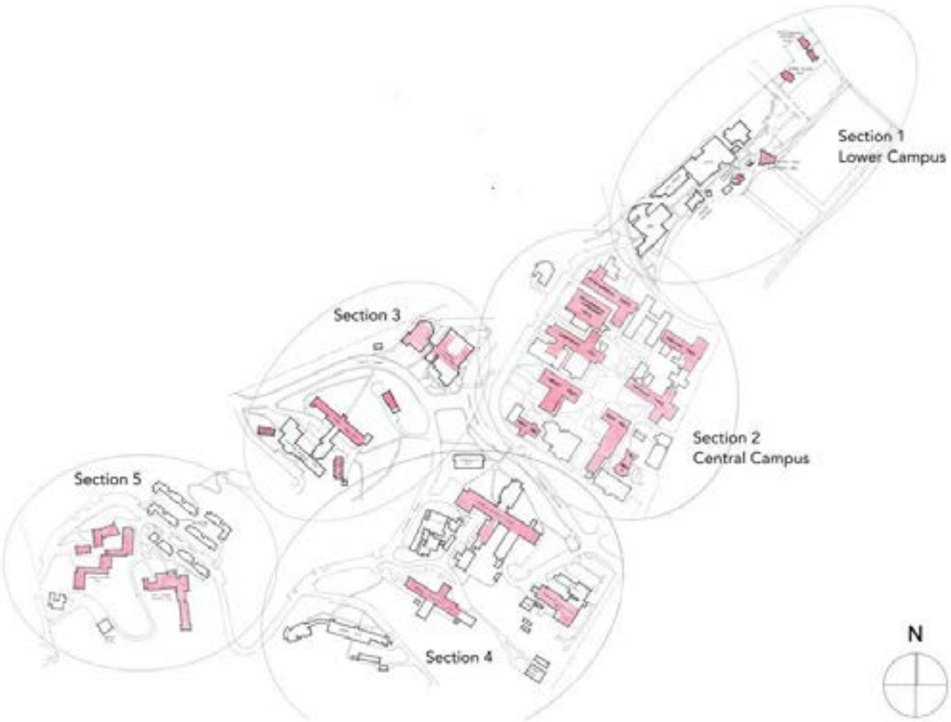

Figure 8: Site plan showing buildings built up to 1969 overlaid on current Site layout. The following figures provide enlarged views of sections 1-5. Source: Paul Davies Pty Ltd

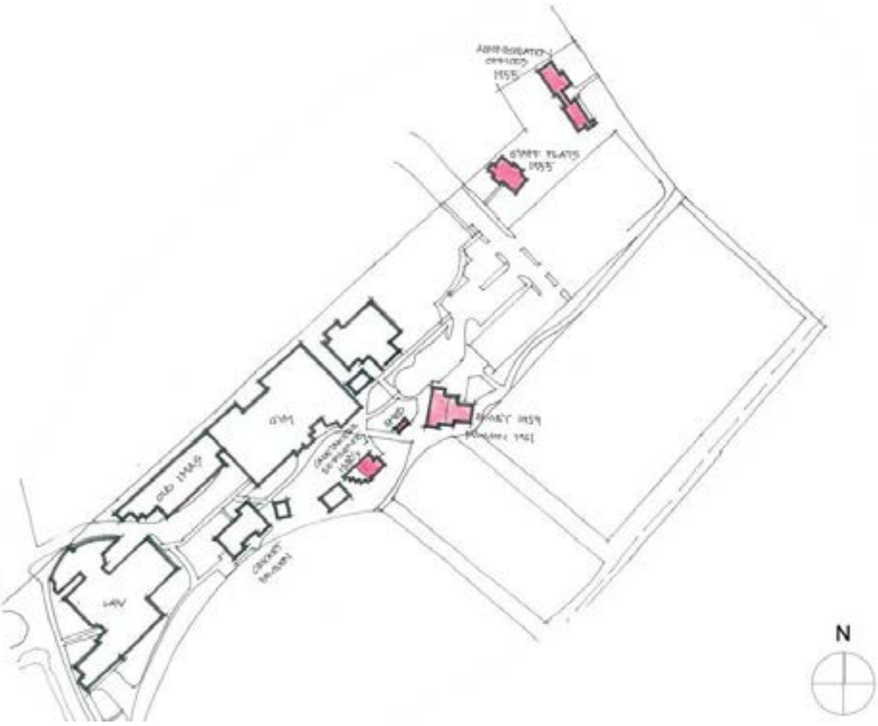

Figure 9: Lower Site plan showing buildings built up to 1969 overlaid on current campus layout. Source: Paul Davies Pty Ltd

Figure 10: Central Site plan marking the buildings constructed to 1965 overlaid on current campus layout. Source: Paul Davies Pty Ltd

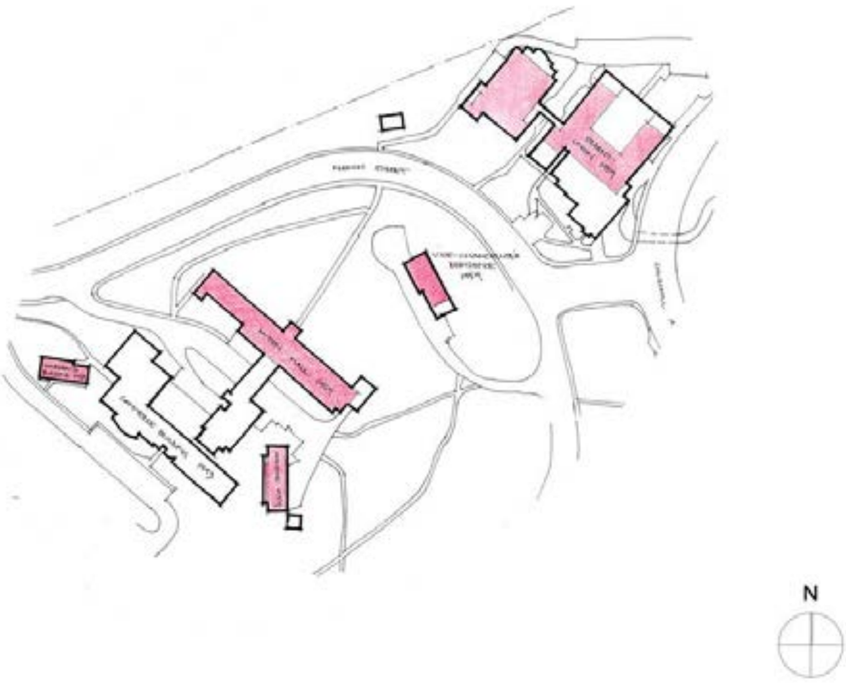

Figure 11: Site Plan Section 3 marking the buildings constructed to 1965 overlaid on current campus layout. Source: Paul Davies Pty Ltd

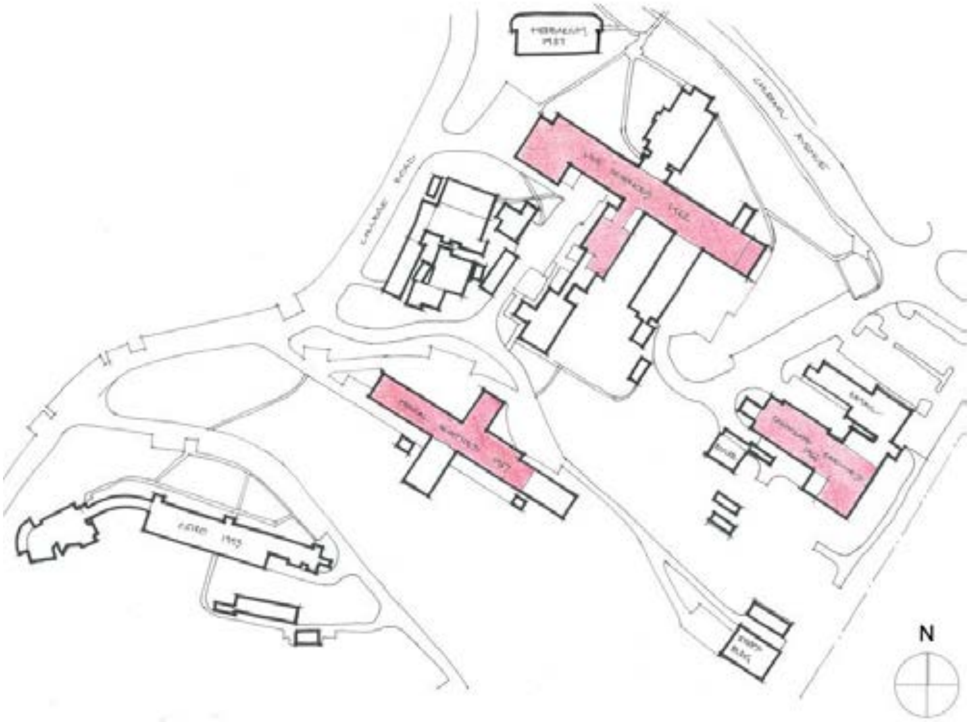

Figure 12: Site Plan Section 4 marking the buildings constructed to 1965 overlaid on current campus layout.

Source: Paul Davies Pty Ltd

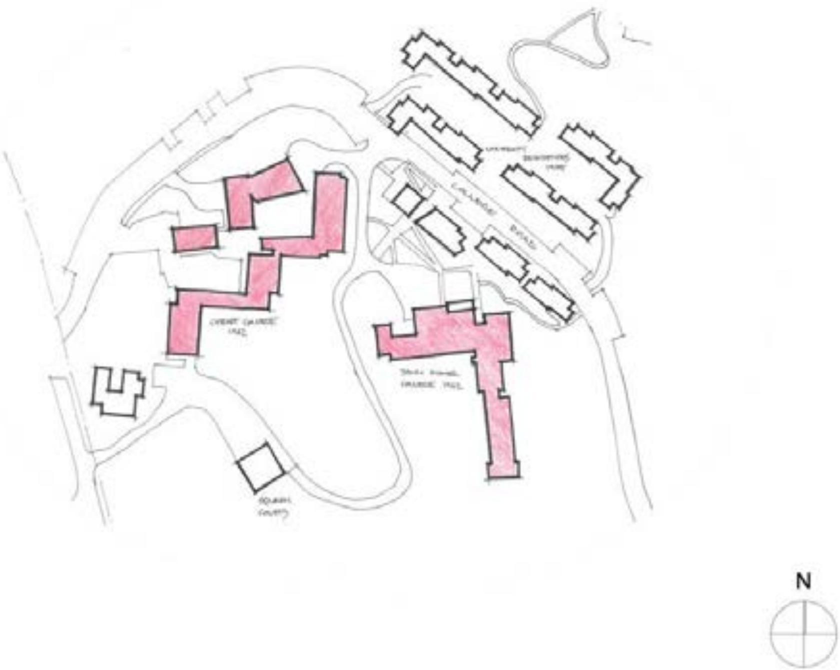

Figure 13: Site Plan Section 5 marking the buildings constructed to 1965 overlaid on current campus layout. Source: Paul Davies Pty Ltd

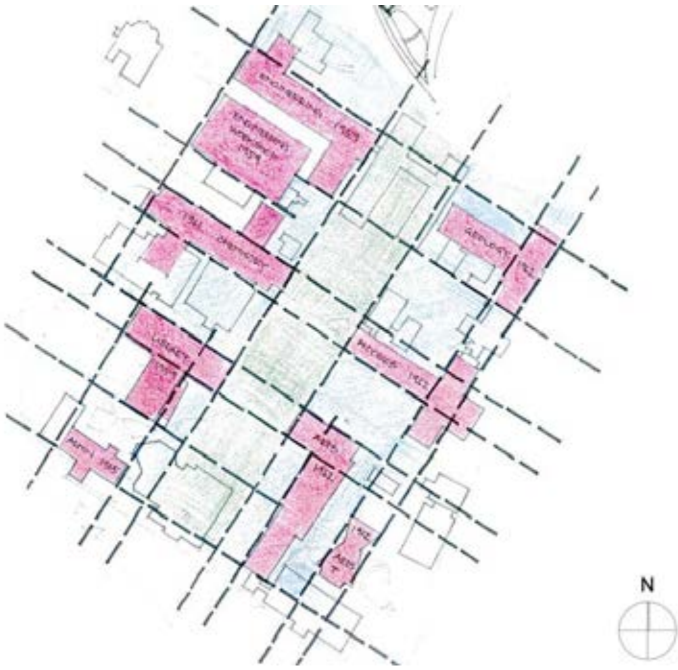

Figure 14: Central Campus plan marking the buildings from 1959 to 1965 showing the arrangement of buildings in the first period of development. The buildings, even though all the buildings are of different designs, they follow a fairly strict arrangement of both built form and open space as indicated by the grid lines. The central avenue is open along its length. Source: Paul Davies Pty Ltd

Figure 15: Central Campus plan marking the buildings from 1959 to 1965 with the remaining spatial arrangement related to the earlier buildings. The Administration building, of slightly later date than the other indicated buildings, while fitting within the grid arrangement is outside the core spatial arrangement of the spine walkway. A number of later buildings were constructed within established open spaces that changed the overall early site masterplan. Source: Paul Davies Pty Ltd

Aspects of the plan that were built in close to their early form were:

- Engineering and the Engineering Workshop (8, 11)
- Chemistry (17)
- The southern sections of the Library (23)
- Physics and Geology, except their locations were reversed (12, 13)
- Most of the Arts Building (26)
- Part of the Student Union Building (21)
- Hytten Hall (40)
- The Medical School but separated into two faculties with agricultural science occupying the northern area (44)
- The Vice Chancellor's Residence (38)

The Administration Building was built close to the masterplan location but slightly further south.

Buildings that did not eventuate as planned included: Nurses quarters, Great Hall, Law, Optics, Botany, Zoology, Gymnasium and Grandstand.

It is also of interest to note the location of the caretaker's cottage, the early farmhouse that was adapted for use as part of the rifle range, as it was relocated further down the site as the playing fields and ovals were developed.

Figure 16: Chemistry Building main entry and glazed curtain wall northern façade.

Source: Paul Davies Pty Ltd. 2021

Figure 17: Arts Lecture Theatre (with addition of upper walkway).

Source: Paul Davies Pty Ltd. 2021

Figure 18: Morris Miller Library curtain wall façade set between brick end walls of the north-south wing.

Source: Paul Davies Pty Ltd, 2021

Figure 19: Medical Sciences Building with pre-cast spandrel panels and a later lecture theatre addition to the left.

Source: Paul Davies Pty Ltd, 2021

Figure 20: Arts Lecture Theatre.

Source: Paul Davies Pty Ltd, 2021

Figure 21: Geology Building with the much later upper floor addition and an early wing to the left of photo.

Source: Paul Davies Pty Ltd, 2021

Figure 22: Hytten Hall.

Source: Paul Davies Pty Ltd, 2021

Figure 23: Former temporary Administration Building.

Source: Paul Davies Pty Ltd, 2021

Figure 24: Former Vice-Chancellor's Residence.

Source: Paul Davies Pty Ltd, 2021

The early history of design on the Site is also interesting in how architects were engaged. As noted above Blythe and Cooper designed the earliest buildings and then Public Works designed the next small group of elements:

- Engineering (8)
- Engineering Workshop (11)
- Vic-Chancellor's Residence (38)
- Warden's Lodge (40b)
- Rugby Changerooms and clubhouse addition (50)

Public Works undertook some additions after this but did not design any further new buildings on the Site except for the Mathematics wing. It is also interesting to observe at the same time that an interstate architect, John F Scarborough from Melbourne, was engaged to design Hytten Hall and the Morris Miller Library.

John Scarborough had already had an impressive career, in partnership with Robertson and Love until the second world war and then in his own practice. He had designed colleges, chapels and libraries and had been the President of the Victorian Chapter of the Institute of Architects.

Around the period of the Tasmanian commissions, his practice was designing library buildings for the ANU, Monash and Melbourne universities with great success and that experience is evident in the design of the Morris Miller Library building.

Bailleau Library at Melbourne University, designed by Scarborough, opened in 1959 and both it and Morris Miller Library demonstrate consistent design approaches and an understanding of modernism.

In contrast, Hytten Hall, the first student residential building on the campus (both buildings completed in 1959), is a transition building with a mix of traditional and modern elements that is hard to understand in relation to the sophisticated and modernist library building design. It would appear that Scarborough's understanding of libraries and modernist forms as seen in the library at Sandy Bay and other campuses did not translate to the student accommodation building.

The Students Union building was also opened in 1959 to a design by Blythe and Blythe (Blythe was then in practice with his son). Its early form was closely related to the linear form of buildings on the campus with wings creating courtyards but this was lost as the building was extensively altered and extended over time.

1960-1970

After 1959, all campus architectural designs were undertaken by Tasmanian based architects.

The next group of main buildings were constructed between 1960 and 1962 with the three last buildings from this period of development built in 1965 and 1966. This marked the end of the major campus building phase and while buildings were added periodically after this time the core campus character was established.

The buildings are:

Building	Architect	Bldg No
1961		
• Chemistry	D Hartley Wilson	(17)
1962		
• Arts	E Brian Howroyd and Cooper + Vincent	(26)
• Arts Lecture Theatre	E Brian Howroyd and Cooper + Vincent	(27)
• Christ College	Hartley Wilson Bolt	(47a)
• John Fisher College	Cooper Vincent McNeill	(47b)
• Physics	Bush, Haslock, Parkes, Shugg and Moon	(13)
• Geography	Harry Hope and John Jacob	(12)
• Life Sciences Building	Johnson Crawford and De Bavay	(34)
1965		
• Administration Building	SWT Blythe	(22)
1966		
• The Maintenance and Service Depot	WM Sampson +Harry Oldmeadow	(32)
• Medical Science	Johnston Crawford + de Bavay	(44)
• Mathematics	Public Works	(14)

Howroyd, Cooper, Vincent, Wilson, Bolt and McNeill are architects, working in a range of collaborations who were designing the significant campus buildings at a critical point in the university's development. Chemistry, Arts, Arts Lecture Theatre, Christ College and St John's College are, with the slightly earlier library, the core group of significant buildings on the campus. They are also buildings that have retained a high level of overall integrity, particularly in their external form and detail. This is of particular interest as there has been quite a high level of change including extensive additions that have altered the early appearance of many campus buildings.

Haslock was an important post war architect in Tasmania who won the first triennial architecture award for his Devonport Ferry terminal. The Physics Building, designed while he was with BHPSM is however a utilitarian building that does not compare in design quality with the group of buildings from that period that surround it.

McNeill and Woolley in their book 'Architecture on the Edge' set out a brief history of post 1950 modernist commercial buildings in Tasmania, including those at the university. They cite Philp, Lighton, Floyd and Beatties' MLC Building in Hobart from 1959 as perhaps the best example of modernism in Tasmania in the period. They describe the university campus buildings as "somewhat disappointing" with the exception of the Arts Theatre. This is a harsh analysis and there are several fine modernist buildings on the campus apart from the Arts Theatre. They also note that Bolt's Christ College (a residential building in contrast to a faculty building) is an important modernist building. The publication does not provide an in-depth analysis of the campus but also does not consider the collective value of the early buildings and their setting.

The Mathematics building is an out of character addition to the Site. The only building that appears to be designed by Public Works during this period, it is utilitarian and located at odds with the earlier masterplan intent.

The Medical Science Building, although now re-purposed has retained much of its integrity in form and detail.

The remaining buildings from this period, Physics, Geography, Life Sciences, Administration and the Maintenance Building have all had extensive additions and change but also do not capture the design quality of the buildings noted above.

It is also interesting to observe that there is no commonality in the construction systems, finishes, levels through the Site and materiality across the various buildings. Each is a bespoke design to address a specific brief and use.

The detailed design of the buildings is of some interest. They are largely framed buildings with brickwork or panellised cladding, mostly flat roofs, often using curtain walls or continuous strips of fenestration for glazing and the more significant buildings have very well designed and impressive entries, foyers and public stairs. Very few buildings have external features that are integral to their design, the exception being the Arts Building that uses a water feature and wide colonnade to manage the changes of level across the frontage. This element is a key part of the overall design of that building.

Internally the buildings fall into several forms, from the very open plan library, through large span laboratories and lecture theatres, to rows of small cell like offices opening off usually central corridors. A number of the buildings are structured around wings of more open and larger spaces and wings of small spaces. Relatively few buildings use perimeter corridors (Physics being an exception) placing offices and teaching spaces along the principal facades.

Most of the stair access (there were few lifts) is integrated into the design with stairs featuring as key design elements, there are also many external stairs, mostly added to allow for additions.

Apart from the main public spaces, such as the entry to the Chemistry Building - where the two level void allows for light and the sculptural treatment of the gallery along with inlaid floor finishes - the internal finishes of the majority of the buildings are utilitarian and basic, as could be expected for an institutional use.

Specific internal design elements of buildings from this decade that stand out from the general finishes are:

Building	Bldg No	Element
Arts Building	26	Main foyer and stair with finishes and detail
		Eastern internal stair
Arts Lecture Theatre	27	Lecture Theatre Interior
		Foyer
Chemistry	17	Entry foyer and two storey void with sculptural elements and finishes
		Use of face brick to internal corridors and work spaces
Geology	12	Terrazzo inlaid floor finish in south-eastern foyer
		South foyer stairs
		Central stair

The above list demonstrates the overall utility of much of the internal design undertaken as there are relatively few elements of particular design significance. Most buildings have a main entry with stairs that is grander than the general interiors but a number of these are not outstanding.

The Arts Theatre Building is the exception to the regularized form of the campus with its curved parabola roof form. It is clearly designed in direct relationship to the adjacent former Arts Building and the two buildings create a very clear ensemble as would have been intended by their architects.

1970-1980

Both new buildings and additions to existing buildings took place during the 1970s across the campus. None of the buildings from this period were of the scale or design quality of the earlier buildings. Law and the Arts Education buildings were the more major structures but both returned to more conservative design approaches.

The Law Building is now lost within a plethora of additions and is barely recognizable to its early form. It has had many additions in widely ranging styles that have created what could at best be seen as a confused set of forms.

The Arts Education Building is a pragmatic building sited without reference to the very fine Arts Lecture Theatre which it somewhat looms over and, unlike the earlier buildings, has an inflexible floor plan and construction system with perimeter offices and a large core area surrounded by an internal donut shaped corridor. It reflects a shift to utilitarianism with exposed blockwork walls and a highly cellular form.

The list of new buildings during this period are:

Building	Architect	Bldg No
1971		
• STEPS Building	Johnson Crawford and De Bavay	(51)
• Law Building	Bush Park Shugg + Moon	(6)
1972		
• University Club	Blythe + Blythe	
1973		
• Uni Gym	Blythe + Blythe	(4)
1974		
• Computer Centre building		(28)
• Arts Education building	Philp Lighton Floyd + Beattie	(29)
1975		
• Lady Gowrie	Blythe + Blythe	(3)
1980		
• University Centre	Philp Lighton Floyd Beattie	(25)

Apart from Arts Education, which has had almost no significant change, the other buildings from this period have all undergone considerable change. Law, Uni Gym, University Club, Lady Gowrie and the University Centre are hard to recognize in relation to their early designed forms. Whatever design value they may have had in their original built form is now at least partly lost and the buildings have a very different form and presentation.

Blythe, now in practice with his son continued to work on the campus adding three buildings, the most interesting of which was the staff club. Bush, Park, Shugg and Moon added to their campus work with the Law building which was an unusual design that, as already noted, is almost now unrecognizable. Johnson Crawford and De Bavay also continued working on the campus with the STEPS Building, a minor structure in a remote part of the Site.

From this period only the Arts Education Building survives with any integrity. It was the first work of Philp Lighton Floyd + Beattie on the Site. This firm also added the adjacent University Centre, completing that part of the early masterplan where the 'Great Hall' was proposed.

Overall, the 1970s period did not add any outstanding buildings to the campus.

1981-2021

A number of substantial buildings were added in the 1980s and early 1990s, again with many additions and alterations to existing buildings but only one building of substance, Pharmacy, has been built since the late 1990s. This reflects a number of activities of the University that were external to Sandy Bay including establishing the Launceston Campuses at Inveresk and more recently the move to build new campus buildings within the city of Hobart and not at Sandy Bay. The 'decanting' of faculties has also seen buildings change use, in some case substantially.

This period also saw a range of new architects undertake work: Heffernan, Viney, Forward, Woolan, Wade, Morris-Nunn and Michael Cooper. The only building added by a firm that had previously worked on the campus was Pharmacy.

The dominant architectural presence on the campus over this time has been Michael Viney and Gary Forward. This is not only seen in new buildings but in the numerous additions and upgrades that adopt post-modern forms that Forward, in particular, added to the Site. While each building is quite different in design approach there is a consistency of style across these works that is in strong contrast to the then established form of the campus.

The buildings added to the Site since 1980 are:

Building	Architect	Bldg No
1982		
• Institute of Agriculture	Heffernan Viney	(16)
1986		
• Cricket Pavilion	Forward Consultants	(5)
• Mathematics Wing	Public Works	(14)
1987		
• Herbarium	Michael Viney and Associates	(36)
1989		
• Centenary building	Michael Viney + Associates, Forward Consultants	(10)
1993		
• Commerce	Forward Viney Woolan	(40a)
• CSIRO	Forward Viney Wade and Morris-Nunn	(45)
1995		
• University Apartments	Michael Cooper + Associates	(47c)
2007		
• Pharmacy	Bush Parkes Shugg + Moon	(20)

The main buildings constructed during this period are the Centenary Building, Commerce, CSIRO, Pharmacy and the University apartments. The first three by Forward and Viney in various practice arrangements, the Apartments by Michael Cooper and Pharmacy by BPS+M.

Michael Cooper's father was part of architectural practices responsible for the Arts Lecture Theatre, Arts and John Fisher College and BPS+M had been a long-established practice in Hobart with several generations of architects.

The University Apartments do not form part of the central campus and relate to the earlier colleges in both use and siting. They adopt a more contemporary housing form as a small village in contrast to the quite institutional college form of the earlier residential developments.

CSIRO and Commerce are located on the upper slopes within bushland and continued the tradition of linear buildings stepping up the hillside on levelled platforms. The CSIRO building is perhaps the most successful building from this period and is the most convincing of the post-modern designs on the campus.

Interestingly, a number of buildings from this time (and additions) received Institute awards including: Herbarium; Centenary Building; Commerce; CSIRO; University Apartments; Staff Club additions; and the Cricket Pavilion. As noted earlier this perhaps reflects the way in which awards were made and the absence of awards when the core buildings on the campus were built. Many of the awards were for additions to existing buildings.

There was also a clear intent to change the character of the campus during this period by the new architects commissioned. This is seen in the way minor additions, particularly around building entries, were added in a consistent post-modern styling irrespective of the form of the building being added to.

The Centenary Building, the largest and most prominent later building on the campus was located within the central vista at the lower end of the main campus fundamentally changing the spatial structure of the Site by blocking views to the east and the openness that was previously available from the central campus area.

Additions to buildings also had a cumulative impact on changing the character of the Site. As with many institutional sites, additions often were added in quite random ways to address specific needs of a faculty and without much reference to the earlier spatial arrangement of the Site. While some additions were finely executed most have not added to the aesthetic or spatial qualities of the Site.

The additions during this period included:

Building	Architect	Bldg No
• Geography, roof addition	Forward and Associates	1988
• Gymnasium additions	Jacob, Allom, Wade	1988
• Law additions	Forward Consultants	1990
• Law additions	Eastman Heffernan Walch + Button	1993
• Gymnasium additions	Philp Lighton	1995
• Lady Gowrie 1st floor addition	Blythe, Yeung, Menzies	1995
• Institute of Agriculture additions*		1995
• University Club east addition*	Forward Viney and Partners	2000
• Life Sciences Entry*		2003
• University Bar*	Jacob, Allom, Wade	2004
• Corporate Services addition*	Philp Lighton	2008

- Commerce Building re-purposed for student accommodation 2019-20
- Library entry Forward and Partners
- University Centre entries
- Agricultural Science east wing Forward and Partners
- Vice chancellors Residence entry

* Additions marked with an asterix won Institute of Architect awards.

** Note that this is not a comprehensive list of all additions on the campus.

The works listed above varied in scale from substantial works to quite minor entry elements but collectively they slowly changed the appearance of the campus.

The smaller works also demonstrate a wider use of architects than were commissioned for new buildings.

Internal changes have not been considered in this analysis but it is observed that most buildings have undergone ongoing internal change to accommodate changing teaching and research approaches but largely without major impact on the appearance and form of the campus.

It is also noted that the more minor built elements have not been addressed where they do not affect the key arrangements or spatial values of the campus.

Summary

The Site in its current form contains a wide range and mix of built forms, styles, materials and periods of development. The two predominant and more significant periods of development are the late 1950s to early 1960s where modernism can be seen to be explored with some finesse and success. The later overlay of post-modernism has been a less successful addition to the overall Site form and quality.

Some early buildings remain with little change and interestingly they are also the most convincing designs.

4.0 Physical Description

4.1. UTAS Sandy Bay Site Description and Analysis of the Landscape

The UTAS Sandy Bay campus is a large land holding (approximately 100 hectares) that contains a range of landscape forms, from open playing fields to natural bushland. In its early days, prior to university use, the Site comprised cleared farmland with wooded hills above and then the rifle range east of Churchill Avenue and the bushland, interspersed with cleared areas, to the west. Land was cleared over time to accommodate the rifle range use but the upper slopes remained wooded.

The creation of Churchill Avenue in the 1950s with the various road junctions and cuttings created a significant disconnection through the centre of the campus with roads winding up the slopes (French Street and College Road) providing access to Proctors Road and developments on the upper campus.

This pattern of development was determined from the initial masterplan with some of the earliest buildings, Hytten Hall and the VC residence intentionally set above the campus with views to the river. The VC residence siting is of interest as early photos show it angled towards the core campus with a commanding overview of the campus below.

Lower Site

The lower campus, the flatter part of the Site that has had considerable modification with filling and levelling, has been an open landscape since the 1880s and probably earlier. A former creek line and swampy area was filled and the creek piped through the Site and the lower areas raised considerably to bring them to the elevated level of Sandy Bay Road. The playing fields with the narrow band of buildings to the north forms one of the largest open spaces in the district.

The pattern of development along the northern edge with first a farm house and then the rifle range clubhouse and sheds was dictated by the slight elevation of the land above the creek and swamp areas and was continued by the university to provide for playing fields. The narrow strip of land along the north-western boundary was added to in 1915 with an acquisition from the adjoining Golf Course Estate that extended from Sandy Bay Road to Regent Street[3].

The landforms are not of particular heritage significance but do reflect an open form that has characterised the Site since the area developed as a suburb. Interestingly, the Earl Street hedgerow, a heritage item, is the only identified landscape heritage feature of the Site in statutory listings.

[3] A History of the Rifle Range Site Sandy Bay Gwenda M Lord 2003

Figure 25: Drainage plan of the arrangement to pipe water from the Golf Links Estate sub-division to the creek and for additional land to be added to the Rifle Range. The plan is useful in showing the creek line and swampy ground. The current University boundary follows the heavy line but includes the lot fronting Sandy Bay Road marked as swamp. Grace Street now extends into the campus Site. The former Golf Club House remains as a residence on lot 270.

Source: Archives office of Tasmania

Central Campus

The central campus area, created from open grassland, is an overlaid landscape form creating a now mature landscape form around a series of courtyards and a central walkway. The landscape and its various elements have varied over time in response to the addition of buildings but the overall form relates closely to the central pathway with distinctive courtyards.

The landscape steps up the slope with ramps, paths and stairs and contains areas of lawn, plantings, now mature trees, water features, sculptures and art works, seating and a generally informal arrangement that links the buildings.

The landscape around the core buildings is a now essential part of their overall form and setting even though not all of the pavements and elements are significant.

Key landscape elements include:

- the central walkway
- the library walkway and undercroft
- the elevated water feature and lower courtyard garden that forms part of the former Arts Building
- the mature trees both native and exotic
- a range of memorials*
- art works located strategically in the spaces*

Overall, it is the way in which the landscape connects the buildings that is most significant. There was a simple but effective spatial arrangement through the central campus that has now matured and is very successful in linking the various built elements even though not every building is of equal interest or value.

The areas around the edge of the central campus have no particular heritage or heritage landscape value beyond providing a general landscape setting. Specific elements such as the amphi-theatre and the entry area to Chemistry add to the overall value of the Site but much of the perimeter landscaping does not have particular value.

The area to the south of the central campus area, adjoining Churchill Avenue, contains parking and considerable level changes leading to the upper campus via an elevated footbridge and has no landscape or built character of note.

Upper Campus

The upper campus has a very different landscape form with a combination of the bushland, particularly on the steeper slopes descending towards the creeklines, cleared wooded areas with various cross slopes and defined areas of added landscape immediately around some of the buildings. Playing fields are located at the extremity of the upper campus near Proctors Road.

Buildings such as CSIRO and the University Colleges sit within the recovered landscape which creates a subtle setting but which also has inevitable issues around bushfire protection.

The area around Hytten Hall sees a form of grassland with retained trees and small amounts of localised added landscape and the once quite formal gardens around the former VC residence and Wardens Cottage are now less maintained and have also returned to a more open grassed landscape but retain their basic form with mature shrubs. The character in these areas was managed woodland that was established on the severely cleared land in the 1950s around the time of building.

The significant aspects of the upper campus landscape are the integration of buildings into the bushland setting and the lack of delineation in many areas between natural and added landscape. There are also many rock faces created from cutting to establish building platforms and roads and parking areas.

Pedestrian access through the upper campus is via a series of tracks and walkways that wind through the often steep bushland providing a subtle movement pattern through the Site.

The introduced landscape in this part of the campus does not appear to have any particular heritage values although the whole of the campus landscape form has biodiversity and natural values that are addressed in other reports.

Art Works and Memorials

The Site contains a number of art works and memorials. They are spread across the Site and represent an acquisition program of artworks by UTAS, the incorporation of artworks into some of the buildings as part of their design and specific memorials to individuals or groups of people with associations to the University.

The three groups of works have different significance but they all relate to the criteria of social and/or aesthetic significance as their principal reasons for significance.

Art works acquired over time by UTAS form part of the UTAS collection any may be moved or relocated from time to time. It is anticipated that they will remain part of the University collection wherever they are located.

Art works that form part of buildings such as terrazzo floor designs, sculptural elements built into buildings or art works that are part of the building design have been identified as significant parts of those buildings in the CMP assessments. Those elements are also located in buildings that have significance for other reasons.

Memorials are the most site specific elements in this group. There are not many memorials and they vary in form from a seat to a tree and plaque to a garden. The future management of these elements will vary. Those that are readily movable may be relocated to another agreed part of the Site, several are located adjacent to significant buildings where they can remain, several others will require relocation and possibly reconstruction. The key element of this work is that memorials are retained, that a process is developed where change is necessary to ensure that the values of the memorials and connections to people and place are addressed.

A schedule of artworks and memorials has been separately compiled and the CMP recommends that the key aspect of future planning is that a sound process to address them is in place.

Figure 26: The amphi-theatre behind Arts Theatre.

Source: Paul Davies Pty Ltd, 2021

Figure 27: The area in front of the University Centre looking towards the former Arts Building.

Source: Paul Davies Pty Ltd, 2021

5.0 Assessment of Heritage Significance

5.1. Criteria for Assessing Cultural Heritage Significance

Assessing Historic Heritage Significance (Version 5 October 2011) *for application with the Historic Cultural Heritage Act 1995,* was developed by the Heritage Office and Department of Primary Industries, Parks, Water and Environment to provide the basis for assessment of the heritage significance of an item by evaluating its significance by reference to the following criteria.

Table 4: Criteria for Assessing Cultural Heritage Significance.

Criterion (a)	the place is important to the course or pattern of Tasmania's history;
Criterion (b)	the place possesses uncommon or rare aspects of Tasmania's history;
Criterion (c)	the place has the potential to yield information that will contribute to an understanding of Tasmania's history;
Criterion (d)	the place is important in demonstrating the principal characteristics of a class of place in Tasmania's history;
Criterion (e)	the place is important in demonstrating a high degree of creative or technical achievement;
Criterion (f)	the place has a strong or special association with a particular community or cultural group for social or spiritual reasons;
Criterion (g)	the place has a special association with the life or works of a person, or group of persons, of importance in Tasmania's history;
Criterion (h)	the place is important in exhibiting particular aesthetic characteristics.

5.2. Detailed Assessment of Heritage Significance

The following assessment of significance has been taken from the 2021 Conservation Management Plan[4] for the Site and addresses the campus as a whole.

Course or Pattern

Criterion (a)

The place is important to the course or pattern of Tasmania's history.

The development of the UTAS campus at Sandy Bay was a major development in the State in the provision of tertiary education and in the development of a large educational facility. While UTAS had already had a long and distinguished history at Glebe, its expansion and 'coming of age' in relation to campuses being developed in parts of Australia marks the Sandy Bay Site as a significant place.

The establishment of a completely new campus also was a rare development in Tasmania.

[4] The CMP was prepared by Paul Davies Pty Ltd to guide development of the Masterplan in relation to heritage values.

The earlier use of the site as a rifle range is also significant in demonstrating the importance of defense and training of the military in close proximity to the City.

Aspects of Tasmania's History

Criterion (b)

The place possesses uncommon or rare aspects of Tasmania's history.

While not the only tertiary campus in the State, it is the most extensive and main UTAS campus and contains bespoke buildings designed for the university faculties and associated facilities.

It is rare that so many prominent local and several interstate architects were engaged to design the range of facilities and there is no other place in the State where this has occurred to such an extent.

Information

Criterion (c)

The place has the potential to yield information that will contribute to an understanding of Tasmania's history.

Some attributes of the place have the ability provide information about Tasmania's history. In particular the two remaining pre-University buildings and the very significant early group of buildings including Arts Theatre, Psychology, the Library, Chemistry and Christ and St John Colleges are among the most outstanding modernist buildings of their time as they demonstrate design approaches, materiality and construction forms that are closely linked to the changes from traditional design and building forms to modernist forms.

Social significance

Criterion (d)

The place is important in demonstrating the principal characteristics of a class of place in Tasmania's history.

The place as a whole and its more significant elements demonstrate the development of a university campus and major public work from the 1950 and 1960 period in particular.

The buildings demonstrate the principal and significant characteristics of modernist commercial/institutional buildings.

Achievement

Criterion (e)

The place is important in demonstrating a high degree of creative or technical achievement.

Aside from the activities of the university that include high levels of achievement in many areas, the campus does demonstrate a high level of creativity and achievement in a number of the built and other elements as set out in detail in the assessments. A number of individual buildings demonstrate exceptional and high levels of creativity and technical achievement where other elements do not. The various sculptures and art works demonstrate very high levels of creativity and achievement. Generally, the landscape form of the Site does not demonstrate this characteristic.

Association

Criterion (f)

The place has a strong or special association with a particular community or cultural group for social or spiritual reasons.

The Site has a strong association with the generations of staff and students who studied and lived there. The Site also has strong cultural links within the Sandy Bay community who use and are connected to the Site. Part of this value relates to individual's links to specific buildings and places however there is no specific place that demonstrates a value across the various individuals who may have connections to the Site.

The retention of the campus as a place that retains elements of its university use including buildings, elements and landscape is important to retaining the underlying value of the place within the community.

Association - People

Criterion (g)

The place has a special association with the life or works of a person, or group of persons, of importance in Tasmania's history.

UTAS has numerous associations with significant people, however most of these do not directly relate to the buildings or Site and will continue to be part of the university tradition wherever the campus is located.

Associations that are significant in relation to the campus are those with particular buildings - Morris Miller Library for example, named after the then Vice-Chancellor, a small number of memorials located around the Site that relate to students or staff and the links of specific significant buildings to prominent architects.

Aesthetic Characteristics

Criterion (h)

The place is important in exhibiting particular aesthetic characteristics.

The Site exhibits a strong aesthetic character as a whole that is principally derived from its scale, the topography, the bushland setting, the open space and the now mature interlinking added landscape form. While some of these relate to heritage values they also relate to the role of the campus within the southern area of Hobart as a major open space and recreation area. The landscape aesthetic values generally have a secondary heritage role.

Specific landscape aesthetic heritage values reside in the central walkway of the core campus area which is a constructed landscape that links the various significant built elements and other Site features. The mature landscape form was an intended and is now a key part of the setting of the elements or heritage value.

The numerous art works across the Site have high aesthetic value both as individual works and as part of the Site form.

The single listed heritage landscape item, the hedge fronting Earl Street, that relates to the earlier sub-divisions taking place around the then rifle range, is a dominant streetscape element that defines the southern edge of the Site along the Earl Street alignment.

A number of individual buildings have high aesthetic significance as set out in detail below however, most site elements do not demonstrate aesthetic values that support them being of heritage significance.

6.0 Proposal

University of Tasmania Properties Pty Ltd (UPPL) is developing an urban renewal Masterplan to reimagine the current Sandy Bay campus (the Site), enabled by the University relocating its existing Sandy Bay Campus (the existing Campus) into the Hobart CBD over the next decade. The new masterplan for the site envisions a dynamic, ecologically sensitive, future-ready mix of uses, arranged into five unique neighbourhood precincts. Each precinct is intrinsically mixed-use, but with a particular focus and character - from sporting and recreation, to innovation to education and eco-tourism, whilst still retaining a 50ha bushland reserve at its heart.

The details of the Proposal are set out in the UTAS Sandy Bay Masterplan document that is a key part of the overall submission.

The heritage background to the Proposal has been to understand the Site in relation to its possible heritage values to inform the development of the Masterplan. When UTAS, over time, relocate, the Site will contain a range of buildings and features that have specifically related to University use. They will largely be unsuitable for future adaptive re-use.

Aspects of the methodology for the Masterplan have been to recognise key heritage elements and to work with them and also to consider other built elements that may have future adaptive value and to allow retention and adaptation to be part of the future of the site. Consequently the Masterplan Proposal identifies buildings to be retained for their heritage value and other built elements that have potential for adaptation.

7.0 Discussion of Heritage Issues in relation to the future of the UTAS Sandy Bay Site

7.1. General Discussion

There are a number of ways to consider the UTAS Sandy Bay Masterplan[5] in relation to heritage.

Under the *Tasmanian Cultural Heritage Act 1995* and the *Interim Hobart Planning Scheme 2015*, a place, which can be a building, a feature, a site or, a piece of land, that is described correctly (with title information or cadastral definition) and which is within a schedule under either of those pieces of legislation, has protection for whatever heritage values are set out in the supporting data sheet or listing.

Alternatively, if a place is located within a heritage conservation area that is similarly set out in those pieces of legislation and the place contributes to the heritage values of that area, as set out in the supporting documents, it will also attract heritage protection but at a lesser level than an individually listed place.

There are no provisions in Tasmanian Planning to consider other places for their heritage value.

However, this does not mean that either a local Council or the Tasmanian Heritage Council cannot take an interest in a non-listed place and either pursue a listing or engage in dialogue with an applicant as to how the perceived values of a place may be retained.

Heritage listing is a far from perfect process and while many places are correctly heritage listed for their identified value, many are not and have been overlooked or not seen, and many are listed without any supporting information that provides assistance as to why they are listed.

Heritage in Tasmania in synonymous with its colonial and nineteenth century history and most people identify Tasmania's heritage with reference to places such as Port Arthur, Battery Point, Richmond and a range of similar 'historic' places. It would be rare for late twentieth century buildings to be identified as having heritage value.

While some mid to late twentieth century places are listed in planning scheme schedules and the *Tasmanian Cultural Heritage Act 1995*, this is not common and there is little precedence or reference to base comparative assessments on (as was explored in the CMP). Modern Tasmanian architecture is not well understood except by the Tasmanian Chapter of the Institute of Architects who have consistently fought for the recognition and retention of Modernist buildings. However, the Institute has no statutory role in protecting buildings.

The Sandy Bay Site (with the exception of the farm cottage and store room adjacent) was developed from the 1950s and its heritage values are largely framed within that context as there are almost no remnants of the earlier site uses extant.

There are two basic approaches to how heritage may be addressed on the site. They are set out for clarity. Approach 2 has been adopted as the preferred approach to heritage management on the Site.

[5] For the following sections, for clarity, the Sandy Bay UTAS Masterplan is referred to as the 'Masterplan'.

Approach 1

The Site technically can be assessed under the Hobart Planning Scheme (and the Tasmanian Cultural Heritage Act in relation to Christ College), in relation to its heritage values, and against the scheme provisions for listed places. There are no heritage precincts on the Site (although there are adjacent precincts) so the consideration is limited to the three listed places within the overall boundary of the Site. There is no other statutory assessment required.

The UTAS Sandy Bay Masterplan retains the three listed places and their immediate settings. To satisfy the scheme provisions each is considered briefly below in relation to their heritage values, the proposal and any potential impacts as this is a necessary statutory requirement.

The fundamental objective of the Act and the Planning Scheme in relation to heritage is to conserve places that are set out within that legislation. There are a range of controls about process, assessment, etc, but the intent of the legislation is for heritage places to be retained, managed, conserved and where development is proposed to undertake that work without undue impact on the heritage place or its values.

The basis for understanding heritage values may be the data sheet (where one exists) that supports the listing or, may be a separate analysis document such as a CMP, as is the case on the UTAS Site.

Tasmanian Heritage Register (THR)

The Site contains the following building listed on the Tasmanian Heritage Register.

Table 5: Details of Heritage Listings in Tasmanian Heritage Register

Place ID	Item Name	Address	Suburb	Postcode	Municipality	Heritage Place Status
7500	Christ College	2 Churchill Ave	Sandy Bay	7005	Hobart City Council	P.Reg

Hobart Interim Planning Scheme 2015

The Hobart Interim Planning Scheme 2015 includes the heritage listings affecting the Site outlined in Table 3 below.

Table 6: Details of Heritage Listings in Hobart Interim Planning Scheme Table E13.1 Heritage Places

Ref No.	Item Name	Street/Location	C.T.	General Description
185	Christ College	Baintree Avenue	127402/1	Part of 2 Churchill Avenue
609	Arts Lecture Theatre,	Churchill Avenue	167424/1	Arts Lecture Theatre only, including the grounds within 3m of the building
	Hedge	Earl Street		

Christ College

Christ College is perhaps the most significant modernist building in Tasmania. It is correctly heritage listed and it demonstrates the early 'coming of age' of modern architecture in the State. Dirk Bolt, the principal architect, changed the direction of design and the building is an exceptional work within its period. A simple comparison with a building such as Hytten Hall (also on the campus and with a similar student accommodation use), demonstrates the leap in design approach that is seen in the College.

Christ College is a complex building that has undergone change over its life and which requires a detailed analysis and study before any works in the future were to take place.

The UTAS Sandy Bay Masterplan retains the College, in its current form and does not propose any works or change to the buildings or immediate site. It will remain in use as a University College. This is an ideal outcome in the current masterplan process.

If works are proposed in the future they must be based on a site specific conservation management plan and analysis of the place and given its exceptional value only changes that recover, enhance or manage its significance should be undertaken. This does not however, preclude some change, but it is within the context of working with an exceptional site.

Consequently, the current proposal has no adverse impact on the college or its setting.

Arts Theatre

It is unclear why the Arts Theatre was heritage listed. It is one of a number of fine buildings of similar age that defined the campus but it is the only building that broke the regimented rectilinear form of the campus UTAS Sandy Bay Masterplan and added a building that is eccentric and playful. While the campus has many values, true innovation in design and playfulness is rarely seen.

The Arts Theatre has been correctly identified as an exceptional building of its time. It is designed for purpose, is interesting, breaks the somewhat rigid mould of rectilinear modernism and is innovative and inventive. The work of Esmond Dorney has a similar design ethic where forms defy convention and create fascinating and varied buildings.

As a bespoke building, it has had relatively little change and is retained in the UTAS Sandy Bay Masterplan with an enhanced setting. Changes to the building will be investigated in detail and the intent is to return the building to its designed form and uses. This would also be subject to a detailed building study that is beyond the scope of this current study.

The outcome is the retention of an important building and its setting and its conservation and re-use to uses that closely align to its designed intent.

Earl Street Hedge

The Earl Street Hedge is an anomalous heritage feature of the Site. It is not without value and the apparent story behind its existence relating back to Lord and his retention of the strip of land to defeat the University's attempt to avoid paying for a road access is amusing and quaint if not of pivotal significance.

The Hedge is now a visually defining and separating element along Earl Street that enhances the overall setting and marks a boundary. It has some landscape value but not at an exceptional level.

The UTAS Sandy Bay Masterplan retains the Hedge as the boundary of the Site which is appropriate. It retains its significance and it will continue to be a modestly interesting and visually pleasing element of the townscape.

Summary

The UTAS Sandy Bay Masterplan satisfies all of the statutory requirements of the extant heritage listing on the Site, proposes conservation and protection of the listed heritage elements and provides funding to undertake works and create improved settings and a secure future for these elements through the redevelopment of the Site.

Approach 2

It is reasonable to conclude that until the current process of relocation of UTAS that the broader heritage and architectural values of the Site have not been explored or fully understood. There has been no reason to do it, there has been no real or perceived threat to values and the Site has had a use that has retained the buildings in their generally intended uses even when a number of those buildings are clearly no longer really suitable for those uses.

There is no university in Australia that has not redeveloped, replaced obsolete buildings and fitouts and created vibrant new campus forms to address the changing world of tertiary learning. Even well-established campuses have been redefined by new development to meet the shifts taking place. Generally, this is done by working around significant buildings and elements but there are also often major site changes on campuses.

The Site in its current state is significantly out of date and would require major investment and re-working of elements.

The history of the Site is interesting in that after initial intense development phases, the place was defined by many minor and sometimes not well-considered additions and works and, later, from several poorly conceived major buildings that have had adverse impacts on the whole Site setting.

UTAS, as part of the current process, commissioned a campus wide CMP to understand what may be significant given that there are almost no reference points in Tasmania to consider modernist heritage and that they are planning for a major change across the whole Site. This has been a significant action that sets UTAS apart from many property owners as it introduces the potential risk of places being significant and possibly restricting development potential where at this point in time there are almost no heritage constraints on the Site.

It is also important to clearly separate cultural heritage considerations from natural or environmental values. The Site has a range of environmental values that are set out in other reports and are not considered in this assessment.

The nature of the Sandy Bay Site CMP is broad as it has had to address the whole campus with all its elements. Most Site elements are not of heritage significance but they still required assessment to ensure that values that were not understood could be revealed and where they existed, considered.

At a very broad level the Site has significance as the major University campus in the State. That significance is both historic and physical in that elements of the use are extant. There are also heritage values related to earlier Site uses, but these elements are small and while important are not defining elements of the place.

Once UTAS use ceases or significantly reduces, the use of the place and its component buildings will be of largely historical significance as the use will have relocated. This is an inevitable outcome of change as use is usually (but not always) a key element of significance.

The significance of the 'former' use (that is what will in time be a former use) will be embodied in built elements that are retained, the overall spatial form of parts of the campus, interpretation and ongoing community and other uses that then overlay the former university use. As the campus use will cease over a long period of time, the Site will transition to new uses rather than abruptly change which will allow the place to slowly take on new values overlaid on any existing values.

The ongoing use of the colleges and university apartments at the upper end of the Site for student accommodation will continue a key aspect of Site usage into the future that will retain links to the now 70 year history of UTAS on the Site.

The CMP took a critical approach to heritage values and broadly graded the built elements into places of potential high significance, moderate value and little or no value. This reflected a range of values that included:

- when it was built and how it relates to the establishment of the campus
- the current integrity of each place and whether it has retained form, details and visual qualities
- the quality of the original building design
- connections with architects of significance
- the relationship of key built elements on the campus as part of an intended masterplan for the Site
- the life cycle of the building and its potential for ongoing use or adaptation

There are also values identified in the setting and the relationship of built and landscape/natural elements that are integral to the character and form of the Site. This includes open space areas, courtyards, topography, introduced plantings etc.

The CMP set out a schedule of all built elements and graded them. This HIS only considers the elements that were assessed as having considerable significance and then those of moderate value.

The following table sets out each category and considers how each place has been addressed. The 7 criteria are those set out in the Tasmanian Cultural Heritage Act:

a The place is important to the course or pattern of Tasmania's history.

b The place possesses uncommon or rare aspects of Tasmania's history.

c The place has the potential to yield information that will contribute to an understanding of Tasmania's history.

d The place is important in demonstrating the principal characteristics of a class of place in Tasmania's history.

e The place is important in demonstrating a high degree of creative or technical achievement.

f The place has a strong or special association with a particular community or cultural group for social or spiritual reasons.

g The place has a special association with the life or works of a person, or group of persons, of importance in Tasmania's history.

h The place is important in exhibiting particular aesthetic characteristics.

Table 7: List of buildings by date that were considered for potential heritage significance with summary criteria assessments.

No	Name	Year	Architect	a	b	c	d	e	f	g	h
Pre-University Buildings											
53	Childcare Cottage	c1880s		•	-	-	-	-	-	-	•
53a	Brick Storeroom	c1914		•	-	-	-	-	-	-	-
University Built between 1956 and 1969											
8	Engineering	1957	DPW -Tasmania. Chief Architect C.D Rose	•	-	-	-	-	-	-	-
13	Physics	1961	DPW -Tasmania in association with Bush Haslock Parkes Shugg and Moon	•	-	-	-	-	-	-	-
17	Chemistry/ Central Science Laboratory	1957	D Hartley Wilson	•	•	•	•	•	-	•	•
23	Library, Morris Miller	1958	John F.D. Scarborough	•	•	•	•	•	•	•	•
26	Psychology Social Sciences	1959	R Brian Howroyd with Cooper and Vincent	•	•	•	•	•	-	•	•
27	Arts Lecture Theatre	1959	E Brian Howroyd with Cooper and Vincent	•	•	•	•	•	-	•	•

No	Name	Year	Architect	a	b	c	d	e	f	g	h
40	Hytten Hall, Education	1952-55	John FD Scarborough	•	-	-	-	-	-	-	-
47a	Christ College Voted most significant building in the 30 years following the war by an architectural panel	1960-1969	Hartley Wilson and Partners / Hartley Wilson & Bolt Architects	•	•	•	•	•	•	•	•
47b	John Fisher College		Cooper Vincent and McNeill	•	•	-	•	-	•	-	•
47d	The Lodge	1964	Hartley Wilson and. Bolt Architects	•	•	•	-	-	-	-	•

University Buildings built after 1970

No	Name	Year	Architect	a	b	c	d	e	f	g	h
10	Centenary Building	1989	Michael Viney and Associates with Forward Consultants	-	-	-	•	-	-	-	•
45	CSIRO	c1991	Michael Viney and Associates with Forward Consultants	-	-	-	•	•	-	-	•
20	Pharmacy	2007	Bush Parkes Shugg and Moon	-	-	-	•	-	-	-	•

The CMP observed that buildings built after 1970 while they may be fine buildings should not be considered for heritage listing.

The following tables look at various assessed levels of significance with the threshold assessments set out in the CMP. These are different to the Act criteria above and were developed to consider how modernist buildings may be considered in relation to their specific heritage values.

The seven categories are:

1 Contribution to the overall quality and form of the place, that is the collective value that the Site or parts of the Site may have.

2 The individual design and aesthetic quality of the element.

3 The relationship of a particular element with its setting and the elements of significance around it.

4 Associations with a prominent architect/designer.

5 Demonstration of technological achievement, innovation or stylistic variation of importance.

6 The integrity of the place or element in relation to its significant designed (and built) form, noting that integrity is only relevant if a place is otherwise assessed to be significant.

7 Its significance, on a comparative basis, with other similar significant places in Hobart and Tasmania.

Sandy Bay Campus Buildings - Heritage Listed

There are two heritage listed buildings on the campus and both are retained with their settings and uses as part of the Masterplan.

Levels of Significance: E = Exceptional. H = High. M = Moderate. L = Low or minimal.

Green are buildings to be retained in the proposed UTAS Sandy Bay Masterplan

Table 8: Campus Buildings that are heritage listed

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
27	Arts Lecture Theatre	1959	E Brian Howroyd with Cooper and Vincent	E	E	H	H	E	H	E
47a	Christ College Voted most significant building in the 30 years following the war by an architectural panel	1960-1969	Hartley Wilson and Partners / Hartley Wilson & Bolt Architects	E	E	E	E	H	H	E

Sandy Bay Campus Buildings - with Potential Heritage Significance but not heritage listed

Five campus buildings have been assessed as having potential for individual heritage listing (in addition to the two existing listings). All of these buildings are to be retained in the UTAS Sandy Bay Masterplan noting that nearly all buildings will require some form of adaptation to achieve new uses and compliance with building and other codes.

The following applies to the tables: Levels of Significance: E = Exceptional. H = High. M = Moderate. L = Low or minimal.

Green shading are buildings to be retained in the Masterplan

Table 9: Campus Buildings considered for Potential heritage listing

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
17	Chemistry/ Central Science Laboratory	1957	D Hartley Wilson	H	H	H	H	H	H	H

Chemistry is one of the four critical central campus buildings designed by Wilson who was in partnership with Bolt. The building is well crafted, well-designed, functional and demonstrates many of the attributes of modernism. Its impressive entry foyer, use of materials, overall form and spaciousness stand out as an exceptionally fine modernist building.

The building satisfies the seven areas for consideration to a high level and is an exemplar building of its time. The additions and changes are largely limited to the western side of the building (where new works are proposed in the Masterplan) which allows the three principal facades to be retained.

The Masterplan retains the main wing, part of the eastern wing (truncating it) and removes the various additions to the west. The Masterplan proposes removal of the lecture theatre which is an interesting space but which is difficult re-purpose and which is not embedded in various additions to a point where its external form is no longer recoverable.

Retaining the main entry, the eastern curtain wall and the overall form and roofscape are critical elements of retaining significance.

Internally the building is to be re-purposed, the large laboratory spaces allow for relatively easy adaptation. Internal face brick finishes and the very significant foyer space are to be retained.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
23	Library, Morris Miller	1958	John F.D. Scarborough	E	E	H	H	H	H	H

The Library building is one of the key buildings on the campus and has significance beyond the campus as part of a collection of buildings by Scarborough across major institutions in southern Australia. It stands out as a heritage item and is capable of adaptive re-use due to its open form and generous floor heights.

It satisfies both the assessment areas above and most of the criteria under the Act for heritage listing.

The building largely retains its setting in the central area.

The building less the later foyer additions is to be retained.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
26	Psychology Social Sciences	1959	R Brian Howroyd with Cooper and Vincent	E	E	H	H	H	H	H

The Psychology Building was designed by the same architects around the same time as the Arts Theatre Building. While the buildings have different forms they closely relate and form a pairing of forms. In combination with the Arts Theatre, Library and Chemistry Buildings, it forms the core of the central campus and this group of elements are key to the modernist quality of the Site.

The building satisfies the assessment areas above to a high level and also satisfies most of the Act criteria for heritage listing to a high level.

The building is to be retained with minor potential external change at the western end but will undergo internal changes to adapt the building from offices and teaching rooms to other uses. The modular form of the building allows this to take place. Key internal elements such as the foyer and stairs are to be retained. With the Arts Theatre and the Library they form a band of buildings across the upper part of the central campus of high built and spatial significance.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
47b	John Fisher College		Cooper Vincent and McNeill	H	H	H	H	M	M	M

John Fisher College is significant in its own right and also significant as part of the pair of colleges located on the upper campus. With Christ College, the two building groups demonstrate approaches to design and the provision of student accommodation that vary considerably but which represent sophisticated responses to setting, brief and contemporary architectural thinking.

The building satisfies the areas above and meets all of the Act requirements for heritage listing.

The College is retained in the Masterplan as a college, retaining part of its primary social significance as well as the physical elements of the place.

53	Childcare Cottage	c1880s		H	M	M	L	L	M	M

The Cottage is the only site element remaining from the period prior to the rifle range use and related to the earlier farm use of the property. The Master Plan relocates the cottage to a setting that is more commensurate with its scale and with some open space around it. As the cottage has been previously relocated, a further move to provide an enhanced setting is appropriate particularly as it is within the original farm area.

The building is of particular historic significance as it has had uses in the three settlement phases of use of the Site, farm, rifle range and campus. It is not an outstanding building in terms of design or innovation but it represents all the phases of use of the Site.

The move will remove the various additions and return the building to its farmhouse form.

Sandy Bay Campus Buildings - with potential Moderate heritage significance that are not heritage listed

There are 18 buildings in the following table that have been assessed as having some potential for moderate heritage significance. Eight of those buildings post-date 1970 and are considered to not reach a threshold for consideration for a heritage listing due to their relatively recent origin.

The remaining ten buildings are either heavily modified or were not buildings that have been assessed as satisfying a threshold for an individual heritage listing.

Eight of the buildings in the table are proposed to be retained in the UTAS Sandy Bay Masterplan.

Levels of Significance: E = Exceptional. H = High. M = Moderate. L = Low or minimal.

Building coloured green are proposed to be retained with adaptation for new uses, buildings uncoloured are proposed to be demolished.

Table 10: Campus Buildings considered as having moderate heritage significance below a threshold for heritage listing

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
1	301 Sandy Bay Rd Research	1955	SWT Blythe + Roderick W Cooper	M	M	L	H	L	M	L
An early building that has undergone considerable upgrade and change. While recognisable as a 1950s building the extent of change has reduced potential for the building to be a significant Site element. The building is proposed to be removed.										
2	6 Grace Street	1955	SWT Blythe in association with Roderick W Cooper	L	M	L	H	L	M	L
An early building that has undergone some upgrade and change. It was one of the more utilitarian buildings built in the first phase of works on the campus. While within the campus it occupies a Site that is outside the main part of the campus. It also falls outside the adjacent heritage conservation are boundary. The building is proposed to be removed.										
8	Engineering	1957	DPW -Tasmania. Chief Architect C.D Rose	H	M	H	M	M	M	L
The Engineering Building was an early element of the campus in a prominent location marking the eastern edge of the central campus. It retains a reasonable level of intactness and is a strong visual element of the area overlooking the playing fields. It forms part of the original structured gridded masterplan for the central campus area. Architecturally it is not of the same design quality as the Library, Chemistry or Psychology buildings but it does represent the early design approach adopted by Public Works. It has been assessed as having some heritage significance but not at a level that would attract individual heritage listing. With the Geology Building, it 'bookmarks' the eastern edge of the Central campus and both building forms are important spatial elements in the overall gridded structure that established the original campus masterplan. The main wing of the building and lecture theatre area are retained in the Masterplan.										
10	Centenary Building	1989	Michael Viney and Associates with Forward Consultants	M	M	L	H	M	H	M
A large building built in the major vista of the central campus with a post-modern form and a scale that is unrelated to other campus buildings in the central part of the Site. As a newer element it has retained its integrity and was designed by prominent Tasmanian architects. As a more recent building it is not a building that warrants heritage listing even though it has some moderate value on the campus. The building received an AIA award. It is proposed for removal.										

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
11	Engineering Workshop	1957	DPW -Tasmania. Chief Architect C.D Rose	M	M	M	M	M	M	L

An early building of utilitarian design and function it has moderate heritage significance as part of the early campus form but is not a building that achieves high heritage significance. It has undergone some alteration and additions.

It is proposed for removal.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
12	Earth Sciences Geography and Environment CODES	1961	DPW -. Chief Architect C.D Rose in association with Harry Hope and John Jacob	M	M	M	M	L	L	L

An early period building that has undergone extensive change including an upper floor but which retains presence in relation to the playing fields to the east and the edge of the Central campus.

The Masterplan retains the main wing, removes various additions and adds to the west of the building.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
13	Physics	1961	DPW -Tasmania in association with Bush Haslock Parkes Shugg and Moon	H	M	H	H	L	M	L

The Physics Building is a central campus building of much simpler design than some of the nearby buildings. It has had several additions including infilling of its original entry and the Masterplan looks to recover the early entry, remove a range of additions, provide a new western addition and re-purpose the building. Unlike surrounding buildings, the built form uses an edge corridor with larger teaching spaces.

The core building is to be retained, partially recovered, additions removed and is to have new additions to the west.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
6	Tas Institute of Agriculture (TIA)	1972	DPW -Tasmania. Chief Architect S.T Tomlinson in association with Johnson Crawford and De Bavay	M	M	M	M	M	M	M

The building is a modest building, well-designed, that later became attached to the Agricultural Science Building. It has moderate heritage value only.

The building with additions is proposed for removal.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
20	Pharmacy	2007	Bush Parkes Shugg and Moon	H	H	M	H	M	M	M

The Pharmacy building is a well-considered addition and infill building in the central part of the Site on an area that was previously undeveloped. While it is a well-designed building, it is too recent to attract consideration of heritage listing even though it satisfies some of the assessment areas. It is also not a key building in the history of the campus. Its areas of interest are its individual design, its connection to a prominent firm of Tasmanian architects and the way in which it has been contextually designed. It is not a key building to understanding the structure and early masterplan for the campus.

The Masterplan indicates its removal and new development on the Site.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
24	Studio Theatre	1980	Philip Lighton Floyd Beattie	M	M	L	M	L	M	L

The Studio Theatre is to be retained as theatres and associated spaces with the adjoining University Centre. The building will most likely undergo some adaptation to add facilities and remove some of the later additions.

It is not a significant building in relation to heritage values.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
25	University centre, Lazenby's café, Classics museum, John Elliot	1974	Philip Lighton Floyd Beattie in association with Civil and Civic	M	M	L	M	L	M	L

The University Centre is to be retained as theatres and associated spaces with the adjoining Studio Theatre. The building will most likely undergo some adaptation to add facilities.

It is not a significant building in relation to heritage values.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
29	Humanities	1974	Philp Lighton Floyd and Beattie	M	M	L	M	L	M	L

The Humanities Building has some moderate heritage significance but is not a building that exemplifies the quality of the core campus as seen in the adjacent buildings of Psychology and Arts. Built after the main campus development was established it was poorly sited and adopts a form and design that is relatively inflexible for adaptation which is in contrast to most of the central campus buildings.

The building is proposed for demolition to facilitate both new development in the area and to recover the setting and views to the Arts Theatre and Psychology Buildings.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
34	Life Sciences Building Agricultural Science	1962	DPW – Tasmania in association with Johnston Crawford & De Bavay	M	M	M	M	L	L	L

The Agriculture Building, as built, was a large rectilinear building that dominated the area above Churchill Avenue. The building has had extensive additions and changes to a point where its planned form is not easily read and while it was one of the early upper campus buildings it has now lost most of its potential heritage value.

The building with additions is proposed for removal.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
36*	Herbarium	1987	Michael Viney and Associates	M	M	M	H	M	M	M

The herbarium, which is a partially below ground structure is retained in the Masterplan.

It is one of 5 buildings on the campus to receive an AIA award that are retained in the Masterplan.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
40	Hytten Hall, Education,	1952-55	John FD Scarborough	H	M	M	H	L	M	L

Hytten Hall is one of the earlier campus buildings and the first student accommodation building. It was designed by Scarborough who later designed the Library. While the building has some historical interest, it is transitional building looking to modern forms but still tied to the immediate post war forms of development that retained traditional forms as seen for example in roof form. The building has significant operational and compliance issues is not a key building in relation to the high quality of design seen in a some buildings and is not proposed to be retained. As an early accommodation building it has historical value and is associated with Scarborough but it has limited heritage significance beyond those areas.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
40a	Old Commerce Building	1992	Forward Viney Woolan	M	M	M	H	M	M	M

The Commerce building was recently adapted for student accommodation and uses and is proposed to be retained and potentially further adapted for educational related uses in the Masterplan. It is a post-modern design.

It is one of 5 buildings on the campus to receive an AIA award that are retained in the UTAS Sandy Bay Masterplan.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
44	Old Medical Sciences	1966	DPW -Tasmania. Chief architect S.T. Tomlinson in association with Johnston Crawford and de Bavay Sketch plans 1964 CD Rose	M	M	M	M	L	L	L

The building has moderate heritage significance as part of the second phase of campus development. In its original form it was a simple rectilinear building with a rhythmic form. This has been altered over time and while elements of the early building can be seen it no longer retains a high level of integrity

The building is proposed to be removed in the Masterplan.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
45	CSIRO	c1991	Michael Viney and Associates with Forward Consultants	H	H	H	H	H	H	H

The CSIRO building is one of the most interesting and competent buildings on the Site in its later development. While it is not recommended for heritage listing as it within a recent time frame that makes heritage listing considerations difficult, it has potential for future listing and makes an important design contribution to the campus and Tasmanian architecture. Its interest derives from its response to siting and context and the successful way the building fits within its bushland setting.

The building was recognised by the AIA.

It is to be retained and is understood to have an ongoing lease to CSIRO. There are no works proposed to it or around it in the Masterplan.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
47c	University Apartments		Michael Cooper and Associates	M	M	M	M	M	H	M

The apartments are a more recent development providing student accommodation. The use is proposed to continue in the Masterplan and no change is proposed to the buildings or area.

It is one of 5 buildings on the campus to receive an AIA award that are retained in the Masterplan.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
47d	The Lodge	1964	Hartley Wilson and. Bolt Architects	?	?	?	H	?	?	?

The lodge forms part of the Christ College complex and requires further study as part of any future works proposed around the college. It is not clear from the heritage listing whether the building forms part of the extant State and Council listing.

The building has not been visited and separately assessed at this time. If works are proposed to or around this building or around Christ College, it should be further investigated.

The building is retained and no change is proposed as part of the Masterplan.

Bldg No	Name	Date of Construction	Original Architect	1	2	3	4	5	6	7
50	Rugby Pavilion/Club	1959	DPW -Tasmania. Chief architect C.D Rose	M	M	M	M	L	M	L
The Rugby Cub Building is a typical 1950s modest sports facility, initially a set of change rooms and then extended to create a clubhouse. Its main significance is social in relation to sport on the campus. It is not significant in relation to its design. While playing fields remain, their alignment is changed and the clubhouse does not relate to the overall development. It is proposed to be removed.										
53a	Brick Storeroom	c1914		M	L	M	L	L	M	M
The brick store building was apparently built as part of the rifle range period of use of the site to house equipment and possibly ammunition. It is a modest structure that while a remnant element of the earlier site use has been removed from that context and within the Masterplan would be further removed from its early setting. It has some historical significance and was associated with the rifle range use. While the building has moderate heritage significance its removal is proposed.										

The following Site plans show the buildings proposed for potential heritage listing with their mapped settings. It is noted that if listing proposals proceed that precise mapping will be required.

Figure 28: Complete Site Plan showing locations of heritage buildings. Overlay of UTAS Sandy Bay Masterplan drawing. The following drawings provide details of the upper and central areas of the site.

Figure 29: Upper Site Plan around the University Colleges showing the combined setting of Christ and St Johns Colleges. Note that the setting is approximate and will require precise definition. Paul Davies Pty Ltd 2021.

Figure 30: Central Site Plan around the Main campus showing the combined setting of the four heritage buildings. Note that there are existing and proposed built elements within the setting illustrated that are not of heritage significance. The area around the buildings indicates a zone that requires a designed response to the heritage values of the key buildings if new work is to be proposed. Note that the setting is approximate and will require precise definition. Paul Davies Pty Ltd.

7.2. CMP Policy Assessments

Preamble

This section sets out relevant the CMP policies and makes comments about how the UTAS Sandy Bay Masterplan has responded to the general policies. As the Masterplan is a broad document that does not identify the detail of what may take place in each area of the Site, comments are general.

Policy - General:

Table 11: CMP Policies - General

CMP Policy	Heritage Impact Assessment Response
Establishing achievable and appropriate uses for the significant buildings and areas of the Site is the key future activity that will ensure the retention of significance.	There are presently two heritage listed buildings on the campus and a further six buildings recommended for heritage listing, all are to be retained in the Masterplan. Uses for buildings have been carefully matched to the potential for retaining significant forms and elements and the types of spaces contained within each building. It is also noted that other buildings of moderate significance are also t be retained.
Appropriate funding to ensure that the significant elements of the place are conserved is to be established.	Funding is achieved through the implementation of the Masterplan.
Where conflict arises between use and heritage values, as an over-riding principle, heritage values should prevail. This may require creative and innovative ways to implement new uses and change that work within the heritage framework of the buildings and Site.	The development of the Masterplan has involved considerable discussion and input on which elements are to be retained, adapted, etc and where new interventions should take place.

Policy - Use:

Table 12: CMP Policies - Use

CMP Policy	Heritage Impact Assessment Response
Select uses for significant buildings that require the least intervention and which can fit within the overall structure, form and detail of the building without undue impacts on significance.	As referenced above, uses have been matched to building typologies.

Ensure that the setting of significant buildings has uses that retain the current overall landscape form of an open activated campus.	The setting of significant buildings has been a major consideration in the development of the Masterplan. The Site is undergoing significant change in use and development intensity, care has been taken to ensure that the settings and interconnections of key buildings retain the core spatial arrangements that define the campus. Essential settings are as outlined in the previous section of the study.

Policy - Fabric

The following table sets out the significant fabric of each of the identified significant buildings with a response to how it is being managed.

Table 13: Detailed Fabric Considerations

Building	Building element	Level of significance	Policy	Response
Morris Miller Library	Exterior			
	Original Facades	High	1 Retain all elements 2 Replicate damaged or failed elements	Proposed
	Entry additions	Intrusive	1 Remove and reinstate early entry form	Proposed
	Fenestration	High	1 Retain all elements 2 Replicate damaged or failed elements	Proposed
	Undercroft	High	1 Retain	Proposed
	Interior			
	General	Moderate	1 Retain some open areas and central void space 2 Provide for adaptation for new uses.	Proposed
	Central Stairs	Moderate	1 Retain if possible	Unknown
	East and west stairs	High	1 Retain in current form 2 Minor adaptation for compliance	Proposed

Building	Building element	Level of significance	Policy	Response
Arts Theatre	Exterior	High	1 Retain all original finishes and elements 2 Potentially remove later additions	Proposed Proposed
	Interior	High	1 Recover early interior form 2 Remove added elements in foyer 3 Remove added elements in theatre space	Proposed Proposed Proposed
Psychology Building	Exterior			
	Original and early Facades	High	1 Retain all elements 2 Replicate damaged or failed elements	Proposed Proposed
	Terrace	High	1 Retain	Proposed
	Water Feature	High	1 Retain	Proposed
	Southern stair addition	Intrusive	1 Remove and replace with original stair design	Proposed
	Changes to entry doors	Intrusive	1 Redesign to more sympathetic form	Proposed
	Interior			
	Main entry foyer	High	1 Retain all early finishes and reinstate missing elements 2 Retain stair 3 Retain lift allowing for car upgrades 4 Adjoining corridors, retain connections to foyer	Proposed Proposed Proposed Proposed Proposed
	Secondary stair	High	1 Retain current detail and form	Proposed
	Balance of interior	Moderate to low	1 Allow for adaptation for new uses including changing the spatial arrangement of the interior	Proposed
Chemistry Building	Exterior			

Building	Building element	Level of significance	Policy	Response
	Early facades	High	1 Retain all early finishes and reinstate missing elements 2 Remove ductwork when obsolete	Proposed – noting that the east wing is to be truncated Proposed
	Additions - facade	Low	1 Retain or remove as required 2 Reinstate missing façade or undertake further work in these areas	Proposed Proposed
	Entry portico	High	1 Retain intact to early form	Proposed
	Entry stairs and walls	High	1 Retain, only undertake careful adaptation for access requirements	Proposed
	Interior			
	Entry foyer including mezzanine and sculptural elements	High	1 Retain intact including floor finishes, sculptural ceiling finishes, face brick walls and other decorative elements	Proposed
	Main corridors	Moderate	1 Retain as face brick	Unknown
	Laboratories and Ancillary spaces	Low	1 Adapt as required	Proposed – adaptation will be for new uses
	North stair	Low	1 No requirement	-
	South stair	Low	1 No requirement	-
	Lecture Theatre	Moderate	1 Retain if possible	Not proposed
Cottage	Exterior			
	Form at time of university use commenced	High	1 Retain cottage core external form and detail 2 It is noted the building was moved by the university and it is possible to move it again. 3 Additions should be removed and ideally returned to cottage form	Proposed Proposed Proposed

Building	Building element	Level of significance	Policy	Response
	Interior			
	General	Low	1 Interior has been significantly altered, retain remnant elements.	Proposed
Former Ammunition Store	Exterior	Moderate	1 Retain exterior form.	To be demolished
	Interior	Low	1 no requirements	-
Christ College	Exterior			
	Original form and fabric	High	1 Retain significant form and materials	Proposed
	Additions and Changes	Low	1 Remove or allow managed change	Proposed
	Interior		Not inspected	-
St John College	Exterior			
	Original form and fabric	High	1 Retain significant form and materials	Proposed
	Additions and Changes	Low	1 Remove or allow managed change	Proposed
	Interior		Not inspected	-
Geology	Interior			
	Terrazzo floor at entry	High	1 Retain in situ, or if this area of building is not to be retained relocate to new selected position on site.	Proposed
General	Honour boards	High	1 Retain with university	Proposed
	Art Works in buildings	High	1 Retain with university	Proposed
	Art Works external	High	1 Retain on site or relocate to new university campus areas	Proposed
	Memorials	High	1 Retain on site ideally in situ, if to be relocated, refer to specific policy.	Proposed

Policy - Fabric:

Table 14: Fabric Policy

Policy	Heritage Impact Assessment Response
Significant building fabric, both internally and externally should be retained and conserved within future programs of conservation or adaptation. Conservation priorities shall generally respond to the level of significance of an item.	While the Masterplan is a general plan, it has considered how to retain significant buildings, fabric and forms. Future conservation of significant elements is proposed.
Preservation and ongoing maintenance of original and significant fabric should be carried out using appropriate conservation methods and treatments with recording of any new work.	Advice to future stages of project.
Removal of intrusive elements or fabric of little significance is permitted	Extensive removal of additions and intrusive fitout is proposed.
Where new fittings, fixtures or architectural elements are to be introduced they should be designed/selected to be sympathetic with the visual qualities of the existing building fabric and to minimise the loss of existing significant fabric in the building.	This stage of the project has not been reached but the policy will apply.

Policy - Interpretation:

Table 15: Interpretation Policy

Policy	Heritage Impact Assessment Response
An interpretation plan should be prepared to accompany major future works that sets out a coherent and organised approach to interpreting the history of the place as a university campus and its uses prior to that time.	This work will form part of later work and would be addressed by conditions of consent.
A history of the university at Sandy Bay should be commissioned to provide a detailed record of both the development of the campus and the activities and work that took place over the 70-80 year use of the Site.	This work will form part of later work and would be addressed by conditions of consent.

Policy – Adaptation

Table 16: Adaptation Policy

Policy	Heritage Impact Assessment Response
Adaptation of significant buildings may take place provided that significant fabric and spatial arrangements in and around the buildings, as identified in this CMP, are not adversely impacted.	The recommended heritage listings and the retention of built elements is predicated on a level of adaptation. The above brief analysis summarises approaches to retention of fabric and adaptation.
Adaptation should take place to areas of generally lower significance.	Guiding principle.
Advice on how to integrate new uses and services must be taken from an experienced heritage practitioner if works are proposed that may affect elements of high significance.	Guiding principle.

Policy - Vistas, Views and Setting

Table 17: Vistas, Views and Setting Policy

Policy	Heritage Impact Assessment Response
Retain and enhance significant views to and from the Site.	Views are a complex issue as the Site is so large. The Masterplan has analysed and considered views to, from and within the campus. Broad views that are of heritage significance are of a Site that comprises building, recreation facilities and to the west bushland interspersed with buildings. That overall form will not change noting that there will be additional development. Aspects of the Masterplan open up views, such as along the central walkway by removing built elements that impede views, spatially the central Site area retains the central spine with edge entries. The upper area of the Site has buildings replaced but retains the buildings within the landscape form that currently exists.
Retain and manage significant views and vistas, utilising the skills and knowledge of specialists in landscaping and arboricultural practices.	The Masterplan responds to this.
Consider impacts on views and vistas when redeveloping parts of the Site, or adjacent sites or if considering new buildings.	The Masterplan responds to this.

Policy	Heritage Impact Assessment Response
Incorporate plantings on the Site in ways that enhance the visual (and historical) aspects of the Site.	Advice for later phases of development.

7.3. Heritage Around the Site

The campus has a number of nearby and adjoining heritage conservation areas.

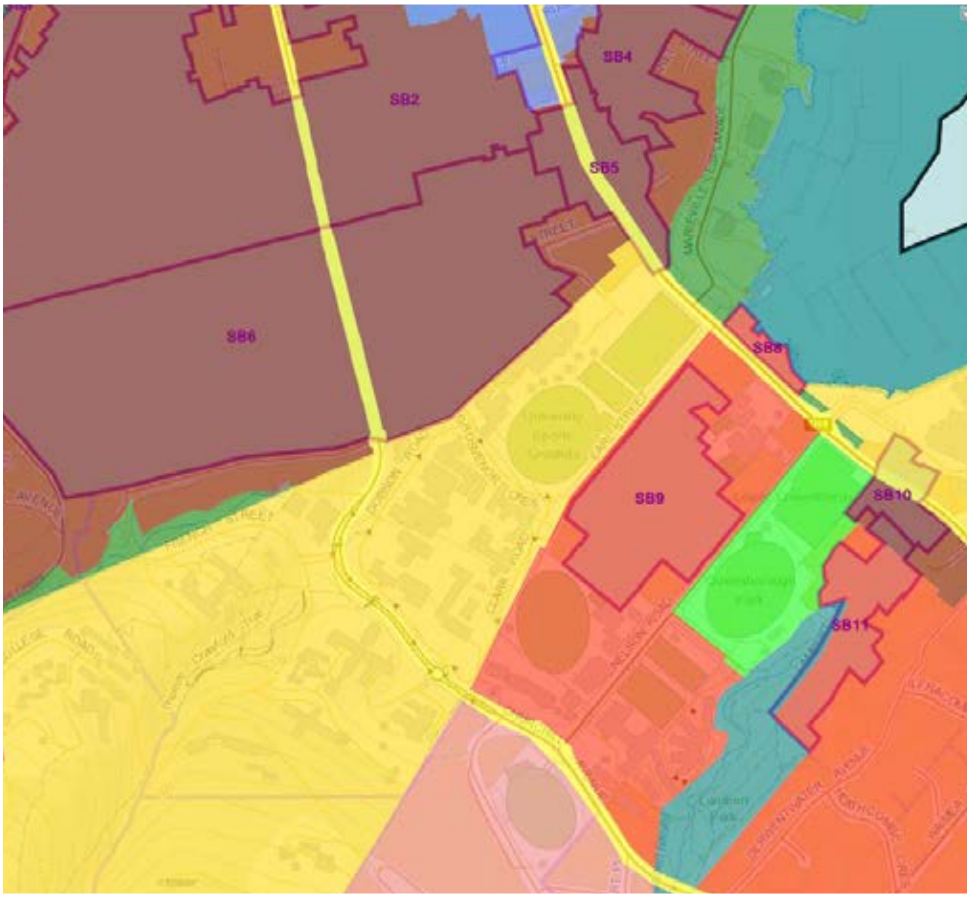

Figure 31: Excerpt from Hobart Interim Planning Scheme mapping showing HCAs SB5, 6, 8 and 9 in close proximity to the Site. The only directly shared boundary is the northern boundary to SB6. It can be observed that SB6 does not include the end of Grace Street.

SB5 overlaps the campus boundary alignment slightly along Sandy Bay Road but is little impacted by redevelopment of the northern part of the Sandy Bay Road frontage. Similarly, SB8 is a small waterfront precinct that does not interact with the campus. SB9 is edged by Earl Street and has views over the playing fields and the hedge, these are retained. SB6 shares a boundary below Grosvenor Street where rear boundaries of properties in View and Grosvenor Streets adjoin a range of relatively solid built forms extending for most of the length of that boundary.

8.0 Summary Discussion

As the Sandy Bay Site was developed from the 1950s, its current heritage status is limited to two outstanding modernist buildings and the listing of a hedge. There is no statutory requirement to undertake further analysis. However, the Site has a range of values, that include heritage value, that deserve consideration when planning for a significant change such as the set out in the Masterplan for the Site.

The approach of the heritage study and how that has informed the Masterplan is to consider the various built elements and the spatial arrangement of the Site for its significance in relation to its campus use and development as well as it earlier uses for farming and as a rifle range.

The greatest significance of the campus is as a physical response to the coming of age of the University of Tasmania with a new bespoke campus designed in response to the influence of modernism on the Tasmanian architectural scene.

The CMP analysis established that a small group of buildings, in addition to the two listed buildings, have sufficient heritage significance to meet the threshold of individual heritage listing. They are the former farmhouse that is now used as a childcare centre, the Morris Miller Library, Psychology and the Chemistry Building. With the Arts Theatre and Christ College, the five modernist campus buildings are all of undoubted State heritage significance.

The CMP also assessed a range of other buildings built up to the mid to late 1960s as having moderate significance. Individually, the buildings are unlikely to achieve an individual listing at local or State level, but they have a collective value, particularly in relation to the central campus form and layout and the arrangement of the residential colleges on the upper hillside that suggests they make a contribution to the values of the Site.

The Masterplan has responded to these assessments by retaining the key buildings and also retaining a number of the moderately significant buildings so that the overall form and pattern of the Site is discernible and readable as new development takes place.

There is no requirement in the CMP, beyond the more significant elements, to retain or adapt any specific building but a logic has been adopted that reinforces the early campus layout with the proposed retention of Engineering, Geology, Physics and the University Centre in the main campus area and John Fisher College, CSIRO and several other less significant but adaptable buildings on the upper campus.

As UTAS vacates the Site over time, adaptation of the buildings will need to take place. This will vary from minor changes to significant use and fabric changes, particularly to interiors as most buildings are not suited n their current forms for changes of use.

For the five major campus buildings future change will need to be guided by building specific conservation management plans to ensure that their values are retained. For other buildings, their external form with specific internal elements noted are to be retained and in some places recovered (to an earlier form) as there value is as spatial elements within the campus that created the strong axial arrangement of the central campus.

It is also important to retain landscape and spatial arrangements on the campus as these elements form the other aspect of significance. That is significance is not limited to buildings.

Retaining a group of core campus buildings and replacing and rebuilding others allows the central spatial relationships of the campus to be retained. A key element has been the use of in essence a ring road (noting it was not complete) with entry to buildings from the edges of the campus and a pedestrian internal space. The UTAS Sandy Bay Masterplan largely retains this arrangement noting that there is a desire to create a vehicle cross link through the centre of the campus. While a vehicle link is not desirable within a pedestrian precinct, it is possible to achieve a low key share zone, of which there are many examples, to allow some permeability through the core spaces.

Overall, in the central campus area the planned arrangement of having vehicle movements around the edges is sound and is retained. This will retain the spatial arrangements of the Site, allow mature landscape to be retained and enhanced and interprets the early masterplan form of the Site as a campus for the benefit of the occupants.

On the upper campus, retaining the colleges and student accommodation as a precinct retains the broad spatial values of the campus that is a key part of the significance of the important buildings.

Other aspects of potential heritage impacts relate to the setting of the campus within the surrounding area.

While there are few heritage constraints on most of the Site, the campus adjoins residential and educational uses some of which have heritage value. To the north is the Golf Links Estate HCA and to the south is

The campus to the north shares a boundary with 18 residential properties in Alexander, View, Grace and York Streets and a number of other properties are located near the Site but separated by roads from it. This boundary has been a shifting one over time with parts of the original Golf Links Estate being acquitted by the rifle range and later university to expand development and use on the northern edge.

The interface of new development along the boundary to the Golf Links Estate requires careful design resolution as the UTAS Sandy Bay Masterplan takes more form. At present the northern boundary is lined with relatively blank facades of university buildings with a height of around 3 storeys, set quite close to the common boundaries. The UTAS Sandy Bay Masterplan proposes future development along this interface, set back some distance from the boundary and also of greater height and density. From a heritage perspective, provided that suitable design controls are in place to provide for a designed interface (not addressing amenity of or other planning matters), there is logic in placing more intense development in an area already subject to development and retaining open space and playing fields to the south.

The Earl Street interface is largely retained with the boundary hedge and playing fields, noting that levels change along that boundary.

Further up the Site as the land rises there are existing areas of bushland that separate campus development from adjoining areas.

A final consideration is how artworks and memorials contained on the Site are managed. The University have had a long-term program of acquiring public art and placing it in the campus. There are also a number of specific memorials to staff, students and events in the form of gardens, seats, individual tree plantings, sculptures and large-scale art works. The CMP notes these as significant at various levels.

Where items are tied to the campus it is proposed to retain them in-situ wherever possible. Some elements may also be relocated on the campus. Other elements may be relocated to other parts of the university that are not at Sandy Bay. The UTAS Sandy Bay Masterplan does not resolve this in detail, the CMP requires a policy to be developed so that each elements is addressed and managed for its significance both cultural and social and this will form part of the future stages of work.

The heritage values of the campus have been explored and while there will be more to discover over time, the UTAS Sandy Bay Masterplan reflects a sound understanding of not just the statutorily listed elements of the place but the elements that are considered important to retain as part of the university's heritage on the Site.

The UTAS Sandy Bay Masterplan has achieved a sound and balanced response to heritage values.