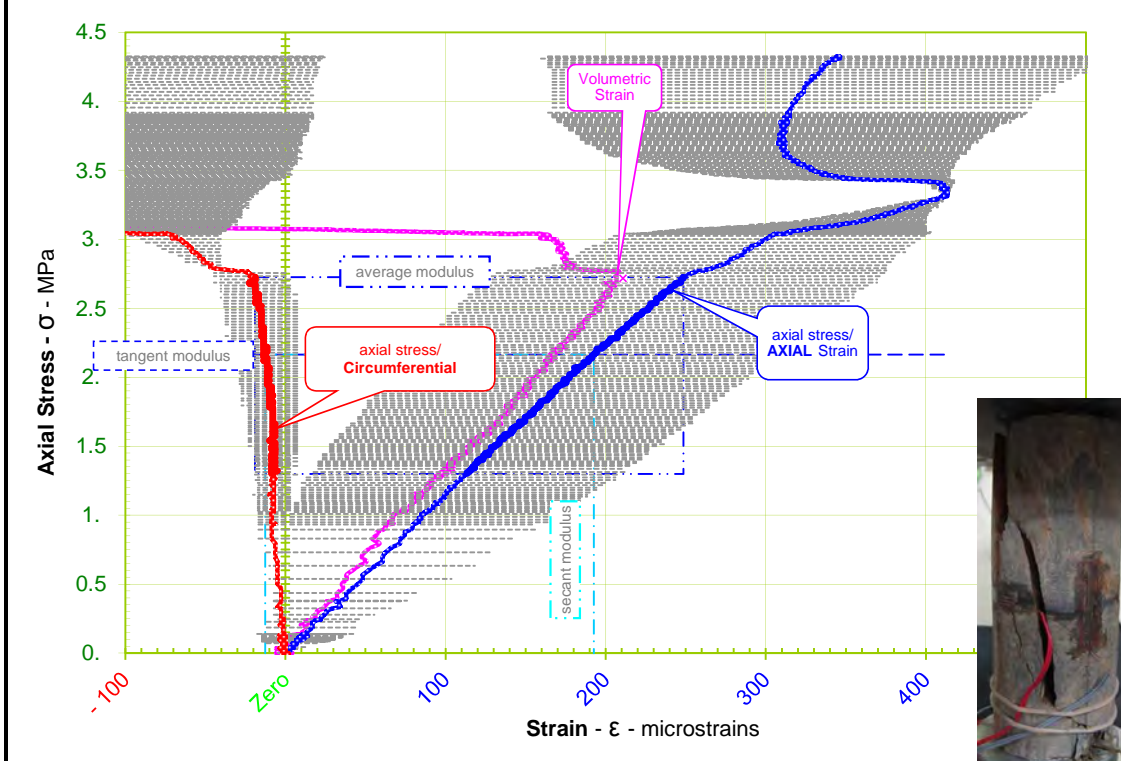


# uniaxial compressive strength with deformation parameters using strain gauges

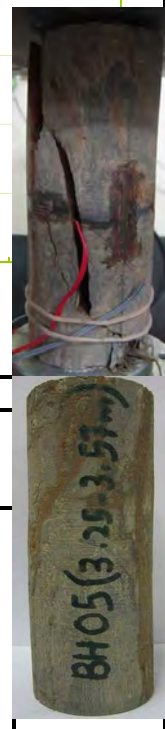
client: <i>COFFEY GEOTECHNICS PTY LTD(FYSHWICK)</i>	job no: <b>INFOABTM 00191AA</b>
principal:	laboratory: <i>Abbotsford</i>
project: <i>GEOTFYSH09703AA-ELERTON DRIVE EXT :</i>	report date: <i>1 Jul 2014</i>
location:	client's sample ID: <b>BH05</b>
test procedure: <i>AS 4133 4.2.1 - 2007, 4.3.1 - 2009, 1.1.1 - 2007</i>	test date: <i>30 Jun 2014</i>
test apparatus: <i>Avery with 50 kN KELBA load cell S/N 531686 calibrated June 2013</i>	
work order number: <b>ABTM14W 00340</b>	borehole no: <b>BH05</b>
laboratory sample number: <b>ABTM14S 01438</b>	depth: <i>from 3.25 to 3.57 m.</i>
<i>The height of this specimen was longer than the Standard's requirements.          This sample was tested in an "as received" condition.</i>	
sample dimensions: <b>166 mm high by 51.5 mm dia.</b> <b>Test 1 of 1</b>	

Young's Modulus	Poisson's Ratio $\nu$	uniaxial compressive strength - $q_u$ : <b>4.33 MPa</b>
$E_t$ tangent: <b>10.2 GPa</b>	<b>0.06</b>	<i>Calculated at 50 % of the maximum axial stress.</i>
$E_s$ secant: <b>11.2 GPa</b>	<i>The UCS is below the 50 MPa specified by the Standard</i>	<i>Calculated between zero and 50 % of the maximum axial stress.</i>
$E_{av}$ average: <b>10.5 GPa</b>		<i>Calculated between 30 % and 63 % of the maximum axial stress.</i>



rock substance description: <i>Sandstone</i>	moisture content: <b>4.2 %</b>
bedding: <i>Bedding planes are at an angle of 20degrees to the axis of loading</i>	wet density: <b>2.53 t/m<sup>3</sup></b>
mode of failure: <i>Defect</i>	dry density: <b>2.43 t/m<sup>3</sup></b>
duration of test: <i>9.18 minutes</i>	
rate of loading: <i>0.47 MPa/min</i>	

remarks:



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 Accredited for compliance with ISO/IEC 17025  
 The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/national standards.

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 No. 431  
 Authorised Signature:  
**Gayani Samaradiwakara**  
 Associate Engineering Technician

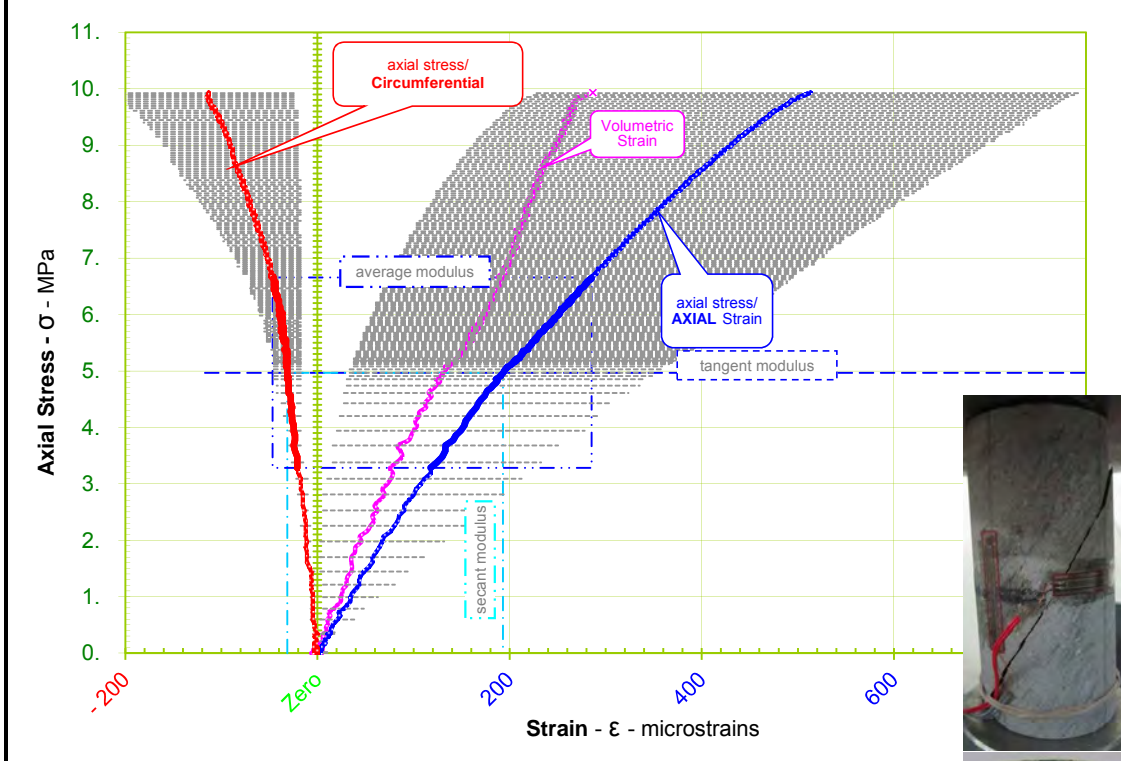
Date: 1 Jul 2014

ABTM--modulus--RPTstrg--003--2013

# uniaxial compressive strength with deformation parameters using strain gauges

client: <i>COFFEY GEOTECHNICS PTY LTD(FYSHWICK)</i>	job no: <b>INFOABTM 00191AA</b>
principal:	laboratory: <i>Abbotsford</i>
project: <i>GEOTFYSH09703AA-ELERTON DRIVE EXT :</i>	report date: <i>1 Jul 2014</i>
location:	client's sample ID: <b>BH14</b>
test procedure: <i>AS 4133 4.2.1 - 2007, 4.3.1 - 2009, 1.1.1 - 2007</i>	test date: <i>30 Jun 2014</i>
test apparatus: <i>Avery with 50 kN KELBA load cell S/N 531686 calibrated June 2013</i>	
work order number: <b>ABTM14W 00340</b>	borehole no: <b>BH14</b>
laboratory sample number: <b>ABTM14S 01439</b>	depth: <i>from 2.4 to 2.62 m.</i>
sample dimensions: <b>107 mm high by 51.9 mm dia.</b>	
The height of this specimen was shorter than the Standard's requirements. This sample was tested in an "as received" condition.	
Test 1 of 1	

Young's Modulus	Poisson's Ratio $\nu$	uniaxial compressive strength - qu: <b>9.94 MPa</b>
$E_t$ tangent: <b>18.1 GPa</b>	<b>0.16</b>	<i>Calculated at 50 % of the maximum axial stress.</i>
$E_s$ secant: <b>25.7 GPa</b>	<i>The UCS is below the 50 MPa specified by the Standard</i>	<i>Calculated between zero and 50 % of the maximum axial stress.</i>
$E_{av}$ average: <b>19.3 GPa</b>		<i>Calculated between 33 % and 67 % of the maximum axial stress.</i>



rock substance description: <i>Sandstone</i>
bedding: <i>Bedding planes are at an angle of 40 degrees to the axis of loading</i>
mode of failure: <i>Shear</i>
duration of test: <i>5.30 minutes</i>
rate of loading: <i>1.87 MPa/min</i>

moisture content:	<b>4.4 %</b>
wet density:	<b>2.65 t/m<sup>3</sup></b>
dry density:	<b>2.54 t/m<sup>3</sup></b>

remarks:



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NATA Accredited Laboratory  
 No. 431  
 Authorised Signature:  
**Gayani Samaradiwakara**  
 Associate Engineering Technician

Date: **1 Jul 2014**

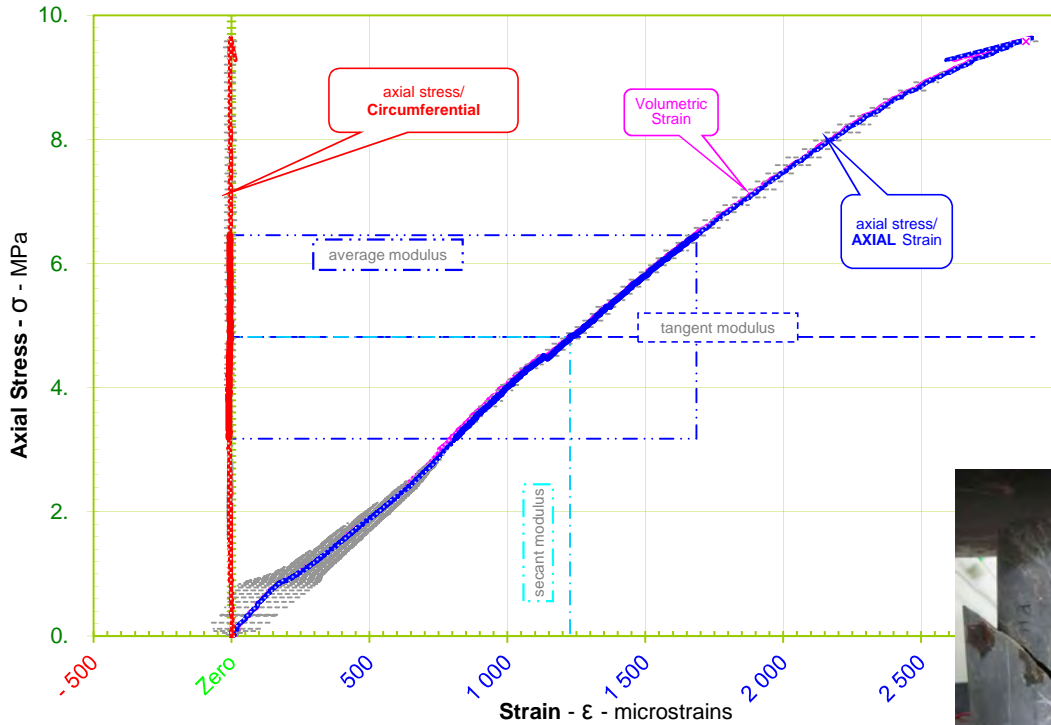
# uniaxial compressive strength with deformation parameters using strain gauges

client: <i>COFFEY GEOTECHNICS PTY LTD(FYSHWICK)</i>	job no: <b>INFOABTM 00191AA</b>
principal:	laboratory: <i>Abbotsford</i>
project: <i>GEOTFYSH09703AA-ELERTON DRIVE EXT :</i>	report date: <i>1 Jul 2014</i>
location:	client's sample ID: <b>BH15</b>
test procedure: <i>AS 4133 4.2.1 - 2007, 4.3.1 - 2009, 1.1.1 - 2007</i>	test date: <i>30 Jun 2014</i>
test apparatus: <i>Avery with 50 kN KELBA load cell S/N 531686 calibrated June 2013</i>	
work order number: <b>ABTM14W 00340</b>	borehole no: <b>BH15</b>
laboratory sample number: <b>ABTM14S 01440</b>	depth: <i>from 3.33 to 3.57 m.</i>
sample dimensions: <i>134 mm high by 51.8 mm dia.</i>	

This sample was tested in an "as received" condition.

Test 1 of 1

Young's Modulus	Poisson's Ratio $\nu$	uniaxial compressive strength - qu: <b>9.64 MPa</b>
$E_t$ tangent: <b>3.45 GPa</b>	<i>See notes below</i>	<i>Calculated at 50 % of the maximum axial stress.</i>
$E_s$ secant: <b>3.69 GPa</b>	<i>The UCS is below the 50 MPa specified by the Standard</i>	<i>Calculated between zero and 50 % of the maximum axial stress.</i>
$E_{av}$ average: <b>3.69 GPa</b>		<i>Calculated between 33 % and 67 % of the maximum axial stress.</i>



rock substance description: <i>Siltstone</i>	moisture content: <b>1.8 %</b>
bedding: <i>Bedding planes are at an angle of 30degrees to the axis of loading</i>	wet density: <b>2.65 t/m<sup>3</sup></b>
mode of failure: <i>Shear</i>	dry density: <b>2.61 t/m<sup>3</sup></b>
duration of test: <i>9.25 minutes</i>	
rate of loading: <i>1.04 MPa/min</i>	

remarks:  
*The circumferential Strain Gauges did not intercept the shear plane, resulting in very little circumferential strain being recorded, and hence Poissons Ratio could not be established.*



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NATA Accredited Laboratory  
 No. 431  
 Authorised Signature:  
**Gayani Samaradiwakara**  
 Associate Engineering Technician

Date: 1 Jul 2014

ABTM--modulus--RPTstrg--003--2013

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# Appendix G – Lighting Design Report

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**OPUS INTERNATIONAL PTY LTD ON BEHALF OF  
QUEANBEYAN CITY COUNCIL**

**ELLERTON DRIVE EXTENSION**

**QUEANBEYAN, NSW**

---

**PRELIMINARY SKETCH PLAN (PSP) REPORT**

**FOR**

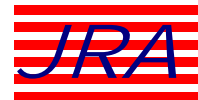
**ELECTRICAL SERVICES – STREET LIGHTING**

---

Prepared by: **JOHN RAINERI & ASSOCIATES PTY. LTD.  
CONSULTING ENGINEERS**

**UNIT 17, 169 NEWCASTLE STREET, FYSHWICK ACT 2609  
P.O. BOX 3002 MANUKA, ACT 2603**

Tel No: (02) 6280 8333 Fax No: (02) 6280 8444



Client: OPUS International Pty Ltd

Issue: P

Date: 16<sup>th</sup> July 2014

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## Appendices

PSP Lighting Schedule

## Amendments

Revision	Description	Author	Reviewer	Date
P	PSP Issue	A. Yoe	B. Witowski	16/07/2014



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# 1. INTRODUCTION

---

## 1.1 GENERAL

This report shall be read in conjunction with the street lighting drawings and other relevant project drawings.

This PSP report describes the existing street lighting installations on Ellerton Drive and new street lighting installations on the proposed Ellerton Drive Extension as detailed below:

- ▶ Existing Ellerton Drive Chainages (CH) 680 to CH 1000; and
- ▶ CH 3000 to CH4680 including the new bridge between CH3320 and CH3560.

This report has been prepared based on the following:

- ▶ Site Visit;
- ▶ Discussion with the design team members;
- ▶ Discussion with the relevant Authorities e.g. Queanbeyan City Council, and Essential Energy connection department;
- ▶ Existing underground services asset plans (DBYD) – Ellerton Drive and Old Cooma Road;
- ▶ Civil plans; and
- ▶ Project Brief.

## 1.2 STANDARDS AND REGULATIONS

The design of new street lighting installations within Queanbeyan is governed by Essential Energy Street Lighting Standard and Drawings - CEOM7260 and also requires to be carried out in accordance with relevant Australian Standards as follows:

- ▶ AS/NZS 1158.0
- ▶ AS/NZS 1158.1.1
- ▶ AS/NZS 1158.1.2
- ▶ AS/NZS 1158.2.2

These documents require new street lighting design be carried out in accordance with the relevant Australian Standards general computer procedure for the calculation of technical parameters for Category V Lighting.

The most suitable lighting category has been proposed for this project in order to set out lighting technical parameters.

---

## 2. NEW STREET LIGHTING PROPOSAL

---

### 2.1 GENERAL

The existing street lighting installations on Ellerton Drive consist of various type street lighting luminaires mounted on 6.5 metre high columns with approximately 1.5 metre outreach arms. The existing street lighting does not appear to comply with the required lighting levels of Category V3.

It is proposed to upgrade the existing street lighting installations on Ellerton Drive with new street lighting system to achieve compliance with all relevant legislations and standards as previously mentioned. It is also to maintain consistency with the rest of new street lighting installations on Ellerton Drive Extension.

The lighting technical parameters will be simulated /assessed to comply with AS/NZS 1158.1.1 Table 2.2 and AS/NZS 1158.3.1 Table 2.6. The assessment will be carried out using lighting software design tools, AGI32.

### 2.2 LIGHTING CATEGORY

AS/NZS 1158 series describe the different lighting categories that are applicable for different types of roads based on road operating characteristics (Category V). The following table summarises the lighting categories proposed for Ellerton Drive Extension and each lighting category description can be found in the AS 1158.1.1.

**Table 1 Proposed Road Lighting Category**

Area	Lighting Category	
	Road area	Verge area ( pathway)
Ellerton Drive Extension	V3	NA

### 2.3 STREET LIGHTING COLUMN

Street lighting design for Ellerton Drive Extension will utilise 12 m high tapered round galvanised steel columns with 4.5 m curved outreach arms. Street lighting design will also consist of a mixture of single outreach arm and double outreach arms (back-to-back) columns. Street lighting columns setback will be 1.7 metres minimum from road shoulders or on the centre of medians. Street lighting columns will be slip base construction type mounted on screw anchor. The proposed column height, outreach arm length and column arrangement to each area is tabulated in the table below:

**Table 2 Proposed Column Height, Outreach Arm Length and Column Arrangement**

<b>Street Name</b>	<b>Columns Description</b>	<b>Column Arrangement</b>	<b>Column Height and Outreach Arm Length on Roadway</b>
Ellerton Drive Extension including new bridge and intersection	Single Outreach Arm	Single Sided	12 m and 4.5 m
Ellerton Drive Extension	Back-to-Back Outreach Arms	Central on Median	12m and 4.5 m

It is proposed where suitable to utilise street light columns as combined-use columns with traffic signal to minimise street lighting cluster at intersections. Further coordination with the Traffic Signal consultant is required.

### 2.3.1 Street Lighting Luminaire

Efficient lighting design can be achieved by using high performance luminaires and high efficiency high pressure sodium lamps. It is proposed that the street lighting luminaire will be Sylvania Roadster with flat glass (aeroscreen) for this project.

Aeroscreen type luminaire with flat glass diffuser will be utilised to limit the upward light component into the night sky and maintain zero lighting distribution below horizontal plane to match with the existing street lighting installations on Edwin Land Parkway Bypass.

The street lights will utilise high pressure sodium light sources and standard tubular lamp type in accordance with EE Lighting CEOM7206.05 drawing.

The luminaire technical specifications are as follow:

1. Sylvania Roadster luminaire ( single and back-to-back outreach arms ) :
  - ▶ Sylvania Roadster Aeroscreen Configuration with polycarbonate diffuser.
  - ▶ Body size = 650 mm (L) x 299 mm (H).
  - ▶ Die-cast aluminium
  - ▶ IP Rating : IP 66
  - ▶ 250 W High Pressure Sodium lamp
  - ▶ Lamp colour temperature = 2000 K
  - ▶ Active reactor control gear
  - ▶ PE Cell 3 pin to suit NEMA Base

The Sylvania Roadster is an approved luminaires in accordance with the EE Lighting Design Manual.

## **2.4 STREET LIGHTING CONNECTIONS**

Our preliminary investigation indicates that new street lighting installations on Ellerton Drive Extension can be connected to the following existing substations and low voltage pillar:

- ▶ SUB 16499 located at the intersection between Tennyson Drive and Ellerton Drive. A new low voltage (LV) pillar will be provided and mounted above ground on a concrete plinth.
- ▶ SUB 644 located at the intersection between Barrack Flat Drive and River Drive. A new low voltage pillar (LV) will be provided and mounted above ground on a concrete plinth.
- ▶ Low Voltage Pillar 14619 located on Edwin Land Parkway Bypass.

New service cables between the existing substations and new LV pillars will be supplied and installed by the ASP 1 contractor. All contestable works including street lighting are to be carried out by ASP 1 contractor.

A network connection request will be submitted to Essential Energy Network Planner South East Region for review and approval.



## **2.5 POWER FOR TRAFFIC SIGNAL CONTROLLER**

None of power or LV pillar and Telstra connection for new traffic signal controllers has been allowed for in the electrical services documentation. Further discussion with the traffic signal consultant is required.

# PSP Lighting Schedule

## LIGHTING SCHEDULE

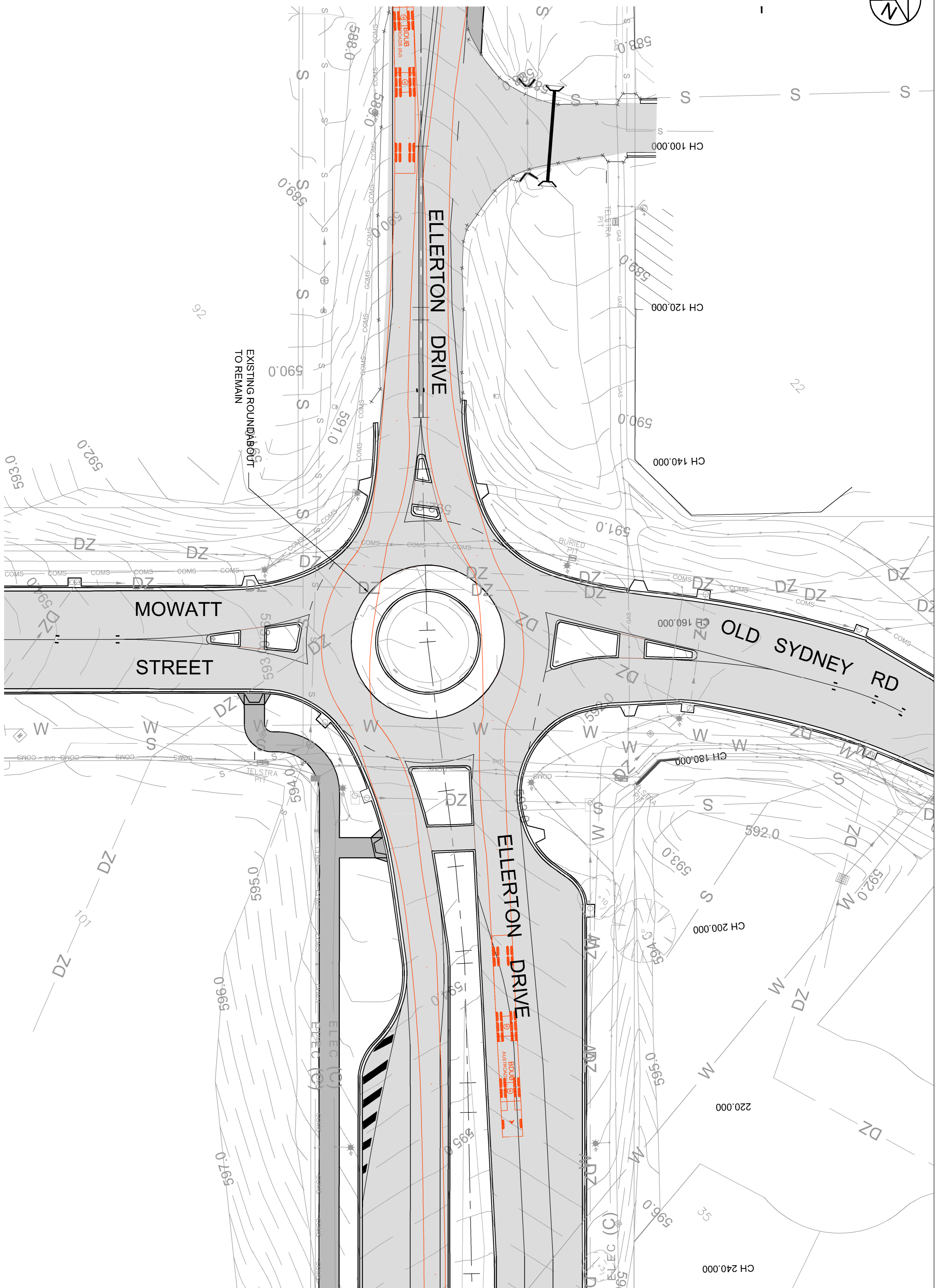
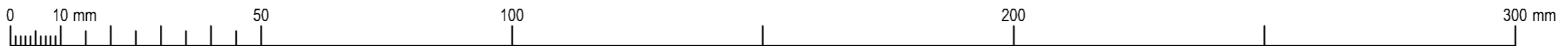
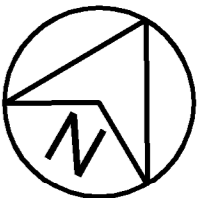
Indicated in the following table is a PSP design schedule of luminaire types. This table shall be read in conjunction with the set of electrical PSP documentation drawings.

Type	Description
<p style="text-align: center;">Type N</p> 	<p>2 x 250 W High Pressure Sodium (HPS) aeroscreen luminaire mounted on 12 metre high tapered round column with 4.5 metre curved back-to-back outreach arms equal to Sylvania Roadster Aeroscreen.</p>
<p style="text-align: center;">Type N1</p> 	<p>1 x 250 W High Pressure Sodium (HPS) aeroscreen luminaire mounted on 12 metre high tapered round column with 4.5 metre curved single outreach arm equal to Sylvania Roadster Aeroscreen.</p>
<p style="text-align: center;">Type E</p>	<p>Existing street lighting to remain in place. Clean and re-lamp.</p>
<p style="text-align: center;">Type ED</p>	<p>Existing street lighting to be demolished. Clean and re-lamp. Remove redundant underground cables associated with street light column.</p>

### Notes:

- Street light columns will be installed at 1.7 m from road shoulder in zone 2 in accordance with AS 1158.1.2.

# Appendix H – Intersection Turning Movements





PLAN

**NOTES**

1. FOR LEGEND REFER TO DRG T-C0040.00.300.

**PRELIMINARY ISSUE**  
NOT FOR CONSTRUCTION

	Revision
	Approved
	
	
<p><b>Queanbeyan City Council</b></p> <p>Canberra Office 46 2 6132 2700</p> <p>J. LETHBRIDGE C. NOVATI</p>	<p>Unit 18, Mitchell Business Centre 160 Lysegh Street ACT 2911, Australia</p> <p>M. HILL 13.07.2014</p>
Project No. T-C0040.00	Scale 1:250 @A1
<p>Project: QUEANBEYAN CITY COUNCIL ELLEERTON DRIVE EXTENSION PRELIMINARY SKETCH PLAN - STAGE 1</p> <p>Sheet: ROUNDABOUT PLAN OLD SYDNEY RD - MOWATT ST - ELLEERTON DR</p>	
Drawing No. PSP REPORT APPENDIX H	Sheet No. SK01