



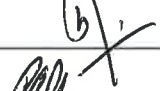

DS006 – LV CONSAC CABLE REPLACEMENT

Project Scope DS006.19 – 2018/19

Prepared by Asset Strategy and Planning

November 2017

REVIEW AND APPROVAL SCHEDULE

Responsibility	Position	Name	Signature	Date
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Reviewed	Senior Renewal Project Development Engineer	Jonathan Cook		8/11/17
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1.0 PURPOSE

The purpose of this document is to specify the scope of works required under SARP program DS006 during 2018/19.

Program DS006 is a condition based program whose purpose is to replace low voltage (LV) CONSAC cable which is in poor condition, is at risk of failure and/or presents a safety hazard for employees and the public.

2.0 BACKGROUND

LV CONSAC distribution mains were installed in residential areas across Endeavour Energy's Network up to 1975 and in Campbelltown area until 1981. A total of approximately 700km was installed.

This cable can suffer from a number of failure modes including failures of joints in pillars and streetlight columns, in ground joints and failure of the concentric aluminium neutral conductor. The principal risk presented by CONSAC failure is shock hazards to the public and workers due to the loss of the neutral connection and as a result, a program to replace CONSAC cable in a planned manner has been in place for a number of years.

Approximately 30% of CONSAC in Endeavour Energy's network has been replaced with XLPE cable leaving approximately 500 kms of CONSAC remaining in service. Table 1 below shows the current status of the replacement works in each of the three regional areas.

TABLE 1 - STATUS OF PROGRAM DS006 ON A REGIONAL BASIS

Region	Original Installed length (kms)	Approximate length replaced (kms)	Length remaining in service (kms)
Northern	220	75	145
Central	385	110	275
Southern	93	16	77
Totals	698	201	497

Smart meter devices with neutral integrity (NI) monitoring capability are continuing to be installed on the switchboards of customer's who are supplied by LV CONSAC cable under a separate program MC112 *Neutral Integrity Monitoring*. The data from these devices is now assisting the identification of sections of CONSAC which are deteriorating and at risk of failure. Based on this information LV CONSAC is identified for replacement.

All work detailed in this project scope is capital expenditure and is covered by SARP item DS006.

Gate 2 approval for works in this program is for a total amount of \$14.9 million in 2018/19.

3.0 SCOPE OF WORKS

3.1 ASSETS INCLUDED

The scope of works includes the planned replacement of CONSAC cable with XLPE cable. The scope may also include the following associated works within the section of cable replaced:

- Replacement of older street lighting columns that contain termination of mains cables as per MCI 0006 section 5.4.
- Replacement of service cable;
- Replacement of substandard pillars (particularly metal pillars); and
- The addition of pillars as required.

3.2 ASSETS EXCLUDED

Where it is considered necessary to replace the LV switchgear in a padmount substation, or the substation itself, due to its condition or inability to accommodate the replacement of the CONSAC cables, then a change request shall be raised for the works to be carried out under

the relevant programs e.g. DS305 for Compact LV switchgear replacement, DS301 for Ground substation refurbishment or DS315 for HH or other LV switchgear replacement.

3.3 PROACTIVE REPLACEMENT

Based on NI monitoring data 18.84 kilometres of LV CONSAC cable have been identified for planned replacement in 2018/19.

Further detail of each LV CONSAC project identified for planned replacement within 2018/19 can be found in Appendices A and B.

3.4 REACTIVE REPLACEMENT

The scope includes the reactive replacement of approximately 1km CONSAC cable with XLPE cable when a developing neutral connection fault is indicated by the NI monitoring system during the course of the year. These would be incorporated into the program as they are found based on their condition and level of risk they present. These changes would be required to be managed through the process outlined in GNV 1120 – *CONSAC condition reporting for fault finding and cable replacement* with requested works submitted for AS&P endorsement through the change control process.

Projects of expanded scope should be discussed with AS&P at the concept stage to gain endorsement of the concept prior to committing resources to the detailed design.

Where cable replacement is required that would affect the repair of a termination in a pillar or column, a temporary repair should be carried out and then a project developed to replace the section of CONSAC cable to provide a permanent solution.

3.5 TIMING OF DESIGN WORKS

An allowance for 12km of ongoing design works has been included to ensure that designs are completed ready for construction at the start of the following year in anticipation of the program continuing.

This will also allow for more accurate estimates of the cost of the upcoming works to be made and streamline the commencement of the delivery phase in the subsequent year.

These design works should not include the scheduling or completion of any construction (replacement) works until appropriate approvals are provided.

Further detail of the design only sites can be found in Appendix C.

3.6 ENVIRONMENTAL MANAGEMENT PROCESS

An environmental assessment including an environmental management plan (EMP) to demonstrate compliance with the Code of Practice for Authorised Network Operators (the Code) must be prepared for projects completed under DS006.

The Project Manager must contact the Network Environmental Assessment (NEA) section of EE to obtain advice regarding the appropriate Class of environmental assessment required under the Code.

NEA must be contacted with sufficient lead-time to satisfy the assessment requirements, including undertaking the appropriate level of community/stakeholder consultation and monitoring as required by the Code prior to and during construction.

The Project Manager must liaise with NEA to determine an appropriate auditing schedule for the project. This must include audits at site establishment/set-up, during works if required depending on the project scope and timeframe and at the practical completion of the project. These audits may be undertaken in conjunction with EE's Safety Auditor. Audit scheduling must be noted in the project timeline.

The Project Manager is responsible for appropriately addressing/rectifying matters of environmental non-compliance that are identified by the audits. The audit findings must be included in the Post Commissioning Review of the project.

4.0 COST ESTIMATE

As part of the annual program development, PMG have determined an average nominal replacement cost of \$750,000 per km. This has been based on actual costs of previously delivered works and includes:

- Project Management;
- Design;
- Materials;
- Labour and plant; and
- Traffic management.

An allowance of \$14.13 million should provide funding for the replacement of the 18.84 kilometres of LV CONSAC cable specified in Appendix A.

In addition to the 18.84km of design works identified for replacement as outlined in Appendix A, an allowance of \$60,000 for 12km of ongoing design works is proposed to be included to ensure that designs are completed ready for construction at the start of the following year in anticipation of the program continuing.

A funding allowance of \$750,000 is included to cover reactive works and should provide funding for approximately 1km of CONSAC replacement.

A summary of approved funding is shown in Table 2 below.

TABLE 2 – SUMMARY OF LV CONSAC REPLACEMENT WORKS AND FUNDING 2018/19

Region	Design (km)	Construct (km)	Total (\$)
Northern (Planned)	18.84	18.84	14,130,000
Unspecified (Design)	12	-	60,000
Unspecified (Reactive)	1	1	750,000
Totals	31.84	19.84	14,940,000

It is expected that the works outlined in Table 2 above will be completed within the 2018/19 financial year.

4.1 CONTINGENCY PROVISION

It is considered that there is sufficient diversity of sites within the overall program to allow for cost “overs and unders” to cancel out and therefore a contingency amount has not been included.

5.0 APPENDICES

APPENDIX A - Table of replacement works in 2018/19

APPENDIX B - Project scope sheets

APPENDIX C - Ongoing design works

APPENDIX A – TABLE OF REPLACEMENT WORKS IN 2018/19

REGION	DARRTS SCOPE SHEETS		SUBSTATIONS	SUB ADDRESS	CONSAC replacement (km)	Nominal cost estimates (\$)
	DARRTS Project Scope Reference	Area highlighting replacement				
Northern	CRN04319	Scope Sheet	7014	Sedgman Cres SHALVEY	1.2	900,000
Northern	CRN04314	Scope Sheet	3112	Carlisle Ave - BIDWILL	1.54	1,155,000
Northern	CRN04320	Scope Sheet	7016	Greenway Ave SHALVEY	1.2	900,000
Northern	CRN04317	Scope Sheet	6738	Pine Cres BIDWILL	0.96	720,000
Northern	CRN04318	Scope Sheet	6978	Luxford Rd - SHALVEY	1.68	1,260,000
Northern	CRN04309	Scope Sheet	3098	Myrtus Cres - BIDWILL	0.97	727,500
Northern	CRN04384	Drawing No: 381404 Project: DSN00211	6706	Palm PI BIDWILL	1.43	1,072,500
Northern	CRN04385	Scope Sheet	3109	Luxford Rd BIDWILL	1.05	787,500
Northern	CRN04386	Scope Sheet	3093	Chestnut Cres - BIDWILL	1.43	1,072,500
Northern	CRN04316	Scope Sheet	6664	Bennett Gr - BIDWILL	0.56	420,000
Northern	CRN04387	Scope Sheet	7103	York Rd PENRITH	0.96	720,000
Northern	CRN04388	Drawing No: 386347 & 393490 Project: DSN00254 /329	7066	Kiparra Cres PENRITH	1.3	975,000
Northern	CRN04389	Drawing No: 392172 Project: DSN00270	16498	Birmingham Rd PENRITH	0.375	281,250
Northern	CRN04390	Scope Sheet	7070	Ikin St PENRITH	0.95	712,500
Northern	CRN04391	Drawing No: 391286 Project: DSN00303	7071	Kempsey St PENRITH	1.06	795,000
Northern	CRN04392	Drawing No: 392345 Project: DSN00305	15584	Lilac PI PENRITH	0.145	108,750
Northern	CRN04393	Drawing No: 391420 Project: DSN00273	7063	Malcolm Ave WERRINGTON	0.65	487,500
Northern	CRN04315	Scope Sheet	3158	Ridgeway Cres QUAKERS HILL	1.38	1,035,000
				Totals	18.84	\$ 14,130,000

APPENDIX B – PROJECT SCOPE SHEETS

DS006 – LV CONSAC Replacement Program 2018/19

Zone: **Plumpton, 9542**
Feeder: **8685 – Popondetta Rd**
Location: **Myrtus Cr, Bidwill**

Item No: **CRN04309** Amd No: **0**
LG Area: **BCC**
Prepared: **Peter Scholte**

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

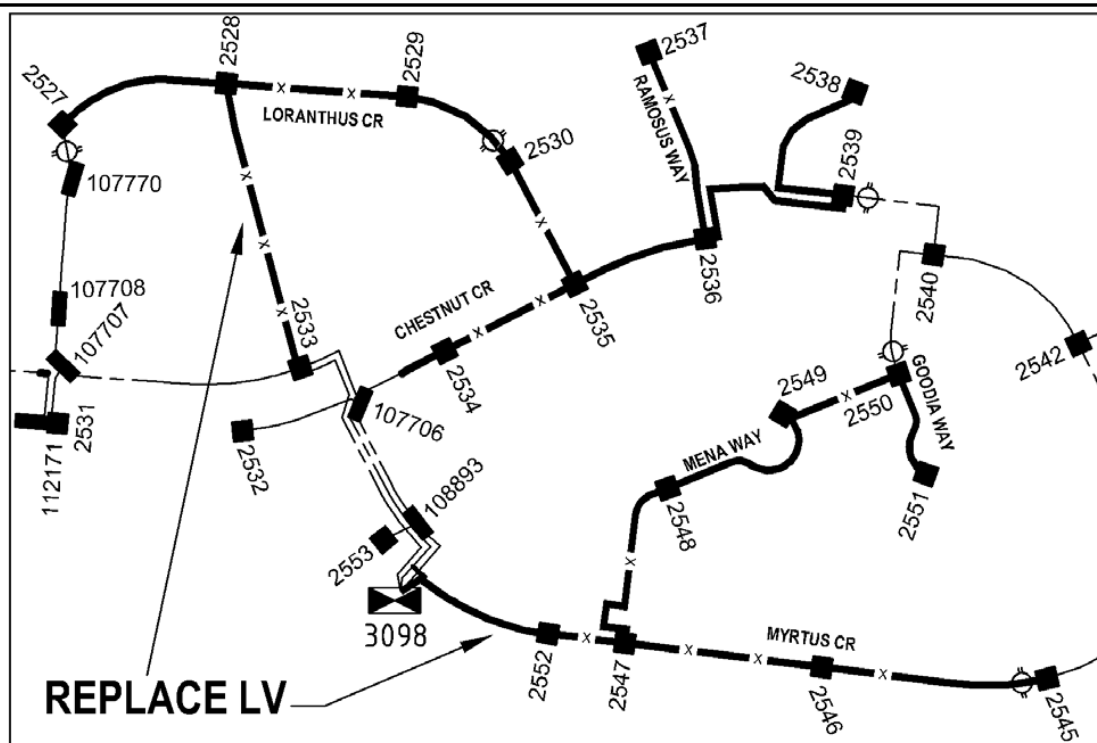
Description Of Works	Length (km)
Replace existing LV CONSAC cable along Myrtus Crescent, Mena and Goodia Way, from Sub 3098 to Columns 2551 & 2545.	0.39
Replace existing LV CONSAC cable along Chestnut Crescent, from LVSTJ location (west of Column 2534) to columns 2530, 2537, 2538 & 2539.	0.35
Replace existing LV CONSAC cable along Loranthus Cr & through easement between Loranthus & Chestnut Cr's, from Columns 2527, 2530 & 2533.	0.23

Estimated Total Project Cost:

\$727,500

Remarks

Planning cost estimate based on historical rate of \$750k/km.



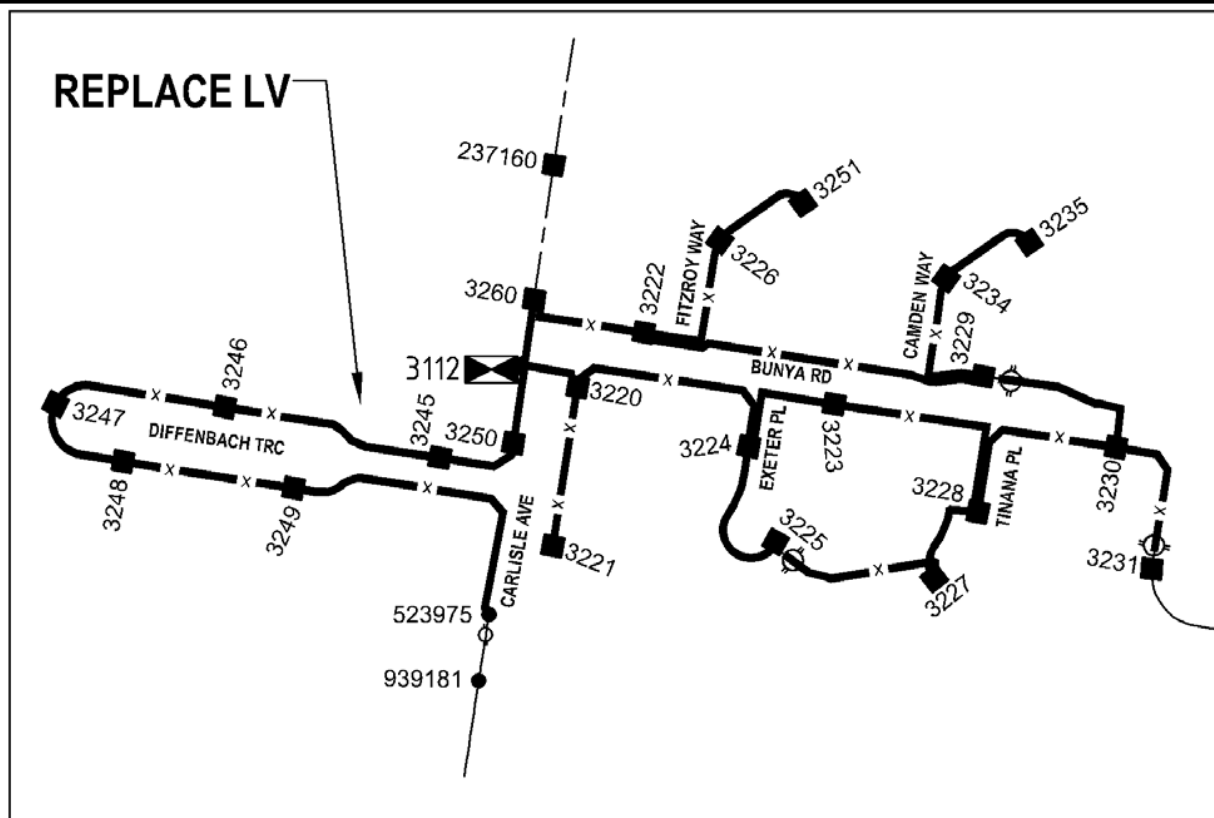
Asset Strategy & Planning

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC cable along Carlisle Ave & Dieffenbach Trc, from Sub 3112 to Pole 523975.	0.44
Replace existing LV CONSAC cable along Carlisle Ave, Bunya, Fitzroy & Camden Ways, from Sub 3112 to Columns 3260, 3251, 3235 & 3229.	0.4
Replace existing LV CONSAC cable along Carlisle Ave, Bunya Way , Exeter & Tinana Pl's, from Sub 3112 to Columns 3221, 3225, 3227 & 3231.	0.7

\$1,155,000

Planning cost estimate based on historical delivery of \$750k/km.



Zone: **Quakers Hill, 9554**
 Feeder: **B719A – Nirimba**
 Location: **Ridgeway Cr, Quakers Hill**

Item No: **CRN04315** Amd No: **0**
 LG Area: **BCC**
 Prepared: **Peter Scholte**

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

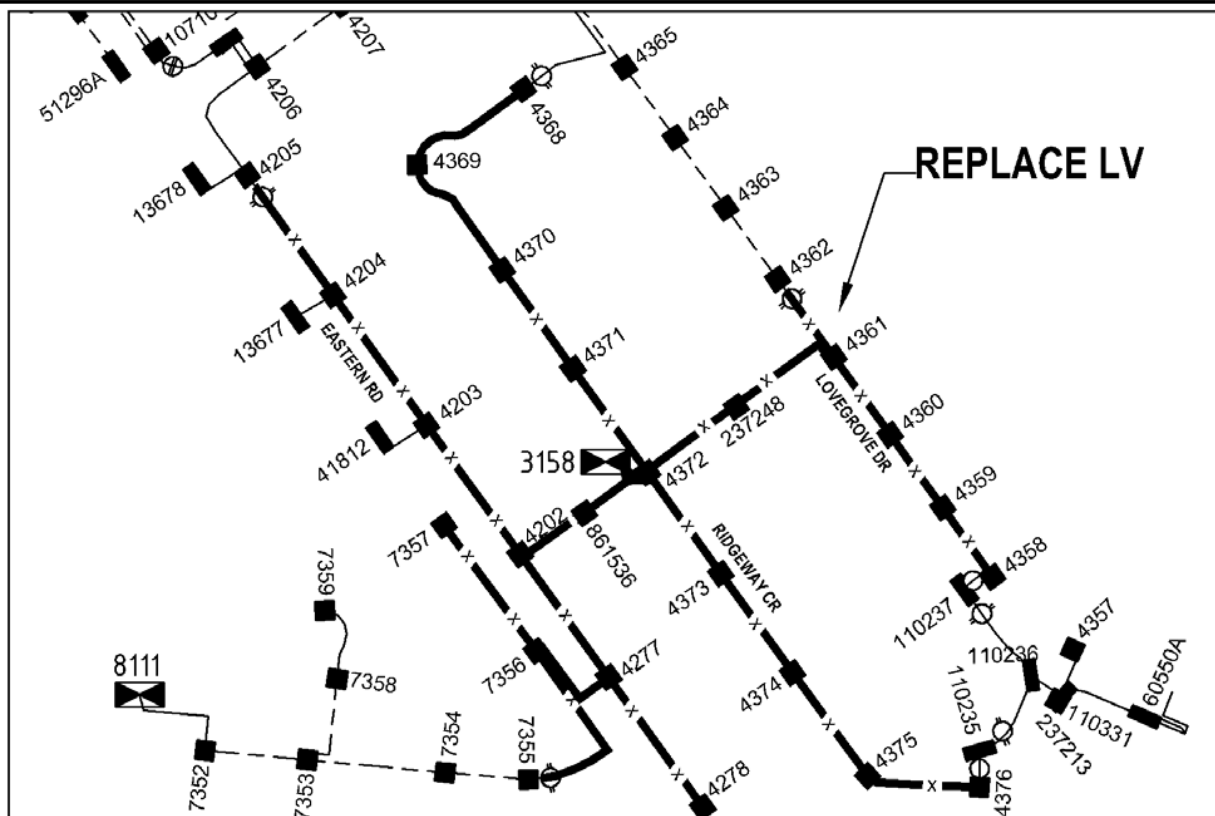
Description Of Works	Length (km)
Replace existing LV CONSAC cable along Ridgeway Cres from Sub 3158 to Column 4368.	0.25
Replace existing LV CONSAC cable through easement & along Lovergrove Dr, from Sub 3158 to Columns 4362 & 4358.	0.28
Replace existing LV CONSAC cable along Ridgeway Cres, from Sub 3158 to Column 4376.	0.23
Replace existing LV CONSAC cable through easement and along Eastern Rd, from Sub 3158 to Columns 4278, 7355, 7357 & 4205.	0.62

Estimated Total Project Cost:

\$1,035,000

Remarks

Planning cost estimate based on historical rate of \$750k/km.



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DS006 – LV CONSAC Replacement Program 2018/19Zone: **Plumpton, 9542**Item No: **CRN04316**Amd No: **0**Feeder: **8685 – Popondetta Rd**LG Area: **BCC**Location: **Bennet Gr, Bidwell**Prepared: **Peter Scholte****Reason for Works**

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC east along Bennett Grove from Sub 6664 to column 764.	0.05
Replace existing LV CONSAC west along Bennett Grove from Sub 6664 to column 748.	0.24
Replace existing LV CONSAC along Bennett Grove and Popondetta Road from Sub 6664 to column 754.	0.27

Estimated Total Project Cost:**\$420,000****Remarks**

Planning cost estimate based on historical rate of \$750k/km.

DS006 – LV CONSAC Replacement Program 2018/19

Zone: Plumpton, 9542	Item No: CRN04317	Amd No: 0
Feeder: 8685 – Popondetta Rd	LG Area: BCC	
Location: Pine Cr, Bidwell	Prepared: Peter Scholte	

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC along Pine Crescent and Amelia Way from Sub 6738 to columns 2664 and 2666.	0.3
Replace existing LV CONSAC along Pine Crescent and Carne Way from Sub 6738 to columns 2643 and 2645.	0.3
Replace existing LV CONSAC along Carne Way from Sub 6738 to column 2645.	0.16
Replace existing LV CONSAC along Pine Crescent and Amelia Way from Sub 6738 to columns 2656 and 2666.	0.2

Estimated Total Project Cost:**\$720,000****Remarks**

Planning cost estimate based on historical delivery of \$750k/km.

DS006 – LV CONSAC Replacement Program 2018/19Zone: **Plumpton, 9542**Item No: **CRN04318**Amd No: **0**Feeder: **8679 – Hardy St**LG Area: **BCC**Location: **Luxford Rd, Shalvey**Prepared: **Mark Alexander****Reason for Works**

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC along Luxford Road to Segman Crescent from Sub 6978 to column 1717.	0.58
Replace existing LV CONSAC along Luxford Road and Bradman Road from Sub 6978 to columns 717870 and 590.	0.35
Replace existing LV CONSAC along Luxford Road from Sub 6978 to column 717926.	0.2
Replace existing LV CONSAC along Luxford Road from Sub 6978 to column 717927.	0.19
Replace existing LV CONSAC along Luxford Road, Emerson Street, Stolle Street and Dent place from Sub 6978 to columns 122349, 1754 and 510830.	0.36
Estimated Total Project Cost:	\$1,260,000

Remarks

Planning cost estimate based on historical delivery of \$750k/km.

Zone: **Plumpton, 9542**
 Feeder: **8679 – Hardy St**
 Location: **Sedgman Cr, Shalvey**

Item No: **CRN04319** Amd No: **0**
 LG Area: **BCC**
 Prepared: **Peter Scholte**

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

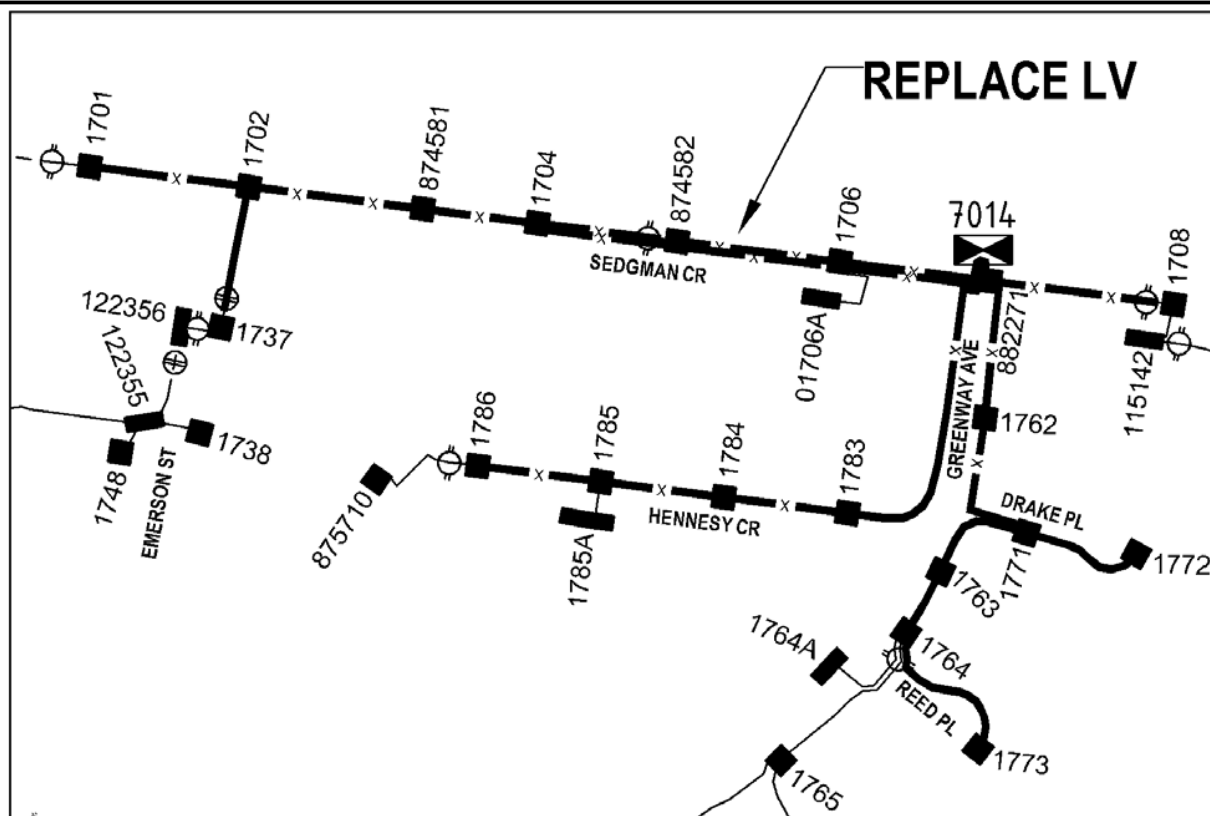
Description Of Works	Length (km)
Replace existing LV CONSAC along Sedgman Road from Sub 7014 to column 1708.	0.075
Replace existing LV CONSAC along Sedgman Road from Sub 7014 to columns 874582, 1748 and 1701.	0.45
Replace existing LV CONSAC along Sedgman Road and Greenway Avenue from Sub 7014 to columns 874582, 882271 and 1786.	0.375
Replace existing LV CONSAC along Greenway Avenue from Sub 7014 to columns 1772, 1764 and 1773.	0.3

Estimated Total Project Cost:

\$900,000

Remarks

Planning cost estimate based on historical delivery of \$750k/km.

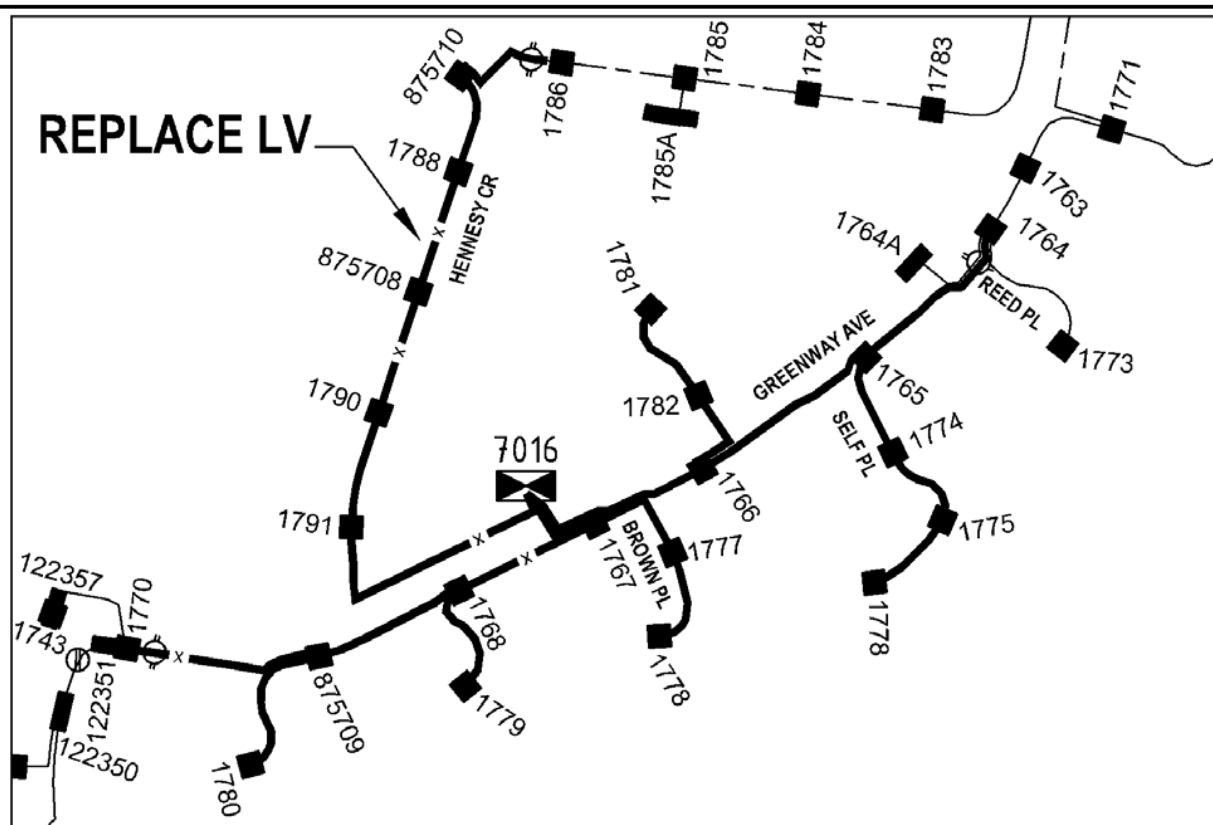


Asset Strategy & Planning

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Estimated Total Project Cost: **\$900,000**

Planning cost estimate based on historical delivery of \$750k/km.



DS006 – LV CONSAC Replacement Program 2018/19

Zone: Plumpton, 9542	Item No: CRN04384	Amd No: 0
Feeder: 8679 – Hardy St	LG Area: BCC	
Location: Palm Place, Bidwell	Prepared: Mark Alexander	

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC from DSUB 6706 as per drawing number 381404.	1.43

Estimated Total Project Cost:	\$1,072,500
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Remarks

Planning cost estimate based on historical delivery of \$750k/km.

Zone: **Plumpton, 9542**Item No: **CRN04385**Amd No: **0**Feeder: **8679 – Hardy St**LG Area: **BCC**Location: **Luxford Road, Bidwell**Prepared: **Mark Alexander****Reason for Works**

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC along Water Lily Tce and Luxford Road from Sub 3109 to Columns 3181, 3179 and 3178.	0.6
Replace existing LV CONSAC along Acacia Tce from Sub 3109 to Column 3126.	0.23
Replace existing LV CONSAC around Wide Bay CCT from Sub 3109 to Columns 3119, east to S112970 and west to 3122.	0.42

Estimated Total Project Cost:**\$787,500****Remarks**

Planning cost estimate based on historical delivery of \$750k/km.

DS006 – LV CONSAC Replacement Program 2018/19

Zone:	Plumpton, 9542	Item No:	CRN04386	Amd No:	0
Feeder:	8679 – Hardy St	LG Area:	BCC		
Location:	Chestnut Cresent, Bidwell	Prepared:	Mark Alexander		

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC along Cupania Cresent from SUB 3093 to column 2517.	0.23
Replace existing LV CONSAC along Chestnut Cresent from SUB 3093 to columns 2156, 77173 and 77176.	0.45
Replace existing LV CONSAC along east side of Capparis CCT from SUB 3093 to column 2508.	0.37
Replace existing LV CONSAC along west side of Capparis CCT from SUB 3093 to columns 2508 and 2510.	0.38

Estimated Total Project Cost:	\$1,072,500
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Remarks

Planning cost estimate based on historical delivery of \$750k/km.

DS006 – LV CONSAC Replacement Program 2018/19

Zone: Plumpton, 9542	Item No: CRN04387	Amd No: 0
Feeder: 8679 – Hardy St	LG Area: PENCC	
Location: York Road, Penrith	Prepared: Mark Alexander	

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existining LV CONSAC along York Road from Sub 7103 to column 4526.	0.25
Replace existining LV CONSAC along Charkers Street from Sub 7103 to column 4909.	0.11
Replace existining LV CONSAC along York Road from Sub 7103 to column 4913.	0.05
Replace existining LV CONSAC along York Road from Sub 7103 to columns 4034 and 894293.	0.35
Replace existining LV CONSAC along Tudara Road and Moolana Parade from Sub 7103 to columns 4531, 144542, 4063 and 4061.	0.5
Estimated Total Project Cost:	\$720,000

Remarks

Planning cost estimate based on historical delivery of \$750k/km.

Zone: Plumpton, 9542	Item No: CRN04388	Amd No: 0
Feeder: 8679 – Hardy St	LG Area: PENCC	
Location: Kiparra Crescent, Penrith	Prepared: Mark Alexander	

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC from DSUB 7066 as per drawing number 386347.	1.1
Replace existing LV CONSAC from DSUB 7066 as per drawing number 393490.	0.195

Estimated Total Project Cost:	\$975,000
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Remarks

Planning cost estimate based on historical delivery of \$750k/km.

DS006 – LV CONSAC Replacement Program 2018/19

Zone: Plumpton, 9542	Item No: CRN04389	Amd No: 0
Feeder: 8679 – Hardy St	LG Area: PENCC	
Location: Birmingham Road, Penrith	Prepared: Mark Alexander	

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC from DSUB 16498 as per drawing number 392172.	0.375

Estimated Total Project Cost:	\$281,250
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Remarks

Planning cost estimate based on historical delivery of \$750k/km.

DS006 – LV CONSAC Replacement Program 2018/19Zone: **Plumpton, 9542**Item No: **CRN04390**Amd No: **0**Feeder: **8679 – Hardy St**LG Area: **PENCC**Location: **Ikin Street, Penrith**Prepared: **Mark Alexander****Reason for Works**

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC along Ikin Street and Enfield Street from Sub 7070 to columns 890371, 2942 and 2952.	0.5
Replace existing LV CONSAC along Abberon Street, Crest Place and Brendon Place from Sub 7070 to columns 2945, 2944, and 2939.	0.45

Estimated Total Project Cost:**\$712,500****Remarks**

Planning cost estimate based on historical delivery of \$750k/km.

DS006 – LV CONSAC Replacement Program 2018/19

Zone:	Plumpton, 9542	Item No:	CRN04391	Amd No:	0
Feeder:	8679 – Hardy St	LG Area:	PENCC		
Location:	Kempsey Street, Penrith	Prepared:	Mark Alexander		

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC from DSUB 7071 as per drawing number 391286.	1.06

Estimated Total Project Cost:	\$795,000
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Remarks

Planning cost estimate based on historical delivery of \$750k/km.

Zone: **Plumpton, 9542**Item No: **CRN04392**Amd No: **0**Feeder: **8679 – Hardy St**LG Area: **PENCC**Location: **Lilac Place, Penrith**Prepared: **Mark Alexander****Reason for Works**

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC from DSUB 15584 as per drawing number 392345.	0.145

Estimated Total Project Cost:**\$108,750****Remarks**

Planning cost estimate based on historical delivery of \$750k/km.

DS006 – LV CONSAC Replacement Program 2018/19

Zone:	Plumpton, 9542	Item No:	CRN04393	Amd No:	0
Feeder:	8679 – Hardy St	LG Area:	PENCC		
Location:	Malcom Avenue, Werrington	Prepared:	Mark Alexander		

Reason for Works

Monitoring of the LV network has indicated the CONSAC in this area requires replacement.

Description Of Works	Length (km)
Replace existing LV CONSAC from DSUB 7063 as per drawing number 391420.	0.65

Estimated Total Project Cost:	\$487,500
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Remarks

Planning cost estimate based on historical delivery of \$750k/km.

APPENDIX C – ONGOING DESIGN WORKS

(To be provided by AS&P April 2018)