Environmental Impact Statement

WELLINGTON NORTH SOLAR PLANT

AUGUST 2018

www.nghenvironmental.com.au

Document Verification

Project Title: Wellington North Solar Plant

Project Number:	17-382
Project File Name:	Wellington North Solar Plant EIS Final v2.2

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Final v2.2	10/08/18	Jane Blomfield	Minor changes	Brooke Marshall

NGH Environmental prints all documents on environmentally sustainable paper including paper made from bagasse (a by-product of sugar production) or recycled paper.

NGH Environmental Pty Ltd (ACN: 124 444 622. ABN: 31 124 444 622) and NGH Environmental (Heritage) Pty Ltd (ACN: 603 938 549. ABN: 62 603 938 549) are part of the NGH Environmental Group of Companies.

www.nghenvironmental.com.au

e: ngh@nghenvironmental.com.au

Bega - ACT and South East NSW
suite 1, 216 carp st (po box 470)
bega nsw 2550 (t 02 6492 8333)

Sydney Region
18/21 mary st
surry hills nsw 2010 (t 02 8202 8333)

Canberra - NSW SE & ACT
8/27 yallourn st (po box 62)
fyshwick act 2609 (t 02 6280 5053)

Brisbane
8 trawalla st
the gap qld 4061 (t 07 3511 0238)

Newcastle - Hunter and North Coast
7/11 union st
newcastle west nsw 2302 (t 02 4929 2301)

Wagga Wagga - Riverina and Western NSW
suite 1, 39 fitzmaurice st (po box 5464)
wagga wagga nsw 2650 (t 02 6971 9696)

Bathurst - Central West and Orana
35 morrisset st (po box 434)
bathurst nsw 2795 (t 02 6331 4541)

CONTENTS

EXECUTIVE SUMMARY xiv

1 INTRODUCTION 1

1.1 PURPOSE OF THIS REPORT 1

1.2 PROPOSAL OVERVIEW 1

1.2.1 The Proposal locality 1

1.2.2 The Proposal site 4

1.2.3 Key components of the Proposal 9

1.3 THE PROPONENT 13

2 OBJECTIVES, PROJECT NEED AND BENEFITS 13

2.1 PROPOSAL OBJECTIVES 13

2.2 PROJECT NEED AND BENEFITS 14

2.2.1 Climate change mitigation 14

2.2.2 Electricity reliability and security benefits 16

2.2.3 Socio-economic benefits 17

3 SELECTION OF THE PREFERRED OPTION 18

3.1 EVALUATION OF ALTERNATIVES 18

3.2 THE 'DO NOTHING' OPTION 19

3.3 ALTERNATIVE SITE LOCATIONS 19

3.4 ALTERNATIVE TECHNOLOGIES 20

3.4.1 Generation technology 20

3.5 SCALE OF THE PROPOSAL 21

3.6 CONSIDERATION OF OTHER LAND USES IN SITE SELECTION 21

3.7 PREFERRED OPTION 22

3.8 PROJECT JUSTIFICATION 22

4 THE PROPOSAL 22

4.1 SUMMARY TABLE 22

4.2 PROPOSAL LAYOUT 24

4.3 PROPOSED INFRASTRUCTURE 25

4.3.1 Solar arrays 26

4.3.2 Power conversion stations 28

4.3.3 Medium voltage collection systems 29

4.3.4 Transmission network connection 30

4.3.5 Ancillary infrastructure 30
4.3.6 Site access and internal tracks 31
4.3.7 Security fencing and visual screening 32
4.4 EARLY WORKS 33
4.5 CONSTRUCTION 33
4.5.1 Construction activities 33
4.5.2 Site preparation and earthworks 33
4.5.3 Materials and resources 34
4.5.4 Transport and access 35
4.5.5 Hours of operation during construction 38
4.6 OPERATION 38
4.6.1 Activities during operation 38
4.6.2 Water requirements 39
4.6.3 Personnel and work hours 39
4.6.4 CCTV and Lighting 39
4.6.5 Refurbishment and upgrading 40
4.7 DECOMMISSIONING AND REHABILITATION 40
4.8 INDICATIVE TIMELINE 40
4.9 CAPITAL INVESTMENT 40
5 PLANNING CONTEXT 41
5.1 ASSESSMENT CONTEXT 41
5.2 ENVIRONMENTAL PLANNING INSTRUMENTS 41
5.2.1 State Environmental Planning Policies 42
5.2.2 Local Environmental Plans 45
5.3 NSW LEGISLATION 46
5.3.1 Legislation to be applied 46
5.3.2 Approvals that do not apply 47
5.3.3 Other relevant State legislation 47
5.4 COMMONWEALTH LEGISLATION 49
5.4.1 Environmental Protection and Biodiversity Conservation Act 1999 49
5.4.2 Native Title Act 1993 50
5.4.3 Renewable Energy (Electricity) Act 2000 51
5.5 OTHER RELEVANT POLICIES AND MATTERS 51
5.5.1 Matters of consideration 51

5.5.2 Ecologically Sustainable Development 53
5.6 APPROVALS AND LICENCES 54
6 CONSULTATION 55
6.1 AFFECTED LANDOWNER, COMMUNITY AND LOCAL GOVERNMENT CONSULTATION 55
6.1.1 Community & Stakeholder Engagement Plan 55
6.1.2 Community and local government consultation activities to date 56
6.1.3 Summary and outcomes of affected landowner, community and local government consultation to date 58
6.1.4 Benefit sharing with the local community 66
6.2 ABORIGINAL COMMUNITY CONSULTATION 66
6.2.1 Aboriginal Community Feedback 68
6.3 MINERAL TITLE HOLDER, EXPLORATION LICENCE HOLDER AND QUARRY OPERATOR CONSULTATION 68
6.3.1 Mineral titles holder and exploration licence holder consultation 68
6.3.2 Quarry operator consultation 69
6.4 AGENCY STATE GOVERNMENT CONSULTATION 69
6.4.1 Secretary's environmental assessment requirements (SEARs) 69
6.4.2 Relevant EPIs, policies, guidelines and plans 73
6.4.3 Agencies additional comments and consultation 75
6.5 COMMONWEALTH GOVERNMENT CONSULTATION 80
6.6 INFRASTRUCTURE AND SERVICE PROVIDER CONSULTATION 80
6.7 FUTURE AND ONGOING CONSULTATION 81
7 ASSESSMENT OF KEY ISSUES 81
7.1 BIODIVERSITY 81
7.1.1 Approach 81
7.1.2 Existing environment 82
7.1.3 Potential impacts 95
7.1.4 Loss of species credit species habitat or individuals 97
7.1.5 Loss of hollow-bearing trees 97
7.1.6 Offset requirements 99
7.1.7 Safeguards and mitigation measures 104
7.2 ABORIGINAL HERITAGE 105
7.2.1 Approach 105
7.2.2 Archaeological Context 106
7.2.3 Survey results 106

7.2.4 Potential impacts ... 109
7.2.5 Safeguards and mitigation measures ... 113
7.3 NOISE AND VIBRATION ... 114
7.3.1 Approach ... 114
7.3.2 Existing environment ... 114
7.3.3 Noise monitoring ... 115
7.3.4 Construction noise impact assessment ... 117
7.3.5 Operational noise assessment ... 122
7.3.6 Vibration assessment ... 127
7.3.7 Road traffic noise assessment ... 128
7.3.8 Cumulative assessment ... 129
7.3.9 Safeguards and mitigation measures ... 133
7.4 VISUAL IMPACT ASSESSMENT ... 134
7.4.1 Approach ... 134
7.4.2 Results ... 134
7.4.3 Potential impacts ... 136
7.4.4 Safeguard and mitigation measures ... 156
7.5 SOILS AND AGRICULTURAL LAND CAPABILITY ... 157
7.5.1 Approach and methods ... 157
7.5.2 Existing environment ... 158
7.5.3 Potential impacts ... 164
7.5.4 Safeguards and mitigation measures ... 173
7.6 COMPATIBILITY WITH EXISTING LAND USES ... 175
7.6.1 Approach and methods ... 175
7.6.2 Existing environment ... 175
7.6.3 Potential impacts ... 180
7.6.4 Safeguards and mitigation measures ... 182
7.7 HISTORIC HERITAGE ... 182
7.7.1 Approach ... 182
7.7.2 Results ... 182
7.7.3 Heritage significance ... 186
7.7.4 Historical background relevant to the Proposal site and Noonee Nyrang Homestead ... 188
7.7.5 NSW historical themes ... 189
7.7.6 Site inspection ... 189
7.7.7 Potential impacts ... 194

7.7.8 Safeguards and mitigation measures 200
7.8 FLOODING 200
7.8.1 Existing environment 200
7.8.2 Potential impacts 204
7.8.3 Safeguards and mitigation measures 206
7.9 TRAFFIC TRANSPORT AND SAFETY 206
7.9.1 Existing environment 206
7.9.2 Potential impacts 217
7.9.3 Safeguards and mitigation measures 222
8 ASSESSMENT OF ADDITIONAL ISSUES 224
8.1 WATER QUALITY AND WATER USE 224
8.1.1 Existing environment 224
8.1.2 Potential impacts 231
8.1.3 Safeguards and mitigation measures 233
8.2 SOCIAL AND ECONOMIC IMPACTS 234
8.2.1 Background 234
8.2.2 Potential impacts 237
8.2.3 Safeguards and mitigation measures 238
8.3 BUSHFIRE 239
8.3.1 Existing environment 239
8.3.2 Potential impacts 240
8.3.3 Mitigation measures 241
8.4 ELECTROMAGNETIC FIELDS 243
8.4.1 Existing environment 243
8.4.2 Potential impacts 246
8.4.3 Mitigation measures 246
8.5 AIR QUALITY AND CLIMATE 247
8.5.1 Existing environment 247
8.5.2 Criteria 249
8.5.3 Potential impacts 249
8.5.4 Safeguards and mitigation measures 252
8.6 RESOURCE USE AND WASTE GENERATION 253
8.6.1 Resource use and energy payback 253
8.6.2 Waste 254

8.6.3 Potential impacts 255
8.6.4 Safeguards and mitigation measures 256
8.7 CUMULATIVE IMPACTS 257
8.7.1 Existing environment 257
8.7.2 Potential impacts 258
8.7.3 Environmental safeguards 261
9 ENVIRONMENTAL MANAGEMENT 262
9.1 ENVIRONMENTAL MANAGEMENT FRAMEWORK 262
9.2 CONSOLIDATED MITIGATION MEASURES 263
10 CONCLUSION 277
10.1 PROPOSAL OVERVIEW 277
10.2 BENEFITS OF AND NEED FOR THE PROPOSAL 277
10.3 ENVIRONMENTAL IMPACTS AND MANAGEMENT 277
10.4 ABILITY TO BE APPROVED 278
11 REFERENCES 279
APPENDIX A SECRETARYS ENVIRONMENTAL ASSESSMEMENT REQUIREMENTS ..... A-I
APPENDIX B PROPOSAL PLANS ..... B-I
APPENDIX C CONSULTATION ..... C-I
APPENDIX D MINERAL TITLES EXPLORATION LICENCE HOLDER CONSULTATION ..... D-I
APPENDIX E BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT ..... E-II
APPENDIX F ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT ..... F-I
APPENDIX G NOISE ASSESSMENT ..... G-I
APPENDIX H VISUAL IMPACT ASSESSMENT ..... H-I
APPENDIX I SOIL SURVEYS ..... I-I
APPENDIX J HYDROLOGY REPORT ..... J-I
APPENDIX K TRAFFIC IMPACT ASSESSMENT ..... K-I

TABLES

Table 1-1 Proposal site. xxi
Table 1-1 Proposal site. 4
Table 2-1 Objectives of the Wellington North Solar Plant proposal. 13
Table 4-1 Summary of the key features of the Proposal. 23
Table 4-2 Estimated machinery and equipment 34

Table 4-3 Estimated material resources. 35

Table 4-4 Estimated traffic volumes and requirements for the Wellington North Solar Plant. 37

Table 4-5 Indicative timeline. 40

Table 5-1 Rural Lands SEPP Planning Principles. 43

Table 5-2 Summary of EPBC Act Protected Matters Report search results 50

Table 5-3 Matters for consideration 51

Table 5-4 Assessment of the Proposal against the principles of ESD 53

Table 5-5 Summary of licences and approvals required for the Proposal. 55

Table 6-1 SEARSs and where they are addressed in the EIS. 69

Table 6-2 Relevant EPIs, policies, guidelines and plans and where they are addressed in the EIS. 74

Table 6-3 Additional State Government authority comments, where they are addressed in the EIS and consultation. 75

Table 7-1 Candidate species credit species returned from the BAM Calculator as requiring assessment. 90

Table 7-2 Table of current and future vegetation integrity scores for each vegetation zone within the development footprint (solar arrays, laydown area, roads infrastructure). 96

Table 7-3 Table of current and future vegetation integrity scores for each vegetation zone within the Western Transmission Line Option 96

Table 7-4 Table of current and future vegetation integrity scores for each vegetation zone within the Eastern Transmission Line Option 96

Table 7-5 Summary of species credit species loss at the Proposal site 97

Table 7-6 Hollow bearing trees impacted by the Proposal 97

Table 7-7 Credit requirement for the Proposal – Eastern Transmission Line option. 100

Table 7-8 Credit Requirement for the Proposal - Western Transmission Line option 100

Table 7-9 Safeguards and mitigation measures for biodiversity impacts. 104

Table 7-10 Identified risk to known sites. 109

Table 7-11 Safeguards and mitigation measures for Aboriginal heritage 113

Table 7-12 Measured existing background (L_{90}) & ambient (L_{eq}) noise levels, dB(A). 115

Table 7-13 Rating Background Noise Level, dB(A). 115

Table 7-14 Noise management levels at residential receivers 117

Table 7-15 Construction noise management levels at residential receivers 117

Table 7-16 Construction Noise Management Levels at other Noise Sensitive Land Uses 118

Table 7-17 Construction equipment sound power levels within Proposal site. 118

Table 7-18 Construction equipment sound power levels for transmission line construction. 119

Table 7-19 Predicted $L_{Aeq\ 15\ min}$ construction noise levels at receiver locations for works with the Proposal site. 120

Table 7-20 Predicted $L_{Aeq\ 15\ min}$ construction noise levels at receiver locations for works within the transmission line options. 121

Table 7-21 Relative effectiveness of various forms of noise control, dB(A) 122

Table 7-22 NPfl Proposal Specific criteria 122

Table 7-23 Intrusiveness noise criteria 122

Table 7-24 Applicable amenity noise criteria..... 123

Table 7-25 Proposal Noise Trigger Levels, dB(A)..... 124

Table 7-26 Typical operational plant and equipment and sound power levels for the Proposal..... 125

Table 7-27 Predicted $L_{Aeq\ 15min}$ operational noise levels at residential receiver locations, dB(A). 126

Table 7-28 Predicted $L_{Aeq\ 15min}$ operational noise levels at other sensitive receiver locations, dB(A)..... 126

Table 7-29 Potential vibration Impacts for Identified receivers..... 127

Table 7-30 RNP Road Traffic Noise Criteria, dB(A) 128

Table 7-31 Summary of estimated construction traffic volumes during peak..... 128

Table 7-32 Predicted road traffic noise contribution levels along public roads, dB(A)..... 129

Table 7-33 Predicted $L_{Aeq\ 15\ min}$ cumulative construction noise levels from Wellington North Solar Plant and Wellington Solar Farm..... 130

Table 7-34 Predicted $L_{Aeq\ 15\ min}$ cumulative construction noise levels from Wellington Solar Farm and Wellington North Solar Plant's transmission line options..... 130

Table 7-33 Predicted $L_{Aeq\ 15min}$ cumulative operational noise levels at residential receiver locations, dB(A). 132

Table 7-34 Safeguards and mitigation measures for noise impacts 133

Table 7-35 Visual sensitivity criteria. 136

Table 7-36 Visual impact criteria. 137

Table 7-37 Viewpoint analysis. 139

Table 7-38 Safeguards and mitigation measures for visual impacts 156

Table 7-39 Potential landscape limitations of Ferrosols. 158

Table 7-40 Land and soil capability class 3 and 4(OEH, 2012). 161

Table 7-41 LURA probability and consequence evaluation system. 168

Table 7-42 Land use conflict assessment from the Proposal. 170

Table 7-43 Safeguards and mitigation measures for land use, resources and soil 173

Table 7-44 ELs relevant to the Proposal site. 177

Table 7-45 Safeguards and mitigation measures for land use, resources and soil 182

Table 7-46 Summary of heritage listed items in the former Wellington Council LGA. 182

Table 7-47 Locally listed heritage items within and in close proximity of the Proposal site. 183

Table 7-48 NSW Heritage Assessment Criteria. 186

Table 7-49 Noonee Nyrang Homestead SHI listing. 187

Table 7-50 NSW historical themes. 189

Table 7-51 Modified Cowan method for estimation of floodplain roughness. 205

Table 7-52 Safeguards and mitigation measures for flooding impacts 206

Table 7-53 Road network key features. 208

Table 7-54 Peak hour average surveyed traffic volume on the surrounding road network 215

Table 7-55 Key traffic data summary. 215

Table 7-56 Mid-block level of service (peak flows per direction) 219

Table 7-57 Peak hour mid-block level of service. 219

Table 7-58 Safeguards and mitigation measures for traffic, transport and road safety impacts 222

Table 8-1 Tributaries onsite. 224

Table 8-2 Safeguards and mitigation measures for water quality and water use impacts. 233

Table 8-3 Statistical overview of Dubbo, Wellington, Bodangora and Geurie (ABS, 2016). 234

Table 8-4 Safeguards and mitigation measures for Community and Socio-economic impacts 238

Table 8-5 Mitigation measures for bushfire. 241

Table 8-6 ICNIRP reference levels (ICNIRP, 2010) 244

Table 8-7 Mitigation measures for hazards 246

Table 8-8 Wellington weather station (site number 065034). 247

Table 8-9 Air quality sensitive receivers 249

Table 8-10 Comparison of CO_2 equivalent emissions produced per kilowatt hour. 252

Table 8-11 Safeguards and mitigation measures for climate and air quality impacts 252

Table 8-12 Resource requirements for the Proposal Wellington North Solar Plant. 253

Table 8-13 Safeguards and mitigation measures for resource use and waste generation impacts 256

Table 9-1 Consolidated list of mitigation measures 263

FIGURES

Figure 1-1 Location of the Proposal site. 3

Figure 1-2 Cropped paddock in Proposal site. 5

Figure 1-3 Improved pasture in Proposal site. 6

Figure 1-4 Waterway located in solar plant site. 7

Figure 1-5 Ephemeral waterway located in solar plant site. 7

Figure 1-6 Heritage listed dwelling at solar plant site. 8

Figure 1-7 Soil Conservation Service; main building. 8

Figure 1-8 Indicative Proposal layout. 11

Figure 1-9 Proposal layout in the context of the site's constraints. 12

Figure 3-1 The existing Wellington Substation is identified as a Connection Opportunity (TransGrid, 2018). 20

Figure 4-1 Typical fixed array solar plant - Nyngan NSW (Nyngan Solar Plant is owned by the Powering Australian Renewables Fund (PARF). Image courtesy of PARF). 26

Figure 4-2 Example of typical panel framing (Image courtesy of PARF). 27

Figure 4-3 Typical single axis tracking system (panels in landscape). 27

Figure 4-4 Typical pile driving unit (Image courtesy of PARF). 28

Figure 4-5 Typical containerised PCS (courtesy: SMA) 29

Figure 4-6 Typical PCS (courtesy: Power Electronics). 29

Figure 4-7 Examples of a crossing on small intermittent watercourse (DPI, 2012). 32

Figure 4-8 Example of a fish passage friendly water crossing (DPI, 2012). 32

Figure 4-9 Typical BAR and BAL intersections proposed for Cobbora Road and Campbells Lane, and for Campbells Lane and the main site access. 36

Figure 4-10 Typical BAR and BAL treatments showing shoulder treatments. 37

Figure 4-11 -– Estimated single tips per day per month of construction. 38

Figure 7-1 Example of White Box woodland in the Proposal site. 84

Figure 7-2 Example of White Box Woodland planted within the Proposal site. 84

Figure 7-3 Example of White Box Woodland derived grassland within the Proposal site. 85

Figure 7-4 Example of Yellow Box Woodland in the Proposal site. 85

Figure 7-5 Example of Yellow Box Planted Woodland in the Proposal site. 86

Figure 7-6 Example of Yellow Box Woodland derived grassland in the Proposal site. 86

Figure 7-7 Vegetation zones within the Proposal site (north). 87

Figure 7-8 Vegetation zones within the Proposal site (south). 88

Figure 7-9 Threatened species polygons and targeted survey locations (north). 93

Figure 7-10 Threatened species polygons and targeted survey locations (south). 94

Figure 7-11 Impacts requiring offset, not requiring offset and not requiring assessment (north). 102

Figure 7-12 Impacts requiring offset, not requiring offset and not requiring assessment (south). 103

Figure 7-13 Heritage assessment survey results. 108

Figure 7-14 Residential receivers and noise monitoring locations adjacent to the Proposal site (Renzo Tonin, 2018). 116

Figure 7-15 Viewpoint assessment locations and photomontages locations. 138

Figure 7-16 Indicative view of the Proposal from Goolma Road (Viewpoint 05). 152

Figure 7-17 Indicative view of the Proposal from Goolma Road (Viewpoint 07). 152

Figure 7-18 Indicative view of the Proposal from Cobbora Road (Viewpoint 12). 153

Figure 7-19 Indicative view of the Proposal from Cobbora Road (Viewpoint 13). 153

Figure 7-20 Potential contamination environment in the southern section of solar plant site. 159

Figure 7-21 Potential contamination in the southern section of solar plant site. 160

Figure 7-22 Biophysical Strategic Agricultural Land (BSAL) mapping for the Proposal site. 163

Figure 7-23 Exploration Licences, Proposal site and substation outlined in red. Transmission line options in orange. 179

Figure 7-24 Comparative reflection analysis (Spaven Consulting, 2011). 181

Figure 7-25 Noonee Nyrang Homestead. 184

Figure 7-26 Narrawa Homestead..... 185

Figure 7-27 Keston Homestead. 185

Figure 7-28 Nanima Homestead..... 186

Figure 7-29 Photos of the main house features..... 190

Figure 7-30 Photos of stone shed, out buildings and old farming equipment surrounding the homestead. 191

Figure 7-31 View west of the stone trough. 192

Figure 7-32 View south of the stone culvert at creek crossing. 192

Figure 7-33 View south of European Survey Marker Tree. 192

Figure 7-34 Close-up of European Survey Marker Tree. 192

Figure 7-35 Photos of SCS..... 194

Figure 7-36 Noonee Nyrang Homestead and out buildings and the proposed development footprint for the Wellington North Solar Plant..... 197

Figure 7-37 Historical items (listed and non-listed) within and in close proximity to the solar plant Proposal site. 198

Figure 7-38 Wellington Soil Conservation Research Centre and the proposed development footprint for the Wellington North Solar Plant..... 199

Figure 7-39 Flood Risk Information Map, solar plant site in red (i.e. excludes transmission lines; Geoscience Australia 2018) 201

Figure 7-40 Flood Planning Area, solar plant site in red (DPE 2018). 202

Figure 7-41 Waterways and stream orders (blue) within the solar plant site (red) (Footprint, 2018)..... 203

Figure 7-42 Terrain analysis over solar plant site (1m contour interval)..... 204

Figure 7-43 Road network near Proposal site (GHD 2018). 207

Figure 7-44 Cobbora Road west of the site (looking south)..... 210

Figure 7-45 Goolma Road east of the site (looking south)..... 210

Figure 7-46 Campbells Lane north of the site (looking west)..... 211

Figure 7-47 Bela Vista Lane north of the site (looking west)..... 211

Figure 7-48 Mitchell Highway west of the site (looking north). 212

Figure 7-49 Traffic survey locations..... 213

Figure 7-50 Daily traffic volumes..... 214

Figure 7-51 Study area crash data (Transport for NSW Centre for Road Safety – Modified by GHD)..... 216

Figure 7-52 AM peak hour construction vehicle movements 218

Figure 7-53 PM peak hour construction vehicle movements..... 218

Figure 7-54 5MW block 340W module estimated daily vehicle movements during decommissioning (GHD 2018)..... 222

Figure 8-1 Waterways and stream orders (blue) within the solar plant site (red) (Footprint, 2018)..... 226

Figure 8-2 Tributary 1..... 227

Figure 8-3 Tributary 2..... 227

Figure 8-4 Groundwater bores within and adjacent to the solar plant site (red) (DPI, 2017)..... 229

Figure 8-5 Terrestrial GDEs at the Proposal site (red) and surrounds (BOM, 2017)..... 230

Figure 8-6 Bush fire prone land identified at the Proposal and existing substation (red) from the NSW DPE Planning Viewer (2018)..... 239

Figure 8-7 Typical electric fields from overhead powerlines (EMFs.info, 2017)..... 245

Figure 8-8 Projected climate change impacts for the Central West and Orana region of NSW (OEH, 2014) 248

Certification

For submission of an Environmental Impact Statement (EIS) under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (NSW).

EIS prepared by: NGH Environmental

Applicant: Wellington North Solar Farm Pty Limited

Proposed Development:

The Wellington North Solar Plant proposal includes the construction, operation and decommissioning of a photovoltaic solar plant that would produce approximately 300 megawatts (MW) of electricity. Associated infrastructure would include an on-site substation and connection to an existing off-site substation via overhead or underground transmission lines.

Land to be developed:

The Wellington North Solar Plant proposal would be located on an approximately 970 hectare property comprising of Lots 75-84, 88, and 119-121 / DP 2987, Lots 1 and 2 / DP 1104720, Lot 3 / DP 976701, Lots 1-3 / DP 808748, Lot 100 / DP 750760, Lot 1 / DP 664645 and Lot 1 / DP 1206579.

Certification

I certify that I have prepared the contents of this EIS in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (NSW). To the best of my knowledge, this assessment contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure, and that information in the EIS is neither false nor misleading.

Name:	Jane Blomfield	Brooke Marshall
Qualification	BEnvSc (land & water), MEM	B.Nat.Res (Honours)
Signature:		
Date:	06/06/2018	26/06/2018

ABBREVIATIONS AND ACRONYMS

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
AC	alternating current
ACHA	Aboriginal Cultural Heritage Assessment
ACHCRP	*Aboriginal cultural heritage consultation requirements for proponents*
AEP	Annual Exceedance Probability
AER	Australian Energy Regulator
AFT	Artefact scatter
AGO	Australian Greenhouse Office
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ARI	Average Recurrent Interval
APZ	Asset Protection Zone
ARENA	Australian Renewable Energy Agency
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASL	Above sea level
BAL	Basic Left Turn
BAM	Biodiversity Assessment Methodology
BAR	Basic Right Turn
BC Act	*Biodiversity Conservation Act 2016*
BCC	Biobanking Credit Calculator
BDAR	Biodiversity Development Assessment Report
BFMC	Bush Fire Management Committee
BOM	Australian Bureau of Meteorology
BOS	Balance of System
BSAL	Biophysical strategic agricultural land
CCP	Community Consultation Plan
CEC	Clean Energy Council
CEMP	Construction environmental management plan
CENTROC	Central West Regional Organisation of Councils
CER	Clean Energy Regulator
CHMP	Cultural Heritage Management Plan
CSG	coal seam gas
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application

dB(A)	Decibels, a measure of A-weighted *(c.f.)* sound levels.
DC	Direct current
DECC	Department of Climate Change (now OEH)
DECCW	Department of Climate Change and Water (now OEH)
DEMP	Decommissioning Environmental Management Plan
DIS	Department of Industry and Science
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DOE	Department of the Environment (Commonwealth)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELF	Extremely low frequency, in relation to Hz *(c.f.)*
EMFs	Electromagnetic fields
EMP	Environmental Management Plan
EMS	Environmental Management Strategy
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000* (NSW)
EPA	(NSW) Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPC	Engineering Procurement and Construction
EPI	environmental planning instruments
EPL	Environment Protection Licence, issued under the POEO Act *(c.f.)*
ERP	Emergency Response Plan
ESD	Ecologically sustainable development
FM Act	*Fisheries Management Act 1994*
FPL	Flood Planning Level
FRV	Fotowatio Renewable Ventures
GDE	Groundwater Dependent Ecosystems
GHG	Greenhouse gas
GWh	Gigawatt hours
ha	hectares
HBT	Hollow Bearing Tree
HV	High Voltage
Hz	Hertz
IBRA	International Bioregions of Australia
ICNG	Interim Construction Noise Guideline
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEA	International Energy Agency

IF	Isolated find
INP	Industrial Noise Policy
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
kl	kilolitres
km	kilometres
kV	kilovolts
kW	kilowatts
LALC	Local Aboriginal Land Council
LCA	Life Cycle Assessment
LEMC	local emergency management committee
LEP	Local Environment Plan
LGA	Local Government Area
LLS	Local Land Services
LUCRA	land use conflict risk assessment
m	metres
mm	millimetres
ML	Megalitres
MNES	Matters of National Environmental Significance, under the EPBC Act (*c.f.*)
MW	Megawatt
MWh	Megawatt hours
NEM	National Electricity Market
NML	Noise Management Level
NPfI	NSW Policy for Industry
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
NTNDP	National Transmission Network Development Plan
O&M	Office and Maintenance
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
OEMP	Operation Environmental Management Plan
PARF	Powering Australian Renewables Fund
PBP	Planning for Bushfire Protection
PCS	Power conversion stations
PCT	Plant Community Type
PEA	Preliminary Environmental Assessment
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PV	Photovoltaic
RAPs	Registered Aboriginal Parties

RBL	Rating Background Level - the level of background noise
RE Act	*Renewable Energy (Electricity) Act 2000* (Commonwealth)
RET	Renewable Energy Target
RFP	Request for Proposal
RFS	NSW Rural Fire Service
RMS	(NSW) Roads and Maritime Services, formerly Roads and Traffic Authority (RTA)
RNP	*Road Noise Policy*
Roads Act	*Roads Act 1993* (NSW)
SAII	Serious and Irreversible Impacts
SCS	Soil Conservation Service
SEARs	Secretary's Environmental Assessment Requirements
SEIFA	Socio Economic Indexes for Areas
SEPP	State Environmental Planning Policy (NSW)
SHI	State Heritage Inventory
SOE	State of the Environment
sp/spp	Species/multiple species
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011 (NSW)*
SSD	State Significant Development
SWMP	Soil and Water Management Plan
TEC	Threatened Environmental Communities
TMP	Traffic Management Plan
µT	Microtesla, multiples of a unit of magnetic field
VIA	Visual Impact Assessment
V	Volts
VOC	Volatile Organic Compound
WAL	Water Allocation License
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WHO	World Health Organisation
WMP	Waste Management Plan

EXECUTIVE SUMMARY

Introduction

This Environmental Impact Statement (EIS) identifies and assesses the potential environmental impacts associated with the construction, operation and decommissioning of the proposed Wellington North Solar Plant (the Proposal). The proposed solar plant would generate approximately 300MW (AC) to be supplied directly to the national electricity grid. NGH Environmental has prepared the EIS on behalf of the proponent; Wellington North Solar Farm Pty Limited (AGL), a subsidiary of AGL Energy Limited.

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) to support a development application (DA) to be lodged with the NSW Department of Planning and Environment (DPE).

The indicative infrastructure layout presented in this EIS has been developed iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process aims to avoid or minimise potential impacts wherever practicable and results in a Proposal that responds appropriately to the site constraints for the Wellington North Solar Plant.

To inform the development of the most appropriate proposal, an environmental constraints analysis of the Proposal site was undertaken in the early planning stages to assist with designing the solar plant layout and planning the detailed methodologies for the environmental assessment. Environmental constraints can be defined as factors which affect the 'developability' of a site and include physical, ecological, social and planning factors. A map of these constraints was prepared for the Preliminary Environmental Assessment (PEA) (NGH Environmental 2017). Following the detailed field investigations, the mapping has been further refined and is presented in this EIS. This process demonstrates how the Proposal has appropriately responded to the site's constraints. With reference to the site's key constraints, the Proposal assessed in this EIS has:

Biodiversity:	• Avoided areas of good condition White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (EEC). • Minimised the impact to areas of moderate condition remnant vegetation. These were areas of White Box Grassy Woodland and Yellow Box Woodland with a grazed understorey. • Avoided waterways and riparian zones that may provide foraging habitat for threatened species such as the Southern Myotis, Eastern Bent-wing Bat and Grey-headed Flying Fox. • Minimised impacts to rocky outcrops. • Minimised impacts to hollow-bearing trees.
Aboriginal heritage:	• Avoided two scar trees within the Proposal site. A 10m buffer would be applied to ensure no indirect impacts.
Sensitive receivers:	• Consulted extensively with nearby residential receivers, which have greater potential to be impacted by the Proposal. Consultation has included the presentation of six photomontages to better understand the visual impacts from specific locations.

	• Vegetation screening has been included in the Proposal layout specifically onsite along the eastern, northern and western boundaries of the solar plant site.
Waterways:	• Buffered three waterways in accordance with their classification and the "Guidelines for Riparian Corridors on Waterfront Land" to minimise impacts on hydrology and water quality. This includes a 30m buffer (on each side of the waterway) along the north to south west waterway and 20m buffers (on each side of the waterways) along the two east to west waterways.
Historic heritage:	• Avoided identified historic heritage site; the historic homestead.

Proposal needs and benefits

There is a clear need for the Proposal to meet Australia's greenhouse gas reduction, renewable energy and electricity needs. It would additionally bring local benefits such as job opportunities and local expenditure.

The Wellington North Solar Plant would:

- Support Commonwealth and New South Wales (NSW) climate change commitments.
- Generate enough clean, renewable energy for about 114,000 average NSW homes.
- Displace approximately 581,000 metric tonnes of carbon dioxide – the equivalent of taking about 125,000 cars off the road.
- Enhance electricity reliability and security.
- Create approximately 250 local job opportunities during construction and up to four jobs during operation.
- Inject capital expenditure into the local area and spread the benefits of the Proposal more effectively through a local community energy offer and a local community investment program. This would develop a strong social licence to operate for this long term proposal.
- Diversify the regional economy; providing an alternative income stream that does not affect the long term land capability or its suitability for other uses (such as a return to agriculture, after decommissioning).

Benefit sharing with the local community

AGL is committed to conducting activities, operations and projects in ways that demonstrate and contribute enduring benefits to the community, through integrated consideration of social, environmental, ethical and economic impacts.

Through AGL's ongoing consultation with the local community, AGL is developing options for community benefit sharing, should the Proposal be approved and construction commenced.

Based on current consultation, community members would favour a longer-term focus on community benefits. The *Dubbo Regional Council Stronger Communities Fund* and the Bodangora Wind Farm *Community Benefit Fund* are already assisting the community with small grants and programs. AGL has discussed with Dubbo Regional Council an alternative approach to these existing fund-based activities. As such, AGL are considering supporting training and apprenticeships to assist the community to tackle some of the broader employment issues. This potential program has been discussed with the local branch of TAFE NSW and local employment and skills development organisations, who have expressed strong support for the concept.

Dubbo Regional Council has also expressed a desire for a more enduring benefit sharing program and AGL would continue to develop the idea with them and the broader community.

Other programs currently being considered based consultation with the community include:

- Rooftop solar for the residences most impacted by construction and operation activities.
- An energy discount for all new and existing AGL Energy Limited customers in Wellington.
- A local community investment program for construction and/or operation.

These potential programs would continue to go through consultation with the Dubbo Regional Council and the future Community Dialogue Group to determine where AGL's support can be best utilised.

Proposal description

The proposed Wellington North Solar Plant is located on an agricultural property about 7 kilometres (km) north east of Wellington off Goolma Road in the Dubbo Regional Council Local Government Area (LGA), New South Wales (NSW). The proposed solar plant would connect to an existing substation approximately 3km south of the site. The Wellington North Solar Plant Proposal site is outlined in Table 1-1.

Table 1-1 Proposal site.

Referred to in the EIS	Proposed infrastructure	Lots and DP	Owner	Existing use	Ownership arrangements
Solar plant site	All proposed solar plant infrastructure	Lots 75-84 and 119-121 / DP 2987, Lots 1 and 2 / DP 1104720, Lot 3 / DP 976701, Lot 1 / DP 808748, Lot 100 / DP 750760, Lot 1 / DP 664645 and Lot 1 / DP 1206579	Currently owned by one private landowner	Agriculture	The land would be purchased by Wellington North Solar Farm Pty Limited.
		Lots 2-3 / DP 808748 and Lot 88 / DP 2987	SCS	Commercial and agriculture	Wellington North Solar Farm Pty Limited to lease land.
Western Transmission line option	Western Transmission line	Lot 1 / DP 807187, Lots 69-73 / DP 2987, Lot 2 / DP 1226751 and Lot 2 / DP 588075	Four private landowners	Agriculture	Easement would be established.
		Lot 1 / DP 100778 and Lot 12 / DP 572344	Dubbo Regional Council	Industrial	Easement would be established.
Eastern Transmission line option	Eastern Transmission line	Lot 32 / DP 622471	One private landowner	Agriculture	Easement would be established.
		Lots 1- and 2 / DP 1141897 and Lot 15 / DP 1018104	Wellington / Macquarie Correctional Centres	Industrial	Easement would be established.
		Lot 1 / DP 1226751	TransGrid		TransGrid.

Referred to in the EIS	Proposed infrastructure	Lots and DP	Owner	Existing use	Ownership arrangements
Wellington Substation	Transmission lines and connection to existing Wellington Substation			Electricity generation - substation	Easements would be required for transmission lines.

The existing Wellington Substation, located on Lot 1 DP 1226751, is owned by TransGrid. The Project would be connected to this substation. There are currently two high voltage transmission line options under consideration to connect the solar plant to the existing Wellington Substation, located approximately 3km south of the Proposal site. Both are presented in Section 4.3.4 and assessed in this EIS. Only one of these would be constructed. An easement for the transmission line would be created either through five landowners' properties for the western option or two landowners' properties for the eastern option.

The proposed development footprint covers approximately 837 ha, including the solar plant site and both transmission line options. The indicative layout presented has been developed iteratively, in tandem with the environmental assessment and consultation with agencies and the community, to avoid and minimise potential impacts wherever practicable.

The Proposal site would have three vehicular access points. The primary access point during construction for light and heavy vehicles would be off Campbells Lane, along the northern boundary of the site. Campbells Lane would be accessed via Cobbora Road and the Mitchell Highway. Two existing driveways would also be used as additional access points (one currently leads to the existing residence and the other to the SCS facility). These access points would be used mostly by light vehicles.

It is anticipated that the proposed Wellington North Solar Plant would include the following infrastructure elements:

- PV modules mounted on a horizontal fixed or tracking structure.
- Power conversion stations (PCS) to allow conversion of DC module output to AC electricity.
- An onsite substation containing transformers and associated switchgear.
- Underground electrical conduits and cabling to connect the arrays on the array site.
- Internal access tracks and upgrades to existing access roads, where required.
- An area for a future battery storage facility.
- Site office and maintenance building with associated car park.
- Perimeter security fencing and CCTV.
- Up to approximately 7km of 132kV or 330kV, overhead or underground transmission line to the existing TransGrid 330kV substation (either an east and or west transmission line).
- Native vegetation planting to provide visual screening from specific viewpoints, as required.

The construction phase is expected to last approximately 18 - 24 months with peak activity during the middle nine months of the construction period. At the peak of the construction, it is anticipated that up to 250 site personnel would be required onsite.

At the end of the Proposal's operational life, the site would be either returned to its pre-solar plant land capability for a return to agricultural land use, or to an alternative land use. During the site's decommissioning, all solar plant infrastructure would be removed.

Community and Stakeholder Consultation

AGL has undertaken comprehensive consultation with affected landowners, the local community and other relevant stakeholders in developing the Proposal. A community and stakeholder engagement plan is in place for the Wellington North Solar Plant. AGL's community and stakeholder engagement plan considers stakeholders' views and provides timely feedback on any matters raised.

AGL has informed and engaged with relevant local, State and Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders and quarry operators on the Proposal.

The development of the Wellington North Solar Plant was made known to the public early in its development with a fact sheet circulated to the surrounding community.

While much of the consultation process focused on informing the community about issues relating to the Proposal, activities to engage the community in two-way dialogue were also undertaken.

From the early stages of the Proposal, AGL has carried out extensive face-to-face meetings with affected landowners of the Proposal. These meetings had the aim of explaining the scope of the Proposal and the process, as well as addressing concerns and discussing opportunities that were raised.

As well as one -on -one and small group meetings, to date AGL has provided a variety of opportunities for the community members to find out more about the Proposal, including:

- Creation of a fact sheet for the Proposal, and a letter-box drop to residences and businesses within a 10km radius of the Proposal site.
- On 28 November 2017, AGL led a drop-in session at the Wellington Civic Centre for interested community members.
- On 28 November 2017, a presentation to Dubbo Regional Council Councillors on 28 November 2017 to introduce Councillors to the AGL team and the Proposal outline.
- On 5 February 2018, the AGL team presented to the Wellington Men's Shed introducing them to AGL, the National Electricity Market and Large-Scale Solar, including the proposed Wellington North Solar Plant.
- On 18 April 2018, AGL provided a bus trip to the Nyngan Solar Plant and invited neighbours, Dubbo Regional Council Councillors and the Wellington Men's Shed. Over 40 people attended the tour and AGL received 30 feedback forms. The purpose of the bus trip was to respond to the Men's Shed request and to answer questions or concerns regarding AGL's proposal, provide an opportunity for locals to view a solar plant, be up close to solar panels and associated infrastructure and gain a better understanding of how large-scale solar works.
- On 4 May 2018, AGL presented to approximately 30 members of the Wellington Probus Club.

AGL would continue its consultation with affected landowners, the community and other relevant stakeholders throughout the submission of the EIS.

Key environmental issues

Biodiversity

Biodiversity (flora and fauna) investigations included searches of relevant data bases and a site assessment in line with the NSW Office of Environment and Heritage (OEH) Biodiversity Assessment Methodology (BAM) (OEH, 2014). Two Plant Community Types (PCTs) were identified in the development site, *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes* (PCT 266) and Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion (PCT 437). Both these PCTs are listed as Endangered Ecological Communities.

Three threatened species were identified within the Proposal site, including the Grey-headed Flying Fox (*Pteropus Poliocephalus),* Southern Myotis (*Myotis Macropus)* and Eastern Bent-wing Bat (*Miniopterus schreibersii oceanis)*. It was found that the proposed development footprint would only impact on the potential habitat of the Southern Myotis (0.2ha).

Impacts from the removal of the identified PCTs and threatened species habitat would require offsetting in accordance with the NSW Biodiversity Offsets Policy for Major Proposals.

Aboriginal heritage

The Aboriginal heritage investigations included consultation, background research, a field survey and significance assessment. The consultation with Aboriginal stakeholders was undertaken in accordance with clause *80C of the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010* (NSW). The assessment was guided by the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011) and the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH, 2010a). The survey recorded 37 site occurrences. These archaeological features have been recorded as nine artefact scatters and 28 isolated finds. Two possible scarred trees and a European survey marker tree were also recorded.

Based on the land use history, an appraisal of the landscape, soil, level of disturbance and the results from the field survey, it was concluded that there was negligible potential for the presence of intact subsurface deposits with high densities of objects or cultural material within the Proposal site.

Of the 37 sites recorded three isolated find sites (Wellington Nth IF113, Wellington Nth IF13 and Wellington Nth IF17) and a portion of Wellington Nth AFT9 would be not impacted by the proposed development footprint. The two possible scarred tree sites would not be impacted by the Proposal. The other sites would be salvaged prior to development.

Noise

Noise investigations were undertaken in accordance with *NSW Policy for Industry* (EPA, 2017), NSW *Interim Construction Noise Guideline* (DECC, 2009), the NSW Environment Protection Authority's *Assessing Vibration: A Technical Guideline* (DECC, 2006) and *NSW Road Noise Policy* (DECCW ,2011). Background noise monitoring was undertaken adjacent to the closest receiver of the Proposal site. The monitoring location was used to model construction and operational noise impacts for the Proposal.

The assessment predicted noise emissions would exceed relevant criteria during construction of the proposed solar plant for receivers R1, R2, R4 and R6. It is noted that construction noise levels at all receivers are predicted to be less than the highly noise affected level of 75dB(A). A draft noise management plan has been developed to guide the management of noise impacts. Mitigation measures such as increasing

the distance of machinery from receivers and noise screening would limit the potential noise generated to within acceptable levels.

The assessment found no operational noise levels exceedances. No exceedances of noise limits are predicted from traffic. Additionally, there is a very low risk of adverse comment from potential vibration impacts.

Visual amenity and landscape character

Visual impact assessments are used to identify and determine the value, significance and sensitivity of a landscape to change.

Fourteen representative viewpoints were assessed, taken from publicly accessible roads surrounding the site. The viewpoints which have been included represent the areas from where the development would appear most prominent, either based on the degree of exposure or the number of people likely to be affected. The viewpoints were evaluated based on their land use, effect of the development on the viewpoint and overall visual impact. Potential for cumulative impacts from the approved solar farm to the south have also been considered.

Overall the proposed Wellington North Solar Plant would result in impacts on the existing landscape and scenic values. The proposed solar plant would be visible from a range of viewpoints. It would be most visible (and impacts highest) from locations on Goolma and Cobbora Roads where it is in close proximity to the boundary and where no existing vegetation would screen or fragment views. These impacts are however easily mitigated through boundary screen planting accommodated in appropriate setbacks. The proposed development could be undertaken whilst maintaining the core landscape character of the area with an acceptable Visual Impact on the surrounding character.

Agriculture and land use

The Proposal site occurs in a rural landscape with agriculture as the current dominant land use. The site is mapped as Biophysical Strategic Agricultural Land (BSAL), Soil Capability Class 3 (high capability land) on the western lower slopes and plains and Class 4 (moderate capability) on the eastern high slopes and crests. However, soil surveys undertaken as part of this EIS found substantive soil limitations; the soil surface structure has potential to deteriorate following prolonged cultivation/ handling to produce a hard-setting surface. The land cannot sustain high levels of productivity. Therefore, although the land is mapped as BSAL and Class 3 and 4 land, the soil survey results and historic use does not align with 'high capability land'. The Proposal site's low relief landscape and proximity to waterways has likely resulted in the BSAL mapping being of a higher capability than what can actually be realised onsite.

No land use conflicts are anticipated for existing adjacent agricultural land uses or future agricultural land uses on the Proposal site or adjacent lands during construction. A land use conflict risk assessment (LUCRA) was carried out in accordance with the Department of Primary Industries Land Use Conflict Risk Assessment Guide (DPI, 2011). Land use conflicts identified included conflicts with agriculture land, mineralised land, and aviation during all phases of the Proposal. However, all the conflicts are expected to be manageable with measures outlined within this EIS. The soil surveys at the Proposal site found the Proposal would have limited impact on agricultural resources, and the land upon decommissioning of the solar plant would be suitable for alternative land uses such as forestry and mining in addition to agriculture.

Historic heritage

The results of the heritage investigations found one historic heritage site located within the Proposal site, Noonee Nyrang, listed on the *Wellington Local Environmental Plan 2012* (NSW). The local listing for the property has identified that it has historical and aesthetic heritage significance at a local level.

The property, and the region, has historically been the site of agricultural activities and the solar plant would introduce solar panel structures into what has been agricultural farmland. The solar plant would therefore alter the historical context into which the Noonee Nyrang Homestead was built. Whilst this is an impact, the Noonee Nyrang Homestead would remain, and the solar plant would eventually be decommissioned with the opportunity of returning the land to agricultural use and setting.

During the site inspection, a European survey marker tree, a culvert and a stock watering trough and the NSW SCS facility at Wellington were also identified as having potential for historic heritage significance within the Proposal site. Consultation with Dubbo Council's Planning Services Team Leader and Heritage Advisor (22 June 2018), which included site inspection, has determined that these features have no special significance. Council would not object to their removal.

The solar plant proposal is not considered likely to have a significant impact in accordance with the NSW *Heritage Act 1977* (NSW), the EP&A Act, or the EPBC Act, in terms of historic heritage.

Cumulative impacts

Proposed developments within the locality or region which may contribute to the cumulative impacts of the Proposal include:

- The Bodangora Wind Farm, proposed by Infigen Energy, is located 10km north of the Proposal site and has commenced construction.
- The Wellington Solar Farm, proposed by First Solar, would be located directly south of the Proposal and has been approved.
- The Suntop Solar Farm, proposed by Photon Energy, would be located 12km south west of the Proposal site. The EIS and DA are currently being prepared.
- The Maryvale Solar Farm, proposed by Photon Energy, would be 2km north west of the Proposal site. The EIS and DA are currently being prepared.
- The Uungula Wind Farm, proposed by Wind Prospect, would be 40km east of the Proposal site. The EIS and DA are currently being prepared.

It is expected that the construction of the Bodangora Wind Farm would be completed before construction of Wellington North Solar Plant commences. Due to the distance and location of the Suntop Solar Farm, Maryvale Solar Farm and Uungula Wind Farm, these are unlikely to have a local cumulative impact (for example, traffic, dust, visual and socio-economic).

The most relevant cumulative impacts relate to the construction of the Wellington Solar Farm by First Solar, occurring concurrently with the construction of the Wellington North Solar Plant and visually, the operation of the two adjacent solar plants (should they both be approved). Additionally, the Wellington North Solar Plant would be near an existing substation, and the site has existing transmission lines. The potential cumulative impacts identified have been assessed as manageable with the implementation of mitigation measures outlined in this EIS.

Other environmental issues

Eight lower risk issues were investigated, primarily using desktop assessment, including:

- Flooding.
- Traffic, transport and safety.
- Water quality and water use.
- Social and economic.
- Bushfire.
- Electromagnetic fields.
- Air quality and climate.
- Resource use and waste generation.

These impacts were assessed as acceptable and highly manageable.

Management impacts

Impact avoidance and minimisation measures have been incorporated into the design of the Proposal. These measures are considered practical and achievable by the proponent. They are set out for each area of investigation in Sections 7 and 8 and summarised in Section 9.2 of this EIS.

All commitments and environmental safeguards would be managed through the implementation of an Environmental Management Strategy, consisting of a Construction Environmental Management Plan, an Operation Environmental Management Plan and a Decommissioning Environmental Management Plan. These plans would be prepared sequentially and submitted to the Department of Planning and Environment (DPE), prior to each stage of works. These mechanisms ensure that the commitments of the EIS are carried through to on ground activities to ensure effective onsite mitigation of impacts for all project stages.

Conclusion

The Wellington North Solar Plant would result in a number of benefits, local and regional, and has been developed to ensure the benefits are spread into the longer term, reflecting community expectations specific to this proposal.

The environmental impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Mitigation strategies have been developed with the community and other relevant agencies stakeholders in many cases. On balance, the Proposal is considered appropriate to the site's constraints and is therefore, justifiable and acceptable.

1 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

Wellington North Solar Farm Pty Limited (AGL), a subsidiary of AGL Energy Limited, proposes to construct, operate and decommission a photovoltaic (PV) solar plant with an estimated capacity of 300 Mega Watts (MW). The proposed Wellington North Solar Plant (the Proposal) is located on agricultural properties about 7 kilometres (km) north east of Wellington off Goolma Road in the Dubbo Regional Council Local Government Area (LGA), New South Wales (NSW) (formerly Wellington Council LGA) (Figure 1-1). The proposed solar plant would connect to an existing substation approximately 3km south of the site.

This Environmental Impact Statement (EIS) identifies and assesses the potential environmental impacts associated with the construction, operation and decommissioning of the proposed Wellington North Solar Plant. NGH Environmental has prepared the EIS on behalf of the proponent Wellington North Solar Farm Pty Limited.

The EIS:

- Describes the proposed works, the Proposal site and the wider study area.
- Identifies statutory approval requirements.
- Identifies and assesses the significance of impacts on the community.
- Identifies and assesses the significance of impacts on environmental values.
- Identifies and assesses potential cumulative impacts.
- Provides mitigation measures to avoid, minimise or mitigate identified impacts.

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) to support a development application (DA) to be lodged with the NSW Department of Planning and Environment (DPE).

The objective of this EIS is to fulfil the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (NSW) (EP&A Regulation) and section 4.15 of the EP&A Act. The structure and content of the EIS address the Secretary's Environmental Assessment Requirements (SEARs), provided by the DPE on 18 December 2017 (refer Section 6.4.1).

1.2 PROPOSAL OVERVIEW

1.2.1 The Proposal locality

Wellington is the main town and rural centre within the locality. It has a population of approximately 4,077 (ABS, 2016). Wellington is a service centre for the villages of Geurie, Elong, Mumbil, Stuart Town and Euchareena.

The land immediately surrounding the Proposal site includes cropping and grazing land, the Wellington and Macquarie Correctional Centres, rural residences (including a residential subdivision) and a TransGrid 330kV substation.

Agriculture is the main local industry for employment in the Wellington district. Agricultural enterprises include sheep, beef cattle and grain farming. The steeper land to the east of Wellington supports mainly grazing activities and the undulating land to the west supports mainly cereal production. Mining

exploration activity is of continuing interest, with a number of mineral deposits within the area (Regional Development Australia – Orana, 2016). Renewable energy projects are also emerging in the region:

- The Bodangora Wind Farm, proposed by Infigen Energy, is located 10km north of the Proposal site and has commenced construction.
- The Wellington Solar Farm, proposed by First Solar, would be located directly south of the Proposal and has been approved.
- The Suntop Solar Farm, proposed by Photon Energy, would be located 12km south west of the Proposal site. The EIS and DA are currently being prepared.
- The Maryvale Solar Farm, proposed by Photon Energy, would be 2km north west of the Proposal site. The EIS and DA are currently being prepared.
- The Uungula Wind Farm, proposed by Wind Prospect, would be 40km east of the Proposal site. The EIS and DA are currently being prepared.

Approximately 134 residences are located within 2km of the proposed solar plant (including transmission line options). Thirteen residences are located within 500m of the site.

Notable features within the region include:

- Mount Arthur Reserve, located outside the town of Wellington and approximately 4.5km to the south-west of the Proposal site. Rising to 563m above sea-level (ASL), this 2,123ha reserve is set aside for public recreation and environmental protection. Seven marked walking trails are available within the reserve with scenic vantage points from the three main peaks, providing views over Wellington, the valley and the Bell and Macquarie Rivers.
- Siding Spring Observatory is located approximately 130km north of the Proposal site. The Dark Sky Region is centred around this observatory which is considered Australia's most important visible-light observatory. The Dark Sky region consists of land within a 200km radius of the observatory, which therefore includes the Proposal site.

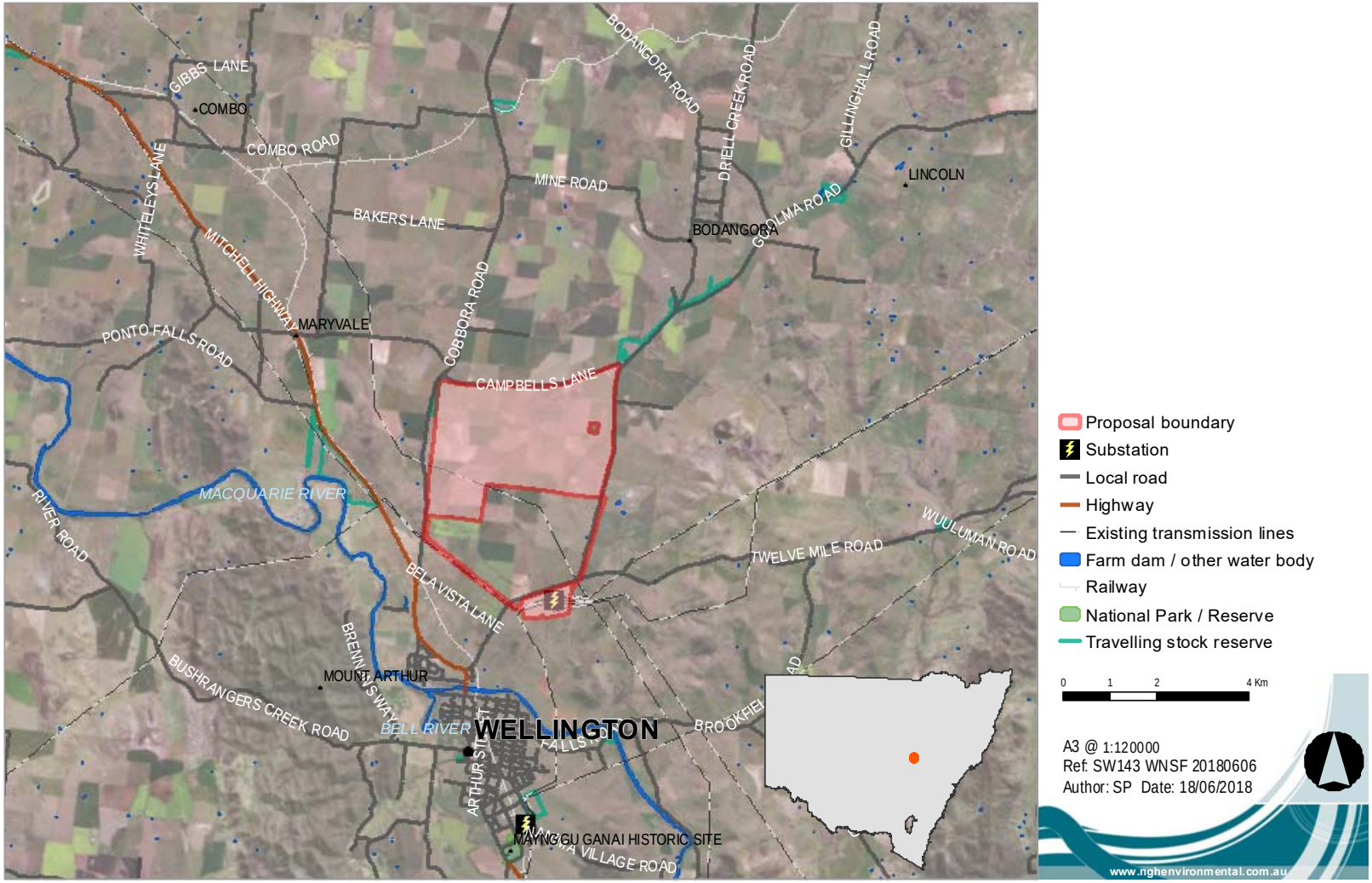

Figure 1-1 Location of the Proposal site.

1.2.2 The Proposal site

The Wellington North Solar Plant Proposal site is outlined in Table 1-1.

Table 1-1 Proposal site.

Referred to in the EIS	Proposed infrastructure	Lots and DP	Owner	Existing use	Ownership arrangements
Solar plant site	All proposed solar plant infrastructure	Lots 75-84 and 119-121 / DP 2987, Lots 1 and 2 / DP 1104720, Lot 3 / DP 976701, Lot 1 / DP 808748, Lot 100 / DP 750760, Lot 1 / DP 664645 and Lot 1 / DP 1206579	Currently owned by one private landowner.	Agriculture	The land would be purchased by Wellington North Solar Farm Pty Limited.
		Lots 2-3 / DP 808748 and Lot 88 / DP 2987	SCS	Commercial and agriculture	Wellington North Solar Farm Pty Limited to lease land.
Western Transmission line option	Western Transmission line	Lot 1 / DP 807187, Lots 69-73 / DP 2987, Lot 2 / DP 1226751 and Lot 2 / DP 588075	Four private landowners.	Agriculture	Easement would be established.
		Lot 1 / DP 100778 and Lot 12 / DP 572344	Dubbo Regional Council	Industrial	Easement would be established.
Eastern Transmission line option	Eastern Transmission line	Lot 32 / DP 622471	One private landowner	Agriculture	Easement would be established.
		Lots 1- and 2 / DP 1141897 and Lot 15 / DP 1018104	Wellington / Macquarie Correctional Centres	Industrial	Easement would be established.
Wellington Substation	Transmission lines and connection to existing Wellington Substation	Lot 1 / DP 1226751	TransGrid	Electricity generation - substation	TransGrid.
					Easements would be required for transmission lines.

The solar plant site comprises approximately 970ha of freehold land. It includes Lots 75-84, 88, and 119-121 / DP 2987, Lots 1 and 2 / DP 1104720, Lot 3 / DP 976701, Lots 1-3 / DP 808748, Lot 100 / DP 750760, Lot 1 / DP 664645 and Lot 1 / DP 1206579. These lots are currently run as agricultural enterprises (including one private landholder and one commercial enterprise; the SCS).

The solar plant site is bounded by Campbells Lane to the north, Goolma Road to the east, private land and Cobbora Road to the west and private agricultural land to the south.

The Proposal site is intended to be owned by Wellington North Solar Farm Pty Limited, except for Lots 2-3 / DP 808748 and Lot 88 / DP 2987. These three lots could remain under the ownership of the SCS, a

commercial subsidiary entity and division of Local Land Services, NSW Department of Primary Industries (DPI and leased to Wellington North Solar Farm Pty Limited. An easement for the transmission line would be created either through five properties for the western option or two properties for the eastern option. The existing Wellington Substation, located on Lot 1 DP / 1226751, is owned by TransGrid.

The Proposal site is located on land zoned as RU1 Primary Production under the *Wellington Local Environmental Plan 2012* (Wellington LEP). Both transmission line options extend offsite to the existing substation on Goolma Road. The eastern transmission line option would occur on land zoned RU1 Primary Production, SP2 Correctional Facility, SP2 Classified Road and SP2 Electricity Supply. The western transmission line option would occur on land zoned RU1 Primary Production, R5 Large Lot Residential, SP2 Classified Road and SP2 Electricity Supply.

Agricultural cropping and grazing for production and environmental consulting services are the existing onsite land uses. The Proposal site comprises of several large paddocks which consist of undulating hills that have been largely cleared for cropping. Remnant vegetation throughout the site is derived from a community of White Box Woodland and Yellow Box Woodland. The remnant areas have been highly disturbed and lack native understorey, due to grazing and pasture improvement practices. Plantings of native species have been used as wind breaks and for rehabilitation along onsite waterways. A dry land salinity plantation is located in the north east of the site. Figure 1-2 and Figure 1-3 depict the site's substantial modification for agricultural use.

Figure 1-2 Cropped paddock in Proposal site.

Figure 1-3 Improved pasture in Proposal site.

Four dams occur within the solar plant site; three along the south-western boundary and one in the south-eastern corner. Six watercourses occur within the solar plant site; all are tributaries of Wuuluman Creek. Two of these waterways can be seen in Figure 1-4 and Figure 1-5. Wuuluman Creek is a tributary of the Macquarie River, which is located 4.5km west of the solar plant site.

One residential dwelling is located within the solar plant site; within Lot 84 / DP2987 (Figure 1-6). The dwelling is listed as an item of local heritage significance under Schedule 5 of the *Wellington* LEP.

The solar plant site also contains a SCS facility (Figure 1-7). The SCS is an environmental consulting and soil conservation business entity within the Local Land Services, DPI. There are approximately five buildings and five sheds within the SCS land. Accommodation facilities are also associated with the SCS. The SCS site is in the south eastern portion of the solar plant site (Lot 2 and 3 / DP808748 and Lot 88 / DP2987).

An existing Essential Energy 132kV transmission line crosses the south western corner of the solar plant site.

The land within the Proposal site is subject to two is subject to the following authorities under the *Mining Act* 1992 (NSW):

- Exploration licence (EL) 6178 held by Modeling Resources Pty Ltd, which occupies the majority of the Proposal site.
- EL 8505 held by Drummond West Pty Ltd, which occupies a small portion of the south eastern corner of the Proposal site.

Figure 1-4 Waterway located in solar plant site.

Figure 1-5 Ephemeral waterway located in solar plant site.

Figure 1-6 Heritage listed dwelling at solar plant site.

Figure 1-7 Soil Conservation Service; main building.

1.2.3 Key components of the Proposal

The Wellington North Solar Plant proposal involves the construction, operation and decommissioning of a ground-mounted PV solar array which would generate approximately 300MW (AC) to be supplied directly to the national electricity grid. The solar plant site is approximately 970ha (2,397 acres) of which approximately 806ha (1,992 acres) would contain solar plant infrastructure. An additional area of up to 31 ha is required for transmission line easements to connect to the existing Wellington substation. Some internal works are also required within the Wellington substation. The total development footprint for the Proposal is approximately 837 ha, which includes development within the solar plant site and the 'worst case' (largest impact area) transmission line option.

The indicative infrastructure layout presented in this EIS has been developed iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process aims to avoid or minimise potential impacts wherever practicable and results in a Proposal that responds appropriately to the site constraints for the Wellington North Solar Plant.

On an annual basis, the proposed Wellington North Solar Plant would provide enough clean, renewable energy for about 114,000 average NSW homes while displacing approximately 581,000 metric tons of carbon dioxide.

There are currently two high voltage transmission line options under consideration to connect the solar plant to the existing Wellington substation, located approximately 3km south of the Proposal site. Both are presented in Figure 1-8 and assessed in this EIS. Only one of these would be constructed.

The solar plant site would have three vehicular access points. The primary access point during construction for light and heavy vehicles would be off Campbells Lane, along the northern boundary of the site. Campbells Lane would be accessed via Cobbora Road and the Mitchell Highway. Two existing driveways would also be used as access points (one currently leads to the existing residence and the other to the SCS facility). These access points would be used mostly by light vehicles.

It is anticipated that the proposed Wellington North Solar Plant would include the following infrastructure elements:

- Approximately 1.2 million PV modules, spaced 4-8m and mounted on east-west horizontal tracking systems or north-orientated fixed-tilt structures (both fixed and tracking options are considered viable for the Proposal).
- Up to approximately 155 PV inverter stations to allow conversion of DC module output to AC electricity and transformation to medium voltage for site reticulation (typically 22kV or 33kV).
- Underground electrical conduits and cabling to connect the solar panels, combiner boxes and inverters.
- An onsite substation containing up to two transformers and associated switchgear.
- Up to approximately 7km of 132kV or 330kV, overhead or underground transmission line to the existing TransGrid 330kV substation (either an east and or west transmission line).
- Additional electrical transformation equipment to be positioned in close proximity to the existing TransGrid substation, if the 132kV transmission line option is progressed.
- Site access off Campbells Lane, with additional access for mostly light vehicles off Goolma Road.
- Internal access tracks and upgrades to existing access roads, where required.

- Site office and maintenance building with associated car park.
- Space for future energy storage facility. Energy storage is not currently proposed and therefore is not part of this assessment.
- Perimeter security fencing and CCTV.
- Vegetation planting to provide visual screening for specific viewers, as required.

Refer to Section 4.3 for further detail on these elements.

The construction phase of the Proposal would take approximately 18 – 24 months in total with a shorter peak construction period of approximately nine months, during which time the main construction works would take place.

The Wellington North Solar Plant would be expected to operate for approximately 30 years. After this initial operating period, the solar plant would either be decommissioned, removing all above ground infrastructure and returning the site to its existing land capability, or repowered with new PV equipment to continue operations as a solar plant. It is noted that an indefinite approval is being sought.

The Wellington North Solar Plant would have an estimated capital investment of approximately $550 million.

The Wellington North Solar Plant design and construction, operation and decommissioning requirements are described in more detail in Section 4.2. An indicative layout is shown in Figure 1-8. Detailed design may lead to some minor layout changes. The layout shown represents the maximum impact areas that would be required. The maximum impact areas shown have been determined following the outcomes of a preliminary constraints assessment, completed in November 2017, as well as detailed specialist assessments presented in this report. Notable changes to the layout reflecting the site's constraints included:

- Avoiding good condition conservation significant vegetation and threatened species habitat.
- Buffering waterways in accordance with their classification and the "Guidelines for Riparian Corridors on Waterfront Land".
- Visual screening, in consideration of nearby sensitive receivers.
- Avoiding an identified Historic Heritage site.

Figure 1-9 shows the indicative layout in the context of the site's environmental constraints.

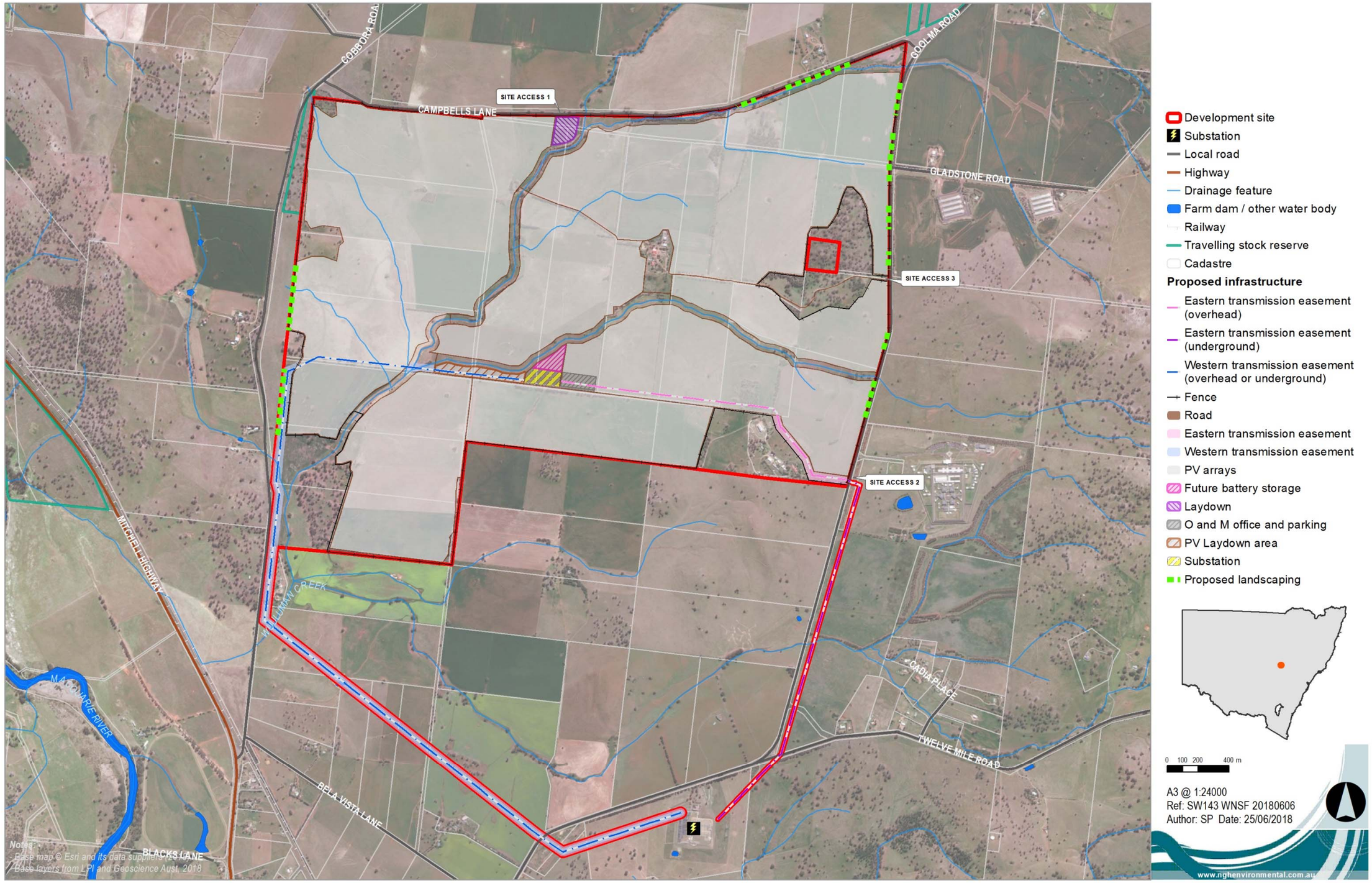

Figure 1-8 Indicative Proposal layout.

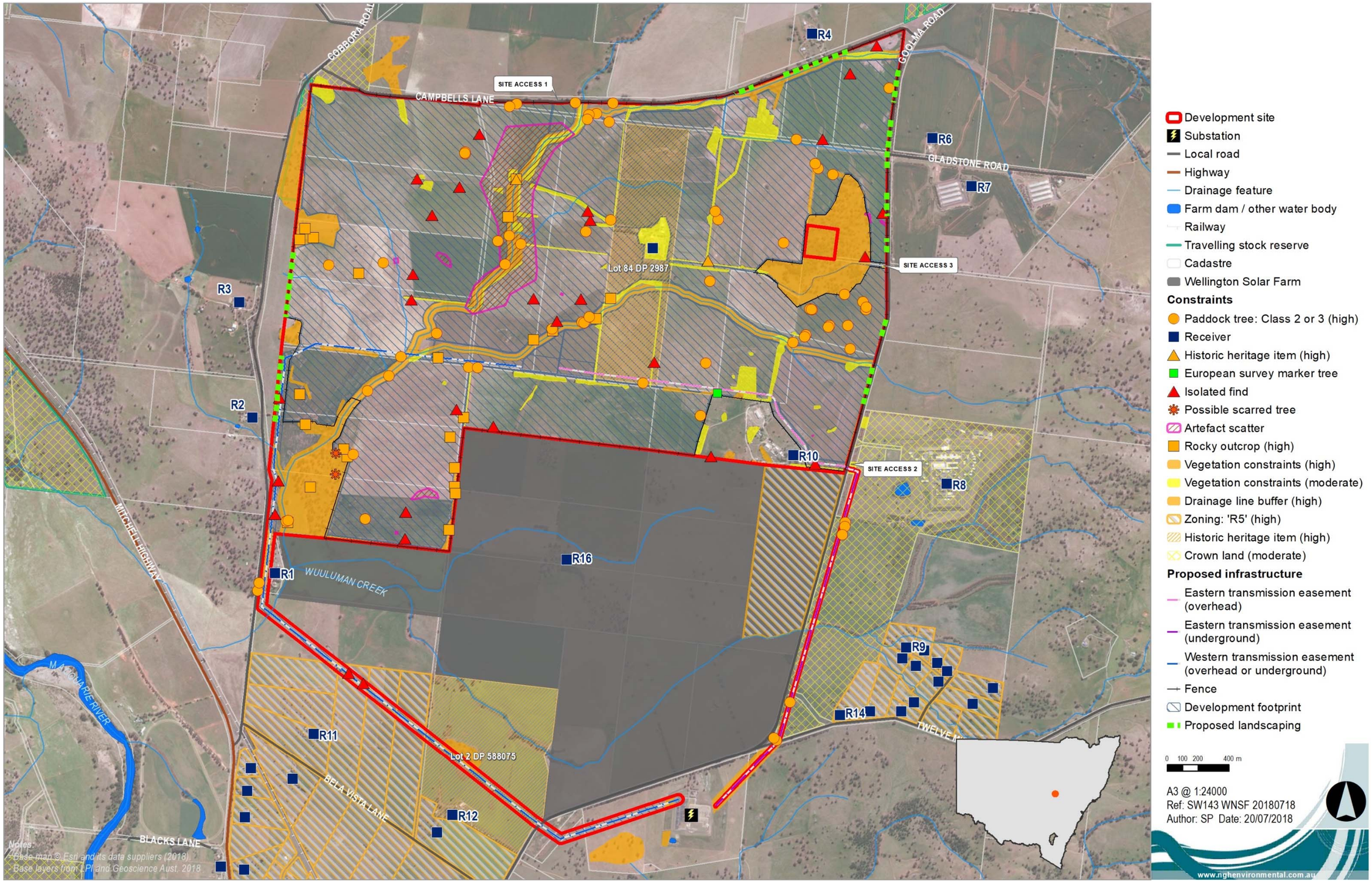

Figure 1-9 Proposal layout in the context of the site's constraints.

1.3 THE PROPONENT

The proponent for this proposal is Wellington North Solar Farm Pty Limited (AGL); a wholly owned subsidiary of AGL Energy Limited.

AGL Energy Limited is committed to helping shape a sustainable energy future for Australia. The company operates the country's largest electricity generation portfolio, is the largest ASX-listed investor in renewable energy and has more than 3.6 million customer accounts. The company has made significant investments in renewable energy, including the Nyngan and Broken Hill Solar Plants, which when constructed were Australia's largest utility-scale solar photovoltaic (PV) power plants and represented the birth of large scale solar in Australia.

Proudly Australian, and with more than 180 years of experience, AGL Energy Limited have made it their responsibility to provide sustainable, secure and affordable energy for their customers. Their aim is to prosper in a carbon-constrained world and build customer advocacy as the energy industry transforms. Hence, AGL Energy Limited has committed to the progressive retirement of their coal-fired generation by 2050 and would continue to develop innovative solutions for their customers.

2 OBJECTIVES, PROJECT NEED AND BENEFITS

2.1 PROPOSAL OBJECTIVES

The objectives of the Wellington North Solar Plant proposal and how they have been met are outlined in Table 2-1.

Table 2-1 Objectives of the Wellington North Solar Plant proposal.

Objective	How would the Proposal achieve this objective?
Develop an economically viable commercial solar electricity generation project, which contributes to the provision of affordable, sustainable and reliable electricity for NSW;	The selected site has favourable solar irradiation and the close proximity to the existing substation makes the site an economically viable commercial project. The Wellington North Solar Plant would form an integral part of a broader plan to provide affordable, reliable and sustainable electricity to NSW homes and businesses. The plan includes this proposal, other renewables, storage, as well as gas-fired electricity generation.
Support AGL Energy Limited's NSW Generation Plan, following the retirement of ageing power stations;	The Wellington North Solar Plant proposal is a renewable energy project that would generate approximately 300MW (AC) per year. This would contribute 19% of the NSW Generation Plan's 1600MW 'new renewables' target.
Produce clean and renewable energy to help reduce greenhouse gas (GHG) emissions and contribute to efforts to meet state and national climate change mitigation targets;	The Proposal would provide enough clean, renewable energy for about 114,000 average NSW homes while displacing approximately 581,000 metric tonnes of carbon dioxide – the equivalent of taking approximately 125,000 cars off the road.

Objective	How would the Proposal achieve this objective?
Obtain broad support for the solar plant from the local community;	Community engagement activities have been undertaken to inform the community of the Proposal and capture feedback to assist the development of the most appropriate solar plan project. The feedback received to date has been included within this EIS.
Provide local and regional employment opportunities as well as other community benefits;	Approximately 250 construction jobs would be created during peak construction and during operation the Proposal would employ approximately 2-4 full time staff. It is expected that in addition to the full-time staff, there would be a range of opportunities for local suppliers in general trade and support services, such as: • Vegetation management; clearing, mulching, rehabilitation. • Fencing services. • Electrical work. • General civil services, such as grader, dozer and excavator operators. • Water services. • Security services. • Traffic management. • General construction services. • Meals and accommodation services.
Avoid / minimise environmental impacts wherever practicable, through careful design and best practice environmental protection and impact mitigation.	The maximum impact area presented is responsive to the site's key environmental constraints, identified through detailed investigations as: • Biodiversity. • Heritage. • Waterways.

2.2 PROJECT NEED AND BENEFITS

2.2.1 Climate change mitigation

The Proposal supports Commonwealth and NSW climate change commitments.

Paris Agreement

Under the United Nations Paris Climate Change Agreement, Australia has committed to the following greenhouse gas emission reduction targets:

- 5% below 2000 levels by 2020.
- 26 - 28% below 2005 levels by 2030.
- Net zero emissions in the second half of the century.

Electricity generation is the largest individual contributor of greenhouse gas emissions in Australia, representing 35 per cent of emissions (DOE, 2016). The transition to low carbon renewable energy sources would be critical to enable Australia to meet its Paris commitments.

In terms of renewable energy technologies, solar projects have the capacity to provide faster results in reducing greenhouse gas emissions than other options because of shorter potential construction and commissioning times (CER, 2017). Rapidly improving technology in this sector is also seeing the improved performance of solar energy projects.

The Wellington North Solar Plant proposal would generate approximately 300MW (AC) per year, saving approximately 581,000 tonnes of carbon dioxide per year[1].

Renewable Energy Target (RET) Scheme

The legislated objectives of the Commonwealth Renewable Energy Target (RET) Scheme are:

- To encourage additional generation of electricity from renewable sources.
- To reduce emissions of greenhouse gases in the electricity sector.
- To ensure generation of electricity from ecologically sustainable renewable energy sources.

The RET works by creating a market for renewable energy certificates, which drives investment in the renewable energy sector. Renewable energy generators create certificates for electricity generated or displaced. Electricity retailers purchase these certificates to meet their renewable energy obligations.

The RET aims to achieve large-scale renewable generation of 33,000GWh in 2020, equating to about 23.5% of Australia's total electricity generation.

The Large-scale Renewable Energy Target component of the RET requires an estimated 6,000MW of new renewable power stations to be built by 2020, which is likely to consist of approximately 75 per cent wind and 25 per cent solar (Clean Energy Regulator 2015 in Finkel *et al.* 2016). This would represent a doubling of the total renewable capacity installed since 2001 (Ernst and Young 2016 in Finkel *et al.,* 2016).

The 2020 target remains achievable provided investment momentum can be maintained throughout 2018 and 2019.

The proposed 300MW Wellington North Solar Plant would contribute to meeting the RET by generating approximately 700 gigawatt hours (GWh) per year.

The Proposal has the added advantage that the shorter potential time lag between investment and commissioning in solar projects allows RET certificates to be processed and made available to the market sooner.

National Energy Guarantee

AGL Energy Limited welcomes the Energy Security Board's proposed approach to integrate emissions reductions policy with energy policy, through the proposed design of the National Energy Guarantee (Guarantee).

With careful consideration given to the detailed design, AGL Energy Limited believes the Guarantee can contribute to a more sustainable energy market for the long-term benefit of customers in Australia. Furthermore, by developing a mechanism that would reduce emissions in a manner consistent with the

[1] Precise generation figures may change subject to final site design and product selection.

Government's target (26-28% on 2005 levels by 2030), there would be increased demand for new renewable projects such as the Wellington North Solar Plant.

NSW goals and policies

The Proposal supports NSW climate change and energy goals and policies.

The *NSW Climate Change Policy Framework* (State of NSW and Office of Environment and Heritage, 2016) aims to 'maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate and current and emerging international and national policy settings and actions to address climate change'. The framework endorses and is intended to complement the national Paris Agreement targets, and has the following aspirational long-term objectives:

- Achieve net-zero emissions by 2050.
- Produce greater resilience in NSW to a changing climate.

Implementation of the framework encompasses emission reduction and adaptation. It includes the development of an advanced energy action plan, a new energy efficiency plan, a climate change adaptation action plan, as well as additional policy investigations for sectors with significant opportunities and risks. Under the framework, a draft Climate Change Fund Strategic Plan has been released for public consultation (OEH, 2016a). The Proposal would directly contribute to the objectives of the framework by reducing greenhouse gas emissions.

The Proposal would also contribute to the *NSW Renewable Energy Action Plan* (NSW Government, 2013), which supports national renewable energy targets. The Proposal would progress the three goals of the Action Plan:

1. Attract renewable energy investment and projects.
2. Build community support for renewable energy.
3. Attract and grow expertise in renewable energy.

In accordance with the *NSW 2021: A plan to Make NSW Number One*, the Wellington North Solar Plant would:

- *Contribute to the national renewable energy target … by promoting energy security through a more diverse energy mix, reducing coal dependence, increasing energy efficiency and moving to lower emission energy sources* (NSW Government, 2011).

In 2017, the NSW Government released the *Draft Large-Scale Solar Energy Guideline.* The guideline identifies the key planning and strategic considerations relevant to solar energy State significant development (SSD) in NSW. It aims to assist in the site selection and design of proposals and it would be used by the DPE to assist in the assessment of relevant DAs. The Proposal has referenced these guidelines throughout the development assessment process.

2.2.2 Electricity reliability and security benefits

The Proposal would enhance electricity reliability and security.

While most of Australia's electricity is currently provided by coal-fired power stations, as many as three-quarters of these plants are operating beyond their original design life (DIS, 2015). Nine coal-fired power stations have closed since 2011-2012, representing around 3,600MW of installed capacity (AER, 2015 in Commonwealth of Australia, 2016).

AGL Energy Limited has publicly committed to closure dates for its coal-fired plants, commencing with the closure of Liddell Power Station in the Hunter Valley NSW in 2022. Liddell would be close to 50 years old by this point. This would see a further 2000 MW withdrawn from the NEM. AGL Energy Limited has put together a comprehensive NSW Generation Plan which provides details of the proposed approach to replace Liddell Power Station. The plan provides for a series of staged investments in new, low emissions generation and upgrades to existing generation to come online ahead of the Liddell retirement in 2022. The plan includes up to 1,600MW of new renewables, and the Wellington North Solar Plant is proposed to contribute to this plan.

AGL Energy Limited's *Greenhouse Gas Policy*, released in April 2015, sets out its commitment that they "would not build, finance, or acquire new conventional coal-fired power stations (i.e. without Carbon Capture and Storage)." Instead, AGL Energy Limited is prioritising investment in renewables and complementary near-zero emission technologies.

The retirement of old power stations would require the development of new, reliable and low-emissions energy supply. Given the high levels of solar irradiance in the central west of NSW, the strong transmission network in the region and the declining cost of solar power over the last decade, Wellington North Solar Plant proposal is an important source of new power generation.

The transition to renewable energy sources based on variable wind and solar PV generators has implications for reliability and security; these sources lack usable inertia to support power system security (Finkel *et al.,* 2017). The National Energy Market grid is long and linear, with much less network meshing than many international systems. Geographic and technological diversity in the network can improve security and smooth out the impacts of variability (Finkel *et al.,* 2017).

While grid-supplied electricity consumption is expected to remain stable (AEMO, 2016), the Wellington North Solar Plant proposal would benefit network reliability and security by providing embedded electricity generation closer to local consumption centres, contributing to a more diverse mix of energy sources and potentially regulating inputs (including improving the security of supply).

2.2.3 Socio-economic benefits

Local economic benefits

The Proposal would provide local economic stimulus, particularly during construction. The Proposal would generate around 250 direct jobs during construction. In addition, it would employ approximately 2-4 full time staff during the operation and maintenance phase (expected to be 30 years).

The employment benefits extend through the local supply chains to fuel supply, vehicle servicing, uniform suppliers, hotels/motels, B&B's, cafés, pubs, catering and cleaning companies, tradespersons, tool and equipment suppliers and many other businesses. In 2015-2016, 11,500 Australians were employed directly in the renewable energy sector and the industry is set to generate 18,400 new jobs by 2020 (CEC, 2014; CEC, 2016). These benefits would be predominately during construction; however they would also occur during operation. This would occur mainly in relation to the maintenance and upgrade of infrastructure over the lifetime of the Proposal.

Considering adjacent agricultural land holding, during operation, there may be opportunities for adjacent landowners to rotate sheep on the Proposal site. Following on from similar trials at Nyngan Solar Plant, this proposal would investigate the trial of sheep grazing on the site to help manage stable ground cover vegetation cover whilst continuing to provide a contribution to the local agricultural economy.

Downward pressure on electricity prices

Household electricity bills increased 61% between 2008-09 and 2012-13, due mainly to network expenditure (ABS, 2016 in Commonwealth of Australia, 2016). Australian households would pay $510 million more for power in 2020 without renewable growth through the RET and up to $1.4 billion more per year beyond 2020 (Roam Consulting, 2014). Renewables increase diversity and competition in the wholesale energy market – and as in any market, less competition means higher prices.

Variable renewable energy generation such as PV solar operates with no fuel costs and can, with the right policy framework and technological development to manage variability, be used to reduce overall wholesale prices of electricity (Finkel *et al*., 2017).

Several studies on the impacts of increased large scale renewable energy generation under the RET have indicated that this is likely to put downward pressure on electricity prices (Australia Institute, 2015).

Local community package to spread the benefits of the Proposal into the operational stage

During construction, operation and decommissioning, AGL would provide the community with a local community energy offer and a local community investment program. This program would continue to be developed with the community and is discussed in Section 6.1.4.

AGL is committed to conducting activities, operations and projects in ways that demonstrate and contribute enduring benefits to the community, through integrated consideration of social, environmental, ethical and economic impacts.

Through this commitment, AGL is considering the following benefit-sharing opportunities from construction commencement:

- Supporting employment in Wellington - AGL are currently working with employment providers to develop an AGL sponsored apprenticeship program that would enable locals to benefit from energy employment opportunities.
- Residential Solar - Rooftop solar packages for affected landowners.
- Local energy benefits - AGL would offer locals an energy deal with a percentage discount off electricity and gas usage charges.

Details of these considerations are outlined in Section 6.1.4.

3 SELECTION OF THE PREFERRED OPTION

3.1 EVALUATION OF ALTERNATIVES

Various options relating to the location, technology and scale of the Proposal were evaluated in developing the Proposal. These were considered, accounting for the objectives of the Proposal and how the benefits of the Proposal could be maximised. This section outlines the alternatives that were considered and justification for the preferred option that is the subject of this EIS.

3.2 THE 'DO NOTHING' OPTION

The 'do nothing' option must always be considered in any evaluation of options. It represents the status quo situation; avoiding all development impacts but similarly not realising the Proposal's many potential benefits.

The direct consequence of not proceeding with the Proposal would be to forgo the benefits outlined in Section 2.2. This would entail:

- Lost opportunity to reduce GHG emissions in the electricity generation sector and contribute to state and national climate change targets and commitments.
- No benefit realised in electricity network reliability and security benefits.
- No direct or indirect social and economic benefits, including employment and increased demand for local goods and services.

The 'do nothing' option would avoid the environmental impacts associated with the development and operation of the Proposal. These include construction noise, traffic and dust and visual impacts. Agricultural output at the site would be expected to continue largely as it is; with intermittent cropping and grazing. However, as is detailed in Sections 7 and 8 of this EIS, these impacts are considered to be manageable and would not likely result in a substantive negative impact to the environment or community over the medium and/or long term.

Given the potential benefits of the Proposal (including climate change mitigation, electricity reliability and socio-economic benefits, as set out in Section 2.2.3), the 'do nothing' option is not the preferred option and cannot be justified from an economic or social standpoint.

3.3 ALTERNATIVE SITE LOCATIONS

AGL Energy Limited have reviewed numerous sites within NSW for the solar plant proposal and determined that the proposed Wellington North Solar Plant Proposal site represents an opportunity for PV development that could be developed to meet the federal Renewable Energy Target of 33,000GWh by 2020.

Considerations during initial site investigations included consideration of:

- Access to and capacity of the electrical transmission network.
- Availability of an abundant solar resource.
- Availability of appropriate land i.e. topography, aspect, presence of native vegetation.
- Suitability in terms of the interests of other stakeholders and the environment.

Of these considerations, AGL put substantial weight on obtaining access to the 330kV transmission network. This is important because it provides long term network stability, lower losses and the ability to connect a higher capacity plant (200MW+), which supports lower cost and greater diversification in the energy supply to AGL Energy Limited's customers. Wellington is one of the most westerly points on the 330kV transmission network in NSW and hence is a key location for connection of large scale solar plant. The existing Wellington Substation has also been identified by TransGrid as a connection opportunity in reference to current network capacity availability (Figure 3-1).

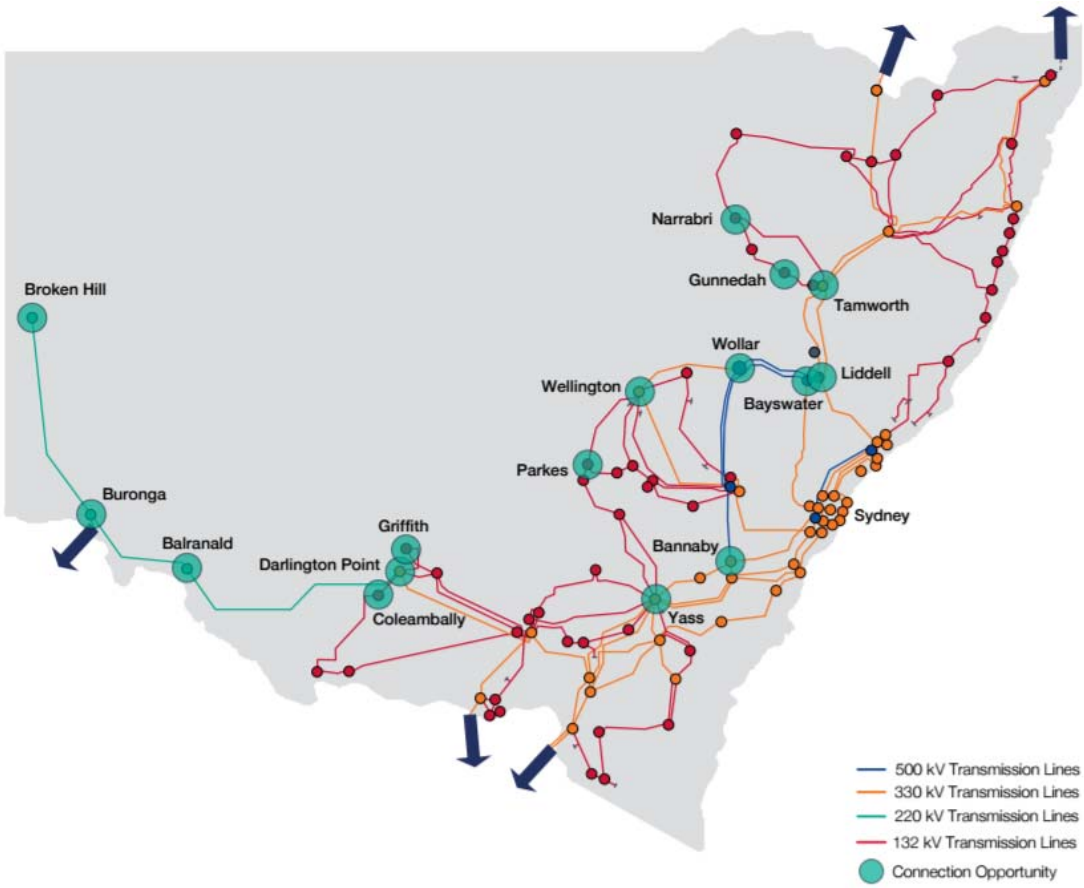

Figure 3-1 The existing Wellington Substation is identified as a Connection Opportunity (TransGrid, 2018).

3.4 ALTERNATIVE TECHNOLOGIES

Alternative technologies for renewable energy generation at the Proposal site encompass generation technology (principally solar or wind) and PV solar equipment.

AGL Energy Limited invests in generation assets that support reliability, low emissions and affordability for customers. The AGL Energy Limited generation portfolio is diversified across a range of supply technologies to ensure these three key characteristics are delivered. The Wellington North Solar Plant proposal would further add to this diversification through the provision of additional solar capacity to the AGL Energy Limited portfolio. There is a broad range of solar technologies available in the market, however only PV solar can be delivered cost effectively at this stage.

3.4.1 Generation technology

AGL Energy Limited's NSW Generation Plan addresses the potential shortfall that it identified may follow the retirement of ageing power stations, commencing in 2022.

AGL Energy Limited is implementing their NSW Generation Plan, which proposes a mix of high-efficiency gas peaking plant, renewable plant (including solar and wind), battery storage and demand response as well as an efficiency upgrade at their existing Power Station at Bayswater.

The plan delivers dispatchable power by incorporating a mix of technologies, in a market where the cost of renewable technology is falling and more flexible, peaking generation is required.

3.5 SCALE OF THE PROPOSAL

The scale of the Proposal has been influenced by:

- The interest of local landholders and their willingness to be involved in the Proposal.
- The demand for new renewable electricity generation to meet generation targets.
- Commercial investment and viability considerations.
- Transmission grid capacity.
- The constraints and impacts identified in this EIS.

The proposed scale of the solar plant successfully responds to the constraints and opportunities presented by these factors. The Proposal seeks to maximise the use of available land within the Proposal boundary, whilst considering the environmental, cultural, and community impacts identified through the development of this EIS. The constraints are outlined in Section 4.

The scale of the Proposal is also influenced by the market demand for electricity, and the ability of the local transmission network to support the energy generated by the Proposal.

Each of these has contributed to the decision to develop the Proposal to a scale of approximately 300MW (AC), with an expected annual energy generation of 700,000MWh.

3.6 CONSIDERATION OF OTHER LAND USES IN SITE SELECTION

The Proposal site is located primarily on rural land that is currently used for sheep grazing. Sheep grazing represents 46.5% (meat and wool) of agricultural commodities from the former Wellington Council LGA (DPI, 2011). This is equal to 4.65% of the sheep (meat and wool) agricultural commodities for NSW. The census (2011) recorded 594,694 sheep in the former Wellington Council LGA. The Proposal site's sheep carrying capacity is less than 1% of this total. The surrounding properties within the former Wellington Council LGA provide for similar agricultural production including cropping (37.3%), wool (28%) and meat agriculture (34.7%).

The land in the immediate vicinity of the Proposal site is characterised by a higher concentration of industrial land uses, including two correctional facilities, a soil science facility, poultry farms and land containing major electrical infrastructure. The selection of the Proposal site was influenced by this existing industrial land use, in particular, it considered:

- Access to a robust transmission network connection.
- Willing community members to participate in the solar infrastructure proposal.
- Access to land cleared of native vegetation and cultural/heritage impacts.

Site selection for the Proposal commenced in late 2016. At that time two wind farm projects were publicly known in the area:

- The Bodangora Wind Farm, currently being constructed by Infigen Energy, located 9km north of the Proposal.
- The Uungula Wind Farm proposed by CWP Renewables 15km east of the Proposal site. The EIS and DA is currently being prepared.

During the feasibility and early stakeholder engagement phase of the Proposal, three other solar farms were publicly announced in the area:

- The Wellington Solar Farm, proposed by First Solar, is located directly south of the Proposal and has been approved for construction (announced 25 May 2018).
- The Suntop Solar Farm by Photon Energy is proposed 12km south west of the Proposal site. The EIS and DA is currently being prepared (announced September 2017).
- The Maryvale Solar Farm by Photon Energy is proposed 2km north west of the Proposal site. The EIS and DA is currently being prepared (announced October 2017).

The announcement of these solar farm proposals shows that the solar development industry appreciates the value of the land in the region for solar power generation, over existing land uses.

3.7 PREFERRED OPTION

The preferred option is to develop an appropriately sited, designed and scaled proposal to achieve the stated objectives (Section 2.1). The Proposal balances technological, energy and environmental aspects, while retaining the flexibility and adaptability required in the final design stage of the Proposal.

The preferred option represents a commercially viable, technologically feasible contribution to the need to reduce carbon emissions in the energy sector, while achieving a low level of environmental impact. Solar generation using PV panels is particularly well-suited to the topographical and climatic conditions of the Proposal site.

Details of the preferred option are provided in Section 4.

3.8 PROJECT JUSTIFICATION

There are clear justifications for the further development of solar resources in Australia, and specifically at the Wellington North Solar Plant Proposal site:

- The Proposal supports Australia's international commitments to mitigate climate change and NSW targets for renewable energy development.
- The Proposal has benefits that range from providing enhanced electricity reliability and security to the national electricity grid to local economic stimulus and community benefits.

The site, technology and size of the Proposal have been developed in full consideration of alternatives, to ensure the operational site would maximise the benefits of the Proposal to the locality and region in the long term. This section sets out the justification for the Proposal and how the preferred option, that is assessed in this EIS, was selected based on these considerations.

4 THE PROPOSAL

4.1 SUMMARY TABLE

The key features of the Proposal are summarised in Table 4-1. Note that component specifications are subject to change. Where required, upper limit quantities and power level estimates are provided to ensure the assessment and any subsequent approval maintains the flexibility required in the detailed design in the Engineering Procurement and Construction (EPC) stage.

Table 4-1 Summary of the key features of the Proposal.

Proposal element	Description
Proposal	Wellington North Solar Plant
Proponent	Wellington North Solar Farm Pty Limited
Capacity	Approximately 300MW (AC)
Solar Plant site area	Approximately 970ha
Site description	**Solar plant site**: Lots 75-84, 88, and 119-121 / DP 2987, Lots 1 and 2 / DP 1104720, Lot 3 / DP 976701, Lots 1-3 / DP 808748, Lot 100 / DP 750760, Lot 1/ DP 664645 and Lot 1 / DP 1206579. Freehold agricultural land and commercial land. Zoned RU1 Primary Production under the Wellington LEP. **Western transmission line option:** Lot 1 DP807187, Lot 69-73 DP2987, Lot 1 DP100778, Lot 12 DP572344, Lot 2 / DP 588075 and Lot 2 DP1226751 Agricultural land Zoned RU1 Primary Production and SP2 Infrastructure under the Wellington LEP. **Eastern transmission line option:** Lot 32 DP622471, Lot 2 DP 1141897, Lots 1- 2 DP 1141897 and Lot 15 DP 1018104 Agricultural and industrial land Zoned RU1 Primary Production, R5 Large Lot Residential and SP2 Infrastructure under the Wellington LEP. **Wellington Substation:** Lot 1 / DP 1226751 Industrial land Zoned SP2 Infrastructure under the Wellington LEP.
Local Government	Dubbo Regional Council
Subdivision	None required
Solar array	Approximately 773ha of solar panels Row spacing: Approximately 4m – 8m Height: Up to approximately 4m to top of array when fully tilted
Substation	Up to approximately 2ha, enclosed by security fencing
Access tracks	Approximately 35km of access tracks Width: Approximately 6m Material: Unsealed gravel
Operations and maintenance buildings	Buildings would be constructed to provide control, switchroom and storage facilities for the solar plant.
Security fencing, lighting and CCTV	Perimeter security fencing would be provided to a height of approximately 2.4m high. CCTV and lighting would be provided to critical infrastructure areas.
Battery Storage	An area has been put aside for the future development of battery storage. It is not part of this EIS and would require a separate application.
Construction hours	Standard daytime construction hours: Monday to Friday: 7.00am to 6.00pm and Saturday: 8.00am to 1.00pm
Construction timing	Expected 18 – 24 month construction period, with a proposed start date of March 2019.
Workforce	Construction: Approximately 250 workers Operation: Approximately 2-4 full time equivalent staff
Operation period	Up to 30 years initially with possible extension subject to future technology and economics.
Decommissioning	All infrastructure would be removed. The site would be rehabilitated consistent with future land use requirements.
Capital investment	Estimated $550 million.

4.2 PROPOSAL LAYOUT

The indicative infrastructure layout presented in this EIS has been developed iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process aims to avoid or minimise potential impacts wherever practicable and results in a Proposal that responds appropriately to the site constraints for the Wellington North Solar Plant.

To inform the development of the most appropriate proposal, an environmental constraints analysis of the Proposal site was undertaken in the early planning stages to assist with designing the solar plant layout and planning the detailed methodologies for the environmental assessment. Environmental constraints can be defined as factors which affect the 'developability' of a site and include physical, ecological, social and planning factors. A map of these constraints was prepared for the Preliminary Environmental Assessment (PEA) (NGH Environmental 2017). Following the detailed field investigations, the mapping has been further refined and is presented in Figure 1-9. This process demonstrates how the Proposal has appropriately responded to the site's constraints. With reference to the site's key constraints, the Proposal assessed in this EIS has:

Biodiversity:	• Avoided areas of good condition White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (EEC). • Minimised the impact to areas of moderate condition remnant vegetation. These were areas of White Box Grassy Woodland and Yellow Box Woodland with a grazed understorey. • Avoided waterways and riparian zones that may provide foraging habitat for threatened species such as the Southern Myotis, Eastern Bent-wing Bat and Grey-headed Flying Fox. • Minimised impacts to rocky outcrops. • Minimised impacts to hollow-bearing trees.
Aboriginal heritage:	• Avoided two scar trees within the Proposal site. A 10m buffer would be applied to ensure no indirect impacts.
Sensitive receivers:	• Consulted extensively with nearby residential receivers, which have greater potential to be impacted by the Proposal. Consultation has included the presentation of six photomontages to better understand the visual impacts from specific locations. • Vegetation screening has been included in the Proposal layout specifically onsite along the eastern, northern and western boundaries of the solar plant site.
Waterways:	• Buffered three waterways in accordance with their classification and the "Guidelines for Riparian Corridors on Waterfront Land" to minimise impacts on hydrology and water quality. This includes a 30m buffer (on each side of the waterway) along the north to south west waterway and 20m buffers (on each side of the waterways) along the two east to west waterways.
Historic heritage:	• Avoided identified historic heritage site; the homestead onsite.

4.3 PROPOSED INFRASTRUCTURE

The Wellington North Solar Plant proposal involves the construction, operation and decommissioning of a ground-mounted photovoltaic (PV) solar array which would generate approximately 300MW (AC) into the national electricity grid. The total development footprint is approximately 837 ha, which includes approximately 31 ha for the 'worst case' (largest impact area) transmission line option.

The key infrastructure for the Proposal would include:

- Approximately 1.2 million PV modules, spaced 4-8m and mounted on east-west horizontal tracking systems or north-orientated fixed-tilt structures (both fixed and tracking options are considered viable for the Proposal).
- Up to approximately 155 PV inverter stations to allow conversion of DC module output to AC electricity and transformation to medium voltage for site reticulation (typically 22kV or 33kV).
- Underground electrical conduits and cabling to connect the solar panels, combiner boxes and inverters.
- An onsite substation containing up to two transformers and associated switchgear;
- Up to approximately 7km of 132kV or 330kV, overhead or underground transmission line to the existing TransGrid 330kV substation; either an east (underground) or west (overhead or underground) transmission line.
- Additional electrical transformation equipment to be positioned in close proximity to the existing TransGrid substation, if the 132kV transmission line option is progressed.
- Site access off Campbells Lane, with additional access for mostly light vehicles off Goolma Road.
- Internal access tracks and upgrades to existing access roads, where required.
- Site office and maintenance building with associated car park.
- Space for future energy storage facility. Energy storage is not currently proposed and therefore is not part of this assessment.
- Perimeter security fencing and CCTV.
- Vegetation planting to provide visual screening for specific viewers, as required.

The layout of the infrastructure components is shown on Figure 1-8 and key areas are summarised below. The components are described in detail in the following sections. Indicative plans and images of infrastructure components are provided below. The plans and specifications of the components would be subject to detailed design and product selection through a competitive tender process.

Mapped proposal boundary:	**1047 ha**
Solar plant site boundary	970 ha
Worst case (largest impact area) development footprint:	**837 ha**
Infrastructure within the solar plant site, excluding transmission line options	806 ha
Western transmission line option (largest impact area)	*31 ha*
Eastern transmission line option	7 ha

4.3.1 Solar arrays

The Proposal involves the installation of PV solar panels, arranged in a series of rows positioned to maximise the use of the solar resource available at the site (refer to Figure 4-1). The Proposal detail design would consider two options for the configuration of PV panels:

1. Fixed configuration, where the panels would be placed on fixed frames running in rows from east to west and tilted to the north; or
2. Single axis tracking, where the panels would be in rows configured in a north-south direction and the panels would track the sun from east to west throughout the day.

In either configuration, the panels would be fixed to and supported by ground-mounted framing (refer to Figure 4-2 and Figure 4-3). The ground mounted frame piles would be driven or screwed into the ground. During the piling installation, work would be undertaken to avoid disturbing the existing ground cover to minimise ground disturbance and limit the potential for erosion (Figure 4-4).

The typical dimensions of the PV solar panels are up to 2m by 1m, which provides a surface area of approximately 2 square metres (m^2) per PV solar panel. PV solar panels are designed for maximum light absorptivity and constructed of solar glass with an anti-reflective surface treatment. Subject to detailed design and the selected configuration the edge of the panels would be up to 4m high when fully tilted.

Approximately 1,200,000 PV solar panels could be accommodated at the site, providing an estimated capacity in the order of 300MW (AC). The final number of PV solar panels within the development footprint would be dependent on detailed design, availability and commercial considerations at the time of construction.

Figure 4-1 Typical fixed array solar plant - Nyngan NSW (Nyngan Solar Plant is owned by the Powering Australian Renewables Fund (PARF). Image courtesy of PARF).

Figure 4-2 Example of typical panel framing (Image courtesy of PARF).

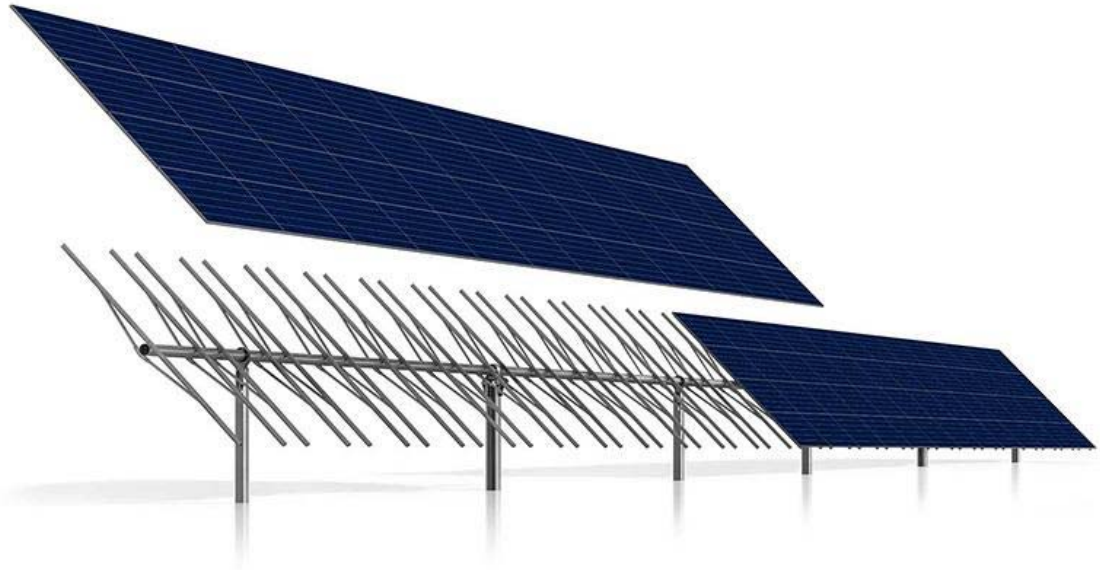

Figure 4-3 Typical single axis tracking system (panels in landscape).

Figure 4-4 Typical pile driving unit (Image courtesy of PARF).

4.3.2 Power conversion stations

The solar array would be divided into blocks, which would generally be sized between 2MW to 8MW. This would provide up to 155 Power Conversion Stations (PCS) consisting of:

- Inverters to convert DC power to AC power.
- Power transformers to step the voltage up to the solar plant reticulation voltage.
- Medium voltage switchgear.
- Communications and ancillary equipment.

The PCSs would be approximately 12m long, 3m high and 3m wide (refer to Figure 4-6). They would be spread evenly across the site, in areas designated for solar panels.

Figure 4-5 Typical containerised PCS (courtesy: SMA)

Figure 4-6 Typical PCS (courtesy: Power Electronics).

4.3.3 Medium voltage collection systems

The on-site electrical collection systems would be medium voltage (typically 22kV or 33kV) and predominantly run underground. These would generally follow site access tracks from each power conversion unit to the onsite electrical substation. Cables would be buried to a depth of 600mm – 1200mm in accordance with appropriate standards.

Cables would be required to cross the two main waterways onsite. The cable crossings would be designed in accordance with *Guidelines for Laying Pipes and Cable in Watercourses on Waterfront Land (NSW DPI, 2012),* to minimise erosion and protect the water way function.

In some instances, overhead cabling may be required to facilitate adverse geotechnical conditions, or other technical impairments.

4.3.4 Transmission network connection

All electricity generated by the solar plant would be transmitted to the national electricity grid via the existing Wellington Substation. Following extensive discussions with TransGrid and network studies, it is proposed to connect the plant to the Wellington substation at a voltage of 330kV.

The Proposal seeks approval for either the eastern or western transmission line option to be constructed. A 132kV or 330kV overhead or underground transmission line would be constructed to connect the solar plant to the existing Wellington Substation via one of the transmission line options (presented in Figure 1-8). The western line, if constructed, would be either overhead or underground. The largest impact area results from the western overhead option. Overhead options would provide for an easement up to 60m wide and up to approximately 50m high. It constructed solely as an overhead line, the easement would total 31 ha. The eastern line, if constructed, would be underground. Underground easements would be 15m wide. This option would total 7 ha.

If the 132kV overhead transmission line is progressed, an additional transformer (132/330kV) at the Wellington Substation would be required to facilitate the connection to the 330kV transmission network. The western transmission line option passes through five properties and for the majority of its route runs parallel to two existing transmission lines. It crosses Goolma Road to west of the Wellington Substation land.

The eastern transmission line option passes through two properties. The majority of its route runs parallel to Goolma Road through land operated by the NSW Government containing the Wellington and Macquarie Correctional Centres. The route crosses Goolma Road immediately east of the solar site and Twelve Mile Road near the intersection with Goolma Road.

4.3.5 Ancillary infrastructure

An onsite substation would be provided to convert the medium voltage AC electricity to 132kV or 330kV electricity. This would then be suitable for connection to the existing Wellington Substation via the new overhead or underground transmission line. The onsite substation would include a prepared foundation bench with earth grid, transformers, switchgear, and would occupy approximately 2ha. It would be surrounded by gravel and enclosed by a security fence.

A site office and staff amenities building would be constructed in close proximity to the substation. These buildings would include:

- Staff offices.
- Control room.
- Toilets with appropriate septic tank.
- Showers.
- Lunch room.
- First aid room.
- Water tanks.
- Covered walkways.
- Covered storage area.
- Associated data, water and electrical reticulation.

A maintenance building would be established in close proximity to the site office and would provide storage for spare parts, maintenance equipment, and a workshop.

Temporary laydown areas for construction equipment and parking for construction workers and operational staff would also be provided. Temporary construction laydown and parking areas would be rehabilitated in the operational phase.

The location of all ancillary infrastructure is shown on Figure 1-8.

The existing residential dwelling and the SCS facilities would not be used as part of the Proposal. Therefore, no change in use or material change to these buildings is part of this proposal.

4.3.6 Site access and internal tracks

Three vehicular access points to the development the Proposal site are proposed:

1. **Access Point 1.** The primary access point would be via Campbells Lane along the northern boundary of the site. This access point would be used for light and heavy vehicles.
2. **Access Point 2.** The existing driveway off Goolma Road that leads to the residential dwelling on the property. This access point would be utilised by light vehicles only.
3. **Access Point 3.** The existing driveway off Goolma Road that leads to the SCS facilities. This access point may continue to be utilised by SCS staff in addition to light vehicle access to the solar plant. By exception only, the access point may be required for some heavy vehicle movements, such as the delivery of high voltage transformers. The existing access road caters for heavy vehicles due to the existing access requirements of the SCS.

Proposed construction upgrades to these access ways are discussed in Section 4.4.4.

Internal access tracks would be constructed of compacted gravel. Access tracks would be up to 6m wide to allow for the safe delivery, unloading and installation of key components such as the power conversion stations, PV panels, transformers and switching equipment. The exact location of access tracks would be determined during the detailed design phase, when the solar array design in finalised. Internal access tracks are private roads designed and constructed only for construction, operation and maintenance purposes. A preliminary layout of main internal tracks is shown on Figure 1-8.

The internal access tracks would require approximately five waterway crossings within the two main waterways onsite. The design of the waterway crossings would be in accordance with the following publications, to minimise erosion and protect the waterway function:

- *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge, 2003).*
- *Policy and Guidelines for Fish Friendly Waterway Crossings (NSW DPI, 2003).*
- *Guidelines for Watercourse Crossings on Waterfront Land (NSW DPI, 2012).*

Examples of these guidelines watercourse crossings are in Figure 4-7 and Figure 4-8.

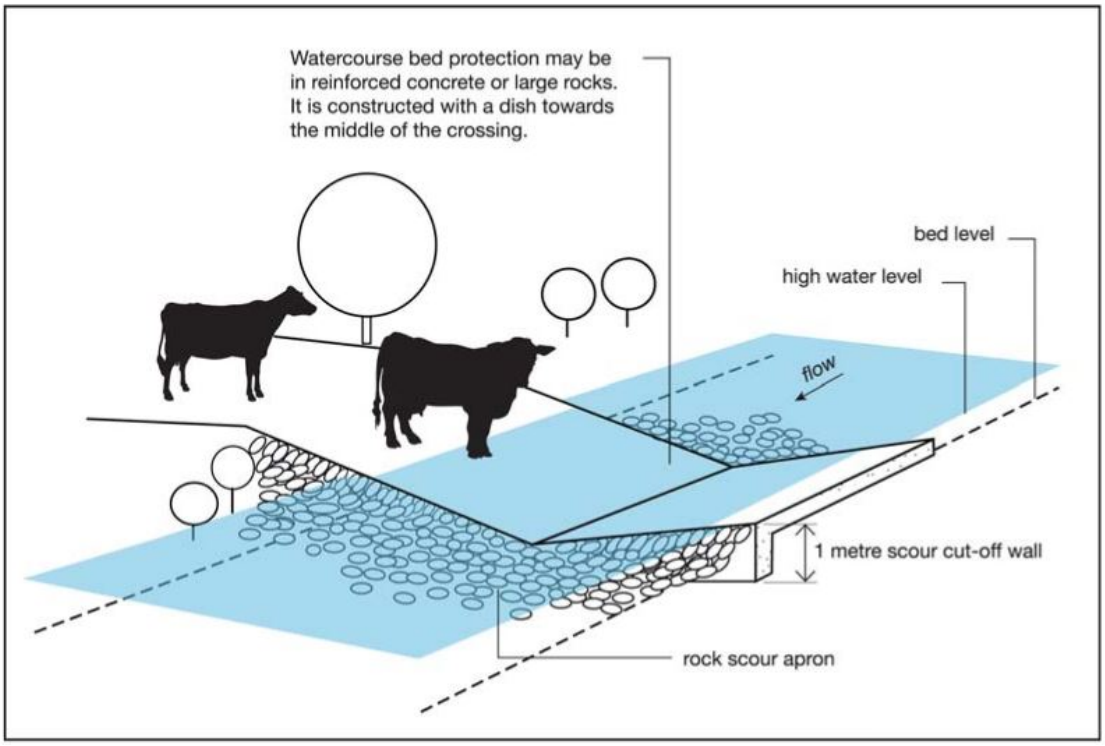

Figure 4-7 Examples of a crossing on small intermittent watercourse (DPI, 2012).

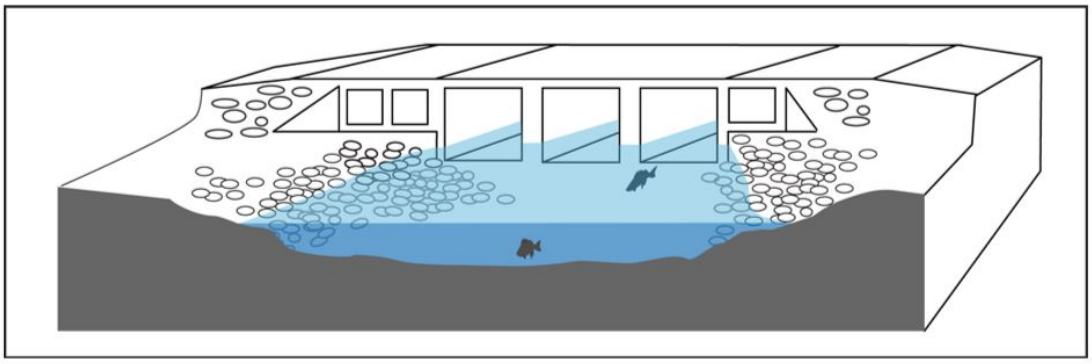

Figure 4-8 Example of a fish passage friendly water crossing (DPI, 2012).

4.3.7 Security fencing and visual screening

A security fence approximately 2.4m high would be constructed around the perimeter of the site infrastructure areas as shown in Figure 1-8. The final location of the security fence would be dependent on the detailed design of infrastructure.

CCTV cameras and security lighting would be provided around the onsite substation, maintenance building and offices.

Some sections of the fenced perimeter would be targeted for landscaping treatments (refer to Figure 1-8). This would entail 6m wide screening positioned between the property boundary and solar arrays of locally occurring native tree species planted to break up views of the infrastructure from specific receivers. Species selection would consider the impact of shading on the array.

4.4 EARLY WORKS

The proposed Wellington North Solar Plant may include early works (activities that would commence prior to the construction phase) including upgrades to the public road network and site entry point, installation of fencing, collection of artefacts, overhead line safety marking, geotechnical drilling and / or surveying and preparation of construction compounds and site facilities.

4.5 CONSTRUCTION

4.5.1 Construction activities

The construction phase is expected to last approximately 18 - 24 months with peak activity during the middle nine months of the construction period. The main construction activities would include:

1. Site establishment and preparation for construction - fencing, ground preparation, construction of the internal access track system, upgrade of existing access points/intersections, preliminary civil works and drainage.
2. Installation of steel post and framing system for the solar panels.
3. Installation of underground cabling (trenching) and installation of power conversion stations and footings.
4. Installation of PV panels.
5. Construction of site office and maintenance building.
6. Construction of the onsite substation and connections.
7. Removal of temporary construction facilities and rehabilitation of disturbed areas.

It is expected that some of these stages of construction would occur concurrently.

4.5.2 Site preparation and earthworks

Figure 1-8 indicates the development footprint which covers approximately 837 ha including development within the solar plant site and the 'worst case' (largest impact area) transmission line option. A majority of the area is already disturbed due to farming activities. Ground disturbance resulting from earthworks associated with proposal would be minimal and limited to:

- The installation of the piles supporting the solar panels, which would be driven or screwed into the ground typically to a depth of approximately 1.5 -2.4m depending on geotechnical conditions.
- Construction of internal access tracks and access points and associated drainage.
- Substation bench preparation.
- Concrete or steel pile foundations for the of power conversion stations, onsite substation and maintenance building.
- Cable trenches up to approximately 1200mm deep.
- Establishment of temporary staff amenities and offices for construction.
- Construction of perimeter security fencing.

The ground disturbance from pile foundations would be less than approximately 1% (representing approximately 8ha) of the total site area. Panels within the solar array area would sit above the ground and existing ground cover vegetation would be maintained underneath the panels. Approximately 80% of the total site area groundcover would be affected by shading to varying degrees depending on time of year

and time of day. Monitoring ground cover to ensure species selection is appropriate forms part of the Proposal's commitments.

Apart from the permanent development footprint (approximately 837ha, including the largest transmission line option), any disturbed areas would be restored to vegetation (groundcover) after construction.

Topsoil and ground cover vegetation under the footprint of the array area would remain in place during the construction of the solar plant. With the exception of some topsoil smoothing to facilitate construction, minimal impact is expected during construction and the intention is to restore any damage from trampling such that the ground cover provides protection against erosion, during the operational phase of the Proposal.

Where required weed treatments would be undertaken prior to earth works commencing, in order to reduce the potential for spread of these species within the development footprint.

4.5.3 Materials and resources

Key resourcing requirements for the Proposal would include labour, machinery and equipment, steel, electrical components (including PV panels and cables), water, gravel and landscaping materials.

Machinery and equipment

The machinery and equipment required for the construction of the Proposal would include earthmoving machinery and equipment for site preparation, cable trenching and laying equipment, post-driving equipment, assisted material handling equipment (forklifts and cranes), machinery and equipment for connection infrastructure establishment, and water trucks for dust suppression. Typical quantities of such machinery and equipment for this proposal are listed in the table below.

Table 4-2 Estimated machinery and equipment

Plant Description	Estimated Number of Items
Small pile driving rig	10
Crane	4
Drum roller	4
Padfoot roller	4
Wheeled loader	3
Dump truck	6
30t Excavator	10
Grader	6
Chain trencher	4
Water truck	4
Telehandler	4
Forklift	4

Materials

Proposed resource materials for construction are listed in the table below. These figures are estimated and would be confirmed during the detail design phase of the Proposal.

Table 4-3 Estimated material resources.

Resource	Estimated Quantity
Gravel (access tracks)	26,000m^3
Sand (bedding for cables)	5,000m^3
Concrete	1,200m^3
Estimated no of solar panels	1,000,000
Water during construction	55ML pa. (approximately 110ML total)

Potable water would be trucked to the site on an as needs basis and stored within temporary water tanks at the staff amenities area. Water for dust suppression would be sourced from farm bores or from a local council standpipe.

4.5.4 Transport and access

Construction infrastructure and materials are expected to be delivered to the site via road transport, in preference to rail transport options.

The site is serviced by major state and regional roads including the Mitchell Highway and the Golden Highway (via Cobbora Road). It is anticipated that materials would be delivered to the site from either the port of Sydney or the port of Newcastle. Materials would generally be shipped in containers on heavy vehicles up to B-double size and would include, and not be limited to:

- PV solar panels.
- Piles, mounting structures and frameworks.
- Electrical equipment and infrastructure including cabling, inverters, switchgear, and the onsite substation (or transformer).
- Construction and permanent buildings and associated infrastructure.
- Earthworks and lifting machinery and equipment.

The main vehicular access to the site is planned from Campbells Lane via Cobbora Road. The existing driveway off Goolma Road that leads to the SCS facilities may be required for some heavy vehicle movements (as set out in Section 4.3.6).

Specialist oversize equipment such as the site transformers would have 'Oversize' transport management in place to transport these items to site. A Construction Traffic Management Plan would be prepared following project approval to manage haulage traffic during the construction phase.

Intersection upgrades

Subject to the finalisation of the transport route, it is anticipated that some intersections may need to be upgraded to facilitate the transport regime. It is proposed that for the intersections of:

- Cobbora Road and Campbells Lane; and
- Campbells Lane and the main site access.

that Basic Right Turn (BAR) and Basic Left Turn (BAL) features as required (refer to Figure 4-9 and Figure 4-10) would be installed. The turn treatments would be designed to accommodate articulated vehicles up to 19m in length. Shoulder widening would be required on the western and eastern road alignment of the Cobbora Road and for the Campbells Lane main site access intersection.

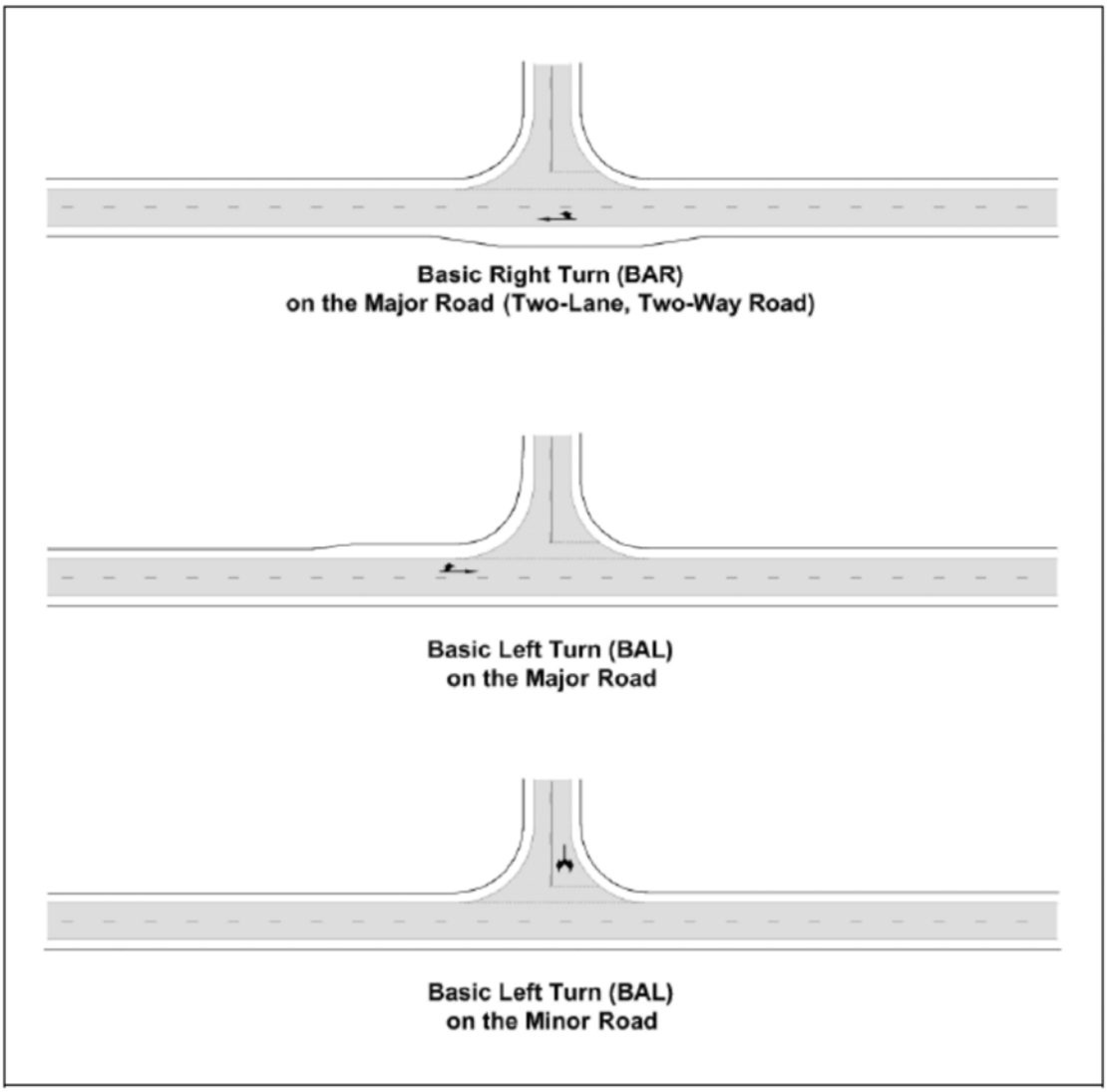

Figure 4-9 Typical BAR and BAL intersections proposed for Cobbora Road and Campbells Lane, and for Campbells Lane and the main site access.

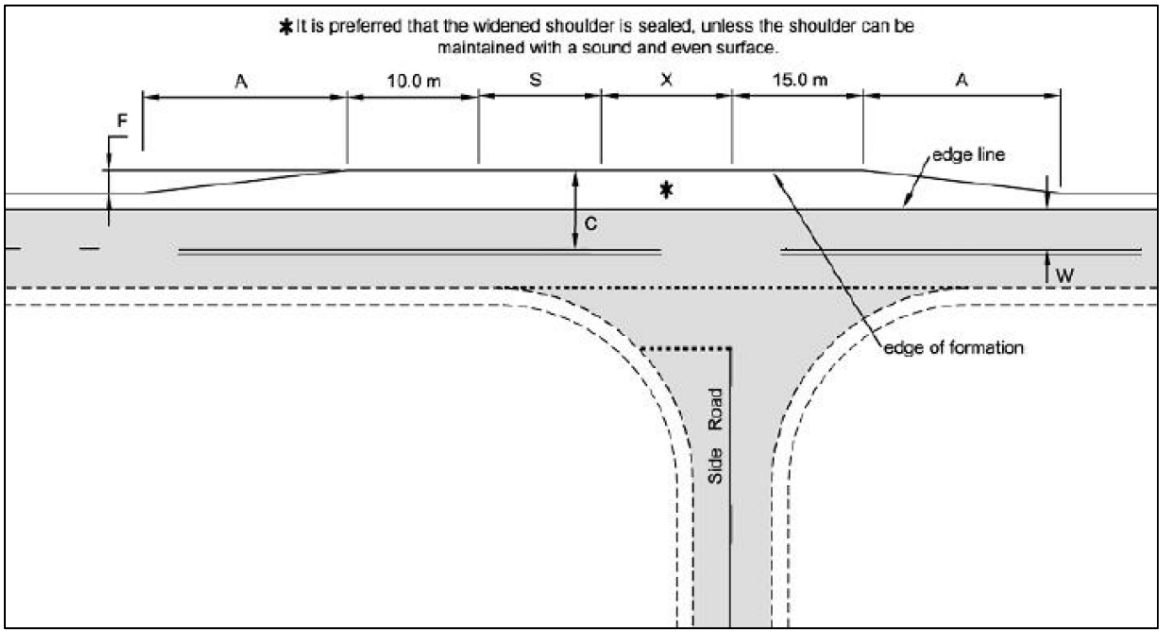

Figure 4-10 Typical BAR and BAL treatments showing shoulder treatments.

Traffic movements

Estimated total and maximum daily traffic movements during construction and peak construction are shown in Table 4-4 and Figure 4-11.

Table 4-4 Estimated traffic volumes and requirements for the Wellington North Solar Plant.

Type of vehicle	Vehicles over construction duration (one way)	Peak maximum daily number of Trips (one-way)
Semi-Trailers	6,605	41
Oversize load	2	0
Light Vehicles	5,500	17
Buses	2,904	10
Single unit truck	60	1
Flatbed truck	10	0
Total	**15,081**	**69**

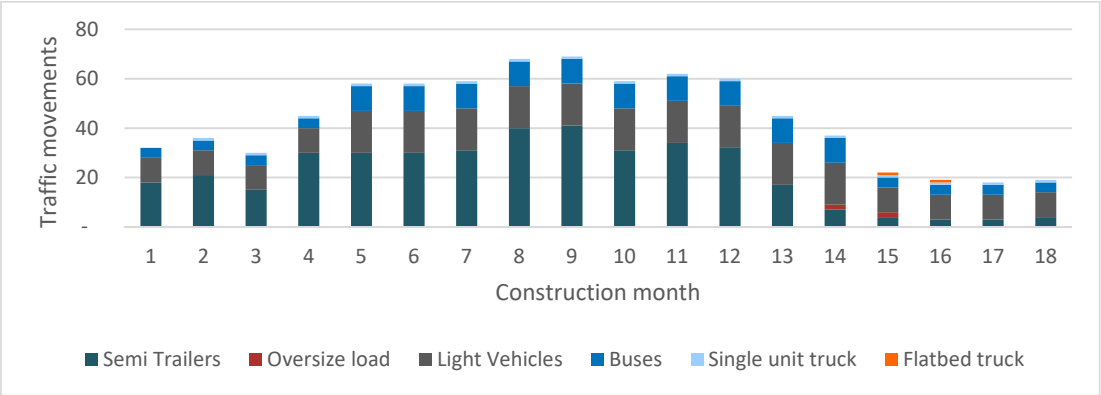

Figure 4-11 -– Estimated single tips per day per month of construction.

At the peak of the construction, it is anticipated that up to 250 site personnel would be required to undertake the works. A shuttle bus system may be put in place to transport workers to the site consisting of a 20 seater bus. This would generate up to 20 vehicle movements (10 in and 10 out) during a peak hour period, equating to 40 vehicle movements daily. Additionally, an extra allowance has been made for up to thirty people to travel in light vehicles (assuming approximately 2 people per vehicle) to access the site, generating up to 17 one way trips (inbound in the AM and outbound in the PM peak periods). This has been taken into consideration within Table 4-4.

The number of oversized vehicles required for the construction of the Wellington North Solar Plant is low. It is expected that up to four one-way movements of oversized vehicles would be required within the later months of the construction period (month 14 and 15).

4.5.5 Hours of operation during construction

Construction activities would be undertaken during standard daytime construction hours (7.00am to 6.00pm Monday to Friday and 8.00am to 1.00pm on Saturdays). Exceptions would occur as staff arrive and leave the site, before and after shifts. Some of this light traffic and/or buses may occur outside the standard construction hours. Additionally, the delivery of large components may take place outside normal working hours.

Any construction outside of these normal working hours, if required, would only be undertaken in accordance with approvals from relevant authorities.

4.6 OPERATION

4.6.1 Activities during operation

Activities undertaken during operation would include:

- Routine visual inspections, general maintenance and cleaning operations of the solar arrays as required.
- Routine visual inspections, general maintenance and cleaning operations of the substation.
- Vegetation management within the development envelope. This is likely to use a combination of mechanical methods as well as a trial of controlled grazing of sheep to manage grass growth beneath the panels. Groundcover vegetation would be maintained over the site to minimise erosion, dust and weeds (subject to climatic conditions).

Groundcover would be monitored and remediation (such as reseeding or soil protection) undertaken as required to maintain a stable cover.

- Site security response (24hr), if required.
- Site operational response (24hr), if required. [
- Replacement of equipment and infrastructure, as required.
- Maintenance of landscaping and screening plantings, as required.
- Pest plant and animal control, as required.

4.6.2 Water requirements

During operation, non-potable water would be required for cleaning panels, onsite toilet and showers, landscaping and animal care. Potable water would be required for the workers. Rain water would be collected onsite. In terms of quantities required, the operational water use volumes during operation would be minimal; the water required for staff amenities is estimated to be approximately 150kL per annum. Panel cleaning may be required in dry conditions when cropping operations in the locality are generating dust, however AGL Energy Limited's modules currently do not require cleaning anywhere along the east coast of Australia. Rain water would be gathered from the O&M building roof and stored within onsite tanks. In cases of prolonged drought, water would be trucked to site as required.

4.6.3 Personnel and work hours

The solar plant would be monitored and operated remotely and would require a small number of maintenance personnel (approximately 2-4 full time equivalent staff) to be based at the site. They would primarily use light vehicles (4x4) for site maintenance activities. It is expected that the staff would be local to the region.

The majority of plant infrastructure maintenance, including power conversion station, transformer and HV switchgear, PV arrays and the trackers (if fitted), would be conducted by site staff on a rolling basis with activities scheduled consistently throughout the year. There would be some occasions, such as during a major substation maintenance shut down, where additional maintenance staff may be required on site. If required, the staff would be accommodated in the operations building at the site and any additional traffic could be minimised through carpooling.

Other site maintenance activities would include:

- Vegetation management.
- Weed and pest management.
- Fence and access track management.
- Security monitoring.

4.6.4 CCTV and Lighting

CCTV security cameras and security lighting would be provided around the site substation, maintenance building and operational offices. The use of night security lighting would be minimised and designed to ensure reduced disturbance to neighbouring properties. There would be no permanent night lighting installed within the array, but lighting may be included in each PCS for conducting night maintenance when the solar plant is de-energised.

4.6.5 Refurbishment and upgrading

The solar plant operator may replace or upgrade solar panels or other infrastructure within the existing development envelope during the projected 30 year life of the solar plant. If any upgrade works during the life of the solar plant would extend beyond the proposed development footprint or alter the nature or scale of environmental impacts, the proponent would consult the DPE regarding the need for further assessment or approval.

4.7 DECOMMISSIONING AND REHABILITATION

At the end of the Proposal's operational life, the site would be either returned to its pre-solar plant agricultural land capability, or to an alternative land use. During the site's decommissioning, all solar plant infrastructure would be removed. Key elements of the Proposal decommissioning would include:

- The solar arrays would be removed, including the foundation posts. Materials would be sorted and packaged for removal from the site for recycling or reuse. Much of the solar array panels would be recyclable.
- All site amenities and equipment would be removed, and materials recycled or reused, wherever practicable.
- Posts and cabling installed would be removed and recycled, equipment below this depth would be left in situ.
- Fencing would be removed including small concrete footings.

Areas of soil disturbed during decommissioning would be rehabilitated with the aim of meeting the pre-solar plant land capability. Soil survey proposal commitments would assist to meet this objective.

Traffic required for decommissioning would be similar in type but of shorter duration than that required for the construction phase.

4.8 INDICATIVE TIMELINE

An indicative timeline for the Proposal is outlined in Table 4-5. The commissioning of the solar plant would likely be phased. It is expected that the solar plant would be commissioned progressively in 1-3 phases before full commissioning at the end of the 18-24 month construction period.

Table 4-5 Indicative timeline.

Phase	Approximate commencement	Approximate duration
Construction	1st Quarter 2019	18 -24 months
Operation	3rd Quarter 2020	30 years
Decommissioning	2050	9 months

4.9 CAPITAL INVESTMENT

The Wellington North Solar Plant would have an estimated capital investment of approximately $550 million (excluding storage).

5 PLANNING CONTEXT

This section sets out the legislative planning context for the Proposal. This includes:

- Clarification of the status of the Proposal as SSD.
- The permissibility of the Proposal under relevant environmental planning instruments (EPIs), including relevant State environmental planning policies (SEPPs) and local environmental plans (LEPs).
- Evaluation of the Proposal against relevant NSW, local, State and Commonwealth legislation (Acts and Regulations).

This section also identifies any additional approvals which would apply to the Proposal.

5.1 ASSESSMENT CONTEXT

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and its associated regulations and instruments set the framework for development assessment in NSW.

Development assessment provisions are contained in Part 4 of the Act. Section 4.36 of the EP&A Act provides that a development would be State Significant Development (SSD) if it is declared to be SSD by a State Environmental Planning Policy (SEPP).

The *State Environmental Planning Policy (State and Regional Devel*opment) *2011* (NSW) (SRD SEPP) declares the Wellington North Solar Plant to be SSD, as it is development for the purpose of electricity generating works with a capital investment value of greater than $30 million (Clause 20, Schedule 1).

Section 4.12(8) of the EP&A Act requires a DA for SSD development application to be accompanied by an EIS prepared in accordance with the EP&A Regulation. This EIS is intended to meet the objectives and assessment requirements of the EP&A Act, the EP&A Regulation and the SRD SEPP.

The proponent made a written application to the Secretary requesting Secretary's Environmental Assessment Requirements (SEARs) for the proposed Wellington North Solar Plant in November 2017. This is in accordance with Clause 3 of Schedule 2 of the EP&A Regulations. The proponent's application was accompanied by the PEA, which outlined key information about the proposed Wellington North Solar Plant proposal, including the key environmental issues and investigation strategies, for the Proposal site.

On 18 December 2017, the Secretary issued the SEARs for the Wellington North Solar Plant (Appendix A). In formulating the SEARs, the Secretary consulted with relevant public authorities and agencies and considered key issues raised by those authorities. Section 6.4.1 outlines the SEARs and provides a cross reference to where each item is addressed within this EIS. Additional agency consultation undertaken during the preparation of the EIS is also summarised, in Section 6.4. This EIS complies with the SEARs and the environment assessment requirements contained in Schedule 2 of the EP&A Regulation.

5.2 ENVIRONMENTAL PLANNING INSTRUMENTS

EPIs are legal documents that are prepared under the EP&A Act to regulate land use and development. EPIs determine the relevant part of the EP&A Act under which a development proposal must be assessed and therefore determines the need or otherwise for development consent. EPIs consist of SEPPs and LEPs, but do not include development control plans.

5.2.1 State Environmental Planning Policies

State Environmental Planning Policy (State and Regional Development) 2011

The aims of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) are to identify development that is SSD, which are major projects that require approval from the Minister for Planning and Environment or delegate (being, the Independent Planning Commission, the Secretary of the DPE or other public authority).

Clause 20 of Schedule 1 the SRD SEPP defines SSD as including:

> *Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:*
>
> *(a) has a capital investment value of more than $30 million, or*
>
> *(b) has a capital investment value of more than $10 million and is located in an environmentally sensitive area of State significance.*

The Wellington North Solar Plant would have an estimated capital investment cost greater than $30 million and is therefore considered to be SSD under Part 4 of the EP&A Act.

State Environmental Planning Policy (Infrastructure) 2007

Clause 34(7) of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) provides that development for the purpose of a solar energy system may be carried out by any person with consent on any land (except land in a prescribed residential zone if the system has the capacity to generate more than 100kW).

A 'solar energy system' includes a photovoltaic PV electricity generating system. The proposed Wellington North Solar Plant would be located within a rural zone (RU1 Primary Production), under the Wellington LEP (refer Section 5.2.2).

It is noted that the western transmission line option is adjacent to existing transmission lines, would occur on land zoned R5 Large Lot Residential under the Wellington LEP. No solar panels or other associated infrastructure other than the transmission line would occur on this land, as it is located outside the solar plant site. The Proposal is therefore permissible with consent under the ISEPP.

State Environmental Planning Policy (Rural Lands) 2008

Clause 13 of the *State Environmental Planning Policy (Rural Lands) 2008* (Rural Lands SEPP) identifies land as being State Significant Agricultural Land if it is listed in Schedule 2. Schedule 2 does not currently identify any land.

The Proposal site is located on land that is identified as Biophysical Strategic Agricultural Land (BSAL) for the purpose of protecting agricultural land from the impacts of mining and coal seam gas (CSG) activity. The BSAL mapping has been completed at a regional scale and is not extensively ground-truthed. The site surveys suggest that sustained high productivity (such as annual cropping) would not be supported at the site. Soil surveys undertaken to accurately assess land capability found the Proposal would have limited impact on agriculture resources and land locally. Section 7.4 outlines the potential impacts of the Proposal to land use.

The Rural Lands SEPP Planning Principles and their relevance to the Proposal are outlined in Table 5-1.

Table 5-1 Rural Lands SEPP Planning Principles.

Planning Principles	Applicability to the Wellington North Solar Plant proposal
(a) ***the promotion and protection of opportunities for current and potential productive and sustainable economic activities in rural areas,***	The solar plant would allow for a diversification of sustainable economic activity, compatible with other rural land uses. The impact on land forms, soil and water resources are minimal (refer to Sections 7.5 and 8.1). Commitments are made to restore the site to its existing land capability so that future land use options are maintained.
(b) ***recognition of the importance of rural lands and agriculture and the changing nature of agriculture and of trends, demands and issues in agriculture in the area, region or State,***	The loss of agricultural productivity in the region that would be attributed to the Wellington North Solar Plant would be insignificant in relation to the extent of productive land in the South Western Slopes of New South Wales. It would result in a loss of 0.86% of BSAL within the Dubbo Regional Council LGA. The key driver for the development is the increased economic gain able to be achieved under solar plant operation. This can be achieved with no long-term loss of agricultural productivity potential. The proponent anticipates using sheep to control the grass cover within the plant, maintaining local agricultural benefits of resting paddocks, subject to seasonal limitations.
(c) ***recognition of the significance of rural land uses to the State and rural communities, including the social and economic benefits of rural land use and development,***	Community consultation with the local community identified few concerns with regard to land use and employment. Further, the Proposal would provide significant construction and operational benefits for the community by generating around 250 construction jobs during peak construction as well as indirect supply chain jobs. During the operation and maintenance phase it would employ approximately 2-4 full time staff. Large scale renewable projects create long term employment opportunities, which are rare in many rural communities. The Proposal is not anticipated to adversely impact on the rural land uses or development that could occur adjacent to the site.
(d) ***in planning for rural lands, to balance the social, economic and environmental interests of the community,***	As above, the key driver for the development is the increased economic gain able to be achieved under solar plant operation. Environmental and community impacts have been investigated in this EIS to ensure that the resultant proposal balances these three components. Changes to the Proposal to ensure these conflicts are resolved is set out in Section 8.2.
(e) ***the identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land,***	The site selection and layout of the proposed solar plant has been developed iteratively with environmental constraints mapping, to ensure the Proposal responds to the site's constraints. Particularly, the Proposal demonstrates avoidance of good condition EEC and threatened species habitat. Refer to Section 4.2.

Planning Principles	Applicability to the Wellington North Solar Plant proposal
(f) ***the provision of opportunities for rural lifestyle, settlement and housing that contribute to the social and economic welfare of rural communities,***	The Proposal does not address this aim directly. The buildings onsite would not change building use. Considering offsite effects, through the creation of employment, and economic stimulus effects during construction and operation, the Proposal could help current local families to continue living in rural areas, and newly settled families to live the rural lifestyle.
(g) ***the consideration of impacts on services and infrastructure and appropriate location when providing for rural housing,***	The Proposal does not address this aim. It would not provide rural housing. The relevant infrastructure likely to be impacted are transport corridors. It is noted that traffic management measures have been committed to as part of the Proposal and these would address impacts on transport corridors.
(h) ***ensuring consistency with any applicable regional strategy of the Department of Planning or any applicable local strategy endorsed by the Director-General***	No applicable local strategies are relevant to the Proposal.

State Environmental Planning Policy No 55 - Remediation of Land

The *State Environmental Planning Policy No 55 - Remediation of Land* (SEPP No 55) aims to promote the remediation of contaminated land for the purposes of reducing the risk of harm to human health or any other aspect of the environment. Clause 7 of the SEPP No 55 requires that the remediation of land be considered by a consent authority in determining a DA. There are no contaminated sites for the former Wellington Council LGA (now amalgamated with Dubbo Regional Council however the database search has not been updated to reflect the amalgamation) in the NSW Environment Protection Authority (EPA) contaminated land register (NSW Government, 2017). Contamination associated with agricultural activities (e.g. pesticides, petrochemicals, hydrocarbon contamination) or asbestos construction or insulation materials has potential to be present on site. A geotechnical report (GHD, 2018) and soil report (McMahon, 2018) of the Proposal site did not identify any potential contamination onsite, however an area of waste disposal and potential contamination was identified by NGH Environmental during site inspections in the southern area of the Proposal site. In terms of the proposed solar plant, the need for remediation in this area prior to works commencing is considered to be low. Section 7.5 considers the potential for contamination at the Proposal site and potential contamination impacts from the Proposal.

The DPE has announced that *SEPP No 55 would be repealed and replaced by the* Remediation of Land SEPP. *This proposed solar plant is in accordance with the Draft* Remediation of Land SEPP.

State Environmental Planning Policy No. 44 – Koala Habitat Protection

The *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP No 44) encourages the conservation and management of natural vegetation that provides habitat for Koalas. Koalas are listed under the *Biodiversity Conservation Act 2016* (NSW) (BC Act) as a vulnerable species. The SEPP No 44 applies to each local government area listed in Schedule 1. The former Wellington Council LGA (now amalgamated with Dubbo Regional Council) is not listed in Schedule 1 of SEPP No 44 and the SEPP does not apply to the Proposal. However, it is noted that the Biodiversity Assessment, using the prescriptive

Biodiversity Assessment Methodology (BAM), has considered the potential impacts of the Proposal to the Koala; refer (see Section 7.1 and Appendix D).

5.2.2 Local Environmental Plans

Wellington Local Environmental Plan 2012

The site is located within the Dubbo Regional Council LGA, which has two LEPs. The Proposal is subject to the provisions of the Wellington LEP. The Proposal site is located across the following land zones:

- The solar plant site:
  - **RU1 – Primary Production**
- Both proposed transmission line routes:
  - **RU1 – Primary Production**
  - **SP2 – Infrastructure**
- The western transmission line option is additionally in:
  - **R5 – Large Lot Residential**

RU1 - PRIMARY PRODUCTION

The majority of the Proposal site is zoned RU1 Primary Production. Electricity generation is prohibited within the RU1 zone, however the ISEPP allows the development for the purpose of a solar energy system on any land with consent, which overrides the local provisions.

The Wellington LEP states that the consent authority must have regard to the objectives for development in a zone when determining a DA. The objectives of this zone are:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To provide for a range of tourism-related uses that support the agricultural industry or are compatible with agricultural uses.*

The Proposal would harness a natural resource (solar energy) for the life of the Proposal. While the activity would impact on land available for primary production, the Proposal would allow for diversification of land use. The Proposal would be reversible, involve limited ground disturbance, and would not remove the potential to use the land for cropping (or some alternative permissible rural land use) at the end of the solar plant's life (expected to be in the order of 30 years).

Mitigation measures are contained within the EIS that would form a commitment of the Proposal, address construction and operational soil and water impacts and would act to maintain the onsite land capability. Land use and capability is assessed in Section 7.4.

SP2 – Infrastructure (Classified Road Electricity Supply and Correctional Facility)

Electricity generation is permitted with consent within this zoning. The objectives for development in this zone are:

- *To provide for infrastructure and related uses.*

- *To prevent development that is not compatible with or that may detract from the provision of infrastructure.*

The Proposal would involve development of infrastructure that is compatible with the site.

R5 – Large Lot Residential

Parts of Lots 69, 70, 71 and 72 / DP2987, required for the western transmission line option, are located within R5 Large Lot Residential zoned land. Electricity generation is prohibited within this land zoning however, no electricity generation would occur as part of the Proposal. The proposed transmission line would be adjacent to existing transmission lines within this land zoning. The route of the proposed western transmission line option was selected as it is the shortest and most cost effective route to the substation. Additionally, it has the least potential for environmental and community impacts due to the presence of an existing easement and transmission lines.

5.3 NSW LEGISLATION

5.3.1 Legislation to be applied

Under section 4.42 of the EP&A Act, several authorisations cannot be refused if they are necessary for the carrying out of SSD authorised by development consent and substantially consistent with the consent. These authorisations include:

- An aquaculture permit under section 144 of the *Fisheries Management Act 1994* (NSW) (FM Act).
- An approval under section 15 of the former *Mine Subsidence Compensation Act 1961* (NSW).
- A mining lease under the *Mining Act 1992* (NSW) (Mining Act).
- A production lease under the *Petroleum (Onshore) Act 1991* (NSW).
- An environment protection licence (EPL) under Chapter 3 of the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act) (for any of the purposes referred to in section 43 of the POEO Act).
- A consent under section 138 of the *Roads Act 1993* (NSW) (Roads Act).
- A licence under the Pipelines Act 1967 (NSW).

Two matters that may be relevant to the Proposal include:

- An EPL under the POEO Act.
- A consent under section 138 of the *Roads Act 1993*.

Protection of the Environment Operations Act 1997

Under section 48 of the POEO Act, premises-based scheduled activities (as defined in Schedule 1 of the POEO Act) require an Environment Protection Licence (EPL). Clause 17 of Schedule 1 of the POEO Act concerns electricity generation works, however does not include solar power. The Proposal would not be a scheduled activity under the POEO Act and an EPL is not required.

Roads Act 1993

The *Roads Act 1993* (Roads Act) is administered by Roads and Maritime Services (RMS), local councils or the Department of Industry -– Land (DoI – Land). RMS has jurisdiction for classified roads, local councils for non-classified roads and the DoI - Land for road reserves or Crown roads.

The Roads Act regulates the carrying out of various activities in, on and over public roads. Under section 138, the consent of the appropriate roads authority is required to:

(a) erect a structure or carry out a work in, on or over a public road

(b) dig up or disturb the surface of a public road

(c) remove or interfere with a structure, work or tree on a public road

(d) pump water into a public road from any land adjoining the road

(e) connect a road (whether public or private) to a classified road.

The Proposal involves works that would trigger items a), b) and e) above. The Proposal would potentially use two existing access points from Goolma Road and one from Campbells Lane, for its operation and construction. Intersection upgrades would be required at the Campbells Lane and Cobbora Road intersection, as well as the Campbells Lane site access. Each of the proposed transmission line route options (east and west) would be required to cross over Goolma Road. Therefore, additional consent under the *Roads Act* would be required from RMS (works on Goolma Road) and Dubbo Regional Council (works on Campbells Lane) for the Proposal.

5.3.2 Approvals that do not apply

Under section 4.41 of the EP&A Act, SSD authorised by development consent developments does not require the following authorisations:

(a) A permit under section 201, 205 or 219 of the *FM Act* (NSW).
(b) An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977* (NSW) (Heritage Act).
(c) An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974* (NSW) (NPW Act).
(d) A bush fire safety authority under section 100B of the *Rural Fires Act 1997* (NSW).
(e) A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000* (NSW).

Even though the Proposal doesn't require the authorisations listed above, the potential impact of the Proposal on these matters is assessed in this EIS and mitigation strategies included in the Proposal's commitments.

5.3.3 Other relevant State legislation

Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) establishes a new regulatory framework for assessing and offsetting the biodiversity impacts of proposed developments and activities. The Act contains provisions relating to flora and fauna protection (repealing parts of the NPW Act), threatened species and ecological communities listing and assessment (repealing the *Threatened Species Conservation Act 1995* (NSW) and section 5A of the EP&A Act), a single BAM, and a Biodiversity Offsets Scheme (BOS) for the calculation and retirement of biodiversity credits and biodiversity assessment and planning approvals. The BC Act is supported by the *Biodiversity Conservation Regulation 2017* (NSW). The BC Act has been considered in the preparation of this EIS and in the provision of a Biodiversity Development Assessment Report (BDAR) and BOS.

Biosecurity Act 2015

The *Biosecurity Act 2015* (NSW) repealed the *Noxious Weeds Act 1993* (NSW) and provides a framework for the prevention, elimination and minimisation of biosecurity risks. The Act and supporting *Biosecurity Regulation 2017* (NSW) provide for the establishment and functions of Local Control Authorities for weeds (Dubbo Regional Council or, a county council or a joint organisation, as defined under the LG Act) and weed control obligations on public and private land. The EIS provides for the control of priority weeds occurring at the Proposal site as part of the proposed works (refer Section 7.1).

Mining Act 1992

The main objective of the *Mining Act 1992* is to encourage and facilitate the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development (ESD).

The land within the Proposal site is subject to the following authorities under the *Mining Act 1992* (DPE, 2017):

- EL 6178 – held by Modeling Resources Pty Ltd; and
- EL 8505 – held by Drummond West Pty Ltd.

No activities authorised by the exploration licences have been carried out on land within the Proposal site.

AGL have consulted with the authority holders and the details and outcomes of the consultation are provided in Section 5. There is a potential to impact exploration activities under each authority. However, there would have be no impact on the exploration of mineral resources which could be explored at the end of the Proposal's life, if this becomes a preferred land use option at this later stage.

Crown Lands Act 1989

The objective of the Crown Lands Act *1989* (NSW) is to ensure that Crown land is managed for the benefit of the people of NSW. The DoI – Land is responsible for the sustainable and commercial management of Crown land.

Lot 109 / DP 750760, adjacent to land subject of the Proposal within the eastern portion of the site, is mapped as Crown land. The proposed development envelope does not coincide with this lot. The Crown land has been identified as a constraint to be avoided by the Proposal (Section 7.6).

The identified paper roads within the solar plant site are managed by Dubbo Regional Council. AGL has made an application to the Dubbo Regional Council to close the paper roads within the Proposal site. AGL has consulted with the DoI – Land and Dubbo Regional Council and is continuing to pursue this process.

Waste Avoidance and Resource Recovery Act 2001

Waste management during the proposed works would be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act). Waste minimisation and management is addressed in Section 8.6 of the EIS.

Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) sets out to conserve fish stocks and key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation and biological diversity. Further, it aims to promote viable commercial fishing, aquaculture industries and recreational

fishing opportunities. Threatened species, populations and ecological communities and key threatening process are listed in the schedules of the FM Act.

The Wellington North Solar Plant is within the Macquarie-Bogan catchment. The Wellington Key Fish Habitat Map (NSW DPI, 2016) maps the main waterway onsite, refer to as tributary 1 that flows north to south west corner as Key Fish Habitat. Key Fish Habitat are those aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species (DPI 2016).

This EIS considers the potential impact of the Proposal on Key Fish Habitat, threatened species, populations and ecological communities listed in the FM Act (refer to 7.1 and 8.1).

5.4 COMMONWEALTH LEGISLATION

5.4.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) provides an assessment and approval process for actions likely to cause a significant impact on Matters of National Environmental Significance (MNES). The nine MNES are:

- World Heritage properties.
- National Heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Listed threatened species and ecological communities.
- Migratory species protected under international agreements.
- Nuclear actions (including uranium mines).
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- A water resource, in relation to coal seam gas development and large coal mining development.

Approval by the Commonwealth Environment Minister is required if an action is likely to have a significant impact on a MNES. Assessments of significance based on criteria listed in Significant Impact Guidelines 1.1 issued by the Commonwealth (Commonwealth of Australia, 2013) are used to determine whether the proposed action is likely to have a significant impact (i.e. is likely to be considered a 'controlled action').

A search of the Commonwealth Protected Matters Search Tool (coordinate search, undertaken on 12/09/2017) indicates that there are no World Heritage or National Heritage areas or items within the Proposal site. Two areas of Commonwealth land were identified, Australian Postal Commission and Australian Telecommunications Commission. These are not present at the site. One Commonwealth heritage place was identified, Wellington Post Office, which is located approximately 7km from the Proposal site.

The potential impacts to listed threatened species and communities are assessed in the BDAR (Appendix D) and summarised in Section 7.1. These conclude that the Proposal is not likely to have a significant impact on threatened species and communities, migratory bird species and marine species listed under the EPBC Act.

A summary of the EPBC Act search report is provided in Table 5-2. The full search report is provided in the BDAR (Appendix D).

Table 5-2 Summary of EPBC Act Protected Matters Report search results

Protected Matter	Entities with potential to occur within 10km of the Proposal site
World Heritage Properties	0
National Heritage	0
Wetlands of International Importance (Ramsar)	4
Threatened Ecological Communities	2
Threatened Species	29
Migratory Species	11
Listed Marine Species	17
Commonwealth land	2
Commonwealth Heritage places	1
Critical habitats	0
Commonwealth reserves (terrestrial)	0
State reserves	0
Regional Forest Agreements	0
Invasive species	29
Nationally Important Wetlands	0

It is noted that, at this time, the new BC Act and BAM are not endorsed by the Commonwealth to address MNES. These matters are therefore considered specifically in the BDAR, using Commonwealth criteria, and not as part of the NSW assessment.

5.4.2 Native Title Act 1993

The *Native Title Act 1993* (Cwth) provides a legislative framework for the recognition and protection of common law native title rights. Native title is the recognition by Australian law that Indigenous people had a system of law and ownership of their lands before European settlement. Where that traditional connection to land and waters has been maintained and where government acts have not removed it, the law recognises the persistence of native title.

People who hold native title have a right to continue to practise their law and customs over traditional lands and waters while respecting other Australian laws. This could include visiting to protect important places, making decisions about the future use of the land or waters, and hunting, gathering and collecting bush medicines. Further, when a native title claimant application is registered by the National Native Title Tribunal, the people seeking native title recognition gain a right to consult or negotiate with anyone who wants to undertake a proposal on the area claimed.

Native title may exist in areas such as:

- Vacant Crown land.
- Some national parks, forests and public reserves.
- Some types of pastoral leases.
- Some land held for Aboriginal communities.
- Beaches, oceans, seas, reefs, lakes, rivers, creeks, swamps and other waters that are not privately owned.

A search of the National Native Title Tribunal Registers on 4th December 2017 found no Native Title Claims or active applications within the Dubbo Regional Council LGA.

5.4.3 Renewable Energy (Electricity) Act 2000

The *Renewable Energy (Electricity) Act 2000* (Cth) (RE Act) aims to:

- Encourage the additional generation of electricity from renewable sources.
- Reduce emissions of greenhouse gases in the electricity sector.
- Ensure that renewable energy sources are ecologically sustainable.

Section 17 of the RE Act defines renewable energy sources eligible under the Commonwealth Government's RET; including solar energy.

Certificates for the generation of electricity are issued using eligible renewable energy sources. This requires purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire. In January 2011, renewable energy certificates were reclassified as either large-scale generation certificates or as small-scale technology certificates following changes to the RET scheme.

The Wellington North Solar Plant would need to be accredited as a Renewable Energy Generator to create Renewable Energy Certificates.

5.5 OTHER RELEVANT POLICIES AND MATTERS

5.5.1 Matters of consideration

Under Section 4.15 of the EP&A Act, the consent authority is required to consider a number of matters when determining a DA under Part 4. These matters are listed in Table 5-3 and assessed in terms of their relevance to the Proposal.

Table 5-3 Matters for consideration

Provision	Relevance to the Proposal
Any environmental planning instrument;	Relevant EPIs are discussed in Section 4. They include: • SRD SEPP. • ISEPP. • Rural Lands SEPP. • SEPP No 55. • SEPP No 44. • Wellington LEP.
Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority;	There are no draft instruments relevant to the Proposal.
Any development control plan;	Clause 11 of the SRD SEPP provides that development control plans do not apply to SSD.
Any planning agreement that has been entered into under section 93F, or any draft planning agreement that	There are no planning agreements that have been entered into, nor are any planning agreements proposed, that relate to the Proposal.

Provision	Relevance to the Proposal
a developer has offered to enter into under section 93F;	
The regulations (to the extent that they prescribe matters for consideration);	Clause 92 of the EP&A Regulation requires consideration of: • The Government Coastal Policy, for DAs in certain local government areas; and. • The provisions of AS 2601 for DAs involving the demolition of structures. • The provisions of a subdivision order and any development plan for development of land that is subject to a subdivision order. • The provision of development under the *Dark Sky Planning Guideline.* The Wellington North Solar Plant is located on land that is under provisions of the *Dark Sky Planning Guideline.* This guideline is addressed in the Visual Impact Assessment Section 7.4 and Appendix H. The Proposal does not involve any other types of development and therefore the other provisions provided by the EP&A Regulation are not relevant to the Proposal.
Any coastal zone management plan (within the meaning of the *Coastal Protection Act 1979*), that apply to the land to which the development application relates;	Coastal zone management is not applicable to the Proposal.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;	The likely impacts of the Proposal, including environmental impacts on both the natural and built environments, and the social and economic impacts in the locality, are detailed in Sections 7 and 8 of this EIS. This EIS demonstrates that the environmental impacts of the Proposal have, to the extent, reasonably and feasibly practicable, been avoided or minimised through careful proposal design and through the implementation of mitigation measures provided within this EIS.
The suitability of the site for the development;	As discussed in Section 3, various options were considered when selecting an appropriate site for the Proposal. The Proposal site has a number of characteristics that make it suitable for the development of a solar plant. Most notably, its location is within close vicinity to an existing transmission line and electricity substation with good connection capacity. Other characteristics include: • Access to and capacity of the electrical transmission network. • Availability of an abundant solar resource. • Availability of appropriate land i.e. topography, aspect, presence of native vegetation. • Suitability in terms of the interests of other stakeholders and the environment. Further, the Wellington North Solar Plant is largely reversible; at the end of the life of the solar plant, all above ground infrastructure could be removed and agricultural land use activities could resume.

Provision	Relevance to the Proposal
Any submissions made in accordance with the EP&A Act or the regulations; and	AGL would consider and, as necessary, respond constructively to any submission made in relation to the Wellington North Solar Plant. Consultation with stakeholders that has been undertaken during the planning stages including the preparation of this EIS is summarised in Section 6.
The public interest.	The Wellington North Solar Plant is in the public interest for a number of reasons. The plant would produce up to 300MW. On an annual basis, the proposed Wellington North Solar Plant would provide enough clean, renewable energy for about 105,570 average NSW homes while displacing approximately 581,000 metric tonnes of carbon dioxide. The solar plant would also assist to: • Directly contribute to helping Australia in meeting international commitments. • Reduce greenhouse gas emissions required to meet Australia's energy demands • Assist in the transition towards cleaner electricity generation. • Create economic benefits to the region, through the creation of direct and indirect jobs, supporting small business and by developing skills in a growing industry. AGL has undertaken community consultation activities to inform the community and stakeholders about the Proposal and provided opportunities to provide input into the assessment and development process. Further details on the consultation process is provided in Section 6.

5.5.2 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In NSW, the concept has been incorporated into legislation including the EP&A Act, the EP&A Regulation and the *Protection of the Environment Administration Act 1991* (NSW).

Based on the likely costs and benefits of the proposed solar plant, the Proposal is considered to comply with the principles of ESD. ESD principles and their relationship to the design, construction and ongoing operations of the Proposal are identified in Table 5-4.

Table 5-4 Assessment of the Proposal against the principles of ESD

(a) The precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: ***(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*** ***(ii) an assessment of the risk-weighted consequences of various options.***
The precautionary principle has been adopted in the assessment of impact; all potential impacts have been considered and mitigated where a risk is present. Where uncertainty exists, measures have been included to

address the uncertainty. A 'worst case' impact assessment has been undertaken to account for the uncertainty in the final impact footprint.

(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

Potential impacts of the Wellington North Solar Plant are likely to be localised and would not diminish the options regarding land and resource uses and nature conservation available to future generations. Importantly, the Wellington North Solar Plant provides additional renewable energy that contributes to minimising the risk of climate change to current and future generations by reducing carbon emissions intensity of electricity generation.

The Wellington North Solar Plant would be decommissioned at the end of its operational life, removing all infrastructure. Decommissioning would therefore result in returning the site to its existing land capability for future generations.

(c) conservation of biological diversity and ecological integrity— namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.

The impacts of the Wellington North Solar Plant on biodiversity, including EPBC Act listed species, have been assessed in detail in the Biodiversity Assessment in Appendix D and are summarised in Section 7.1 of this EIS. This has included avoidance of areas of higher conservation value and management prescriptions to minimise and manage residual impacts.

(d) improved valuation, pricing and incentive mechanisms— namely, that environmental factors should be included in the valuation of assets and services, such as:

- ***(i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and***
- ***(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, and***
- ***(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.***

Attributes of the Proposal site such as the existing native vegetation, land capability, soil and hydrology have been valued in terms of their broader contribution to the catchment and catchment processes. Pollution risks have been assessed and would place any cost of remediation solely upon the proponent.

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in Section 9.2 provide an auditable set of environmental management commitment to these parameters. Based on the social and environmental benefits accruing from the Wellington North Solar Plant at a local and broader level, and the assessed impacts on the environment and their ability to be managed, it is considered that the development would be ecologically sustainable within the context of ESD.

5.6 APPROVALS AND LICENCES

The approvals and licence requirements for the Proposal are summarised in Table 5-5. Any additional licences or approvals that may be required would be obtained prior to the commencement of relevant activities.

Table 5-5 Summary of licences and approvals required for the Proposal.

Legal instrument	Approving authority	Approval or licence
EP&A Act	DPE	Development consent
Roads Act 1993	RMS, Dubbo Regional Council	Section 138 approval for work within a public road reserve (Goolma Road, Campbells Lane, Cobbora Road).

The Applicant must also ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the Building Code of Australia.

6 CONSULTATION

The SEARs require that Wellington North Solar Plant consults with relevant local, State and Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders. This includes undertaking detailed consultation with affected landowners surrounding the proposed site.

This section describes the consultation that was carried out with the stakeholders above. It identifies issues raised during this consultation and explains how these issues have been addressed in the EIS.

6.1 AFFECTED LANDOWNER, COMMUNITY AND LOCAL GOVERNMENT CONSULTATION

AGL has undertaken comprehensive consultation with affected landowners, the local community (including community groups) and Dubbo Regional Council in developing the Proposal. The following section describes the consultation undertaken with these stakeholders.

6.1.1 Community & Stakeholder Engagement Plan

A community and stakeholder engagement plan is in place for the Wellington North Solar Plant (Appendix C). AGL's community and stakeholder engagement plan considers stakeholders' views and provides timely feedback on any matters raised. The consultation program is based on AGL's approach to stakeholder consultation as outlined below.

AGL's approach to stakeholder consultation

AGL Energy Limited maintains a company-wide Community Engagement Policy that is applied across all business sectors in the development of new projects, expansions of existing infrastructure and ongoing operations.

The Community Engagement Policy commits AGL Energy Limited to:

- **Be proactive**: AGL Energy Limited would engage with communities early and often, to understand and respond to their interests and concerns.

- **Be flexible and inclusive**: AGL Energy Limited would offer a range of engagement opportunities that are tailored to the variety of needs and preferences of the communities in which it operates.
- **Be transparent**: AGL Energy Limited would act honestly and ethically in all its dealings with the communities in which it operates.
- **Support employees and contractors to engage well**: AGL Energy Limited would provide tools, peer support and training to enable its staff to deliver on commitments.
- **Continuously improve engagement**: AGL Energy Limited would evaluate the effectiveness of its engagement and modify it as needed to ensure that its activities address community needs and expectations.

Affected landowner consultation activities to date

AGL identified, through early consultation during the PEA phase, that the neighbours closest to the Proposal and those with a clear view of the Proposal site were most likely to be affected. These affected landowners have been a key focus of AGL's consultation activity throughout the development of this EIS.

AGL has had one-on-one meetings with these affected landowners on numerous occasions, including on 29 November 2017, 19 December 2017, 6 February 2018 and 21 March 2018 to discuss their individual impacts and concerns, organise for a specialist studies and discuss mitigation options.

The key issues raised during these meetings related to:

- Visual amenity;
- Noise;
- Traffic;
- Land use; and
- Bush fire management.

Details of these discussions are provided in section 6.1.3.

In May 2018, AGL presented the outcomes of the specialist EIS studies to most of the affected landowners and, where appropriate, discussed mitigation options. Further consultation with affected landowners is ongoing.

6.1.2 Community and local government consultation activities to date

AGL has informed and engaged a variety of community members from Local and State Government, Dubbo Regional Council, Local Aboriginal Land Councils, business leaders, environmental groups and residents directly impacted by the Proposal.

The development of the Wellington North Solar Plant was made known to the public early in its development with a fact sheet circulated to the surrounding community.

While much of the consultation process focused on informing the community about issues relating to the Proposal, activities to engage the community in two-way dialogue were also undertaken.

In addition to one on one consultation with affected landowners and small group meetings, to date AGL has provided a variety of opportunities for community members to find out more about the Proposal including:

- Creation of a fact sheet for the Proposal, and a letter-box drop (week commencing 13 November 2017) to residences and businesses within a 10km radius of the Proposal site.

- On 28 November 2017, AGL led a drop-in session at the Wellington Civic Centre on 28 November 2017, (between 3:00 and 6:00pm), for interested community members. The event allowed attendees to find out more about the Proposal. This was advertised on the Proposal's website, in the Wellington Times, on the fact sheet and on Binjang Radio. Over 12 people attended with 9 leaving their name and contact details. Feedback from this session included locals valuing the rural charm of the area, wanting to understand more about how large-scale solar works and querying any visual impact.
- On 28 November 2017, a presentation to Dubbo Regional Council Councillors on 28 November 2017 to introduce Councillors to the AGL team and the Proposal outline. A key issue identified is employment in Wellington. A councillor suggested the local area is more suitable for grazing than intensive cropping undertaken and hence not prime agricultural land. Councillors suggested that Community Dialogue Groups/Community Consultative Committees are a good way to engage with the community. They also expressed interest in understanding the overall economic impact of the farm verses the overall economic impact of a solar plant.
- On 5 February 2018, the AGL team presented to the Wellington Men's Shed introducing them to AGL, the National Electricity Market and Large-Scale Solar, including the proposed Wellington North Solar Plant. Questions that were asked broadly focussed on electricity and gas billing, demand response and opportunities for investment by AGL. The Men's Shed shared that they had a good experience with Infigen Energy as they could go on site and requested this also happen with the AGL proposal (see below).
- On 18 April 2018, AGL provided a bus trip to the Nyngan Solar Plant and invited neighbours, Dubbo Regional Council Councillors and the Wellington Men's Shed. Over 40 people attended the tour and AGL received 30 feedback forms. The purpose of the bus trip was to respond to the Men's Shed request and to answer questions or concerns regarding AGL's proposal, provide an opportunity for locals to view a solar plant, be up close to solar panels and associated infrastructure and gain a better understanding of how large-scale solar works. The primary questions raised were regarding the noise associated with PCS' converting energy from DC to AC; community members had not considered noise being an impact from the Plant. Additionally, the scale and size of the Plant was surprising to community members.
- On 04 May 2018, AGL presented to approximately 30 members of the Probus Club. The primary questions that were raised included work required on the TransGrid substation, long-term employment opportunities and the maintenance of the homestead on the site. There were a range of questions regarding the energy market and the energy generation mix across the National Electricity Market.

6.1.3 Summary and outcomes of affected landowner, community and local government consultation to date

Impact / Issue	Stakeholder Group	Engagement Activity	Outcome/s (and where addressed in EIS)
Noise / vibration	Affected Landowner (Direct Neighbour)	One neighbour had concerns about the cumulative impacts of the Bodangora Wind Farm and the solar plant on vibration.	Comprehensive noise and vibration study has been conducted as part of the EIS. The Noise and Vibration Assessment is summarised in Section 7.3. and provided in Appendix G. Cumulative impacts of the Proposal have been addressed in this EIS, refer to Section 6 and 7. It is likely Bodangora Wind Farm would be completed construction before Wellington North Solar Plant commences construction.
Visual amenity	Affected Landowners (Direct Neighbours)	One-on-one meetings with neighbours to the Proposal site on 29 November 2017, 19 December 2017, 06 February 2018 and 21 March 2018 to discuss their individual impacts and concerns, organise for a visual impact assessment and discuss visual impact assessment, including mitigation options.	A visual impact assessment has been undertaken for the proposed Wellington North Solar Plant (Section 7.4 and Appendix H) Photomontages were provided to individual neighbours with potential visual impact, demonstrating the possible view of the solar plant from their property. The visual amenity impact of the proposed solar plant on neighbours can broadly be mitigated with a small amount of onsite screening. Screening has been provided as part of the visual impact assessment. Onsite screening is proposed along the eastern, northern and western boundaries.
	Broader Wellington community	Visual amenity of the proposed project was raised during initial consultation and in AGL's PEA. Subsequently, understanding the visual amenity impact was raised at AGL's first meeting with local business owners on 26 September 2017 where the importance of the visual amenity of Goolma Road was highlighted. Questions from this group included the reflectivity of solar panels and whether planting trees around the boundary	A visual impact assessment has been undertaken for the proposed Wellington North Solar Plant (Section 7.4. and Appendix H). Screening has been provided as part of the visual impact assessment. Onsite screening is proposed along the eastern, northern and western boundaries. The reflectivity of panels is discussed in the visual impact assessment and Section 7.6. Recent studies have suggested that potential for glare from PV solar panels is relatively limited (Spaven Consulting, 2011). PV solar panels are designed to reflect as little sunlight as possible as the PV panels are designed to absorb solar energy in order to generate the maximum amount of electricity. It is documented that PV panels may

Impact / Issue	Stakeholder Group	Engagement Activity	Outcome/s (and where addressed in EIS)
		of the site would be feasible as a mitigation option to visual impact. In a phone call with one community member, the member believed that the proposed plant would be an eyesore.	reflect as little as 2% of the light they receive (FAA, 2010). The panels would not generally create noticeable glare compared with an existing roof or building surface. Given that the aim of solar panels is to take in as much sun as possible, there would be areas of the Proposal where trees along the boundary would not be possible because the output of each sting of solar panels can be significantly affected even by a small amount of shading.
	Wellington Visitor Information Centre	When discussing the proposed project to staff in a meeting at the Wellington Visitor Information Centre on 05 October 2017, questions were raised about the visual impact of the site from public access areas, such as Goolma Road. Staff expressed an interest in understanding whether trees similar to the jail could work for the Proposal. When presenting the Proposal to Councillors on 28 November 2017, visual impact was brought up as a relevant issue that AGL should address in the EIS.	
	Potential easement host	Phone call with a potential easement host on 10 January 2018 who was concerned about AGL's western transmission line option and the visual impact of the transmission line. Other neighbours voiced concerns around the visual amenity of additional power lines on their and/or neighbours land.	There are extensive powerlines in the area including six (6) 132kV powerlines and two (2) 330kV powerlines. They are of various designs and all emanate from the Wellington substation nearby. The final design of the transmission line for this proposal would incorporate the existing character of the area and would include continued consultation with the residents who experience visual impacts from the Proposal.
Property values	Affected landowners	Questioned whether there was evidence as to whether or not their property values would be impacted.	Property prices in any area are governed by a number of factors. While public perception of the area is undoubtedly one of these factors, it is only one of the many complicated interactions that drive the market-set prices of housing stock and rural agricultural land.

Impact / Issue	Stakeholder Group	Engagement Activity	Outcome/s (and where addressed in EIS)
		Main concern is how the visual impact would impact property values and how this can be mitigated.	Predominantly, land surrounding the Proposal is zoned as RU1 "Primary Production" The Proposal would not impact the ability of the surrounding lands to sustain agricultural production. Throughout the preparation of this EIS, AGL has considered the likely proposal impacts upon amenity (predominately visual but also noise and road and traffic impacts). This EIS describes the measures AGL is committed to implementing to limit these amenity impacts in the short-term and longer-term. AGL has organised visual impact assessments at concerned neighbour's properties and is continuing to work through individual mitigation options, including vegetation screening. The implementation of environmental management plans in order to ensure the conditions are complied with would also ensure amenity and other potential impacts are adequately managed by AGL and their contractors.
Use of agricultural land for a non-agricultural purpose	Affected landowners	During one-on-one meetings on 08 November 2017, 29 November 2017, 19 January 2018 and 06 February 2018, neighbours had questions regarding the management of pests and weeds on site and how that could impact their agricultural operations. Discussions on potential agricultural use on the property was bought up often, as well as concerns on what not cultivating/farming the land could do to the soil and its agricultural potential. During consultation, the potential for agistment of sheep on the Proposal site was discussed with a number of neighbours. As some neighbours don't run sheep, there was an occasion when one neighbour had a concern that some neighbours	Biosecurity Management plans would be developed by the head contractor during the construction phase and by AGL as the operator during operations and would be finalised with consultation with neighbours. The Proposal is considered highly reversible following the completion of solar plant operations. The Proposal would commit to returning the land capability, for continued agricultural use (or other land uses) at the completion of proposal operations. AGL Energy Limited has had mixed success with sheep grazing at Nyngan Solar Plant. Utilising sheep for controlling grasses and reducing spraying has been successful with Merino sheep however unsuccessful with Dorper sheep as the Dorper's damaged the panels. AGL are not aware of any trials involving cattle or other stock within solar plant. Primary concern is the impact or potential damage to the solar infrastructure

Impact / Issue	Stakeholder Group	Engagement Activity	Outcome/s (and where addressed in EIS)
		could benefit more than others if they reach an agistment agreement with AGL.	AGL are willing to continue to trial sheep on the Wellington North Solar Plant once the Proposal reaches operation. The potential impacts on agricultural land from the proposed solar plant are discussed in Section 7.5.
	Broader Wellington community	Use of agricultural land for a non-agricultural purpose was raised during initial consultation and in AGL's PEA. Discussions with the broader Wellington community often involved questions and concerns regarding using agricultural land for an industrial purpose. A community member voiced their opposition to solar on 'prime agricultural land' however was interested to understand more about how solar panels and farming activities could co-exist.	
	Dubbo Regional Council	When discussing the Proposal with Councillors individually as well as at the Council presentation on 28 November 2017, using traditionally agricultural land for a different purpose was raised as a potential issue, however Councillors had not been approached by community members. This was the same as when AGL met with Council staff. Some Councillors noted that the local area has more grazing than intensive cropping and therefore shouldn't be considered as 'prime' agricultural land.	
	NSW Farmers	Reached out to NSW Farmers on 24 January 2018 offering presentation to the local NSW Farmers Branch on the Proposal, as well as a couple of follow up emails in March. This offer has not yet been taken up.	No action required.

Impact / Issue	Stakeholder Group	Engagement Activity	Outcome/s (and where addressed in EIS)
Traffic	Affected landowners	During initial consultation, the traffic impact on Goolma Road during construction was raised, particularly during the changeover shift at the Wellington and Macquarie Correctional Centres and during the morning and afternoon school bus run. Additionally, the following traffic concerns have been raised: • Getting into and out of home without delays; • Dust creation from truck movements; • Road safety of contractors and AGL staff; • Road upkeep and maintenance; and • Cumulative traffic impacts from the Bodangora Wind Farm and the adjacent solar plant.	The proposed heavy vehicle site access point is off Campbells Lane. AGL expects the main transport route for construction materials to utilise Cobbora Road via the Golden Highway or the Mitchell Highway. Preliminary traffic analysis has suggested the use of basic right (BAR) and basic left (BAL) intersection treatments at the intersection of Cobbora Road and Campbells Lane. This would be confirmed prior to construction and form part of an overall Traffic Management Plan, which would consider other concerns such as driving amenity, safety, dust, and cumulative impacts. Potential traffic impacts are addressed in Section 7.9 and Appendix K.
	Dubbo Regional Council	Similarly to neighbours, the Dubbo Regional Council has raised questions on the impact of local roads from construction traffic and the cumulative traffic impacts from the Bodangora Wind Farm and the adjacent solar plant.	
Employment opportunities	Affected landowners	Questions from neighbours around how taking farming off the land would impact businesses in town, such as the local rural supplier losing business as there is no need to buy stock feed.	AGL expects that the approved Project would require approximately 250 employees during construction. AGL would seek to source as many construction workers and facility and maintenance operators from the local region as practicable. Local procurement and employment has been AGL's demonstrable approach in the past and is consistent with AGL's Community Engagement Policy. This approach aims to generate positive socio-economic impacts for the Wellington community, as well as
	Broader Wellington community	Understanding the employment opportunities for the community was initially raised during early consultation and reported in the PEA.	

Impact / Issue	Stakeholder Group	Engagement Activity	Outcome/s (and where addressed in EIS)
		Conversation with Neighbourhood Centre on 23 October 2017 mentioned that employment was a large issue for the community and that any employment opportunities that could stem from the development would be welcome. Small business owners have had some experience with working on local large-scale renewable energy projects, including the Bodangora Wind Farm. A key concern from their experience was ensuring that sub-contractors are paid in a timely manner. In a meeting on 6 February 2018 RDA Orana expressed an interest in being involved with the 'Meet the Contractor' events should the Proposal be approved.	communities within the wider Dubbo Regional Council LGA and neighbouring LGAs. If the Proposal proceeds, local business would benefit from the flow-on economic activity generated. There would also be opportunities for ongoing provision of goods and services to the Site. AGL would work with their EPC Contractor to provide opportunities for local business participation in the Proposal. This would be managed through a local industry participation plan developed by the EPC contractor and would include 'Meet the Contractor' events.
	Dubbo Regional Council	In the meeting with Councillors on 28 November 2017, employment was bought up as a big issue in Wellington, particularly indigenous and youth employment. In individual one-on-one meetings, Councillors asked about job prospects, including anticipated job numbers for the construction and operational phases, and what opportunities for local contractors would be available.	
	Local training organisations	AGL has engaged with a variety of local employment agencies and training organisations through one-on-one meetings to gain a better understanding of the employment opportunities and needs of the Wellington community and surrounding towns.	Undertaking this consultation has led to an increased understanding of the local demographic and AGL are using this knowledge to develop a program that is tailored to the local community. Section 6.1.4 outlines AGL's benefit sharing with the local community.

Impact / Issue	Stakeholder Group	Engagement Activity	Outcome/s (and where addressed in EIS)
		These groups included: • Skillset • TAFE Western • Murdi Paaki Regional Enterprise Corporation • Wellington High School • Industry Capability Network (ICN)	
	Regional suppliers	AGL has had a few phone calls from suppliers regarding the Proposal and how they can get involved.	AGL has added them to the update list and would let them know how the Proposal is progressing.
Community benefit sharing	Affected landowners	Broad interest in what AGL would commit to in the community. Comments that Wellington has seen a large injection of support from both the Council amalgamation and the Bodangora Wind Farm.	During AGL's extensive consultation with the local community there have been conversations about potential opportunities for AGL to contribute to the social fabric of the Wellington community. As such, AGL is considering a variety of programs and activities to address concerns regarding the impact of the Proposal as well as opportunities to address some of the existing socio-economic issues within the community. AGL would continue to work with the Dubbo Regional Council and the local community to determine the best approach for AGL share the benefits of the Proposal, as outlined in Section 6.1.4.
	Dubbo Regional Council	During meetings with Dubbo Regional Council staff on 05 October 2017, 29 November 2017, and 5 February 2018 there were discussions regarding community benefits that AGL could commit to if the Proposal is approved. Council staff expressed a preference for AGL to showcase benefit sharing from the Proposal. The Council staff were primarily concerned with the need for AGL to acknowledge the cumulative impacts of the wind farm and the proposed adjacent solar farm. When meeting with Councillors from the Dubbo Regional Council, there was suggestion that benefits for the local community can come in a variety of shapes and sizes. There was broad	

Impact / Issue	Stakeholder Group	Engagement Activity	Outcome/s (and where addressed in EIS)
		appreciation for the Bodangora Wind Farm community investment program.	
	Broader Wellington community	During one-on-one meetings and small group meetings there was a broad agreement that although the funds stemming from the Council amalgamation and the Bodangora Wind Farm were appreciated and great for the local area, another community investment program might not be the best way to benefit the local community. There was interest in what else AGL could provide to the local community by way of sharing the benefits of the Proposal.	
Tourism and educational opportunities	Broader community	Opportunities to use the homestead as a tourism or educational facility have been floated with the broader community.	AGL are continuing to work with the local community on what the best use of the homestead on the property would be. This decision process is intended to go through a future Community Dialogue Group.
Bushfires	Affected landowner	One neighbour raised a concern around who would be responsible for land stewardship and how risk of bushfires would be managed.	AGL are committed to preparing and implementing a Bushfire Management Plan and Emergency Response Plan in consultation with RFS and Fire & Rescue NSW. Bushfire risks are addressed in Section 8.3. The Bushfire Management Plan needs to include the volume and location of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures. The Emergency Response Plan needs to address foreseeable on site and off site fire events and other emergency incidents and include risk control measures.
	Broader Wellington Community	In some conversations that AGL had, there was an emphasis on the need for a bushfire management strategy.	

6.1.4 Benefit sharing with the local community

AGL is committed to conducting activities, operations and projects in ways that demonstrate and contribute enduring benefits to the community, through integrated consideration of social, environmental, ethical and economic impacts.

Through AGL's ongoing consultation with the local community, AGL is developing options for community benefit sharing, should the Proposal be approved and construction commenced.

Based on current consultation, community members would favour a longer-term focus on community benefits. The *Dubbo Regional Council Stronger Communities Fund* and the Bodangora Wind Farm *Community Benefit Fund* are already assisting the community with small grants and programs. AGL has discussed with Dubbo Regional Council an alternative approach to these existing fund-based activities. As such, AGL are considering supporting training and apprenticeships to assist the community to tackle some of the broader employment issues. This potential program has been discussed with the local branch of TAFE NSW and local employment and skills development organisations, who have expressed strong support for the concept.

Dubbo Regional Council has also expressed a desire for a more enduring benefit sharing program and AGL would continue to develop the idea with them and the broader community.

Other programs currently being considered based consultation with the community include:

- Rooftop solar for the residences most impacted by construction and operation activities.
- An energy discount for all new and existing AGL Energy Limited customers in Wellington.
- A local community investment program for construction and/or operation.

These potential programs would continue to go through consultation with the Dubbo Regional Council and the future Community Dialogue Group to determine where AGL's support can be best utilised.

6.2 ABORIGINAL COMMUNITY CONSULTATION

The consultation with Aboriginal stakeholders was undertaken in accordance with clause *80C of the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010* (NSW) (NPW Amendment Regulation) following the consultation steps outlined in the *Aboriginal cultural heritage consultation requirements for proponents 2010* (ACHCRP) guide provided by OEH. The guide outlines a four-stage process of consultation as follows:

- Stage 1 – Notification of project proposal and registration of interest.
- Stage 2 – Presentation of information about the proposed project.
- Stage 3 – Gathering information about cultural significance.
- Stage 4 – Review of draft cultural heritage assessment report.

The full list of consultation steps, including those groups and individuals that were contacted and a consultation log is provided in Appendix F. A summary of actions carried out in accordance with these stages are as follows.

Stage 1. Letters outlining the development proposal and the need to carry out an ACHA were sent to the Wellington LALC and various statutory authorities including OEH, as identified under the ACHCRP. An advertisement was placed in the local newspaper, Dubbo Daily Liberal Advertiser on the 27th of October 2017 seeking registrations of interest from Aboriginal people and organisations. A further series of letters

was sent to other organisations identified by OEH in correspondence to NGH Environmental. In each instance, the closing date for submission was 14 days from receipt of the letter.

As a result of this process, four groups contacted the consultant to register their interest in the Proposal. The groups who registered interest were Wellington Local Aboriginal Land Council, Wellington Valley Wiradjuri Aboriginal Corporation, Gallangabang Aboriginal Corporation and Binjang Wellington Wiradjuri Heritage Survey.

No other party registered their interest, including the entities and individuals recommended by OEH.

Stage 2. On the 8th of December 2017, an Assessment Methodology document for the Wellington North Solar Plant was sent to all registered parties. This document provided details of the background to the Proposal, a summary of previous archaeological surveys and the proposed heritage assessment methodology for the Proposal. The document invited comments regarding the proposed methodology and sought any information regarding known Aboriginal cultural significance values associated with the subject area and/or any Aboriginal objects contained therein. A minimum of 28 days was allowed for a response to the document.

Bradley Bliss responded for the Wellington Valley Wiradjuri Aboriginal Corporation and the Gallangabang Aboriginal Corporation. The main points raised in the comments received from the Bradley Bliss on the methodology were in relation to:

- Survey spacing, and
- Recording of sites and information provided by RAPs.

These comments were addressed by NGH in a reply letter sent to the Wellington Valley Wiradjuri Aboriginal Corporation on the 6th of February 2018. No further correspondence was received regarding the letter from NGH Environmental that addressed the comments on the methodology.

No other comments were provided from other registered parties.

Stage 3. The *Assessment Methodology* outlined in Stage 2 included a written request to provide any information that may be relevant to the cultural heritage assessment of the study area. It was noted that sensitive information would be treated as confidential. No response regarding cultural information was received prior to fieldwork.

The fieldwork was organised and all of the registered parties were asked to participate in fieldwork. A single representative from each of the four RAPs participated in the fieldwork. The fieldwork was carried out over 8 days in late February 2018.

The Aboriginal community representatives who participated in the field survey were:

- Jamie Gray - Binjang Wellington Wiradjuri Heritage Survey.
- Peter Packham - Wellington LALC.
- Tjanara Talbot, - a trainee heritage officer with the Wellington LALC.
- Bradley Bliss - Wellington Valley Wiradjuri Aboriginal Corporation.
- Brendan Doherty - Gallangabang Aboriginal Corporation.

During the fieldwork cultural information was provided to the archaeologists about the area from one of the RAPs. This information has been requested to be treated as confidential and is not included in this report. The information relates the Proposal site to the larger Aboriginal cultural landscape and surrounding sites. The cultural information may be relevant to the individuals that hold the appropriate knowledge in determining the cultural significance of the sites. The cultural significance of sites can only be determined by the local Aboriginal community.

Stage 4. In May 2018 a draft version of this *Aboriginal Cultural Heritage Assessment Report* for the Proposal was forwarded to each registered Aboriginal party inviting comment on the results, the significance assessment and the recommendations. A minimum of 28 days was allowed for responses to the document.

6.2.1 Aboriginal Community Feedback

Community consultation occurred throughout the assessment stage. The draft Aboriginal Cultural Heritage Assessment (ACHA) was provided to each of the Registered Aboriginal Parties (RAPs) and feedback was sought on the recommendations, the assessment, and any other issues of importance.

On the 23rd of May 2018 Bradley Bliss, representing the Wellington Valley Wiradjuri Aboriginal Corporation, informed NGH via email that four additional scarred tree sites had recently been recorded in the travelling stock route land adjacent to the north-western corner of the Proposal site. The sites are now recorded on AHIMS as #36-1-0742/Cobbora Road TSR Scar Tree, #36-1-0743/Cobbora Road TSR Scar Tree 1, #36-1-0744/Cobbora Road TSR Scar Tree 2 and #36-1-0745/Cobbora Road TSR Scar Tree 3. Two of the sites (#36-1-0742 and #36-1-0744) are located in close proximity to the Proposal site and the management of these two sites would now need to be considered in the Cultural Heritage Management Plan for the Wellington North Solar Plant.

The proponent has since been informed by NGH Environmental about the proximity of these two recently recorded heritage sites to the Proposal site. The proponent has been notified that they would need to ensure these sites are not impacted or harmed during development, particularly during fencing, fire break and vegetation screening works given that they are located close to the boundary of the Wellington North Solar Plant Proposal site.

At the submission of this EIS, some draft report feedback is still to be received. The feedback will be included in final report presented with the Wellington North Solar Plan Submissions Report, after the public exhibition of the EIS.

It is noted that a minor change to transmission line options (whether overhead or underground) occurred after the draft ACHA was issued to RAPs. The change did not affect the assessment or recommendations. RAPs have been notified of this change.

6.3 MINERAL TITLE HOLDER, EXPLORATION LICENCE HOLDER AND QUARRY OPERATOR CONSULTATION

6.3.1 Mineral titles holder and exploration licence holder consultation

Following issue of the SEARs, two relevant exploration licence holders were identified, being Drummond West Pty Ltd (EL 8505) and Modeling Resources Pty Ltd (EL 6178).

A phone call and follow up email was sent on 8 January 2018 to Modeling Resources Pty Ltd to update the organisation on the Proposal. Feedback from the phone call was that Modeling Resources Pty Ltd.'s primary concern was that solar activity would sterilise exploration. In the follow up email, AGL provided the Proposal fact sheet, a map of the Proposal site and an offer to have a conversation on how best to move forward and consult in the future.

On 30 January 2018, AGL sent formal letters to Drummond West Pty Ltd, UTM Global Pty Ltd and Modeling Resources Pty Ltd. The letters provided a proposal update, a map of the Proposal site, lot numbers

impacted by the Proposal and a request to meet with each organisation to discuss the Proposal. The letter requested each organisation to respond by 26 February 2018.

A response from Modeling Resources Pty Ltd was received on 20 February 2018 requesting a meeting with AGL. On 21 March 2018, AGL met with two representatives from Modeling Resources Pty Ltd in Orange. At this meeting, Modeling Resources Pty Ltd requested that AGL share geotechnical studies and discussed access to the property and expressed an interest in working with the head contractor during construction to look at the rock when cabling trenching occurs. Consultation with Modeling Resources Pty Ltd is ongoing.

As AGL did not hear back from Drummond West Pty Ltd and UTM Global Pty Ltd, AGL sent an email to landuse.minerals@industry.nsw.gov.au on 23 March 2018. AGL would continue to seek contact with Drummond West Pty Ltd (EL 8505) to further consultation.

AGL met with DPE - Division of Resources and Geosciences (GSNSW) on 16 May 2018. The primary concern raised by GSNSW was the potential for biodiversity offsets generated by the Proposal to sterilise future mineral exploration in the region. AGL noted GSNSW's preference to maintain offsets within the Proposal site and would continue to consult with GSNSW whilst developing any biodiversity offset strategy.

No additional relevant exploration licence holders or mineral title holders have been identified.

6.3.2 Quarry operator consultation

AGL sent a letter to the Dubbo Regional Council regarding the Montefiores Pit (Nanima Quarry) and Brookfield Pit on 2 May 2018. AGL has not yet received a response from the Dubbo Regional Council.

AGL also sent an email to Boral regarding the Maryvale Quarry on this date. Boral responded on 8 May 2018 after reviewing their operations in the area and noted they did not have any concerns with AGL's proposal. Boral noted that it would review the EIS once it is placed on exhibition.

6.4 AGENCY STATE GOVERNMENT CONSULTATION

6.4.1 Secretary's environmental assessment requirements (SEARs)

On 18 December 2017, the DPE issued SEARs in connection with the DA for the Wellington North Solar Plant.

Table 6-1 SEARSs and where they are addressed in the EIS.

Issue summary	Addressed in this EIS
The EIS for the development must comply with the requirements in Schedule 2 of the EP&A Regulation. The EIS must include the following:	
• a stand-alone executive summary;	• An executive summary is provided at the start of the EIS.
• a full description of the development, including: o details of construction, operation and decommissioning; o a site plan showing all infrastructure and facilities (including any infrastructure that	• The Proposal is described in Section 4. • A site plan is provided Figure 1-8. No required infrastructure is part of a

Issue summary	Addressed in this EIS
would be required for the development, but the subject of separate approvals process); o a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development;	separate approvals process. • An updated constraints map developed during the assessment and used to inform the design is included in Figure 1-9.
• a strategic justification of the development focusing on site selection and the suitability of the proposed site with respect to potential land use conflicts with existing and future surrounding land uses (including other proposed or approved solar farms);	• The Proposal justification is provided in Section 2.
• an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including: o a description of the existing environment likely to be affected by the development; o an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice; o a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and o a description of the measures that would be implemented to monitor and report on the environmental performance of the development;	• Site context is provided in Section 1.2.2 Existing environment of the site is described in Section 6.6 and 8. • Detailed information regarding environmental legislation relevant to the Proposal is outlined in Section 5. • Commensurate with the level of impact, detailed impact assessment, mitigation and monitoring are included in Section 6.6 and 8. Draft management plans or management outlines have been included for: o Proposed visual screening (Appendix H). o Draft Noise Management Plan (Appendix G).
• a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; and	• A summary of all environmental management measures is included in Section 9.2.
• the reasons why the development should be approved having regard to: o relevant matters for consideration under the EP&A Act, including the objects of the Act and how the principles of ESD have been incorporated in the design, construction and ongoing operations of the development;	• Key matters under the EP&A Act and ESD principles are addressed in Section 5.5. • Section 2 includes a summary of the key benefits, reasons why the Proposal should be approved and feasible

Issue summary	Addressed in this EIS
o suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses; and o feasible alternatives to the development (and its key components), including the consequences if the development does not proceed.	alternatives to the development and its components if the development does not proceed.
The DA must be accompanied by: • a signed report from a suitably qualified person that includes an accurate estimate of the capital investment value of the development (as defined in Clause 3 of the EP&A Regulation).	• The capital investment report has been provided separately. • Landowners consent has been provided separately.
The EIS must address the following specific issues:	
• Biodiversity – including an assessment of the biodiversity values and the likely biodiversity impacts of the development in accordance with the BC Act, a detailed description of the proposed regime for minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development in accordance with the BC Act;	• A BDAR has been completed and is summarised in Section 7.1 and provided in full in Appendix D.
• Heritage – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community;	• An Aboriginal Cultural Heritage Assessment Report (ACHA) has been completed and is summarised in Section 7.2 and provided in full Appendix F. • This includes consultation, summarised in Section 6. Historic heritage is addressed in Section 7.7.

• Land – including an assessment of the impact of the development on agricultural land (including Biophysical Strategic Agricultural Land) and flood prone land, a soil survey to consider the potential for erosion to occur, and paying particular attention to cumulative impacts and compatibility of the development with the existing land uses on the site and adjacent land (e.g. Bodangora Airstrip, operating mines, extractive industries, mineral or petroleum resources, exploration activities, aerial spraying, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land, in particular with the prohibition in the R5– Large Lot Residential zone;	• An assessment of agricultural land impacts is detailed in Section 7.5.
	  • An assessment of impact on flood prone land is detailed in Appendix J and Section 7.8.
	  • A soil survey has been undertaken and is summarised in Section 7.5 and provided in Appendix I.
	• An assessment of cumulative and the compatibility of existing and surrounding land use on the site and adjacent land is detailed in Section 7.6.
	• Land zoning is addressed in Section 5.2.2 and 7.6.

Issue summary	Addressed in this EIS
• Visual – including an assessment of the likely visual impacts and cumulative impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, having regards to the *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring,* including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners;	• A Visual Impact Assessment has been completed (Appendix H) and is summarised in Section 7.4. • The Dark Sky Planning Guideline is addressed by the visual assessment and Section 7.4. • A screening is provided in the Visual Impact Assessment.
• Noise – including an assessment of the construction noise impacts and cumulative noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG) and operational noise impacts in accordance with the NSW Noise Policy for Industry (NPI), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria;	• A noise assessment has been completed and is summarised in Section 7.3. • A draft noise management plan is included in Appendix G.
• Transport including an assessment of the site access route, site access point and likely transport impacts and cumulative transport impacts (including peak and average traffic generation) of the development on the capacity and condition of roads (including on any Crown land), a description of the measures that would be implemented to mitigate any impacts during construction, and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required);	• An assessment of transport impacts and measures is detailed in Appendix K and Section 7.9. • Proposed road upgrades is detailed in Section 4.5.4. • Consultation with RMS is summarised in Section 6.4.3.
• Water – including: o an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including the Wuuluman Creek and its tributaries, riparian land, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts; o details of water requirements and supply arrangements; and	• An assessment of water impacts is detailed in Section 7.8 and 8.1. • Details of water requirements and supply arrangements are outlined in Section 4.3 and 8.1. • A description of erosion and sediment measures are detailed in Section 7.5.4.

Issue summary	Addressed in this EIS
o a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004);	
• Hazards and Risks – an assessment of potential hazards and risks associated with bushfires and the proposed transmission line and substation against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) *Guidelines for limiting exposure to Time- varying Electric, Magnetic and Electromagnetic Fields*; and	• An assessment of bushfire risks is detailed in Section 8.3. • An assessment of hazards and electromagnetic interference impacts is detailed in Section 8.4.
• Socio-Economic – including an assessment of the likely impacts on the local community and a consideration of the construction workforce accommodation including assessment of cumulative impacts.	• An assessment of potential impacts on the local community are addressed in Section 8.2.
The EIS consultation process includes:	
• During the preparation of the EIS, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders.	• Consultation is summarised in Section 6.
• In particular, you must undertake detailed consultation with affected landowners surrounding the development.	
• The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.	• Issues raised during consultation and how it is addressed in the EIS is summarised in Section 6.1.3.
If you do not lodge a DA and EIS for the development within 2 years of the issue date of these Environmental Assessment Requirements, you must consult further with the Secretary in relation to the preparation of the EIS.	NA

6.4.2 Relevant EPIs, policies, guidelines and plans

The SEARs contain a list of some EPIs, policies, guidelines and plans that may be relevant to the environmental assessment of the Wellington North Solar Plant.

Table 6-2 Relevant EPIs, policies, guidelines and plans and where they are addressed in the EIS.

Aspect	Guideline	How guideline has been addressed?
Biodiversity	Biodiversity Assessment Method (OEH)	Biodiversity assessment, Appendix D and Section 7.1.
	Threatened Species Assessment Guidelines – Assessment of Significance (OEH)	
	Biosecurity Act 2015	
	Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI)	Water assessment and measures, Section 7.8 and 8.1.
	Policy and Guidelines for Fish Habitat Conservation and Management (DPI)	
Heritage	Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH)	Heritage assessment Section 7.2, Section 7.7. and Appendix F.
	Code of Practice for Archaeological Investigations of Objects in NSW (OEH)	
	Guide to investigating, assessing and reporting on aboriginal cultural heritage in NSW (OEH).	
	NSW Heritage Manual (OEH)	
Land	Primefact 1063: Infrastructure proposals on rural land (DPI)	Land use, Section 7.5 and 7.6.
	Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry (ARENA)	Consultation, Section 6 Visual Assessment, Section 7.4 and Appendix H
	Local Land Services Act 2013 (NSW)	Biodiversity assessment, Appendix D and Section 7.1.
	Australian Soil and Land Survey Handbook (CSIRO)	Land use, agriculture and soils, Section 7.5 and 7.6.
	Guidelines for Surveying Soil and Land Resources (CSIRO)	
	The land and soil capability assessment scheme: second approximation (OEH)	
Noise	NSW Industrial Noise Policy (EPA)	Noise Assessment, Appendix G and Section 7.3.
	Interim Construction Noise Guideline (EPA)	
	NSW Road Noise Policy (EPA)	
Light	Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring (DPE)	Visual Assessment, Appendix H and Section 7.45.
Transport	Guide to Traffic Generating Developments (RTA)	Proposal Description, Section 4. Traffic, transport and road safety, Appendix K and Section 7.9.
	Road design Guide (RMS) & Relevant Austroads Standards	
	Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development	

Aspect	Guideline	How guideline has been addressed?
Water	Managing Urban Stormwater: Soils & Construction (Landcom)	Land use, agriculture and soils, Section 7.5 and 7.6.
	Floodplain Development Manual (OEH)	Hydrology, Section 7.8. Flooding, Section 7.8 and 8.1.
	Guidelines for Controlled Activities on Waterfront Land (DPI Water)	
	Water Sharing Plans (DPI Water)	
	Floodplain Management Plan (DPI Water)	
	Guidelines for Watercourse Crossings on Waterfront Land (DPI Water)	
Waste	Waste Classification Guidelines (EPA)	Resource use and waste generation, Section 8.6.
Electromagnetic Interference	ICNIRP Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields	Electromagnetic fields, Section 8.4.
Environmental Planning Instruments	SRD SEPP	Planning context, Section 5.
	ISEPP	
	Rural Lands SEPP	
	SEPP No 55	
	SEPP No 44	
	Wellington LEP	

6.4.3 Agencies additional comments and consultation

The SEARs require that, in preparing the EIS for the development, relevant State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders be consulted.

The issues raised through consultation with these authorities are provided below.

Table 6-3 Additional State Government authority comments, where they are addressed in the EIS and consultation.

Agency	Issue raised	How issue has been addressed
Roads and Maritime Services	Matters raised in the RMS's addendum to the SEARs included the requirement for traffic studies, the need for road improvements and the development of a traffic management plan.	
	Matters raised in RMS's addendum to the SEARs included the requirement for: • A Traffic Impact Study prepared in accordance with Section 2 of *RTA's Guide to traffic Generating Developments 2002* and including: o Hours and days of construction o Staging of the Proposal o Traffic volumes.	The traffic assessment is included in Appendix K and Section 7.9. AGL has sought to discuss the Traffic Impact Study with RMS on 2 May 2018 and again on 9 May 2018. Each time without success. AGL would continue to pursue this consultation.

Agency	Issue raised	How issue has been addressed
	o Travel routes for traffic. • Vehicle access • Description of over size and over mass vehicles and materials to be transported. • Assessment of the impact of generated traffic and measures to ensure efficiency and safety on the public roads. • The need for; and proposed road improvements, to mitigate the impact of project-related traffic. • Consideration of local climate conditions in regard to road safety for vehicles. • Proposed road facilities, access and intersection treatments are to be identified and be in accordance with Austroads Guide to Road Design and, on classified roads, Roads and Maritime supplements, including safe intersection sight distance. • Layout of internal road network, parking facilities and infrastructure within project boundary. • Development of a Traffic Management Plan (TMP) in consultation with the Dubbo Regional Council and RMS prior to the commencement of haulage and/or construction operations. The TMP is to identify and provide management strategies to manage the impacts of project related traffic.	The appointed construction contractor would prepare a Traffic Management Plan (TMP), including this information, in consultation with the RMS and Dubbo Regional Council.
Office of Environment and Heritage (OEH)	Matters raised in the OEH's addendum to the SEARs included impacts on biodiversity, Aboriginal Cultural Heritage, water, soils and flooding.	
	• Biodiversity and offsetting: o Biodiversity impacts to be assessed and documented in accordance with the Framework for Biodiversity Assessment.	The biodiversity assessment and offsetting is summarised in Section 7.1 and provided in full in Appendix D. Additional consultation was undertaken within OEH including: • On 22/12/17 regarding mapped important areas for the Swift Parrot and Regent Honeyeater. • On 31/01/18, confirming offsetting not required for vegetation with a Vegetation Integrity score of less than 15. • On 13/03/18, confirming approach to deal with

Agency	Issue raised	How issue has been addressed
		planted native vegetation in the BAM Calculator. • On 16/03/18, clarifying definition of the Glossy Black Cockatoo Geographic limitations in the BAM Calculator. • The week of 11 June regarding the landscape assessment method in the BDAR[2]. Details are provided in Appendix D.
	• Aboriginal Cultural Heritage: o Identify and describe the Aboriginal cultural heritage values that exist across the whole area that would be affected by the development. o Where Aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken. o Impacts on Aboriginal cultural heritage values are to be assessed. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notification made to an OEH regional officer.	The Aboriginal heritage assessment has used the *Guide to Investigating, assessment and reporting on Aboriginal Cultural Heritage in NSW* and *Aboriginal cultural heritage consultation requirements for proponents 2010* as required, summarised in Section 7.2 and provided in full Appendix F.
	• Historic Heritage: o A heritage assessment including but not limited to an assessment of impacts to *State and local heritage* including conservation areas, natural heritage areas, places of Aboriginal heritage value, buildings, works, relics, gardens, landscapes, views, trees should be assessed. Where impacts to State or locally significant heritage items are identified, the assessment shall: o Outline the proposed mitigation and management measures generally consistent with the *NSW Heritage manual* (1996);	The heritage assessment was desktop, informed by a site inspection. Refer to Section 7.7. A letter was sent to Dubbo Regional Council on 19th April 2018 regarding unlisted potential heritage items identified at the Proposal site. Dubbo Regional Council responded on the 23 April 2018, outlining council would undertake further research in to these items, including a site

[2] A discrepancy was identified between the BAM training provided and the newly released operational manual regarding how the landscape assessment is to be completed.

Agency	Issue raised	How issue has been addressed
	o Be undertaken by a suitably qualified heritage consultant(s); o Include a statement of heritage impact for all heritage items (including significance assessment); o Consider impacts including, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant); and o Where potential archaeological impacts have been identified develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations (terrestrial and maritime as relevant) and include the results of these test excavations.	inspection. Council also recommended the items be avoided with a 20m buffer until they assess the significance. As of June 22, 2018, Council had completed their site inspection and determined that three features (stone trough, stone culvert, and survey marker tree) had no special significance. Council would not object to their removal. Council verified that no impacts would occur for the forth site; the Soil Conservation Research Centre.
	• Water and soils: o The EIS must map the following features relevant to water and soils including: ▪ Acid sulfate soils. ▪ Rivers, streams, wetlands, estuaries. ▪ Groundwater. ▪ Groundwater dependent ecosystems. ▪ Proposed intake and discharge locations. o Must describe background conditions for any water resource likely to be affected by the development. o Must assess the impacts of the development on water quality. o Must assess the impact of the development on hydrology.	The soil and water assessments were desktop, informed by a site inspection. Refer to Section 7.5. and 8.1.
	• Flooding: o Must map the following features relevant to flooding including: ▪ Flood prone land. ▪ Flood planning area, the area below the flood planning level. ▪ Hydraulic categorisation (flood ways and flood storage areas). o Must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 1 in 10 year, 1 in 100 year flood levels and the probable maximum flood, or an equivalent extreme event.	The flooding assessment was undertaken by a specialist and included a desktop assessment, informed by a site inspection. Flooding risks are assessed in Appendix J and Section 7.8.

Agency	Issue raised	How issue has been addressed
	o Must model the effect of the proposed development (including fill) on the flood behaviour. o Must assess the impacts on the proposed development on flood behaviour.	
Department of Primary Industries (DPI)	Matters raised in the DPI's addendum to the SEARs included impacts on land and water.	
	• An assessment of the impacts of the development on agricultural land and flood prone land • A soil survey to confirm the agricultural value of the land. The area is mapped as biophysical strategic agricultural land. DPI advised: o To continue to use the land for agricultural purpose during the operation of the solar farm; o The land should be returned back to agricultural production at final rehabilitation on closure. • A description of current and potential important agricultural land in accordance with *A guideline to identifying important agricultural lands in NSW (2012).* • A decommission and rehabilitation plan. • Proposed baseline data collection and monitoring to be adopted. • Assessment of any impacts to Crown lands or roads.	Assessment of impacts on agricultural land is in Section 7.5. Assessment of impacts on flood prone land is in Appendix J and Section 7.8. A soil survey has been undertaken. The soil survey would inform any soil treatments and provide baseline information for the decommissioning rehabilitation refer to Section 7.5 and Appendix H. A Decommissioning and Rehabilitation Plan is recommended in Section 7.5. A description of current and potential important agricultural land is in Section 7.5. Assessment of impacts on Crown land is in Section 7.6. AGL has made an application to close paper roads within the Proposal site. AGL has consulted with DoI - Land and Dubbo Regional Council and is continuing to pursue this process.
Department of Planning and Environment - Division of Resources and Geoscience (DPE – DRG)	Matters raised in the DPE - DRG addendum to the SEARs included impacts on mineral titles.	
	• The proposed site is partially subject to Exploration License 6178 (Act 1992) (EL 6178) held by Modeling Resources Pty Ltd and partially subject to Exploration Licence 8505 (Act 1992) (EL 8505) held by Drummond West Pty Ltd under the Mining Act.	Consultation undertaken is outlined in Section 6.3 and provided within Appendix D.

Agency	Issue raised	How issue has been addressed
	• Acknowledge and identify the current in force mineral titles on the Proposal's map, including the Proposal site and current mining or exploration title in the vicinity. • Make contact with the title exploration licence holders (Modeling Resources Pty Ltd and Drummond West) to determine their level of interest in the Proposal area. Including evidence of: o Notification of the Proposal to the exploration licence holder; o Project map (noted above); and o Any response from the exploration licence holder to the proponent. • Consultation, during the preparation of the EIS, with mineral resource stakeholders.	Potential impact on mineral resources and map of features is provided in Section 7.6. Mitigation measures include ongoing consultation with the stakeholders.
NSW Rural Fire Service	• The EIS should include a bush fire assessment prepared by a suitably qualified person that addresses the aim and objectives of *Planning for Bush Fire Protection 2006*. • The report should also recommend measures to prevent a fire occurring within the site from developing into a bush/grass fire risk to the surrounding area.	Bushfire risk is addressed in Section 8.3. The measures include prevention of fires occurring on site.

6.5 COMMONWEALTH GOVERNMENT CONSULTATION

To date no consultation has been undertaken with the Commonwealth Government. This EIS has considered Matters of National Environmental Significance and has concluded that it would be highly unlikely for the project to generate an adverse impact for any Commonwealth Matter of National Environmental Significance (MNES). As such, an EPBC referral is not considered to be required for the Proposal.

6.6 INFRASTRUCTURE AND SERVICE PROVIDER CONSULTATION

Consultation undertaken with Dubbo Regional Council is outlined in Section 6.1.3. Consultation undertaken with RMS is outlined in Table 6-3.

In addition to conducting specialist studies to assess the capability of the electricity network, AGL has been in regular consultation with TransGrid as the operator of the existing 330kV Wellington Substation. AGL has been consulting with TransGrid to determine the regulated scope of work required to connect the project to the Wellington Substation and to determine the optimal location of the Project's transmission lines or underground cables on TransGrid's property.

A number of Essential Energy assets, including a 132kV overhead transmission line, and 11kV power lines are located on the site. AGL will consult with Essential Energy regarding the avoidance or relocation of those assets as required.

6.7 FUTURE AND ONGOING CONSULTATION

When the EIS is placed on public consultation, AGL would email all the contacts in their consultation database (approximately 50) notifying them that public consultation has begun, providing the dates when public consultation would occur and informing them where to find the EIS. Similarly, AGL would send a copy of this EIS to each of the affected landowners and offer face to face consultation.

AGL further proposes another two community drop-in sessions to provide an opportunity for community members to discuss the EIS and explain any technical aspects of the Proposal. These dates, times and locations would be advertised in the local newspapers as well as on the Proposal website. AGL would again distribute a factsheet with key details contained in the EIS and outlining the drop-in session dates to the broader community within a 10km radius of the Proposal site.

Should the Proposal be approved, AGL would establish a Community Dialogue Group based on the DPE's *Community Consultative Committee Guidelines for State Significant Projects* (November 2016), including an independent chair from the Talent Pool. The Group would become the primary interface between AGL and the local community.

Consultation would be ongoing with government agencies throughout the submission of the EIS.

7 ASSESSMENT OF KEY ISSUES

7.1 BIODIVERSITY

7.1.1 Approach

A specialist BDAR was prepared by NGH Environmental to investigate and assess the potential impacts of the Wellington North Solar Plant on biodiversity. The aims of the report were to:

1. Address the requirements of the NSW BAM, the NSW biodiversity offsets policy developed for Major Projects (OEH, 2014) and the requirements of the SEARs in relation to biodiversity.
2. Assess the Proposal in relation to MNES as per the EPBC Act.

The full report is included in Appendix E and the report is summarised below.

The assessment approach involved literature reviews, database searches, and field surveys conducted in accordance with relevant survey guidelines. The proposed solar plant conforms to the definition of a site-based development according to the BAM a development other than a linear shaped development, or a multiple fragmentation impact development.

Surveys were undertaken over a number of days during October 2017 and February 2018. The following methods were adopted during the surveys:

- Vegetation Integrity Survey plots. A total of 26 plots were completed across native and exotic dominated areas.
- Random meander and targeted searches for threatened flora species.

- Fauna habitat assessment. Trees within the Proposal site were inspected for hollows, and the number, size and occupancy of the hollows, as well as the species, diameter at breast height and height of the hollow-bearing trees were all recorded.
- Targeted fauna surveys were conducted with the aim of identifying occurrence or defining habitat for threatened fauna species.

The aims of the site surveys were as follows:

- Determine vegetation communities present within the Proposal site, their condition and extent.
- Identify potential EECs within the Proposal site and determine their condition and extent.
- Conduct searches for threatened flora and fauna species predicted to occur in the Proposal site.
- Assess the availability and extent of flora and fauna habitat, particularly threatened species habitat, such as hollow-bearing trees.

A BAM Credit assessment was completed. The assessment ID for this proposal is 00009144/BAAS17026/18/00009145. There are two versions v0 and v1 to account for the two transmission line options.

7.1.2 Existing environment

Landscape features

Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features, and flora and fauna communities. The Proposal site is located within the NSW South Western Slopes Bioregion and the Inland Slopes subregion (DoEE, 2012). The geology is characteristic of the eastern Lachlan Fold Belt, comprised of Cambrian to Early Carboniferous sedimentary and volcanic rocks, with characteristic landforms of undulating and hilly ranges and isolated peaks set in wide valleys at the apices of the Riverina alluvial fans. The dominant IBRA subregion impacted by the Proposal is the Inland Slopes subregion.

The Proposal site is in the Mullion Slopes and Macquarie Alluvial Plains Mitchell Landscape. Mullion slopes is the dominant landscape.

As determined by GIS mapping from aerial imagery, approximately 1,071ha of native vegetation occurs within the 1500m buffer area surrounding the site. This vegetation within the buffer area is considered to be predominantly Western Slopes Grassy Woodland comprised of White Box on the Hilltops and Yellow Box along the gullies. Plantings of native vegetation generally occur as linear strips along fence lines or gullies.

Cleared areas within the subject land are primarily used for cropping and grazing. These areas have been frequently cultivated and lack any remnant native vegetation. Cleared areas provide very little in terms of native fauna habitat but could provide limited foraging habitat for raptors, parrots, cockatoos and macropods. Approximately 720ha of cleared land occurs within the boundary of the Proposal site. This is approximately 75% of the Proposal site.

Native vegetation

Two Plant Community Types (PCT) were identified in the Proposal site:

- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266).
- Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion (PCT 437)

These PCTs form part of the listed EEC – White Box – Yellow Box – Blakely's Red Gum woodland and Inland Grey Box Woodland.

WHITE BOX GRASSY WOODLAND IN THE UPPER SLOPES SUB-REGION OF THE NSW SOUTH WESTERN SLOPES BIOREGION (PCT 266)

The remnant woodland within the Proposal site is very degraded having been extensively cleared and heavily grazed. Scattered paddock trees remain in patches on the rocky hilltops and very little native understorey species remain. The dominant native species on the hilltops are White Box. Some scattered White Cypress and Kurrajong also occur on the hill slopes. An occasional Grey Box (*Eucalyptus microcarpa*) occurred on the lower hillslopes. The understorey is mostly exotic pasture species or bare ground however scattered *Austrostipa verticillata*, Fuzzweed (*Vittadinia cuneata*) and Knottybutt Grass (*Paspalidium constrictum*) occur in low abundance.

Within the Proposal site, PCT 266 occurred as:

- Approximately 40.5ha of remnant woodland.
- Approximately 3.5ha of planted woodland.
- Approximately 93.1ha of derived grassland.

Figure 7-1 Example of White Box woodland in the Proposal site.

Figure 7-2 Example of White Box Woodland planted within the Proposal site.

Figure 7-3 Example of White Box Woodland derived grassland within the Proposal site.

YELLOW BOX GRASSY WOODLAND ON LOWER HILLSLOPES AND VALLEY FLATS IN THE SOUTHERN NSW BRIGALOW BELT SOUTHERN BIOREGION (PCT 427)

The remnant woodland within the Proposal site is very degraded having been extensively cleared and heavily grazed. Scattered paddock trees remain along the river flats and watercourses. The dominant native species along the flats are Yellow Box with occasional Kurrajong (*Brachychiton populneus*). Understorey species are mostly exotic pasture species however some native species occur.

Within the Proposal site, PCT 437 occurred as:

- Approximately 29.0ha of remnant woodland.
- Approximately 19.9ha of planted woodland.
- Approximately 4.3ha of derived grassland.

Figure 7-4 Example of Yellow Box Woodland in the Proposal site.

Figure 7-5 Example of Yellow Box Planted Woodland in the Proposal site.

Figure 7-6 Example of Yellow Box Woodland derived grassland in the Proposal site.

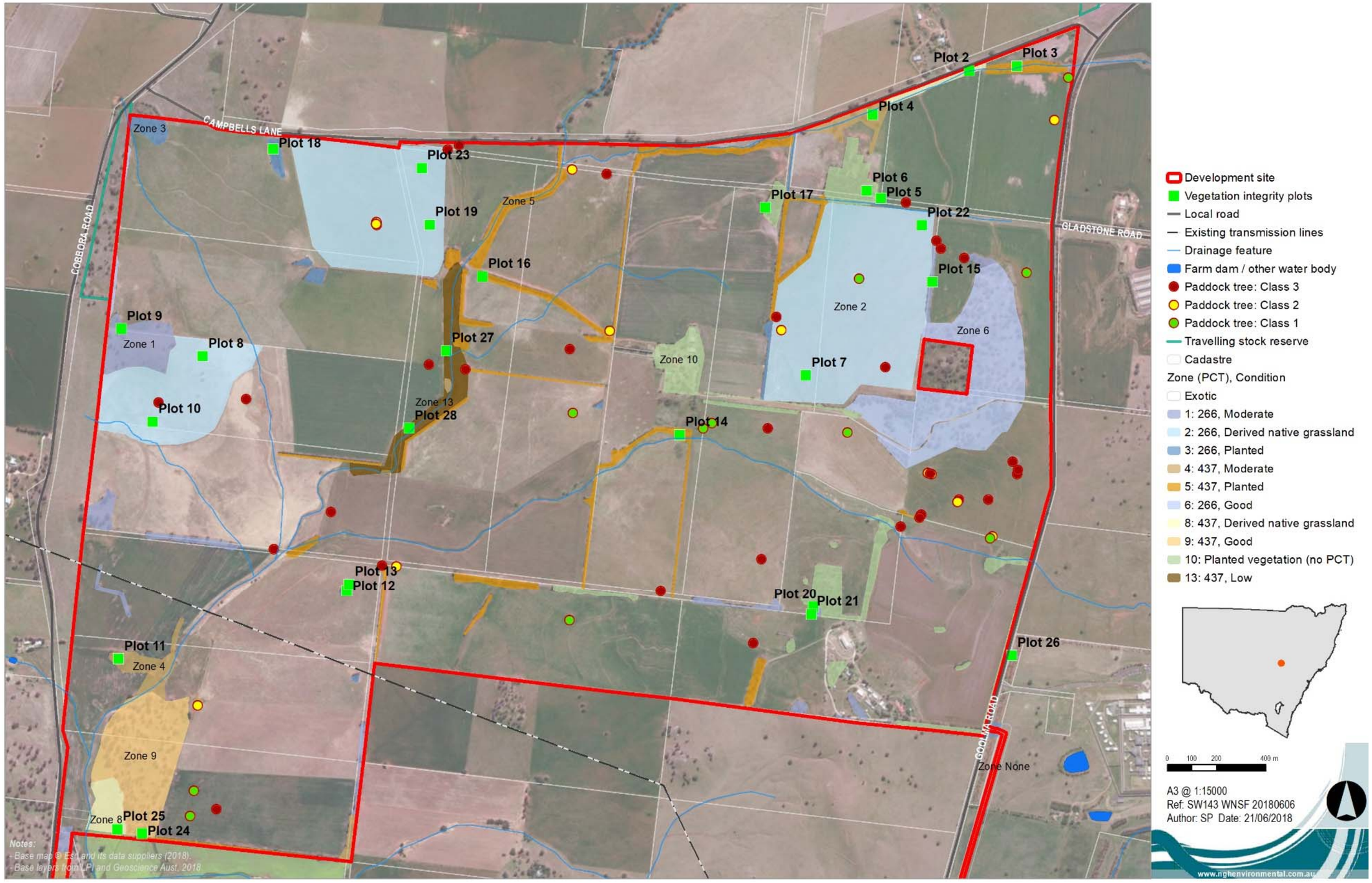

Figure 7-7 Vegetation zones within the Proposal site (north).

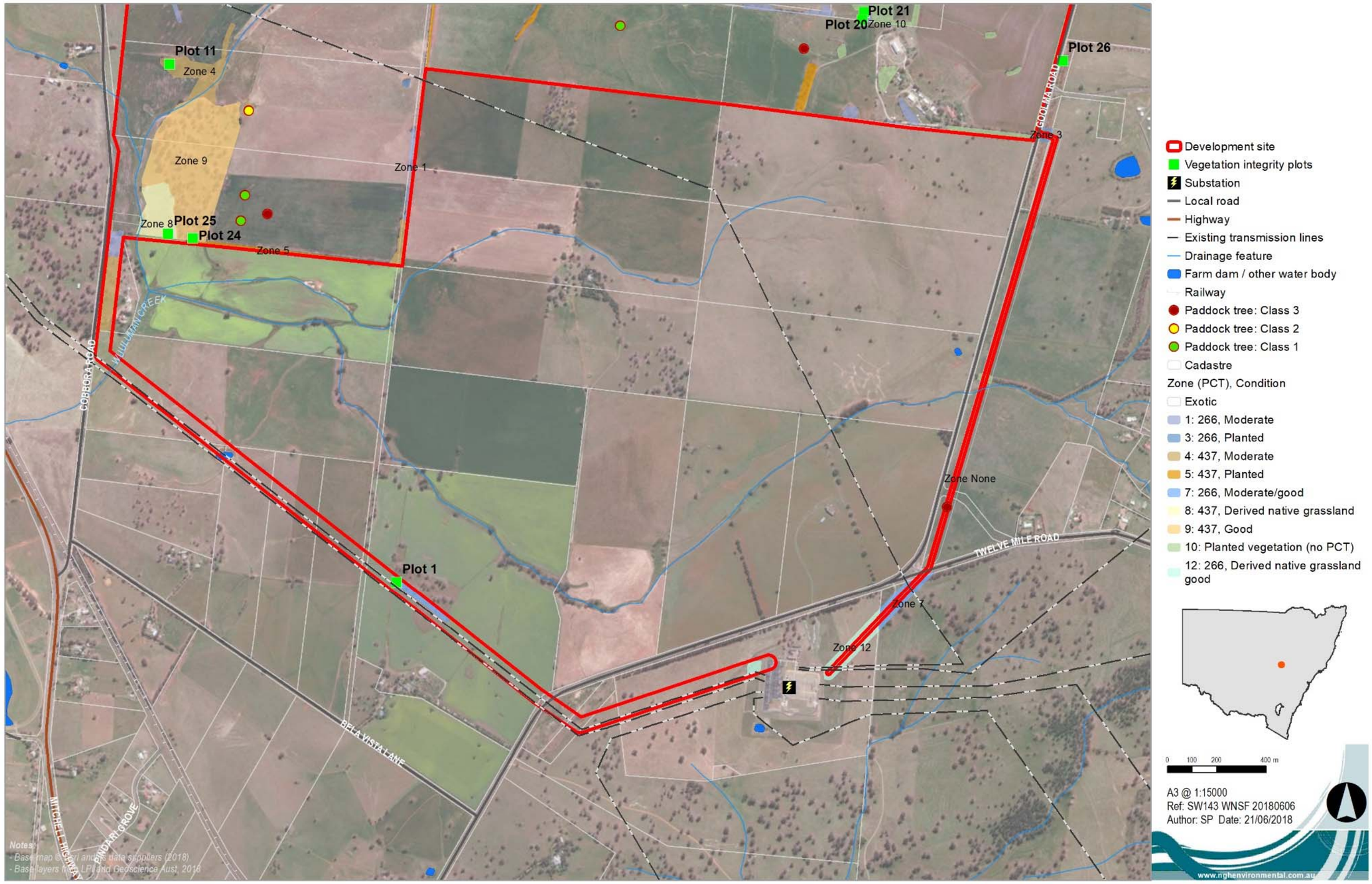

Figure 7-8 Vegetation zones within the Proposal site (south).

Cleared areas (Non-native vegetation)

Approximately 720ha of cleared land occurs within the boundary of the Proposal site. This is approximately 75% of the Proposal site. In these areas, there is a prevalence of exotic or planted non-local groundcover species, including crop and pastoral species such as Oats (**Avena sativa*) and Barley (**Hordeum distichon*).

Paddock Trees

A total of 91 scattered paddock trees occurred throughout the Proposal site, made up of a mix of White Box (*Eucalyptus albens*), Kurrajong (*Brachychiton populneus*), Yellow Box (*Eucalyptus melliodora*), White Cypress (*Callitris glaucophylla*) Mugga Ironbark (*Eucalyptus sideroxylon*) and the exotic Pepper Tree (*Schinus molle* var. *areira*). Paddock trees have been assigned to the above PCTs based on the following assumptions White Box, White Cypress and Kurrajong on the hills most likely formed part of PCT266 - White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion and Yellow Box, White Cypress and Kurrajong on the flats most likely formed part of PCT437 - Yellow Box Grassy Woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion. A number of these paddock trees are hollow-bearing.

Rivers and Streams

Seven unnamed watercourses occur within the Proposal site. These facilitate water in the north-south direction and are all tributaries of Wuuluman Creek which is located some 300m south of the Site. These tributaries flow into the Macquarie River, approximately 2.5km downstream. The watercourses include (refer to Section 8.1):

- Tributary 1: Third order stream flowing north to south west. This is the only waterway onsite that flows.
- Tributary 2 and 4: Second order streams that are irregularly inundated.
- Tributary 3, 5 and 6: First order streams that are minor incised drainage lines, flowing only after rain events.
- Tributary 7: One constructed channel for drainage surrounding cropping land.

Wetlands

No wetlands occur within or adjacent to the Proposal site. The nearest nationally Important wetland downstream from the Proposal site is the Macquarie Marshes located over 150km downstream. Four man-made dams occur within the Proposal site for stock.

Threatened species

The following threatened species were identified from the BAM Calculator as potentially being present and requiring targeted survey. Table 7-1 states whether each species was detected during surveys and furthermore, if they are expected to be impacted by the Proposal and therefore are required to be offset.

Table 7-1 Candidate species credit species returned from the BAM Calculator as requiring assessment.

Species Credit Species	Biodiversity risk weighting	Survey time	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
FAUNA					
Pink-tailed Legless Lizard *Aprasia parapulchella*	2.00	September - November	Surveyed Oct 2017	No	-
Glossy Black Cockatoo *Calyptorhynchus lathami*	2.00	May - August	Surveyed May 2018	No	-
Gang-Gang Cockatoo *Callocephalon fimbriatum*	2.00	October - January	Surveyed Oct 2017	No	-
Large-eared Pied Bat *Chalinolobus dwyeri*	3.00	September - March	Surveyed December 2017	No	
Eastern Pygmy Possum *Cercartetus nanus*	2.00	October - March	Surveyed Oct 2017	No	
Little Eagle *Hieraateus morphnoides*	1.5	August - October	Surveyed Oct 2017	No	
White Bellied Sea-Eagle *Halliaeetus leucogaster*	2.00	July-December	Surveyed Oct 2017	No	
Swift Parrot *Lathamus discolor*	3.00	May - August	Surveyed Oct 2017	No	
Square-tailed Kite *Lophoictinia isura*	1.5	September-January	Surveyed Oct 2017	No	-
Superb Parrot *Polytelis swainsonii*	2.00	September - November	Surveyed Oct 2017	No	
Eastern Bent-wing-bat *Miniopterus schreibersii oceanis*	3.00	November - February	Surveyed Dec 2017	Yes. Foraging only. No Breeding Habitat	-

Species Credit Species	Biodiversity risk weighting	Survey time	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Southern Myotis *Myotis macropus*	2.00	November – March	Surveyed December 2017	Yes	0.23ha – (Combined area of hollow bearing trees within 200m of watercourse)
Barking Owl *Ninox connivens*	2.00	May - December	Surveyed Oct 2017	No	-
Squirrel Glider *Petaurus norfolcensis*	2.00	All Year	Surveyed Oct 2017	No	-
Brush-tailed Phascogale *Phascogale tapoatafa*	2.00	All Year	Surveyed Oct 2017	No	-
Koala *Phascolarctos cinereus*	2.00	All Year	Surveyed Oct 2017	No	-
Grey-headed Flying Fox *Pteropus Poliocephalus* (Breeding camps)	2.00	October - December	Surveyed Oct 2017	Foraging only. No Breeding Camps.	-
Masked Owl *Tyto novaehollandiae*	2.00	May - August	Surveyed Oct 2017	No	-
Regent Honeyeater *Anthochaera phrygia*	3.00	September - December	Surveyed Oct 2017	No	-
FLORA					
Ausfelds Wattle *Acacia ausfeldii*	2.00	Any	Surveyed Oct 2017	No	
Bluegrass *Dichanthium setosum*	2.00	December – May	Surveyed Feb 2018	No	
Euphrasia *Euphrasia arguta*	3.00	-	Surveyed Oct 2017	No	
Small Purple-pea *Swainsona recta*	1.00	September - October	Surveyed Oct 2017	No	
Silky Swainson-pea *Swainsona sericea*	2.00	September - October	Surveyed Oct 2017	No	

Species Credit Species	Biodiversity risk weighting	Survey time	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Zieria obcordata *Zieria obcordata*	3.00	All	Surveyed Oct 2017	No	

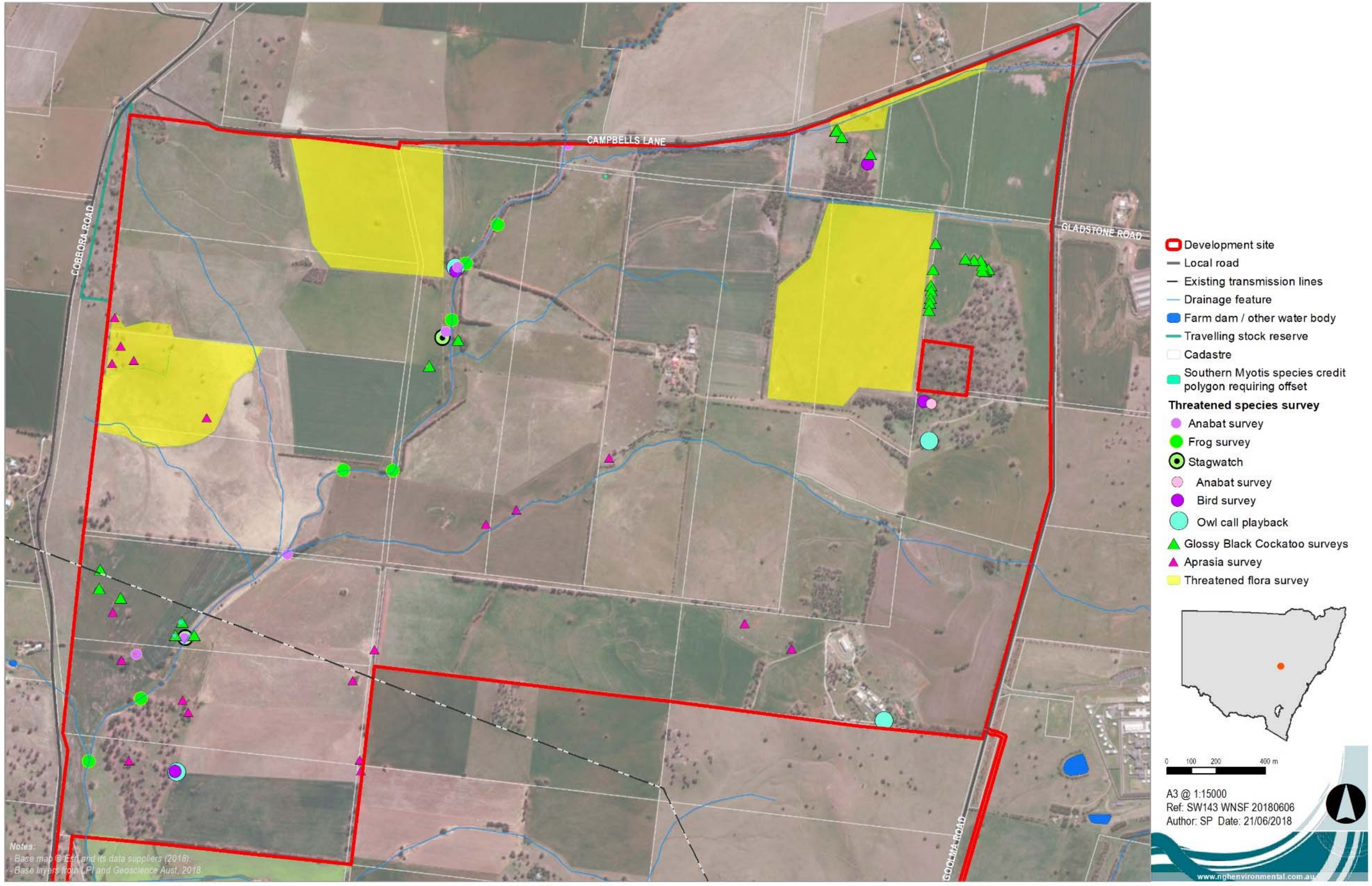

Figure 7-9 Threatened species polygons and targeted survey locations (north).

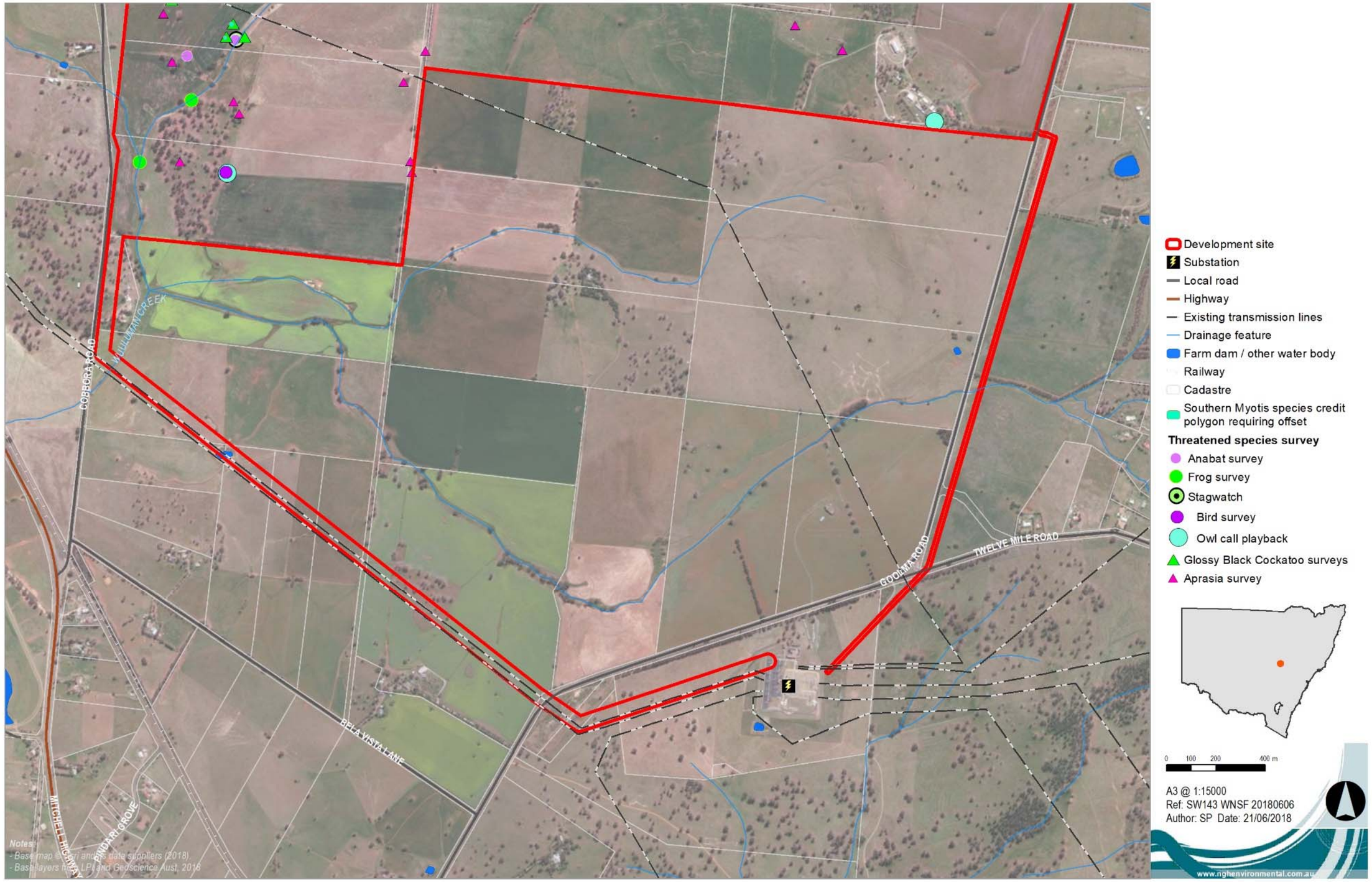

Figure 7-10 Threatened species polygons and targeted survey locations (south).

Site surveys

124 flora species and 70 fauna species were detected during the surveys. Three of these species were listed under NSW or Commonwealth legislation. These were the Grey-headed Flying Fox *Pteropus Poliocephalus* (Vulnerable, BC Act and EPBC Act). Southern Myotis *Macropus* (Vulnerable, BC Act) and Eastern Bent-wing Bat *Miniopterus schreibersii oceanis* (Vulnerable, BC Act).

25 threatened species were returned by the BAM Calculator as requiring survey (and therefore with potential to generate species credits).

7.1.3 Potential impacts

Avoidance of impacts

To inform the development of the most appropriate proposal, an environmental constraints analysis of the Proposal site was undertaken in the early planning stages to assist with designing the solar plant layout and planning the detailed methodologies for the environmental assessment. The development footprint was designed:

- Good condition remnant vegetation that formed part of an EEC– These were areas of White Box Grassy Woodland and Yellow Box Woodland that had minimal grazing would be avoided.
- Minimising the impact to areas of moderate condition remnant vegetation (EEC's). These were areas of White Box Grassy Woodland and Yellow Box Woodland with a grazed understorey.
- Locating the Proposal away from the 3rd order stream that may provide foraging habitat for threatened species such as the Southern Myotis, Eastern Bent-wing Bat and Grey-headed Flying Fox.
- Buffering waterways in accordance with their classifications and the "Guidelines for Riparian Corridors on Waterfront Land" (NSW office of Water, 2012) to minimise impacts on hydrology and water quality.
- Avoiding impacts to Rocky Outcrops, where practicable.
- Avoiding impacts to Hollow-bearing trees, where practicable.
- Locating ancillary facilities in areas where there are no biodiversity values.
- Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the Proposal site.

Impacts on native vegetation

The changes in vegetation integrity scores as a result of clearing for the solar array, laydown areas and access roads are documented for each vegetation zone in Table 7-2. Table 7-3 and Table7-4 show the changes in vegetation scores from the two transmission line options.

Table 7-2 Table of current and future vegetation integrity scores for each vegetation zone within the development footprint (solar arrays, laydown area, roads infrastructure).

Zone ID	PCT	TEC and/or threatened species habitat?	Area of impact (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	266_Moderate	EEC – White Box-Yellow Box-Blakely's Red Gum Woodland	3.1	23	0
2	266_DerivedGrassland	-	90.7	5.8	0
3	266_Planted	-	2.1	53.7	0
4	437_Moderate	EEC – White Box-Yellow Box-Blakely's Red Gum Woodland	2.1	49.4	0
5	437_Planted	-	10.2	45.3	0
		TOTAL:	**108 ha**		

Table 7-3 Table of current and future vegetation integrity scores for each vegetation zone within the Western Transmission Line Option

Zone ID	PCT	TEC and/or threatened species habitat?	Area of impact (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	266_Moderate	EEC – White Box-Yellow Box-Blakely's Red Gum Woodland	0.6	23	0
4	437_Moderate	EEC – White Box-Yellow Box-Blakely's Red Gum Woodland	1.8	49.4	0
5	437_Planted	-	0.3	45.3	0
7	266_Mod/Good	EEC – White Box-Yellow Box-Blakely's Red Gum Woodland	0.8	46.7	0
2	266_DNG_good	EEC – White Box-Yellow Box-Blakely's Red Gum Woodland	0.3	40	0

Table 7-4 Table of current and future vegetation integrity scores for each vegetation zone within the Eastern Transmission Line Option

Zone ID	PCT	TEC and/or threatened species habitat?	Area of impact (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
3	266_Planted	-	0.1	53.7	0

Zone ID	PCT	TEC and/or threatened species habitat?	Area of impact (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
7	266_Mod/Good	EEC – White Box-Yellow Box-Blakely's Red Gum Woodland	0.4	46.7	0
2	266_DNG_good	EEC – White Box-Yellow Box-Blakely's Red Gum Woodland	0.5	40	0

7.1.4 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 7-5 below.

Table 7-5 Summary of species credit species loss at the Proposal site

Species Credit Species	Biodiversity risk weighting	Area of habitat lost (ha)
Southern Myotis (*Myotis Macropus*)	2	0.2

7.1.5 Loss of hollow-bearing trees

99 Hollow-bearing trees were recorded within the Proposal site. 35 of these Hollow-bearing trees occur within the development footprint and would be removed by the Proposal. The number of hollow bearing trees in each zone are shown in Table 7-6.

Table 7-6 Hollow bearing trees impacted by the Proposal

Zone	Description	HBTs within zone	HBTs impacted
1	266_Moderate	54	18
2	266_DerivedNativeGrassland	0	0
3	266_Planted	0	0
7	266_Moderate/good	1	1
4	437_Moderate	35	7
8	437_DerivedNativeGrassland	0	0
5	437_Planted	0	0
	Paddock Trees	9	9
	TOTAL	**99**	**35**

Direct and indirect impacts unable to be avoided

The construction and operational phases of the Proposal has the potential to impact biodiversity values at the site that cannot be avoided.

<u>Construction and decommissioning</u>

In addition to the offset requirement, direct impacts that must be managed during construction and decommissioning include:

- Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks). The consequences of this impact may include:
    - Direct loss of native flora and fauna habitat from clearing, including removal of hollow bearing trees and habitat for Southern Myotis (*Myotis Macropus*) and Glossy Black Cockatoo.
    - Displacement of resident fauna.
    - Injury and mortality to fauna during clearing of fauna habitat.
    - Disturbance to fallen timber, dead wood, bush rock and riparian vegetation.

A commitment to a Biodiversity Management Plan to address the risks during construction and decommissioning forms part of the Proposal.

Indirect impacts identified in the BDAR included:

- Risks for soil and water contamination.
- Introduction and spread of weeds and pathogens.
- Creation of barriers to fauna movement.
- Generation of excessive dust, light or noise.

<u>Operation</u>

Potential impacts during operation of the Proposal include:

- Shading by solar array infrastructure. The consequences of this impact may include:
    - Ongoing prevention of flora regeneration.
    - Unstable ground surfaces and sedimentation of downstream habitats.
    - Collision risk to fauna (fencing, array infrastructure, and driving).

Indirect impacts identified in the BDAR included risks for light spill, weed encroachment, increased vehicle traffic, solar array microclimate, fences, pest animals, and mobilisation of sediments. Where not already included as soil and water mitigation commitments of the Proposal, these issues are addressed in the mitigation measures below.

Serious and Irreversible Impacts (SAIIs)

One threatened ecological community would be impacted on by the Proposal that is listed as a potential SAII entity in the Guidance to assist a decision-maker to determine a serious and irreversible impact. This is the;

- White Box-Yellow Box- Blakely's Red Gum Woodland EEC (Box-gum Woodland)

One threatened species observed within the Proposal site is listed as an SAII entity in the Guidance to assist a decision-maker to determine a serious and irreversible impact. This is the;

- Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*).

An assessment of the impacts to the Box-gum woodland and Eastern Bent-wing Bat was undertaken under the Guidance to assist a decision-maker to determine a serious and irreversible impact. Based on these criteria, it is considered unlikely the Proposal would have a serious and irreversible impact on the White Box Yellow Box Blakely's Red Gum Woodland EEC and the Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis*.

Matters of National Environmental Significance

One EPBC-listed threatened species was recorded during the surveys; several Grey-headed Flying Fox were seen flying along the creek line in the Proposal site. Foraging habitat for this species within the Proposal site is primarily limited to isolated fruits and flowers of native trees such as Eucalypts, Melaleucas and Banksia.

An assessment of significance has been completed for the Grey-headed Flying-Fox (Appendix J of the BDAR) and concluded that a significant impact was unlikely on the basis that the Proposal would not:

- Lead to a reduction of the size or area of occupancy of an important population, or fragment or disrupt the breeding cycle of an important population.
- Affect habitat critical to the survival of the species.
- Affect habitat or introduce disease such that the species would decline.
- Introduce invasive species harmful to the Grey-headed Flying Fox.
- Interfere with the recovery of the species.

An EPBC referral is not considered necessary for this species.

Ten additional threatened species were considered to have potential habitat within the Proposal site:

- Regent Honeyeater (*Anthochaera phrygia*).
- Painted Honeyeater (*Grantiella picta*).
- Swift Parrot (*Lathamus discolor*).
- Superb Parrot (*Polytelis swainsonii*).
- Large-eared Pied Bat (*Chalinolobus dwyeri*).
- Corben's Long-eared Bat (*Nyctophilus corbeni*).
- Koala (*Phascolarctos cinereus*).
- Pink-tailed Worm-lizard (*Aprasia parapulchella*).
- Striped Legless Lizard (*Delmar impar*).
- Small Purple-pea (*Swainsona recta*).

These species were surveyed for and found not to occur.

Eleven listed migratory species were returned from the protected matters report. Two of these species could occur on the site on occasion – the Fork-tailed Swift and the White-throated Needletail. As these species are almost exclusively aerial (DoE, 2015) impacts to these species are however considered unlikely.

No other MNES are relevant to the Proposal. A significant impact on MNES is not anticipated and no referral under the EPBC Act is proposed.

7.1.6 Offset requirements

Where biodiversity impacts could not be avoided, the BAM Calculator generated the following credit requirements:

- Eastern transmission line option (Table 7-7):
    - Ecosystem credits – 409 Ecosystem credits were generated from the removal of 8.ha of native vegetation and 50 paddock trees.
    - Species Credits – 6 species credits were generated from impacts to one threatened species.
- Western transmission line option (Table 7-8):

- Ecosystem credits – 468.25 Ecosystem credits were generated from the removal of 10.8ha of native vegetation and 45 paddock trees.
- Species Credits – 6 species credits were generated from impacts to one threatened species.

The retirement of these credits would be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Proposals, and would be achieved by either:

- Retiring credits under the Biodiversity Offsets Scheme (BOS).
- Making payments into the Biodiversity Conservation Fund.
- Funding a biodiversity action.

Table 7-7 Credit requirement for the Proposal – Eastern Transmission Line option.

Ecosystem credits	Offset credits required
White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266)	114
Paddock Trees – White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266)	9.5
Subtotal:	**123.5**
Yellow Box Grassy Woodland on lower hillslopes and valley flats in the Southern NSW Brigalow Belt South Bioregion (PCT437)	256
Paddock Trees - Yellow Box Grassy Woodland on lower hillslopes and valley flats in the Southern NSW Brigalow Belt South Bioregion (PCT437)	29.5
Subtotal:	**285.5**
TOTAL:	**409**
Species credits	**Offset Credits Required**
Southern Myotis (*Myotis Macropus*)	6
TOTAL	**6**

Table 7-8 Credit Requirement for the Proposal - Western Transmission Line option

Ecosystem credits	Offset credits required
White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266)	123

Ecosystem credits	Offset credits required
Paddock Trees – White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266)	9.5
Subtotal:	**132.5**
Yellow Box Grassy Woodland on lower hillslopes and valley flats in the Southern NSW Brigalow Belt South Bioregion (PCT437)	307
Paddock Trees - Yellow Box Grassy Woodland on lower hillslopes and valley flats in the Southern NSW Brigalow Belt South Bioregion (PCT437)	28.75
Subtotal:	**355.75**
TOTAL	**468.25**
Species credits	**Offset Credits Required**
Southern Myotis (*Myotis Macropus*)	6
TOTAL	**6**

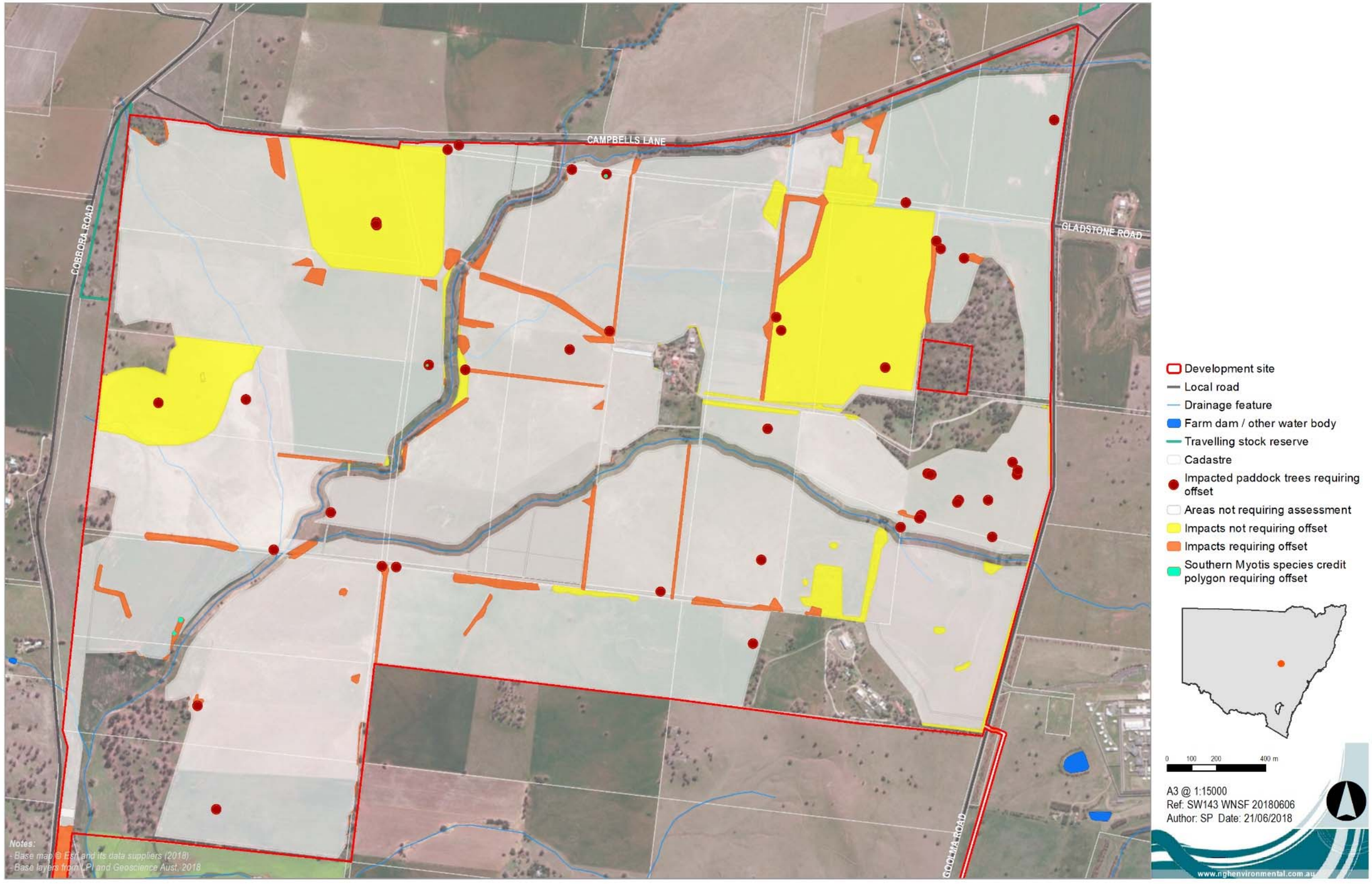

Figure 7-11 Impacts requiring offset, not requiring offset and not requiring assessment (north).

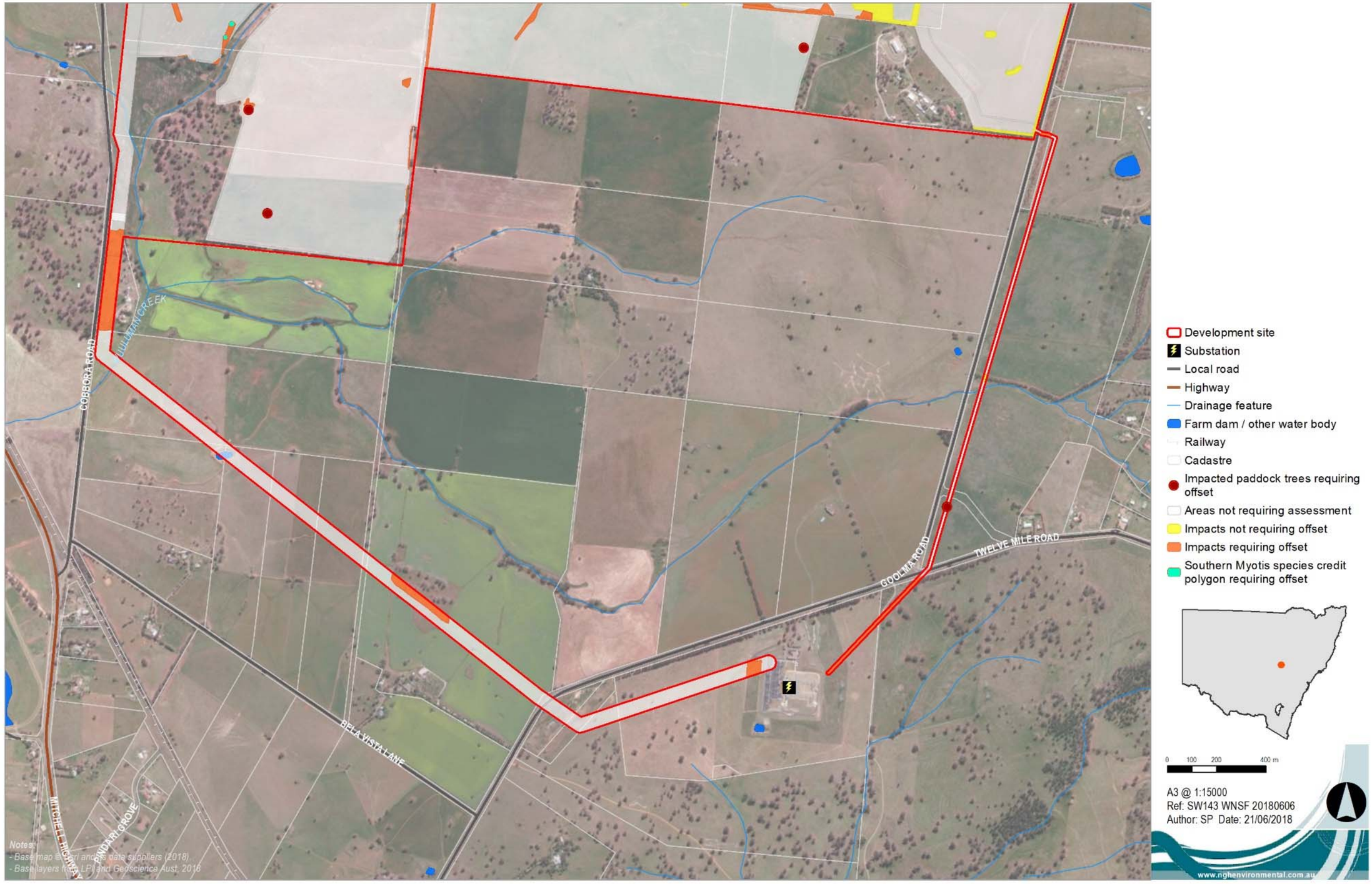

Figure 7-12 Impacts requiring offset, not requiring offset and not requiring assessment (south).

7.1.7 Safeguards and mitigation measures

Table 7-9 Safeguards and mitigation measures for biodiversity impacts.

C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and mitigation measures	C	O	D
1	• Time works to avoid critical life cycle events: o Hollow-bearing trees would not be removed during breeding season or hibernation period (Winter to early summer) to mitigate impacts on Southern Myotis. o If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur.	C		
2	• Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler: o Pre-clearing checklist. o Tree clearing procedure.	C		
3	• Relocate habitat features (fallen timber, hollow logs) from within the Proposal site: o Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement.	C		
4	• Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed: o Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing. o No stockpiling or storage within dripline of any native vegetation. o In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance.	C		
5	• Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill: o Avoid Night Works. o Direct lights away from vegetation.	C	O	
6	• Temporary fencing to protect significant environmental features such as riparian zones: o Prior to construction commencing, exclusion fencing and signage would be installed around habitat to be retained.	C		
7	• Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas:	C	O	

ID	Safeguards and mitigation measures	C	O	D
	o A Weed Management Procedure would be developed for the Proposal to prevent and minimise the spread of weeds. This would include: o Management protocol for declared priority weeds under the Biosecurity Act 2015 during and after construction o Weed hygiene protocol in relation to plant, machinery, and fill o Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported. o The weed management procedure would be incorporated into the Biodiversity Management Plan.			
8	• Staff training and site briefing to communicate environmental features to be protected and measures to be implemented: o Site induction. o Toolbox talks.	C		
9	• Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed development: o Preparation of a Biodiversity Management Plan that would include protocols for: ▪ Protection of native vegetation to be retained. ▪ Best practice removal and disposal of vegetation. ▪ Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist. ▪ Weed management. ▪ Unexpected threatened species finds. ▪ Rehabilitation of disturbed areas.	C		
10	• Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the Proposal site: o Retained native vegetation would be considered as an offset site.		O	
11	• Staff training and site briefing to communicate impacts of traffic strikes on native fauna: o Awareness training during site inductions regarding enforcing site speed limits. o Site speed limits to be enforced.	C	O	

7.2 ABORIGINAL HERITAGE

7.2.1 Approach

A specialist Aboriginal Cultural Heritage Assessment (ACHA) was undertaken to provide an assessment of the Aboriginal cultural values associated with the Proposal site and to assess the cultural and scientific significance of any Aboriginal heritage sites recorded.

The full report is provided in Appendix F and is summarised below.

This ACHA Report was prepared in line with the following:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011).
- *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH, 2010a).
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (ACHCRP) (OEH, 2010b)

The consultation with Aboriginal stakeholders was undertaken in accordance with clause 80C of the NPW Amendment Regulation following the consultation steps outlined in the (ACHCRP) guide provided by the OEH. The full list of consultation steps, including those groups and individuals that were contacted and a consultation log is provided in Appendix F. As a result of this process, four groups contacted the consultant to register their interest in the Proposal. The groups who registered interest were:

- Wellington Local Aboriginal Land Council.
- Wellington Valley Wiradjuri Aboriginal Corporation.
- Gallangabang Aboriginal Corporation.
- Binjang Wellington Wiradjuri Heritage Survey.

No other party registered their interest, including the entities and individuals recommended by the OEH. The fieldwork was organised and all registered parties were asked to participate in the fieldwork. The fieldwork was carried out in February 2018. A copy of the draft report was provided to all the registered parties for comment.

7.2.2 Archaeological Context

The assessment included a review of relevant information relating to the existing landscape of the Proposal site. Included in this was a search of the OEH AHIMS database. No Aboriginal sites had previously been recorded within the Proposal site. A single isolated find site, at the First Solar Wellington Solar Farm IF 1 (#36-4-0142) is located adjacent to the south-western proposal boundary.

Assessment of Aboriginal site models for the region suggests that there may be a pattern of site location that relates to the presence of potential resources for Aboriginal use. The most archaeologically sensitive areas are noted to occur within close proximity of water. Nonetheless, given that Aboriginal people have lived in the region for tens of thousands of years, there is potential for archaeological evidence to occur across the Proposal site. This would most likely be in the form of stone artefacts and scarred trees.

7.2.3 Survey results

The survey strategy was to cover as much of the ground surface as practicable within the Proposal site. Although the actual ground impact from the construction method for the proposed solar arrays is likely to be low, the placement of solar arrays across the landscape has the potential to cover any cultural heritage sites. Survey transects were undertaken on foot across the Proposal site to achieve maximum coverage. All mature native trees within the Proposal site were also inspected for evidence of Aboriginal scarring.

Visibility within the Proposal site was variable however as a whole the Proposal site generally had good visibility averaging 35% overall. The effective visibility in the paddocks ranged from 90% in exposures to less than 5% in areas of dense grass. Between the survey participants, over the course of the field survey, approximately, 800km of transects were walked across the Proposal site. Allowing for an effective view width of 5m for each person and given the variability in the ground visibility across the Proposal site, overall

the survey effectively examined 13.1% of the Proposal site. It is considered that the survey of Wellington North Solar Plant Proposal site had sufficient and effective survey coverage.

Despite the variable visibility encountered during the survey, there were 99 stone artefacts found across the Proposal site that were recorded as 37 site occurrences. These archaeological features have been recorded as nine artefact scatters and 28 isolated finds. Two possible scarred trees and a European survey marker tree were also recorded.

In terms of the current proposal therefore, extrapolating from the results of this survey, it is possible that additional stone artefacts could occur within the proposed development footprint. Based on the land use history, an appraisal of the landscape, soil, level of disturbance and the results from the field survey it was concluded that there was negligible potential for the presence of intact subsurface deposits with high densities of objects or cultural material within the Proposal site.

The results of previous archaeological surveys in the Wellington region show that there are sites and artefacts present across the landscape. The predictions based on the modelling for the Proposal site were that stone artefacts and scarred trees were the most likely manifestation of Aboriginal occupation of the area. It was noted that while Aboriginal sites may be expected throughout all landscapes the most archaeologically sensitive areas occur in proximity to water. The survey results have confirmed this prediction with stone artefacts recorded as isolated finds and artefact scatters across the Proposal site, even in areas highly disturbed by farming activities. The sites were identified across a range of landforms including slopes, flats, spurs, low hill crests and along creeks/drainage lines and their associated flats. Over half of the artefacts recorded during the survey were located along creeks/drainage lines and their associated flats.

The cultural significance of the sites recorded during this assessment is only determined by the local Aboriginal community.

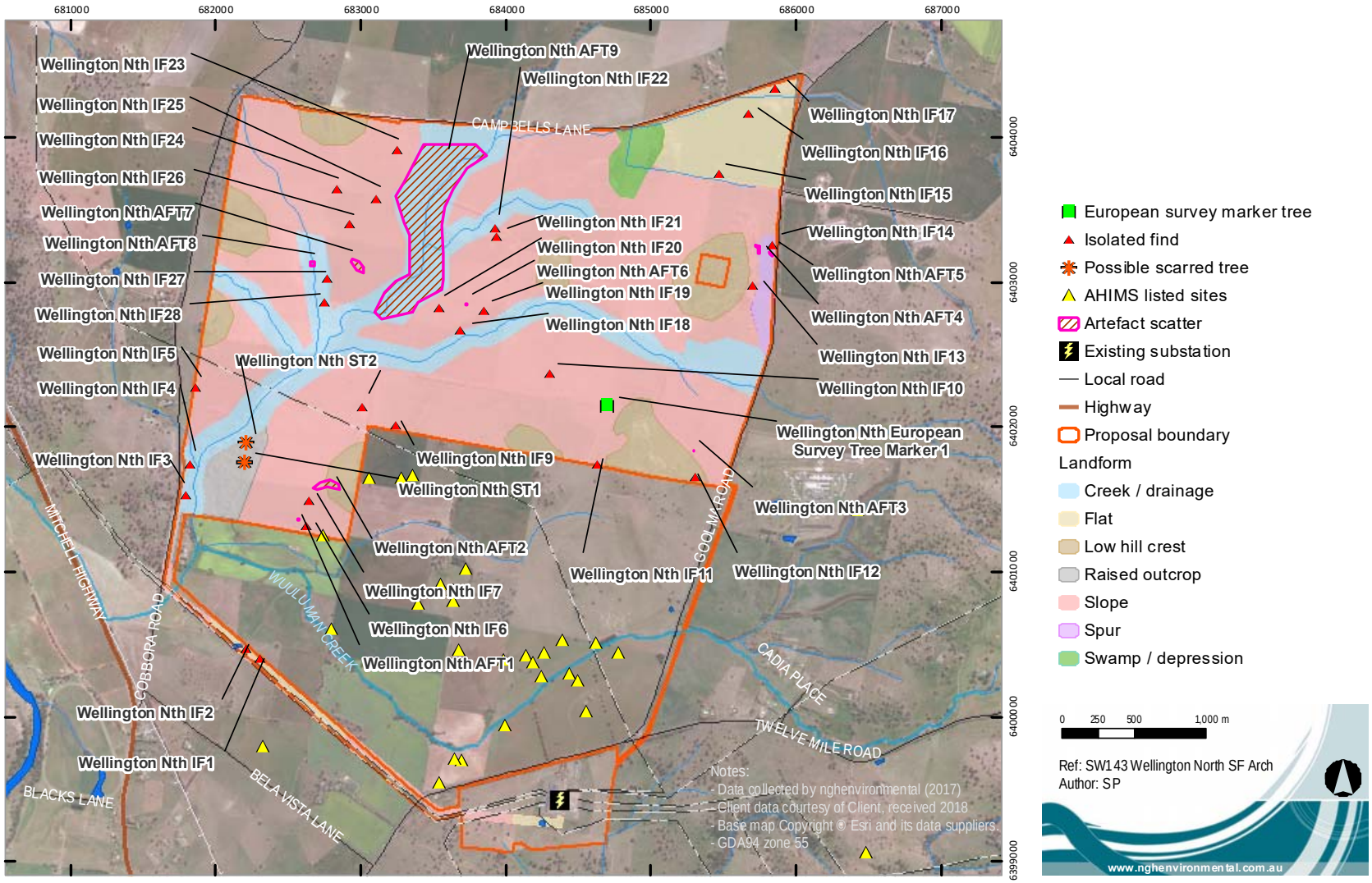

Figure 7-13 Heritage assessment survey results.

7.2.4 Potential impacts

The Proposal involves the construction of a solar plant and includes connection to the nearby substation with an above or underground transmission line that would extend to the existing Wellington substation on Lot 1 / DP1226751. The total development footprint would result in disturbance of up to 837 ha, which includes 31 ha for the 'worst case' (largest impact area) transmission line option. The impact is likely to be most extensive where earthworks occur and would involve the removal, breakage or displacement of artefacts. This is considered a direct impact on the Aboriginal objects by the development in its present form.

The impact to the scientific values if the nine artefact scatters (Wellington Nth AFT1- Wellington Nth AFT9) and 25 of the 28 recorded isolated finds (Wellington Nth IF1 to Wellington Nth IF 10, Wellington Nth IF 12, Wellington Nth IF14 to Wellington Nth IF16, Wellington Nth IF18 to Wellington Nth IF28) were to be impacted by the current proposal is considered low. It should be noted that the site Wellington Nth AFT9 would only be partially impacted. The two possible scarred tree sites would not be impacted by the Proposal as per the proposed development footprint.

The stone artefacts have little research value apart from what has already been gained from the information obtained during the present assessment. This information relates more to the presence of the artefacts and in the development of Aboriginal site modelling, which has largely now been realised by the recording. The impact to the edge-ground axes (Wellington Nth AFT 2, Wellington Nth AFT 5 and Wellington Nth AFT 9) are considered to have low to moderate loss of scientific value.

The Wellington North Solar Plant proposal is classified as SSD under the EP&A Act which have a different assessment regime. As part of this process, Section 90 harm provisions under the NPW Act are not required, that is, an AHIP is not required to impact Aboriginal objects as the DPE provides development approval.

The table below details the impacts to the eight artefact scatters, 28 isolated finds and two possible scarred trees within the Wellington North Solar Plant proposal boundary. Of the 37 sites recorded with stone artefacts three isolated find sites (Wellington Nth IF113, Wellington Nth IF13 and Wellington Nth IF17) and a portion of Wellington Nth AFT9 would be not impacted by the proposed development footprint. The two possible scarred tree sites would also not be impacted by the proposed development footprint.

Table 7-10 Identified risk to known sites.

Site name	Scientific significance	Type of harm	Degree of harm	Consequence of harm	Recommendation
Wellington Nth AFT1	Low	Direct	Total	Total loss of value	Salvage objects prior to development of Proposal site.
Wellington Nth AFT2	Low to moderate	Direct	Total	Total loss of value	Salvage objects prior to development of Proposal site
Wellington Nth AFT3	Low	Direct	Total	Total loss of value	Salvage objects prior to development of Proposal site.
Wellington Nth AFT4	Low	Direct	Total	Total loss of value	Salvage objects prior to

Site name	Scientific significance	Type of harm	Degree of harm	Consequence of harm	Recommendation
					development of Proposal site.
Wellington Nth AFT5	Low to moderate	Direct	Total	Total loss of value	Salvage objects prior to development of Proposal site.
Wellington Nth AFT6	Low	Direct	Total	Total loss of value	Salvage objects prior to development of Proposal site.
Wellington Nth AFT7	Low	Direct	Total	Total loss of value	Salvage objects prior to development of Proposal site.
Wellington Nth AFT8	Low	Direct	Total	Total loss of value	Salvage objects prior to development of Proposal site.
Wellington Nth AFT9	Moderate	Direct	Partial	Partial loss of value	Salvage objects within development footprint prior to development of Proposal site
Wellington Nth IF1	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF2	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF3	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF4	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF5	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF6	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.

Site name	Scientific significance	Type of harm	Degree of harm	Consequence of harm	Recommendation
Wellington Nth IF7	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF8	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF9	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF10	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF11	Low	Would not be harmed - outside development area	None - outside development area	No loss of value - outside development area	Outside of development area. Ensure minimum 5m buffer to avoid inadvertent disturbance or impacts to site.
Wellington Nth IF12	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF13	Low	Would not be harmed - outside development area	None- outside development area	No loss of value- outside development area	Outside of development area. Ensure minimum 5m buffer to avoid inadvertent disturbance or impacts to site.
Wellington Nth IF14	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF15	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF16	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.

Site name	Scientific significance	Type of harm	Degree of harm	Consequence of harm	Recommendation
Wellington Nth IF17	Low to moderate	Would not be harmed - outside development area	None- outside development area	No loss of value- outside development area	Outside of development area. Ensure minimum 5m buffer to avoid inadvertent disturbance or impacts to site.
Wellington Nth IF18	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF19	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF20	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF21	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF22	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF23	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF24	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF25	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF26	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth IF27	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.

Site name	Scientific significance	Type of harm	Degree of harm	Consequence of harm	Recommendation
Wellington Nth IF28	Low	Direct	Total	Total loss of value	Salvage object prior to development of Proposal site.
Wellington Nth ST1	Low	Would not be harmed - outside development area	None- outside development area	No loss of value- outside development area	Outside of development area. Ensure avoided with a minimum 10m buffer placed around site.
Wellington Nth ST2	Low	Would not be harmed - outside development area	None- outside development area	No loss of value- outside development area	Outside of development area. Ensure avoided with a minimum 10m a buffer placed around site.

7.2.5 Safeguards and mitigation measures

The report identifies a number of safeguards, these are identified below, tabulated by finds in Table 7-10 and stipulated as proposal commitments in the Safeguards and mitigation measures provided in Table 7-11.

Table 7-11 Safeguards and mitigation measures for Aboriginal heritage

C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and Mitigation Measures	C	O	D
1	• The development must avoid the two possible Scarred Tree (Wellington Nth ST1 and Wellington Nth ST2) as per the proposed development footprint in this report. A minimum 10m buffer around the trees should be in place to protect the tree canopy and root system.	Design		
2	• If complete avoidance of the nine artefacts scatters and 28 isolated find sites recorded within the Proposal site is not practicable, the artefacts within the development footprint must be salvaged prior to the proposed work commencing and moved to a safe area within the property that would not be subject to any ground disturbance.	C		
3	• The collection and relocation of the artefacts should be undertaken by an archaeologist with representatives of the registered Aboriginal parties and be consistent with Requirement 26 of the *Code of practice for Archaeological Investigation of Aboriginal Objects in New South Wales.* A new site card/s would need to be completed once the artefacts are moved to record their new location on the AHIMS database. The Aboriginal community requests that a Cultural Smoking Ceremony take place to cleanse any artefacts salvaged and the reburial location.	C		

ID	Safeguards and Mitigation Measures	C	O	D
4	• A minimum 5m buffer should be observed around all artefact scatters and isolated find sites including those outside the development footprint.	C	O	D
5	• Wellington North Solar Plant Pty Limited should prepare a Cultural Heritage Management Plan (CHMP) to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Plant and management of known sites and artefacts. The Plan should include the unexpected finds procedure to deal with construction activity. Preparation of the CHMP should be undertaken in consultation with the registered Aboriginal parties.	C		
6	• In the unlikely event that human remains are discovered during the construction, all work must cease in the immediate vicinity. OEH, the local police and the registered Aboriginal parties should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal.	C		
7	• Further archaeological assessment would be required if the Proposal activity extends beyond the area of the current investigation as detailed in this report, including the entire proposed eastern transmission route and any portions of the western transmission route outside the surveyed alignment. This would include consultation with the registered Aboriginal parties and may include further field survey.	C	O	D

7.3 NOISE AND VIBRATION

7.3.1 Approach

A Construction and Operational Noise and Vibration Assessment for the proposed Wellington North Solar Plant was undertaken by Renzo Tonin and Associates. The full report is provided in Appendix G and is summarised below. It includes consideration of noise and vibration impacts from the construction and operation phases of the Proposal in accordance with SEARs.

7.3.2 Existing environment

The Proposal is located in a regional setting, approximately 7km north east of Wellington. The surrounding land uses to the proposed solar plant are generally agriculture, including cropping and cattle and sheep grazing. The Wellington and Macquarie correctional centres are located east of the Proposal site. Noise sources in the locality include traffic along Goolma Road and agricultural activities such as the operation of large harvesters, tractors, haulage trucks, irrigation pumps, quad bikes and 4WD vehicles.

Figure 7-14 illustrates the locations of the nearest receivers to the Proposal site, with the nearest non-involved residential dwelling being approximately 110m north of the Proposal site (R4).

7.3.3 Noise monitoring

Criteria for the assessment of construction and operation noise are usually derived from the existing noise environment of an area. The NSW Policy for Industry (NPfI) (EPA, 2017) outlines methods for determining the background noise level of an area. This assessment of the proposed works has used long-term noise monitoring.

Noise monitoring was undertaken near the closest residence (R4, monitored at L1 on Figure 7-14). Long term (unattended) noise monitoring was carried out at L1 between Thursday 5th October and Thursday 12th October 2017. The existing background and ambient noise levels determined from the monitoring are presented in Table 7-12.

Table 7-12 Measured existing background (L_{90}) & ambient (L_{eq}) noise levels, dB(A).

Monitoring location	L_{90} Background Noise Levels			L_{eq} Ambient noise level		
	Day	Evening	Night	Day	Evening	Night
L1 (near R4) (-32°29'0.48", 148°58'26.84")	27	34	26	49	46	47

The identified receivers surrounding the subject site are all classified as rural under NPfI guidelines. It was found that the background noise levels were typical for a rural area, with a day RBL less than 40dB(A), an evening RBL of 35 dB(A) and a night RBL less than 30dB(A).

Based on Table 2.1 of the NPfI Guidelines, where background noise levels are less than the minimum assumed Rating Background Noise Levels (RBLs), the minimum assumed RBL's are adopted for all receiver locations. Therefore, the background noise levels relevant to the Proposal are as per the fourth column of Table 7-13 below.

Table 7-13 Rating Background Noise Level, dB(A).

Time of day	Measured Existing Background (L_{90}), dB(A)	Minimum Assumed RBLs, dB(A)[1]	Applicable Rating Background Level, dB(A)
Day	27	35	**35**
Evening	34	30	**34**
Night	26	30	**30**

[1] In accordance with Table 2.1 of the NSW NPfI.

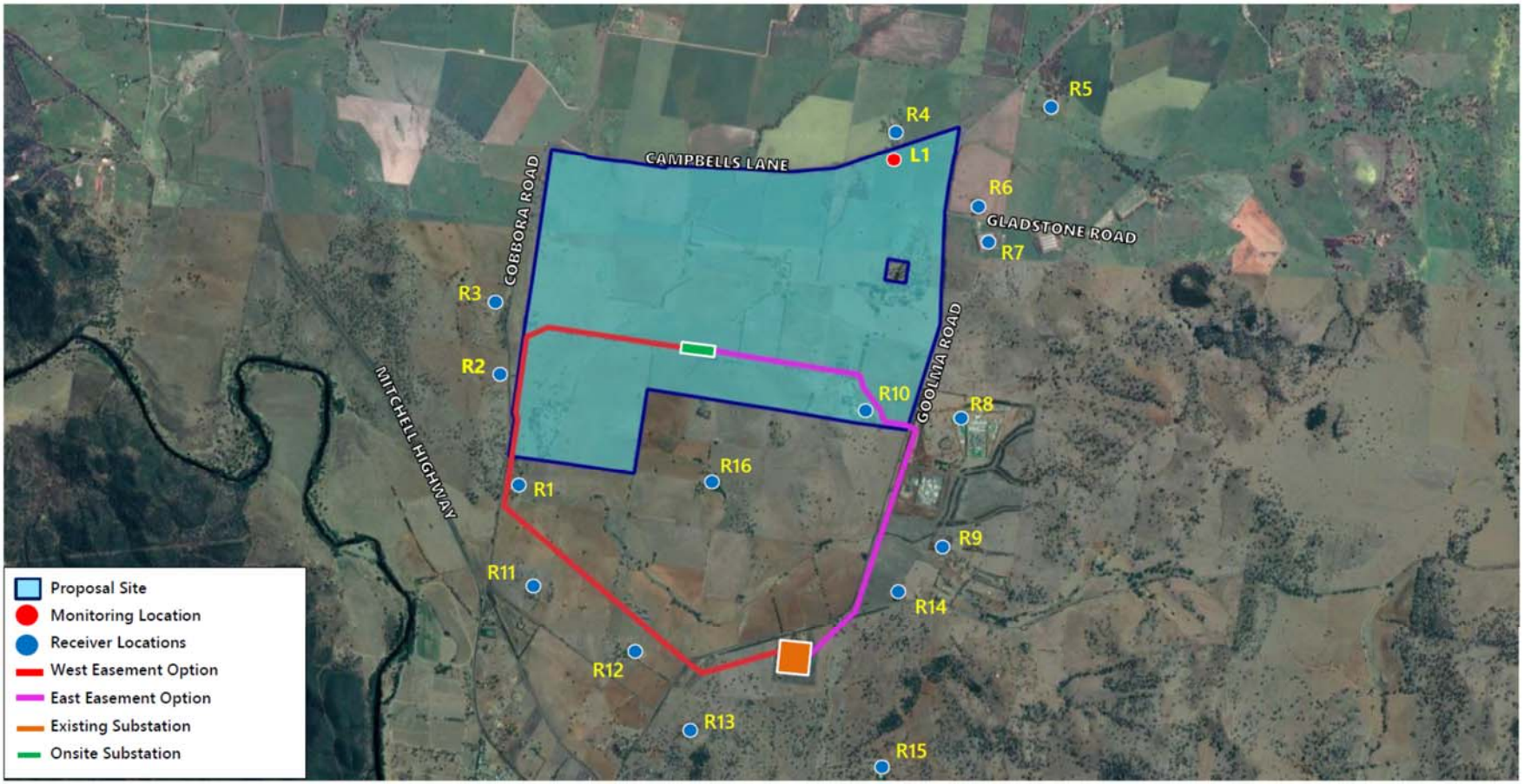

Figure 7-14 Residential receivers and noise monitoring locations adjacent to the Proposal site (Renzo Tonin, 2018).

7.3.4 Construction noise impact assessment

Criteria

The NSW *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) deals with managing construction noise impacts. According to the guideline, a quantitative assessment of noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total. The construction of the Wellington North Solar Plant meets the requirements of a quantitative assessment.

Residential receivers

The guideline specifies noise targets, or 'noise management levels', for residences and other noise sensitive receivers (Table 7-14). The Rating Background Level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period. Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified below.

Table 7-14 Noise management levels at residential receivers

Time of day	Management Level
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected Rating Background Level + 10dB(A)
	Highly noise affected 75dB(A)
Outside recommended standard hours	Noise affected Rating Background Level + 5dB(A)

Table 7-15 identifies the adopted construction Noise Management Levels (NMLs) for the nearest noise sensitive residential receivers for the Wellington North Solar Plant proposal (refer to Figure 7-14). The NMLs for the receiver locations are derived from the RBLs represented by the background noise levels measured at the monitoring location (Table 7-13) and NSW ICNG (DECC, 2009) criteria (Table 7-14). During standard construction hours, a highly affected noise criteria of 75 dB(A) applies for all receivers.

Table 7-15 Construction noise management levels at residential receivers

Location description	Day L_{A90} background noise level (RBL)	Day noise management $L_{A90\ (15min)}$
All residential receivers (R1-R6, R9 and R11-R16)-	35 dB(A)[1]	35 + 10 = 45 dB(A)

Notes: 1. As no night works or works outside the recommended standard hours are proposed.

Sensitive land uses

Table 7-16 sets out ICNG noise management levels for other types of noise sensitive receiver locations applicable to the Wellington North Solar Plant proposal.

Table 7-16 Construction Noise Management Levels at other Noise Sensitive Land Uses

Land use	Receiver type	Where objective applies	Management level L_{Aeq} (15min)
Receiver R7 – 104 Gladstone Rd, Bodangora	Industrial	External noise level	75B(A)
Receiver R8 – Wellington Correctional Centre	Commercial	External noise level	70dB(A)
Receiver R10 – NSW SCS Commission Offices	Commercial	External noise level	70dB(A)

Construction noise sources

Noise impact predictions take into account the typical noise levels of construction equipment likely to be used for the construction phase. The equipment and their sound power levels to be used within the Proposal site are in Table 7-17. While Table 7-18 details the equipment required to construct the transmission lines for the Proposal.

Table 7-17 Construction equipment sound power levels within Proposal site.

Equipment used	LAeq Sound power levels (dBA) per single item	No. Items required
Small Pile Driving Rig	114	10
Crane	110	4
Drum roller	109	4
Padfoot roller	109	4
Wheeled loader	109	3
Dump Truck	108	6
30T Excavator	107	10
Grader	107	6
Chain trencher	104	4
Water truck	104	4
Telehandler	98	4
Forklift	90	4

Table 7-18 Construction equipment sound power levels for transmission line construction.

Equipment used	LAeq Sound power levels (dBA) per single item	No. Items required
Crane	110	1
Dump Truck	108	1
30T Excavator	107	1
Grader	107	1
Chain trencher	104	1
Water truck	104	1

Construction noise assessment

Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments surrounding the study area. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction models take into account:

- Location of noise sources and receiver locations.
- Height of sources and receivers.
- Separation distances between sources and receivers.
- Ground type between sources and receivers.
- Attenuation from barriers (natural and purpose built).

Table 7-19 presents the noise levels likely to be experienced at the nearby affected receiver locations during the construction works within the Proposal site. The predicted levels are considered a worst-case scenario with up to three nosiest plants operating concurrently.

Table 7-19 Predicted $L_{Aeq\ 15\ min}$ construction noise levels at receiver locations for works with the Proposal site.

Receiver location (refer to Figure 7-14)	Noise management level[1]	Predicted construction noise Level, $L_{Aeq\ (15\ min)}$ [2]	Compliance with criteria? (Yes/No)
Residential receivers			
R1	45	<20-41	Yes
R2		**<20-51**	**No**
R3		<20-45	Yes
R4		**<20-49**	**No**
R5		<20-33	Yes
R6		**<20-46**	**No**
R9		<20-31	Yes
R11		<20-31	Yes
R12		<20-28	Yes
R13		<20-23	Yes
R14		<20-28	Yes
R15		<20-20	Yes
R16		20-36	Yes
Sensitive land uses			
R7	75	<20-42	Yes
R8	70	<20-42	Yes
R10		<20-59	Yes

Notes: 1. Noise management for standard day time construction works (i.e. Monday to Friday 7am to 6pm and Saturday 8am to 1pm).

2. Based on up to three nosiest construction plant and equipment operating concurrently.

Table 7-20 refer to the noise levels likely to be experienced at the nearby affected receivers due to the construction of the transmission lines. The noise levels represent the noise source being located at the furthest to the closest proximity to each receiver location.

Table 7-20 Predicted $L_{Aeq\ 15\ min}$ construction noise levels at receiver locations for works within the transmission line options.

Receiver location (refer to Figure 7-14)	Noise management level[1]	Eastern transmission line option		Western transmission line option	
		Predicted Construction Noise Level, $L_{q\ (15\ min)}$ [2]	Comply? (Yes/No)	Predicted Construction Noise Level $L_{q\ (15\ min)}$ [2]	Comply? (Yes/No)
Residential receivers					
R1	45	<20-21	Yes	**<20-55**	**No**
R2		<20-23	Yes	**<20-50**	**No**
R3		<20-22	Yes	<20-40	Yes
R4		<20	Yes	<20	Yes
R5		<20	Yes	<20	Yes
R6		<20-23	Yes	<20	Yes
R9		<20-35	Yes	<20-24	Yes
R11		<20-20	Yes	<20-38	Yes
R12		<20-25	Yes	<20-45	Yes
R13		<20-28	Yes	<20-37	Yes
R14		<20-41	Yes	<20-29	Yes
R15		<20-29	Yes	<20-28	Yes
R16		23-28	Yes	21-28	Yes
Sensitive land uses					
R7	75	<20-24	Yes	<20	Yes
R8	70	<20-40	Yes	<20	Yes
R10		21-58	Yes	<20-24	Yes

Based on the construction noise levels presented in the tables above, the construction management levels at receivers R2, R4 and R6 may be exceeded when the construction works are conducted on the Proposal site. For the east easement option, construction noise would not exceed at any receiver locations. For the west easement option, the construction noise management levels at Receivers R1 and R2 may also be exceeded. It is noted that construction noise levels at all receivers are predicted to be less than the highly noise affected level of 75dB(A) for works in all locations.

In light of the predicted noise levels above, it is recommended that a feasible and reasonable approach towards noise management measures be applied to reduce noise levels as much as practicable to manage the impact from construction noise and assist in meeting compliance for R1 and R2. Table 7-21 outlines potential noise reductions from using some recommended control methods (refer to Appendix G).

Table 7-21 Relative effectiveness of various forms of noise control, dB(A)

Noise control method	Practical examples	Typical noise reduction possible in practice		Maximum noise reduction possible in practice	
		AS2436	Renzo Tonin and Associates	AS2436	Renzo Tonin and Associates
Distance	Doubling of distance between source and receiver	6	6	6	6
Noise screening	Acoustics barriers such as earth mounds, temporary or permanent noise barriers	5 to 10	5 to 10	15	15
Acoustic enclosures	Engine casing lagged with insulation and plywood	15 to 25	10 to 20	50	30
Engine Silencing	Residential class mufflers	5 to 10	5 to 10	20	20
Substitution by alternative process	Use electric motors in preference to diesel or petrol	-	15 to 25	-	40

7.3.5 Operational noise assessment

Background noise monitoring

The background noise data collected to assess construction noise was also used to assess operational noise.

Criteria

The NSW *Noise Policy* for Industry (NPfI) (EPA, 2017) specifies noise criteria relating to intrusive noise impacts and noise level amenity. The assessment criteria under the NPfI for the Wellington North Solar Plant is outlined in Table 7-22.

Table 7-22 NPfI Proposal Specific criteria

Assessment Criteria	Proposal Specific Criteria
Intrusive	Rating background level + 5dBA
Amenity	$L_{Aeq\ period}$ recommended amenity noise levels - 5dBA $L_{Aeq\ period}$ + 3dBA

The operational proposal-specific noise criteria for the solar plant based on the NPfI criteria and guidelines (Table 7-22) is shown in Table 7-23 and Table 7-24.

Table 7-23 Intrusiveness noise criteria

Receiver	Period	LAeq (15 minute) (dBA)
All residential receivers [1]	Day	35 + 5 = 40
	Evening	34 + 5 = 39
	Night	30 + 5 = 35

Notes: Intrusiveness criteria is only applicable for residential receivers.

Table 7-24 Applicable amenity noise criteria

Receiver	Indicative noise amenity area	Time of day	Recommended noise level	
			$L_{Aeq\ Period}$	$L_{Aeq\ 15\ min}$
Residence (R1-R6, R9 and R11-R13)	Rural	Day [1]	50 – 5 = 45	45 + 3 = 48
		Evening [2]	45 – 5 = 40	40 + 3 = 43
		Night [3]	40 – 5 = 35	35 + 3 = 38
Commercial premises (R8 and R10)	All	When in use	65 – 5 = 60	60 + 3 = 63
Industrial premises (R7)	All	When in use	70 – 5 = 65	65 + 3 = 68

Notes: 1. Day is defined as 7.00am to 6.00pm, Monday to Saturday, 8.00am to 6.00pm Sundays and Public holidays

2. Evening is defined as 6.00pm to 10.00pm, Monday to Sunday and Public Holidays.

3. Night is defined as 10.00pm to 7.00am, Monday to Saturday, 10.00pm to 8.00am, Sundays and Public Holidays.

In accordance with the NPfI guidelines, the Proposal noise trigger levels are the lowest (i.e. more stringent) value for the Proposal intrusiveness noise levels and proposal amenity noise levels. These have been determined and reproduced in Table 7-25 below.

Table 7-25 Proposal Noise Trigger Levels, dB(A).

Receiver location (refer to Figure 7-14).	$L_{Aeq\ 15\ min}$ Proposal Noise Triggers[1]		
	Day	Evening	Night
Residential receivers			
R1	40	39	35
R2			
R3			
R4			
R5			
R6			
R9			
R11			
R12			
R13			
R14			
R15			
R16			
Sensitive land uses[4]			
R7	68	68	68
R8	63	63	63
R10			

Notes:
1. Monday-Saturday, Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am.
2. On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
3. The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.
4. Proposal Noise Trigger Levels only apply when premises are in use.

To assess the likelihood of sleep disturbance, the potential of maximum noise level events from premises during the night-time period has been considered in this assessment. In accordance with NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or
- L_{AFmax} 52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

Operational noise sources

The potential sources of noise during operation of the solar plant considered for the assessment included:

- Mechanical noise from the tracking system of the solar panels, from up to 13,367 tracking motors to drive solar panels.
- Operation of 155 inverter stations that are evenly distributed across the site.

- Operation of four new 175MVA transformers (two within the new onsite substation and two within the existing offsite substation).
- Operation of two existing 375MVA transformers (within the existing offsite substation).
- Four staff members onsite daily with the use of a light vehicle.

The sound power level data for the existing 375MVA transformers were provided by the client and were measured to be 96dB(A) each. To provide a conservative assessment it was assumed that all the existing and proposed transformers have the same sound power level as the existing larger 375MVA transformer.

The predicted power levels of these operation activities are outlined in Table 7-26.

Table 7-26 Typical operational plant and equipment and sound power levels for the Proposal

Plant description	LAeq Sound power levels (dBA)
Tracker motor (up to 13,367 in total)	78 (each)
Ingeteam 1640TL B630 inverters (up to 155)	88 (each)
New 175MVA transformers (4 in total)	96 (each)
Existing 375MVA transformers [1] (2 in total)	96 (each)
Light vehicle (4 in total)	88 (each)

[1] Sound power levels determined using formula provided in AS/NZS 60076.10:2009

During the night time period, only mechanical plant would be operating, including the tracking motors, inverters and the substation.

Operational noise assessment

In order to determine the noise impacts of the operating solar plant, a computer model incorporating all significant noise sources, receiver locations, topographical features of the intervening area, and potential noise control treatments surrounding the study area. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

Additionally, in accordance with NPfI noise predictions, three meteorological conditions are considered, including:

- Calm and isothermal conditions (acoustically neutral) – no wind and no temperature inversion.
- Slight to gentle breeze –3m/s wind velocity at 10m from ground level between each noise source and each noise receiver (as per INP default wind conditions). Wind direction was based on wind travelling from the source to the receiver.
- Moderate temperature inversion – applicable for noise predictions during night time periods only.

Table 7-27 and Table 7-28 present the predicted noise levels for the 'worst case scenario' based on concurrent operation all plant and equipment shown in Table 7-26. The tracker motors were time corrected based on their operation of one (1) minute out of a 15 minute period.

Table 7-27 Predicted $L_{Aeq\ 15min}$ operational noise levels at residential receiver locations, dB(A).

Receiver location (refer to Figure 7-14)	Proposal noise triggers[1]			Predicted operational noise levels, LAeq (15 min)			Comply? (Yes/No)
	Day	Evening	Night	Calm and isothermal conditions	Slight to gentle breeze	Moderate temperature inversion[2]	
R1	40	39	35	24	31	30	Yes
R2				30	34	34	Yes
R3				28	33	33	Yes
R4				28	32	33	Yes
R5				<20	26	26	Yes
R6				28	33	33	Yes
R9				35	31	31	Yes
R11				35	28	28	Yes
R12				35	31	31	Yes
R13				35	33	33	Yes
R14				35	34	34	Yes
R15				35	33	33	Yes
R16				35	34	34	Yes

Notes: 1. Criteria for Day, Evening and night periods

2. Applicable for the night time period only.

Table 7-28 Predicted $L_{Aeq\ 15min}$ operational noise levels at other sensitive receiver locations, dB(A).

Receiver location (refer to Figure 7-14 7-14)	Proposal noise triggers[1]			Predicted operational noise levels, $L_{Aeq\ (15\ min)}$			Comply? (Yes/No)
	Day	Evening	Night	Calm and isothermal conditions	Slight to gentle breeze	Moderate temperature inversion[2]	
R7	68	68	68	26	32	32	Yes
R8	63	63	63	26	32	31	Yes
R10	63	63	63	31	35	35	Yes

Notes: 1. When in use
2. Applicable for the night time period only.

Based on the predicted noise levels presented in the table above, operational noise levels from the proposed solar plant and the upgraded substation at the nearest receivers each comply under all scenarios and meteorological conditions.

Therefore, no noise mitigation measures are required to reduce operational noise impacts.

The predicted operational noise levels would additionally be below the sleep disturbance criteria of 40 dB(A) and 52 dB(A). No specific mitigation measures are required.

7.3.6 Vibration assessment

Vibration generating activities would occur only during the construction phase. There are no vibration generating activities expected during the operational phase. The nearest identified non-involved receiver is in excess of 100m from the Proposal site, structural damage due to vibration is not expected. Assessment for vibration impact on human comfort is assessed during the construction phase.

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with EPA's *Assessing Vibration: A Technical Guideline* (DECC, 2006). Based on the proposed plant items to be used during construction (Table 7-17), vibration generated by construction plant was estimated and potential vibration impacts are summarised in Table 7-29.

Table 7-29 Potential vibration Impacts for Identified receivers.

Receiver location (refer to Figure 7-14)	Approx. distance to nearest buildings from works	Type of nearest sensitive buildings	Assessment on potential vibration impacts	Vibration monitoring
R1	330m	Residential	Very low risk of adverse comment	Not required
R2	135m	Residential	Very low risk of adverse comment	Not required
R3	315m	Residential	Very low risk of adverse comment	Not required
R4	110m	Residential	Very low risk of adverse comment	Not required
R5	910m	Residential	Very low risk of adverse comment	Not required
R6	225m	Residential	Very low risk of adverse comment	Not required
R7	330m	Commercial	Very low risk of adverse comment	Not required
R8	400m	Commercial	Very low risk of adverse comment	Not required
R9	1,220m	Residential	Very low risk of adverse comment	Not required
R10	75m	Commercial	Very low risk of adverse comment	Not required
R11	580m	Residential	Very low risk of adverse comment	Not required
R12	250m	Residential	Very low risk of adverse comment	Not required
R13	530m	Residential	Very low risk of adverse comment	Not required
R14	350m	Residential	Very low risk of adverse comment	Not required

Receiver location (refer to Figure 7-14)	Approx. distance to nearest buildings from works	Type of nearest sensitive buildings	Assessment on potential vibration impacts	Vibration monitoring
R15	1300m	Residential	Very low risk of adverse comment	Not required
R16	760m	Residential	Very low risk of adverse comment	Not required

The potential for adverse comment to vibration impacts was determined to be very low. No vibration mitigation measures are required.

7.3.7 Road traffic noise assessment

As the proposed vehicle access to the subject site is much greater during the construction stage than the operational stage, road traffic noise assessment is only considered for the construction stage to provide a 'worst case' assessment. Vehicle movements during operation of the solar plant would be minimal. Refer to Section 4.5.4 for detailed traffic volumes.

Noise impact from the potential increase in traffic on the surrounding road network due to construction is assessed against the NSW '*Road Noise Policy*' (RNP) (DECCW, 2011). The RNP sets out criteria to be applied to particular types of road and land uses. Campbells Lane is categorised as a sub-arterial road. Criteria for these roads are outlined in Table 7-30.

Table 7-30 RNP Road Traffic Noise Criteria, dB(A)

Road Category	Type of Proposal/Land Use	Assessment Criteria, dB(A)	
		Day 7am – 10pm	Night 10pm – 7am
Local	Existing residences affected by additional traffic on existing local roads generated by land use developments	L_{Aeq},(1 hour) 55 (external)	L_{Aeq},(1 hour) 50 (external)

The primary vehicle access to the subject site would be via Campbells Lane on the northern boundary of the site. Two other existing access tracks off Goolma Road, may also be used for the Proposal. The proponent has advised that peak vehicle movements during the construction stage are presented in the following table.

Table 7-31 Summary of estimated construction traffic volumes during peak.

Vehicle type	Trips per day
Cars/light vehicles	17
Trucks/heavy vehicles	52

Table 7-32 Predicted road traffic noise contribution levels along public roads, dB(A).

Receiver	Road	Criteria	Truck traffic movements	Speed (km/h)	Distance to Road	Predicted Noise Level	Comply? (Yes/No)
R4 66 Campbells Lane Bodangora	Local	$L_{Aeq(15\ hour)}$ 55 dB(A)	Refer to Table 7-31	100	110m	50 dB(A)	Yes

From Table 7-32 it can be seen that road traffic noise level contributions from the truck movements associated with the construction works are at least 5dB(A) below the applicable noise criteria based on dwellings being 110m from the road. No specific mitigation measures are required.

7.3.8 Cumulative assessment

Additional advice was sought from Renzo Tonin regarding cumulative impacts, should Wellington Solar and Wellington North Solar be constructed and operated at the same time.

CONSTRUCTION

Construction activities associated with the recently approved Wellington Solar Farm may potentially occur at the same time as construction works required for the proposed Wellington North Solar Plant. As a result, some of the nominated receivers may be impacted by construction noise from both solar plants concurrently. Therefore, a cumulative construction noise assessment has been undertaken for the scenario where both solar plants are being constructed at the same time; however, it is highly unlikely the two solar plants will be constructed concurrently due to the different timelines of the projects and the timing of approvals.

The construction and operation noise and vibration assessment for the Wellington Solar Farm was previously prepared by Renzo Tonin & Associates [ref: TJ643-01F01 Report (r5), dated 24 November 2017], which identified nearby receivers potentially impacted by construction noise.

The following assessment assumes that the same construction plant and equipment are being used at both solar plants concurrently during the construction of the solar plants. Furthermore, the construction of the Wellington Solar Farm concurrently with each of the easement options have also been assessed.

From the comparison of Table 7-17 and Table 7-18, it is evident that the typical plant and equipment used to construct the solar plant slightly differ to the plant and equipment used for the construction of the easements. Therefore, for the scenario where the easements are constructed concurrently with the Wellington Solar Farm, a conservative approach has been taken, where it is assumed that the three (3) noisiest plant items from each work site are operating concurrently.

Table 7-33 presents cumulative construction noise levels likely to be experienced at the nearby affected receivers based on the concurrent construction of the Wellington North Solar Plant and Wellington Solar Farm. Similarly, Table 7-34 present the cumulative construction noise levels for the scenario where each of the easements associated with the Wellington North Solar Plant are constructed concurrently with the Wellington Solar Farm.

Table 7-33 Predicted $L_{Aeq\ 15\ min}$ cumulative construction noise levels from Wellington North Solar Plant and Wellington Solar Farm.

Receiver location (refer to Figure 7-14)	Noise management level[1]	Predicted cumulative construction noise Level, $L_{Aeq\ (15\ min)}$ [2]	Compliance with criteria? (Yes/No)
Residential receivers			
R1	45	**26-50**	**No**
R2		**26-51**	**No**
R9		26-39	Yes
R11		26-35	Yes
R12		26-41	Yes
R13		26-39	Yes
R14		26-44	Yes
Sensitive land uses			
R8	70	26-46	Yes
R10		24-60	Yes

Notes: 1. Noise management for standard day time construction works (i.e. Monday to Friday 7am to 6pm and Saturday 8am to 1pm).

2. Based on up to three nosiest construction plant and equipment operating concurrently.

Table 7-34 Predicted $L_{Aeq\ 15\ min}$ cumulative construction noise levels from Wellington Solar Farm and Wellington North Solar Plant's transmission line options.

Receiver location (refer to Figure 7-14)	Noise management level[1]	Eastern transmission line option		Western transmission line option	
		Predicted cumulative construction Noise Level, $L_{q\ (15\ min)}$ [2]	Comply? (Yes/No)	Predicted cumulative construction Noise Level $L_{q\ (15\ min)}$ [2]	Comply? (Yes/No)
Residential receivers					
R1	45	**26-49**	**No**	**26-56**	**No**
R2		26-36	Yes	**26-50**	**No**
R9		26-43	Yes	25-39	Yes
R11		26-33	Yes	26-39	Yes
R12		26-40	Yes	**26-46**	**Yes**
R13		26-39	Yes	26-41	Yes
R14		**26-46**	**No**	26-44	Yes
Sensitive land uses					
R8	70	26-46	Yes	26-44	Yes

Receiver location (refer to Figure 7-14)	Noise management level[1]	Eastern transmission line option		Western transmission line option	
		Predicted cumulative construction Noise Level, $L_{q\ (15\ min)}$ [2]	Comply? (Yes/No)	Predicted cumulative construction Noise Level $L_{q\ (15\ min)}$ [2]	Comply? (Yes/No)
R10		25-58	Yes	23-47	Yes

Notes: 1. Noise management for standard day time construction works (i.e. Monday to Friday 7am to 6pm and Saturday 8am to 1pm).

2. Based on up to three nosiest construction plant and equipment operating concurrently.

The results presented in Table 7-33 indicate exceedances above the NML for Receivers R1 and R2. The exceedance at Receiver R1 is mainly due to the construction of the Wellington Solar Farm, which was initially identified as exceeding the NML in the Wellington Solar Farm's noise and vibration assessment [ref: TJ643-01F01 Report (r5), dated 24 November 2017]. The construction of the Wellington North Solar Plant is the main contributor to the exceedance at Receiver R2. Therefore, the predicted cumulative noise impact from the construction of both solar plants does not identify any new exceedances at nearby affected receivers.

For the cumulative construction noise levels of the Wellington North Solar Plant's eastern easement and the Wellington Solar Farm construction works, Receivers R1 and R14 exceed the NML. The exceedance at Receiver R1 is only due to the construction works from the Wellington Solar Farm, while the exceedance at R14 only occurs when the three (3) noisiest plant and equipment are operating at the closest proximity to the receiver from each work site.

Similarly, the cumulative construction of the Wellington North Solar Plant's western easement and the Wellington Solar Farm exceed the NML at Receivers R1, R2 and R12. The construction noise from the western easement and the Wellington Solar Farm both contribute to the exceedance at R1. The exceedance at R2 is caused by the construction works from the western easement. When the concurrent construction of the Wellington North Solar Plant's western easement and the Wellington Solar Farm occur at the closest proximity to receiver R12 it is predicted to exceed the NML.

The probability of the scenario, where the Wellington Solar Farm, and either of the Wellington North Solar Plant's easements are constructed concurrently and have their three (3) noisiest plant equipment operating at the closest proximity to the affected receivers, is generally low. However, if it were to occur it is recommended that a feasible and reasonable approach towards noise management measures should be applied to reduce the noise levels as much as possible to manage the impact from the cumulative construction noise. These measures are outlined in Section 7.3.9.

Additionally, the cumulative construction noise levels of the Wellington Solar Farm and the Wellington North Solar Plant, and it's associated easements, are predicted to be less than the highly noise affected level of 75dB(A).

VIBRATION

The potential for adverse cumulative vibration impacts was determined to be very low for both Solar Plant projects. No vibration mitigation measures are required.

OPERATIONAL

It is likely that the recently approved Wellington Solar Plant, located south of the proposed Wellington North Solar Plant, would be operating concurrently with the Wellington North Solar Plant. Therefore, cumulative noise impacts at the nearest affected receivers due to both solar plants operating has been considered. The construction and operation noise and vibration assessment of the Wellington Solar Plant was previously prepared by Renzo Tonin & Associates [ref: TJ643-01F01 Report (r5), dated 24 November 2017], which identified nearby receivers potentially impacted by operational noise.

An assessment of cumulative noise impacts from the Wellington North Solar Plant, the upgraded substation and the Wellington Solar Plant has been quantified for the nearest affected receivers. The cumulative noise levels are presented in Table 7-35 for the applicable meteorological conditions.

Table 7-35 Predicted $L_{Aeq\ 15min}$ cumulative operational noise levels at residential receiver locations, dB(A).

Receiver location (refer to Figure 7-14)	Proposal noise triggers[1]			Predicted operational noise levels, LAeq (15 min)			Comply? (Yes/No)
	Day	Evening	Night	Calm and isothermal conditions	Slight to gentle breeze	Moderate temperature inversion2	
R1	40	39	35	28	33	33	Yes
R2				30	35	35	Yes
R9				29	34	34	Yes
R11				25	31	31	Yes
R12				28	34	34	Yes
R13				28	34	34	Yes
R14				**33**	**37**	**37**	**No**
R8[3]	63	63	63	29	35	35	Yes
R10[3]				33	37	37	Yes

1. Trigger levels for Day, Evening and Night periods

2. Applicable for the night time period only

3. When in use

From Table 7-35 it can be seen that the predicted noise levels generally comply at all receiver locations under all scenarios and meteorological conditions. However, under noise enhancing weather conditions, the predicted cumulative noise levels at Receiver R14 exceed the criterion by 2dB(A) during the night period. The exceedance at R14 is mainly attributed to the noise emissions from the Wellington Solar Farm, which predicts noise levels equal to the night time Project Noise Trigger Level of 35dB(A). When the noise emissions from the upgraded substation is considered, it is predicted to increase the overall noise levels by 2dB(A) at the receiver and therefore yielding an exceedance of 2dB(A) at Receiver R14.

In accordance with Table 4.1 and Table 4.2 of the NPfI, a 2dB(A) exceedance is considered to be negligible as a 2dB(A) change in noise level is not discernible or noticeable to the average person. Therefore, the predicted noise levels at Receiver R14 are determined to be acceptable in accordance with the NPfI and no further reasonable and feasible noise mitigation measures are required.

TRAFFIC

Cumulative traffic noise impacts are expected to be negligible, as there is minimal overlap in proposed access and haulage routes between the two solar projects. Wellington North Solar Plant's primary access would be via Campbells Lane. Traffic would access Campbells Lane from Cobbora Road and Mitchell Highway. The Wellington Solar Farm proposes to use Goolma Road for access and transport. The Wellington North Solar Plant would occasionally use existing accesses from Goolma for light vehicles. No further mitigation measures are required.

7.3.9 Safeguards and mitigation measures

Table 7-36 Safeguards and mitigation measures for noise impacts

C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and mitigation measures	C	O	D
1	• Implement noise control measures such as those suggested in Australian Standard 2436-2010 "Guide to Noise Control on Construction, Demolition and Maintenance Sites", to reduce predicted construction noise levels.	C		
2	• A Noise Management Plan would be developed as part of the CEMP and would specifically target R1, R2, R4 and R6 in order to achieve compliance. The plan would include, but not be limited to: o Use less noisy plant and equipment where feasible and reasonable. o Plant and equipment to be properly maintained. o Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended. o Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel. o Avoid any unnecessary noise when carrying out manual operations and when operating plant. o Any equipment not in use for extended periods during construction work should be switched off. o Complaints procedure deal with noise complaints that may arise from construction activities. Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits. o Establish good relations with people living in the vicinity of the site at the beginning of proposal and maintain. Keep people informed, take complaints seriously, deal with complaints expeditiously. The community liaison member of staff should be adequately experienced.	C		

7.4 VISUAL IMPACT ASSESSMENT

Moir Landscape Architecture completed a Visual Impact Assessment (VIA) for the proposed Wellington North Solar Plant (provided in full, Appendix H and summarised below). The VIA provides a full assessment of the visual impacts associated with the Proposal, including:

- Landscape character and scenic vistas in the locality.
- Stakeholder values regarding visual amenity.
- Potential impacts on representative viewpoints, including residences and road corridors.

This report includes consideration of reflectivity and glare, an evaluation of potential visual impacts significant vistas in the locality, consideration of the *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring,* and a draft landscaping plan.

7.4.1 Approach

VIA is used to identify and determine the value, significance and sensitivity of a landscape. The assessment was undertaken as follows:

- Objective assessment of the relative aesthetic value of the landscape; defined as visual quality and expressed as high, medium or low. This assessment generally relates to variety, uniqueness, prominence and naturalness of the landform, vegetation and water forms within each character type.
- Determination of the landscape sensitivity and its ability to absorb different types of development on the basis of physical and environmental character.
- An assessment of viewer sensitivity to change. This includes how different groups of people view the landscape (for example, a resident as opposed to a tourist), and how many people are viewing the Proposal and from how far away.
- Viewpoint analysis to identify areas likely to be affected by development of the site and a photographic survey using a digital camera and a handheld GPS unit to record position and altitude.
- Preparation of photomontages depicting the Proposal.
- Assessment of visual impacts. Suggestions are made for suitable development patterns that would maintain the areas visual quality.

7.4.2 Results

Existing environment

In terms of the visual landscape, the proposed solar plant is located in the Orana Region in central New South Wales and within Dubbo Regional Council LGA. The region is predominately rich agricultural land utilised for wheat, beef cattle and sheep farming. The site is located approximately 7km to the north east of Wellington urban area. Wellington Correctional Centre is located to the east, the Mitchell Highway (A32) and rail line is located approximately 1km to the west and the Macquarie River is location approximately 1.7km to the west of the site. An electrical substation and transmission lines are visible within the agricultural landscape.

Wellington is an inland country town located at the junction of the Macquarie and Bell River in inland New South Wales. The town is located approximately 370km by road north west of Sydney, at the foothills of Mount Arthur.

Bodangora is a small, historical village located approximately 3.5km north east of the proposed solar plant. Bodangora was formerly known as Mitchell's Creek and has a rich history in gold mining and farming. Located just over 11 km north east of Wellington, Bodangora is today a small settlement of rural residential properties within close proximity to the Wellington Airport.

The region is generally used for grazing purposes and cropping. Crops include wheat, oats, legume, canola, peas and large areas of lucerne. The main animal enterprises include cattle, prime lambs and wool. A number of isolated homesteads are located throughout the region generally servicing the agricultural industry.

The Siding Spring Observatory is located approximately 130 km north of the Proposal site. The Dark Sky Region is centred around this observatory which is considered Australia's most important visible-light observatory. The Dark Sky region consists of land within a 200 km radius of the observatory, which therefore includes the Proposal site.

Values of the local community

Community consultation undertaken to inform the assessment and design of the Proposal is summarised in Section 6 of this EIS.

Existing landscape character

The landscape character of the Proposal site and surrounding area can be broken down as follows:

Land use:	The site is zoned RU1 Primary Production. To the south of the site is an area of rural residential lots zoned R5 Large Lot Residential and to the east the Wellington Correctional Centre zoned SP2 Infrastructure.
Topography:	The landform of the study area is typically sloping to undulating topography with local rises. A hill in the eastern section of the site has an elevation of approximately 400m Australian Height Datum (AHD), and the site gently falls to the south west to an elevation of approximately 300m AHD. A small valley with a watercourse runs from the central northern border to the south west corner of the site. Distant views are generally limited by vegetation and topography, with many views enclosed. Some distant views are possible from higher areas.
Roads:	Major roads include the Mitchell Highway (A32) to the west, which is approximately 1km from the site and Goolma road which is directly adjacent to the site to the east. The A32 runs west of the site in a north-south direction. Goolma road is a main road linking Wellington and Gulgong, which runs from the A32 to the north-east. Cobbora Road runs from the A32 in a northerly direction. A number of minor local roads service the rural residential properties where the site is located including Campbells Lane.
Vegetation:	The landscape typical of the region is predominately cleared, open grazing land with scattered groupings of remnant native trees. Retained vegetation is also common along water courses, roadsides and along the perimeters of paddocks and property boundaries. Land surrounding the site has been predominantly cleared for rural paddocks and residential use, with some native and exotic vegetation plantings associated with the residential lots.
Waterbodies:	A number of small intermittent watercourses run throughout the site in the form of small streams and minor drainage lines. Wuuluman Creek runs in a

	westerly direction within the land adjacent to the site to the south. These creek lines form part of the Macquarie River Catchment, draining into Lake Burrendong. These watercourses generally lack riparian vegetation and are prone to erosion.
Infrastructure:	Existing infrastructure in the area is generally limited to roads, power lines and farm structures. A wind farm approximately 2km north of Bodangora and 5.5km north of the site is currently being constructed. Infrastructure associated with the Wellington Correctional Centre is located to the east of the site and Wellington Substation to the south east of the site.

7.4.3 Potential impacts

Criteria

VISUAL SENSITIVITY

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the Proposal (EDAW, 2000). Sensitivity ratings are defined as high, moderate or low and are shown in the table below.

Table 7-37 Visual sensitivity criteria.

Land use	Distance zones				
	Foreground		Middle Ground		Background
	0-1km	1-2km	2-4.5km	4.5-7km	>7km
Tourist/Recreation	High	High	High	Moderate	Low
Residential: Rural or Urban	High	High	High	Moderate	Low
Main Travel Corridor	Moderate	Moderate	Low	Low	Low
Minor/Local Roads	Moderate	Moderate	Low	Low	Low
Railway Line (Freight)	Low	Low	Low	Low	Low
Industrial Areas	Low	Low	Low	Low	Low

VISUAL EFFECT

Visual effect is the interaction between a proposal and the existing visual environment. It is often expressed as the level of visual contrast of the Proposal against its setting or background in which it is viewed. The visual effects are assessed as:

- Low visual effect: occurs when a proposal blends in with its existing viewed landscape due to a high level of integration of one or several of the following; form, shape, pattern, line, texture or colour. It can also result from the use of effective screening often using a combination of landform and landscaping.

- Moderate visual effect: occurs where a proposal is visible and contrasts with its viewed landscape however, there has been some degree of integration (e.g. good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).
- High visual effect: results when a proposal has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

VISUAL IMPACT

Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect would result in high, moderate and low overall visual impacts as suggested in the below table (URBIS, 2009).

Table 7-38 Visual impact criteria.

Visual sensitivity levels	Visual effect zone		
	High	**Moderate**	**Low**
High	High	High	Moderate
Moderate	High	Moderate	Low
Low	Moderate	Low	Low

Viewpoint analysis

A total of 14 viewpoints were assessed as part of the VIA (Figure 7-15). The viewpoints were taken from publicly accessible roads surrounding the site. The viewpoints which have been included represent areas where the development would appear most prominent, either based on the degree of exposure or the number of people likely to be affected. Table 7-36 below evaluates the representative viewpoints based on their land use, effect and impact. Four montages were also produced as part of the assessment and provided in Figure 7-16 to Figure 7-19. One viewpoint (VP04) is an example of the modified landscape and is not part of the assessment or included in the table below. All assessed viewpoints were found to have a low potential for visual impact, although mitigation was considered appropriate from some vantages.

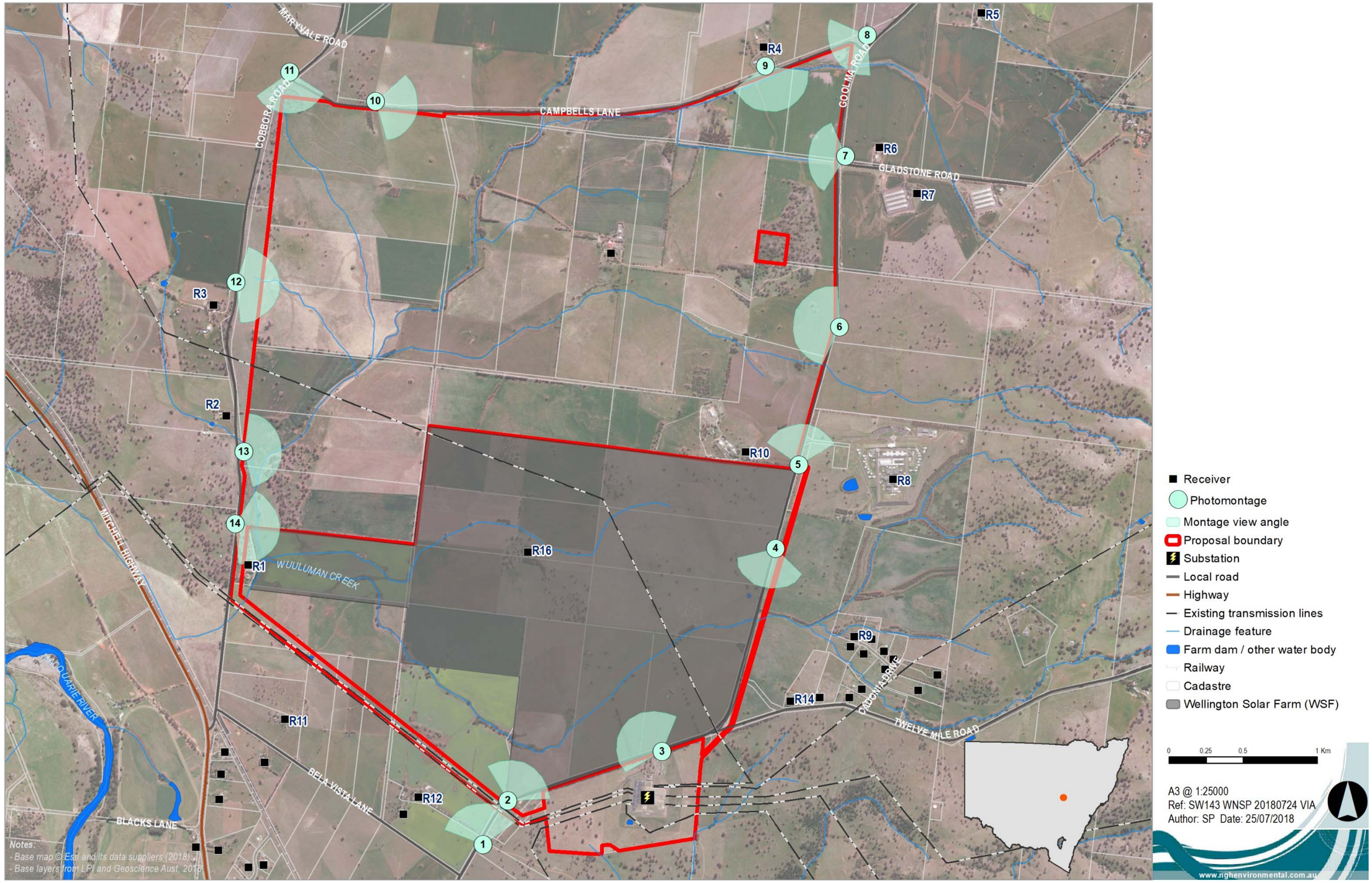

Figure 7-15 Viewpoint assessment locations and photomontages locations.

Table 7-39 Viewpoint analysis.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
1	2.9km	The viewpoint is taken from the gate at the property along the boundary of Lot 1 DP588075 and Lot 2 DP 588075. The view shows the line of vegetation following a creek line in the foreground and a general rise to a hilltop in the north east.	Main Road	Low	Moderate	Low	From this viewpoint the proposed solar plant would be visible, appearing as a thin grey line on the horizon. The solar plant would be partially screened due to a combination of the topography, distance from the viewpoint and the existing vegetation in the foreground. The visual effect from this viewpoint is assessed as low, resulting in an overall visual impact of low.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
2	2.65km	The viewpoint is taken from Goolma Road at property Lot 2 DP 588075. The view shows the line of vegetation following a creek line in the foreground and a general rise to a hilltop in the north east. **This viewpoint represents receiver R12.**	Main Road	Low	Moderate	Low	From this viewpoint the proposed solar plant would be visible, appearing as a thin grey line on the horizon. The solar plant would be partially screened due to a combination of the topography, distance from the viewpoint and the existing vegetation in the foreground. The visual effect from this viewpoint is assessed as low, resulting in an overall visual impact of low.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
3	2.1km	The viewpoint is taken from Goolma Road at property Lot 1 DP 34690. The viewpoint is at the entry to the Wellington Substation. The view is across open pasture to the north towards the site.	Main Road	Low	Moderate	Low	From this viewpoint views to the solar plant would be predominantly screened by topography and distance from the viewpoint and the existing vegetation in the foreground. The visual effect from this viewpoint is assessed as low resulting in an overall visual impact of low

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
5	10m	Viewpoint from the corner of Lot 3 DP 808748. The landscape is fairly flat agricultural lands. The photo is taken at the entry to the SCS. The property buildings and curtilage are not in view. Established tree planting is situated within the boundary on Goolma Road. The tree line in the middle ground is associated with boundary planting to the North of the SCS Office buildings. **This viewpoint represents receivers R9 and 14.**	Main Road	Moderate	Moderate	Moderate	The solar plant would be visible from this location situated in the open paddock area in the cropped view. It is likely that the boundary planting would screen views from Goolma Road as vehicles travel further to the north. As access to this view is brief the visual effect is rated as moderate resulting in an overall visual impact of moderate. Refer photomontage in Figure 7-16 .

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
6	10m	Viewpoint from the corner of Lot 1 DP 808748. The landscape is gently undulating open pastoral land. Scattered vegetation, particularly along the rises is a key feature of the landscape.	Main Road	High	Moderate	High	The solar plant would be visible from this location. Lot 1 DP 808748 is included in the development proposal. Due to the contrasting nature of the panels within the view the visual effect of the Proposal site from this viewpoint is rate high resulting in an overall visual impact of high.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
7	10m	Viewpoint from the intersection of Gladstone Rd and Goolma Road. The view is of gently undulating pastural land with distant views to vegetated ridgelines. A vegetated rise is visible to the south and vegetation associated with a dense area of woodland situated on lower ground directly to the west. **This viewpoint represents receivers R6 and R7.**	Main Road	High	Moderate	High	The solar plant would be visible from this location. Due to the close proximity and contrasting nature of the panels within the view the visual effect of the Proposal site from this viewpoint is rate high resulting in an overall visual impact of high. Refer photomontage in Figure 7-19.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
8	400m	Viewpoint from the corner of Lot 1 DP 206579. The landscape is generally flat agricultural land. The view is from the corner of Goolma Road and Campbells Lane. Rising land can be seen to the south west to an adjoining property. Vegetation on the property boundary is visible in the foreground. **This viewpoint represents receiver R8.**	Local Road	Moderate	Moderate	Moderate	The solar plant would be visible from this location. Lot 121 DP 2987 is included in the development proposal. Views to the panels would be screened by vegetation in the foreground with some glimpse views. The visual effect of the Proposal site from this viewpoint is moderate resulting in an overall visual impact of moderate.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
9	60m	Viewpoint from Lot 120 DP 2987120. The landscape is fairly flat agricultural land sloping down to the west with scattered vegetation in the background over a minor rise in the south. The view is taken at Campbells Lane. **This viewpoint represents receiver R4.**	Local Road	High	Low	Moderate	The solar plant would be visible from this location. Lot 120 DP 2987120 is included in the development footprint. The close proximity of the panels to the fence line results in a high visual effect. The overall visual impact is rated as moderate.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
10	10m	Viewpoint from Lot 81 DP 2987. The view is taken at Campbells Lane at a minor high point. The landscape is gently undulating with the land primarily cleated with scattered vegetation.	Local Road	High	Low	Moderate	The solar plant would be visible from this location. Lot 81 DP 2987 is included in the development proposal. The close proximity of the panels to the fence line results in a high visual effect. The overall visual impact is rated as moderate.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
11	280m	Viewpoint from Lot 81 DP 2987. The view is taken on Cobbora Road at the intersection with Campbells Lane. The landscape is rolling hills and agricultural lands with scattered vegetation in the foreground and along the creek line beyond the trees.	Main Road	Moderate	Moderate	Moderate	The solar plant would be visible from this location, beyond trees in the foreground however views would be screened by vegetation. Lot 81 DP 2987 is included in the development footprint. The visual effect of the Proposal site from this viewpoint is moderate resulting in an overall visual impact of moderate.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
12	195m	Viewpoint to Lot 79 DP 2987. The view is taken at the boundary gates of 301 Cobbora Road. The landscape is characterised by gently undulating pastoral land with scattered vegetation. **This viewpoint represents receiver R3.**	Main Road	Moderate	Moderate	Moderate	The solar plant would be visible from this location although it would be considerable set back from the edge of Cobbora Road. Lot 79 DP 2987 is included in the development footprint. The visual effect of the Proposal site from this viewpoint is moderate resulting in an overall visual impact of moderate. Refer to photomontage Figure 7-18.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
13	115m	The view is taken on Cobbora Road toward Lot 76 DP2987, the landscape is predominately undulating with open woodland on a local rise dominating the view. **This viewpoint represents receiver R2.**	Main Road	Moderate	Moderate	Moderate	The solar plant would be visible from this location; however the views would be fragmented by existing vegetation. The vegetation on the rise in the foreground is to be retained. Lot 79 DP 2987 is included in the development footprint. The visual effect of the Proposal site from this viewpoint is moderate resulting in an overall visual impact of moderate. Refer to photomontage in Figure 7-19.

Viewpoint	Distance to site	Viewpoint description	Land use	Visual effect	Visual sensitivity	Visual impact	Comment
14	460m	The view is taken on Cobbora Road toward Lot 75 DP2987. The viewpoint is taken from a slight rise on Cobbora Road, Roadside vegetation screens views into the site.	Main Road	Low	Moderate	Low	It is likely that there would be fragmented views to the solar plant from this viewpoint. Views towards the site would be largely constrained by topography and vegetation in the foreground. Lot 79 DP 2987 is included in the development footprint. The visual effect of the Proposal site from this viewpoint is low resulting in an overall visual impact of low.

Figure 7-16 Indicative view of the Proposal from Goolma Road (Viewpoint 05).

Figure 7-17 Indicative view of the Proposal from Goolma Road (Viewpoint 07).

Figure 7-18 Indicative view of the Proposal from Cobbora Road (Viewpoint 12).

Figure 7-19 Indicative view of the Proposal from Cobbora Road (Viewpoint 13).

Visual impact assessment at representative viewpoints

The nature and scale of the proposal would create a new landscape and visual environment. Overall, the Proposal would result in impacts on the existing landscape elements, character and quality in the context of the site and its environs.

Overall the proposed Wellington North Solar Plant will result in impacts on the existing surrounding environment in terms of landscape and scenic values. The visual impacts associated with the proposal will vary depending on the viewing location.

The solar panel arrays are relatively low lying, reaching a height of approximately 4m above the existing ground level. The solar plant would be constructed as an array of panels arranged in a north south direction, tracking east to west on a single axis. The highest visual effect of the PV panels is likely to be seen from the east and west, where the most surface area is visible. Visibility of the solar plant from the north and south would be significantly lower. The visual impact is likely to be greatest during the construction phase.

Although the construction of the solar plant would add a new element to the existing landscape, the surrounding area has undergone significant transformation over recent decades due to the construction and recent expansion of the Wellington Correctional Facilities, electricity substation and associated infrastructure and the Bodangora Wind Farm which is currently nearing completion. The site is also relatively close to the outskirts of Wellington and could be considered a transition zone between the density of the town and the broader rural landscape beyond.

The proposed development is situated between Goolma Road to the east, which is a main road connecting Wellington with Mudgee and Gulgong, and Cobbora Road to the west, which is a main road connecting Wellington with Dunedoo. There are clear and close views to the site from these main transport corridors and it is from these roads that the development would affect the most significant change in character from the public domain. Visual impact in close proximity is generally brief and, due to the low nature of the development, easily mitigated with screen planting along the boundary line. Due to the undulating nature of the topography, distant views to the site are largely contained and where available it is likely the solar panels would appear as grey/black lines within open paddocks. Additionally, the pattern layout of the solar panels is varied and therefore breaks between existing vegetation and localised topographical variations that would reduce the overall impact.

There are a number of rural properties located within close proximity of the Proposal. AGL have been directly consulting with these neighbours and the outcomes of this engagement is summarised in Section 6. Photomontages were provided to individual neighbours with potential visual impacts, demonstrating the possible view of the solar plant from their property.

The Proposal is sited along Goolma Road which is a main road between Wellington and Mudgee. Views to the site from these main transport corridors would be visible, and it is likely the solar panels would appear as grey/black lines on the horizon with distance. Additionally, the layout of the solar panels is varied and therefore breaks between existing vegetation and localised feature reduce the overall impact.

Currently two transmission line options area proposed. The western transmission line option is situated to the west of the site and extends south along Cobbora Road before joining the existing transmission easement that travels west to east linking with the Wellington Substation. This option is likely to have little impact on views from the public domain. There is potential for this option to be viewed from residences to the south of the existing easement.

The second transmission option proposes to extend transmission lines along the eastern side of Goolma Road running north to south linking with the substation. This would be overhead with a 60m easement

within the solar plant site, then be underground with a 15m easement from the solar plant site to the substation. It is unlikely that this proposal will result in any significant visual impact as this view is already dominated by the presence of the Wellington Correction Facility and the Wellington substation. The addition of the transmission line along this corridor would not modify the character of views to the east along Goolma Road.

Dark Sky region mitigation

Additional impacts are relevant to the Proposal, given its location within the *Dark sky region*. Construction has potential to increase the levels of dust in the locality temporarily. Excavation would be minimal however the traffic on unsealed internal access tracks is likely to increase local dust levels, particularly in dry conditions. Dust would be supressed during construction through the use of water applications and covering of loads. Minimal night lighting (limited security lighting) is anticipated.

During operation, the dust generation would likely be less than for existing agricultural land uses. The arrays themselves as well as the ground cover retained beneath the array would limit dust generation and movement. The unsealed perimeter access track would have low traffic levels during operation and is unlikely to generate substantially more dust that existing farm access tracks onsite. Limited security lighting is anticipated. General measures to minimise light pollution including reducing dust are however, recommended.

Cumulative

Currently there are no existing Solar Plants in the immediate vicinity of the site with the nearest being the South Dubbo Solar Farm which is approximately 45km away by road. On a 450ha parcel directly to the South of the site a 174MW solar plant has recently been approved by the NSW DP&E. Visually the proposal is similar in scale to the Wellington North proposal. If both proposals are approved and constructed this will establish solar arrays as a significant character element along Goolma Road at the gateway to the town of Wellington.

As the two proposals are directly adjacent to each other it is likely that they will be viewed as a single development. However, at the boundary where the two sites meet there is a ridgeline that extends east to west; this ridgeline contains views between the two developments. The ridgeline results in receivers north and south of the developments being unable to view both sites. Furthermore, both development sites are undulating, resulting in the same situation for receivers to the west and east of the sites. Due to the undulating nature of the surrounding landscape there are no opportunities along Goolma Road, Cobbora Road or from nearby receivers to view either development in their entirety or the two sites together, in their entirety.

The greatest cumulative impact is likely to be experienced by motorists travelling north along Goolma Road as solar arrays will be situated along the road boundary for approximately 6km. However, Goolma Road does extend for over 70km before terminating at Guntawang Road and both proposals sit at the very start of the journey close to Wellington and immediately adjacent to the other contrasting character elements being the correctional centre and the substation.

Although forming a significant mass of solar arrays on plan, it is likely that due to the areas topography and existing established vegetation that the potential cumulative impacts are acceptable. It is intended that the screen planting along Goolma Road for Wellington North Solar Plant will be in keeping within the adjoining screen planting associated with the Wellington Solar Farm to maintain a consistent character along Goolma Road.

7.4.4 Safeguard and mitigation measures

The most significant visual impact when viewed from the public domain is from locations along Goolma Road and Cobbora Road where the proposal is in close proximity to the boundary and where there is no existing vegetation of a sufficient scale to screen or fragment views.

As solar arrays are generally 4 metres or below in height (fixed or tracking), they can generally be screened by relatively narrow sections of vegetation if the vegetation consists of a mix of tree and mid level shrub species. An intermittent band of screen planting of varying height is positioned between the property boundary and the solar arrays in locations along Goolma Road and Cobbora Road where there is no existing vegetation and where the arrays are immediately adjacent to the boundary. Additionally, intermittent screen planting should also be located along the Campbells Lane boundary to mitigate impacts on properties on the northern side of Campbells Lane.

To ensure that the screen planting integrates into the existing landscape character, the bands should be planted with a mix of endemic tree and shrub species to ensure a naturalistic effect whilst also providing habitat and movement corridors for native fauna. Planting should also not form a consistent hedge between the road and the solar plant but rather form a row of intermittent copse plantings that reflect the existing character of roadside vegetation in the area.

Screen planting should be considered for locations surrounding buildings associated with the proposal where located in close proximity to Goolma Road or Cobbora Road where there is no existing vegetation of a sufficient scale to screen or fragment views.

Materials and colours utilised in the construction of site sheds, battery storage and associated infrastructure should also be considered to ensure that visual impacts are minimised. In general materials should be nonreflective and should be painted in neutral colours that are sensitive to the surrounding landscape.

Table 7-40 Safeguards and mitigation measures for visual impacts

C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and mitigation measures	C	O	D
1	Regarding landscaping to fragment / soften the view of infrastructure: • An intermittent band of screen planting would be located: o Between the property boundary and the solar arrays, in locations along Goolma Road and Cobbora Road where there is no existing vegetation and where the arrays are immediately adjacent to the boundary. o Along the Campbells Lane boundary to mitigate impacts on properties on the northern side of Campbells Lane (identified in Appendix H). • To ensure that the screen planting integrates into the existing landscape character: o Bands of planting would be a mix of locally native tree and shrub species to ensure a naturalistic effect whilst also providing habitat and movement corridors for native fauna. o Planting would not form a consistent hedge between the road and the solar farm but rather form a row of intermittent copse plantings that reflect the existing character of roadside vegetation in the area	Pre-construction		

ID	Safeguards and mitigation measures	C	O	D
	• Screen planting should be considered for locations surrounding buildings associated with the proposal where appropriate. • Strategies to ensure the effective screening is maximised early in the project life and maintained would be implemented, for example: o Planting would aim to be undertaken as soon as practical in the construction process depending on the season, as it would take time for the plants to establish and become effective as a screen. Seasonal requirements for planting should also be considered. o Successional planting may be undertaken (quick growing species replaced by longer living species). o The screen would be maintained for the operational life of the solar plant. Dead plants would be replaced. Pruning and weeding would be undertaken as required to maintain the screen's visual amenity and effectiveness in breaking up views.			
2	• Where feasible, underground rather than overhead power lines would be considered. • Where feasible, co-location of powerlines would be undertaken to minimise the look of additional power poles. If additional poles are required, these would match existing pole design as much as practicable. o Materials and colours utilised in the construction of site sheds, battery storage and associated infrastructure would be considered to ensure that Visual Impacts are minimised. In general materials should be non-reflective and should be painted in neutral colours that are sensitive to the surrounding landscape.	Design stage		
3	• Night lighting would be minimised to the maximum extent practicable (i.e. manually operated safety lighting at main component locations).	C	O	

7.5 SOILS AND AGRICULTURAL LAND CAPABILITY

7.5.1 Approach and methods

Impact on land capability and resource values of the Proposal site and locality have been assessed with reference to the following:

- NSW Land and Soil Capability Assessment Scheme.
- Primefact 1063 Infrastructure proposals on rural land.
- Biophysical Strategic Agricultural Land and Important Agricultural Land identification processes.
- Landholder, ABS and ABARES agricultural production.

7.5.2 Existing environment

Topography, geology and soils

The topography of the solar plant site is flat to gently undulating and sits at an elevation of between 300 and 405m above sea level (ASL). The site includes the following topographic features:

- One large hill (the highest elevation point on the site) and five small hills along the north and north west of the site; this includes the elevated position of the homestead.
- Six watercourses are present on the site, the main waterway flows north-south towards Wuuluman Creek, south of the site.

One soil landscape occurs at the solar plant site: Bodangora ('bz'). This soil landscape has the following limitations (Lawrie and Murphy, 1998):

- High erosion hazard under cultivation and low cover levels.
- Moderate fertility.
- Friable surface soils.
- Moderate to high shrink-swell potential in subsoils.
- Aggregated clays may leak in earthworks.

A preliminary geotechnical survey performed by GHD indicates the subsurface conditions are composed predominantly of colluvial and alluvial silty clay, clayey sand above residual clay and weathered rock consisting of conglomerate, basalt and breccia. The soil is non-saline and alkaline with pH ranging from 7 – 9.1; generally a soil pH of 6.0 – 7.5 is favourable for most plants and crops. Alkaline clays commonly consist of a high proportion of calcium, magnesium, potassium and sodium, but have a decreased availability of phosphorus and micronutrients including manganese, copper, zinc, boron and iron. Alkalinity may also reduce infiltration capacity that is required for efficient crop growth. Improvement to soil quality through lack of cultivation and maintenance of groundcover throughout the operation of the solar plant is likely.

A detailed soil survey was undertaken for the Proposal site on 13 and 14th March 2018, refer to Appendix I (McMahon, 2018). Sampling and classification of in situ soils was carried out as per the Australian Soil and Land Survey Field Handbook (2009) and The Australian Soil Classification (Isbell, 1996). The soils onsite were confirmed to be Ferrosols, which are:

- Topsoils of dark reddish-brown clay loams to light clays, moderately well-structured with sub-angular or angular blocky peds. Field pH increases from 5.5 to 7.0 in the A horizon; to 35cm depth. Gradual boundaries were observed to subsoils.
- Subsoils of moderately to strongly structured reddish-brown light to medium clays with smooth-faced, sub-angular or polyhedral peds. Gravel increases with depth and soft nodules of calcium carbonate begin to appear at about 90cm depth. Field pH 8.0 to 8.5.

The potential landscape limitations of Ferrosols are outlined in Table 7-38.

Table 7-41 Potential landscape limitations of Ferrosols.

Soil type	Erosion hazard	Salinity risk	Acid Soil	Waterlogging risk	Acid Sulfate Soils	Infrastructure stability
Ferrosol	Low	Low	Yes	Moderate	No	Moderate – due to shrink and swell soil properties

Potential for soil contamination

Searches have been undertaken to determine potential and known soil contamination at the site. These include:

- NSW Environment Protection Authority (EPA) contaminated lands record and list of NSW contaminated sites notified to the EPA.
- POEO Act public register licence application and notices.
- State of the Environment (SoE) Report (Dubbo Regional Council 2016).
- Wellington LEP.
- Site field survey.

The results of the database searches found no evidence of contaminated sites occurring within the Proposal site.

The NGH Environmental field survey identified one area of potential contamination at the site. The site is located in the southern part of the Proposal site, previously used as a private waste disposal area (Figure 7-20 and Figure 7-21). This area was previously managed by SCS. Evidence of old hydrocarbon contamination and general farm waste including old chemical containers were observed. In terms of the proposed solar plant, the need for remediation in this area prior to works commencing is considered to be low. There is no potential for acid sulfate soils to occur at the Proposal site.

The onsite geotechnical report (GHD, 2018) and soil report (McMahon, 2018), do not identify any contamination onsite.

Figure 7-20 Potential contamination environment in the southern section of solar plant site.

Figure 7-21 Potential contamination in the southern section of solar plant site.

Agricultural land capability

The Proposal site occurs in a rural landscape with agriculture as the current dominant land use. The Dubbo Regional Council LGA services a region of 120,000 people, a third of the geographic area of NSW. The agriculture sector contributes 3.6% to the economy for the LGA. In 2015, the largest number of registered businesses (969) were in the 'agriculture, forestry and fishing' sector (Dubbo Regional Council, 2016).

The township of Wellington is approximately 7km south of the Proposal site and is the commercial centre for the surrounding district. Wheat, wool, lamb and beef are products of the local pastoral lands. Vegetables and alfalfa are grown along the river lands, which contribute to the local economy. The closest grain receiver is the Fletcher International Exports site in Dubbo which can be reached via harvest routes along Goolma Road, Mitchell Highway and Golden Highway that surround the proposed solar plant site (RMS, 2016).

The land surrounding the Proposal site includes a mixture of cropping and grazing land. The steeper land to the east supports mainly grazing activities and the gentle undulating land to the west and north supports mainly cereal production. A poultry farm is located approximately 300m east of the Proposal site.

The solar plant site has a long history of grazing (sheep and cattle) and cropping (lucerne, barley, oats and grain). Aerial imagery and site inspections confirm most of the site has been heavily cleared and highly modified by agriculture in the past. Currently the solar plant site is operated as a mixed planting enterprise with sheep and cattle grazing. Feed crops for stock are planted irregularly dependent on the season, no sustained cropping is undertaken.

LAND AND SOIL CAPABILITY ASSESSMENT SCHEME

Land capability is the inherent physical capacity of the land to sustain a range of land uses and management practices in the long term without degradation to soil, land, air and water resources (OEH, 2012). The NSW

land and soil capability assessment scheme (OEH, 2012) describes and maps eight land and soil capability classes. The classes range from 1 (best, highest capability land) and 8 (worst, lowest capability land). The classification is based on the biophysical features of the land and soil (including landform position, slope gradient, drainage, climate, soil type and soil characteristics) and susceptibility to hazards (including water erosion, wind erosion, soil structure decline, soil acidification, salinity, waterlogging, shallow soils and mass movement).

The Proposal site is located on land mapped in Capability Class 3 (high capability land) on the western lower slopes and plains and Class 4 (moderate capability) on the eastern high slopes and crests. Class 3 is defined as having moderate agricultural limitations with careful management required while Class 4 has moderate to high agricultural limitations, with restricted management options. Table 7-39 provides an overview of Class 3 and Class 4 under the *Land and Soil Capability Assessment Scheme* (OEH, 2012).

Table 7-42 Land and soil capability class 3 and 4(OEH, 2012).

Class	Broad category	Description
Class 3	High capability land	Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation.
Class 4	Moderate capability land	Land has moderate to high limitations for high-impact land uses. Would restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.

BIOPHYSICAL STRATEGIC AGRICULTURAL LAND (BSAL)

With the exception of a very minor section of the western transmission line option, all of the proposed development footprint is mapped as Biophysical Strategic Agricultural Land (BSAL) (Figure 7-22). This is land which features the best quality soil and water resources and can sustain high levels of productivity (DPE, 2017b). Similar to the land capability mapping, BSAL is not extensively ground truthed (It is noted that the detailed soil survey undertaken for the Proposal, Appendix I, provides more accurate mapping of soil properties). The purpose of mapping BSAL is to ensure competing land use proposals on this category of land are managed effectively. Proposals for State significant coal seam gas or mining sites that occur on BSAL land are subject to an independent Gateway assessment of land and water impacts prior to lodgement of a DA. This Gateway assessment doesn't apply to solar plants.

Nearly the entire Wellington North Solar Plant site development footprint (approximately 835ha) is mapped as BSAL. This equates to 1% of the mapped BSAL within the Dubbo Regional Council LGA; there is approximately 98,903 ha of mapped BSAL within the Dubbo Regional Council LGA. Two hectares of the western transmission route are not mapped as BSAL.

Current land management on the site is dominated by grazing. Feed crops for stock are planted irregularly dependent on the season, no sustained cropping is undertaken. Many of the drainage lines mapped for the

site are ephemeral and have been highly modified. These waterways are not capable of supporting irrigated agriculture or crops requiring high water usage. Land degradation is evident onsite including erosion and salinity. Soil surveys (McMahon, 2018) of the site found the soil surface structure has potential to deteriorate following prolonged cultivation/ handling to produce a hard-setting surface. The soils were found to be susceptible to rill and sheet erosion. The soil surveys noted the land could not sustain high levels of productivity.

Therefore, although the land is mapped as BSAL and Class 3 and 4 land, the soil survey results and historic use does not align with 'high capability land' and would not qualify as BSAL. The Proposal site's low relief landscape and proximity to waterways has likely resulted in mapping of a higher classification than what is actually present.

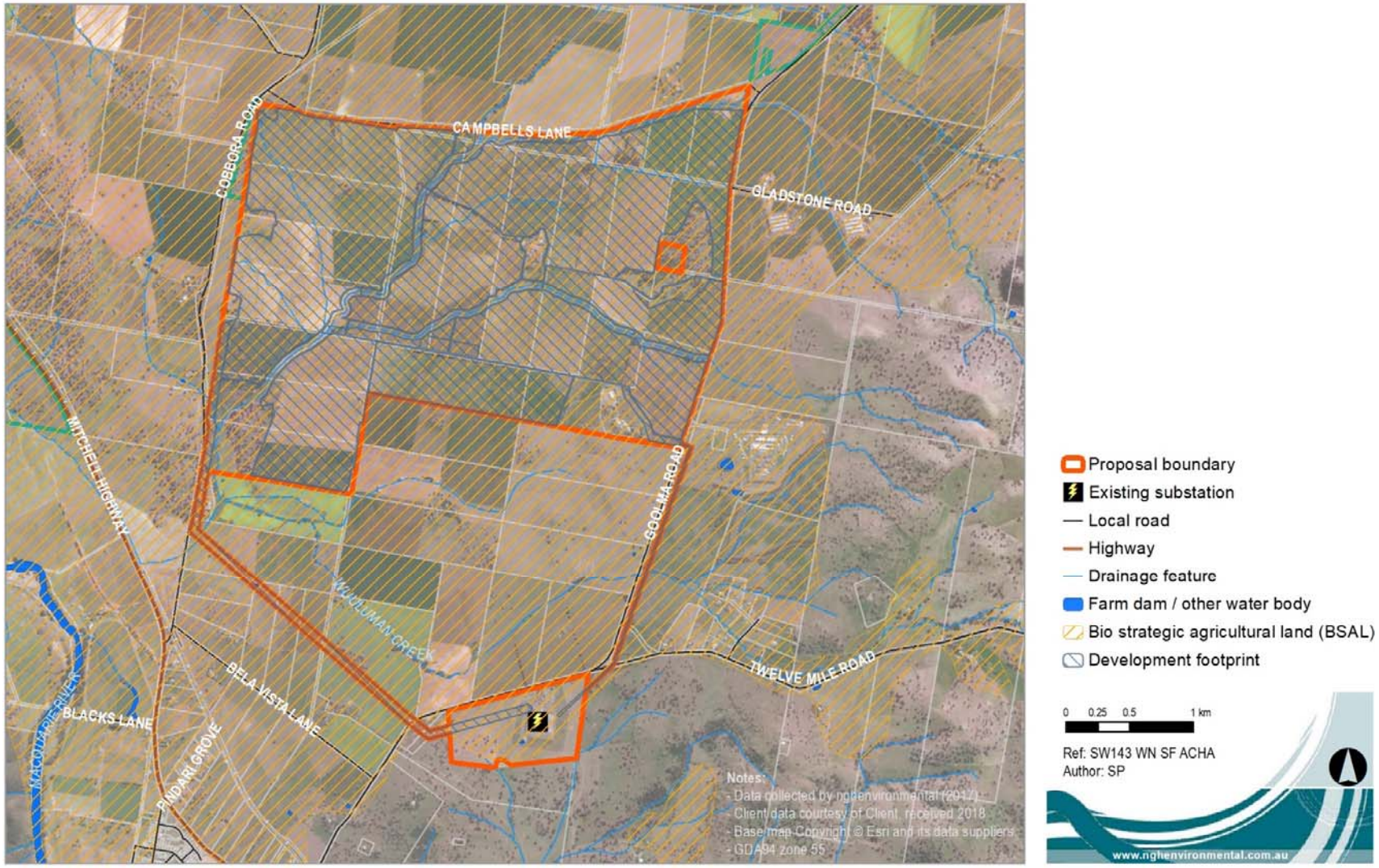

Figure 7-22 Biophysical Strategic Agricultural Land (BSAL) mapping for the Proposal site.

7.5.3 Potential impacts

Construction and decommissioning

SOIL DISTURBANCE

The proposed disturbance area for the Proposal is approximately 837 ha, which includes development within the solar plant site and the 'worst case' (largest impact area) transmission line option. It is identified that the soils onsite have a moderate to high erosion risk. Soils within the Proposal site have been previously disturbed by agriculture activities. The Proposal would disturb soils through the following activities:

- Excavation of trenches for cabling and underground electricity transmission line options (if adopted) up to 1200mm deep and 1000m wide.
- Excavation for power pole footings.
- Construction of internal access tracks and access points and associated drainage.
- Installation of mounting structures for solar panels (pile driven to a depth of 1.5 -2.4m).
- Vegetation clearance.
- Substation bench preparation.
- Foundations for the inverter stations, substation and maintenance building.
- Establishment of temporary staff amenities and offices for construction.
- Construction of perimeter security fencing.

Regarding assumed impacts for the establishment of electricity transmission, it is noted that:

- Where overhead transmission options are utilised, actual soil impacts will be minor; restricted to pole footings and minor compaction due to access, although an easement width of 60m is used in the impact area calculations.
- Where underground options are utilised, actual impact areas will be greatly reduced; a 1m wide trench will be excavated within the 15m easement.

The disturbance of soils has the potential to result in the following impacts:

- Erosion and sedimentation could result in loss of top soils and impact waterways.
- Compaction of soils in hardstand areas and access tracks.
- Machinery and vehicles have potential to track sediments onto public roads.
- Expose buried contaminants (pesticides and hydrocarbons).

Ground disturbance resulting from the Proposal would be minimal as no major earthworks are required due to the low relief of the landscape. The excavations and earthworks for the access tracks and associated drainage, foundations for infrastructure and buildings and the trenches for underground cabling / electricity transmission would remove vegetation cover and disturb soils, potentially decreasing their stability and increasing susceptibility to erosion. The installation of the piles and security fence poles is unlikely to result in substantive ground distance due their small and discrete footprint at the pole location. Ground cover would be retained as far as practicable prior to and during construction and would be rehabilitated post-construction. A Ground Cover Management Plan would be prepared to ensure stability post construction and is ongoing into operation of the solar plant.

The soil surveys at the solar plant site also identified that the Proposal has the potential to improve erosion characteristics of the land owing to the minimisation of grazing and cessation of cultivation during all stages of the Proposal (McMahon, 2018).

Erosion and sedimentation impacts associated with soil disturbance from the construction and decommissioning activities can be minimised by undertaking works in accordance with the provisions of the *Managing Urban Stormwater: Soils and Construction* series, in particular:

- *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition* (Landcom, 2004), known as 'the Blue Book.'
- *Volume 2A Installation of Services* (DECC, 2008a)
- *Volume 2C Unsealed Roads* (DECC, 2008b).

Soil compaction would occur as hardstands and internal access roads are created, which would reduce soil permeability thereby increasing runoff and the potential for concentrated flows across the site. During excavations, mixing of different soil horizons can retard plant growth due to inadequate top soil layer. Top soil management would be required as part of the construction process.

Machinery and vehicles have potential to track sediments onto public roads. This has potential to create a risk to other road users through reduced road traction. Cleaning vehicles and machinery as part of the soil and water management plan would reduce this risk.

The use of fuels and other chemicals during fuelling of machinery and weed spraying onsite, poses a risk of soil contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and (minimally) herbicides. Additionally, the use of portable toilets onsite poses a contamination risk through spills or leakages. Spills of these contaminants can alter soil health, affecting its ability to support plant growth. When mobilised, such as in a rain event or flooding, these substances may spread via watercourse onsite, affecting much larger areas of aquatic habitat such as Wuuluman Creek and the Macquarie River west of the Proposal site. This risk is considered manageable.

While a low risk, it is possible that contamination associated with past agricultural activities (e.g. buried pesticides, fuels) could be present on the site. A contaminated soil protocol has been included to manage this risk should it occur.

No soil impacts in addition to those mentioned for construction are anticipated during the decommissioning phase.

AGRICULTURAL LAND CAPABILITY

The Proposal would temporarily remove agricultural production from the areas involved in access and construction of the Proposal for up to 24 months. The temporary loss of the site for agricultural production would potentially occur for the life of the Proposal. With the exception of the internal tracks, drainage and small footings onsite for inverters, buildings and substation, the majority of the soil surfaces would not be impacted by the Proposal in the long term. No large areas of reshaping or excavation are proposed.

Due to the Proposal site requiring relatively low levels of impacts on the soil surface, the Proposal is viewed as highly reversible. Some compaction on access roads, from cabling and building footings would occur. Following decommissioning, the rehabilitated site would have similar opportunities for land use as the site currently possesses. At the end of the Proposal, all above and underground infrastructure would be removed.

A Rehabilitation Plan is a commitment of the Proposal, relevant to decommissioning. The objective is to ensure the array site is returned to its pre-solar plant land capability. Cropping, other forms of agriculture, or alternative land uses could occur. The plan would be developed with reference to soil testing results that have been undertaken (Appendix I) and with input from an agronomist. The site would be left stabilised, under a cover crop or other suitable ground cover. The plan would reference:

- *The Australian Soil and Land Survey Handbook* (CSIRO, 2009).
- *The Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008).
- *The land and soil capability assessment scheme: second approximation* (OEH, 2012).

No land use conflicts are anticipated for existing adjacent agricultural land uses or future agricultural land uses on the Proposal site or adjacent lands during construction.

The soil surveys at the solar plant site found the Proposal would have limited impact on agricultural resources, and the land upon decommissioning of the solar plant would be suitable for alternative land uses such as forestry and mining in addition to agriculture (Appendix I, McMahon, 2018).

Operation

SOIL DISTURBANCE

Impacts to soils during operation of the Proposal are expected to be minimal and would be limited to the following:

- Localised soil erosion under the panels from rainfall and cleaning water runoff, if ground cover is not maintained beneath the array infrastructure. This is a risk if panels are fixed, but a low risk if panels are tracking. The risk is also influenced by rainfall and groundcover management.
- Ongoing erosion from disturbed areas such as unsealed tracks and drainage structures.

The potential for shading of the groundcover from the panels is considered to be low. As the panels would most likely be tracking, panels would not provide continuous shading. The site supports groundcover but has minor limitations with salinity. The microclimate created under the panels (reduced surface air movement, evaporation, and ground temperatures) is expected to offset the negative impacts of shading A species mix, which is tolerant of intermittent shading and selected based on findings of the soil survey, would be used for the groundcover at the site. Potential responses to any persistent localised impacts under the array would include revegetation.

All areas disturbed during construction would have been rehabilitated, and groundcover would be established, monitored and maintained. Therefore the risk to impact soils during operation are low. Soil stability and erosion throughout the site, including beneath the array, would be regularly monitored during the operation of the Proposal.

AGRICULTURAL LAND CAPABILITY

During operation, the solar plant site would change from agricultural land use to power generation. Grazing may occur as a maintenance strategy to reduce biomass and assist weed management. It may be a benefit to the local agricultural industry, providing additional feed and an opportunity to rest pastures, continuing this aspect of the site's land use and contribution to the local agricultural economy. Land condition would be improved through less intensive agricultural use of the site. The impacts of the Proposal on impacts on agricultural resources and enterprises is detailed below with respect to *Primefact 1063: Infrastructure proposals on rural land* (DPI, 2013).

The Proposal would potentially result in the following agricultural impacts:

- Limited resource loss associated with solar panel installation.
- The end of opportunistic cereal cropping at the subject site for the lifetime of the operation.
- A potential reduction in biosecurity, through reduced pest and weed control opportunity.
- Potential bushfire risks if not routinely grazed (DPI, 2013).

Resource loss and fragmentation

The Proposal would be likely to preclude the extraction of mineral resources from the site for the life of the solar plant. The Proposal would not prevent future resource exploitation following decommissioning of the solar plant.

The Proposal would result in the loss of 853ha of BSAL which represents 0.86% of BSAL for the Dubbo Regional Council LGA during the operation life of the Proposal. As discussed, desktop assessments and surveys of the site have the found the land is not suitable for intensive or high production agriculture due to site limitations.

Construction works would involve only minor excavation activities and pile driving which would create minimal disturbance to soil resources. This in turn would reduce the soil loss risk. At the end of the solar plant operational life, all solar plant infrastructure would be removed, the land rehabilitated to its pre-existing condition, and the site may return to agricultural production or another land use.

Impacts on farming operations and livestock

The Proposal would displace approximately 837 ha (including larger transmission line option) of agricultural land at the site for the life of the solar plant (approximately 30 years). The property is typical of much of the land use in the locality, the LGA and the region.

Some sheep grazing may continue to be undertaken at the Proposal site for production purposes and to control grass and weed growth around the solar arrays. Grass fuel levels within the site would be managed to minimise bushfire risks (refer to Section 8.3). Adequate groundcover would be maintained to protect soil and water values (refer Section 8.1).

Sheep grazing represents 46.5% (meat and wool) of agricultural commodities from the former Wellington Council LGA (DPI, 2011). This is equal to 4.65% of the sheep (meat and wool) agricultural commodities for NSW. The census (2011) recorded 594,694 sheep in the former Wellington Council LGA. The Proposal site's sheep carrying capacity is less than 1% of this total. The surrounding properties within the former Wellington Council LGA provide for similar agricultural production including cropping (37.3%), wool (28%) and meat agriculture (34.7%).

The Proposal would not affect access or agricultural land uses on surrounding properties during the operation phase. Neighbouring properties have the potential to benefit from potential future grazing arrangements with Wellington North Solar Plant.

Best practice waste and wastewater management, fuel storage and re-fuelling and chemical handling would be stringently applied to prevent soil and water pollution (refer Section 7.5.4 and 8.6). Construction noise and traffic would be managed to minimise impacts to landholders around the site and along the access route (refer Section 7.3 and 7.9).

Impacts on soils and erosion risk are assessed above, impacts on downstream water quality are assessed in Section 8.1 and impacts on local air quality are assessed in Section 8.5. These assessments conclude that the Proposal would not be likely to adversely affect land uses or activities on neighbouring properties or elsewhere in the locality, subject to identified mitigation measures.

Increased weed, biosecurity and bushfire risks

The productivity of agricultural production depends in part on the management of pests and diseases, including the prevention or incursion of pests and diseases onto properties. The financial impact of weeds on agriculture alone is about $2.5 billion in lost production and $1.8 billion in control activities annually.

The major biosecurity risks from this proposal relate to the movement of people, vehicles and machinery, with the risks occurring at both construction and operation phases. High biosecurity standards would be applied during the construction period, including pre-works weed treatment and maintaining high levels of weed and disease hygiene for construction vehicles, machinery and materials. A Weed Management Plan would be prepared for the construction and decommissioning phases. Similarly, pest plants and animals would be monitored and controlled as part of the continuing management of the solar plant site (refer Section 7.1).

Impacts on fire risk are assessed in Section 8.3. It concluded that the bushfire risk from the Proposal is low and with the implementation of mitigation measures the identified risks can be managed.

LAND USE CONFLICT ASSESSMENT

A land use conflict risk assessment (LUCRA) has been carried out in accordance with the DPI Land Use Conflict Risk Assessment Guide (DPI, 2011).

To undertake the LUCRA, activities are assessed according to the probability and consequence of conflicts that may ensue. Probability is categorised from A to E (refer to column headers of Table 7-40 for further explanation). Consequence is categorised from 1 to 5 (refer to row titles of Table 7-40 for further explanation). Based on the risk and consequence, each activity is given a rank. Generally, an activity that produces a rank of above '10' is considered to generate unacceptable risk and requires further management. These are highlighted in red.

Table 7-43 LURA probability and consequence evaluation system.

Evaluation criteria		A – Almost certain: Common or repeating occurrence	B – Likely: Known to occur, or 'it has happened'	C – Possible: Could occur, or 'I've heard of it happening'	D – Unlikely: Could occur in some circumstances, but not likely to occur	E – Rare: Practically impossible
1	• Severe and/or permanent damage to the environment • Irreversible • Severe impact on the community • Neighbours are in prolonged dispute and legal action involved	25	24	22	19	15
2	• Serious and/or long-term impact to the environment • Long-term management implications • Serious impact on the community • Neighbours are in serious disputes	23	21	18	14	10
3	• Moderate and/or medium-term impact to the environment and community • Some ongoing management implications • Neighbour disputes occur • Minor and/or short-term impact to the environment and community • Can be effectively managed as part of normal operations • Infrequent disputes between neighbours	20	17	13	9	6

Evaluation criteria		A – Almost certain: Common or repeating occurrence	B – Likely: Known to occur, or 'it has happened'	C – Possible: Could occur, or 'I've heard of it happening'	D – Unlikely: Could occur in some circumstances, but not likely to occur	E – Rare: Practically impossible
4	• Minor and/or short-term impact to the environment and community • Can be effectively managed as part of normal operations • Infrequent disputes between neighbours • Example/ Implication • Theoretically could affect the environment	16	12	8	5	3
5	• Very minor impact to the environment and community • Can be effectively managed as part of normal operations • Neighbour disputes unlikely	11	7	4	2	1

This LUCRA for the Wellington North Solar Plant lays out the information gathered about the existing and adjacent land use activities and activities associated with the Proposal. Based on desktop studies and field work, the risk level of each activity is evaluated. Where applicable, management strategies to reduce risk are identified. These factors are reviewed and presented in a risk assessment matrix (refer to Table 7-41). Given the management strategies proposed, no items result in a score greater than '10'.

The table below lists the potential sources of land use conflict from the Proposal, assesses the risk based on the matrix above, and suggests management strategies to reduce possible conflicts. Land use conflicts identified are expected to be manageable.

Table 7-44 Land use conflict assessment from the Proposal.

Activity	Identified Potential Conflict	Risk Category and Rank	Management Strategy (Method of Control)	Revised Risk Category and Rank	Performance Target
Use of Agricultural Land	Opportunity cost: For the lifetime of the Proposal, the current agricultural practices would be precluded or limited. Cropping would not occur, and limited grazing would be possible. The site is mapped as Biophysical Significant Agricultural Land. Generally, this implies the land has high value as agricultural land and is managed as such within the regulatory framework. However, soils surveys onsite have demonstrated the site is not capable of sustained intensive agricultural use.	A3 / 20	The installation of infrastructure is limited to a depth of 2.4 m. A groundcover plan would ensure erosion and weeds are addressed during the operation of the solar plant. Soil surveys have provided base line information to guide remediation post construction and during decommissioning. A Rehabilitation Plan has been developed to remove all infrastructure following the decommissioning of the Proposal. The landscape, soil and climatic factors that make this site suitable for agriculture would not be impacted by the Proposal. Therefore, following decommissioning of the site, the land can once again be used for agricultural purposes.	D3 / 9	Return site to equal or better agricultural potential following proposal decommissioning.
Use of mineralised land	Opportunity cost: Exploration and extraction of natural resources on the site would be precluded for the lifetime of the Proposal.	A3 / 20	The Proposal is not expected to modify or depreciate the value of mineralisation on the site. The Proposal is to build limited infrastructure in the form of boundary roads and substations while the solar panels would be installed on pile driven posts or on small pad footings. Upon decommissioning of the solar plant, the pile driven posts or small pad footings would be removed causing minimal soil and landscape disturbance and the	D3 / 9	

Activity	Identified Potential Conflict	Risk Category and Rank	Management Strategy (Method of Control)	Revised Risk Category and Rank	Performance Target
			land would be largely as it occurs today. Following the decommissioning of the Proposal it is expected any economic resources would be available for exploitation.		
Construction and decommissioning	Visual amenity: During construction of the Proposal construction equipment, personnel and facility would be installed. Earthworks would be undertaken.	C4 / 8	The impacts would be temporary and distributed across a large landscape. No specific mitigation is proposed.	C4 / 8	Respond promptly to complains.
	Noise and vibration: Based on the distance to sensitive receivers, noise is unlikely to exceed noise management levels.	D4 / 5	Adherence to a noise management plan is required to manage this impact.	D4 / 5	Comply with noise management plan.
	Dust: During construction and especially earthworks, dust may be generated.	D4 / 5	The dust generated is not anticipated to exceed levels of dust generated during agricultural activities such as ploughing, that are already established in the region.	D4 / 5	The POEO Act requires that no vehicle shall have continuous smoky emissions for more than ten seconds. Limits on dust emission of less than 4mg/m/m^2 are also specified.
	Traffic: There would be an increase in the number of heavy vehicles along Campbells Lane with the construction of Wellington North Solar Plant. Up to 69 vehicles may access the site on a given day during the peak period. Existing traffic volumes have been assessed as relatively low and the roads can accommodate the increase.	B4 / 12	Traffic impacts are most notable during construction and decommissioning phases of the Proposal. A Traffic Management Plan would be developed to mitigate traffic impacts.	B5 / 7	Comply with traffic management plan.
Operation and maintenance of PV array and associated infrastructure	Visual amenity: The PV array is visually a significant deviation from the current land use.	B4 / 12	There are no dwellings in the immediate vicinity of the Proposal. The infrastructure occupies low relief and	B5 / 5	Comply with landscape plan.

Activity	Identified Potential Conflict	Risk Category and Rank	Management Strategy (Method of Control)	Revised Risk Category and Rank	Performance Target
			should not greatly modify skylines / horizons. Although the PV array is visually dissimilar to the current land use, it should be noted that a correction facility and large sheds that are possibly used for poultry/swine are located in the vicinity of the site. Screen planting would be undertaken onsite outside the perimeter fencing to mitigate visual impacts to nearby residents.		
	Aviation: glare during aerial agricultural activities (spraying, etc.)	D4 / 5	There is unlikely to be an impact to aerial spraying activities given low levels of glare and the limited height of infrastructure.	D4 / 5	NA
	Bushfire ignitions: Depreciated electrical infrastructure is a known source of bushfire ignitions.	D2 / 14	The site would be maintained in accordance with management practices for electrical sites. Biomass on site would be reduced by grazing and weed management. The site would be decommissioned once depreciated.	E2 / 10	NA
	Traffic: The Proposal is expected to employ up to four employees long term on site and is unlikely to cause traffic congestion. No long term modification of roads planned.	E5 / 1	None required	E5 / 1	NA
Weed and pest control	Weeds: Transfer of weeds from site to surrounding properties which may affect agricultural or amenity plantings on neighbouring properties.	D4 / 5	Implementation of weed management plan during construction and operation phases.	E4 / 3	Comply with weed management protocols.
Grazing around PV array	Grazing: The site is currently used for grazing, and the	N/A	N/A	N/A	N/A

Activity	Identified Potential Conflict	Risk Category and Rank	Management Strategy (Method of Control)	Revised Risk Category and Rank	Performance Target
	surrounding land is also used for grazing, grazing surrounding the PV array is not expected to cause conflicts.				
Agriculture on land surrounding site	Agriculture: Agriculture on lands surrounding the site is not expected to cause conflicts for the solar array.	N/A	N/A	N/A	N/A

7.5.4 Safeguards and mitigation measures

Table 7-45 Safeguards and mitigation measures for land use, resources and soil

C: Construction, O: Operation, D: Decommissioning

ID	Mitigation measures	C	O	D
1	As part of the CEMP, a Soil and Water Management Plan (SWMP) (with erosion and sediment control plans) would be prepared, implemented and monitored during the Proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to: o Implement management responses outlined in the Soil Survey Report (McMahon, 2018). o Install, monitor and maintain erosion controls. o Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability. o Manage topsoil in all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. Stockpile topsoil appropriately so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity. o Minimise the area of disturbance from excavation and compaction; rationalise vehicle movements and restrict the location of activities that compact and erode the soils as much as practical. Any compaction caused during construction would be treated such that revegetation would not be impaired. o Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site	C	O	D

ID	Mitigation measures	C	O	D
	should be stabilised, and work ceased until the wet period had passed.			
2	A Groundcover Management Plan would be developed in consultation with an agronomist and taking account of soil survey results to ensure perennial grass cover is established across the site as soon as practicable after construction and maintained throughout the operation phase. The plan would cover: • Soil restoration and preparation requirements. • Species election. • Soil preparation. • Establishment techniques. • Maintenance requirements. • Perennial groundcover targets, indicators, condition monitoring, reporting and evaluation arrangements – i.e. Live grass cover would be maintained at or above 70% at all times to protect soils, landscape function and water quality. Any grazing stock would be removed from the site when cover falls below this level. Grass cover would be monitored on a fortnightly basis using an accepted methodology. • Contingency measures to respond to declining soil or groundcover condition. Identification of baseline conditions for rehabilitation following decommissioning.	C	O	
3	The array would be designed to allow sufficient space between panels to establish and maintain ground cover beneath the panels and facilitate weed control.	Design		
4	A Spill and Contamination Response Plan would be developed as part of the overall Emergency Response Plan to prevent contaminants affecting adjacent surrounding environments. The plan would include measures to: • Respond to the discovery of existing contaminants at the site (e.g. pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements. • Requirement to notify the EPA for incidents that cause material harm to the environment (refer s147-153 of the POEO Act). • Manage the storage of any potential contaminants onsite. • Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and the EPA notification procedures and remediation.	C	O	D

ID	Mitigation measures	C	O	D
	• Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks. • Prevent contaminants affecting adjacent pastures, dams, water courses and native vegetation. • Monitor and maintain spill equipment • Induct and train all site staff.			
5	A protocol would be developed in relation to discovering buried contaminants within the Proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements.	C	O	D
6	A Rehabilitation Plan would be prepared to ensure the array site is returned to its pre-solar Plant land capability. The plan would be developed with reference to the base line soil testing and with input from an agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover. The plan would reference: • *Australian Soil and Land Survey Handbook* (CSIRO, 2009) • *Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008) • *The land and soil capability assessment scheme: second approximation* (OEH, 2012)			D
7	Manage pests and weeds during construction and operation. Where practicable integrate weed and pest management with adjoining land owners	C	O	
8	Consultation with local community, to minimise impact of the Proposal on adjacent agricultural activities and access.	C	O	D

7.6 COMPATIBILITY WITH EXISTING LAND USES

7.6.1 Approach and methods

Impact on land use of the Proposal site and locality have been assessed with reference to the following:

- MinView and Common Viewer databases.

7.6.2 Existing environment

The Proposal site is located on land zoned as RU1 Primary Production under the Wellington LEP. Both transmission line options, extend offsite to the existing substation on Goolma Road. The eastern transmission line option would occur on land zoned RU1 Primary Production, SP2 Correctional Facility, SP2 Classified Road and SP2 Electricity Supply. The western transmission line option would occur on land zoned RU1 Primary Production, R5 Large Lot Residential, SP2 Classified Road and SP2 Electricity Supply.

Three existing land uses are currently relevant to the Proposal site:

- Agricultural production (one operation).
- Environmental consultancy (one business).
- Residential (one dwelling).

Adjacent land uses also relevant to the site and which may be affected by the Proposal or may constitute future land uses that the Proposal site may support, include:

- Agricultural production (cropping and grazing, poultry).
- Residential (large rural holdings as well as two subdivisions within 1.6 km of the Proposal site).
- Tourism.
- Industry and commercial.
- Aviation.
- Renewable energy.
- Mining.

Agriculture is discussed in Section 7.5. All other land uses related to the Proposal are discussed below.

Residential and tourism

The Proposal site is located approximately 7km north east of Wellington along Goolma Road. Wellington has a population of approximately 4,000 and located at the junction of the Macquarie and Bell Rivers at the foot of Mt Arthur (ABS, 2016). Wellington is a popular stopover on the Mitchell Highway. The Wellington Caves and Phosphate Mine, Mount Arthur Reserve and the close proximity to Lake Burrendong, also draw visitors (Dubbo Regional Council, 2017.).

There are approximately 134 residences within 2km of the Proposal site. A number of large lot residential dwellings occur about 1.6km south west of the Proposal site in the suburb of Montefiores. Most other dwellings are scattered farm dwellings including a number of heritage listed properties and homesteads. (Refer to Section 7.7).

Industry and commercial uses

There are several existing transmission lines within the Proposal site, which connect to the substation south of Goolma Road. The Proposal would require an additional overhead or underground transmission line to connect to the substation.

The Wellington Correctional Centre is located off Goolma Road, east of the Proposal site. The Correctional Centre is a maximum-security prison for males and females, and is operated by Corrective Services NSW, an agency of the Department of Attorney General and Justice. The Correctional Center was recently expanded in 2016 enabling a higher intake of inmates.

Aviation

A number of airstrips are located within close proximity to the Proposal site, the closest being Bodangora airstrip which is located about 2km north east of the Proposal site. This airstrip is small and primarily used by council for light aircraft, private charter flights and medical services. The remaining airstrips include:

- A landing ground located approximately 9km north west.
- A landing ground approximately 18km east.
- A landing ground approximately 22km north west.

- Dubbo airport approximately 48km north west.
- Mudgee airport approximately 62km east.
- Narromine airport approximately 72km north west.

Dubbo City Regional Airport is one of the leading regional airports in Australia that provides direct services to major airports in Australia. The remaining airstrips are small airports primarily used by light aircraft, private charter flights and medical services.

Due to the nature of the mining and agricultural industry in the area, there are potentially other smaller (private) airstrips at the locality used for transport or aerial spraying of crops.

Renewable energy projects

The Bodangora Wind Farm project site is located approximately 9 km north of the Proposal site. The wind farm was developed, and would be owned and operated, by Infigen Energy. The wind farm would have a generating capacity of 113.2MW. The Proposal has started construction, which would take approximately 18 to 24 months and full commercial operation is targeted to be in the third quarter of 2020. There would be no cumulative construction impacts from the wind farm associated with Wellington North Solar Plant as the construction timeframes do not overlap.

There are also a number of solar farms proposed:

- The Wellington Solar Farm, proposed by First Solar, is located directly south of the Proposal and has been recently approved (May 2018).
- The Suntop Solar Farm by Photon Energy is proposed 12km south west of the Proposal site. The EIS and DA is currently being prepared.
- The Maryvale Solar Farm by Photon Energy is proposed 2km north west of the Proposal site. The EIS and DA is currently being prepared.
- The Uungula Wind Farm by Wind Prospect is proposed 40km east of the Proposal site. The EIS and DA is currently being prepared.

Mineral titles, exploration licences and quarries

Two current exploration licences apply to the Proposal site (Table 7-43 and Figure 7-23). AGL has consulted with the exploration licence holders. This consultation is summarised in Section 6.3.

Table 7-46 ELs relevant to the Proposal site.

Mineral Title/ Licence number	Owner	Grant date	Expiry date	Mineral type
EL 6178	Modeling Resources Pty Ltd	19.01.2004	19.01.2021	Group 1 (metallic minerals)
EL 8505	Drummond West Pty Ltd	06.02.2017	06.02.2020	Group 1 (metallic minerals)

Three mines/quarries occur within 5km of the Proposal site including:

- Montfiores Pit (Nanima Quarry) - located south of Goolma Road, immediately south of the Proposal site. It is a sandstone and siltstone quarry and classed as unprocessed construction materials - major.

- Brookfield Pit - located off Twelve Mile Road, about 4 km east of the Proposal site. Is classed as unprocessed construction materials – minor and relates to mineral title EL 8252. The operational status of this pit is unknown.
- Maryvale via Wellington – located next to the Macquarie River, about 3 km west of the Proposal site. The quarry is operational in coarse aggregate, river gravel and sand. It is classed as unprocessed construction materials – major.

These mines/quarries traffic are unlikely to use Campbells Lane, Cobbora Road or Goolma Road for haulage due to their location. Traffic from these mines/quarries is likely to be on Mitchell Highway, however the Mitchell Highway has capacity for these heavy vehicles.

Crown land and paper roads

Lot 109 / DP 750760, adjacent to land subject of the Proposal within the eastern portion of the solar plant site, is mapped as Crown land. The Proposal would not occur within this lot.

There are two paper roads within the solar plant site. These roads have been identified as Council roads and AGL is working with Dubbo Regional Council and the Crown to close and realign these paper roads. The identified paper roads within the solar plant site are managed by Dubbo Regional Council. AGL has made an application to the Dubbo Regional Council to close the paper roads within the Proposal site. AGL has consulted with the DoI – Land and Dubbo Regional Council and is continuing to pursue this process.

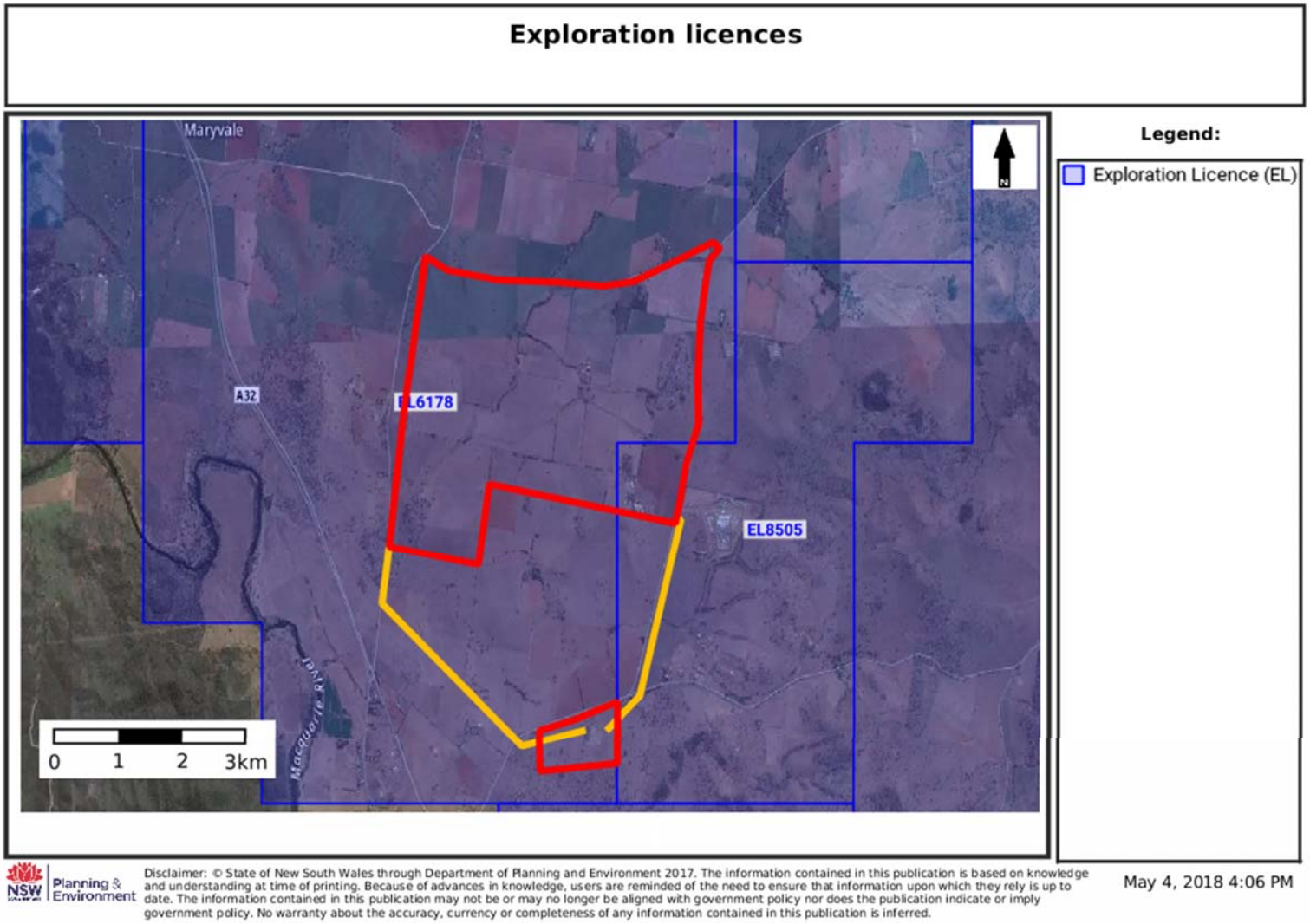

Figure 7-23 Exploration Licences, Proposal site and substation outlined in red. Transmission line options in orange.

7.6.3 Potential impacts

Construction and decommissioning

The potential impacts during construction and decommissioning of the Proposal on surrounding land uses is considered to be minimal give the temporary nature of the work and implementation of mitigation measures. Potential impacts to surrounding land uses include:

- Residences located near to the site may experience noise, dust and traffic during construction. These are temporary and manageable impacts, addressed in Section 7.3, 7.9 and 8.5. No impacts on the use of any recreational areas would occur.
- Consultation is being undertaken with TransGrid to ensure the construction of the Proposal and transmission line would have minimal impact on their adjacent substation and transmission lines onsite.
- There would not be able to be any extraction of minerals onsite during the construction period, affecting mineral lease holders (nor during operation). Due to the Proposal being highly reversible however, mineral exploration would not continue to be sterilised in the long term, post decommissioning. The relevant leaseholders have been notified of these restrictions. It is understood that vegetation offset areas, established in perpetuity, may form an additional long term restriction to exploration. It is noted that offset areas can be developed under the Biodiversity Offset Scheme, albeit with a surcharge applied to account for impacts on offset areas.
- There is unlikely to be any impacts on aviation or aerial spraying during construction of the Proposal. The proposed infrastructure is low-lying with the transmission line poles being the tallest infrastructure. The installation of this infrastructure would not impact on any flight paths or present a hazard to aircraft.

Potential impacts to agricultural land uses are discussed in Section 7.5.

Operation

Land use impacts during operation of the proposed solar plant relate to aviation. There is unlikely to be any impacts on aviation or aerial spraying during operation of the Proposal. The proposed infrastructure is low-lying with the transmission line poles being the tallest infrastructure. The installation of this infrastructure would not impact on any flight paths or present a hazard to aircraft.

There is a perceived issue of glint or glare associated with PV solar panels. Glint is a quick reflection that occurs when the sun is reflected on a smooth surface. Glare is a longer reflection. Onsite infrastructure that may cause glint or glare depending on the sun angle, include:

- Solar panels.
- Steel array mounting - array mounting would be steel or aluminium.
- PCSs.
- Transmission line poles, if steel is used.
- On-site substation.
- Temporary construction site buildings.

Recent studies have suggested that potential for glare from PV solar panels is relatively limited (Spaven Consulting, 2011). PV solar panels are designed to reflect as little sunlight as possible as the PV panels are

designed to absorb solar energy in order to generate the maximum amount of electricity. It is documented that PV panels may reflect as little as 2% of the light they receive (FAA, 2010).

The panels would not generally create noticeable glare compared with an existing roof or building surfaces. Figure 7-24 compares the reflectivity of various common surfaces. Seen from above (such as from aircraft) they appear dark grey and do not cause a glare or reflectivity hazard. Solar PV plants have been installed on a number of airports around the world and in Australia including Karratha in WA and Darwin in NT.

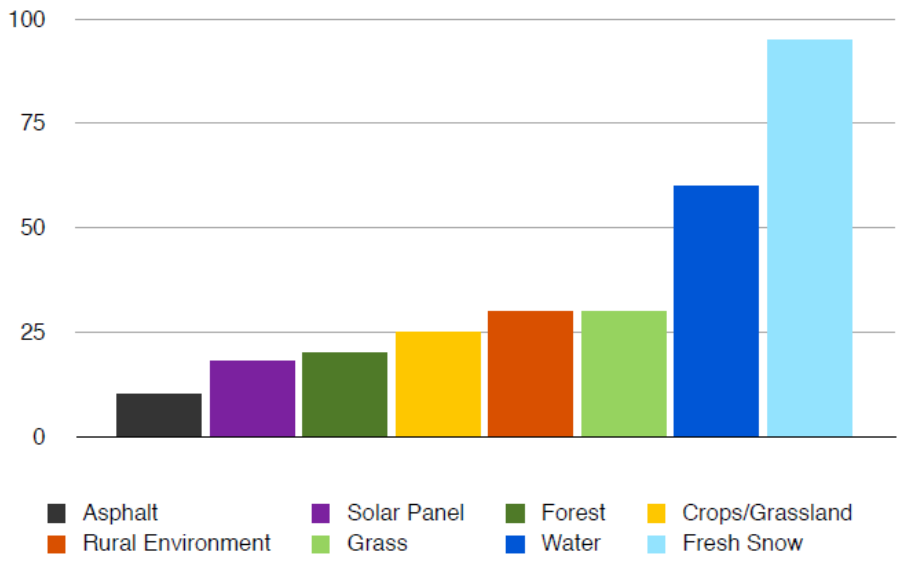

Figure 7-24 Comparative reflection analysis (Spaven Consulting, 2011).

Cumulative impacts

Proposed developments within the locality or region which may contribute to the cumulative impacts of the Proposal include:

- The Bodangora Wind Farm, approximately 10km north east of the Proposal site
- The Wellington Solar Farm, directly south of the Proposal site.
- The Suntop Solar Farm by Photon Energy, approximately 12km south west of the Proposal site.
- The Maryvale Solar Farm by Photon Energy, approximately 2km north west of the Proposal site.

The cumulative impact on land use would be negligible due to these relating to specific onsite issues and distance between sites. The impacts also relate to specific issues including traffic, noise and air quality, that are addressed in other sections of this EIS.

7.6.4 Safeguards and mitigation measures

Table 7-47 Safeguards and mitigation measures for land use, resources and soil

C: Construction, O: Operation, D: Decommissioning

ID	Mitigation measures	C	O	D
1	Consultation would be undertaken with TransGrid regarding connection to the substation and design of electricity transmission infrastructure.	C	O	D
2	Consultation with Proposal site mineral titleholders regarding the Proposal and potential impacts.	C	O	D

7.7 HISTORIC HERITAGE

7.7.1 Approach

A desktop study and site inspection was undertaken to identify any historic heritage (non-indigenous) items or places in proximity to the study area, with a focus on the Proposal site and surrounding landscape. The following resources were used as part of this assessment:

- The NSW State Heritage Inventory (SHI), this includes items on the State Heritage Register and items listed by state agencies and local Government, to identify any items currently listed within or adjacent to the Proposal site.
- The Australian Heritage Database, this includes items on the National and Commonwealth Heritage Lists, to identify any items that are currently listed within or adjacent to the Proposal site.
- Heritage schedule of Wellington LEP, for locally listed heritage items, that are within or adjacent to the Proposal site.

7.7.2 Results

A summary of the results of the heritage searches are illustrated in Table 7-45 and discussed below.

Table 7-48 Summary of heritage listed items in the former Wellington Council LGA.

Name of register	Number of listings
World Heritage List	0
National Heritage List	0
NSW State Heritage Register	6
NSW State Agency Heritage Register (section 170)	8
Wellington LEP	62

Australian Heritage Database

The Australian Heritage Database search was undertaken on the 19 September 2017 using a search of the former Wellington Council LGA. The search resulted in one Commonwealth listed item; the Wellington Post Office, located approximately 7km south of the Proposal site.

No known items listed under the World Heritage List were identified in relation to the Proposal site.

NSW State Heritage Inventory

The NSW State Heritage Inventory database search was undertaken on the 12 September 2017 for the former Wellington Council LGA, there were 6 items listed under the NSW State Heritage Register, eight items listed under the NSW State Agency Heritage Register (Section 170). None of the items listed are within or adjacent to the Proposal site.

A total of 62 items were also listed by Local Government and State Agencies on the NSW State Heritage Inventory database. None of the items listed are within the Proposal site. The closest item*, Keston aka Bella Vista* Homestead (database ID: 2640031), is located approximately 300m south of the western transmission line route and 1.6km from the southernmost extent of the proposed solar plant area. *Nanima* Homestead (database ID: 2640104) is located approximately 550m south of the western transmission line and 2.5km south-east from the southernmost extent of the proposed solar plant area. *Keston* and *Nanima* Homesteads are both also listed on the Wellington LEP and further details are provided below.

Wellington Local Environmental Plan 2012

The Wellington LEP database search was conducted on the 12 September 2017. One item of local heritage has been identified onsite within the solar plant Proposal site, the *Noonee Nyrang* Homestead. Three additional sites were identified between 750 and 2,500m from the solar plant Proposal site. Two of these sites were identified to be between 300 and 550m south of the western transmission line.

Table 7-49 Locally listed heritage items within and in close proximity of the Proposal site.

Name	Address	LEP listing ID	Approximate distance from the Proposal site
Noonee Nyrang Homestead	6444 Goolma Road Lot 84, DP 2987	I11	Surrounded by the Proposal site.
Narrawa Homestead	6916 Goolma Road Lot 90, DP 588075	I49	750 m to the east and south of the southern boundary of the Proposal site.
Keston homestead	6938 Goolma Road Lots 1 and 2, DP 588075	I50	1.6 km south of the southernmost boundary of the Proposal site and 300 m south of the western transmission line to the existing substation.
Nanima homestead	7009 Goolma Road Lot 2, DP 806578	I51	2.5 km to the south-east of the southernmost boundary of the Proposal site and 550 m south of the western transmission line to the existing substation.

Noonee Nyrang

Noonee Nyrang is a locally listed property consisting of a Federation style house and outhouse of importance that includes a drop log buggy shed, stables, stallion yard and a large stone barn which predates the house. The property is historically important as the home was built for Mr W.G Smith who was prominent in the advancement and development of agriculture during the 19th and early 20th Century. The house has been modified with the addition of a timber wall at the rear of the house to enclose a courtyard to form an extra room which is now a renovated kitchen. Nyrang was held by the Smith family until purchased by Mr and Mrs Keith Holmes in 1975 and renamed Noonee Nyrang. It is currently owned by Tony and Penny Inder.

Noonee Nyrang Homestead – Main house

Noonee Nyrang Homestead - large stone barn

Figure 7-25 Noonee Nyrang Homestead.

Narrawa

Narrawa Homestead is a locally listed property built in 1908. It is a typical large country home with Federation features in its ceilings, joinery and detail. The brick homestead is a large house with strong elements of the Federation Queen Anne style and with a sympathetic addition and complementary garden setting in keeping with the ambience of the house. Historically important as an example of a type of residence erected on prosperous country properties pre-World War I. The current owners have extended the original house using sandstone bricks sourced from an old building in Dubbo to match the original. Narrawa was once a part of a group of properties comprising of “Kelvin”, “Keston” and Narrawa”. The Cameron family bought Narrawa, then called Kelvin, from the Egelabra Stud. Keston was owned by Mr Joe Quirk and his daughter, Lois Quirk, married to Colin Cameron with their children, Ron and Jennifer, growing up on the property. Jon and Margy White bought Kelvin from the Cameron’s in 1990 and changed the name back to Narrawa.

Narrawa Homestead -Main house

Narrawa Homestead -View of extension

Figure 7-26 Narrawa Homestead.

Keston

Keston is a locally listed property consisting of a Victorian Italianate style house with a decorative façade, bracketed eaves and asymmetrical form. The front veranda has a cast iron balustrade in the lilies and daisies pattern. The exterior of the house has at some point been stuccoed and painted. Internally, the house still retains many of its original features with high ceilings, large double hung windows, three marble fireplaces, ornate cornice and plaster work and a cellar. Historically it was built by Nancarrow, prominent in the development of the town and district of Wellington. Significant restoration of the house has taken place over the years. In the late 1970s an extension was added to the house. Extensive renovations also occurred at this time to the interior, the stone out buildings, the garden and a swimming pool was built. To date Keston has been the home to nine different families and is currently owned by Ross and Kate Plasto. For a period of time the property was also known as “Bella Vista”.

Keston Homestead – Main house. Photo Credits to the Wellington Times September 18, 2017.

Keston Homestead – historic photo. Photo Credits to the Wellington Times September 18, 2017.

Figure 7-27 Keston Homestead.

Nanima

Nanima is a locally listed property consisting of a large, single storey with verandah, Bungalow homestead in the Queen Anne style; prominently situated on a hill overlooking the town of Wellington. Planned around a large central living hall the rooms contain the majority of the original decoration and furniture with noted Edwardian interiors. There is a detached stable coach house and two good underground tanks.

Nanima Homestead – Main house. Photo Credits to http://www.websternolan.com.au

Nanima Homestead – Main house. Photo Credits to http://www.websternolan.com.au

Figure 7-28 Nanima Homestead.

7.7.3 Heritage significance

The results of the heritage investigations listed above indicate that one previously recorded heritage site is located within the Proposal site: Noonee Nyrang Homestead. The Noonee Nyrang Homestead is a site of local significance listed on the Wellington LEP (2012). This development footprint was inspected by NGH Environmental. During the site inspection, a European survey marker tree, a culvert and a stock watering trough and the NSW SCS facility at Wellington were also identified as having potential for historic heritage significance within the Proposal site, these are discussed further in Section 7.7.7 .

Noonee Nyrang Homestead is a locally listed heritage item located within the solar plant Proposal site. The local listing for the property has identified that it has historical and aesthetic heritage significance at a local level. The OEH guidelines for *Assessing Heritage Significance (Heritage Office* (former), 2001) states that an item would be considered to be of state and/or local heritage significance if it meets one or more of the NSW Heritage Assessment Criteria, below:

Table 7-50 NSW Heritage Assessment Criteria.

Criteria	Description
Criterion (a)	An item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area);
Criterion (b)	An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area);
Criterion (c)	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area);
Criterion (d)	An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons;
Criterion (e)	An item has potential to yield information that would contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area);

Criteria	Description
Criterion (f)	An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area);
Criterion (g)	An item is important in demonstrating the principal characteristics of a class of NSW's • cultural or natural places; or • cultural or natural environments. (or a class of the local area's • cultural or natural places; or • cultural or natural environments.)

In order to undertake an assessment of an item against the NSW heritage assessment criteria, the OEH guidelines recommend that the following steps be undertaken:

- Investigate the historical context of the item or study area.
- Investigate the community's understanding of the item.
- Establish local historical themes and relate them to the State themes.
- Investigate the history of the item.
- Investigate the fabric of the item.

Noonee Nyrang Homestead Wellington LEP Listing

The Noonee Nyrang Homestead is listed as item I11 on the Wellington LEP, located as 6444 Goolma Road, Bodangora (Lot 84, Deposited Plan 2987).

Dubbo Regional Council manage a heritage inventory (State Heritage Inventory) database for heritage items listed on the Wellington LEP. The Noonee Nyrang Homestead State Heritage Inventory (SHI) listing number is 2640142. The SHI inventory sheet for the property includes the following provided in Table 7-48.

Table 7-51 Noonee Nyrang Homestead SHI listing.

SHI #2640142.	Noonee Nyrang Homestead State Heritage Inventory (SHI) listing
Physical description	The house was built about 1894 of locally quarried bluestone, random cut and rough hewn, tuckpointed with coloured mortar to give the appearance of even blocks. The high pitched roof is hipped with timber detailing and finials and five tall chimneys. The bull-nosed verandah roof is supported by timber posts with wrought iron brackets and panels. All interior joinery is cypress pine with white box doorsteps 7 panelled cedar doors. Ceilings are pressed metal and all the light fittings are original. Servant's call bells operated by battery are in place in the kitchen. The stone fence surrounding the house and native garden was built with stone from the underground tank excavation. The unusual garden sheds are circular corrugated iron. The buggy shed, stables and stallion yards are dropped log construction. The large and imposing stone barn possibly predates the house. The rafters in the barn are unmilled timber logs.
Historical notes of provenance	When Nanima Estate (known as "Towri Great Farm") was subdivided and auctioned in 1893 by Mrs C.H.R. Barton after the death of Mr C.H.R. Barton, Robert M. Smith the manager of "Towri" bought a portion which he called Nyrang.

SHI #2640142.	Noonee Nyrang Homestead State Heritage Inventory (SHI) listing
	Nyrang was held by the Smith family until purchased by Mr and Mrs Keith Holmes in 1975 and renamed Noonee Nyrang. Noonee Nyrang is a historic part of the Wellington district being built in a period of development and expansion.
Assessment of significance	Criteria a): Historically of importance as the home built for Mr W.G Smith who was prominent in the advances and development of agriculture during the 19th and early 20th Century Criteria c): Built of locally quarried bluestone, random cut and rough hewn, Noonee Nyrang is an excellent example of a home built with Federation influence. The outhouses are of especial importance: the drop log buggy shed, stables and stallion yard and the large and imposing stone barn which predates the house
Statement of significance	Historically of importance as the home built for Mr W.G Smith who was prominent in the advances and development of agriculture during the 19th and early 20th Century the residence is built of locally quarried bluestone, random cut and rough hewn and therefore Noonee Nyrang is an excellent example of a home built with Federation influence with local heritage significance. The outhouses are of especial importance: the drop log buggy shed, stables and stallion yard and the large and imposing stone barn which predates the house.

7.7.4 Historical background relevant to the Proposal site and Noonee Nyrang Homestead

Five years after the crossing of the Blue Mountains, explorers ventured down the lower reaches of the Macquarie River. Surveyor General John Oxley was the first European to describe the Dubbo region, with his first expedition to the Macquarie River Valley in 1817, and a second in 1818. Four years earlier George Evans had ventured along the river as far as present day Wellington, but it was Oxley who named the valley, Wellington Valley, after the Duke of Wellington who had defeated Napoleon at Waterloo in 1812.

A Colonial government outpost was established in Wellington in 1819. In 1823, Governor Brisbane sent Lieutenant Percy Simpson to establish a camp with convicts and soldiers. It was situated about 3 km south of the present townsite of Wellington on the high ground above the Bell River (on the eastern side of the Mitchell Highway).

Although wheat was successfully grown, the settlement was abandoned in 1831, becoming a government stock station. The abandoned government buildings were given to the Church Missionary Society for the opening of a mission for the local Aborigines. When a town was later proposed, the society objected on the grounds that this would interfere with its work and its mission. It was not until after the mission closed in the 1842 that a township developed on the site and was proclaimed as the town of Wellington in 1846.

Towards the end of the 19th century, wheat farming was widespread in the Dubbo districts, fuelled by population growth and the opening up of export markets at the time of world-wide wheat shortages during 1896-7. The Central Western Slopes wheat area trebled from 1897-1906 with the greatest expansion occurring in the Wellington, Dubbo and Narromine areas.

The Noonee Nyrang Homestead was built in 1894 and is a reflection of the prosperity of this period. The Noonee Nyrang land was initially part of the Nanima Estate known as "Towri Great Farm" purchased by Charles Hampen Barton in 1880. Charles Barton was the bank manager in Wellington from 1874 until 1900. Robert Mannacan Smith was the manager of Towri Estate and he purchased the holding from Charles Barton in 1895 which he called Nyrang. The Nyrang holding was a single paddock that was approximately

1500 acres. The property had a number of major changes with the house built in about 1894 followed by the wall around the back yard. The stone shed was also constructed as a grain shed which is noted to pre date the house. Various other buildings were built later as time permitted. The property was held by the Smith family until it was purchased in 1975 by the Holmes' and renamed Noonee Nyrang. Just after World War 2 the NSW government resumed part of the property to establish the Soil Conservation Centre. The current owners of the Noonee Nyrang property are the Inders.

7.7.5 NSW historical themes

An historical theme is a way of describing a major force or process which has contributed to history. Historical themes provide a context within which the heritage significance of an item can be understood, assessed and compared. In using themes to assess individual items it is useful to identify both local or regional themes applying to the item and the broader state theme to which the local or regional theme relates.

Table 7-52 NSW historical themes.

Australian theme	NSW theme	Description	Relevance to Narrawa Homestead
4 Building settlements, towns and cities	Towns, suburbs and villages	Activities associated with creating, planning and managing urban functions, landscapes and lifestyles in towns, suburbs and villages	The Noonee Nyrang Homestead is one of a number of surviving early 20th century homes that were built during a period of prosperity within the region.

7.7.6 Site inspection

Noonee Nyrang Homestead

A site inspection of the Noonee Nyrang Homestead property was undertaken on the 27 February 2018 by NGH Environmental Heritage Consultants. The inspection of the Noonee Nyrang Homestead included the following elements:

- Main house.
- Shed.
- Outbuilding and equipment.

The main house has been restored and a timber wall added at the rear of the house to enclose a courtyard forming an extra room that is now a functioning kitchen.

View south towards the northern elevation of the house and surrounding stone wall.

View south towards the northern elevation of the house with stone tank in foreground.

View east towards the south-western elevation of the house and verandah.

View north-west towards the south-eastern elevation of the main house and verandah.

Close up of decorative federation style finial on the southern elevation of the main house.

View east towards the north-western elevation of the house extension- a timber wall at the rear of the house.

Figure 7-29 Photos of the main house features.

The property includes a stone shed, out buildings and old farming equipment adjacent to the main house.

View west towards the eastern elevation of the stone shed

View east from inside stone shed towards the doors on the eastern elevation of the shed.

View north-west towards the south-eastern elevation of the stone shed.

View south-west with farming equipment and mile post marker to nearby towns with main house in the background.

View south towards the northern elevation of the shed with a wagon/ cart in it.

View west from inside shed of the wagon/ cart.

View east towards the western elevation of the Caretakers cottage.

View north towards the southern elevation of an associated shed.

Figure 7-30 Photos of stone shed, out buildings and old farming equipment surrounding the homestead.

Additional potential heritage items

A stone trough and culvert within the property boundary were also investigated, although they are not included on the Wellington LEP listing for the Noonee Nyrang Homestead. They appeared to be made of local stone with the style and construction technique similar to the house, fence and stone barn. As such these items should be included within the local heritage listing of the property. Council should be provided

with the information and given the opportunity to decide whether the trough and culvert should be included in the Wellington LEP listing. NGH Environmental has advised Council of these items however the results of the Council site inspection are currently unknown. Follow up consultation is in progress.

Figure 7-31 View west of the stone trough.

Figure 7-32 View south of the stone culvert at creek crossing.

A single European survey marker tree was also identified within the property boundary near the boundary with the SCS property. The tree is a mature living Black Box tree approximately 15 m in height in good condition that has a single oval shaped scar facing north. The scar has had significant regrowth with evidence of the regrowth being cut away left at the base of the tree. The letter and /or number 'I' can be noted as engraved however any other engraved writings are covered by regrowth and unable to be seen. A metal nail and metal axe marks were also noted. Local Nanima Parish maps were inspected however, the survey marker does not appear on any of the historic Parish maps inspected.

Figure 7-33 View south of European Survey Marker Tree.

Figure 7-34 Close-up of European Survey Marker Tree.

A site inspection of the SCS property was also undertaken on the 27 February 2018 by NGH Environmental Heritage Consultants, although it is not included on the Wellington LEP as having heritage value. The inspection of the SCS property included the research centre buildings and sheds. This site is a type of local

heritage that is often protected on LEPs. A SCS facility similar to the Wellington SCS facility is listed in the Orange LEP.

The NSW Parliament passed the *Soil Conservation Act 1938* (NSW) and this established the SCS as an agency to conserve soil resources, mitigate erosion and land degradation, and conserve water resources in NSW. Towards the end of World War II the SCS established a series of research stations to conduct research on soil conservation and erosion mitigation in NSW. The Wellington SCS facility was one of these research centres. This site was opened on the 28th of April 1944 and the major focus of the centre was studying gully erosion. The Wellington centre was the second SCS facility to open in NSW following the station at Cowra which is still operational today. Experts from the Wellington facility were accessible to all graziers and farmers in the area. Field Days were held for the benefit of the local community and primary producers were offered specialist advice. A plant nursery site was also operational at the Wellington Centre. The Wellington SCS was a valuable public service provided to assist farmers in the area to improve management practices and reduce erosion.

Main building

Small irrigation bays, glass house and sheds

Farm workshop sheds

Cottage building

Buildings to store chemicals

Sheds

Figure 7-35 Photos of SCS.

7.7.7 Potential impacts

Noonee Nyrang Homestead (Wellington LEP listed items)

Four heritage items listed on the Wellington LEP were identified during the desktop study as outlined above within and/or in close proximity to the proposed Wellington North Solar Pant and transmission lines. However, none of the listed items would be directly impacted upon by the proposed solar plant. The Noonee Nyrang Homestead, located with the Proposal site, would not be impacted physically, as shown in

the Figure 7-36 below. The potential impact would therefore be upon the aesthetic and historical context of the property.

The property, and the region, has historically been the site of agricultural activities and the solar plant would introduce solar panel structures into what has been agricultural farmland. The solar plant would therefore alter the historical context into which the Noonee Nyrang Homestead was built and has been associated with since the late 19th Century. Whilst this is an impact, the Noonee Nyrang Homestead would remain and the solar plant would eventually be decommissioned with the opportunity of returning the land to agricultural use.

The solar plant proposal is not considered likely to have a significant impact in accordance with the NSW Heritage Act, the EP&A Act, or the EPBC Act, in terms of non-Aboriginal heritage and specifically upon the locally listed Noonee Nyrang Homestead.

Narrawa, Keston and Nanima Homesteads (Wellington LEP listed items)

The remaining three heritage items listed on the Wellington LEP (Narrawa, Keston and Nanima homesteads) would not be impacted physically, as shown in the Figure 7-37 below. The potential impact would be visual and therefore would be upon the aesthetic and historical values of the three properties.

Given that the western transmission line follows existing power lines to the substation the impact to the aesthetic and historical values to the Keston and Nanima homesteads is considered to be low. Narrawa homestead would itself be surrounded by the proposed First Solar Wellington Solar Farm and the visual impact from the Wellington North Solar Plant is consequently considered to be low.

The solar plant proposal is not considered likely to have a significant impact in accordance with the NSW Heritage Act, the EP&A Act, or the EPBC Act, in terms of non-Aboriginal heritage and specifically upon the locally listed Narrawa, Keston and Nanima homesteads.

Stone culvert and trough (non- listed items)

The stone culvert and trough are not listed on the Wellington Heritage Inventory site card for the Noonee Nyrang Homestead however, they appeared to be made of local stone with the style and construction technique similar to the house, fence and stone barn.

Consultation with Dubbo Council's Planning Services Team Leader and Heritage Advisor (22 June 2018), which included site inspection, has determined that these features have no special significance. Council would not object to their removal.

Survey marker tree (non- listed item)

The European survey marker tree is not listed on any heritage database including the Wellington LEP.

Consultation with Dubbo Council's Planning Services Team Leader and Heritage Advisor (22 June 2018), which included site inspection, has determined that the tree has no special significance. Council would not object to its removal.

SCS facility (non- listed item)

While the Wellington SCS facility is not listed on the Wellington LEP as having local heritage significance, it has contributed to significant developments in the research of soil conservation and land management practices in NSW and is considered likely to be of local significance. While the buildings connected to the SCS would not be impacted physically by the development, the principal impact would be visual and therefore would be upon any aesthetic values of the centre.

Consultation with Dubbo Council's Planning Services Team Leader and Heritage Advisor (22 June 2018), which included site inspection, has determined that the site has no social or historical significance.

Figure 7-36 Noonee Nyrang Homestead and out buildings and the proposed development footprint for the Wellington North Solar Plant

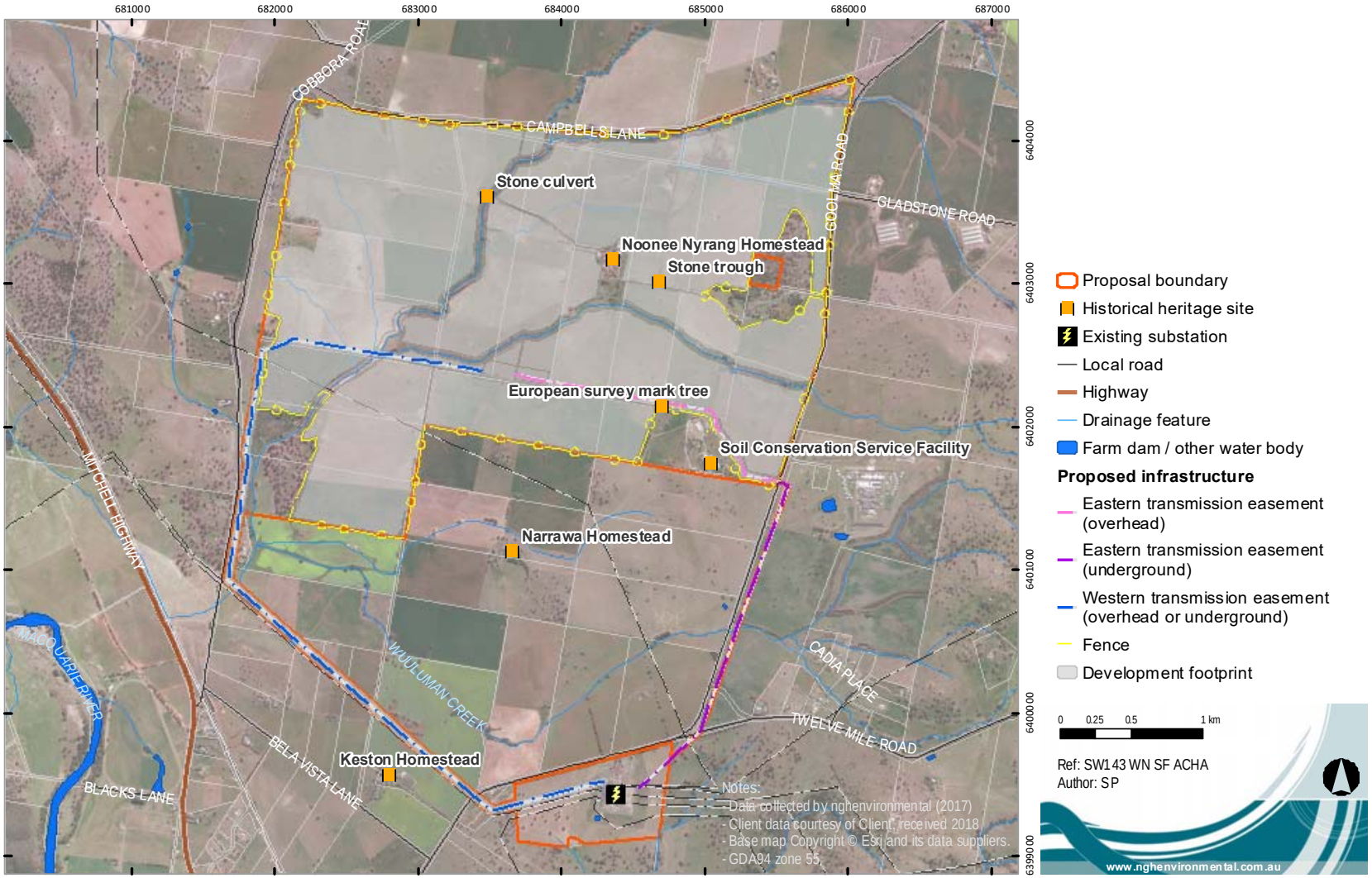

Figure 7-37 Historical items (listed and non-listed) within and in close proximity to the solar plant Proposal site.

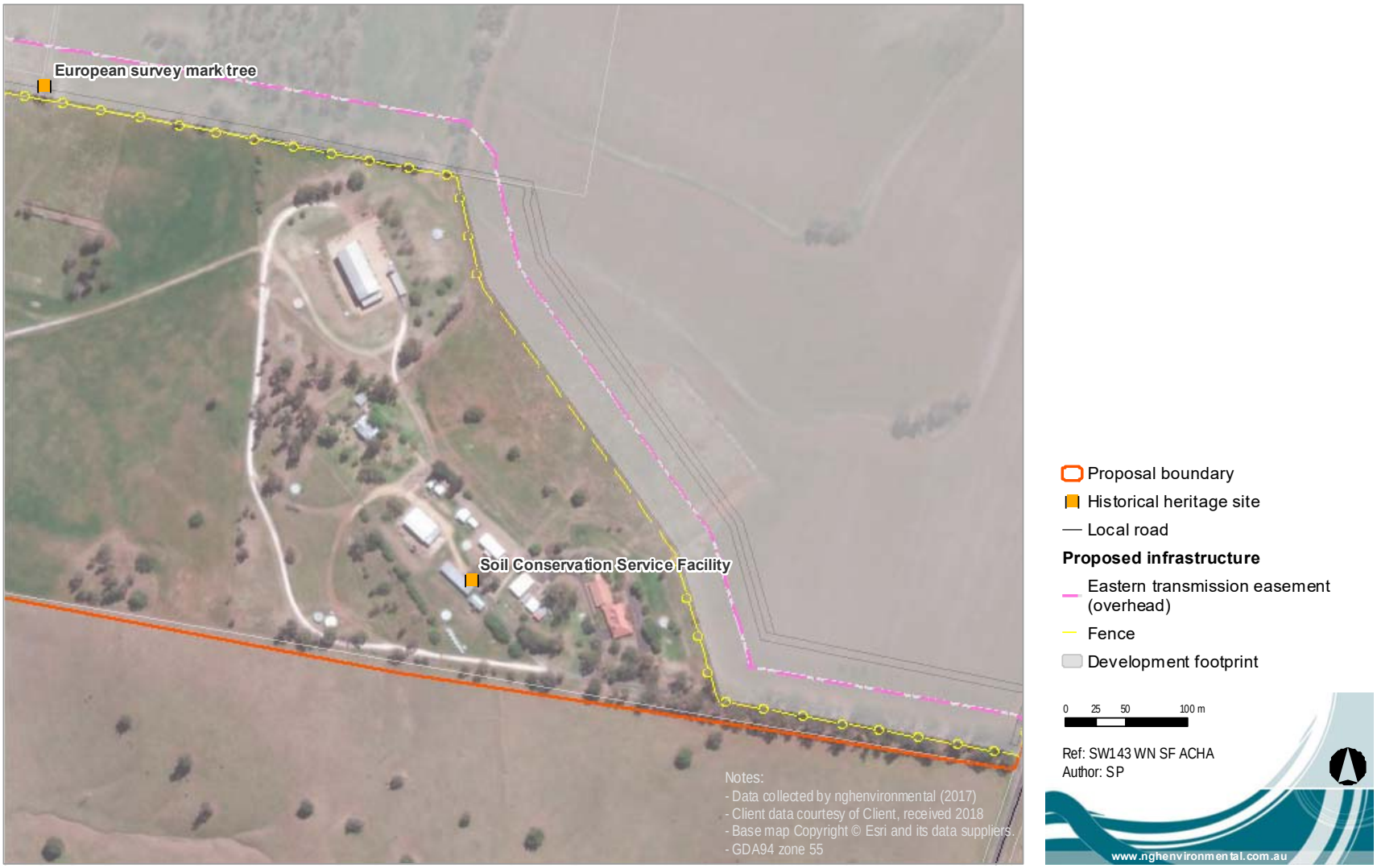

Figure 7-38 Wellington Soil Conservation Research Centre and the proposed development footprint for the Wellington North Solar Plant

7.7.8 Safeguards and mitigation measures

Table 2 Safeguards and mitigation measures for Non-Aboriginal Heritage

PC: Pre Construction, C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and mitigation measures	PC/C	O	D
1	• Should an item of historic heritage be identified, the Heritage Division (OEH) would be contacted prior to further work being carried out in the vicinity.	C	O	D
2	• The Noonee Nyrang Homestead would not be altered whilst in use as an Office and Maintenance building for the solar plant.	C	O	D
3	• The existing outbuildings and stone shed around the Noonee Nyrang Homestead would be maintained and not altered.	C	O	D

7.8 FLOODING

A Hydrological and Hydraulic Analysis Report was prepared by Footprint NSW Pty Ltd to assess potential impacts of the Proposal on existing hydrological conditions of the site. The report has been provided as Appendix J and summarised below.

7.8.1 Existing environment

The Wellington Local Flood Plan covers preparedness measures, response operations and flood recovery. Flooding can occur at any time of the year in the Wellington area, but floods are most common in the winter months. There have been more floods on the Macquarie River in June, July and August than in any other months. At different times of the year, different mechanisms are responsible for producing floods. Flooding in the Wellington area usually results from:

- Well-developed low-pressure troughs.
- Cyclonic depressions.
- High-intensity, short-duration convective thunderstorms.

Flooding in Wellington itself is influenced by the magnitude and synchronisation of flows in the Macquarie and Bell rivers. Flood waters enter the town first by surcharging the banks of the Bell River either due to high flows in the Bell River alone, or in conjunction with backwater flooding from the Macquarie River. The Wellington Local Flood Plan states that the 1955 flood is the largest flood to have occurred in Wellington this century, reaching a height of 14.66m on the Macquarie River gauge, at Wellington Bridge.

The Wellington Local Flood Plan identifies rural roads that may be affected by local flooding; the only road of relevance to the Proposal site is the Mitchell Highway. The Australian Flood Risk Portal (Geoscience Australia, 2017) indicates that water is not detected at the site during any observations (Figure 7-39).

The Floodplain Development Manual (NSW Government 2005) sets out state policies and strategies in relation to the management of flood risk and development control in urban and rural floodplain areas across NSW. The solar plant site is not located within the 'Flood Planning Area' shown in the Wellington LEP 2012 (Figure 7-40). The Flood Planning Area is the area of land below the Flood Planning Level (FPL)

and thus subject to flood related development controls. The FPL is equivalent to the level of a 1:100 average recurrent interval (ARI) flood event, plus 0.5m freeboard.

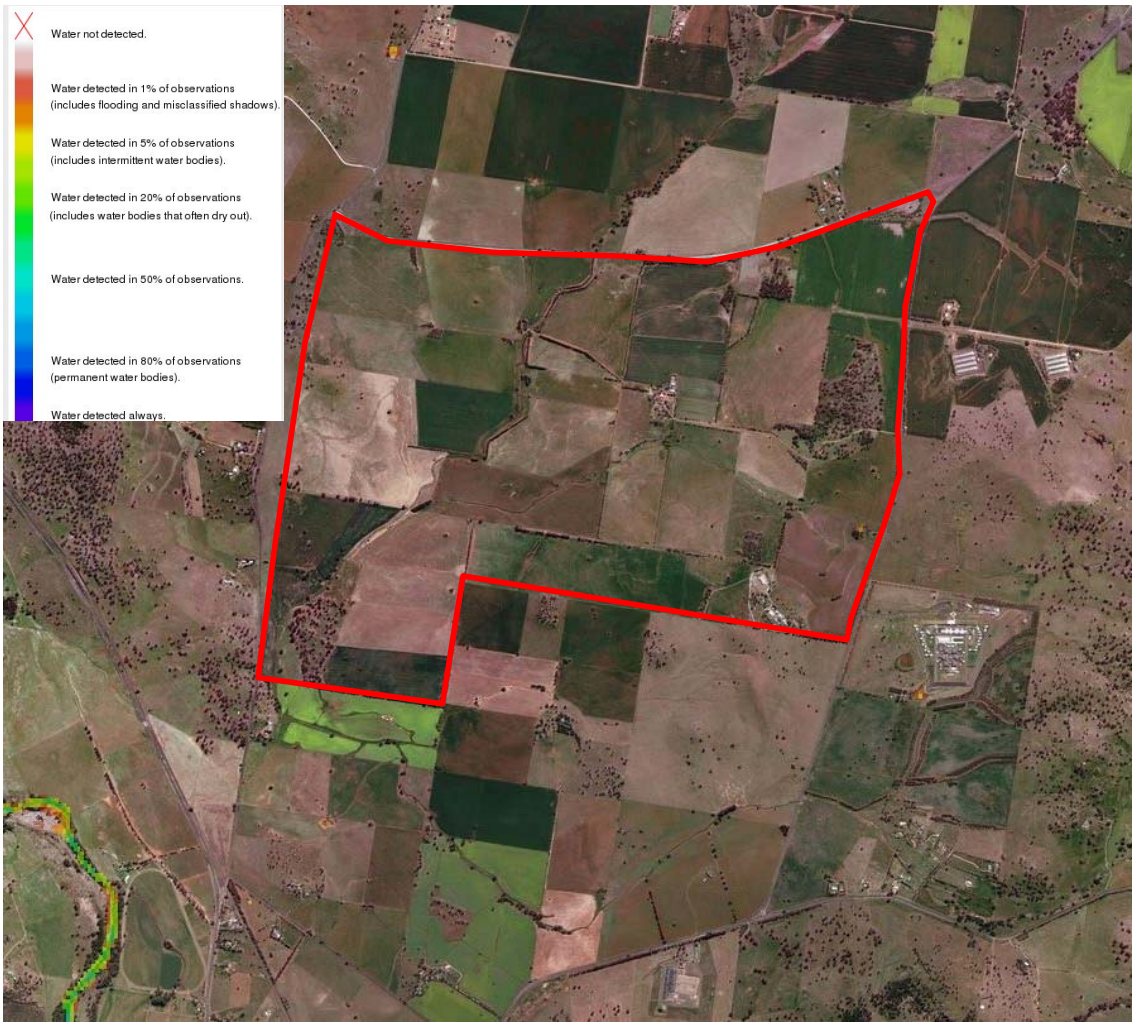

Figure 7-39 Flood Risk Information Map, solar plant site in red (i.e. excludes transmission lines; Geoscience Australia 2018)

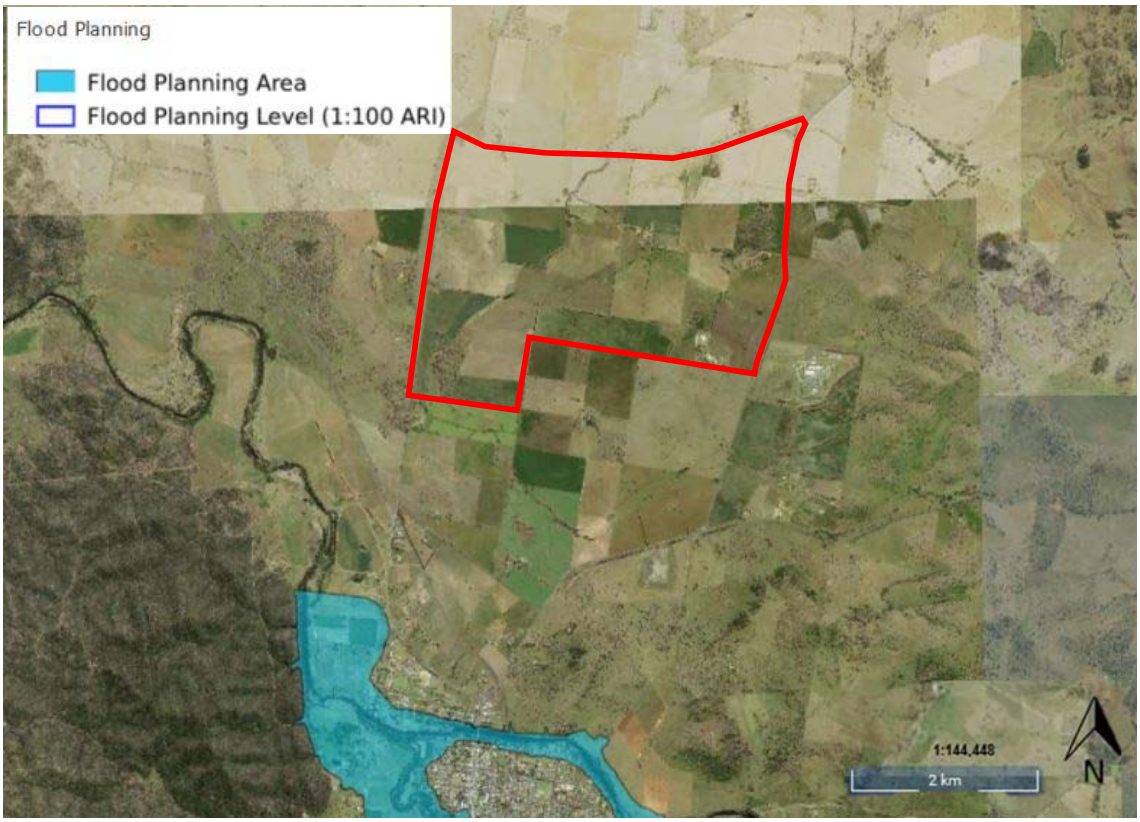

Figure 7-40 Flood Planning Area, solar plant site in red (DPE 2018).

The solar plant site consists of an area of approximately 970ha and is traversed be several unnamed tributaries of Wuuluman Creek. The main tributary traverses north to south west through the western half of the site. The other tributaries traverse north to south and east to west through the site (refer to Figure 7-41). All watercourses are described as ephemeral and would only contain flowing water during rainfall. Wuuluman Creek is a tributary of the Macquarie River, which is located approximately 1.3km west of the Proposal site.

Elevations over the site range from RL310 m AHD to RL390m AHD as depicted in Figure 7-41.

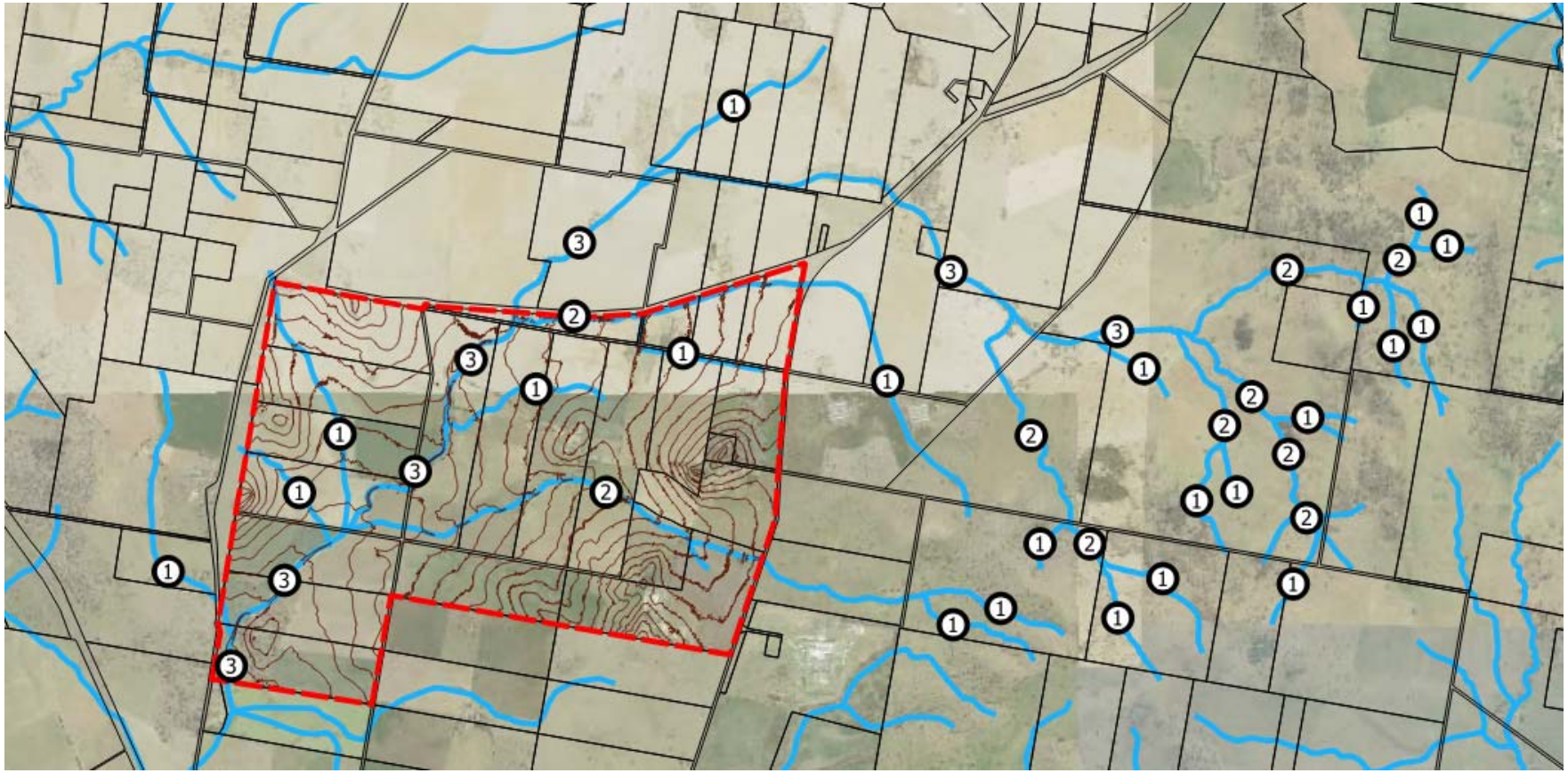

Figure 7-41 Waterways and stream orders (blue) within the solar plant site (red) (Footprint, 2018)

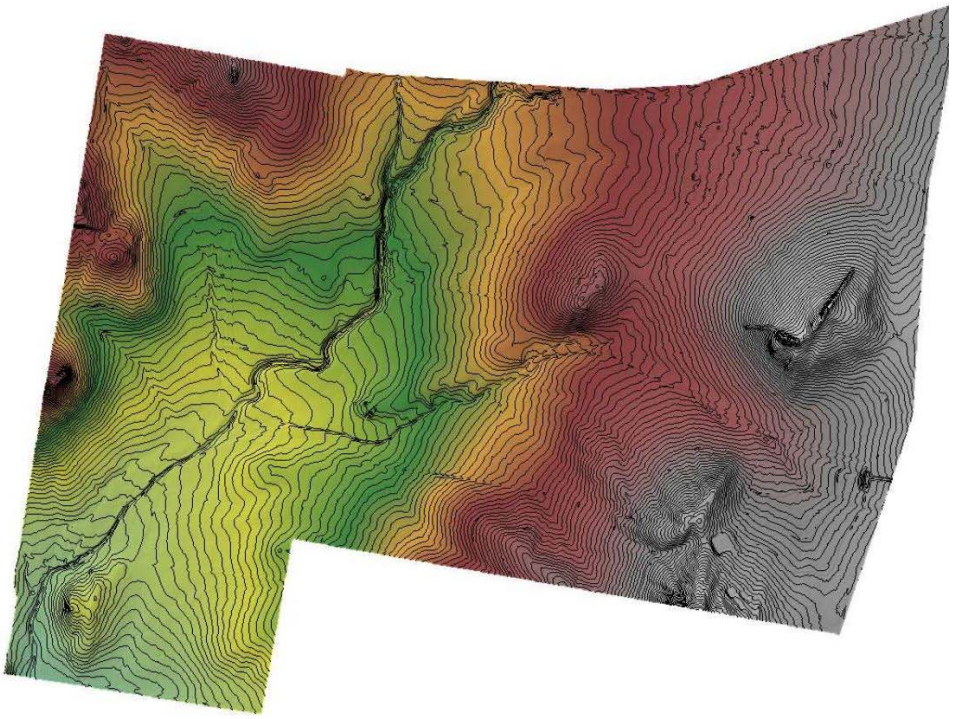

Figure 7-42 Terrain analysis over solar plant site (1m contour interval).

Hydrological and Hydraulic modelling

The results of the hydrological and hydraulic modelling show that flooding in all events is largely confined to the existing watercourse channels with minimal out of bank flows of any significant depth except for that area downstream of the junction of the northern and eastern tributaries in the south-western portion of the site where the watercourse is less defined, and the overbanks are typically wider and flatter. In this area flood depths of up to about 600mm are predicted to occur for distances up to about 150m from the main channel in the 1% AEP event.

7.8.2 Potential impacts

Construction and decommissioning

Flood impacts can relate to the potential of a development to increase the risk of flood occurrence or severity, or the potential to create hazards in the event of a flood actually affecting the site.

Parts of the site may be at risk of temporary minor flooding during high rainfall events and high flows through the south western portion of the site. Temporary localised flooding has the potential to interfere with construction and poses a safety risk for workers onsite. The Proposal has potential to create the following hazards in the event of a localised flood:

- Electrical hazards to staff, emergency workers and assets due inundation of infrastructure.
- Pollution risks from leakage of stored pollutants (hydrocarbons, pesticides, solvents).
- Physical damage from the mobilisation of components in flood waters.

The design of buildings, equipment foundations and footings would consider the potential for flooding at the site. No components are considered susceptible to becoming mobile and entering waterways during

construction. All potential pollutants stored on-site during construction would be stored in accordance with HAZMAT requirements and bunded. A flood response plan would be developed to manage the safety of workers and equipment in the event of extended flooding in the region.

Maintaining grass cover across the site as far as practicable during construction, particularly within the existing waterways, would help maintain soil stability during floods, and would improve soil permeability over time.

Operation

The addition of the solar arrays and their associated infrastructure would result in an increase in surface roughness over the site, from grazed/cropped pasture to a regular grid of steel piers. The change in floodplain roughness associated with the proposed development was assessed using the Modified Cowan Method for Floodplain Roughness and is shown in Table 7-50. It demonstrates that the roughness is anticipated to slightly increase because of the development.

Table 7-53 Modified Cowan method for estimation of floodplain roughness.

Roughness component	Existing (grazed pasture)	Proposed (solar array)
Floodplain material (n_b)	0.020	0.020
Degree of irregularity (n_1)	0.001	0.001
Variation in floodplain cross section (n_2)	N/A	N/A
Effect of obstructions (n_3)	0.000	0.003[1]
Amount of vegetation (n_4)	0.004	0.004
Total (n)	**0.025**	**0.028**

[1] Based on an obstruction of 2.5% of the available flow area (i.e. 150mm piers at 6m intervals)

The slight increase in surface roughness would produce localised increases in flood levels in the vicinity of the arrays. This increase is predicted to be in the order of 30mm, with increases typically in the range of -10mm to +20mm. The predicted changes in flood levels would be limited to the solar plant site. Additionally, the proposed works are not anticipated to adversely increase the velocity in any of the watercourses on their associated overbanks therefore ensuring the stability of their bed and banks and minimising the erosion potential over the site.

Localised flooding during operation may pose the following risks:

- A safety risk for workers and assets, where electrical infrastructure becomes inundated.
- A pollution risk, where stored pollutants may be leaked to the environment.
- A local flooding risk should any components become mobile in flood waters.

Design of footings for electrical componentry would consider flood risk. All infrastructure would be located above the 1% Annual Exceedance Probability (AEP) flood level and would be designed to withstand periods of local flooding. No components are considered susceptible to becoming mobile and entering waterways.

7.8.3 Safeguards and mitigation measures

Table 7-54 Safeguards and mitigation measures for flooding impacts

C: Construction, O: Operation, D: Decommissioning

ID	Safeguards and Mitigation Measures	C	O	D
1	• The design of buildings, equipment foundations and footings for electrical componentry and panel mounts would be designed to avoid the 1% AEP flood level to minimise impacts from potential flooding including: o The solar array mounting piers are designed to withstand the forces of floodwater (including any potential debris loading) up to the 1% AEP flood event, giving regard to the depth and velocity of floodwaters. o The mounting height of the solar module frames would be designed such that the lower edge of the module is clear of the predicted 1% AEP flood level. o All electrical infrastructure, including inverters, would be located above the 1% AEP flood level. o Where electrical cabling is required to be constructed below the 1% AEP flood level it would be capable of continuous submergence in water. o The proposed perimeter security fencing would be constructed in a manner which does not adversely affect the flow of floodwater and should be designed to withstand the forces of floodwater, or collapse in a controlled manner to prevent impediment to floodwater.	Design		
2	• An Emergency Response Plan incorporating a Flood Response Plan would be prepared prior to construction covering all phases of the Proposal. The plan would: o Detail who would be responsible for monitoring the flood threat and how this is to be done. o Detail specific response measures to ensure site safety and environmental protection. o Outline a process for removing any necessary equipment and materials offsite and out of flood risk areas (i.e. rotate array modules to provide maximum clearance of the predicted flood level). o Consider site access in the event that some tracks become flooded. o Establish an evacuation point. o Define communication protocols with emergency services agencies.	C	O	D

7.9 TRAFFIC TRANSPORT AND SAFETY

GHD (2018) prepared a Traffic Impact Assessment for the proposed construction and operation of the Wellington North Solar Plant. The report is summarised below and provided in full in Appendix K.

7.9.1 Existing environment

The proposed Wellington North Solar Plant is located within Dubbo Regional Council LGA on the western side of Goolma Road, south-west of its intersection with Campbells Lane. Primary access to the proposed

Wellington North Solar Plant would be off Campbells Lane via Cobbora Road, which currently consists of a give way priority controlled intersection located to the west of the site. South of the site is a local road network (Bella Vista Lane) providing access to the residential dwellings located within the residential zone.

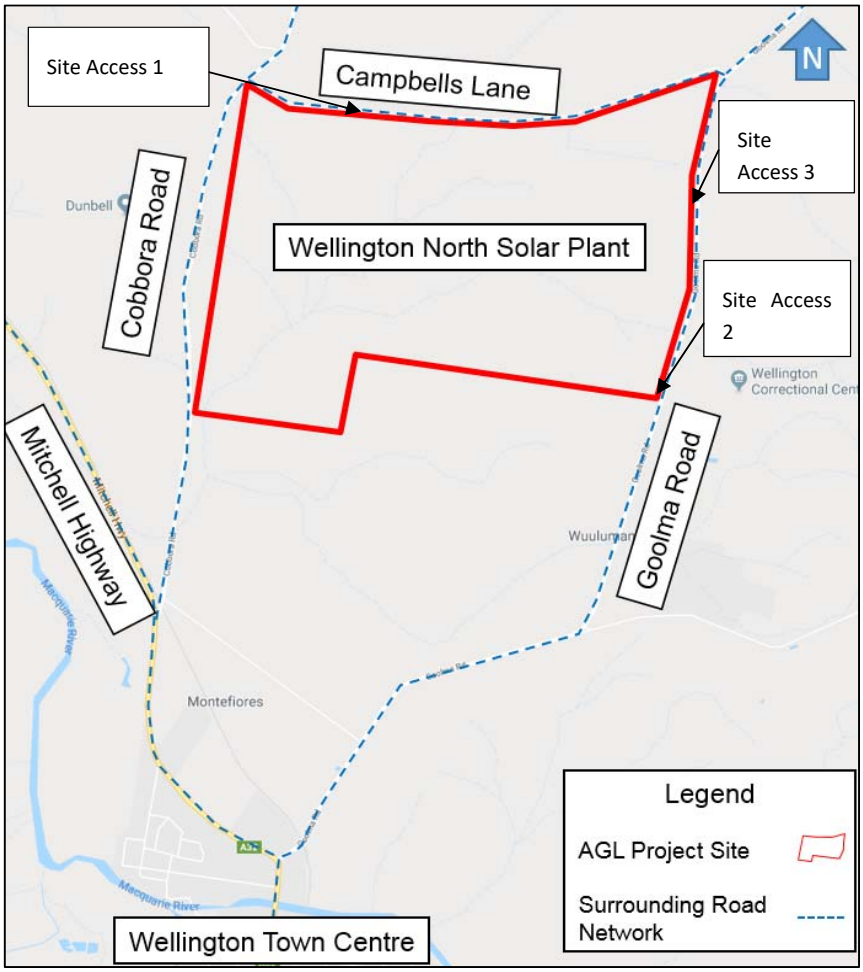

Figure 7-43 Road network near Proposal site (GHD 2018).

Existing road network characteristics

The surrounding road network of the proposed Wellington North Solar Plant (Figure 7-42) includes:

- **Cobbora Road** (Figure 7-43) which acts as a regional road in the vicinity of the Wellington North Solar Plant running in a north-south alignment. Cobbora Road connects to Mitchell Highway to the south and Golden Highway to the north with priority controlled intersections at both locations. Access to the Wellington North Solar Plant from Cobbora Road is via its intersection with Campbells Lane at a give-way priority controlled intersection.
- **Goolma Road** (Figure 7-44) functions as a sub-arterial road with a north-south alignment. The road provides access to the Wellington North Solar Plant via its intersection with Campbells Lane, east of the site. Goolma Road runs between Gulgong in the north and Wellington in the south, forming priority controlled intersections at Mitchell Highway and Campbells Lane.

- **Campbells Lane** (Figure 7-45) is located along the northern boundary of the Wellington North Solar Plant and would act as the primary access to the solar plant. Campbells Lane is a local road running in an east-west alignment from Goolma Road, east of the site, to Cobbora Road in the west. Campbells Lane forms part of a priority controlled intersection at both these locations.
- **Bella Vista Lane** (Figure 7-46) is located south of the Wellington North Solar Plant. Bella Vista Lane is a local road running in an east-west alignment from Goolma Road, east of the site, to Cobbora Road in the west. Bella Vista Lane forms part of a priority controlled intersection at both these locations.
- **Mitchell Highway** (Figure 7-47) forms part of the arterial road network and runs from Dubbo in the north to Bathurst to the south. In the vicinity of the Wellington North Solar Plant, Mitchell Highway has a north-south alignment and forms priority controlled intersections at Goolma Road and Cobbora Road. Mitchell Highway is a state road providing access from the Wellington North Solar Plant to Wellington town centre. Access to the Wellington North Solar Plant via Mitchell Highway is provided through its intersection with Cobbora Road south-west of the site and its intersection with Goolma Road south of the site.

Key features of these roads are outlined in Table 7-52.

Table 7-55 Road network key features.

Feature	Cobbora Road	Goolma Road	Campbells Lane	Bella Vista Lane	Mitchell Highway
Carriageway	There is typically 1 travel lane in each direction with an undivided carriageway.	There is a single travel lane in each direction; with an undivided carriageway. A right turn lane is provided northbound on Goolma Road to access the Wellington and Macquarie Correctional Centre.	There are 1 travel lanes in each direction; with an undivided carriageway.	There is 1 travel lane in each direction; with an undivided carriageway with a gross load limit of 20 tonne.	There is typically 1 travel lane in each direction with an undivided carriageway. An additional turning lane is provided in both directions on the approach to Cobbora Road and a right turn lane from Mitchell Highway northbound into Goolma Road.
Parking	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted

Feature	Cobbora Road	Goolma Road	Campbells Lane	Bella Vista Lane	Mitchell Highway
Speed Limit	No sign posted speed limit (100km/h).	100km/h.	No sign posted speed limit (100km/h).	No sign posted speed limit (100km/h).	110km/h with 80km/h in the southbound direction near its intersection with Cobbora Road and Goolma Road.
Pedestrian Facilities	No dedicated pedestrian facilities.	No dedicated pedestrian facilities.	No dedicated pedestrian facilities.	No dedicated pedestrian facilities.	No dedicated pedestrian facilities.
Bicycle Facilities	No dedicated bicycle facilities.	No dedicated bicycle facilities.	No dedicated bicycle facilities.	No dedicated bicycle facilities.	No dedicated bicycle facilities.
Public Transport	No dedicated public transport facilities, however a level crossing exists across Cobbora Road approximately 80 m north of the Mitchell Highway.	No dedicated public transport facilities.	No dedicated public transport facilities.	No dedicated public transport facilities.	No dedicated public transport facilities within the vicinity of the site. Nearest bus stops are located on Mitchell Highway near Gobolion Street, on both sides of the road.

Figure 7-44 Cobbora Road west of the site (looking south).

Figure 7-45 Goolma Road east of the site (looking south).

Figure 7-46 Campbells Lane north of the site (looking west).

Figure 7-47 Bela Vista Lane north of the site (looking west).

Figure 7-48 Mitchell Highway west of the site (looking north).

Existing road network performance

EXISTING TRAFFIC VOLUMES

In order to identify the existing traffic volumes in proximity to the site, seven-day tube count data was undertaken by Matrix Traffic and Transport Data between 28 February and 6 March 2018 at the following three locations and shown in Figure 7-48.

- Cobbora Road (approximately 500m north of Bela Vista Lane).
- Goolma Road (approximately 300m south of the Wellington Correction Centre access).
- Campbells Lane (approximately 400m west of Goolma Road – approximately mid-way between property access and 90 degree curve in the road).

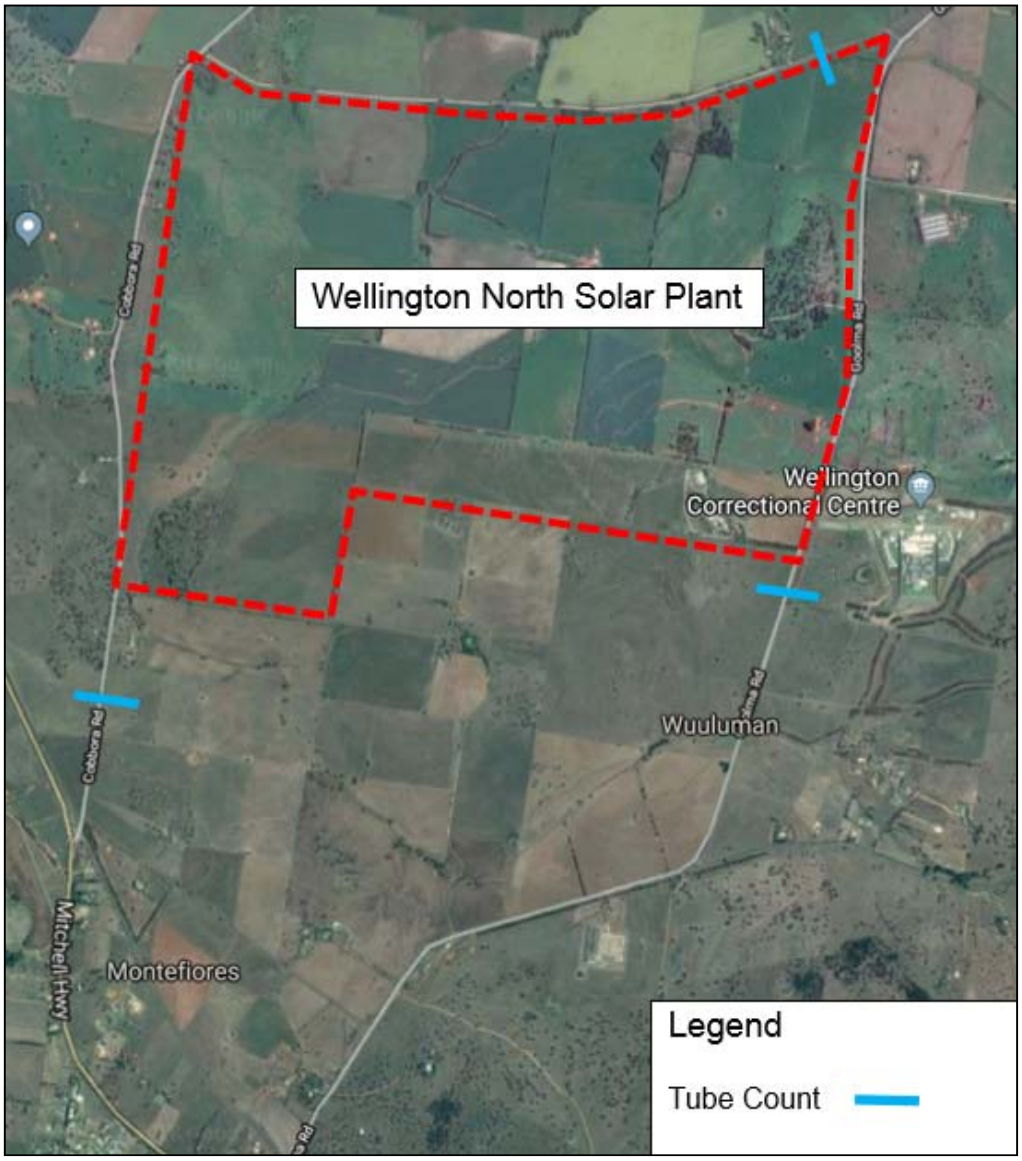

Figure 7-49 Traffic survey locations.

Figure 7-49, Table 7-53 and Table 7-54 summarise the results of the traffic counts.

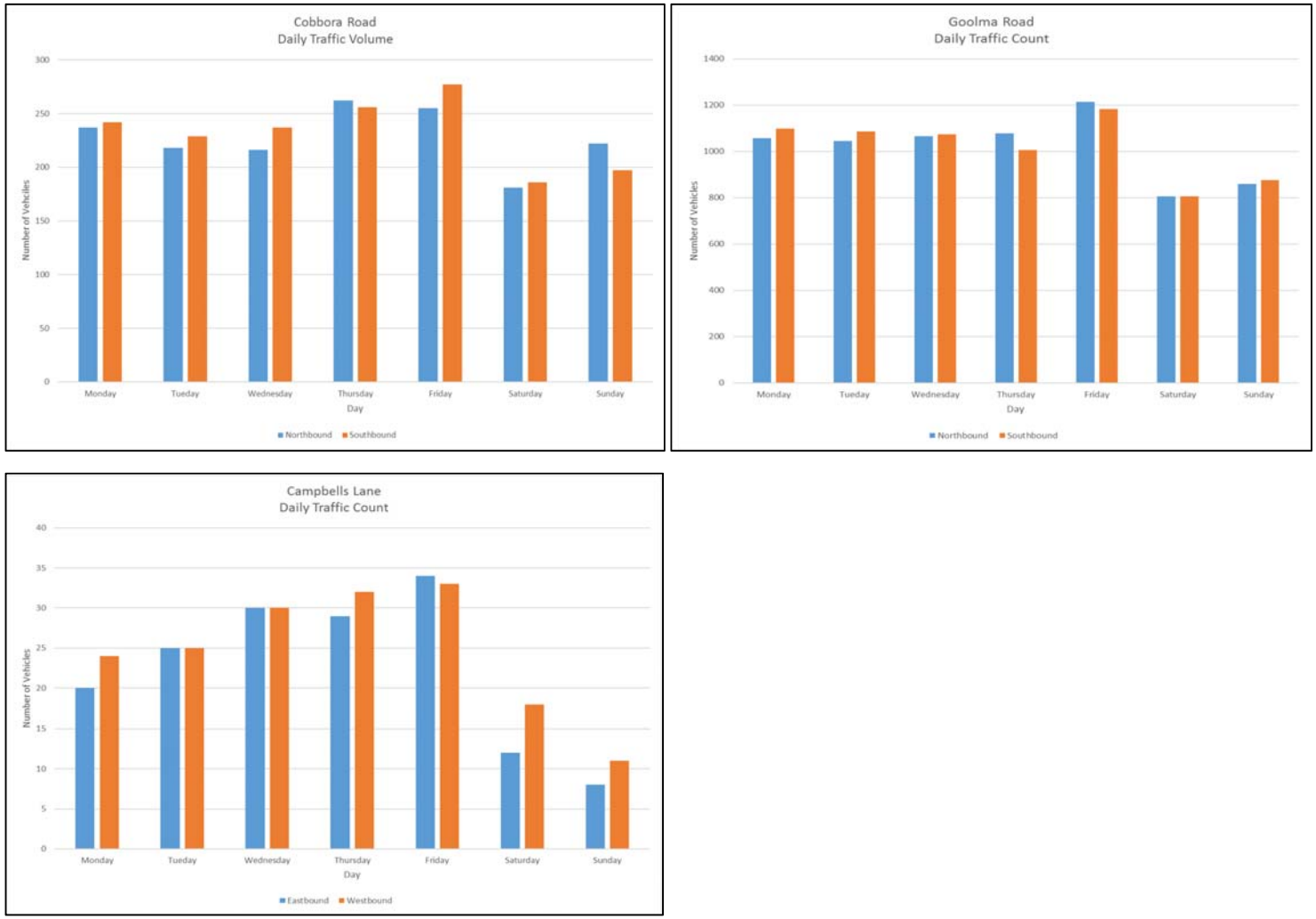

Figure 7-50 Daily traffic volumes

Table 7-56 Peak hour average surveyed traffic volume on the surrounding road network

	Cobbora Road			Goolma Road			Campbells Lane		
	North-bound	**South-bound**	**Total**	**North-bound**	**South-bound**	**Total**	**East-bound**	**West-bound**	**Total**
Average weekday AM peak hour (veh/h)*	20	14	**34**	157	44	**201**	4	1	**5**
Average weekday PM peak hour (veh/h)*	19	29	**49**	66	135	**201**	3	5	**8**
Saturday peak hour (veh/h)*	16	20	**36**	57	94	**151**	1	4	**5**

Table 7-57 Key traffic data summary.

Key data description	Cobbora Road	Goolma Road	Campbells Lane
Weekday % heavy vehicles	25%	18%	12%
Weekend % heavy vehicles	12%	11%	7%
85 percentile speed	98.1km/h	104.7km/h	91.9km/h

CRASH DATA REVIEW

GHD (2018) utilised the Transport for NSW Centre for Road safety website to review the crash statistics for a five-year period (2012-2016) for roads within proximity of the proposed Wellington North Solar Plant. Crash locations on Goolma Road and Cobbora Road near the proposed Wellington North Solar Plant are shown in Figure 7-50.

There were a total of four (4) crashes recorded within proximity to the Wellington North Solar Plant over the five year period between 2012 – 2016. Of the four crashes, three (3) were recorded on Goolma Road and one (1) was located on Cobbora Road. The recorded crashes resulted in two (2) moderate injuries. The causes of the crashes included:

- Two (2) of the crashes were a result of vehicles striking an animal (one crash on Cobbora Road and one crash on Goolma Road).
- One (1) crash was a result of a vehicle colliding with another vehicle emerging from an adjacent driveway (Goolma Road).
- One (1) crash occurred when a vehicle steered off road to the left and struck an object (Goolma Road).

Figure 7-51 Study area crash data (Transport for NSW Centre for Road Safety – Modified by GHD).

Other transport infrastructure

Given the rural nature of the location, there are no formalised pedestrian or cycle facilities on the road network surrounding the site. Wellington Railway Station, located approximately 7km south of the site, is serviced by regular train services to Dubbo, Orange, Bathurst, Lithgow and Sydney. Charter coach services also operate between Wellington and major centres. A local bus service (TLDW – Wellington to Dubbo) operates around the town of Wellington, operates four daily services Monday to Friday. There are no public transport services that run along Goolma Road or Cobbora Road to the site. Accordingly, the vast majority of trips generated by the construction activity and workers are expected to occur using private vehicles. There is no designated school bus route within proximity of the site.

7.9.2 Potential impacts

Construction impacts

The potential traffic, transport and road safety impacts associated with construction of the Proposal relate primarily to the increased numbers of large vehicles on the road network which may lead to:

- Increased collision risks (other vehicles, pedestrians, stock and wildlife).
- Damage to road infrastructure.
- Associated noise and dust (particularly where traffic is on unsealed roads) which may adversely affect nearby receivers.
- Disruption to existing services (school buses).
- Reduction of the level of service on the road caused by platooning of construction traffic.

INCREASED TRAFFIC GENERATION

Two separated options are being considered for the construction of Wellington North Solar Plant:

- 2MW block 420W modules; and
- 5MW block 340W modules.

A review on the impacts to the road network utilising the 5MW block 340W module configuration was adopted, as this construction configuration generated the worst case peak daily trip generation of 69 one-way vehicle movements (or 138 two way trips).

During peak construction, it is anticipated that up to 250 site personnel would be required to undertake the works. A shuttle bus system would be in place to transport workers to the site consisting of a 20 seater bus. This would generate up to 20 vehicle movement (10 in and 10 out) during a peak hour period, equating to 40 vehicle movements daily. Additionally, an extra allowance has also been made for up to thirty people to travel in light vehicles (assuming 2 people per vehicle) to access the site, generating up to 17 one way trips (inbound in the AM and outbound in the PM peak periods).

Within the peak construction period it is estimated daily there would be up to 34 light vehicle and 102 heavy vehicle movements. This results in approximately 75 % of the construction traffic activity would be heavy vehicles.

The number of oversized vehicles is low within the construction of the Wellington North Solar Plant with up to eight two-way movements within the later months of the construction period (month 14 and 15). Oversized vehicles would be utilised to transport transformers to the site during the construction phase, which is anticipated to be arranging from the Port of Newcastle located approximately 370 km west of Wellington.

For a worst-case scenario for the impacts of the road network, it has been assumed that the peak traffic associated with construction activity would be during the arrival and departures of the site workers and occur within the road network AM and PM peak hour period.

It is expected that the remaining vehicle movements (84 two way trips) generated by the construction activity would be spread throughout the day with up to 10 (approx. 10%) two-way trips occurring within the same peak hour of the workers arrival and departure period.

Construction traffic would arrive via The Golden Highway (45 km north of the site) along Cobbora Road and turn left in the Campbells Lane before accessing the site. Egress would be via the same route. It has been assumed that workers would arrive from the south (the town of Wellington), utilising Cobbora Road and

Campbells Lane and the then the site access. This route is proposed to utilise the regional road network with lower traffic volumes to minimise road network impacts.

The peak hour AM and PM movements and approach routes within the vicinity of the site are outlined in Figure 7-51 and Figure 7-52 respectively.

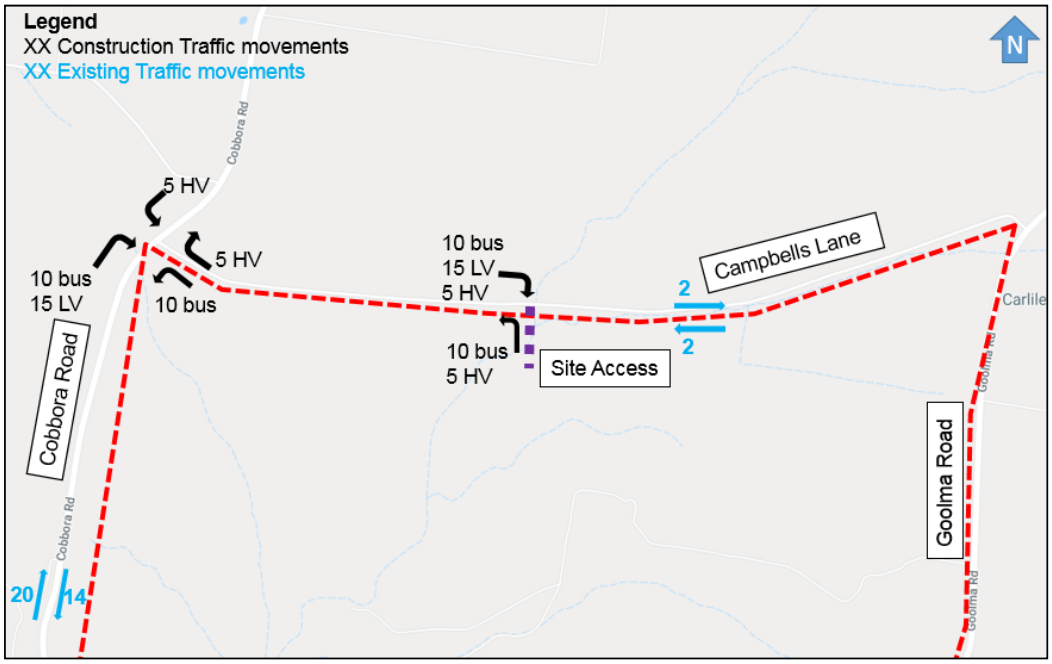

Figure 7-52 AM peak hour construction vehicle movements

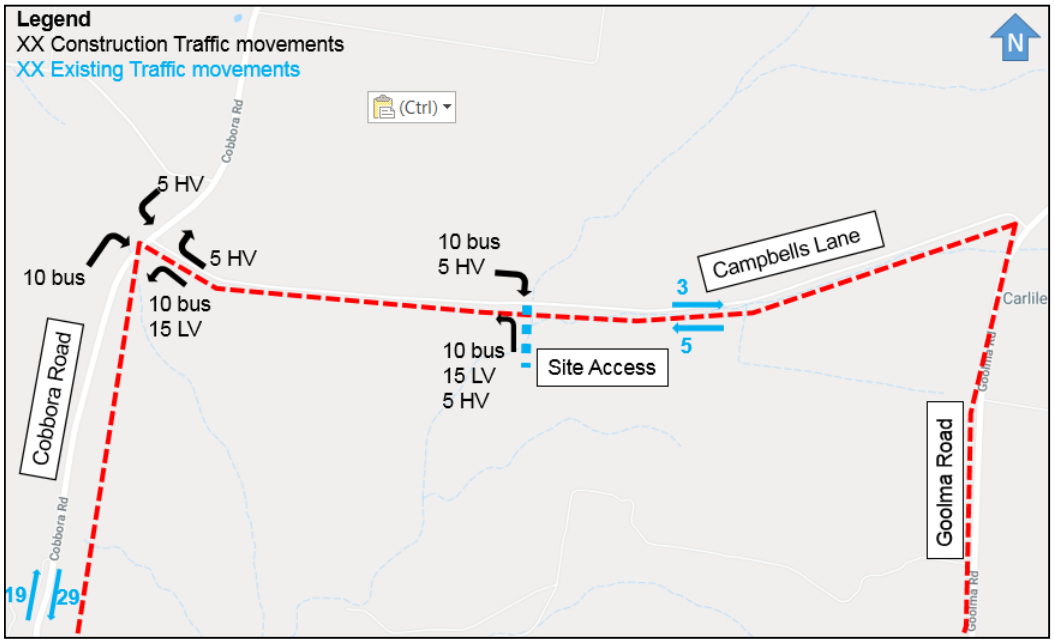

Figure 7-53 PM peak hour construction vehicle movements.

Based on the above information summary of estimated construction vehicle movements, a review of the existing peak traffic and combined construction movement was undertaken with reference to RMS Guide to Generating Developments (2002). This outlines mid-block road capacity Levels of Service based on traffic flows per direction per lane to guide road capacity Level of Service as outlined in Table 7-55.

Table 7-58 Mid-block level of service (peak flows per direction)

Level of Service	Peak hour volume (vph*) One lane	Peak hour volume (vph*) Two lane
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Source: Guide to Traffic Generating Developments (Roads and Maritime Services 2002)

**Note vph = vehicles per hour*

Table 7-56 outlines the Level of Service of the road network with respect to the mid-block level of service.

Table 7-59 Peak hour mid-block level of service

Location	Existing vehicles (two-way)	Additional vehicles (two-way)	Total vehicles (two-way)	Level of Service
AM peak hour				
Cobbora Road (North of Campbells Lane)	34	10	44	A
Cobbora Road (south of Campbells Lane)	34	35	69	A
Campbells Lane	4	45	49	A
PM peak				
Cobbora Road (North of Campbells Lane)	49	10	59	A
Cobbora Road (south of Campbells Lane)	49	35	84	A
Campbells Lane	8	45	53	A

The above review shows that the mid-block Level of Service is good. However, it is recommended that the existing road environment pavement conditions be reviewed and a bituminous paved surface is provided on Campbells Lane to reduce pavement degradation and improved driver safety.

INCREASED COLLISION RISK

Additional works close to public roads would present hazards. These include the development of some sections of the transmission easement. If the eastern underground option is pursued, underboring (requiring entry and exit pits adjacent to the road) would occur beneath Goolma Road. Additionally, trenching adjacent to Goolma Road would be required.

The increased vehicle collision risk however, relates primarily to traffic entering and exiting the solar plant site at the site access off Campbells Lane, and traffic entering/exiting Cobbora Road at its intersections with Campbells Lane and Mitchell Highway. This is related to both oncoming traffic and traffic following behind turning vehicles. Slow moving vehicles may also present a risk to through traffic, requiring signage to warn motorists of the construction timeframes.

It is considered that a Basic Right and Left Turn Treatment (BAR/BAL) is suitable for both the Cobbora Road and Campbells Lane and Campbells Lane and site access. Currently, neither intersection provides this type of treatment, with no shoulder or road widening provided on the major road. It is considered that shoulder widening be provided on the western and eastern road alignment on Cobbora Road at Campbells Lane and a new intersection at site access be constructed in line with a BAR/BAL treatment as shown in Figure 4-9. The turn treatment would be designed to accommodate articulated vehicles up to 19 m in length. Larger vehicles would require special permit and traffic management when required. Based aerial imagery, appropriate sightlines can also be achieved for the site access and intersections.

The majority of the construction traffic would be standard vehicles used by onsite workers, limited overmass or oversize haulage vehicles. As such there are opportunities to rationalise traffic movements, such as through the provision of shuttle buses for workers. This objective would be a requirement of the Traffic Management Plan to be developed for the Proposal.

DAMAGE TO ROAD INFRASTRUCTURE

The increase in traffic and heavy vehicle movement could impact the condition of roads on the haulage network. Along the Mitchell Highway the impact is expected to negligible due to the existing capacity of the road network. Any damage as a consequence of the Proposal would be rectified.

Internal access roads would be constructed or upgraded as required to accommodate the Proposal volumes and loads of traffic. The tracks would be compacted but unsealed gravel.

ASSOCIATED NOISE AND DUST

The Proposal may result in increased noise and dust, particularly on the unsealed access road and internal tracks. Impacts from dust generated from the proposed activity, including that associated with increased traffic, is considered in Section 8.5. During construction, water would be used to minimise dust generation along access tracks.

The DECCW (2011) *NSW Road Noise Policy* (NSW RNP) have been used to evaluate impacts from road traffic noise. This policy outlines a range of measures required to minimise road traffic noise and its impacts, including noise generated by developments that generate additional traffic on existing roads. A road traffic noise assessment is included in Appendix G and Section 7.3 of this EIS.

DISRUPTION TO EXISTING SERVICES

Local traffic in Wellington could potentially be affected by increased vehicles from construction staff seeking accommodation and services, and conducting commercial activities relating to the solar Plant. This would extend outside construction hours.

Increased traffic along Mitchell Highway, Cobbora Road and Campbells Lane during construction may cause disruptions to general traffic flows and to public transport services including school bus routes that operate along the road. The use of buses to transport workers to and from site would reduce the amount of disruption to traffic along both roads.

There would be no disruptions to rail services along the Main Western Railway Line.

CUMULATIVE CONSTRUCTION TRAFFIC IMPACTS

The following projects are either in operation, construction or planned for construction within the proximity of the Wellington North Solar Plant:

- Bodangora Wind Farm.
- Macquarie and Wellington Correctional Centres.
- Maryvale and Wellington Solar Farms.

The existing traffic surveys volumes on the adjoining road network to the Wellington North Solar Plant carried out in February/March 2018 would have included the operation and construction of the existing Macquarie and Wellington Correctional Centres and the current construction activity of the Bodangora Wind Farm.

Based upon the intersection turn treatment review and mid-block assessment of the road network and of the Proposal traffic generation and the Wellington North Solar Plant, the background traffic along the major road network has additional capacity to cater for additional traffic flow as a result of surrounding projects or fluctuations in traffic volumes.

Cumulative traffic impacts may occur if construction of the solar plant occurs concurrently with construction of the Wellington Solar Farm. Cumulative traffic impacts would occur on common construction access and freight transport routes, primarily on the Mitchell Highway and Goolma Road. The Mitchell Highway is a high capacity road designed for heavy vehicle traffic, and is likely to be able to absorb these cumulative impacts of the projects in the region. The Wellington North Solar Plant would be primarily accessed from Campbells Lane with minimal access from Goolma Road. Therefore, there would be minimal interaction of construction traffic from both solar farms along Goolma Road.

Operation

Activities undertaken during the operation phase would include travelling to the site office or maintenance building and carrying out maintenance activities on the solar plant infrastructure. Operational staff would be confined to designated parking areas and access roads/tracks within the Proposal site.

During operation, four full time equivalent staff would access the Proposal site to operate and maintain the solar infrastructure. It is likely two light vehicles (4x4) and an All-terrain vehicle would be required to transport the staff around the site. The anticipated volume of staff would result in very minimal increase in traffic flow on the local road network. Operational staff may also be required to access the substation, adjacent to the Proposal site.

It is considered unlikely that the low levels of operational traffic would obstruct public or private local access. Additional risks to road safety from operational traffic would be minimal.

Decommissioning

Decommissioning impacts are likely to follow a similar pattern as construction, as components are dismantled and removed. It is considered that the construction traffic generated during decommissioning would consist of less daily vehicular movements than the construction of the plant. Although no specific details of on-site vehicle movements for decommissioning of the solar plant has been determined, a preliminary estimate has been undertaken based upon the 5MW block 340W modules system (which created the higher vehicular movement). This estimate was based on the estimated required materials to be decommissioned with decommissioning occurring over a ten month period. As shown in Figure 7-53, the peak daily vehicular movement of construction traffic is 117 two-way trips, which is less than the peak

construction traffic movement of 138 two-way trips. Thereby the traffic analysis undertaken for the construction of the Proposal is a worst-case scenario of traffic movements.

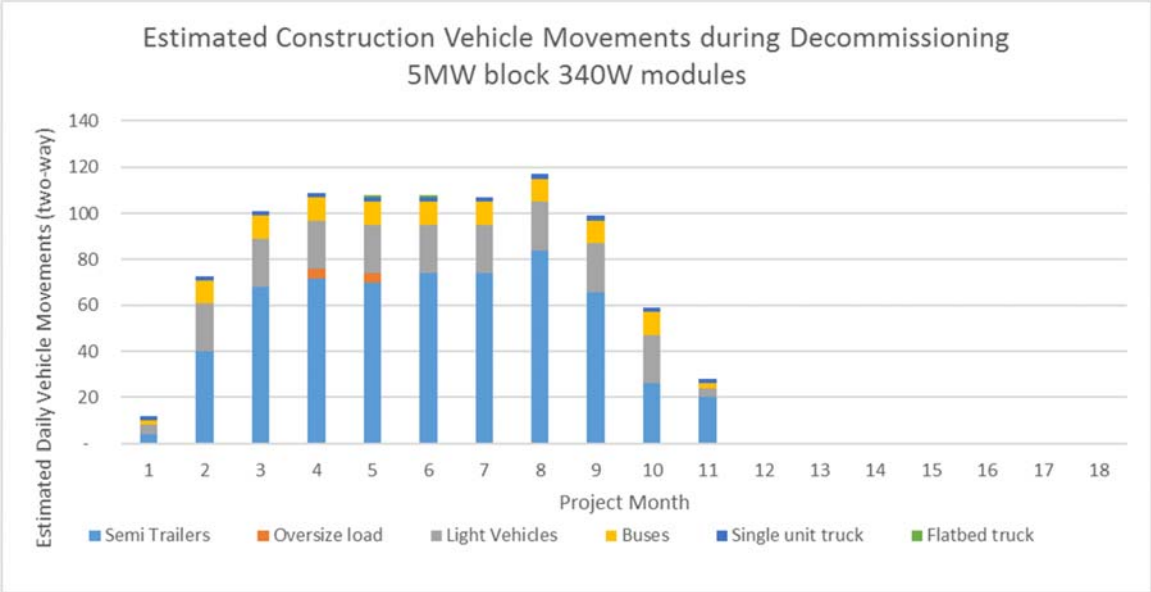

Figure 7-54 5MW block 340W module estimated daily vehicle movements during decommissioning (GHD 2018).

7.9.3 Safeguards and mitigation measures

Traffic and haulage impacts would be managed in consultation with the roads authorities covering issues such as, but not limited to, reinstatement of pre-existing road conditions, shuttle bus transport, intersection upgrade, scheduling of deliveries and traffic controls (speed limits, signage etc.), as detailed in Table 7-57.

Table 7-60 Safeguards and mitigation measures for traffic, transport and road safety impacts

PC: Pre-construction C: Construction, O: Operation: D: Decommissioning

ID	Safeguards and mitigation measures	C	O	D
1	• The following intersections treatments would be undertaken in consultation with Dubbo Regional Council: o The intersection of Cobbora Road / Campbells Lane would be upgraded to provide a BAR/BAL turn type treatment including shoulder widening on Cobbora Road (major road); o The proposed site access on Campbells Lane would be designed to provide BAR/BAL turn type treatment; and o Intersection treatments would be designed to accommodate articulated vehicles of up to 19 m in length.	Design stage		
2	• A Haulage Plan would be developed with input from the roads authority, including but not limited to: o Assessment of road routes to minimise impacts on transport infrastructure. o Scheduling of deliveries of major components to minimise safety risks (on other local traffic). o Consideration of cumulative traffic loads due to other local developments.	PC		D

ID	Safeguards and mitigation measures	C	O	D
	o Traffic controls (signage and speed restrictions etc.).			
3	• Upon determining the haulage route(s) for construction vehicles associated with the Proposal, and prior to construction, undertake a Road Dilapidation Report. The report would: o Assess the current condition of the road(s). o Describe mechanisms to restore any damage that may result due to traffic and transport related to the construction of the Proposal. o Be submitted to the relevant road authority for review prior to the commencement of haulage.	PC		
4	• A pavement review would be undertaken and bituminous surface be applied to Campbells Lane to reduce pavement degradation and improve driver safety.	C		
5	• A Traffic Management Plan would be developed as part of the CEMP and DEMP, in consultation with the Dubbo Regional Council and Roads and Maritime. The plan would include, but not be limited to: o The designated routes of construction traffic to the site. o Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction. o Identify specific road hazards associated with the area including not limited to fog, wet weather, frost and wildlife. o Pedestrian management - Site access is to be restricted to authorised personnel only and existing employees on site. Pedestrian access to and around the site is to be maintained at all times. Within the site pedestrian travel paths are to be maintained to key areas such as building entrances and be free from trip hazards. o Scheduling of deliveries. o Community consultation regarding traffic impacts for nearby residents and school bus operators. o Consideration of impacts to the railway. o Traffic control plans (speed limits, signage, etc.). o Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts. o Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.	PC		D

8 ASSESSMENT OF ADDITIONAL ISSUES

8.1 WATER QUALITY AND WATER USE

8.1.1 Existing environment

Surface water

The Wellington North Solar Plant Proposal site is located within the 74,800km^2 Macquarie-Bogan catchment area of Central West NSW. The dominant surface water feature within the locality is the Macquarie River, located approximately 3.8km west of the Proposal site. The closest Nationally Important Wetland and Ramsar Wetland to the Proposal site is the Macquarie Marshes and Nature Reserve, which is approximately 150km downstream.

The existing surface water environment within the Proposal site is characterised by four dams and six watercourses. Of the four dams, three are located within the south-western portion of the site, and one in the south-eastern corner. Of the six watercourses, five facilitate water flow in the north-south direction and one in an east west direction. All watercourses are tributaries of Wuuluman Creek, which is located 300m south of the site.

The tributaries are described in Table 8-1 and shown in Figure 8-1. The main tributary (tributary 1) onsite flows from north-east to the southwestern corner, contains aquatic habitat and vegetation, and is also mapped as Key Fish Habitat. This tributary also has the best water quality onsite due to the constant water flow. Water quality onsite for all the waterways would influenced by the surrounding agriculture activities specifically stock access, informal waterway crossings and runoff of chemicals (e.g. fertilisers and herbicides) and animal waste.

Table 8-1 Tributaries onsite.

Tributary ID	Strahler Stream order[3]	Mapped as Key Fish Habitat?	Water present during site inspection?	Aquatic vegetation or habitat present	Water quality?	Description
1	3rd	Yes	Yes - flow	Yes – aquatic vegetation and habitat	Moderate – water flow and aquatic habitat present. However, the waterway is accessed by stock and contains informal vehicle crossings.	Main tributary onsite that flows from the north-east to the southwestern corner of the site.
2	2nd	No	Yes – pools of water	No	Poor – limited to no water flow, accessed by stock.	Incised drainage line. Potential to flow during rainfall events.
3	1st	No	No	No	Poor –no water flow, accessed by stock.	Incised drainage line to an overland flow.
4	2nd	No	Yes – pools of water	No	Poor – limited to no water flow, accessed by stock.	Incised drainage line. Potential to flow during rainfall events.

[3] As determined by Footprint, consulting OEH mapping and other sources (Footprint 2018).

5	1st	No	No	No	Poor –no water flow, accessed by stock.	Incised drainage line.
6	1st	No	No	No	Poor –no water flow, accessed by stock.	Incised drainage line.
7	1st	No	No	No	Poor –no water flow, accessed by stock.	Is likely a manmade constructed channel.

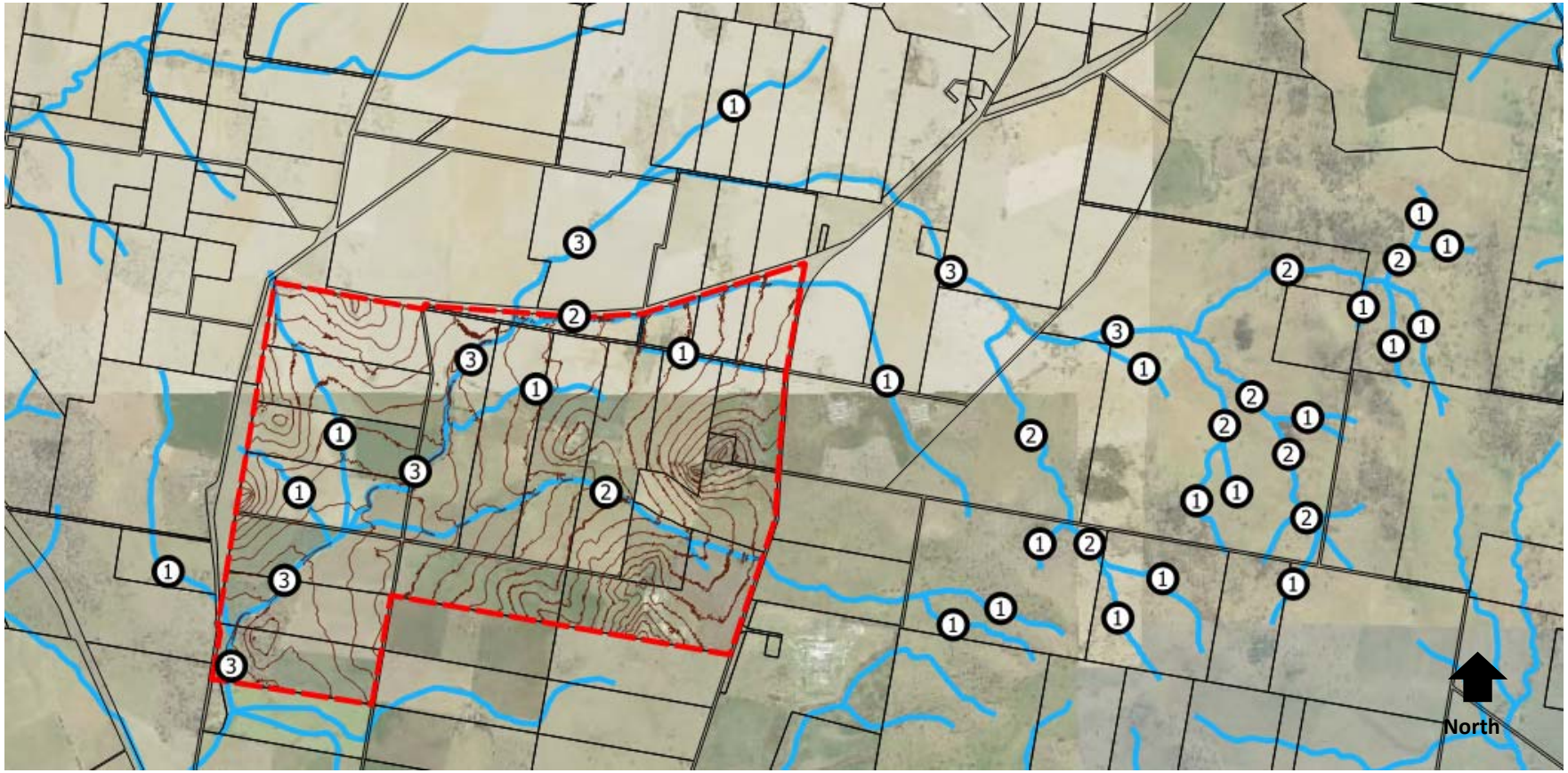

Figure 8-1 Waterways and stream orders (blue) within the solar plant site (red) (Footprint, 2018)

Figure 8-2 Tributary 1.

Figure 8-3 Tributary 2.

Groundwater and water entitlements

There is one groundwater bore (GW014993) located on the boundary of the solar plant site's south-eastern boundary. Figure 8-4 illustrates the location of GW014993, as well as another bore within the vicinity of the development footprint.

The NSW Office of Water does not hold any information about this bore in terms of its licence status, purpose, or standing water level. It has two water bearing zones between 12.2 -14.3m and 17.1 – 17.40m.

The Wellington LEP 2012 identifies the Proposal site as groundwater vulnerable, suggesting groundwater has potential to be intercepted.

The Proposal site occurs in the Central West Water Management Area and is subject to the Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources. The Proposal site overlies the Lachlan Fold Belt MDB Groundwater Source, which is regulated by the Water Sharing Plan for the NSW Murray Darling Basic Fractured Rock Groundwater Sources 2011. Water is also extracted from bores within the water source through basic landholder rights (not requiring a licence).

Groundwater dependent ecosystems (GDEs)

Groundwater Dependent Ecosystems (GDEs) include ecosystems which may rely on the surface expression of groundwater (including surface water ecosystems that may have a groundwater component) and ecosystems which may rely on the subsurface presence of groundwater (including vegetation ecosystems).

Potential Groundwater Dependent Ecosystems (GDEs) within the vicinity of the solar plant site are mapped in the Groundwater Dependent Ecosystems Atlas (BOM, 2017) (refer Figure 8-5).

There are a number of low and moderate potential terrestrial vegetation GDEs mapped within the solar plant site, including:

- *E. conica, E. melliodora, E. macrocarpa.*
- *E. microcarpa/Dodonaea viscosa subsp. Cuneate, Acacia buxifolia.*
- *E. blakelyi, E. melliodora, E. bridgesiana/Acacia dealbata.*
- *Maireana microphylla, Pimela neo-anglica, Sclerolaena birchii/Dichanthium.*
- *E. albens/Acacia decora, Acacia implexa, Acacia deanei.*

Figure 8-4 Groundwater bores within and adjacent to the solar plant site (red) (DPI, 2017).

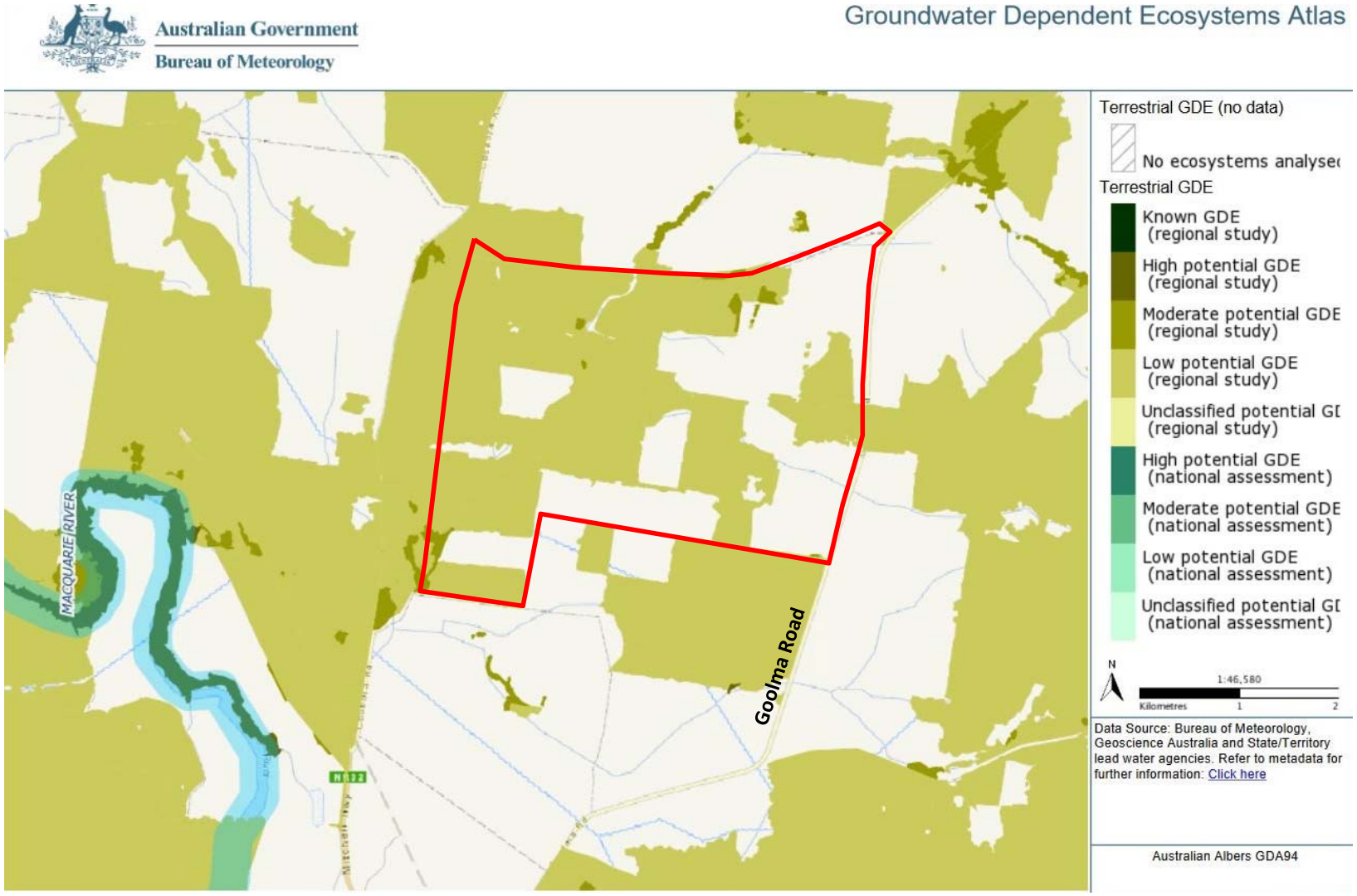

Figure 8-5 Terrestrial GDEs at the Proposal site (red) and surrounds (BOM, 2017).

8.1.2 Potential impacts

Construction and decommissioning

SURFACE WATER

Construction of the Proposal would disturb soils and potentially lead to sediment laden or other pollutants being present in runoff, mobilising and entering local waterways. These activities include:

- Excavations for the construction of internal roads and associated drainage, parking areas, footings for onsite substation, inverters and maintenance building and footings for temporary staff amenities and offices during construction.
- Construction of up to 5 waterway crossings for internal access roads. The crossings would be located along Tributary 1 and 2.
- Trenching for underground cable installation and underground electricity transmission (if this option is adopted).
- Soil compaction would occur when hardstand areas and access tracks are created, which would reduce soil permeability thereby increasing surface water runoff and the potential for concentrated flows.

Existing surface water drainage patterns could be slightly altered by construction, however these would be managed by ensuring flow is directed to the existing locations. Surface water would still drain from the site through the ephemeral drainage lines which flow into the main north-south tributary to Wuuluman Creek. The two main tributaries (1 and 2) would not be altered by the Proposal with the exception for the construction of crossings for the internal access roads and for the installation of underground cables. The design and construction of the waterway crossings would need to consider the requirements of the following publications:

- *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge, 2003).
- *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003).
- *Guidelines for Watercourse Crossings on Waterfront Land* (NSW DPI, 2012).
- *Guidelines for Laying Pipes and Cable in Watercourses on Waterfront Land* (NSW DPI, 2012).

Solar panels would be installed over some sections of the other five drainage lines onsite. However, this is not likely to change the hydrology of the site or present any risk to bank stability. The drainage lines to be constructed over are well grassed first order streams that would only create flow paths in substantial rainfall events.

The construction phase would entail the following water pollution risks:

- A hydrocarbon spill risk from use and re-fuelling of construction vehicles and machinery.
- On-site concreting for building and equipment foundations.
- Wash off from curing asphalt pavement and road seal.
- Storage and use of paints, cleaning solvents and other chemicals.
- Pesticide and herbicide storage and use.
- Fertilisers used for revegetation.
- Runoff from waste materials.

Sediment and chemical pollutants which enter the drainage lines present on the site have the potential to flow into Wuuluman Creek and be further transferred into the Macquarie River.

Activities with the potential for adverse water quality impacts would be managed through the development of site specific sediment control plans and spill control plans, as detailed in Section 8.1. Additionally, impacts to local water quality can be minimised by ensuring erosion and sediment control plans include measures to ensure Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom) criteria are met prior to discharge of water offsite.

GROUNDWATER AND GROUNDWATER DEPENDENT ECOSYSTEMS

Impacts to groundwater during construction and decommissioning are unlikely to occur due to the depth of groundwater, approximately 12.2 to 17.4m. The deepest infrastructure to be installed would be the mounting frames to a depth of between 1.5 m to 2.4m. Additionally the clearing of trees on site would unlikely have an impact on the groundwater levels, up to approximately 7.8ha of moderate/moderate to good condition woodland would be removed.

Terrestrial GDEs are known to occur within the solar plant site, as detailed in Section 8.1.1. Impacts to GDE's within the solar plant site would not occur as a result of impacts to groundwater supplies, as groundwater supplies would not be affected. No groundwater is anticipated to be intercepted, and no groundwater would be extracted. However, the GDE vegetation communities would be directly impacted through vegetation removal. Impacts associated with vegetation removal are considered in Section 7.1 of this EIS.

WATER USE

Water use during the construction phase would be minimal and mainly for dust suppression on unsealed tracks. This water requirement is likely to vary depending on weather conditions such as rainfall and wind and is estimated to be up to 55ML per annum. The water would be sourced from onsite bores and local council water station, in consultation with Council.

To use water from bores onsite, a Water Access Licence (WAL) would need to be obtained. The number of Aquifer WAL's available for the Lachlan Fold Belt MDB Groundwater source as of 16 May 2018 was 1,004. The water available under these Aquifer WAL's was 66,840.7ML for the 2016/17 financial year. Of this volume 3,744.8ML was used or about 5.6% of the water available. The water required for construction represents 0.08% of the volume available and 0.08% of the water not used but available (94%) for that financial year. The impact of drawing the 55ML per annum would be negligible because ample remaining water is available in the system based on previous year's figures.

Dubbo Regional Council have a water filling station with a key for which an application can be made and for which the Council would invoice, based on volume sourced. There is no limit on the amount of water that can be accessed in this manner, according to Council. If this water is required, water can then be trucked to site. Under this arrangement, water is purchased from Council's allocation and no WAL is required by the proponent.

The local water utility available for the 2016/2017 year was 18,805ML with 9 WALs. The water required for the Proposal (55ML per annum) is 0.29% of the local water utility available this past year. For the 2016/2017 period only 11,512.1ML of the allocation was used. Taking the construction water from the local water utility supply for construction in a similar year would have a negligible impact on the available supply. The Proposal's construction water requirement would result in a temporary and short term impact on the local water resource.

Potable water requirements for staff during construction would be approximately 9,125kL per annum. The non- potable water would be trucked to the site on as needs basis and stored within temporary water tanks at the staff amenities area.

Impacts on water use during the decommissioning would be similar to those during construction. The amount would be low and managed using standard measures.

Operation

SURFACE WATER

During operation, there is minimal potential for any impacts to surface water quality to occur. Appropriate drainage features would be constructed along internal roads (such as vegetated swales) to minimise the risks of dirty water leaving the site or entering waterways. With the exception of internal roads, parking areas and areas around onsite substation, the site would be revegetated with grass cover. Water quality impacts at the site would therefore be low and are not considered substantially different to the current potential water quality impacts occurring from existing activities onsite including cropping and use of machinery. There is potential for the water quality onsite to improve due to waterway crossings being constructed in accordance with waterfront land and water crossing guidelines and with the removal of agricultural impacts such spraying and cattle access.

There would be a low risk of contamination in the event of a chemical spill (fuels, lubricants, herbicides etc.) as storage and emergency handling protocols would be implemented.

GROUNDWATER AND GROUNDWATER DEPENDENT ECOSYSTEMS

No operational activities would affect groundwater at the Proposal site. No groundwater is proposed to be sourced during operation of the solar plant.

There would be no impacts to groundwater or GDEs during the operation phase.

WATER USE

Water use volumes during operation would be minimal, approximately 150kL per annum. Water would be required for staff amenities and may be required for panel cleaning. Panel cleaning may be required in dry conditions when cropping operations in the locality are generating dust, however AGL Energy Limited modules currently do not require cleaning anywhere along the east coast of Australia. Rain water would be gathered from the O&M building roof and stored within on site tanks, in cases of prolonged drought water would be trucked to site as required. If onsite requirement are not sufficient, water would be purchased from Council.

8.1.3 Safeguards and mitigation measures

Additional measures that would be implemented to manage water quality and water use impacts are provided below.

Table 8-2 Safeguards and mitigation measures for water quality and water use impacts.

C: Construction; O: Operation; D: Decommissioning

ID	Mitigation measures	C	O	D
1	Design waterway crossings and services crossing in accordance with the publications: • *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge, 2003). • *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003).	C	O	D

ID	Mitigation measures	C	O	D
	• *Guidelines for Watercourse Crossings on Waterfront Land* (NSW DPI, 2012). • *Guidelines for Laying Pipes and Cable in Watercourses on Waterfront Land* (NSW DPI, 2012).			
2	All fuels, chemicals, and liquids would be stored at least 40m from any waterways or drainage lines, not on sloping land and would be stored in an impervious bunded area.	C	O	D
3	The refuelling of plant and maintenance would be undertaken in impervious bunded areas on hardstand areas only.	C	O	D
4	All potential pollutants stored on-site would be stored in accordance with HAZMAT requirements and bunded.	C	O	D
5	Roads and other maintenance access tracks would incorporate appropriate water quality treatment measures such as vegetated swales to minimise the opportunity of dirty water leaving the site or entering the waterways.	C		D
6	A WAL would be obtained, should onsite ground water sources be used.	C		

8.2 SOCIAL AND ECONOMIC IMPACTS

8.2.1 Background

Socio-economic profile

The Proposal site is located within the Dubbo Regional Council LGA and near the following towns and villages:

- Dubbo; Approximately 40km north west.
- Wellington; Approximately 7km south.
- Bodangora; Approximately 3.4km north east.
- Geurie; Approximately 14km north west.

Table 8-3 outlines the socio-economic profiles of these surrounding towns and villages.

Table 8-3 Statistical overview of Dubbo, Wellington, Bodangora and Geurie (ABS, 2016).

Statistic	Dubbo	Wellington	Bodangora	Geurie
Population	38,943	4,519	79	755
Average age	36	44	53	42
Gender split	48.1% male, 51.9% female	48% male, 52% female	58.5% male, 41.5% female	50.3% male, 49.7% female

Statistic	Dubbo	Wellington	Bodangora	Geurie
Main industry	Health care, primary education, social services, retail and tourism	Correctional and detention services, local government administration take-away food services and aged care	No data available	No data available
Unemployment rate	5.5%	12.4%	No data available	5.2%
Highest age group employed	25-34	55-64	No data available	45-54
Aboriginal/Torres Strait Islander	14.6%	26.1%	No data available	9.5%
SEIFA index [1]	950	803	No data available	987

[1] Socio Economic Indexes for Areas (SEIFA) is a suite of indexes that have been created by the Australian Bureau of Statistics (ABS) from social and economic Census information. Each index ranks geographic areas across Australia in terms of their relative socio-economic advantage and disadvantage, with LGA scores ranging from 121 (most disadvantaged) to 1,193 (least disadvantaged).

The region is recognised as a growing mining services centre with mining and exploration projects, both established and emerging, flourishing across the surrounding region. The agriculture sector contributes 3.6% to the economy for the Dubbo Regional Council LGA. In 2015 the largest number of registered businesses (969) were in the 'agriculture, forestry and fishing' sector. However, between 2011 and 2016, the agriculture, forestry and fishing sector experienced the largest decline in jobs (Dubbo Regional Council, 2016).

Wellington total agricultural commodities in 2011 was $73,546,817 and value of total agriculture was $60,763,393 (0.52% of NSW agriculture) and $2,887,622 less than 2006. Dubbo total agricultural commodities in 2011 was $54,028,021 and value of total agriculture was $43,957,937 (0.38% of NSW agriculture) and $4,159,778 less than 2006.

Therefore it is noted that the introduction of large scale solar to the region is a further push away from an agriculturally dominant land use and economic driver.

Community attitudes to renewable energy

Although 77% of Australians believe that large scale solar plants could supply a significant source of Australia's energy requirements (ARENA, 2015), attitudes towards renewable energy proposals can vary significantly from community to community. Opinions are greatly divided about their visual impacts; 30% agree and 26% disagree that large-scale solar plants have a negative visual impact (ARENA, 2015). These uncertainties are often due to lack of information on the ability and efficacy on the renewable energy sector (ARENA, 2015). Approaches to improving community understanding of the visual impacts of large scale installations include (ARENA, 2015):

- Provision of images (from many angles) of large scale solar facilities, particularly in the early stages of a proposal.
- Understanding the similarities between highly supported domestic scale installations and large scale facilities.

- Understanding the current function of the land proposed to hold the facility and the additional value the installation allows for.
- Understanding what steps are needed to prepare the proposed land for the installation and the condition of the land after decommissioning.

This EIS and the CCP address these issues.

A major key learning from other solar plant proposals regarding community and stakeholder engagement was that transparency is essential. Listening to the issues that are important to the community is essential over what issues the community may think are important and fit-for-purpose consultation needs to be a priority (FRV, n.d.). Fit-for-purpose consultation can become a problem in the community consultation phase due to inconsistencies and confusion within the community (FRV, n.d.). Various proposal stages would cause much activity, whilst other stages no consultation activity; this leads to confusion and misconceptions about the Proposal, and interest and attitudes were adversely affected (FRV, n.d.).

The International Energy Agency (IEA) reported that the renewable energy sector is now the largest source of installed power capacity in the world, surpassing coal (OECD/IEA, 2016). Large scale solar energy proposals within Australia have been steadily increasing over the last decade (ARENA, 2015).

In 2016, 10 renewable energy projects were completed and another 11 renewable energy projects commenced construction (Clean Energy Council, 2016). Australia's largest three solar power plants are, Nyngan and Broken Hill (both owned by the Powering Australian Renewables Fund (PARF), which became operational in 2015 and the Moree Solar Farm (owned by FRV) which became operational in 2016 (Clean Energy Council, 2016). Currently Australia's renewable energy sector is well on its way to meeting its 2020 RET (Clean Energy Council, 2018). More than 50 solar and wind projects would provide approximately 5,500 new jobs and investment of over $10 billion (Clean Energy Council, 2018).

In Australia today, electrical consumption is at unprecedented high levels. This is causing great stress on the energy sector with high residential electricity bills and continual disruptions to household electricity in times of peak demand. Australia's demand for clean energy alternatives has seen the renewable energy sector provide 17.3% of Australia's overall electricity, up by 26% from 2015 (Clean Energy Council, 2016). At least 30 new renewable energy projects were to be under construction during 2017, with 3,150 MW of new capacity and approximately 3, 725 new jobs created (Clean Energy Council, 2016).

Australia maintains the highest average solar radiation potential per square metre in the world (ARENA, 2015). It is expected that strong policy support, climate change mitigation, and quality of information may help change attitudes towards renewables in the future (OECD/IEA, 2016).

Proposal consultation activities and results

Section 6 of this EIS details the specific consultation and feedback received so far for the proposed Wellington North Solar Plant. Issues and concerns raised from the consultation has been around:

- Noise and vibration.
- Visual amenity.
- Property values.
- Agricultural land use for non-agricultural purposes.
- Traffic.
- Bushfires.

This concerns have been addressed in this EIS. The addressing of these specific concerns raised and where in the EIS is outlined in Section 6.1.3.

The consultation has also identified several opportunities in relation to the solar plant including employment, community benefits, tourism and education.

8.2.2 Potential impacts

Construction

The Wellington North Solar Plant would assist in providing direct economic stimulus to the Orana region, utilising up to 250 staff during peak construction. Many of these would be drawn from the local area, hence increasing employment opportunities. Additional workers, moving to the area temporarily during construction, may support local economic activity directly. Service industries such as the accommodation, retail and tourism industries would be stimulated.

Conversely, the temporary influx may place pressures on local services such as schools, health services and accommodation. Additional traffic may be noticeable and could present an adverse effect on local tourism, if coinciding with local festivals for example. Additional hazards accompany construction traffic (refer to Section 7.9). Mitigation strategies to address these impacts centre on consultation with the community, so that benefits can be maximised, and conflicts resolved where possible.

The solar plant would change the character of the site from agriculture to electricity generation. This change in land use can be viewed as either positive or negative within a community and can vary depending on the values of each individual, views among the community vary substantially. The development may be viewed as an opportunity for jobs and economic stimulus within the region and a sign of protecting the environment through the generation of renewable energy. Alternatively, some community members are hesitant of changes to the rural landscape and would consider the development to be in conflict with the existing environment and scenic values.

The site would be visible to the public during construction, for traffic travelling along Cobbora Road, Campbells Lane and Goolma Road and glimpsed from some connecting local roads. Thirteen residences are located within 500m of the Proposal site, but the most significant visual impact when viewed from the public domain is from locations along Goolma Road and Cobbora Road where the proposal is in close proximity to the boundary. Visual, noise and traffic impacts and mitigation have been discussed in previous sections.

Operation and decommissioning

The development of rural land uses compatible with agricultural activities, such as solar power generation, have potential to provide increased economic security to rural economies through the following means:

- Diversification of employment opportunities and income streams.
- They provide a substitute for carbon emission producing electricity production that is stable and renewable, and consistent with State and National greenhouse emission reduction objectives.

There is a limited amount of information specifically regarding the effect of rural solar plants on local land values. The key driver of land value is and has been historically, the agricultural productivity of the area. The highly reversible nature of the Proposal aims to ensure that existing land capability is restored during decommissioning (refer to Section 7.5). Amenity values, such as views, rural lifestyle and proximity to Wellington, could also be considered to enhance land value. While visual impacts would occur during operations (and would be minimised via specific areas of vegetation screening), they would similarly be reversible during decommissioning.

It is noted that global warming would increase potential evaporation and water demand, which may reduce the capacity of arable land. Pittock (AGO, 2003) observed that a significant proportion of Australian exports are agricultural products that are sensitive to global warming impacts. Federal Government publications note that failure to adequately mitigate increases in emissions would lead to greater costs for adaptation to the consequences of climate change. In this way the Proposal may assist in addressing a threat to productivity and land value on a regional level.

AGL is proposing the following benefit sharing opportunities should the Proposal be approved and construction commenced:

- Rooftop solar for the residences most impacted by construction and operation activities.
- An energy discount for all new and existing AGL Energy Limited customers in Wellington.
- A local community investment program for construction and/or operation.

Details of these commitments are outlined in Section 6.1.4. These commitments would have a positive socio-economic impact on the region.

Minimal adverse social-impacts are anticipated during operation and decommissioning. During operation, maintenance staffing and activities would be at low levels of approximately 3-4 employees. The additional accommodation and traffic impacts of a number of operational staff are not likely to be noticeable.

Decommissioning is likely to require less staff onsite than for construction. It would offer a similar economic benefit to construction in terms of opportunities for local staff and industries. It may also include local recycling of infrastructure components.

8.2.3 Safeguards and mitigation measures

Table 8-4 Safeguards and mitigation measures for Community and Socio-economic impacts

C: Construction; O: Operation; D: Decommissioning

ID	Mitigation measures	C	O	D
1	Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.	C		
2	Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services.	C		D
3	Liaison with local tourism industry representatives to manage potential timing conflicts with local events.	C		D
4	The Community Consultation Plan would be implemented to manage impacts to community stakeholders, including but not limited to: • Protocols to keep the community updated about the progress of the Proposal and proposal benefits. • Protocols to inform relevant stakeholders of potential impacts (haulage, noise, air quality etc.). • Protocols to respond to any complaints received.	C		D

8.3 BUSHFIRE

8.3.1 Existing environment

The Proposal site is located on cleared agricultural land which is predominantly grassland with small patches of remanent vegetation. The topography of the Proposal site is flat to gently undulating and sits at an elevation of between 300 and 405m above sea level (ASL). The site includes one large hill (the highest elevation point on the site) and five smaller hills along the north and north west of the site, this includes the elevated position of the homestead. The water sources onsite include four dams, six watercourses and one bore. The Proposal site can be accessed from Goolma Road and Campbells Lane.

The majority of the site is not identified as bush fire prone land, however the small area of remnant vegetation in the north east of the site is identified as category 2 bushfire prone land (Figure 8-6). Additionally, two small portions of category 2 and category 1 bushfire prone land (near the Wellington Correctional Centre and west of the Proposal site) also occurs adjacent to the proposed transmission line option one.

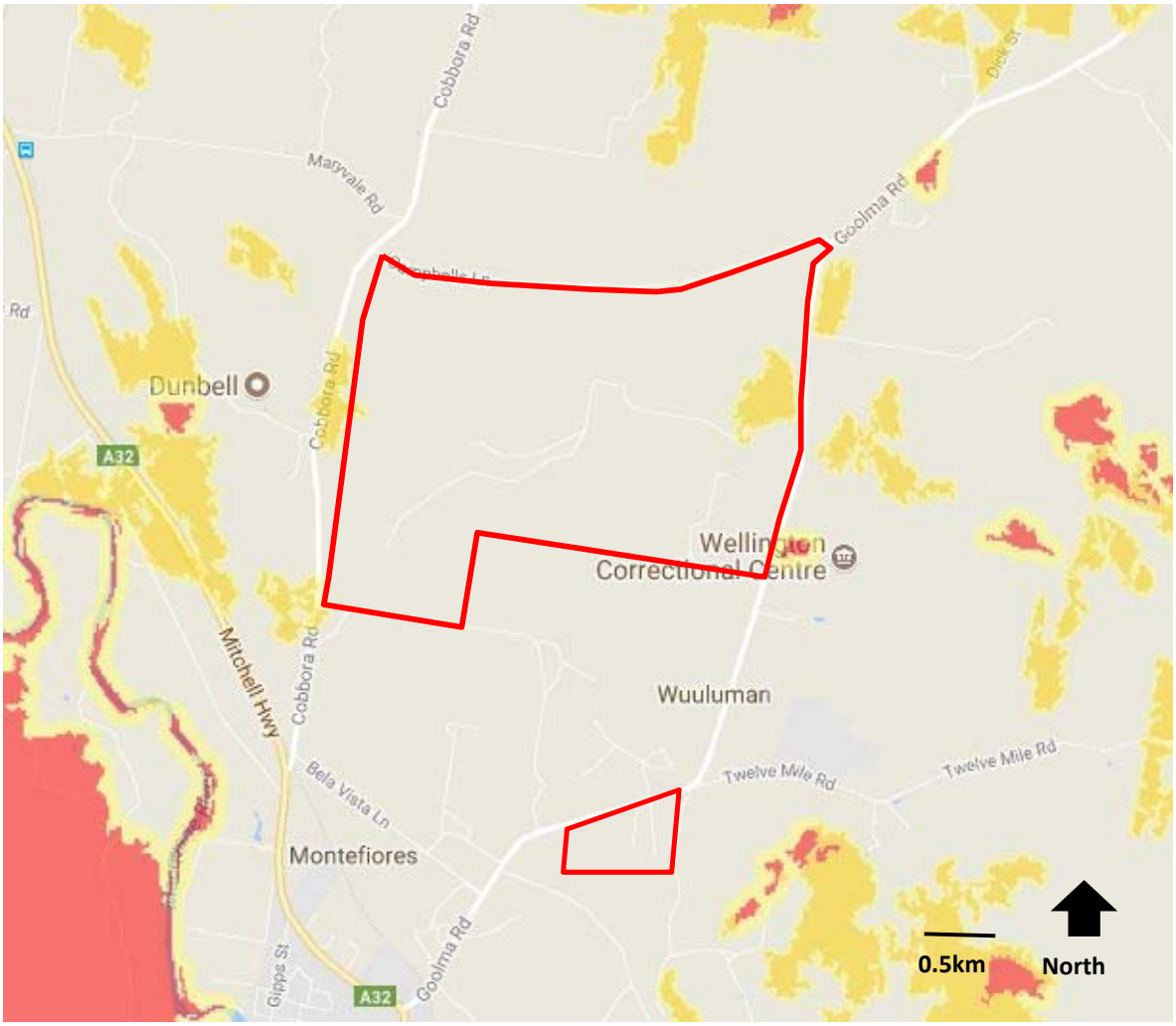

Figure 8-6 Bush fire prone land identified at the Proposal and existing substation (red) from the NSW DPE Planning Viewer (2018).

The Proposal site occurs within the area of the Orana Bush Fire Management Committee (BFMC). The bush fire season in the Orana BFMC area generally commences on the 1st of October and concludes on 31st March (BFMC, 2011). The Orana BFMC area has on average 250 fires per year, of which 10 – 15 can be considered to be major fires. The Orana Rural Fire Service team has over 60 Rural Fire brigades, covering an area or 12,803 square kilometres. Fire brigades in the locality include Wuuluman, Maryvale and there is a NSW Rural Fire Service station in Wellington.

The main bushfire hazards for the Proposal site include the remnant patch of vegetation, the existing transmission lines within the Proposal site and the proximity to local roads including Goolma Road, Cobbora Road and Campbells Lane. Some of the main hazards along local roads which have the potential to result in a fire include car accidents and the incorrect disposal of cigarettes.

The main sources of fires in the Orana Bush fire area include:

- Campfires.
- Lightning strikes.
- Electrical power supply lines.
- Agricultural machinery.
- Vehicle exhaust systems when in contact with vegetation on the sides of roads.
- Escaped controlled permit burns.
- Burning of stolen vehicles.
- Arson activity and careless acts by individuals (such as the use of cutting/welding equipment).

8.3.2 Potential impacts

Construction and decommissioning

The construction of the Proposal has the potential to increase the risk of bushfire. Potential ignition sources associated with construction and decommissioning include:

- Earthworks and slashing machinery causing sparks.
- Hot works activities such as welding, soldering, grinding and use of a blow torch.
- Sparks and contact ignition from vehicles in long combustible vegetation.
- Smoking and careless disposal of cigarettes.
- Use of petrol powered tools.
- Operating plant fitted with power hydraulics on land containing combustible material.
- Electrical faults during testing and commissioning.
- Storage of chemicals and hazardous materials.

Due to the lack of vegetation on site, the flat landscape and low fuel environment, the Proposal is unlikely to pose a significance bushfire risk. Bushfire risks during the construction and decommissioning phases are considered to be low and would be managed by the implementation of mitigation measures.

Operation

Potential bush fire risks associated with the operation of the Proposal include:

- Powerline failure or contact with vegetation within clearances.
- Overheating in the substation.
- Grass fire ignition from vehicles and maintenance machinery.

- Poor groundcover management and associated high fuel loads.

Bushfire and structural fire risks during operation of the solar plant are considered manageable subject to the control of grass fuels at the site, the appropriate maintenance of equipment, adoption of applicable best practice and technical standards and the implementation of safeguards provided below. All electrical components would be designed to minimise potential for ignition. Groundcover beneath panels would be maintained and not allowed to build up to high fuel levels (access and solar input requirements are in line with this activity).

Overall, the Proposal is unlikely to present a substantial bushfire ignition and structural fire threat, or to represent an unacceptable hazard in the event of a bushfire affecting the site. With the implementation of mitigation measures the identified risks can be managed.

It is noted that Council has routinely applied the provisions of *Practice Note 1/11 -Telecommunications Towers in Bush Fire Prone Areas* for solar plants in the region, which have similar electrical infrastructure to telecommunications towers. The *Planning for Bush Fire Protection 2006* (PBP, 2017) provides that determination of the APZ for telecommunication towers, should be done in consultation with RFS. Based on consultation with RFS for similar projects, it has been found that a 10m APZ is usually applied in these cases, and this APZ would be used for all infrastructure excepting the Type C Construction commercial/industrial buildings. This would form a commitment of the Proposal.

8.3.3 Mitigation measures

Table 8-5 Mitigation measures for bushfire.

C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and mitigation measures	C	O	D
1	• Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*.	C	O	D
2	• Develop a Bush Fire Management Plan to include but not be limited to: o Specific management of activities with a risk of fire ignition (hot works, vehicle use, smoking, use of flammable materials, blasting) o Incorporation of fire safety and response in staff and contractor induction, training, OHS procedures and Work Method Statements o Designation of a staff safety officer tasked with ensuring implementation of the plan and regular liaison with firefighting agencies o Document all firefighting resources maintained at the site with an inspection and maintenance schedule o Monitoring and management of vegetation fuel loads o A communications strategy incorporating use of mobile phones, radio use (type, channels and call-signs), Fire	C	O	D

ID	Safeguards and mitigation measures	C	O	D
	Danger Warning signs located at the entrance to the site compounds, emergency services agency contacts • In developing the Bush Fire Management Plan, NSW RFS would be consulted on the volume and location of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures.			
3	• An APZ of minimum 10 metres would be maintained between remnant or planted woody vegetation and solar plant infrastructure. The APZ around the perimeter of the site would incorporate a 4 metre wide gravel access track. • Average grass height within the APZ would be maintained at or below 5 centimetres on average throughout the October-March fire season. Average grass height outside the APZ, including beneath the solar array, would be maintained at or below 15 centimetres throughout the fire season.	C	O	
4	• The overhead powerlines at the site would be managed by maintaining appropriate vegetation clearance limits to minimise potential ignition risks, in accordance with the ISSC 3 Guideline for Managing Vegetation Near Power Lines.		O	
5	• Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction. This equipment would include fire extinguishers, a 1000 litre water cart retained on site on a precautionary basis, particularly during any blasting and welding operations. Equipment lists would be detailed in Work Method Statements.	C		
6	• The NSW RFS and Fire and Rescue would be provided with a contact point for the solar plant, during construction and operation.	C	O	
7	• Following commissioning of the solar plant, the local RFS and Fire and Rescue brigades would be invited to an information and orientation day covering access, infrastructure, firefighting resources on-site, fire control strategies and risks/hazards at the site.		O	
8	• The perimeter access track would comply with the requirements for Fire Trails in the PBP guidelines. All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bush fire emergencies. Access tracks would be constructed as through roads as far as practicable. Dead	C	O	D

ID	Safeguards and mitigation measures	C	O	D
	end tracks would be signposted and include provision for turning firetrucks.			
9	• A Hot Works Permit system would be applied to ensure that adequate safety measures are in place. Fire extinguishers would be present during all hot works. Where practicable hot works would be carried out in specific safe areas (such as the Construction Compound temporary workshop areas).	C	O	D
10	• Machinery capable of causing an ignition would not be used during bushfire danger weather, including Total Fire Ban days.	C	O	D
11	• Prior to operation of the solar plant, an Emergency Response Plan (ERP) must be prepared in consultation with the RFS and Fire & Rescue NSW. This plan must include but not be limited to: o Specifically addresses foreseeable on site and off site fire events and other emergency incidents. o Risk control measures would include the level of personal protective clothing required to be worn, the minimum level of respiratory protection required, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment). o Outline other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site. o Two copies of the ERP are stored in a prominent 'Emergency Information Cabinet' which is located in a position directly adjacent to the site's main entry point/s. o Once constructed and prior to operation, the operator of the facility would contact the relevant local emergency management committee (LEMC).		O	

8.4 ELECTROMAGNETIC FIELDS

8.4.1 Existing environment

Electromagnetic fields (EMFs) consist of electric and magnetic fields and are produced whenever electricity is used. EMFs also occur naturally in the environment, such as the Earth's magnetic field and discharges during thunderstorms (WHO, 2012).

Electric fields are produced by voltage and magnetic fields are produced by current. When electricity flows, EMFs exist close to the wires that carry electricity and close to operating electrical devices and appliances

(WHO, 2007). Electric and magnetic field strength reduces rapidly with distance from the source, and while electric fields are insulated by air and insulation material, magnetic fields are not.

Over decades of EMF research, no major public health risks have emerged, but uncertainties remain (WHO, n.d.). While it is accepted that short-term exposure to very high levels of electromagnetic fields can be harmful to health, the International EMF Project, established by the World Health Organisation, has thus far concluded that there are no substantive health consequences from exposure to ELF electric fields at the low levels generally encountered by the public (WHO, 2007), such as those that would be produced by electricity generation at the proposed solar Plant.

The International Commission on Non-Ionizing Radiation Protection (ICNPR) published *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz)* in 1998. The guidelines were updated in 2010. The objective of the paper was to establish guidelines for limiting EMF exposure that would provide protection against known adverse health effects. To prevent health-relevant interactions with Low Frequency fields, ICNIRP recommends limiting exposure to these fields so that the threshold at which the interactions between the body and the external electric and magnetic field causes adverse effects inside the body is never reached.

The exposure limits, called basic restrictions, are related to the threshold showing adverse effects, with an additional reduction factor to consider scientific uncertainties pertaining to the determination of the threshold. They are expressed in terms of the induced internal electric field strength in V/m. The exposure limits outside the body, called reference levels, are derived from the basic restrictions using worst-case exposure assumptions, in such a way that remaining below the reference levels (in the air) implies that the basic restrictions would also be met (in the body) (ICNIRP, 2016). Reference levels for occupational and general public exposure are shown in Table 8-6.

Table 8-6 ICNIRP reference levels (ICNIRP, 2010)

Exposure characteristics	Electric field strength (kVolts per metre - kV/m)	Magnetic flux density (microteslas - µT)
Occupational	10	1000
General public	5	200

The Proposal includes five main types of infrastructure that could create EMFs:

1. Solar arrays (up to 1.5 kV DC).
2. Power Conversion Stations (up to 8 MW capacity).
3. Underground cables.
4. 132 kV -330 kV overhead or underground transmission lines.
5. 132 kV to 330 kV solar substation.

Typical and maximum EMF levels for these types infrastructure are discussed below. Strength attenuates with distance from the infrastructure and electric field levels for underground infrastructure are lessened by the shielding that the fill (approximate depth of 900mm) provides.

Solar arrays

Research into electric and magnetic fields undertaken at utility scale PV installations in California[4] by Chang and Jennings (1994), indicated that magnetic fields were significantly less for solar arrays than for

[4] Note the U.S.A electricity supply operates at 60 Hz frequency.

household applications. Chang and Jennings (1994) found magnetic fields from solar arrays were not distinguishable from background levels at the site boundary, suggesting the health risk of EMFs from solar arrays is minimal.

The Proposal would require installation of DC wiring between panels and the inverters. This cabling would be underground or above ground on cable trays and would conduct around 1500V. The potential for electromagnetic interference as a result of the solar array cabling is considered to be negligible.

Power Conversion Stations

Up to 155 PCSs would be installed across the site. The stations would have a total output between 2 and 8 MW. The PCSs would have an AC power frequency range between 47 and 63Hz and fall into the Extremely Low Frequency (ELF) range of 0-300Hz. Within this range, EMFs are not considered to be hazardous to human health. In addition, the PCSs would be located within the fenced solar plant site with no public access and would operate only during the day reducing the total time that EMFs are generated by the infrastructure.

Underground cabling

Underground cabling does not produce external electric fields due to the shielding effects of the soil, however magnetic fields still occur. They are expected to be minimal and restricted to the Proposal site.

Overhead powerlines

Figure 8-13 displays the typical electric fields emitted from different voltage overhead powerlines. The Proposal site has existing 132kV powerlines on the south west corner. Most cabling installed for the Proposal would be buried and located along the access tracks. A short section of overhead electrical cabling would be used to connect the substation to the existing TransGrid 132kV or 330kV powerline. The existing and proposed overhead powerlines are less than the recommended 5kV/m and 10kV/m limits.

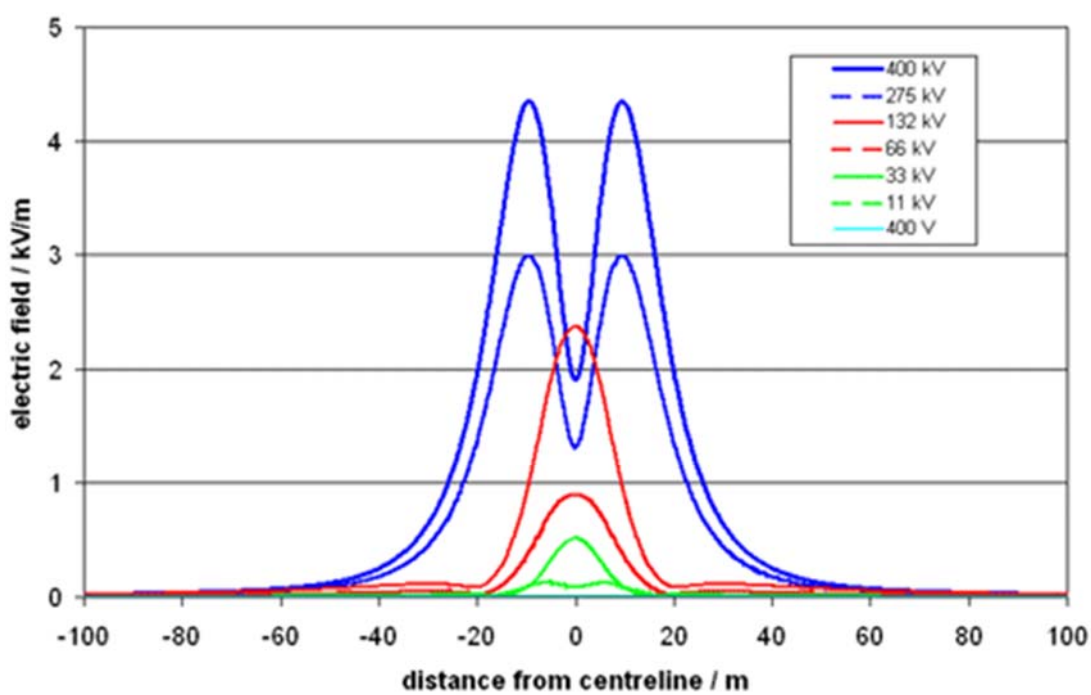

Figure 8-7 Typical electric fields from overhead powerlines (EMFs.info, 2017)

Substation

For the substation and transformers the magnetic fields at distances of 5-10m are generally indistinguishable from typical background levels in a home. The fenced exclusion area around the substation components is sufficient to reduce EMF to negligible levels. Works undertaken to facilitate the connection of the transmission line would require mitigation measures to ensure reduced exposure.

8.4.2 Potential impacts

Construction and decommissioning

There is low potential for EMF impacts during the construction and decommissioning phases of the Proposal. The maximum magnetic field of the proposed transmission line is well under the 200µT and 1000µT limits respectively recommended for public and occupational exposure.

Staff would be exposed to EMF's over intermittent periods during works at and around the proposed 132 kV underground transmission line. Exposure to EMFs during the construction of the transmission line and connection to substation would be short term, therefore the effects are likely to be negligible.

Operation

During operation, EMF sources would include overhead or underground transmission lines, underground cabling, and the solar array incorporating inverters.

Electric fields can be reduced with distance from operating electrical equipment and by shielding, while magnetic fields are reduced more effectively with distance. Using the Principle of Prudent Avoidance to design and site this infrastructure, the exposure to EMFs can be minimised and potential for adverse health impacts minimised also.

The site is surrounded by agricultural land. Public access would be restricted by site fencing around the site and existing substation during the operational phase. Given the levels associated with the infrastructure components, and the distance to the site perimeter fence, EMFs from the solar plant are likely to be indistinguishable from background levels at the boundary fence. The underground cabling would not produce external electric fields due to shielding from soil, and its magnetic fields are expected to be well within the public and occupational exposure levels recommended by ARPANSA and ICNIRP.

Using the Principle of Prudent Avoidance to design and site infrastructure, exposure to EMFs and potential for adverse health impacts can be further reduced. Adverse health impacts from EMFs are therefore unlikely as a result of the Proposal.

8.4.3 Mitigation measures

Table 8-7 Mitigation measures for hazards

C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and mitigation measures	C	O	D
1	• All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.	C		
2	• All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required.	C		

ID	Safeguards and mitigation measures	C	O	D
3	• Design of electrical infrastructure would minimise EMFs.	C		

8.5 AIR QUALITY AND CLIMATE

8.5.1 Existing environment

Air quality

Air quality for the Dubbo Regional Council LGA is generally expected to be good and typical of that found in a rural setting of NSW. Existing sources of air pollution include vehicle emissions, dust during dry periods, mining activities and agricultural activities, particularly stubble burning and harvest. During colder months, there may be a minimal increase in air contaminants due to smoke emissions from the operation of solid fuel heating.

A search of the National Pollutant Inventory (Australian Government, 2017) identified no facilities within the Dubbo Regional Council LGA that are required to record emissions.

The proposed solar plant is located on land zoned as RU1 Primary Production. The land surrounding the Proposal site includes crops (cereals) and grazing land (sheep, beef cattle). As such, the Proposal is located in a low density area. Long-term traffic on the surrounding roads of the Proposal site would be limited to light commercial and private transport, with heavy vehicles being used in the harvest season. The closest receiver to the Proposal site is located approximately 560m to the west.

The Proposal site is located within the 200km radius of the *Dark Sky Region* and approximately 130km north of the Siding Spring Observatory. The Dark Sky Region is centred upon the site of this observatory, which is considered Australia's most important visible-light observatory.

Climate

The Proposal site is located within the South Western Slopes Bioregion. The South Western Slopes is dominated by a sub-humid climate with hot summers and no dry season (NSW National Parks and Wildlife Service, 2003). The closest climate data for the region is from the Wellington (D&J Rural) weather station (site number 065034). Table 8-8 outlines the available data for this weather station from the Bureau of Meteorology (BOM):

Table 8-8 Wellington weather station (site number 065034).

Aspect	Annual Mean	Mean Minimum Range	Mean Maximum Range
Temperature[5]	24.4°C maximum 9.4 °C minimum	16.9 °C (January) to 2.2 °C (July)	32.9 °C (January) to 15.2 °C (July).

[5] Based on data collected between 1907 – 2017.

Aspect	Annual Mean	Mean Minimum Range	Mean Maximum Range
Rainfall[6]	618.7mm	45mm (April)	59.4mm (January)
Wind[7]	NA	3.9 – 8.0km per hour (9am)	7.0 – 11.7km per hour (3pm)

Climate change

Climate change refers to the warming temperatures and altered climatic conditions associated with the increased concentration of greenhouse gases in the atmosphere. Climate change projections for Australia includes more frequent and hotter hot days and fewer frost days, rainfall declines in south eastern Australia and more extreme weather events including intense rainfall, severe drought and harsher fires (CSIRO, 2016). 2017 was Australia's third-warmest year on record, and in much of south eastern Australia, rainfall was below average (BOM, 2017). At the global level, 2016 was the hottest year on record, and the third hottest year in a row (Steffan *et al*., 2017). The annual mean air temperature in Australia is projected to increase by 2.8-5.1°C by 2090 (above the 1986-2005 period) (CSIRO, 2015).

Climate change is recognised as a key challenge for the Central West Region, specifically changes in rainfall and temperature patterns, expected increases in the frequency and intensity of extreme weather events (floods, storms, heatwaves, frosts) and changes in water sharing arrangements (LLS, 2016). Temperatures have been increasing since about 1970, with the largest increase in temperature experienced in recent decades (OEH, 2014). The projected climate change impacts for the Central West and Orana Region are discussed in OEH (2014) and summarised in Figure 8-8 for the near future (2030) and far future (2070).

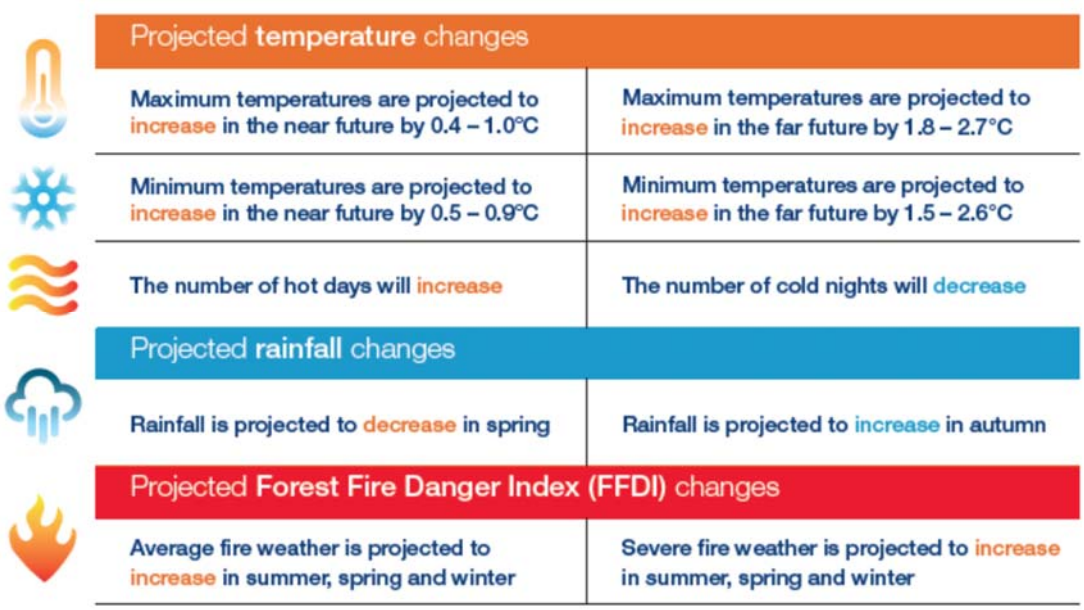

Figure 8-8 Projected climate change impacts for the Central West and Orana region of NSW (OEH, 2014)

[6] Based on data collected between 1881 – 2017.

[7] Based on data collected between 1965 – 2017.

Rural and regional communities are disproportionately affected by the impacts of climate change, through worsening extreme weather events and impacts to capacity, productivity and resilience in some rural industries (Climate Council, 2016). A significant proportion of Australian exports are agricultural products that are sensitive to global warming impacts (AGO, 2003). Some incremental adaptations in agricultural enterprises would be straightforward, but the more transformational adaptive changes may be risky and expensive, especially for individual farmers (Climate Council, 2016).

8.5.2 Criteria

The POEO Act requires that no vehicle shall have continuous smoky emissions for more than ten seconds. Limits on dust emission of less than 4 mg/m/m2 are also specified.

8.5.3 Potential impacts

Construction and decommissioning

AIR QUALITY

The assessment of the construction impacts on air quality has been undertaken qualitatively considering the likely construction equipment, processes and materials expected for the Proposal.

The principle sources of dust and emissions at the Proposal site during construction would be:

- Excavation and earthworks, such as ground breaking, levelling (cutting and filling), trenching, etc.
- Vehicle movement over unpaved surfaces.
- Movement of vehicles to and from the site (e.g. for deliveries).
- Dust from uncovered stockpiled powdery materials or truckloads.
- Emissions (e.g. NOx, SOx and CO) and particulates from vehicles, diesel generators, heavy plant and other mechanical equipment.
- Stored VOCs and other volatile hazardous materials such as paints, fuels and solvents.

In accordance with good international practice, the assessment of sensitive receivers should consider up to 500m from the site boundary for both human and ecological receptors (Holman *et al*., 2014), due to the typical distance of dust dispersion. The assessment of other pollutants (e.g. gaseous exhaust fumes) would require a smaller area of assessment (~ 200m) as suggested by Bignal, K. *et al*. (2004) before emissions are indistinguishable from background concentrations. Table 8-9 outlines the receivers relevant to the Proposal and potential air quality impacts.

Table 8-9 Air quality sensitive receivers

Receiver	Potential air quality impacts
Approximately 134 residences are located within 2km of the proposed solar plant (including both transmission line options) with thirteen residences within 500m of the Proposal site. The closest non-involved receiver to the solar plant site is 110m north.	Trenching underground transmission lines would generate greater potential for dust impacts than the overhead option but would occur over a lesser distance. Trenching adjacent to Goolma

Receiver	Potential air quality impacts
One residential dwelling is located within the Proposal site, within Lot 84 / DP2987. The dwelling is a homestead and is listed as an item of local heritage significance under Schedule 5 of the Wellington LEP.	Road has the potential to affect visibility for motorists. Construction and operational vehicles would use the available roads from Dubbo, Wellington and other supply centres, which go through several residential areas as there are no bypass roads. This would likely lead to increased localised air pollution and dust from unsealed roads. Human exposure to air pollutants can lead to health effects, principally in the respiratory system.
The Proposal site also contains a building delegated to the SCS.	
The Wellington and Macquarie Correctional Centres are situated directly adjacent and east of the Proposal site, off Goolma Road.	
Another solar plant, Wellington Solar Farm owned by First Solar, is proposed on private property immediately south of the site.	Workers would experience emissions from heavy machinery and generators, and increased dust conditions. Human exposure to air pollutants can lead to health effects, principally in the respiratory system.
Project construction and operation workers and staff.	
Air Quality (Gaseous and Particulate)	The proposed location is within a non-degraded air shed as no significant polluting sources are found in the Proposal site.

Dust and air emissions can be a nuisance to nearby receivers including residences, farm workers and motorists. Aerial imagery and site visits reveal there is limited vegetation screening for receivers along Cobbora Road, Goolma Road and Campbells Lane. The degree of impact can be influenced by weather and climate. Work carried out during long periods of dry weather and high winds have a greater potential to generate dust which can impact air quality. Rainfall at Wellington is relatively evenly distributed throughout the year, however evaporation rates in winter would be lower. Construction work during summer months may require greater dust suppression measures to manage any increased impacts.

The construction phase is expected to be approximately 18 months in duration with a peak period lasting six months. Mitigation strategies include a formal community consultation and engagement system, and complaints mechanisms, whereby the sources of any complaints are promptly identified and addressed, and appropriate application of a suite of dust and emission reduction measures

With the minor earthworks proposed and implementation of mitigation measures, air quality issues for sensitive receivers would be considered manageable.

Construction works are expected to have a negligible impact on the *Dark Sky Region* and users of the Siding Spring Observatory. This is due to the minor earthworks proposed, and the implementation of mitigation measures to supress dust and emissions that have potential to impact visibility in the area. Additionally, no permanent night lighting is proposed, limited security lighting is anticipated.

No air quality impacts in addition to those mentioned for construction are anticipated during the decommissioning phase. Traffic requirements would be similar in type but of shorter duration than that required for the construction phase.

CLIMATE AND CLIMATE CHANGE

No climatic impacts are anticipated as a consequence of the construction and decommissioning activities for the solar plant. Haulage traffic and plant and equipment would generate emissions, however, the short duration of the work and the scale of the solar plant proposed suggests this contribution would be negligible in a local or regional context.

Operation

AIR QUALITY

Operational and maintenance process of the solar plant would generate very low emissions of pollutants. Specifically, the source of these pollutants is vehicle emissions from staff vehicles and maintenance equipment. However, it is likely that no vehicles would be present at the site on a permanent basis, with only occasional visits by standard vehicles. Fuel would also be required for temporary power generation in the event of an unplanned outage.

Maintenance activities during operation would result in some minor, localised dust generation from vehicles travelling on the unsealed access roads. A groundcover management plan would be implemented to reduce dust production from disturbed areas and planting of the site would provide screening to, Cobbora Road, Goolma Road and Campbells Lane (Section 7.4). The impacts on local and regional air quality are expected to be negligible during normal operation.

During operation, the dust generation would likely be less than for existing agricultural land uses. The arrays themselves as well as the ground cover retained beneath the array would limit dust generation and movement. The unsealed perimeter access track would have low traffic levels during operation and is unlikely to generate substantially more dust that existing farm access tracks onsite. Limited security lighting is anticipated. Due to the existing minimal impacts on air quality during operation, the cumulative impact is expected to be not significant.

CLIMATE

Concerns have been previously raised regarding the possibility of the heat created from solar arrays resulting in a heat island effect. 'Heat island' is defined as an area having higher average temperature than its surroundings owing to the greater absorption, retention and generation of heat by buildings, pavements and activities. This is usually used in reference to the impact of an urban area on its rural surroundings. Studies have shown that Photovoltaic (PV) panels convert incident solar radiation into heat and this can alter the air-flow and temperature profiles near the panels. Whether such changes may subsequently affect the thermal environment of near-by populations of humans and other species have been questioned (Fthenakis & Yu, 2013). However, to date there have been limited empirical studies on the potential for a heat island effect in utility scale solar plants.

The limited studies that do exist also show results that can be seen as contradictory, as they are so site and project specific. Some studies suggest that PV systems can actually cause a cooling effect on the local environment, depending on the efficiency and placement of the PV panels while others demonstrate a warming effect (Barron-Gafford, Minor, Allen, Cronin, Brooks, & Pavao-Zuckerman, 2016). Other studies conclude that whilst air temperatures may increase within the solar plant itself, they rapidly decrease to the ambient temperature beyond the perimeter of the solar plant (Fthenakis & Yu, 2013).

Fthenakis and Yu (2013) undertook an analysis of the potential for large solar plants to generate a heat island effect and increase air temperature within the solar plant area. The study found at the centre of the solar plant, the annual average air temperature at a height of 2.5m increased by up to 1.9^{0}C. However, this

increase in temperature dissipated at a height of 5m. Additionally, the solar plant completely cooled overnight.

The research suggested a small potential effect on climate within the solar plant site. This effect may actually enhance retention of ground cover in very cold or hot conditions onsite. Negligible impacts on adjacent properties and agricultural activities such as plant growth and health of cattle would occur.

CLIMATE CHANGE

The Proposal would, as part of the transition to renewable energy sources, contribute to reducing greenhouse gas emissions and the mitigation of the negative effects of climate change. On an annual basis, the proposed Wellington North Solar Plant would provide enough clean, renewable energy for about 114,000 average NSW homes. At the same time, it would displace approximately 581,000 metric tonnes of carbon dioxide.

The operation of the Proposal would help reduce greenhouse gas emissions and move towards cleaner electricity generation. Based on 625,000 MWh, the Proposal would offset the equivalent of 203 kilotonnes per annum of CO_2 emissions for Brown Coal, 437 kilotonnes per annum of CO_2 emissions for Black Coal and power the equivalent of 105,570 NSW homes (emission calculation based on 2013 NTNDP emission intensity values averaged across the power stations).

The operation of the solar plant would produce minimal CO_2 emissions when compared to conventional coal and gas fired power stations, refer to Table 8-10.

Table 8-10 Comparison of CO_2 equivalent emissions produced per kilowatt hour.

Generation method	Emissions produced (grams CO_2 equivalent per kWh)	Source
PV solar Plant	**19-59**	**Wright and Hearps (2010)**
Coal-fired power station	800-1000	Wright and Hearps (2010)
Combined cycle gas turbine	400	Alsema *et al*. (2006)

8.5.4 Safeguards and mitigation measures

Table 8-11 Safeguards and mitigation measures for climate and air quality impacts

C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and mitigation measures	C	O	D
1	Dust generation by vehicles accessing the site and earthworks at the site would be suppressed using water applications or other means as required.	C		D
2	Vehicle loads of material which may create dust would be covered while using the public road system.	C		D
3	All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use.	C	O	D

ID	Safeguards and mitigation measures	C	O	D
4	Fires and material burning is prohibited on the Proposal site.	C	O	D

8.6 RESOURCE USE AND WASTE GENERATION

8.6.1 Resource use and energy payback

Estimated resource use

The key resources and estimated quantities (pending the completion of the detailed proposal design) required to construct the proposed Wellington North Solar Plant are listed in Table 8-12. The majority of the required resources would be used during the construction of the proposed solar plant. During operation and decommissioning, resource requirements would relate to maintenance activities including the use of machinery, vehicles and water resources. Water resources would be required throughout construction, operation and decommissioning. Water use is considered in Section 8.1 of this EIS.

Table 8-12 Resource requirements for the Proposal Wellington North Solar Plant.

Resource	Quantity
Gravel (access tracks)	26,000m^3
Sand (bedding for cables)	5,000m^3
Concrete	1,200m^3
Estimated no of solar panels	1,000,000
Water during construction	55ML pa. (approximately 110ML total)

Lifecycle analysis

Life cycle analysis (LCA) assesses and quantifies the energy and material flows associated with a given process to identify the resource impacts of that process and potential for resource recovery. LCA estimates of energy and emissions based on the total life cycle of materials used for a project, i.e. the total amount of energy consumed in procuring, processing, working up, transporting and disposing of the respective materials (Schleisner, 2000).

A life cycle inventory of polycrystalline PV panels has been undertaken by the International Energy Agency Photovoltaic Power System Program. In their report, Life Cycle Inventories and Life Cycle Assessments of Photovoltaic Systems (IEA-PVPS-T12-04:2015) the 'energy payback time' for thin film modules has been estimated at less than 1 year for a solar installation in Southern Europe. This is consistent with the estimation that the Wellington North Solar Plant would have an energy payback period of approximately 2 years. Over the panel's 30 year lifetime, they are expected to produce less than 18g of greenhouse gas per kWh generated, almost 50% lower than for Csi (Fthenakis *et al.,* 2015).

The production of the frames and other system components including cabling would also produce emissions and waste but less than the production of modules. The carbon footprint of PV systems - assuming a location in southern Europe - ranges from 16 to 32 gCO_2 eq. per kWh compared to between 300 and 1000 g CO_2 eq. per kWh when produced from fossil fuels (Solar Power Europe, 2017b). In terms of the water footprint, PV consumes 0.1 l/kWh(VI), mainly during manufacturing and recycling, compared to

0.75 to 75 l/kWh for typical fossil fuel electricity production in a southern Europe location (Solar Power Europe 2017c).

As such, solar plants are favourable in a number of aspects when compared to the major electricity generating methods employed in Australia:

- CO_2 emissions generated per kilowatt hour of energy produced.
- Short energy payback time in comparison to the life span of the Wellington North Solar Plant Project.
- Potential to reuse and recycle component parts such as metals and glass from frames and panels.

8.6.2 Waste

POLICY POSITION

In NSW, waste management and pollution are regulated under the *Protection of the Environment Operations Act 1997* (POEO Act) and the *Protection of the Environment Operations (Waste) Regulation 2005.* Unlawful transportation and deposition of waste is an offence under Section 134 of the Act. Littering is an offence under Section 145 of the Act.

The NSW WARR Act contains waste minimisation and management objectives, including:

- Encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ESD.
- Ensure that resource management options are considered against a hierarchy of the following order:
  - Avoidance of unnecessary resource consumption.
  - Resource recovery (including reuse, reprocessing, recycling and energy recovery).
  - Disposal.

Adopting the above principles would encourage the most efficient use of resources, and reduce costs and environmental harm in accordance with the principles of ESD.

The Central West Regional Organisation of Councils (CENTROC) and Orana Regional Organisation of Councils (OROC) have collaborated to prepare the NetWaste Strategic Waste Plan, which was developed in line with the EPA guidelines and aims to achieve a coordinated approach to waste management based on the WARR Strategy key result areas. Dubbo Council is a member of the regional voluntary Netwaste Group.

The NetWaste Regional Strategic Waste Plan is also consistent with the Community Strategic Plans of member councils. Dubbo Community Strategic Plan 2011-2036, specifies the following:

> *"3.4 Outcome: The community has a high standard of living through the provision of superior waste management services.*
>
> *3.4.1 The Waste Management Strategy for the City is implemented for domestic recycling, greenwaste collection, processing and industry waste reduction plans.*
>
> *3.4.2 The community exhibits positive waste avoidance and reduction behaviour within the City*
>
> *3.4.3 High quality, environmentally sensitive and cost effective waste management services with the capacity to meet current and future growth requirements are provided.*

3.4.4 Systems are in place to maximise resource recovery at the Whylandra Waste Depot.

3.4.5 Dubbo is a regional waste management service provider.

3.4.6 The Whylandra Waste Depot is operated to comply with standards and regulations relating to pollution control and climate change."

The main EPA licensed landfill of relevance to the Proposal is in Dubbo; the Whylamdra Waste & Recycling Facility in Dubbo. This landfill operates on a total disposal capacity of 47,922(tpa), and the main facility's lifespan is >1,500years (Netwaste Strategic Waste Plan 2013-2017).

8.6.3 Potential impacts

Construction

RESOURCE USE

While increasing scarcity of resources and environmental impacts are emerging from the use of non-renewable resources, the supply of the materials required for the Proposal are not currently limited or restricted. In considering the volumes required, the Proposal is unlikely to place significant pressure on the availability of local or regional resources. The use of the required resources is considered reasonable in light of the benefits of offsetting fossil fuel electricity generation.

Water would be required during construction for activities including watering of roads and in the site office and amenities. Water use is considered in Section 8.1.

WASTE

The management of waste during the construction phase would observe the objectives of the WARR Act and the relevant key result areas of the WARR Strategy and the NetWasteStrategic Waste Plan.

Solid waste is one of the major pollutants caused by construction. A number of different construction activities associated with the Proposal would produce solid wastes, including:

- Spoil from trenching.
- Packaging materials.
- Excess building materials.
- Scrap metal and cabling materials.
- Plastic and masonry products, including concrete wash.
- Excavation of topsoils and vegetation clearing (expected to be minimal).
- Bio wastes, from onsite septic systems.

In accordance with the definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction and decommissioning phases would be classified as building and demolition waste within the class general solid waste (non-putrescibles). Ancillary facilities in the site compound would also produce sanitary wastes classified as general solid waste (putrescibles) in accordance with the POEO Act. Waste produced during construction would be disposed at an appropriately licensed waste facility. Green waste from tree clearing would be mulched for use in rehabilitation at the site or removed from the site.

The impact from waste generation, on regional waste facilities is assessed to be moderate without the implementation of any recycling or re-use measures. However, with the implementation of a Waste Management Plan, identification of recycling waste facilities in the LGAE and Orana regional and consulting

with the NetWaste Strategic Waste Plan, the impacts from construction waste disposal on regional landfills, the biological environment and social environment is assessed to be minor.

Operation

RESOURCE USE

Electricity production using PVs emits no pollution, produces no GHGs, and uses no finite fossil-fuel resources (US Department of Energy, 2004). Only limited amounts of fuels would be required for maintenance vehicles during operation of the solar plant.

Some balance of system electrical components (e.g. inverters, transformers, electrical cabling) would likely need replacement over the proposed life of the solar plant, requiring further use of metal and plastic based products.

Over the expected 30 year lifespan of the PV plant, the operational demand on natural resources would be minimal, as such the impacts are considered negligible.

WASTE

During operation, the solid waste streams would be associated with maintenance activities and presence of employees. Some materials, such as fuels and lubricants, and metals may require replacement over the operational life of the Wellington North Solar Plant. These materials would be reused or recycled wherever practicable. Given the minimal amount of moving parts and limited wear tear of equipment, the operational waste streams generated by the PV Plant would be very low and impacts to regional waste disposal facilities would be minor.

Decommissioning

During decommissioning, all infrastructure and materials would be removed. The following materials would either be recycled or reused:

- Solar panels and mounting system.
- Metals from posts, cabling, fencing.
- Buildings and equipment such as the PCS, transformers and similar components would be removed for resale or reuse, or for recycling as scrap.

Buildings and major electrical equipment would be removed for resale or reuse, or for recycling as scrap. Items that cannot be recycled or reused, such as excess of above, would be disposed in accordance with applicable regulations and to appropriate facilities. All above ground infrastructure would be removed from the site during decommissioning.

The majority of the Proposal components are recyclable and mitigation measures are in place to maximise reuse and recycling in accordance with resource management hierarchy principles.

8.6.4 Safeguards and mitigation measures

A Waste Management Plan would be developed to minimise waste and maximise the opportunity for reuse and recycling. Potential impacts are to be addressed with regards to the mitigation measures in Table 8-13.

Table 8-13 Safeguards and mitigation measures for resource use and waste generation impacts

C: Construction; O: Operation; D: Decommissioning

ID	Safeguards and mitigation measures	C	O	D
1	• A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to: o Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy. o Quantification and classification of all waste streams. o Provision for recycling management onsite. o Provision of toilet facilities for onsite workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant). o Tracking of all waste leaving the site. o Disposal of waste at facilities permitted to accept the waste. o Requirements for hauling waste (such as covered loads).	C	O	D
2	• Septic system is installed and operated according to the Dubbo Regional Council regulations.	C	O	

8.7 CUMULATIVE IMPACTS

8.7.1 Existing environment

Cumulative impacts relate to the combined effect of impacts from several activities on a particular value or receiver. They may occur concurrently or sequentially. Considering the Wellington North Solar Plant proposal, the relevant cumulative impacts are those associated with other known or foreseeable developments occurring in proximity to the Proposal.

Proposed developments within the locality or region which may contribute to the cumulative impacts of the Proposal include:

- The Bodangora Wind Farm, proposed by Infigen Energy, is located 10km north of the Proposal site and has commenced construction.
- The Wellington Solar Farm, proposed by First Solar, would be located directly south of the Proposal and has been approved.
- The Suntop Solar Farm, proposed by Photon Energy, would be located 12km south west of the Proposal site. The EIS and DA are currently being prepared.
- The Maryvale Solar Farm, proposed by Photon Energy, would be 2km north west of the Proposal site. The EIS and DA are currently being prepared.
- The Uungula Wind Farm, proposed by Wind Prospect, would be 40km east of the Proposal site. The EIS and DA are currently being prepared.

It is likely the construction of the Bodangora Wind Farm would be completed before construction of Wellington North Solar Plant commences. Due to the distance and location of the Suntop Solar Farm, Maryvale Solar Farm and Uungula Wind Farm, these are unlikely to have a local cumulative impact.

Construction and operation of the Wellington Solar Farm, by First Solar, is the most relevant proposed development. Additionally, the Wellington North Solar Plant would be near an existing substation and existing transmission lines, relevant to both construction and operation of the Proposal.

8.7.2 Potential impacts

Potential cumulative impacts are primarily associated with the following issues:

- Biodiversity impacts.
- Noise impacts.
- Visual and landscape character impacts.
- Traffic impacts.
- Pressures on local facilities, goods and services.

The existing pressures on these issues, in combination with the impacts of the proposed Wellington Solar Farm proposal and existing substation and transmission line development in the area, may be increased by the additional impacts by the Wellington North Solar Plant proposal, such that greater impacts result than considered in the separate assessments.

These issues, and their potential interactions with the Wellington North Solar Plant proposal, have been assessed separately in relevant sections of the EIS. Mitigation measures have been developed for each of the impact areas. In summary:

Biodiversity impacts

The clearing of native vegetation, which is a key threatening process at both State and Commonwealth level, is considered a major factor in the loss of biological diversity. At least 61 per cent of the native vegetation in NSW has been cleared or highly modified since European settlement (NSW Scientific Committee, 2011), and the removal of vegetation for the Wellington North Solar Plant is contributing to this process. The cumulative impact of similar renewable energy projects, particularly where EECs are involved, can be considerable given that many poorly-conserved vegetation communities have a substantial portion of their extents represented on private land where the majority of renewable energy projects are proposed. Small losses of such communities, which may be insignificant at a project level, may accumulate over time to cause a significant reduction in the extent of remnant patches.

Cumulative impacts are considered best addressed by avoiding and minimising. Where avoidance is not practicable, the impacts of each contributing project is assessed on a case by case basis. Long term mechanisms like offsetting through the NSW Biodiversity Offsets Policy for Major Proposals are structured to address the ongoing impacts of multiple projects in a cohesive manner. For the Wellington North Solar Plant, credits were generated through the BCC, therefore offsetting of biodiversity impacts has been considered.

Noise impacts

Noise impacts through the use of plant machinery and vehicles would be heightened if the construction of other developments including Wellington Solar Farm are undertaken concurrently.

An assessment of cumulative noise impacts from the construction of the Wellington North Solar Plant and the Wellington Solar Plant was undertaken for the nearest affected receivers to quantify the potential cumulative noise from construction of both solar plants and transmission lines. The assessment found there would potentially be exceedances above the NML for Receivers R1 and R2 during construction of the solar plants. The exceedance at Receiver R1 is mainly due to the construction of the Wellington Solar Farm. The construction of the Wellington North Solar Plant is the main contributor to the exceedance at Receiver R2. Therefore, the predicted cumulative noise impact from the construction of both solar plants does not identify any new exceedances at nearby affected receivers.

For the cumulative construction noise levels of the Wellington North Solar Plant's eastern easement and the Wellington Solar Farm construction works the NML would be exceeded at Receivers R1 and R14. The exceedance at Receiver R1 is only due to the construction works from the Wellington Solar Farm, while the exceedance at R14 only occurs when the three (3) noisiest plant and equipment are operating at the closest proximity to the receiver from each work site.

Similarly, the cumulative construction of the Wellington North Solar Plant's western easement and the Wellington Solar Farm exceed the NML at Receivers R1, R2 and R12. The construction noise from the western easement and the Wellington Solar Farm both contribute to the exceedance at R1. The exceedance at R2 is caused by the construction works from the western easement. When the concurrent construction of the Wellington North Solar Plant's western easement and the Wellington Solar Farm occur at the closest proximity to receiver R12 it is predicted to exceed the NML.

The probability of the scenario, where the Wellington Solar Farm, and either of the Wellington North Solar Plant's easements are constructed concurrently and have their three (3) noisiest plant equipment operating at the closest proximity to the affected receivers, is generally low.

Overall, cumulative construction noise impacts are expected to be minor and would be managed with recommended mitigation measures and a Noise Management Plan as set out in Section 7.3.8 and included as part of Appendix G.

Cumulative traffic noise impacts are expected to be negligible, as there is minimal overlap in proposed access and haulage routes between the two solar projects. Wellington North Solar Plant's primary access would be via Campbells Lane. Traffic would access Campbells Lane from Cobbora Road and Mitchell Highway. While the Wellington Solar Farm proposes to use Goolma Road for access and transport. Wellington North Solar Plant would occasionally use existing accesses from Goolma for light vehicles.

An assessment of cumulative noise impacts from the Wellington North Solar Plant, the upgraded substation and the Wellington Solar Plant was undertaken for the nearest affected receivers to quantify the potential cumulative noise from both solar plants and the upgraded substation. The assessment found that the predicted noise levels generally comply at all receiver locations under all scenarios and meteorological conditions. However, under noise enhancing weather conditions, the predicted cumulative noise levels at Receiver R14 exceed the criterion by 2dB(A) during the night period. The exceedance at R14 is mainly attributed to the noise emissions from the Wellington Solar Farm, which predicts noise levels equal to the night time Project Noise Trigger Level of 35dB(A). When the noise emissions from the upgraded substation is considered, it is predicted to increase the overall noise levels by 2dB(A) at the receiver and therefore yielding an exceedance of 2dB(A) at Receiver R14.

In accordance with Table 4.1 and Table 4.2 of the NPfI, a 2dB(A) exceedance is considered to be negligible as a 2dB(A) change in noise level is not discernible or noticeable to the average person. Therefore, the predicted noise levels at Receiver R14 are determined to be acceptable in accordance with the NPfI and no further reasonable and feasible noise mitigation measures are required.

Visual and landscape character impacts

The operational view of the proposed Wellington North Solar Plant may generate a cumulative impact with the existing substation and powerlines. The array site and substation require security fencing and steel dominated infrastructure. The mitigation recommended in this report would act to reduce the cumulative impact. Screen planting would be undertaken onsite to minimise views of the fence as well. Generally, adverse cumulative visual impacts are anticipated to be manageable due to the ability to effectively screen infrastructure in key locations.

The operational view of the proposed Wellington North Solar Plant would have a cumulative with the proposed Wellington Solar Farm by First Solar, to be located directly south of the solar plant site. The cumulative effect would be such at it would appear as one development. However, due to the rolling topography and layout of the Proposal the solar plant may result in the Proposal site not appearing visible as a contiguous development. Creek lines and some existing vegetation would screen views for motorists travelling from Wellington along Goolma Road towards Mudgee. The views to the Proposal site are more open from the north travelling south due to the reduced vegetation along the boundary fencing. The cumulative effect is reduced due to the topography landform of hilltops and rolling fields. Furthermore, screen planting along Goolma Road would significantly reduce the impact of both developments, subsequently reducing the cumulative effect of the two projects.

Traffic impacts

The existing traffic surveys volumes on the adjoining road network to the Wellington North Solar Plant carried out in February/March 2018 would have included the operation and construction of the existing Macquarie and Wellington Correctional Centres and the current construction activity of the Bodangora Wind Farm.

Based upon the intersection turn treatment review and mid-block assessment of the road network and of the Proposal traffic generation and the Wellington North Solar Plant, the background traffic along the major road network has additional capacity to cater for additional traffic flow as a result of surrounding projects or fluctuations in traffic volumes.

Cumulative traffic impacts may occur if construction of the solar plant occurs concurrently with construction of the Wellington Solar Farm. Cumulative traffic impacts would be specifically on common construction access and freight transport routes, primarily on the Mitchell Highway and Goolma Road. The Mitchell Highway is a high capacity road designed for heavy vehicle traffic, as is likely to be able to absorb any cumulative impacts of the projects in the region. The Wellington North Solar Plant would be primarily accessed from Campbells Lane, minimal access from Goolma Road. Cumulative impacts to traffic on Campbells Lane and Goolma Road are likely to be noticeable.

During operation, excepting unusual maintenance operations such as inverter or transformer replacement, a small maintenance team using standard vehicles are all that would be required, resulting in a negligible impact.

Pressures on local facilities, goods and services

There is potential that the possible concurrent construction of the Proposal with Wellington Solar Farm and other renewable energy projects in the region would increase pressures on local community services including accommodation. However, there is also potential for positive cumulative economic effects from the construction of multiple developments in the area. As mentioned above, the construction of the Wellington North Solar Plant is likely to commence once Bodangora Wind Farm is operational, therefore the socio-economic benefits in relation to both these projects would be a continuous ongoing benefit for the community. The increased creation of jobs and economic input into local businesses would provide a benefit to local communities.

Assessments concluded that the Proposal would not result in significant impacts to local businesses, residents and road users, subject to the range of identified mitigation measures. Due to the number of local communities in the area, any cumulative impacts on local services are likely to be spread between communities. There is sufficient residual capacity within the existing communities. It is unlikely that there would be negative cumulative impacts to local facilities goods and services.

8.7.3 Environmental safeguards

The cumulative impacts identified for this proposal are considered to be best managed by dealing with each component individually. No additional safeguards are proposed.

9 ENVIRONMENTAL MANAGEMENT

9.1 ENVIRONMENTAL MANAGEMENT FRAMEWORK

The environmental risks associated with the proposed Wellington North Solar Plant would be managed by implementing a proposal-specific suite of mitigation measures detailed in Sections 7 and 8 and summarised below.

All commitments and mitigation measures would be managed through the implementation of a Project Environmental Management Strategy (EMS). The EMS would comprise a Construction Environmental Management Plan (CEMP), an Operation Environmental Management Plan (OEMP) and a Decommissioning Environmental Management Plan (DEMP). These plans would be prepared sequentially, prior to each stage of works by the contractor (CEMP, DEMP) and proponent (OEMP).

The EMS would include performance indicators, timeframes, implementation and reporting responsibilities, communications protocols, a monitoring program, auditing and review arrangements, emergency responses, induction and training and complaint/dispute resolution procedures. The monitoring and auditing program would clearly identify any residual impacts after mitigation. Adaptive management would be used to ensure that improvements are consolidated in updated EMPs.

9.2 CONSOLIDATED MITIGATION MEASURES

The mitigation measures contained in this report comprise proposal-specific safeguards, recommendations from specialist assessment reports and reference to a range of best practice guidelines and regulatory requirements. The measures are to be incorporated in proposal plans and designs, contract specifications and the Construction Environmental Management Plan, Operation Environmental Management Plan and Decommissioning Environmental Management Plan as appropriate. The mitigation measures are consolidated below. Where measures are relevant to more than one environmental aspect, they are cited only once under the most relevant aspect, to avoid duplication.

Table 9-1 Consolidated list of mitigation measures

ID.	Mitigation measure	C	O	D
Biodiversity				
1	Time works to avoid critical life cycle events: • Hollow-bearing trees would not be removed during breeding season or hibernation period (Winter to early summer) to mitigate impacts on Southern Myotis. • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur.	C		
2	Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler: • Pre-clearing checklist. • Tree clearing procedure.	C		
3	Relocate habitat features (fallen timber, hollow logs) from within the Proposal site: • Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement.	C		
4	Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed: • Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing.	C		

ID.	Mitigation measure	C	O	D
	• No stockpiling or storage within dripline of any native vegetation. • In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance.			
5	Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill: • Avoid Night Works. • Direct lights away from vegetation.	C	O	
6	Temporary fencing to protect significant environmental features such as riparian zones: • Prior to construction commencing, exclusion fencing and signage would be installed around habitat to be retained.	C		
7	Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas: • A Weed Management Procedure would be developed for the Proposal to prevent and minimise the spread of weeds. This would include: • Management protocol for declared priority weeds under the Biosecurity Act 2015 during and after construction • Weed hygiene protocol in relation to plant, machinery, and fill • Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported. • The weed management procedure would be incorporated into the Biodiversity Management Plan.	C	O	
8	• Staff training and site briefing to communicate environmental features to be protected and measures to be implemented: • Site induction. • Toolbox talks.	C		
9	Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed development:	C		

ID.	Mitigation measure	C	O	D
	• Preparation of a Biodiversity Management Plan that would include protocols for: o Protection of native vegetation to be retained. o Best practice removal and disposal of vegetation. o Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist. o Weed management. o Unexpected threatened species finds. o Rehabilitation of disturbed areas.			
10	Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the Proposal site: • Retained native vegetation would be considered as an offset site.		O	
11	Staff training and site briefing to communicate impacts of traffic strikes on native fauna: • Awareness training during site inductions regarding enforcing site speed limits. • Site speed limits to be enforced.	C	O	
Aboriginal heritage				
1	The development must avoid the two possible Scarred Tree (Wellington Nth ST1 and Wellington Nth ST2) as per the proposed development footprint in this report. A minimum 10m buffer around the trees should be in place to protect the tree canopy and root system.		Design	
2	If complete avoidance of the nine artefacts scatters and 28 isolated find sites recorded within the Proposal site is not practicable, the artefacts within the development footprint must be salvaged prior to the proposed work commencing and moved to a safe area within the property that would not be subject to any ground disturbance.	C		
3	The collection and relocation of the artefacts should be undertaken by an archaeologist with representatives of the registered Aboriginal parties and be consistent with Requirement 26 of the *Code of practice for Archaeological Investigation of Aboriginal Objects in New South Wales.* A new site card/s would need to be completed once the artefacts are moved to record their new location on the AHIMS database. The Aboriginal community requests that a Cultural Smoking Ceremony take place to cleanse any artefacts salvaged and the reburial location.	C		

ID.	Mitigation measure	C	O	D
4	A minimum 5m buffer should be observed around all artefact scatters and isolated find sites including those outside the development footprint.	C	O	D
5	Wellington North Solar Plant Pty Limited should prepare a Cultural Heritage Management Plan (CHMP) to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Plant and management of known sites and artefacts. The Plan should include the unexpected finds procedure to deal with construction activity. Preparation of the CHMP should be undertaken in consultation with the registered Aboriginal parties.	C		
6	In the unlikely event that human remains are discovered during the construction, all work must cease in the immediate vicinity. OEH, the local police and the registered Aboriginal parties should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal.	C		
7	Further archaeological assessment would be required if the Proposal activity extends beyond the area of the current investigation as detailed in this report, including the entire proposed eastern transmission route and any portions of the western transmission route outside the surveyed alignment. This would include consultation with the registered Aboriginal parties and may include further field survey.	C	O	D
Noise and vibration				
1	Implement noise control measures such as those suggested in Australian Standard 2436-2010 “Guide to Noise Control on Construction, Demolition and Maintenance Sites”, to reduce predicted construction noise levels.	C		
2	A Noise Management Plan would be developed as part of the CEMP and would specifically target R1, R2, R4 and R6 in order to achieve compliance. The plan would include, but not be limited to: • Use less noisy plant and equipment where feasible and reasonable. • Plant and equipment to be properly maintained. • Provide special attention to the use and maintenance of ‘noise control’ or ‘silencing’ kits fitted to machines to ensure they perform as intended. • Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel. • Avoid any unnecessary noise when carrying out manual operations and when operating plant. • Any equipment not in use for extended periods during construction work should be switched off. • Complaints procedure deal with noise complaints that may arise from construction activities. Each complaint would need to be investigated and appropriate noise amelioration measures	C		

ID.	Mitigation measure	C	O	D
	put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits. • Establish good relations with people living in the vicinity of the site at the beginning of proposal and maintain. Keep people informed, take complaints seriously, deal with complaints expeditiously. The community liaison member of staff should be adequately experienced.			
Visual amenity and landscape character				
1	Regarding landscaping to fragment / soften the view of infrastructure: • An intermittent band of screen planting would be located: o Between the property boundary and the solar arrays, in locations along Goolma Road and Cobbora Road where there is no existing vegetation and where the arrays are immediately adjacent to the boundary. o Along the Campbells Lane boundary to mitigate impacts on properties on the northern side of Campbells Lane (identified in Appendix H). • To ensure that the screen planting integrates into the existing landscape character: o Bands of planting would be a mix of locally native tree and shrub species to ensure a naturalistic effect whilst also providing habitat and movement corridors for native fauna. o Planting would not form a consistent hedge between the road and the solar farm but rather form a row of intermittent copse plantings that reflect the existing character of roadside vegetation in the area • Screen planting should be considered for locations surrounding buildings associated with the proposal where appropriate. • Strategies to ensure the effective screening is maximised early in the project life and maintained would be implemented, for example: o Planting would aim to be undertaken as soon as practical in the construction process depending on the season, as it would take time for the plants to establish and become effective as a screen. Seasonal requirements for planting should also be considered. o Successional planting may be undertaken (quick growing species replaced by longer living species).	Pre-construction		

ID.	Mitigation measure	C	O	D
	The screen would be maintained for the operational life of the solar plant. Dead plants would be replaced. Pruning and weeding would be undertaken as required to maintain the screen's visual amenity and effectiveness in breaking up views.			
2	• Where feasible, underground rather than overhead power lines would be considered. • Where feasible, co-location of powerlines would be undertaken to minimise the look of additional power poles. If additional poles are required, these would match existing pole design as much as practicable. • Materials and colours utilised in the construction of site sheds, battery storage and associated infrastructure would be considered to ensure that Visual Impacts are minimised. In general materials should be non-reflective and should be painted in neutral colours that are sensitive to the surrounding landscape.	Design stage		
3	• Night lighting would be minimised to the maximum extent practicable (i.e. manually operated safety lighting at main component locations).	C	O	
Soils, Agriculture and land capability				
1	As part of the CEMP, a Soil and Water Management Plan (SWMP) (with erosion and sediment control plans) would be prepared, implemented and monitored during the Proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to: • Implement management responses outlined in the Soil Survey Report (McMahon, 2018). • Install, monitor and maintain erosion controls. • Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability. • Manage topsoil in all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. Stockpile topsoil appropriately so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity. • Minimise the area of disturbance from excavation and compaction; rationalise vehicle movements and restrict the location of activities that compact and erode the soils as much as practical. Any compaction caused during construction would be treated such that revegetation would not be impaired. • Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised, and work ceased until the wet period had passed.	C	O	D

ID.	Mitigation measure	C	O	D
2	A Groundcover Management Plan would be developed in consultation with an agronomist and taking account of soil survey results to ensure perennial grass cover is established across the site as soon as practicable after construction and maintained throughout the operation phase. The plan would cover: • Soil restoration and preparation requirements. • Species election. • Soil preparation. • Establishment techniques. • Maintenance requirements. • Perennial groundcover targets, indicators, condition monitoring, reporting and evaluation arrangements – i.e. Live grass cover would be maintained at or above 70% at all times to protect soils, landscape function and water quality. Any grazing stock would be removed from the site when cover falls below this level. Grass cover would be monitored on a fortnightly basis using an accepted methodology. • Contingency measures to respond to declining soil or groundcover condition. • Identification of baseline conditions for rehabilitation following decommissioning.	C	O	
3	The array would be designed to allow sufficient space between panels to establish and maintain ground cover beneath the panels and facilitate weed control.	Design		
4	A Spill and Contamination Response Plan would be developed as part of the overall Emergency Response Plan to prevent contaminants affecting adjacent surrounding environments. The plan would include measures to: • Respond to the discovery of existing contaminants at the site (e.g. pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements. • Requirement to notify the EPA for incidents that cause material harm to the environment (refer s147-153 of the POEO Act). • Manage the storage of any potential contaminants onsite. • Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and the EPA notification procedures and remediation. • Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks. • Prevent contaminants affecting adjacent pastures, dams, water courses and native vegetation. • Monitor and maintain spill equipment • Induct and train all site staff.	C	O	D

ID.	Mitigation measure	C	O	D
5	A protocol would be developed in relation to discovering buried contaminants within the Proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements.	C	O	D
6	A Rehabilitation Plan would be prepared to ensure the array site is returned to its pre-solar Plant land capability. The plan would be developed with reference to the base line soil testing and with input from an agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover. The plan would reference: • *Australian Soil and Land Survey Handbook* (CSIRO, 2009) • *Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008) • *The land and soil capability assessment scheme: second approximation* (OEH, 2012)			D
7	Manage pests and weeds during construction and operation. Where practicable integrate weed and pest management with adjoining land owners	C	O	
8	Consultation with local community, to minimise impact of the Proposal on adjacent agricultural activities and access.	C	O	D
Land use				
1	Consultation would be undertaken with TransGrid regarding connection to the substation and design of electricity transmission infrastructure.	C	O	D
2	Consultation with Proposal site mineral titleholders regarding the Proposal and potential impacts.	C	O	D
Historic heritage				
1	Should an item of historic heritage be identified, the Heritage Division (OEH) would be contacted prior to further work being carried out in the vicinity.	C	O	D
2	The Noonee Nyrang Homestead would not be altered whilst in use as an Office and Maintenance building for the solar plant.	C	O	D
3	The existing outbuildings and stone shed around the Noonee Nyrang Homestead would be maintained and not altered.	C	O	D
Flooding				
1	The design of buildings, equipment foundations and footings for electrical componentry and panel mounts would be designed to avoid the 1% AEP flood level to minimise impacts from potential flooding including: • The solar array mounting piers are designed to withstand the forces of floodwater (including any potential debris loading) up to the 1% AEP flood event, giving regard to the depth and velocity of floodwaters;	Design		

ID.	Mitigation measure	C	O	D
	• The mounting height of the solar module frames would be designed such that the lower edge of the module is clear of the predicted 1% AEP flood level. • All electrical infrastructure, including inverters, would be located above the 1% AEP flood level. • Where electrical cabling is required to be constructed below the 1% AEP flood level it would be capable of continuous submergence in water. • The proposed perimeter security fencing would be constructed in a manner which does not adversely affect the flow of floodwater and should be designed to withstand the forces of floodwater, or collapse in a controlled manner to prevent impediment to floodwater.			
2	An Emergency Response Plan incorporating a Flood Response Plan would be prepared prior to construction covering all phases of the Proposal. The plan would: • Detail who would be responsible for monitoring the flood threat and how this is to be done. • Detail specific response measures to ensure site safety and environmental protection. • Outline a process for removing any necessary equipment and materials offsite and out of flood risk areas (i.e. rotate array modules to provide maximum clearance of the predicted flood level). • Consider site access in the event that some tracks become flooded. • Establish an evacuation point. • Define communications protocols with emergency services agencies.	C	O	D
Traffic, transport and safety				
1	The following intersections treatments would be undertaken in consultation with Dubbo Regional Council: • The intersection of Cobbora Road / Campbells Lane would be upgraded to provide a BAR/BAL turn type treatment including shoulder widening on Cobbora Road (major road); • The proposed site access on Campbells Lane would be designed to provide BAR/BAL turn type treatment; and • Intersection treatments would be designed to accommodate articulated vehicles of 19 m in length.	Design stage		
2	A Haulage Plan would be developed with input from the roads authority, including but not limited to: • Assessment of road routes to minimise impacts on transport infrastructure. • Scheduling of deliveries of major components to minimise safety risks (on other local traffic). • Consideration of cumulative traffic loads due to other local developments. • Traffic controls (signage and speed restrictions etc.).	PC		D

ID.	Mitigation measure	C	O	D
3	Upon determining the haulage route(s) for construction vehicles associated with the Proposal, and prior to construction, undertake a Road Dilapidation Report. The report would: • Assess the current condition of the road(s) • Describe mechanisms to restore any damage that may result due to traffic and transport related to the construction of the Proposal. • Be submitted to the relevant road authority for review prior to the commencement of haulage.	PC		
4	A pavement review would be undertaken and bituminous surface be applied to Campbells Lane to reduce pavement degradation and improve driver safety.	C		
5	A Traffic Management Plan would be developed as part of the CEMP and DEMP, in consultation with the Dubbo Regional Council and Roads and Maritime. The plan would include, but not be limited to: • The designated routes of construction traffic to the site. • Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction. • Identify specific road hazards associated with the area including not limited to fog, wet weather, frost and wildlife. • Pedestrian management - Site access is to be restricted to authorised personnel only and existing employees on site. Pedestrian access to and around the site is to be maintained at all times. Within the site pedestrian travel paths are to be maintained to key areas such as building entrances and be free from trip hazards. • Scheduling of deliveries. • Community consultation regarding traffic impacts for nearby residents and school bus operators. • Consideration of impacts to the railway. • Traffic control plans (speed limits, signage, etc.). • Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts. • Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.	PC		D
Water quality and water use				
1	Design waterway crossings and services crossing in accordance with the publications: • *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge, 2003).	C	O	D

ID.	Mitigation measure	C	O	D
	• *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003). • *Guidelines for Watercourse Crossings on Waterfront Land* (NSW DPI, 2012). • *Guidelines for Laying Pipes and Cable in Watercourses on Waterfront Land* (NSW DPI, 2012).			
2	All fuels, chemicals, and liquids would be stored at least 40m from any waterways or drainage lines, not on sloping land and would be stored in an impervious bunded area.	C	O	D
3	The refuelling of plant and maintenance would be undertaken in impervious bunded areas on hardstand areas only.	C	O	D
4	All potential pollutants stored on-site would be stored in accordance with HAZMAT requirements and bunded.	C	O	D
5	Roads and other maintenance access tracks would incorporate appropriate water quality treatment measures such as vegetated swales to minimise the opportunity of dirty water leaving the site or entering the waterways.	C		D
6	A WAL would be obtained, should onsite ground water sources be used.	C		
Social and economic				
1	Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.	C		
2	Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services.	C		D
3	Liaison with local tourism industry representatives to manage potential timing conflicts with local events.	C		D
4	The Community Consultation Plan would be implemented to manage impacts to community stakeholders, including but not limited to: • Protocols to keep the community updated about the progress of the Proposal and proposal benefits. • Protocols to inform relevant stakeholders of potential impacts (haulage, noise, air quality etc.). • Protocols to respond to any complaints received.	C		D
Bushfire				
1	Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*.	C	O	D

ID.	Mitigation measure	C	O	D
2	Develop a Bush Fire Management Plan to include but not be limited to: • Specific management of activities with a risk of fire ignition (hot works, vehicle use, smoking, use of flammable materials, blasting) • Incorporation of fire safety and response in staff and contractor induction, training, OHS procedures and Work Method Statements • Designation of a staff safety officer tasked with ensuring implementation of the plan and regular liaison with firefighting agencies • Document all firefighting resources maintained at the site with an inspection and maintenance schedule • Monitoring and management of vegetation fuel loads • A communications strategy incorporating use of mobile phones, radio use (type, channels and call-signs), Fire Danger Warning signs located at the entrance to the site compounds, emergency services agency contacts In developing the Bush Fire Management Plan, NSW RFS would be consulted on the volume and location of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures.	C	O	D
3	An APZ of minimum 10 metres would be maintained between remnant or planted woody vegetation and solar plant infrastructure. The APZ around the perimeter of the site would incorporate a 4 metre wide gravel access track. Average grass height within the APZ would be maintained at or below 5 centimetres on average throughout the October-March fire season. Average grass height outside the APZ, including beneath the solar array, would be maintained at or below 15 centimetres throughout the fire season.	C	O	
4	The overhead powerlines at the site would be managed by maintaining appropriate vegetation clearance limits to minimise potential ignition risks, in accordance with the ISSC 3 Guideline for Managing Vegetation Near Power Lines.		O	
5	Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction. This equipment would include fire extinguishers, a 1000 litre water cart retained on site on a precautionary basis, particularly during any blasting and welding operations. Equipment lists would be detailed in Work Method Statements.	C		
6	The NSW RFS and Fire and Rescue would be provided with a contact point for the solar plant, during construction and operation.	C	O	

ID.	Mitigation measure	C	O	D
7	Following commissioning of the solar plant, the local RFS and Fire and Rescue brigades would be invited to an information and orientation day covering access, infrastructure, firefighting resources on-site, fire control strategies and risks/hazards at the site.		O	
8	The perimeter access track would comply with the requirements for Fire Trails in the PBP guidelines. All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bush fire emergencies. Access tracks would be constructed as through roads as far as practicable. Dead end tracks would be signposted and include provision for turning firetrucks.	C	O	D
9	A Hot Works Permit system would be applied to ensure that adequate safety measures are in place. Fire extinguishers would be present during all hot works. Where practicable hot works would be carried out in specific safe areas (such as the Construction Compound temporary workshop areas).	C	O	D
10	Machinery capable of causing an ignition would not be used during bushfire danger weather, including Total Fire Ban days.	C	O	D
11	Prior to operation of the solar plant, an Emergency Response Plan (ERP) must be prepared in consultation with the RFS and Fire & Rescue NSW. This plan must include but not be limited to: • Specifically addresses foreseeable on site and off site fire events and other emergency incidents. • Risk control measures would include the level of personal protective clothing required to be worn, the minimum level of respiratory protection required, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment). • Outline other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site. • Two copies of the ERP are stored in a prominent 'Emergency Information Cabinet' which is located in a position directly adjacent to the site's main entry point/s. • Once constructed and prior to operation, the operator of the facility would contact the relevant local emergency management committee (LEMC).		O	
Electromagnetic fields				
1	All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.	C		

ID.	Mitigation measure	C	O	D
2	All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required.	C		
3	Design of electrical infrastructure would minimise EMFs.	C		
Air quality and climate				
1	Dust generation by vehicles accessing the site and earthworks at the site would be suppressed using water applications or other means as required.	C		D
2	Vehicle loads of material which may create dust would be covered while using the public road system.	C		D
3	All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use.	C	O	D
4	Fires and material burning is prohibited on the Proposal site.	C	O	D
Resources use and waste generation				
1	A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy. • Quantification and classification of all waste streams. • Provision for recycling management onsite. • Provision of toilet facilities for onsite workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant). • Tracking of all waste leaving the site. • Disposal of waste at facilities permitted to accept the waste. • Requirements for hauling waste (such as covered loads).	C	O	D
2	Septic system is installed and operated according to the Dubbo Regional Council regulations.	C	O	

10 CONCLUSION

10.1 PROPOSAL OVERVIEW

The proposed Wellington North Solar Plant would be located 7km north east of Wellington in NSW. The primary site access would be off Campbells Lane. The Proposal would connect to the existing substation south of Goolma Road.

The Wellington North Solar Plant proposal involves the construction, operation and decommissioning of a ground-mounted PV solar array which would generate approximately 300MW (AC) to be supplied directly to the national electricity grid. Development of the solar plant would make use of existing electricity infrastructure and contribute to Australia's transition to a low emission energy generation economy. The Proposal is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its previous land capability for agricultural or other existing alternative land uses.

10.2 BENEFITS OF AND NEED FOR THE PROPOSAL

The Proposal would result in a number of benefits including:

- Support Commonwealth and NSW climate change commitments.
- Generation of enough clean, renewable energy for about 114,000 average NSW homes.
- Displacement of approximately 581,000 metric tonnes of carbon dioxide – the equivalent of taking about 125,000 cars off the road.
- Enhance electricity reliability and security.
- Creation of local job opportunities.
- Injection of expenditure in the local area and spread of benefits through a local community energy offer and a local community investment program.
- Exploitation of a new land use thereby diversifying the regional economy.

In summary, there is a clear need for the Proposal to meet Australia's greenhouse gas reduction, renewable energy and electricity needs. It would additionally bring local benefits such as job opportunities and local expenditure.

10.3 ENVIRONMENTAL IMPACTS AND MANAGEMENT

The key environmental risks have been investigated through specialist investigations, and include:

- Biodiversity impacts.
- Aboriginal heritage impacts.
- Noise impacts.
- Visual impact.
- Flooding impacts.

Key concerns raised via community engagement have been addressed in the EIS and proposal design. These include:

- Noise and vibration emissions.
- Visual impacts to landscape.
- Impact on land and property values.

- Impacts to agricultural land.
- Traffic impacts.
- Bushfire risks.

All these matters have been discussed directly with the local community and included in this environmental assessment. Overall there has been considerable support for the Proposal within the community.

The impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Impacts are considered justifiable and acceptable.

10.4 ABILITY TO BE APPROVED

This EIS indicates that the Proposal can be approved, subject to the identified mitigation measures. In summary, this is because:

- The Proposal meets relevant planning requirements, as set out in Section 5.
- The environmental risks associated with the Proposal are well understood and manageable, as set out in Sections 7 and 8. Specifically, the Proposal has demonstrated consideration of avoidance and minimisation of key environmental features as part of the layout and mitigation strategy development. The impacts are largely reversible, and offsetting would be undertaken to ensure an overall 'not net biodiversity loss' outcome for the Proposal.

Consideration has been given to the compatibility of the Proposal with the existing electricity network and the compatibility of the site for the generation of solar energy. This ensures construction and operating costs are reduced, maximising the viability of the Proposal and its contribution to meeting energy needs into the future. Considerations during initial site investigations included:

- Access to and capacity of the electrical transmission network.
- Availability of an abundant solar resource.
- Availability of appropriate land (i.e. topography, aspect, presence of native vegetation).
- Suitability in terms of the interests of other stakeholders and the environment.

The consequences of not proceeding with the proposed Wellington North Solar Plant would result in:

- Loss of opportunity to reduce GHG emissions and move towards cleaner electricity generation.
- Loss of a renewable energy supply that would assist in reaching the RET.
- Loss of additional electricity generation and supply into the Australian grid.
- Loss of social and economic benefits created through the provision of direct and indirect employment opportunities during the construction and operation of the solar plant.

The preferred option assessed in this EIS provides a balance between technological, energy and environmental aspects, while retaining the flexibility required in the final design stage of the Proposal. It would not result in significant impacts to environmental, cultural, social and economic values. Furthermore, the Proposal is consistent with the principles of ESD and forms an important part of Australia's transition to renewable energy generation.

11 REFERENCES

ABS, 2016, *Wellington Census Quickstats*, accessed 2018 from http://www.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/UCL115150?opendocument.

AEMO, 2016, *National Electricity Forecasting Report: For the National Electricity Market*, accessed 2018 from http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/-/media/080A47DA86C04BE0AF93812A548F722E.ashx.

AER, 2015, *Annual Report 2015-2016,* report prepared for Commonwealth of Australia.

AGO, 2003, 'Climate change: An Australian Guide to the Science and Potential Impacts*', Australian Greenhouse Office*, edited by B Pittock, 2003.

Alsema, E. A., de Wild-Scholten, M. and Fthenakis, V. M., 2006, Environmental impacts of PV electricity generation – A critical comparison of energy supply options, *Presented at the 21st European Photovoltaic Solar Energy Conference*, Dresden, Germany.

ARENA, 2015, *Establishing the social licence to operate large scale solar facilities in Australia: Insights from social research for industry*, Australian Renewable Energy Agency (ARENA).

Australian Government, 2017, *National Pollutant Inventory*, accessed December 2017 from http://www.npi.gov.au/npi-data/search-npi-data

Australia Institute, 2015*, Large Scale Solar and the RET*, accessed 2018 from http://www.tai.org.au/sites/defualt/files/Large%20Scale%20Solar%20FINAL.pdf

Barron-Gafford, GA, Minor, RL, Allen, NA, Cronin, AD, Brooks, AE & Pavao-Zuckerman, MA 2016, 'The photovoltaic heat island effect: Larger solar power plants increase local temperatures' *Scientific Reports*, vol 6, 35070. DOI: 10.1038/srep35070

Bignal, K., Ashmore, M., & Power, S. ,2004, The ecological effects of diffuse air pollution from road transport. *English Nature Research Report* 580. English Nature, Peterborough.

BFMC, 2011, *Bush Fire Risk Management Plan*, accessed 2017 from http://www.rfs.nsw.gov.au/__data/assets/pdf_file/0004/2398/Orana-BFRMP.pdf

BOM, 2017, *Groundwater Dependent Ecosystems Atlas*, accessed 2018 from http://www.bom.gov.au/water/groundwater/gde/map.shtml

CER, 2017, *Annual Report 2016-2017*, Australian Government.

Chang, G.J. and Jennings, C., 1994, *Magnetic Field Survey at PG&E Photovoltaic Sites*, accessed 2018from http://www.osti.gov/bridge/servlets/purl/82309-WOEtJb/webviewable/82309.pdf

Clean Energy Council (CEC), 2014, *Energy Storage safety: common consumer questions*, accessed December 2018from http://fpdi.cleanenergycouncil.org.au/reports/guide-for-energy-storage-safety.html

CEC, 2016, *Clean energy Australia report 2016*, accessed December 2017 from *https://www.cleanenergycouncil.org.au/policy-advocacy/reports/clean-energy-australia-report.html*

CEC, 2018, *Clean energy Australia report 2018,* accessed May 2018 from *https://www.cleanenergycouncil.org.au/policy-advocacy/reports/clean-energy-australia-report.html*

Climate Council, 2016, *On the Frontline: Climate Change and Rural Communities*, accessed December 2018 from https://www.climatecouncil.org.au/ruralreport

CSIRO, 2015, *Climate Change in Australia*, accessed 2018 from http://www.climatechangeinaustralia.gov.au/en/

CSIRO, 2016, *State of the Climate*, accessed from https://www.csiro.au/en/Showcase/state-of-the-climate.

DECC, 2006, *Assessing Vibration: a technical guideline,* Sydney: Department of Environment and Climate Change.

DECC, 2008a, *Managing Urban Stormwater: Soils and Construction Volume 2A –Installation of Services*, DECC, Sydney South.

DECC, 2008b, *Managing Urban Stormwater: Soils and Construction Volume 2C –Unsealed Roads*, DECC, Sydney South.

DECCW, 2009, NSW *Interim Construction Noise Guideline,* DECC, Sydney.

DECCW, 2011, *NSW Road Noise Policy*, DECCW, Sydney.

DIS, 2015, *Energy White Paper*, report prepared for Commonwealth of Australia.

DoEE, 2012, *Interim Biogeographic Regionalisation for Australia*, version 7.

DOEE, 2016, *Australia's emissions projections 2016*, Commonwealth of Australia.

DPE 2016 *Community Consultative Committee Guidelines for State Significant Projects*

DPE, 2017, *MinView*, accessed 2018 from https://minview.geoscience.nsw.gov.au/#/?lat=148.9143431&lon=-32.6560775&z=6&bm=bm1

DPE, 2017b, *Agricultural Land Use Planning: A guideline to identifying important agricultural lands in NSW*, accessed from https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/711480/A-guideline-to-identifying-important-agricultural-lands-in-NSW.pdf.

DPE, 2018, *NSW Planning Portal*, accessed 2018 from https://www.planningportal.nsw.gov.au/.

DPI, 2003, *Policy and Guidelines for Fish Friendly Waterway Crossings,* NSW Department of Primary Industries.

DPI, 2011, *Land Use Conflict Risk Assessment Guide*, NSW Department of Primary Industries.

DPI, 2012, *Guidelines for Laying Pipes and Cable in Watercourses on Waterfront Land*, NSW Department of Primary Industries.

DPI, 2012, *Guidelines for Watercourse Crossings on Waterfront Land,* NSW Department of Primary Industries.

DPI, 2012, *Controlled activities on waterfront land - Guidelines for riparian corridors on waterfront land*, NSW Department of Primary Industries.

DPI, 2013, *Primefact 1063 Infrastructure Proposals on Rural Land*, 2nd ed., NSW Department of Primary Industries.

DPI, 2017, *Key Fish Habitat*, accessed online from https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/key-fish-habitat-maps

DPI, 2017, *Groundwater data*, accessed 2018 from http://allwaterdata.water.nsw.gov.au/water.stm

Dubbo Regional Council, 2016, Regional Report: State of the Environment, accessed from https://www.dubbo.nsw.gov.au/Our-Region-and-Environment/Natural-environment/parks-gardens-green-space.

Dubbo Regional Council, 2017, accessed December 2018, https://www.dubbo.nsw.gov.au/

EDAW (Australia) Pty Ltd, 2000, '*Section 12 – Visual Assessment', The Mount Arthur North Coal Project: Environmental Impact Statement*, URS Australia Pty Ltd, Prepared for Coal Operations Limited.

EPA, 2017 *NSW Policy for Industry*, Sydney: EPA.

Fairfull, S. and Witheridge, G., 2003, *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings.* NSW DPI, Cronulla.

Federal Aviation Administration, 2010, *Safety Briefing: Handling abnormal and Emergency Situations*, accessed from https://www.faa.gov/news/safety_briefing/2010/media/NovDec2010.pdf.

Finkel, A., 2016, *Media Release: Future Security of the National Electricity Market*, accessed at http://www.chiefscientist.gov.au/2016/12/media-release-future-security-of-the-national-electricity market/.

Finkel, A., 2017, *Independent Review into the Future Security of the National Electricity Market*. Accessed at https://www.energy.gov.au/sites/g/files/net3411/f/independent-review-future-nem-blueprint-for-the-future-2017.pdf.

Footprint NSW Pty Ltd, 2018, *Hydrological and Hydraulic Analysis Report*. Report prepared for AGL, May 2018.

FRV, n.d, *Lessons learned in the development of Moree solar farm*, accessed December 2017 from http://arena.gov.au/proposal/moree-solar-farm/

Fthenakis, V., Kim, H.C., Frischknecht, R., Raugei, M., Sinha, P., Stucki, M., 2011*, Life Cycle Inventories and Life Cycle Assessment of Photovoltaic Systems*, International Energy Agency (IEA) PVPS Task 12, Report T12 - 02:2011.Geoscience Australia, 2017, *Australia Flood Risk Information Portal*, accessed 28th July 2017 from http://www.ga.gov.au/flood-study-web/#/search

Fthenakis, V.,& Yu, Y., 2013, Analysis of the potential for a heat island effect in large solar farms, *Photovoltaic Specialists Conference* (PVSC), 2013 IEEE 39th**.**

Geoscience Australia, 2017, *Australian Flood Risk Portal*, accessed at http://www.ga.gov.au/flood-study-web/#/search.

GHD, 2018, *Geotechnical Report*. Report prepared for AGL, May 2018.

Heritage Office (former), 2001,*Assessing Heritage Significance*, accessed 2018 from http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/listings/assessingheritagesignificance.pdf.

Holman et al, 2014*, IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management*, London. www.iaqm/wp-content /uploads/guidance/dust_assessment.pdf.

ICNIPR, 1998, *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz)*, Health Physics, 74 (4): 494-522.

ICNIRP, 2010*, ICNIRP Guidelines for limiting Exposure to Time-varying Electric and Magnetic Fields (1Hz-100kHz)*, accessed from https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf.

Isbell, R., National Committee on Soil and Terrain, 1996, *The Australian Soil Classification, Australian Soil and Land Survey Handbooks Series*, Second Edition.

LLS, 2016, *Climate Change in the Central West of NSW*, accessed 2018 from http://centralwest.lls.nsw.gov.au/__data/assets/pdf_file/0010/722665/LLS_CWClimateChangeAddendum_2017_web.pdf

Lawrie, J.W. and Murphy, B.W. 1998, S*oil Landscapes of the Dubbo 1:250 000 Sheet Report*, Dept of Land & Water Conservation, Sydney

McMahon Pty Ltd, 2018, *Soil Survey Report*. Report prepared for AGL, May 2018.

NGH Environmental, 2017, *Wellington Solar Farm Environmental Impact Statement*. Report prepared for First Solar, November 2017.

National Committee on Soil and Terrain (2009), *Australian Soil and Land Survey Field Handbook*, Third Edition, CSIRO Publishing.

NGH Environmental,2017, *Wellington North Solar Plan Preliminary Environmental Assessment*. Report prepared for AGL, November 2017.

NGH Environmental, 2018, *Wellington north Solar Plant Aboriginal Cultural Heritage Assessment*. Report prepared for AGL, May 2018.

NGH Environmental, 2018, *Wellington North Solar Plant Biodiversity Development Assessment Report*. Report prepared for AGL, May 2018.

NSW Government, 2005, *Floodplain Development Manual*, accessed from http://www.environment.nsw.gov.au/research-and-publications/publications-search/floodplain-development-manual

NSW Government, 2013, *NSW Renewable Energy Action Plan,* accessed December 2017.

NSW Government, 2017, *NSW OEH contaminated site register*, accessed December 2018, from http://www.epa.nsw.gov.au/prclmapp/searchregister.aspx

NSW Government, 2017, *Draft Large-Scale Solar Energy Guideline*, accessed from https://www.planning.nsw.gov.au/policy-and-legislation/under-review-and-new-policy-and-legislation/draft-solar-guidelines.

NSW National Parks and Wildlife Service, 2003, *NSW South Western Slopes Biogeographic Region (IBRA): Projection AMG z55*, accessed 2018 from http://www.environment.nsw.gov.au/resources/nature/NSWSouthWesternSlopesMapsTenure.pdf.

NSW Rural Fire Services, 2012, *Practice Note 1/11 – Telecommunication Towers in Bush Fire Prone Areas*, accessed 2018 from https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0005/55256/Telecommunication-towers-in-Bush-Fire-prone-areas.pdf.

OECD/IEA, 2016, *IEA raises its five-year renewable growth forecast as 2015 marks record year*, accessed 2018 from http://www.iea.org/newsroom/news/2016/october/iea-raises-its-five-year-renewable-growth-forecast-as-2015-marks-record-year.html

OEH, 2010a, *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales*, NSW Office of Environment and Heritage.

OEH, 2010b. *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.

OEH, 2011, *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, NSW Office of Environment and Heritage.

OEH, 2012, *The land and Soil capability assessment scheme*, http://www.environment.nsw.gov.au/resources/soils/20120394lsc2s.pdf

OEH ,2014, *NSW Biodiversity Offsets Policy for Major Projects*, accessed 2018 from http://www.environment.nsw.gov.au/biodivoffsets/140672biopolicy.htm.

OEH, 2014, *Western Enabling Regional Adaptation: Central West and Orana region report*.

OEH, 2016, *NSW Climate Change Policy Framework*, accessed 2018 from http://www.environment.nsw.gov.au/topics/climate-change/policy-framework.

PBP, 2017, *Planning for Bush Fire Protection 2006*, accessed 2018 from https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0008/4400/Complete-Planning-for-Bush-Fire-Protection-2006.pdf.

Regional Development Australia – Orana, 2016, *Wellington*, accessed 13 April 2017, http://www.lovethelifewelive.com.au/our-towns/wellington/

Renzo Tonin and Associates, 2018, *Wellington North Solar Plant Construction and Operation Noise and Vibration Assessment*. Report prepared for AGL, May 2018.

Roads and Maritime Service (RMS), 2016, *Traffic Volume Viewer*, accessed 2018 from http://www.rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/aadtmap/index.html#/?z=12&lat=-32.35095965645593&lon=149.46352386474655&yr=2009&id=99894

Roam Consulting, 2014, *RET policy analysis*. Report prepared for Clean Energy Council.

Schleisner, L., 2000, *Life cycle assessment of a wind farm and related externalities Renewable* Energy, vol.20, pp. 279-288.

Spaven Consulting, 2011, *Solar Photovoltaic Energy Facilities: Assessment of potential for impact on aviation*, report prepared January 2011, for RPS Planning and Development.

Steffen W, Alexander D and Rice M, 2017, '2016: Global heat record broken again', *Climate Council of Australia Limited*, accessed from https://www.climatecouncil.org.au/2016-hottest-year-report

Urbis, 2009, *Berrybank Visual Impact Assessment* - Final Report, Australia.

U.S. Department of Energy, 2004, *PV FAQs*, accessed September 2017 from http://www.nrel.gov/docs/fy04osti/35489.pdf

Wellington Council, 2012, *Wellington Local Environmental Plan*, accessed from https://www.legislation.nsw.gov.au/#/view/EPI/2012/578/partlanduseta/include1

Wellington Council, 2012, *Flood Plan Map Sheet FLD_004*, accessed 2018 from https://www.legislation.nsw.gov.au/maps/fbe4a6f5-5721-cb6b-d21a-ce75a6284eed/8150_COM_FLD_004_160_20120711.pdf.

WHO, 2007, *Electromagnetic fields and public health: Exposure to extremely low frequency fields*, Fact sheet N°322, accessed 2018, from http://www.who.int/mediacentre/factsheets/fs322/en/index.html

WHO, 2012, *Electromagnetic Field, a*ccessed 2018 from http://www.who.int/peh-emf/about/WhatisEMF/en/.

Wright, M., and Hearps, P., 2010, *Australian Sustainable Energy. Zero Carbon Australia Stationary Energy Plan,* accessed 2018 from http://www.energy.unimelb.edu.au/uploads/ZCA2020_Stationary_Energy_Report_v1.pdf.