Muswellbrook Mine Affected Roads Network Plan Review



Muswellbrook Shire Council

19 May 2020



Gold Coast

Suite 26, 58 Riverwalk Avenue Robina QLD 4226 P: (07) 5562 5377 Brisbane

Level 2, 428 Upper Edward Street Spring Hill QLD 4000 P: (07) 3831 4442 Studio 203, 3 Gladstone Street Newtown NSW 2042 P: (02) 9557 6202

W: www.bitziosconsulting.com.au

E: admin@bitziosconsulting.com.au

Copyright in the information and data in this document is the property of Bitzios Consulting. This document and its information and data is for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or in part for any purpose other than for which it was supplied by Bitzios Consulting. Bitzios Consulting makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or its information and data.

Document Issue History

Report File Name	Prepared	Reviewed	Issued	Date	Issued to
P4297.001R Muswellbrook MARNP.docx	S.Brooke / J.Kidd	A. Eke / S. Brooke	S. Brooke	18/10/2019	Derek Finnegan - Derek.Finnigan@muswellbrook.nsw.gov.au
P4297.002R Muswellbrook MARNP.docx	S.Brooke / J.Kidd	A. Eke / S. Brooke	S. Brooke	24/10/2019	Derek Finnegan - Derek.Finnigan@muswellbrook.nsw.gov.au
P4297.003R Muswellbrook MARNP.docx	S.Brooke	A. Eke / S. Brooke	S. Brooke	7/04/2020	Derek Finnegan - Derek.Finnigan@muswellbrook.nsw.gov.au
P4297.004R Muswellbrook MARNP.docx	S.Brooke	A. Eke / S. Brooke	S. Brooke	19/05/2020	Derek Finnegan - Derek.Finnigan@muswellbrook.nsw.gov.au





EXECUTIVE SUMMARY

Since the adoption of the original Mine Affected Road Network Plan (MARNP), significant changes have occurred to mining operations within the Shire including the closures of one mine, modifications of existing approvals and the approval of new mines.

Bitzios Consulting and Northrop have been engaged by Muswellbrook Shire Council (MSC), following securing funding from local mining operations, to undertake a review and update of the 2015 MARNP to ensure that it is current with changes to mining activity, road upgrades, recent planning and transport strategies and the transport needs of the community.

This MARNP review looks beyond the mine affected roads towards a road network plan that can work with the mining activity and support other industry and community needs for convenient and connected access and mobility and provide a network that is more resilient, now and into the future.



Figure E-1: Study Area

One of the key issues for the local road network is the gradual decline of road connectivity and access due to mine expansion and the resultant impact on the local road network. There is concern that each road closure and or change to the road network is resulting in roads being moved west, or connectivity being lost, with reduced travel efficiency for rural residents and businesses.

The overall objectives of the MARNP are to:

- Maintain the road network to retain value, quality and capacity
- Provide a safer road environment
- Optimise the efficiency and reliability of moving people and goods
- Meet the needs of the present and future land use development
- Ensure a functional 'legacy' road network that is resilient to potential change and supporting of the longterm local and regional transport needs
- Provide network redundancy for incidents and emergency situations.



Project: P4287 Ve



Significant development has occurred in the four years since the adoption of the MARP with further mines and expansions planned. Some of the key mine-related road network changes include:

- Bengalla Mine Increase in coal ROM extraction, full time employees and contractors. The proposed
 Bengalla Link diversion noted as required around 2035-2037
- Former Drayton mine / Proposed Drayton South Mine (Malabar Mine) Lease taken over by Malabar Mines (Maxwell Project) and will be for underground mining. The previously proposed southern diversion of Edderton Road is still required but to a lesser extent to that proposed by former Drayton South. A Malabar Mines proposed alternative option is to maintain the existing road alignment and monitor subsidence
- Mangoola Mine mining operations proposed to extend to the north which will impact on and require closure of a portion of Wybong Post Office Road, this road section is proposed to be realigned. Also included is the construction of a haul road overpass over Big Flat Creek and Wybong Road to provide access from the existing mine to the additional project area
- Mt Pleasant Mine operation re-commenced in November 2016. Recent modifications comprise of a rail spur adjacent to Overton Road and rail loop crossing over Wybong Road, also removing the need to close Wybong Road between Bengalla Link Road and Kayuga Road.
- West Muswellbrook Mine retains the option for a potential partial closure of Castlerock Road, Halls Road and Dorset Road.
- **Other Future Mine Considerations** the Spur Hill Mine, Dellworth Mine, Dartbrook Mine and Mt Arthur Mines are earmarked for future extensions, exploration or recommencement activities.

This MARNP review assessed local road conditions against Austroads standards and a number of roads were determined to be below acceptable standards for the current proposed use. These include Wybong Road, Edderton Road, Reedy Creek Road and Yarraman Road.

Future road network challenges and opportunities were investigated along with the known changes to mining related traffic and development proposals. These revolved around balancing the regional demands of various industries (i.e. mining, equine and agriculture) with the need for a safe and resilient local network, such as providing alternate routes for Over-size Over-mass vehicles to the Denman Bridge, alternate routes to reduce heavy vehicle impacts in towns and improving freight travel times across the region.

Road network scenarios considered recommendations from the 2015 MARNP along with changes to mine activity and associated proposed road closures. A key focus in the scenario development was to ensure a 'legacy road network' that provides an improved level of accessibility, connectivity and resilience for the community.

The Options Assessment determined that the following key strategies and actions offer the best solution to providing a road network for Muswellbrook Shire that caters for existing and future demands on the network:

- A Western Corridor including:
 - Option W1 Denman to Bengalla Link
 - Upgrades to Edderton Road including:
 - Option E2 Retain Edderton Road Northern Deviation
- An Inner West Link including:
 - Option IW-1 Bengalla Link Road (west of rail line via Overton Road) to Wybong Road
 - Option W7 Wybong Road to New England Highway
- Upgrading the Wybong network including:
 - Option W5 Close Wybong Post Office Road and Upgrade Yarraman Road
 - Option W6 Upgrade Wybong Road between Golden Highway and Reedy Creek Road
- Improving other Infrastructure in the network. Including:
 - Upgrade Hunter River Bridge at Denman including Denman bypass (Option 2).
- Reclassify Thomas Mitchell Drive as a state road

Figure E-2 overleaf displays the abovementioned strategies and actions that form the recommended Muswellbrook Road Network Plan.



Muswellbrook Mines Affected Roads Network Plan Review

Project: P4287





Figure E-2: Recommended Road Network Plan Muswellbrook Mines Affected Roads Network Plan Review

Version: 004

Project: P4287



CONTENTS

		Page
Exe	CUTIVE SUMMARY	
1.	INTRODUCTION	1
1.1	Background	1
1.2	Previous MARNP	1
1.3	Purpose and Objectives	2
1.4	Stakeholders	3
1.5	Study Area	4
1.6	Abbreviations	6
2.	EXISTING CONDITIONS	7
2.1	Network Context	7
2.1.1	Hunter Regional Plan 2036	7
2.1.2	Future Transport Strategy 2056	7
2.1.3	Regional NSW Services and Infrastructure Plan	8
2.1.4	Greater Newcastle Future Transport Plan	8
2.1.5	NSW Freight and Ports Plan 2018-2023	8
2.1.6	The NSW Road Safety Strategy 2012-21	8
2.1.7	Major Network Links	9
2.1.8	Employment Sectors	9
2.1.9	Key Industries	10
2.1.10	0 Key Centres and Activity	10
2.2	Road Hierarchy	11
2.3	State Highways and Major Arterial Roads	13
2.3.1	New England Highway	13
2.3.2	Golden Highway	13
2.3.3	Denman Road	13
2.4	Significant Local Roads	14
2.4.1	Wybong Road	14
2.4.2	Kayuga Road	14
2.4.3	Aberdeen Street	14
2.4.4	Bengalla Link Road	14
2.4.5	Thomas Mitchell Drive	15
2.4.6	Edderton Road	15
2.5	Minor Local Roads Impacted by Mine Related Activities	16
2.5.1	Castlerock Road / Dorset Road	16
2.5.2	Reedy Creek Road	16
2.5.3	Wybong Post Office Road / Yarraman Road / Ridgelands Road	16
2.5.4	Muswellbrook Industrial Estate	16
2.6	Traffic Volumes	16
2.6.1	Updated Traffic Volumes	16
2.7	Performance Assessment	19
2.7.1	Road Hierarchy Review	19
2.8	Geometric Design Standards	21



Muswellbrook Mines Affected Roads Network Plan Review



2.8.1	Cross-Sections	21
2.9	Local Roads Condition Assessment	22
2.9.1	Existing Observed Conditions	22
2.9.2	Existing Road Condition Upgrades	24
2.10	Heavy and Priority Vehicles	27
2.10.1	Over-size and Over-mass Vehicle Requirements	27
2.10.2	2 Muswellbrook Network and Industry	28
2.10.3	B Local Road Network Role	29
2.10.4	Key Constraint Locations	30
2.11	Crash History	33
2.11.1	Key Statistics	33
2.11.2	2 Fatalities and Serious Injuries	34
2.11.3	3 Crashes on Key Roads	34
2.12	Localised Crash Cluster Review	35
2.12.1	Wybong Road / Bengalla Road Intersection	35
2.12.2	2 Wybong Road	36
2.12.3	B Recommended Actions	36
3.	FUTURE NETWORK DEMANDS	37
3.1	Mining	37
3.1.1	Mine Proposals and Activity	37
3.1.2	Mine Network Demands and Impacts	40
3.2	Other Industries	48
3.2.1	General	48
3.2.2	Power Generation	49
3.2.3	Viticulture Industry	49
3.2.4	Equine Industry	49
4.	ROAD NETWORK SCENARIOS	51
4.1	Previous MARNP (2015)	51
4.2	Network Resilience, Redundancy and Connectivity	51
4.3	Challenges and Opportunities	52
4.3.1	General	52
4.3.2	Western Corridor	54
4.3.3	Edderton Road	61
4.3.4	Inner-West Link	62
4.3.5	Wybong Network	65
4.4	Other Road Infrastructure Issues	70
4.4.1	Kayuga Bridge	70
4.4.2	Hunter River Bridge at Denman	71
4.4.3	Thomas Mitchell Drive	72
4.5	Options Assessment	73
5.	ROAD NETWORK PLAN	77
5.1	Context	77
5.2	Key Network Recommendations	77
5.2.1	Western Corridor	77
5.2.2	Inner West Link	77



Muswellbrook Mines Affected Roads Network Plan Review



7.	References	84
6.2	Monitoring and Review	83
6.1	Next Steps	83
6.	NEXT STEPS	83
5.3	Triggers and Priorities	81
5.2.6	Road Network Consistency	78
5.2.5	General Connectivity and Integration	78
5.2.4	Wybong Road	78
5.2.3	Wybong Post Office Road Closure	78

Tables

- Table 2.1: Traffic Volumes and Proportion of Heavy Vehicles by Road Section
- Table 2.2: Road Network Management Hierarchy Rural (as per RMS)
- Table 2.3: Estimated Road Hierarchy
- Table 2.4: Recommended Road Condition Upgrades
- Table 2.5: Wider Heavy Vehicle /Freight Network and Local Roads Connectivity
- Table 3.1: Summary of Anticipated Mine Activity
- Table 4.1: Road Network Resilience Characteristics
- Table 4.2: Options Assessment

Figures

- Figure 1.1: Study Area
- Figure 2.1: Overview of Future Transport 2056
- Figure 2.2: Employment by Industry
- Figure 2.3: Road Hierarchy
- Figure 2.4: Local Road Daily Traffic Volumes (vpd)
- Figure 2.5: Desirable Road Cross Sections Austroads
- Figure 2.6: Existing Road Conditions
- Figure 2.7: Required Roadworks
- Figure 2.8: Key Heavy Vehicle and OSOM Routes
- Figure 2.9: Heavy Vehicle and OSOM Routes Muswellbrook MARNP
- Figure 2.10: Detour during Denman Bridge Closure 2019
- Figure 2.11: Percentage of Heavy Vehicle Related Crashes
- Figure 2.12: All Vehicle Crashes by RUM Code and Road
- Figure 2.13: Heavy Vehicle Crashes by RUM Code and Road
- Figure 2.14: Wybong Road / Bengalla Road Crash Cluster
- Figure 2.15: Wybong Road Crash Cluster
- Figure 3.1: Conceptual Realignment of Bengalla Link Road
- Figure 3.2: Mount Pleasant Plan of Operations
- Figure 3.3: Muswellbrook West Mine (Proposed)
- Figure 3.4: Mangoola Mine and MCCO Project
- Figure 3.5: Malabar (Maxwell Project) Mine



Muswellbrook Mines Affected Roads Network Plan Review

Project: P4287



- Figure 3.6: Propose Northern Realignment of Edderton Road
- Figure 3.7: Equine Industry Routes and Travel Times
- Figure 4.1: Road Network Changes and Opportunities
- Figure 4.2: Options W1, 3B and W8
- Figure 4.3: Options W2/W3 Wybong Road to New England Highway
- Figure 4.4: Options E1/E2 Edderton Road North
- Figure 4.5: Options 2B/IW1 Bengalla Link road to Wybong Road
- Figure 4.6: Options W4/W5 Wybong Post Office Road
- Figure 4.7: Reedy Creek Road Upgrade
- Figure 4.8: Reedy Creek Road / Golden highway Intersection
- Figure 4.9: Causeway on Reedy Creek Road
- Figure 4.10: Kayuga Bridge Options
- Figure 4.11: Golden Highway Upgrade Options Through Denman
- Figure 5.1: Road Network Plan
- Figure 5.2: Recommended Future Road Network

Appendices

- Appendix A: 2015 Muswellbrook MARNP Road Network Plan
- Appendix B: Local Road Condition Observations
- Appendix C: Cost Estimates
- Appendix D: Concept Plans







1.INTRODUCTION

1.1 Background

Muswellbrook is at the heart of a major coal resource. n 1997 Council adopted the 'Muswellbrook Western Roads Strategic Traffic Study'. That document guided decisions and consents for three major mines; Bengalla Mine, Xstrata- Mangoola Mine, and Mt Pleasant Mine. Prior to the development of the Mine Affected Road Network Plan (MARNP) there was major work undertaken to partially implement this strategy, which involved new 'greenfield' roads and bridges, and existing road upgrades.

Concerns were raised by the Muswellbrook community around the gradual westward shift of the road network as a result of mine related closures, citing increased travel times, loss of connectivity and degradation of road conditions. In responding to these concerns, Council commissioned the preparation of the 2015 Mine Affected Road Network Plan (MARNP). The 2015 MARNP completed an assessment of the impacts of mine related traffic on the local road network and developed a range of mitigation strategies to address these impacts.

Muswellbrook lies at the junction of two major highways and two major railways that connect major coalfield resources in the Ulan Basin and Liverpool Plains to the Port of Newcastle. The New England Highway bisects the Muswellbrook township and forms part of the inland Sydney-Brisbane Corridor of the National Land Transport Network (NLTN). This transport network is recognised for its strategic importance to national and regional economic growth, development and connectivity.

In addition to the New England Highway, the Muswellbrook township is also connected to the Golden Highway via Denman Road / Sydney Street.

Mining and other activities generate a large number of over-size over-mass (OSOM) vehicles traffic within and through Muswellbrook Shire. These heavy vehicles add to the through traffic on the Sydney-Brisbane corridor. Further to the impacts of additional trip generation, the mines often expand through existing roadways, necessitating the diversion and closures of sections of the road network.

Muswellbrook Shire Council is responsible for consenting to access to restricted access vehicles on their roads, and the conditions under which they will operate. The HVNL requires Council to formally consent to operation on their roads before a permit can be issued. This is intended to empower local government to ensure safety for all road users, protect and efficiently manage access to important council infrastructure. However, the ability to efficiently fund, resource, manage and invest in road infrastructure which supports the states mining economy is an ongoing issue for Council.

Since the adoption of the original MARNP, significant changes have occurred to mining operations within the Shire including the closures of one mine, modifications of existing approvals and the approval of new mines. Muswellbrook Shire Council has acknowledged the need to revise and update the MARNP to reflect current year conditions and future year strategic planning aspirations. This report has been prepared as a review and update of the 2015 Muswellbrook MARNP.

1.2 Previous MARNP

The current Muswellbrook Mine Affected Road Network Plan was prepared in 2013/14 by Cardno, and adopted by Council in 2015. This plan followed a previous Muswellbrook Western Roads Strategic Traffic Study prepared by Council in 1997.

The 2015 MARNP recommended 13 road network recommendations (also refer to Figures in Appendix A) as follows:





To improve the connectivity of Wybong Road to the New England Highway north of Muswellbrook:

- Replace the Kayuga Bridge in its current location (Option 1C);
- Upgrade Aberdeen Street from Kayuga Bridge to the New England Highway; and,
- Upgrade Wybong Road (East) and Kayuga Road from the new southern Link Road to Kayuga Bridge.

To address the proposed closure of sections of Wybong Road and Castlerock Road to facilitate coal extraction by the Mt Pleasant Mine:

- Construct a Southern Link Road connecting Wybong Road (East) via Overton Road to the Bengalla Link Road west of the Hunter River crossing (Option 2B) in lieu of the previously proposed Northern and Western Link Road
- Connect Castlerock Road to Dorset Road (to local road standard) to facilitate access to properties on these roads
- Should Mt Pleasant Mine not proceed and Wybong Road not be closed in 2026, Wybong Road from the Bengalla Link Road to Kayuga Road will need to be upgraded to maintain a safe and efficient movement of vehicles over this section of road to a standard appropriate to accommodate anticipated traffic volumes from background growth and new mines proposed further west.

To improve connectivity to, and the functioning of, the Main Road Network:

- Modify the proposed Bengalla Link Road Diversion (Option 3A) to facilitate a north-western extension in the longer term (funded by new mines in the west)
- Upgrade Roxburgh Road and Wybong Road connections to the Bengalla Link Road;
- Upgrade Wybong Road (West) (Option 3C) and Reedy Creek Road (Option 3D) in the long term;
- Pursue the reclassification of Thomas Mitchell Drive as a Main Arterial Road under the care and control of NSW Roads and Maritime Services;
- Examine opportunities to forego the temporary relocation of Edderton Road on the less efficient alignment (as proposed by Mt Arthur Mine and the proposed former Drayton South Mine) in lieu of contributions for works to improve the safety and efficiency of Denman Road and the Golden Highway
- In the longer term, at completion of mining activity, the Road Authority prefers Edderton Road to be reconstructed in generally to its current more efficient alignment with upgraded intersections at Denman Road and the Golden Highway at design standards appropriate at the time and considering traffic growth over the period
- Consult with NSW Roads and Maritime Services in relation to options to avoid or rectify problems associated with the Golden Highway. In particular:
 - the Ogilvies Hill ascents
 - the ability of the bridge crossing of the Hunter River near Denman to accommodate oversize vehicles
 - potential mine subsidence impacts from proposed underground mining
 - main road traffic within Denman township.

1.3 Purpose and Objectives

The purpose of this report is to review and update the current (2015) Muswellbrook MARNP to ensure that it is current with:

- changes to mining activity and mine affected roads
- proposed road upgrades and recent planning and transport strategies locally, state-wide and nationally





• the transport needs of the community both now and looking into the future.

This MARNP review also looks beyond the mine affected roads (road closures) and planned mitigation (e.g. diversions or new links) towards a more wholistic road network plan that will work with the mining activity and support other industry and community needs for convenient and connected access and mobility now and into the future.

One of the key issues of the mine affected roads is the gradual decline of road connectivity and access due to mine expansion. There is concern that each road closure and or change to the road network is resulting in roads being moved further west, or connectivity being lost, and reduced travel efficiency for residents and businesses.

Significant development has occurred in the four years since the adoption of the MARNP with further mines and expansions planned. Recently, some of the existing mines have had modifications to their conditions of approval, and new mines have been proposed with additional road impacts.

The overall objectives of the MARNP (2015) was to:

- Maintain the road network to retain value, quality and capacity
- Provide a safer road environment
- Optimise the efficiency and reliability of moving people and goods
- Meet the needs of the present and future land use development.

The above objectives are still relevant however these have been augmented with the following objectives in preparing this Road Network Plan Review:

- Ensure a functional 'legacy' road network that is resilient to potential change and supporting of the long-term local and regional transport needs
- Provide network redundancy for incidents and emergency situations.

1.4 Stakeholders

The key stakeholders for this MARNP review are:

Stakeholder Group	Interests
Muswellbrook Shire Council	Management of the local road network, safety and efficiency of the local road network, approval of OSOM vehicle routes on local road network, impacts of mine related traffic and road closures
Transport for New South Wales	Management of the state-controlled roads, safety and efficiency of the road network, maintenance of state roads
Coal Mines and related support industry	Safe and convenient movement of mine personnel and equipment, mitigation of traffic impacts associated with mine activities
Thoroughbred Horse Industry	Safe and efficient movement of horses between Equine CIC. Minimising travel time and stress on horses while being transported
Other Primary Producers	Maintained access to the broader road network and to essential services and access to market
Transport Industry	Safe, efficient, and resilient road network (state and local). Well defined and maintained freight routes
General Community	Safe and efficient use of the road network (state and local), good access to key centres for employment, health, social and recreation. A well-maintained road network





1.5 Study Area

The study area for the MARNP is the Muswellbrook Shire LGA but also includes the neighbouring LGAs. The key focus area is centred around the current and proposed (potential) mining activity in Muswellbrook Shire predominantly covering the area on the western side of the New England Highway, as shown in Figure 1.1.



Muswellbrook Mine Affected Roads Network Plan Review







Figure 1.1: Study Area

Muswellbrook Mine Affected Roads Network Plan Review

1.6 Abbreviations

AADT	Average Annual Daily Traffic
DPE	NSW Department of Planning and Environment
HEIP	Hunter Economic Infrastructure Plan
НТВА	Hunter Thoroughbred Breeders Association
HV	Heavy Vehicles
LGA	Local Government Area
LOS	Level of Service
LV	Light vehicle
NLTN	National Land Transport Network
MARNP	Muswellbrook Mine Affected Road Network Plan
MCV	Multi-combination vehicles
MSC	Muswellbrook Shire Council
OSOM	Over-size Over-mass Vehicles
RMS	Roads and Maritime Services
RTA	Roads and Transport Authority (Now RMS)
RUM	Road User Movement
TfNSW	Transport for NSW
vpd	Vehicles per day
vph	Vehicles per hour







2. EXISTING CONDITIONS

2.1 Network Context

2.1.1 Hunter Regional Plan 2036

The *Hunter Regional Plan 2036* outlines a range of key challenges facing the Hunter region and highlights the need for better integrated transport and land use planning with focussed investment on key growth industries and inter-regional transport connections.

The study area includes a number of key transport corridors outlined in the Hunter Regional Plan, including the New England Highway, Golden Highway, Denman Road and Upper Hunter Coal Rail Network. In addition, Muswellbrook is one of a number of strategic centres where future growth is expected for services such as allied health, water supply, public transport, as well as diverse energy and agricultural sectors.

The Hunter Regional Plan 2036 aims to maintain Muswellbrook as a key regional centre in the Upper Hunter region. The maintenance and upgrade of the local and regional road network as key industries continue to expand throughout the region will play an important role in meeting this aim.

2.1.2 Future Transport Strategy 2056

Transport for NSW's *Future Transport Strategy 2056* recognises the essential role that transport plays in the land use, tourism and economic development of towns and cities. This strategy includes issue-specific and place-based supporting plans that aim to shift focus away from individual travel modes and more towards integrated solutions. The strategy highlights that over the next five years, the NSW government is taking action to work with the heavy vehicle industry to improve operational safety. The strategy outlines that reliability, efficient travel, and certainty to maximise productivity and reduce costs is an essential part of the freight industry. Hence, any alterations to Muswellbrook's road network should aim to improve travel times and travel efficiency.

The Future Transport Strategy 2056 provides an overarching framework for the Regional NSW Services and Infrastructure Plan, which then feeds into a number of supporting plans, as shown in Figure 2.1.



Figure 2.1: Overview of Future Transport 2056





2.1.3 Regional NSW Services and Infrastructure Plan

The *Regional NSW Services and Infrastructure Plan* sets out NSW government's trending ideas, issues, services and infrastructure needs which shape transport in regional NSW.

The plan lists a number of committed initiatives over the next 10 years, as well as a number of initiatives for investigation in the short term (0-10 years), medium term (10-20years) and visionary (20+ years) periods. Initiatives most relevant to the Muswellbrook region, and this plan, include:

- Committed initiatives 0-10years
 - New England Highway, Muswellbrook Bypass (Planning)
 - New England Highway, Belford to Golden Highway Upgrade (Planning)
 - Golden Highway Safety and Productivity Works
- Initiatives for investigation 0-10 years
 - Golden Highway Improvements (continuation)
- Visionary initiatives 20+ years
 - Duplication of New England highway Muswellbrook to Scone.

2.1.4 Greater Newcastle Future Transport Plan

The *Greater Newcastle Future Transport Plan* provides the overarching strategic transport network and vision that will guide future transport planning for the Greater Newcastle region. This plan covers the five LGAs of Cessnock, Lake Macquarie, Maitland, Newcastle and Port Stephens. The plan states that the M1 Pacific Motorway and New England Highway are key roads within the Greater Newcastle region that carry the largest volumes of traffic and are important in providing movements. These roads will be upgraded as they near capacity.

2.1.5 NSW Freight and Ports Plan 2018-2023

The *NSW Freight and Ports Plan 2018-2023* sets out NSW government's priorities for the sector over the next five years. The sector aims to meet the five key objectives of economic growth, efficiency, connectivity and access, capacity, safety, and sustainability. This plan acknowledges government investment in road and rail infrastructure to provide greater access for freight on the networks. The plan also highlights the need to improve travel times and reliability of the road network.

2.1.6 The NSW Road Safety Strategy 2012-21

The NSW Road Safety Strategy 2012-2021 sets the direction of road safety in NSW. This strategy is underpinned by the safe system approach to improving road safety. This takes a holistic view of the road transport system and interactions among the key components of that system – the road user, the roads and roadsides, the vehicle and travel speeds. It recognises that all these components have a role to play in helping to keep road users safe.

This strategy supports road safety infrastructure improvements such as wider clear zones, wider sealed shoulders, and lanes, as well as behavioural campaigns to reduce the number and severity of crashes along the corridor; in particular crashes relating to speed and driver fatigue.





2.1.7 Major Network Links

The major network links within the study area include:

- New England Highway: The New England Highway is part of the AusLink National Network between Sydney and Brisbane, extending from the Pacific Highway at Hexham, via Muswellbrook and Tamworth, to the Queensland border near Tenterfield
- Golden Highway: The Golden Highway runs eastwards from Dubbo through Merriwa, Sandy Hollow, Denman, Jerry's Plains and Mount Thorley. It then joins onto the New England Highway at Belford (south of Singleton)
- Denman Road (MR 209): Denman Road is used by a significant portion of mine traffic, especially on the eastern section between the Bengalla Link Road and Muswellbrook
- Upper Hunter Coal Rail Network: Coal is transported by rail from a series of mines and coal loaders throughout the Hunter Valley, which is conveyed to the terminals at Port Waratah and Kooragang on the rail-line that runs between Muswellbrook and Newcastle. Coal also feeds onto this line from Ulan and the Gunnedah Basin, west and northwest of Muswellbrook respectively.

2.1.8 Employment Sectors

It is estimated that 10,017 people work in Muswellbrook, of which 31% (3,120 people) work in the mining sector. Other industries that have high levels of employment include electricity gas, water and waste services, health care and social assistance, retail trade, and agriculture, forestry and fishing. Figure 2.2 shows the levels of employment by industry within Muswellbrook.



10,017

SOURCE: Australian Bureau of Statistics' (ABS) 2016 Census Place of Work Employment Data

Total

Figure 2.2: Employment by Industry





2.1.9 Key Industries

Muswellbrook is comprised of a number of key land uses and industries which impact the social, economic and environmental prosperity of the LGA. The key land use elements include:

- Mining Industry: Of the seven mines in the LGA, six are either planning to, or have lodged an application to increase their mine footprint and/or vary their production output. Moreover, mining is the main source of employment for many residents throughout Muswellbrook, which supports economic growth within the region
- **Agricultural Industries:** The specific agricultural industries throughout Muswellbrook include dairy and beef cattle and pasture production, along with associated service industries
- Equine Industry: Muswellbrook is home to one of the largest concentrations of thoroughbred rearing in Australia. The equine industry is extremely successful in Muswellbrook due to its unique topography, soil, air and water quality, making it an ideal location for horse breeding
- Future Industries (Electricity Production): Electricity generation is the main supplier of energy to the NSW economy. In fact, two power stations are in Muswellbrook, being Bayswater Power Station and Liddell Power Station and more than 60% of all of NSW's electricity supply is generated within the Hunter region
- **Tourism Industry:** Tourism plays an important role in the economic success of the LGA and region. Tourists are attracted to Muswellbrook due to its proximity to world heritage listed Barrington Tops National Park, as well as the rural landscapes and viticulture industry
- Viticulture Industry: The wine industry is continuously expanding throughout the Hunter Region as a result of the area's geographic suitability for winemaking. Further, the Muswellbrook viticulture industry is very accessible due to its proximity to Sydney.

2.1.10 Key Centres and Activity

Key activity centres within the regional network have developed along major river valleys where agricultural opportunities presented themselves. The largest of which is Singleton to the South of Muswellbrook with a population of 13,700 followed by the Muswellbrook township which has the second largest population of 10,200. Activity centres surrounding the Muswellbrook LGA include Scone (population 4,600), Gloucester (population 2,400), Dungog (population 2,100), Aberdeen (population 1,800), Denman (population 1,400), Merriwa (population 950) and Murrurundi (population 800) (ABS 2006).

The Hunter Region has three (3) main corridors for transporting goods:

- The Muswellbrook LGA utilise the New England Highway to transport goods to Tamworth Airport to the North and the greater Newcastle area to the south
- The Golden Highway corridor stretches from the Greater Newcastle area to the west through Denman to Dubbo
- The Pacific Highway corridor connects the Greater Newcastle area to Brisbane and is joined by the Oxley Highway corridor which connects the New England Highway corridor to the Pacific Highway corridor.





2.2 Road Hierarchy

The road hierarchy within the study area is shown in Figure 2.3 and includes the State controlled roads of the Golden Highway, New England Highway and Denman Road, and Council controlled local distributor/collector roads which connect to the State roads and provide access to the mines. These roads provide vital access and mobility functions within the region.

On review of the previous MARNP, Edderton Road has been elevated to a local distributor road to better reflect its strategic importance to the road network.









Figure 2.3: Road Hierarchy

2.3 State Highways and Major Arterial Roads

2.3.1 New England Highway

The New England Highway bisects the Muswellbrook township and forms part of the inland Sydney-Brisbane Corridor of the National Land Transport Network (NLTN). This transport network is funded by the Australian, State and Territory governments and is recognised for its strategic importance to national and regional economic growth, development and connectivity. The New England Highway is recognised as a major freight and commuter route in this network.

2.3.2 Golden Highway

The Golden Highway connects the Hunter region (Singleton, Muswellbrook, and Upper Hunter) with the Central West region (Warrumbungle and Western Plains). It connects the New England Highway to the east with the Newell Highway Mitchell and Barrier highways to the west. The Golden Highway is an approved HML B-Double route. It is one of only three east-west B-Double routes north of Sydney over the Great Dividing Range, the others being the New England Highway and the Gwydir Highway.

Restrictions on over-size over-mass using the bridge over the Hunter River east of Denman has implications for the local road network and alternative state road detours route would travel via Gunnedah and Coonabarabran.

The *Hunter Regional Transport Plan* identifies two potential future improvements for the Golden Highway – regrading or realignment of Ogilvies Hill (around 2.5km east of Dalswinton Road, Denman) and Winery Hill (at Edderton Road, Jerrys Plains).

The NSW 20-year vision for Golden Highway (Golden Highway Corridor Strategy – RMS 2016) is to:

- 'Boost productivity support the development of agricultural and mining activities and operate as a critical freight route by enabling access for PBS Class 2B high productivity vehicles (up to 30 m in length) across the Great Dividing Range from western NSW to the Hunter region and the Port of Newcastle.
- Provide safe and efficient travel for all road users by providing a "2+1" lane arrangement east of Denman Road, and two lane two way with an increased number of overtaking/climbing lanes west of Denman Road, and by addressing high risk crash locations.
- Improve road network reliability and access by reducing the impact of flooding.'

2.3.3 Denman Road

This is a main road connecting the New England Highway at South Muswellbrook to the township of Denman. It is primarily a two-lane highway with high standard rural intersections at Thomas Mitchell Drive and Edderton Road. The road is used by a significant proportion of mine traffic on the most eastern section between the Bengalla Link Road and Muswellbrook, and to a lesser degree by employee and trade vehicles to the west connecting to the Golden Highway (destinations west) and Denman.



RTHROP

2.4 Significant Local Roads

2.4.1 Wybong Road

Wybong Road is a 34km long local collector/distributor road linking the Muswellbrook township to the Golden Highway to the South-West and is managed by Muswellbrook Shire Council (MSC). It has a two-lane two-way configuration with centre line marking and no sealed shoulder. Seal width is 7.3m wide outside of Muswellbrook town and varies from 6.3m-8m continuing toward the Golden Highway.

Wybong Road is posted at 100km/h with 85km/h and 55km/h advisory speeds throughout and a Gross Load Limit of 12t.

Wybong Road is an important strategic link within the Muswellbrook LGA road network as it:

- In conjunction with Bengalla Link Road, provides the only HV bypass route that avoids Denman Bridge
- Provides alternative route to the Golden Highway/Denman Road in case of incident on Denman Road
- Provides access for Mangoola Coal mine.

2.4.2 Kayuga Road

Kayuga Road is a 6km north-south local collector/distributor running parallel to the New England Highway before becoming Invermein Street and is managed by MSC. It has a two-lane two-way configuration with line-markings present for 800m from Muswellbrook township and no shoulder. The seal width is generally less than 7.6m with minimal surface patching. Kayuga Road is subject to bottlenecking at Kayuga Bridge over Hunter River which is a one-lane two-way bridge.

Kayuga Road is signed as a 100km/h with an 80km/h zone near residential built-up areas and services approximately 900 vpd (2016).

Kayuga Road is a strategic link within the Muswellbrook LGA road network as it:

- Is fronted by small residential zone
- Key road for residents heading to Muswellbrook or Aberdeen.

2.4.3 Aberdeen Street

Aberdeen Street is an 800m local road linking Wilkins Street, Kayuga Road and Keegan Street to the New England Highway and is managed by MSC. It has a two-lane two-way configuration with centre and shoulder line markings. The seal width is 8m with minor pavement patching present. It is posted at 50km/h.

Aberdeen Street is a strategic link within the Muswellbrook LGA road network as it:

- Services multiple residential lots
- Provides access for Kayuga Road and Wybong Road to the town centre.

2.4.4 Bengalla Link Road

Bengalla Road is a 10km local collector/distributor road linking Wybong road to the North and Denman Road to the South and is managed by MSC. It has a two-lane two-way configuration with centre and shoulder line markings. The sealed width varies from 8m to 9m in width and has significant pavement patching.

Bengalla Link Road has a posted speed limit of 100km/h and services approximately 3,200 vpd (2016).





Bengalla Link Road is an important strategic link within the Muswellbrook LGA road network as it:

- In conjunction with Wybong Road, forms part of the only HV bypass route that avoids Denman Bridge
- Provides HV an alternative route from Kayuga Road to Muswellbrook avoiding Kayuga Bridge
- Is the main access for the Bengalla Mine.

2.4.5 Thomas Mitchell Drive

Thomas Mitchell Drive is an 11km local collector/distributor road linking Denman Road to the North to the New England Highway to the South and is managed by MSC. It has a two-lane two-way configuration with centre line and shoulder line markings and no sealed shoulder. Sealed width is generally 7m to 8m in width and the pavement condition has severely deteriorated in segments, especially at shoulder locations where line markings have been eroded.

Thomas Mitchell Drive has varying signposted speed limits of between 80km/h and 100km/h and carries approximately 9,100 vpd.

Thomas Mitchell Drive is an important strategic link within the Muswellbrook LGA road network as it:

- Is the primary address for the Mount Arthur Mine
- Is the primary access for the proposed Maxwell underground Mine
- Is the frontage for the Thomas Mitchell Drive Industrial area
- Can act as a Muswellbrook Southern bypass between New England Highway and the Golden Highway.

2.4.6 Edderton Road

Edderton Road is a 15km local collector/distributor road linking Denman Road to the north and Golden Highway to the south and managed by MSC. It has a two-lane two-way configuration with no line marking and no sealed shoulders. The sealed width is generally less than 6m and the pavement has significant patching. Saddlers Creek crosses the route as a floodway approximately 3.5km north of the Golden Highway. The floodway has a deep sag vertical curve. The road has a 14t load limit signed at both ends.

The sign posted speed limit varies between 80km/h and 100km/h with a number of speed advisory signs including a 65km/h speed through Saddlers Creek crossing. Edderton Road carries around 830 - 1,000 vpd (2018) and approximately 18.5% heavy vehicles.

Edderton Road is an important strategic link within the Muswellbrook LGA road network as it:

- Provides a more direct link between Jerry's Plains and Muswellbrook compared to the Golden Highway through Denman
- Provides an emergency access route and alternate route in case of incident on Golden Highway through Denman's Gap or Hunter River bridge
- Is an important transport route for equine critical industry clusters between the north of Muswellbrook and Jerry's Plain.





2.5 Minor Local Roads Impacted by Mine Related Activities

2.5.1 Castlerock Road / Dorset Road

Castlerock Road and Dorset Roads serve a number of farmlands to the north of Wybong Road and both are proposed for closure from the Muswellbrook West Mine and the Mt Pleasant Mine. The proposed Muswellbrook West Mine closure effects the Western ends of Castlerock Road and Dorset Road as well as the North-South connection between the two. The Mt Pleasant Mine closure involves closing the eastern section which connects Castlerock Road with Kayuga Road cutting off farm access for Castlerock Road.

2.5.2 Reedy Creek Road

Reedy Creek Road is a north-south connection between Wybong Road and the Golden Highway. It is assumed traffic volume is predominately local drivers with knowledge of the link as number of vpd is relatively low. The proposed upgrade of Reedy Creek Road would aim to divert and provide a higher quality route for all heavy vehicle traffic travelling on Wybong Road to the Golden Highway.

2.5.3 Wybong Post Office Road / Yarraman Road / Ridgelands Road

Wybong Post Office Road / Yarraman Road forms a link between Ridgelands Road and the Golden Highway via Wybong Road. Traffic volumes most likely consist of employees travelling to and from their place of work.

2.5.4 Muswellbrook Industrial Estate

The Muswellbrook Industrial Area offers a wide range of industrial manufacturing and support industries, and therefore generates a significant amount of mine-related and non-mine related heavy vehicle traffic. The section of Thomas Mitchell Drive between the Industrial Area and Denman Road continues to be the most heavily trafficked section of local roads in the Shire.

It is anticipated that the Muswellbrook Industrial Area will continue to provide services and products to the local community as well as the mining industry in the long term. With the potential opening of new mines to the north and west, it can be expected that the proportion of traffic related to the mining industry will increase on roads leading to/from and within the Industrial Area.

2.6 Traffic Volumes

2.6.1 Updated Traffic Volumes

Traffic volumes and the proportion of heavy vehicle traffic on load roads were surveyed in 2013 and reported in the 2015 MARNP. Traffic reports for recent mine proposals and applications have been reviewed to provide updated traffic volumes where data was available. These are presented in Table 2.1.





Table 2.1: Traff	fic Volumes and Pro	portion of Heavy	Vehicles by	Road Section
------------------	---------------------	------------------	-------------	---------------------

		Total Traffic Volumes				
Road Section		Totals (vpd)	Total x Vehicle Types (vpd)		% HV of Total vpd	
Kayuga Road North (Shire Boundary to Wybong	2016	020	LV's	876	1 80%*	
Road)	2010	920	HV's & MCV's	44*	4.00 %	
Kayuga Road East (Wybong Road to Kayuga	2016	740	LV's	730	1.050/	
Bridge)	2010	740	HV's & MCV's	10	1.5576	
Wybong Road West (Sandy Hollow to Mangoola	2017	1150	LV's	1,110	3 /8%	
Mine Entrance)	2017	1150	HV's & MCV's	40	3.40 /0	
Wybong Road (Mangoola Mine Entrance to	2020	1 204	LV's	1,265	0.05%	
Bengalla Link Road)	2020	1,394	HV's & MCV's	129	9.23%	
Wybong Road East (Bengalla Link Road to	2016	760	LV's	730	3.95%	
Kayuga Road)	2010	700	HV's & MCV's	30		
Bengalla Link Road North (Wybong Road to	0040	1,680	LV's	1500	10.71%	
Bengalla Mine Entrance)	2010		HV's & MCV's	180		
Bengalla Link Road South (Bengalla Mine	2016 3	2 220	LV's	2,960	8.36%	
Entrance to Denman Road)		3,230	HV's & MCV's	270		
Thereas Mitchell Drive North (Deerson Deed to	2018	9,180	LV's	8,510	7.30%	
the Industrial Area)			HV's & MCV's	670		
Thomas Mitchell Drive Central (Industrial Area	2012	4 700	LV's	4,133	100/	
to Mt Arthur Mine Entrance)	2013	4,702	HV's & MCV's	569	12%	
Thomas Mitchell Drive South (Mt Arthur Mine	2012	2 700	LV's	3,236	14.50%	
Entrance to former Drayton Mine Entrance)	2013	3,709	HV's & MCV's	553		
Thomas Mitchell Drive East (former Drayton	2019	E E 40	LV's	5,320	4.14%	
Mine Entrance to New England Hwy)	2016	5,540	HV's & MCV's	220		
Edderton Road North (Denman Road to Mt	2019	610	LV's	600	2.00%	
Arthur Heavy Vehicle Assembly Pad)	2016	010	HV's & MCV's	10		
Edderton Road South (Mt Arthur Heavy Vehicle	2012	006	LV's	680	10 E00/	
Assembly Pad to Golden Hwy)	2013	030	HV's & MCV's	155	18.50%	

Based on the above, it is evident that:

- Thomas Mitchell Drive and Bengalla Link Road south carries the highest total traffic volumes (particularly Thomas Mitchell Drive North)
- Thomas Mitchell Drive also carries the highest number of heavy vehicles per day with Bengalla Link Road South being the second-most used road for heavy vehicles.

Figure 2.4 maps the updated traffic volumes on the local road network.



17

NORTHROP



Figure 2.4: Local Road Daily Traffic Volumes (vpd)

Muswellbrook Mine Affected Road Network Plan Review

2.7 Performance Assessment

2.7.1 Road Hierarchy Review

The Rural Road Network Management Hierarchy (RMS NSW (formerly RTA), 2008) organises the road network into categories to ensure roads can be managed according to their relative importance. The categories for rural roads range from Class 6 Rural (6R) to Class 1 Rural (1R) roads. This classification is based on daily traffic volumes, heavy vehicle volumes, speed posting and strategic factors.

The definitions of each relevant rural road class in accordance with the Road Network Management Hierarchy is outlined below:

- Class 1R: are identified by very low levels of traffic volumes including freight, commercial vehicle and public transport travel. They provide a varied but reasonable standard of travel and serve some intra-regional and inter-regional functions. Typically, they have undivided carriageways with two lanes
- Class 2R: provide inter-regional and intra-regional connectivity and the strategic needs of freight. They are classified by relatively low levels of traffic volumes including freight, commercial vehicle and public transport travel. They provide a reasonable standard of travel and serve intra-regional and some inter-regional functions. Typically, they have undivided carriageways with two lanes
- Class 3R: provide a strategic freight function. They are classified by moderate levels of traffic volumes including freight, commercial vehicle and public transport travel. They provide an acceptable standard of travel and service inter/intra-regional functions. Typically, they have undivided carriageways with two lanes
- Class 4R: are identified by moderately high traffic volumes including freight, commercial vehicle and public transport travel. They provide a good standard of travel and serve some inter-state, inter-regional and intra-regional functions with direct access to abutting land controlled. Typically, they have undivided carriageways with two lanes with overtaking lanes.

Table 2.2 lists the attributes of each category within the *Rural Road Network Management Hierarchy* as developed by the RTA (2008).

Class	Average Annual Daily Traffic	Heavy Vehicles (Average)	Speed Limit (km/hr)
6R	12,000 +	2,500	100-110
5R	12,000	1,200	80-110
4R	10,000	1,000	80-110
3R	4,500	500	60-110
2R	1.500	250	60-110
1R	500	50	60-110

Table 2.2: Road Network Management Hierarchy – Rural (as per RMS)

Table 2.3 outlines the different classes of road and provides an estimated road hierarchy.





Table 2.3: Estimated Road Hierarchy

Road Section	Daily Traffic Volumes	Daily Heavy Vehicles	Speed Limit (km/hr)	Class
Kayuga Road North (Shire Boundary to Wybong Road)	920	44	70	2R
Kayuga Road East (Wybong Road to Kayuga Bridge)	740	10	70	2R
Wybong Road West (Sandy Hollow to Mangoola Mine Entrance)	1150	40	70	2R
Wybong Road (Mangoola Mine Entrance to Bengalla Link Road)	1,394	129	80	3R
Wybong Road East (Bengalla Link Road to Kayuga Road)	760	30	80	2R
Bengalla Link Road North (Wybong Road to Bengalla Mine Entrance)	1,680	180	90	3R
Bengalla Link Road South (Bengalla Mine Entrance to Denman Road)	3,230	270	90	3R
Thomas Mitchell Drive North (Denman Road to the Industrial Area)	9,180	670	80	4R
Thomas Mitchell Drive Central (Industrial Area to Mt Arthur Mine Entrance)	4,702	569	80	4R
Thomas Mitchell Drive South (Mt Arthur Mine Entrance to former Drayton Mine Entrance)	3,789	553	80	3R
Thomas Mitchell Drive East (former Drayton Mine Entrance to New England Hwy)	5,540	220	80	4R
Edderton Road North (Denman Road to Mt Arthur Heavy Vehicle Assembly Pad)	610	10	80	2R
Edderton Road South (Mt Arthur Heavy Vehicle Assembly Pad to Golden Hwy)	836	155	80	2R

Overall, there has been a modest increase in traffic volumes across the road network compared to the 2015 MARNP, except for:

- Bengalla Link Road South (Bengalla Mine Entrance to Denman Road) 2,030vpd to 3,230vpd (59% increase)
- Thomas Mitchell Drive East (former Drayton Mine Entrance to New England Hwy) 4,146vpd to 5,540vpd (34% increase)
- Wybong Road (Mangoola Mine Entrance to Bengalla Link Road) 1,288vpd to 1,394vpd (8.2% increase)
- Kayuga Road East (Wybong Road to Kayuga Bridge) 1,718vpd to 740vpd (-57% decrease).

The mid-block capacity and level of service of these roads remains relatively unchanged from the 2015 MARNP, however, on lower volume rural roads, lane and shoulder widths and road pavement condition is a better indicator of level of service than simply relying on traffic volumes.





2.8 Geometric Design Standards

All state agencies and most Councils across Australia have adopted Austroads Guide to Road Design as the industry standard to provide a level of consistency across all jurisdictions.

2.8.1 Cross-Sections

Roads of the same classification, in similar terrain, should have similar cross-sections. It is particularly important that the cross-section be consistent along any one route, so that drivers are not faced with unexpected changes. Also, the operating speed of the road can be affected by cross-section elements, and differential speeds are known to be the cause of many crashes. Figure 2.5 depicts the desirable road cross-sections based on Austroads guidelines, the road network functional hierarchy and the expected traffic composition for each road.



Figure 2.5: Desirable Road Cross Sections – Austroads





2.9 Local Roads Condition Assessment

2.9.1 Existing Observed Conditions

Site visits were undertaken for the key local roads in October 2019. The condition of each road is shown in Figure 2.6 using the following criteria:

- Poor Repeatedly patched/repaired (potholed) road surface, generally across the entire road surface, pavement edge crumbling/breaking away from traffic dropping off road surface. Very narrow to narrow (4.0m to 5.5m formation, 6.0m in some locations) with little to no usable shoulders (less than 0.5m wide). Priority works to be considered to maintain existing posted speed limit
- Below Average Areas of patchy repairs and edge damage. General road width between 6.0 and 6.5m wide. Narrow shoulders (1.0m) with vegetation overhanging and starting to encroach shoulders. Road embankments do not provide safe room to pull off road before a road batter or embankment
- Average Isolated patches and/or minor defects/issues to visible road surface (minor potholing). Road width approximately 7.0m wide with shoulders 1.0m to 1.5m wide with sufficient room to pull vehicle off road if required. Condition may be acceptable for short term, should be monitored and assessed regularly
- Good Minor to No visible defects/issues. Surface condition considered serviceable and acceptable for all vehicles. Road width generally 7.0m or more with wide shoulder (>=1.5m).

Road conditions observations are provided in Appendix B.







Figure 2.6: Existing Road Conditions

Muswellbrook Mine Affected Road Network Plan Review

Project: P4287 Version: 004



2.9.2 Existing Road Condition Upgrades

The road conditions assessment considered each road against geometric standards and condition (e.g. road formation, pavement condition, alignment) as well as its intended hierarchical function in the road network. Table 2.4 summarises the recommended road condition upgrades including indicative estimated costs. Also refer to Figure 2.7 for reference to road sections.

Road	Section	Section Ref #	Suggested Works	Indicative Cost (\$M)
Wybong	Golden Highway to Reedy Creek Road	1	Minor to major works (minor pavement widening, shoulder widening, resurfacing and culvert installation at causeway). NB: Not required if Reedy Creek Road is upgraded to Collector Road	\$13.4M
	Reedy Creek Road to Yarraman Road	2	Minor to major works (minor pavement widening, shoulder widening, resurfacing and culvert installation at causeway).	\$12.1M
Road	Yarraman Road to Wybong PO Road	3	Significant works required to upgrade road to an appropriate standard	\$18.2M
	Wybong PO Road to Spring Creek	4	Minor works required (isolated pothole repairs and resurfacing at intersections	\$1.9M
	Mt Pleasant Mine entrance to Kayuga Road	7	Significant works would be required to this section to meet the intent of the Network plan	\$29M
	Approximately 2.1km from proposed new Denman Road intersection	1	Generally some major to significant works would be required to this section (pavement widening, shoulder widening, install of barriers over culvert, culvert extension and full milling and resurfacing) to meet the intent of the Network plan and make the road safe.	\$7.36M
Edderton Road	1.6km section – refer Figure 2.7	2	Minor works would be required to this section (shoulder widening and potential resurfacing) to meet the intent of the Network plan and to make the road safe.	\$4.2M
	1.7km section – refer Figure 2.7	3	Minor to Major works would be required to this section (pavement widening, shoulder widening and resurfacing) to meet the intent of the Network plan and make the road safe.	\$5.8M
	1.7km section – refer Figure 2.7	4	Minor works would be required to this section (minor pavement and shoulder widening) to meet the intent of the Network plan and make the road safe	\$4.4M
Reedy Creek Road	Wybong Road to Golden Highway	N/A	Potentially on Minor works (minor pavement widening, shoulder widening, resurfacing) required to this road to meet the intent of the Network plan NB: Cost could be higher if upgraded to accommodate OSOM vehicles and/or re- alignment new intersection at Golden Highway	\$3.83M

Table 2.4: Recommended Road Condition Upgrades





Road	Section	Section Ref #	Suggested Works	Indicative Cost (\$M)
Yarraman Road	Wybong Post Office Road to Wybong Road	N/A	Generally major works (pavement and formation widening, shoulder widening, resurfacing, vegetation clearing and a potential bridge over the causeway) required to Yarraman Road to meet the intent of the Network plan	\$13M









Figure 2.7: Required Roadworks

Muswellbrook Mine Affected Road Network Plan Review

Project: P4287 Version: 004



2.10 Heavy and Priority Vehicles

Muswellbrook Shire LGA and surrounds contain a number of heavy and OSOM vehicle routes, as well as local connectors where heavy vehicle access is approved and catered for. Council has a key role to play in the connectivity, accessibility, and travel times for both local and regional industries.

2.10.1 Over-size and Over-mass Vehicle Requirements

Over-size and over-mass (OSOM) vehicles require permits to operate and travel on designated NSW roads. As such, route planning and availability become key factors in the viability and sustainability of many industry activities in the region.

The RMS online mapping tool provides a route map for most types of standard width and weight heavy vehicles (i.e. Articulated and B-double). However, OSOM vehicles have more restricted routes, limited mostly to state arterial routes such as the Golden Highway, New England Highway and Denman Road, with a number of roads that have additional restrictions for some vehicles.

Typical OSOM vehicles might carry:

- Large mining equipment and infrastructure (i.e. drill rigs or building components)
- Agricultural machines (i.e. harvesters and grain augers)
- Wind and solar farm infrastructure (i.e. wind farm blades).

Key RMS mapped routes for OSOM vehicles and for vehicles that exceed 4.6m in height are shown in Figure 2.8.



Figure 2.8: Key Heavy Vehicle and OSOM Routes



Project: P4287 Vers


Roads that are not approved on the RMS map require an access permit from the National Heavy Vehicle Regulator or the relevant road manager. Noting that while currently high loads are required to divert past Muswellbrook township, this will be addressed with Muswellbrook bypass completion.

Some OSOM vehicles used for the various industries in the region exceed standard width and height clearances for local connector and access roads. A road network that can allow access to alternate local routes would provide large benefits in travel times and accessibility for the region making it an important responsibility for Council.

2.10.2 Muswellbrook Network and Industry

The regional road freight network includes the following key directional links:

- **East to West** travelling to/from Newcastle Port and western regional centres (i.e. Dubbo)
- North to South travelling to/from Newcastle Port and northern regional centres (i.e. Tamworth)
- West to North travelling to/from northern and western regional centres (i.e. Merriwa to Tamworth).

Key regional heavy vehicle industries include:

- Mining Industries
- Agriculture Industries
- Equine Industries
- Future Power Industries.

Providing a network that caters for the current industry needs and provides a long-term improvement legacy is a key objective of this plan. By working with RMS and providing upgrades to key local links Council supports and promotes industry growth.

For example, due to the width restrictions on the Golden Highway bridge at Denman some westbound OSOM vehicles need to travel north to Gunnedah before accessing western industries via Coonabarabran and Dundoo (adding over 2 days of travel time). While it is desirable to keep OSOM vehicles on state road upgrades to local connectors within the shire have the potential to improve travel efficiency for these vehicles.

Key regional network links and their localised connectivity through the Muswellbrook Shire are summarised in Table 2.5 below.

Route	Jurisdiction	Key Destinations	Localised Connectivity
East to West Golden Highway	RMS	Newcastle Port and western regional centres (i.e. Dubbo)	Mainly uses Golden Highway. Denman Bridge width restrictions at Hunter River require vehicles to deviate along Denman Road and Thomas Mitchell Road travelling to/from the south.
North to South New England Hwy	RMS/ Council	Newcastle Port, Sydney and regional centres to the north (i.e. Tamworth)	Provision of Muswellbrook bypass will improve route. Limited restrictions, height restriction in Muswellbrook (overpass) - alternate route provided via a curve limited Bell Street.

Table 2.5: Wider Heavy Vehicle /Freight Network and Local Roads Connectivity





Route	Jurisdiction	Key Destinations	Localised Connectivity
West to North/South Wybong Road	Council	Regional Industry and mines, Newcastle Port and centres to the north.	Provides connection to Mines and a local alternate east-west route to Denman Road. The Kayuga Bridge is width and weight limited requiring vehicles on this route to divert via Bengalla Link Road to Denman Road. Some sections of winding and narrow road (i.e. Reedy Creek to Golden Highway).
West to East Denman Road	RMS	Regional Industry and mines, Muswellbrook town, Newcastle Port and centres to the north.	Connection between Muswellbrook and Denman centres. While providing key New England Highway to Golden Highway connection, due to limited width Denman bridge on Golden Highway some oversize vehicles cannot use this route.
Localised North to South Thomas Mitchell Drive	Council	Regional Industry and mines, Newcastle Port and centres to the north.	Local west bypass of Muswellbrook town. Heavily utilised by mine traffic it connects Denman Road with New England Highway.

2.10.3 Local Road Network Role

Within the region the local heavy vehicle network plays a very important role, particularly in the short to medium term prior to the completion of the Muswellbrook Bypass and any future upgrade of the Denman bridge.

As shown in Figure 2.9, Wybong Road and Thomas Mitchell Drive provide the most appropriate routes for OSOM vehicle movements travelling to or from the west. Upgrading this route to be 'heavy vehicle appropriate' also provides a local alternative for other heavy vehicles that may require detours or rerouting due to various construction works, saving significant travel time additions.







Figure 2.9: Heavy Vehicle and OSOM Routes Muswellbrook MARNP

Providing a localised heavy vehicle network not only improves the quality of the regional network but also provides for the high level of local industry within the Muswellbrook LGA. Other benefits for local traffic movements might include improved:

- Safety for road users (both heavy vehicle and other)
- Connectivity for heavy vehicles and less impact on low hierarchy town streets and roads
- Travel times.

2.10.4 Key Constraint Locations

The following section describes some of the key local network limitations in more detail to further inform future network improvement options.

Denman Bridge

Denman bridge is located approximately 1km to the east of Denman on the Golden Highway. The bridge has some historical significance due to its truss frame structure and is approximately 7.9m wide.

The Golden Highway, on which the bridge is located, exists as a major link in the regional freight network and while the bridge caters for most heavy vehicle traffic its width does not allow for oversize and over-mass vehicles commonly used in the region. Further, the bridge is narrower than the *Performance Based Standards Scheme Network Guidelines* (National Transport Commission 2007) recommended 8.4m. This forces these OSOM vehicles to travel significant distances to reach their destination.



Version: 004

Project: P4287



For example, when the bridge was closed for repairs in February 2019 a detour was provided but no heavy vehicles could utilise this detour and were required to travel to the New England Highway via Scone and Merriwa. Adding over 200km in distance for standard heavy vehicles and more for OSOM vehicles.



Figure 2.10: Detour during Denman Bridge Closure 2019

Although the bridge was upgraded to hold more weight, along with some safety improvements as part of the state Golden Highway Strategy to enable access for PBS class 2B (30m) trucks, the width restriction still exists for OSOM vehicles.

As such, in the medium term the provision of a quality alternate route via a Wybong Link Road would provide a significant benefit to local and regional industries. Long term it is recommended to pursue, with RMS, the upgrade or replacement of this bridge to accommodate OSOM vehicles.





Mangoola Mine Overpass (Proposed)

The Mangoola Mine has proposed the construction of an access overpass over Wybong Road located slightly west of the existing Wybong Road / Wybong PO Road intersection.

Considering Wybong Road is recommended as local OSOM route and exists as a local heavy vehicle route, it is recommended that this overpass meet OSOM heavy vehicles requirements specified by TfNSW.

Wybong Road at Reedy Creek

The existing road conditions assessment found that sections of Wybong Road was in poor condition. However, it is a significant local link and has the potential to provide for key OSOM and heavy industry vehicle movements.

It is recommended the whole of Wybong Road is reviewed and upgraded to accommodate OSOM vehicles, with a potential connection to New England Highway (Refer to Section 0).







2.11 Crash History

2.11.1 Key Statistics

Crash data supplied and reviewed as part of this assessment covers the Muswellbrook Local Government Area (LGA) for a 5-year period (2012/13 to 2017/18). Understanding where crashes occur, and the potential influencing factors, informs which roads may require upgrades or repairs to meet a higher standard of safety.

Over a 5-year period Muswellbrook LGA there was 277 recorded casualty crashes (i.e. fatality or injury). A large number of these crashes have occurred on state roads or within the local townships of Denman and Muswellbrook.

The most common crash type was "off path" on a straight or curve, equating to approximately 51% of all crashes in the LGA. By comparison the Hunter Region and across NSW have proportions of 37% and 30% for off-path crashes. Other key crash characteristics are summarised as follows:

- Fatigue Fatigue was involved in 12% of all crashes. This is 3% higher than the Hunter Region average and 4% higher than the NSW State average. Whilst this proportion of fatigue crashes has remained consistent over the last 5 years, it is noted that crashes in 2018 have seen an increase of almost 10% (approximately 22% of all crashes)
- **Speeds** Speed was a factor in 37% of all casualty crashes, a significantly higher proportion when compared to 22% in the Hunter Region and 17% for NSW
- Heavy Vehicles 32% of crashes in Muswellbrook involved heavy vehicles, in comparison to Hunter Region's 18% and NSW's 17%. A trend graph of crashes by vehicle type in the Muswellbrook LGA is shown in Figure 2.11 and demonstrated the increasing proportion of heavy vehicle type crashes over the last 5 years
- **Time of Day -** 25% of crashes in Muswellbrook occurred between the hours of 8:00pm and 6:00am (at night). This is 5% higher than the Hunter region and the NSW across the same period, indicating that a high proportion of traffic utilise the local road at night in potentially poor night road conditions



Figure 2.11: Percentage of Heavy Vehicle Related Crashes







The high number of off path crashes and the increasing proportion of heavy vehicle type crashes, in combination with the abovementioned factors, may indicate that rural road conditions need upgrading to provide additional safety to users. This is particularly important considering the changing landscape of Muswellbrook to large scale industries and the high severity of consequence for off-path crashes on rural roads.

2.11.2 Fatalities and Serious Injuries

Over the last 5 years approximately 6% of all crashes involved fatalities in Muswellbrook. Serious and moderate injuries made up 31% and 50% of all crashes, respectively. By comparison, the Hunter region has proportions of 2%, 27% and 47% respectively. Trends indicate that fatalities have increased while serious and moderate injuries have decreased.

Furthermore, since 2014 Muswellbrook has seen a steady increase in crashes resulting in serious injuries or fatalities that involved heavy vehicles. With 2018 having 8% of all heavy vehicle casualty crashes involving a fatality.

2.11.3 Crashes on Key Roads

Figure 2.12 provides a breakdown of crashes across the local and regional road network within Muswellbrook LGA by RUM code.



Figure 2.12: All Vehicle Crashes by RUM Code and Road

As shown, most crashes are off-path or vehicles travelling in the same direction, particularly on the local roads.

A breakdown of the LGAs heavy vehicles crashes by road and RUM code is provided in Figure 2.13 which demonstrates a similar trend of off-path and same-direction crashes. It is noted that the highest proportion of heavy vehicle crashes occurred on the New England Highway. For local roads, Bengalla Road showed the highest proportion of crashes.



Version: 004

Project: P4287





Figure 2.13: Heavy Vehicle Crashes by RUM Code and Road

2.12 Localised Crash Cluster Review

The largest proportion of crashes within the LGA occurred on state roads or within the local townships of Muswellbrook and Denman. The following crash clusters review focuses on local roads and intersections outside of towns to inform potential improvements to the wider rural network. Crash cluster locations include:

- Wybong Road / Bengalla Road Intersection
- Wybong Road.

2.12.1 Wybong Road / Bengalla Road Intersection

Six (6) recorded crashes occurred at the intersection of Wybong Road / Bengalla Road with three (3) occurring due to 'off-path' on bend.



Figure 2.14: Wybong Road / Bengalla Road Crash Cluster



Version: 004



2.12.2 Wybong Road

Three (3) crashes were recorded along Wybong road approximately 700m West of Ridgelands Road, two (2) occurring from vehicles going off-path.



Figure 2.15: Wybong Road Crash Cluster

2.12.3 Recommended Actions

Over 50% of road crashes in Muswellbrook Shire are run-off-road crashes which is significantly higher than the state (30%) and regional (37%) averages. The crash severity is also proportionally higher than the state and regional averages.

Sealed shoulders improve road safety and reduce crash rates, particularly with respect to run-off-road crashes, with most of the benefit being achieved by a shoulder seal width of 0.5m to 1.5m. It is noted that research in Queensland identified that rural undivided roads with little or no sealed shoulder (< 0.5 m category) had 1.7 times higher risk of casualty crashes (any type) than roads with 2.0m sealed shoulders. Safety benefits of sealed shoulders were also evident on rural roads with lower speed limits, e.g. 80 km/h (Austroads 2014b). All new roads and road upgrades should include sealed shoulders.





3. FUTURE NETWORK DEMANDS

3.1 Mining

3.1.1 Mine Proposals and Activity

Muswellbrook's mining industry is one of the main drivers of economic productivity and growth throughout the region. Underground mining initially commenced in the 1800's, which eventually transitioned to open cut mining by 1944. Coal extraction in Muswellbrook is predicted to remain the primary source of energy production for global electricity and steel production over the next 20 to 40 years. It is also expected that alternate sources of energy (such as renewables) will begin to emerge over the next 10 to 20 years.

Approvals and applications for the expansion, intensification and/or relocation of existing and proposed mines are likely to result in changes to traffic flow in the short and long-term. The approved and proposed mines of Bengalla, former Drayton, Mangoola, Maxwell, Mt Arthur, Mt Pleasant and West Muswellbrook will have impacts on the road network at a local and strategic level.

Table 3.1 summarises the anticipated mine activity over the next 20 and 40 years based on currently available information. Columns two and three list the proposed mine activities reported in the previous MARNP (2015) with the fourth column providing a current (2019) update.







Table 3.1: Summary of Anticipated Mine Activity

Mino	Mine Affected Roads -	Drongood Astivity Undeter		
wine	2014 - 2034 2034 - 2054		Proposed Activity opdates	
Bengalla Mine	The consent for the current Bengalla Mine extraction area will lapse in 2017 and rehabilitation ('care and maintenance') will continue for a number of years thereafter. Currently 400 full-time equivalent employees (fte's) plus contractors work at the mine. Open cut coal extraction will continue in a westerly direction into a new resource area for a further 24 years (with 900 fte's plus contractors).	Coal extraction will continue in a westerly direction until approx. 2041. Potential exists for the open cut extraction to continue into new areas to the west and potentially into underground coal resources.	No change since 2015 MARNP. Increase in coal ROM extraction predicted to increase from 8.3Mt to 10.2MT per year. Workforce is expected to increase to 440 full time equivalent (fte) employees plus 210 contactors. Proposed Bengalla Link diversion required around 2035-2037.	
Former Drayton Mine and proposed Drayton South Mine Malabar Mine	The existing Drayton Mine extraction area will cease operation at the end of 2015 and rehabilitation ('care and maintenance') will continue for a number of years thereafter. A new (reduced) Drayton South Mine will commence in 2015 continuing west for approx. 15 years (2030). (Existing 530 fte's to relocate to Drayton South extraction area).	Coal extraction will continue in a westerly direction until approx. 2030. Potential exists for extraction to continue into underground coal resources.	Lease taken over by Malabar Mines (Maxwell Project) and will be for underground mining. Life of the mine is 15 years and the project disturbance footprint is 1,441ha (25%). Southern diversion of Edderton Road is still required but to a lesser extent to that proposed by former Drayton South. An alternative option to maintain the road alignment and monitor subsidence and maintain is also proposed by Malabar Mines	
Mt Arthur Mine plus Extension	The existing Mt Arthur Mine extraction area has a further 8 years of resource and with approval of the extension to the west, will cease operation in approx. 12 years (2026) after which rehabilitation ('care and maintenance') will continue for a number of years. (2,600 fte's plus contractors currently work at the mine). Further resources within EL 5965 will see the extraction area extend further west beyond the 20-year time frame	Potential exists for the extraction of underground coal resources and new areas of additional open cut coal within EL 5965. Potential mine life span is unknown but is assumed will extend beyond 2054.	Extension to life of the mine by four years (to 2026) with up to 2,600 employees	
Mangoola Mine	Increased extraction rates to see the existing Mangoola Mine resource to run out in 2023-2024 (300 fte's currently working at the mine to increase to 450 fte's plus up to 90 contractors).	Additional open cut resources exist to the north. Future underground resource also exists and may be pursued subject to viability assessment.	Mangoola proposed to extend mining operations to the immediate north of existing operations and have applied for approval to continue the expanded operations until 2030. The extension would impact on and require closure of a portion of Wybong Post Office Road and Mangoola propose a realignment of this road. The proposal also includes the construction of a haul road overpass over Big Flat Creek and Wybong Road to provide access from the existing mine to the additional project area. The MCCO Project (Mangoola) applications identifies a reduction in the approval FTE from 540 to 480.	
Muswellbrook Mine	The existing Muswellbrook Mine extraction area will cease operation in the next 4 years (2018) and		No change	

Muswellbrook Mine Affected Road Network Plan Review

Mine	Mine Affected Roads -	Dran a god A attivity Undeter		
wine	2014 - 2034	2034 - 2054	Proposed Activity opdates	
	rehabilitation ('care and maintenance') will continue for a number of years thereafter.			
Mt Pleasant Mine	Mine construction to commence in 2015 (256 fte's during construction) and coal extraction to commence in 2017 (320 fte's) and to continue for 21 years (to 2038).	Extraction to continue until approx. 2038 and rehabilitation ('care and maintenance') will occur for a number of years thereafter. Future underground resources exist. Viability of extraction depends on market prices and advances in technology.	Construction of the Mt Pleasant Operation re-commenced in November 2016 and is approved to produce up to 10.t Mtpa of ROM coal, and to continue to December 2026. Recent modification comprises of a rail spur adjacent to Overton Road and rail loop crossing over Wybong Road. The modification also removes the need to close Wybong Road between Bengalla Link Road and Kayuga Road.	
West Muswellbrook Mine	<i>EL</i> 19 (West Muswellbrook) is known to contain estimated resources in the order of 460Mt (7Mtpa). Assuming viability, extraction to commence around 2025 and continue for at least 30 years until beyond 2055.	Extraction to continue beyond 2055.	No construction or operational activity at this stage however advice from DPIE suggest the proposal is still active. This includes the potential partial closure of Castlerock Road, Halls Road and Dorset Road.	
Spur Hill Mine	<i>EL</i> 7429 (Spurhill) is known to contain estimated resources in the order of 154Mt. It is assumed that construction will commence in 2015 (400 fte's) and extraction to commence in 2017 (300 fte's) and continue for 25 years (2042).	Extraction to continue until around 2042. Future underground resources exist and may be pursued subject to viability assessment.	Malabar Coal is currently undertaking exploration studies and detailed technical work to determine the next steps in developing the project. <i>(Malabar website)</i>	
Dellworth Mine	EL 6594 (Dellworth) – Unknown resources. Long term potential.	Potential to be acquired by adjoining mines (Drayton, Mt Arthur).	Dellworth holds exploration licence EL 6812 (Savoy Hill tenement) adjacent to mining operations owned and operated by Glencore, Coal & Allied and Anglo Coal. An application for renewal of EL 6812 was lodged with the Department of Planning & Environment, Resources & Geosciences in June 2018. (<i>NuCoal Website</i>)	
Ferndale Mine	<i>EL</i> 7430 (Ferndale) is known to contain estimated resources in the order of 743Mt (up to 85Mt saleable). Assume construction in 2016 (250 fte's) and extraction to commence in 2018 (100 fte's) and continue for 25 years (2043).	Extraction to continue until around 2043. Existence and viability of additional resource extraction unknown.	No data available	
Sandy Creek Mine	Estimated 16.9Mt of marketable reserves. Existing consent lapses in 2020.	Potential long term resource.	No data available	
Dartbrook Mine	Ceased Operating (Jan 2007) – under Care and Maintenance. Future U/G resource unknown.		Australian Pacific Coal Limited recently received approval to recommence operations and extract up to 6 million tonnes of run-of-mine coal annually using longwall methods until 2022.	
Ridgelands Road Mine(s)	EL 6047 (Ridgelands) is located north of Wybong Road – Yet to be explored to identify coal reserves.	Potential long term extraction.	No data available	

*Summary of detail provided within Table 4-1 of the 2015 Muswellbrook Mine Affected Roads Report by Cardno

Muswellbrook Mine Affected Road Network Plan Review

3.1.2 Mine Network Demands and Impacts

The following section summarises the significant mine operations in the area and their likely impact on the local road network.

Bengalla Mine

Bengalla is an existing mine that sits west of Muswellbrook town between Wybong Road and Bengalla Road and has operations approved out to 2039. The mine is currently accessed via Bengalla Link Road.

Development Consent for Modification 4 Bengalla Continuation Project was granted in December 2018 for extension of open cut coal extraction to the west which would require closure of a section of the Bengalla Link Road. The approval included transport related environmental performance conditions that included the design and construction of a realigned Bengalla Link Road, and associated intersection works as conceptually shown in Figure 3.1.

Bengalla is also required to contribute to the upgrade and maintenance of Thomas Mitchell Drive and its intersections with Denman Drive and New England Highway, proportionate to its impacts, in accordance with the *Thomas Mitchell Drive Contributions Study, December 2013 (GHD)*.



Figure 3.1: Conceptual Realignment of Bengalla Link Road



Version: 004



Highway.

NB:

Under the changes to the Mount Pleasant Mine operations the closure of Wybong Road is no longer required, which would then negate the condition to construct the Western Link road. There is potential to utilise the realigned Bengalla Link Road as part of a western

corridor linking Denman

Road to New England

Mount Pleasant Mine

Mount Pleasant Mine is an existing open cut coal extraction mine located north-west of Muswellbrook between Wybong Road and Dorset Road and has operations approved out to 2026.

The Mount Pleasant operation was purchased by MACH Energy from Coal & Allied and recommenced operations in November 2016. The main coal extraction area occurs to the north of Wybong Road and west of Kayuga Road.

The mine is currently accessed via Wybong Road. Figure 3.2 shows the general arrangement of the Mount Pleasant operations. Key features include:

- A proposed new rail spur that parallels Overton Road then crosses over Wybong Road with a rail loop and conveyor north of Wybong Road
- Closure of Castlerock Road for open cut coal extraction
- Closure of Skippens Road.

The conditions of consent for 'Mod 4' was granted on 16 November 2016. The approval set transport related environmental performance conditions including:

- Constructing a new link between Castlerock Road and Dorset Road (Mount Pleasant Northern Link Road) prior to the closure of Castlerock Road
- Constructing a new link (Mount pleasant West Link Road) between Bengalla Link Road to the Mount Pleasant Northern Link Road prior to the closure of Wybong Road
- Upgrading Wybong Road from Bengalla Link road to the Mount Pleasant Mine access road
- Construction intersections (if required) at:
 - Western Link Road and mine access
 - Bengalla Link Road and Western Link Road
 - Castlerock/Mount Pleasant Northern Link Road and Western Link Road
 - Mount Pleasant Northern Link Road and Kayuga Road

The major change from the 2015 MARNP is that the mining operation no longer require the closure of Wybong Road.

<u>NB:</u>

The change in mine operations removed the need to close Wybong Road and the condition to construct the Mount Pleasant Western Link. There is potential road network benefits in retaining the Mount Pleasant Western Link road, or similar route, as part of a possible western corridor linking the Golden Highway and New England Highway.







	LEGEND
	Mining Lease Boundary
C23	Infrastructure Area Envelope
	Indicative Off-site Coal Transport Infrastructure
	Approximate Extent of Approved Surface Development (1997 EIS Year 20)*
0112	Conveyor/Services Corridor Envelope
	Bengalla Mine Approved Disturbance Boundary (SSD-5170)
	Subject to Separate Modification (Modification 3)
	Emplacement Extension
	Area Relinguished for Overburden Emplacement and
	Major Infrastructure

	Key	Elements	of	the	Modification	1
÷.		1.0.1				



Additional Area Relinquished for Major Infrastructure

Notes:

Notes: * Excludes some project components such as water management infrastructure, infrastructure within the Infrastructure Area Envelope, offsite coal transport infrastructure, road diversions, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Modification would also include additional minor components not shown, e.g. water pipelines, pump station, electricity transmission lines, signalling, access tracks, etc.

Source: MACH Energy MOD 4 Environmental Assessment

Figure 3.2: Mount Pleasant Plan of Operations

Source: NSW Land & Property Information (2017); NSW Division of Resources & Geoscience (2017); Department of Planning and Environment (2016); MACH Energy (2017) Orthoghoto: MACH Energy (July 2017)

MACHEnergy

MOUNT PLEASANT OPERATION General Arrangement of the

Mount Pleasant Operation and Key Modification Infrastructure



Muswellbrook Mine Affected Road Network Plan Review

Project: P4287

Version: 004



West Muswellbrook Mine (Proposed)

The West Muswellbrook Project is a proposed new open-cut coal mine, straddling the Muswellbrook and Upper Hunter Local Government Areas, about 12 km northwest of the town of Muswellbrook. The project proposes the extraction of up to 621 million tonnes of coal using open cut terrace mining methods over a 30-year period. A rail spur and rail loop are proposed to be connected to the Muswellbrook-Ulan rail line for transport of coal from the site. The conceptual general arrangement is shown in Figure 3.3.



Source: West Muswellbrook Project – Gateway Application Supporting Document

Figure 3.3: Muswellbrook West Mine (Proposed)



Version: 004



The extended project will require the segmented closure of three roads:

- Castlerock Road
- Dorset Road
- Halls Road.

Castlerock Road primarily provides access for rural property and agricultural industry but also provides a secondary link function connecting Wybong Road and Kayuga Road.

Dorset Road and Halls Road are local roads providing access to rural properties and agricultural land uses that connect with Kayuga Road. The closure of these roads will impact the through traffic functions of Castlerock Road and Dorset Highway reducing the level of network accessibility.

It is noted that consent conditions for Mt Pleasant Mines include the construction of the Mt Pleasant Northern Link on closure of the eastern section of Castlerock Road. The main benefit of this would be to ensure a level of network connectivity and redundancy. Closure of the western (or middle) section of Castlerock Road will have the same impact and therefore limit the potential road network benefits of the Mount Pleasant Northern Link if implemented on its own.

<u>NB:</u>

The Mount Pleasant Western Link would offset the closure of Castlerock Road (and the western parts of Dorset and Hall Roads) and the impacts of reduced network function.

Mangoola Mine

Mangoola Mine is an existing open cut coal mine located approximately 20km to the west of Muswellbrook bordered by Wybong Road to the north and Mangoola Road to the east. It currently operates under an approved 13.5 million tonnes per annum rate using truck and excavator mining methods. As part of the development consent granted to the existing Mangoola Mine, the following were conditions of consent along with a number of other items:

- Upgrade Bengalla Link Road and intersections with Wybong Road and Denman Road in conjunction with the construction of the Bengalla Link Road extensions and prior to carrying out any development on site apart from the defined early works
- Upgrade Wybong road and its intersections with the mine access road, Golden Highway, Wybong Post Office Road and Yarraman Road with focus on
 - Reassess and rectify the identified defects in the road upgrades works
 - Implement the additional recommendations identified in the 'Hyder Report', including improvements to curves, clear zones and intersection safety, and investigate and implement measures to improve safety at 'Bus Stop 2'
 - Contribute to the maintenance of the upgraded road for the life of the mining operations in accordance with the terms of the planning agreement required in condition 12 of schedule 2
- Mangoola is also required to contribute to the upgrade and maintenance of Thomas Mitchell Drive and its intersections with Denman Drive and New England Highway, proportionate to its impacts, in accordance with the Thomas Mitchell Drive Contributions Study, March (2014).

Mangoola's existing operation is approved to operate until 2029. The Mangoola Coal Continued Operations Project (MCCO Project) would integrate with the existing operations for a number of years and extend the overall approval life to 2030.

The expansion requires a partial closure and realignment of Wybong Post Office Road which provides local access to rural properties and agricultural land but also provides a secondary link function connecting Yarraman Road to Wybong Road. In addition, the MCCO Project scope proposes a Wybong Road/Big Flat Creek overpass to integrate mining areas as part of an integrated single mining operation.



Version: 004

Project: P4287





Location of the Mangoola Mine and proposed MCCO Project area are shown in Figure 3.4

Source: Mangoola Coal Continued Operations Project Traffic and Transport Report

Figure 3.4: Mangoola Mine and MCCO Project

<u>NB:</u>

A majority of residential land usage is located on the western end of Wybong Post Office Road and are owned by Mangoola Mine. There is minimal travel time benefit of the proposed Wybong Post Office Road realignment and potential benefits could be realised in upgrading Yarraman Road.



Malabar Mine (Maxell Project)

In May 2017, Malabar acquired EL 5460 and the substantial, existing infrastructure within Coal Lease (CL) 229, Mining Lease (ML) 1531 and CL 395 associated with the former Drayton Mine open cut operation (now known as the 'Maxwell Infrastructure'). The Project will involve an underground mining operation that would produce high-quality coal over a period of approximately 26 years and would use the existing site access from Thomas Mitchell Drive.

The coal extraction will undermine the southern section of Edderton Road, as shown in Figure 3.5. Malabar have identified two options to manage the mine interface with Edderton Road and is seeking consent for both options as part of their current application:

- A realignment of the southern section of the road; or
- Subsidence monitoring and road management.

The realignment options would include a new two-lane road and intersection with Golden Highway approximately 1.2km west of its current location. Malabar proposed the new intersection would include a channelised right turn lane and an auxiliary left turn lane in the Golden Highway for vehicles turning into Edderton Road.

The second option proposed is to maintain Edderton Road on its current alignment and monitor and maintain the road.

It is noted that the EIS (Appendix A) indicates that vertical subsidence of up to 5m could occur and states that:

'Edderton Road crosses directly above the proposed longwalls in the Woodlands Hill, Arrowfield and Bowfield Seams. If the road were to be maintained in its current alignment, cracking, heaving and stepping of the road pavement would occur as each of the proposed longwalls are mined directly beneath it. Alternatively, the potential impacts on the road could be avoided by realigning the road around the proposed mining area. Malabar is liaising with Muswellbrook Shire Council to develop suitable management methods.

The potential impacts on Edderton Road could be managed using visual monitoring and undertaking remediation of the road pavement during active subsidence. These strategies may require temporary lane closures to undertake the repairs and temporary speed restrictions along the section of the road that is impacted by mining. Experience of mining beneath roads in the NSW coalfields indicates that the impacts on unbound pavements develop progressively, where the onset of impacts can be identified early by visual monitoring which, in most cases, allows for the remediation measures to be scheduled outside of peak traffic times. It is still possible that more rapidly developing impacts could occur, as a result of compressive buckling of the near surface bedrock, which may require temporary repairs to be undertaken during peak traffic times. Alternatively, the potential impacts on Edderton Road could be avoided by realigning the road outside of the proposed mining area.'







Source: Maxwell Project EIS (2019)

Figure 3.5: Malabar (Maxwell Project) Mine

TTPP's Traffic Impact Assessment Report for the Maxwell Project estimates that the road realignment option would increase travel times by around 66 seconds, whereas the subsidence impacts could be managed with speed reductions (down to 40km/h) along the 2.4km section, which could increase travel time by 140 seconds.

<u>NB:</u>

The option to monitor and manage subsidence of the existing road alignment poses a significant risks to the road network as there is the potential for the road to be closed (fully or partially) because of road degradation or the need to undertake maintenance works, and this would impact on road users including the Thoroughbred industry. A realigned road would marginally increase travel time but comes with less risk to the network.

Mount Arthur Mine

Hunter Valley Energy Coal (a wholly owned subsidiary of BHP Billiton Limited) owns the existing Mt Arthur Coal Mine, which is an open cut coal mine located approximately 8 km south of the Mount Pleasant Operation, as has approval to mine up to 32Mtpa of run of mine coal until June 2026. The mine is located 5km south-west of the town of Muswellbrook and is accessed via Thomas Mitchell Drive, with intermittent access via Edderton Road for special purposes.

A modification was approved in 2014 for the extension of the open cut mine to the south-west to extract an additional 128 million tonnes.

A realignment of Edderton Road (north) was approved in 2010 by the Minister for Planning under the EP&A Act. This realignment (see Figure 3.6) and new intersection with Denman Road is required to be completed prior to mining within 200m of the existing alignment of Edderton Road.



Version: 004

Project: P4287



It is also understood that Mount Arthur Mines is required, at the end of its mining operations, to reestablish Edderton Road on its original alignment and has provided Council with a bond to covers these works.



Figure 3.6: Propose Northern Realignment of Edderton Road

<u>NB:</u>

Instead of reconstructing Edderton Road on its original alignment at the end of the mining life, an alternative option would be to keep the realigned Edderton Road and intersection with Denman Road and reallocate the funds toward construction of a new link road between Denman Road/Edderton Road intersection and Bengalla Link Road to establish the south/central section of a western corridor connecting Golden Highway with New England Highway.

3.2 Other Industries

3.2.1 General

Muswellbrook has a diverse and thriving economy with various rural, urban, and service sectors that will continue post-mining. These include agriculture, equine, viticulture, tourism, and power generation. The Upper Hunter area is a valuable agricultural resource for NSW and comprises milk and beef production (i.e. cattle farming). Consideration should be given to farm tracks and rural roads in ensuring there are no strategic missing or fragmented links between agricultural land uses.



Version: 004

Project: P4287



3.2.2 Power Generation

The power generation industry is a major contributor to Upper Hunter's economy and is owned by AGL. Moreover, AGL is one of Muswellbrook's major employers, with over 600 workers based at Liddell and Bayswater Power Stations. AGL has stated that they will actively start exploring renewable energy opportunities to start transitioning into from coal.

3.2.3 Viticulture Industry

The Hunter region is Australia's oldest wine-making region with the consistent production of awardwinning wines. The region has recognised branding and is proximate to suppliers, domestic markets, and export ports, making it very attractive to international winemaking expertise. The viticulture industry in Muswellbrook is highly accessible and is located among attractive rural landscapes, which positively contributes to the increasing number of tourists visiting the region each year.

The total investment expenditure associated with the viticulture industry is approximately \$450 million and this industry employs over 7,000 people throughout the Hunter region, excluding wine tourism employment. An additional 30,000 direct and indirect jobs are provided through tourism in the Hunter region and a major source of this tourism is the viticulture industry. The Upper Hunter viticulture industry holds a large number of tourism-based events each year such as the Upper Hunter Wine and Food Fair, Muswellbrook Carnival and Upper Hunter Wine Trail.

The viticulture industry requires critical infrastructure in the form of road access to vineyard areas for wine tourism and for the transport of wine, juice and grapes.

3.2.4 Equine Industry

The Upper Hunter region is home to a multi-billion dollar and internationally renowned equine industry, which greatly boosts the economy and is an essential part of Muswellbrook's cultural identity. Furthermore, the region produces, trains and sells a wide range of equine breeds and is nationally recognised for its specialist equine training, racing, medical and research facilities. Muswellbrook's unique geography of long valleys, wide stretches of alluvial soil on the valley floors, attractive rural landscapes, moderate climate, low risk of pests and diseases, topography, and reliable irrigation options, make it ideal for producing premium quality horses.

The equine industry is continuously threatened by the proposed expansion of mining development and coal seam gas exploration throughout the region. Mining impacts are expected to have longlasting effects on the equine industry mainly due to:

- Increased road and traffic conflicts
- Cumulative impacts on regional air quality
- Inflated regional land prices
- Investor uncertainty and reduced investment in blood stock, staff and facilities.

Currently, mares are transported south through the town of Muswellbrook to mate with the stallions and then transported back up north. Due to this industry being a key economic driver for the region, it is essential that the transportation of stallions be conducted as effectively and efficiently as possible. There has been concern raised by the equine industry regarding the proposed road upgrades and closures (for mining) impacting equine travel times.

The Hunter Thoroughbred Breeders Association (HTBA) has provided the following comments in relation to their vehicle movements and industry changes:





"Horses are transported to sales throughout the year. The transportation of horses by truck at any time causes stress on the animals. The movement of horses between studs increases during the breeding season which extends from July to December each year. A significant proportion of movement is between Jerrys Plains and the Scone studs. During the season, horses are moved from early morning throughout the day, potentially 3 trucks per stud per day. This primarily involves the transportation of mares for breeding purposes but also the movement of young foals. As such, it is highly desirable that the travel time and the number of stops is minimised, as confinement, the heat due to reduced air flow (particularly during summer), and traffic noise causes discomfort and distress to the animals"

The main transport route is via New England Highway from the north, travelling through Muswellbrook town onto Denman Road then turning onto Edderton Road to Golden Highway.

A travel-time comparison was undertaken of a section of the transport route between Edderton Road/Golden Highway intersection and Aberdeen. This compared the existing route, a modified route with the mine proposed diversions (north and south) and Edderton Road, and a potential western corridor linking Edderton Road (at Denman Road), Bengalla Road link through to Castlerock Road, extending north-east to New England Highway 1.5km south of Aberdeen.

Figure 3.7 shows the existing, proposed, and alternate routes that may be used by the equine industry under existing and improved road networks, along with their approximate travel times.



Figure 3.7: Equine Industry Routes and Travel Times



Version: 004



4. ROAD NETWORK SCENARIOS

4.1 Previous MARNP (2015)

The 2015 MARNP investigated a number of route options with the aim to "*better serve the demands created by the mining industry in the longer term*". It acknowledged the following challenges for new roads:

- The Hunter River and its flood plain
- The coal haulage rail line

In review, the MARNP should also aim to also serve other industries and the community better, and to ensure a legacy road network that is well-connected, efficient and more resilient.

In assessing network improvement options, the 2015 MARNP considered the following desired outcomes:

- Provide for the efficient movement of vehicles between destinations
- Preferably direct traffic to the main road network (as the safest and most efficient travel route)
- In the absence of more efficient and viable options, increase the carrying capacity of the existing main travel paths
- Where possible, provide for alternative travel paths in case of interruptions to traffic flows
- Provide for the movement of oversize vehicles
- Achieve favourable benefit to cost comparisons.

The above objects are still current and consistent with overarching strategic (local start and national) transport objectives.

4.2 Network Resilience, Redundancy and Connectivity

Rural road networks, such as Muswellbrook have lower traffic volumes than urban networks, have typically higher speeds, longer trip lengths and less connectivity. Low connectivity places increased importance on the availability of alternative routes to maintain access between towns, places of work and to essential services.

Disruptive events such as floods and fires and traffic crashes can easily block rural roads at any level of the road hierarchy (Austroads 2016). It is particularly important that the road network is resilient and can function at acceptable levels under disruptive events.



A resilient road network has four dynamic abilities, i.e. the ability to avoid, withstand, respond and recover from disruptive events. Table 4.1 summarises key characteristics used to quantify a road network resilience.

Redundancy can have a significant impact on the resilience of road transport networks as it represents the spare capacity of road transport networks under different scenarios. Good redundancy in a road network provides ability to use alternate route options, (including during disruptive events) more route choice and the ability to cater for different road user needs.



Version: 004

Project: P4287



Resilience Characteristics	Definition
Redundancy	The ability of the road transport network to offer different routes
Mobility	The ability of the road transport network to offer a good level of service to its users
Vulnerability	The degree to which the system is susceptible or sensitive to threats or hazards that significantly impact on road transport network performance
Reliability	The probability that traffic can reach a certain destination within an accurately estimated time
Diversity	The availability of different modes serving a certain area
Recovery	The availability of an acceptable level of performance within a short time following the disruptive event and with minimum external help

Table 4.1: Road Network Resilience Characteristics

4.3 Challenges and Opportunities

4.3.1 General

One of the key challenges facing Muswellbrook and the region is the gradual erosion of the local road network through mining expansion. While compensatory roads/works are provided to address the impacts of road closures (such as road deviations), collectively the impact has already, and will continue to reduce network connectivity and increased travel distances and time, not only for the mining industry but also for other industries and the general community.

The planned mine related road changes also present opportunity to review the broader network and identify where and how these new roads can contribute to an improved road network outcome. These opportunities and potential road network scenarios are discussed below.

Figure 4.1 shows the road network changes associated with planned and proposed mining opportunities along with potential opportunities to improve the overall road network in Muswellbrook LGA.







Figure 4.1: Road Network Changes and Opportunities

Muswellbrook Mine Affected Road Network Plan Review

4.3.2 Western Corridor

There is an opportunity to link planned road realignments of Edderton Road (Mt Arthur and Maxwell Mines), Bengalla Link Road (Bengalla Mine) and Wybong Road / Kayuga Road to form a western corridor road linking the Golden Highway at Jerry's Plains and the New England Highway just north of Muswellbrook, resulting in a western bypass of the town centre.

The route would be predominantly used by mine related traffic but would also provide a more direct route for transport of equine thoroughbreds that bypasses the more heavily trafficked streets through the town centre.

The corridor could potentially provide an alternative route for freight including PBS Class 2B high productivity, OSOM vehicles and dangerous goods between Golden Highway (south) and New England Highway to the north.

4.3.2.1 Options W1 / 3B / W8 – Edderton Road to Bengalla Link Road to Wybong Road

The W1 route option would extend north from the Edderton Road northern deviation crossing the Hunter River and the main railway line then connecting to Old Bengalla Road onto Bengalla Link Road at a new intersection.

The 2015 MARNP considered a more westerly link (Option 3B) that ran between Denman Road and Roxburgh Road. Both route options are shown in Figure 4.2.



Figure 4.2: Options W1, 3B and W8



Option W1 – Denman to Bengalla Link

Description:

W1 heads north and links to Bengalla Link Road providing a more direct route for mine access and connection to Wybong Road extending to Kayuga Road and the more developed areas to the north and north-east compared to Option 3B.

Length: 3.3km of new road

Cross-section: Collector/distributor. Type 3 two-lane two-way road

Intersections: Two major intersections (1. A fourth leg to the future Denman Road/Edderton Road intersection, and 2. Bengalla Link Road)

Structures: Two bridges required to cross the Hunter River and the railway line

Constraints: Crossing of the river and rail line, some land resumption may be required

Cost: \$23.9M

Strengths:

- The link would form an integral part of the western corridor providing a link between Golden Highway and New England Highway west of Muswellbrook township
- The link is aligned to the north-east providing a more direct route compared to Option 3B which aligns to the north-west away from Muswellbrook
- As part of the western corridor provides a more direct route for Thoroughbred transport that is away from the congestion and noise impact associated with heavier traffic through Muswellbrook township
- Improves access for mine related traffic and reduces reliance on Bengalla link road
- The link in combination with Edderton Road, Bengalla Link Road and Wybong would provide an OSOM vehicle bypass of Golden Highway restrictions on Denman Bridge
- Provides additional network redundancy and resilience.

Weaknesses:

May have some property impacts (requiring further investigation).

Option 3B – Denman to Roxburgh/Mangoola Road

Description:

This link starts at a new intersection with Denman Road approximately 4km west of Edderton Road and travels in a north-westerly direction, crossing the Hunter River and the main railway line before connecting to Roxburgh Road. This corridor then follows Roxburgh Road to Mangoola Road onto Wybong Road.

Length: 9.6km. 3.5km of new road and 6.08km upgrade of existing road from single lane to two-lane

Cross-section: Collector/distributor. Two-lane two-way - 7.0m sealed width with 1.0m sealed shoulders

Intersections: Two major intersections (1. Denman Road, 2. Roxburgh Road)

Structures: One long bridge approximately 100m (or two smaller bridges) over the Hunter River and railway line



Constraints: Crossing of the rail line and river. No significant implications for flooding impacts from a reduction in width of floodway and flood storage. The location is well downstream of any urban areas. (Cardno 2015)

Cost: \$63.5M (Cardno 2015).

NB. This route lies partially within the Mangoola Mine EL area and the West Muswellbrook EL area. Opportunity may exist for conditional land dedication thereby reducing the estimated cost. The cost of an additional rail access crossing associated with the WMB Mine may need to be included in the above cost estimate (Cardno 2015)

Strengths:

- Utilises mostly existing roads (e.g. Mangoola Road and Roxbury Road)
- Facilitate the effective movements of vehicles to and from the north-west
- Intersects Wybong Road near Ridgelands Road providing more direct access to Mangoola and Muswellbrook West Mines
- Rail and river could potentially be crossed by one bridge compared to Option W1
- Provides an alternative travel path to Bengalla Link Road.

Weaknesses:

- May conflict with the proposed rail access to Muswellbrook West Mine
- Does not align with directionality of a western corridor
- Unlikely to benefit thoroughbred transport due to increased travel time.

Option W8 – Bengalla Link Road to Wybong Road

Description:

This link starts mid-section on the proposed realigned Bengalla Link Road and travels north-east, connecting to Wybong Road just west of Sand Creek.

Length: 3.0 km

Cross-section: Collector/distributor. Two-lane two-way - 7.0m sealed width with 1.0m sealed shoulders

Intersections: Two major intersections (1. Bengalla Link Road, 2. Wybong Road)

Structures: NIL

Constraints: Some land resumptions maybe required

Cost: \$15M

Strengths:

- Provides a more direct travel path to the north west
- Improved connection to Mangoola Mine from Bengalla Link Road
- Could replace the northern section of the Bengalla Link Road realignment and provided as a new connection to the north west

Weaknesses:

Alignment deviates from the approved Bengalla Link Road deviation proposed by Bengalla Mine



4.3.2.2 Options W2 / W3 / W7 – Wybong to New England Highway

Future mining activity will require closure of Castlerock Road. Mt Pleasant Mine is required to construct a new road (referenced as the Northern Link road in the 2015 MARNP) between Castlerock Road and Dorset Road prior to closure of the eastern section of Castlerock Road. The intent of this link was to ensure continued network connectivity of Castlerock Road. Muswellbrook West Mines will have additional network impacts with the potential closure of the central section of Castlerock Road, Halls Road and the western end of Dorset Road. These impacts would effectively remove the Castlerock Road/Dorset Road link between Wybong Road and Kayuga Road, and as such the proposed Northern Link road would be ineffective on its own.

Options W2 and W3 (see Figure 4.3) would connect with the proposed northern link to provide the northern section of the Western corridor between the Golden Highway, Denman Road and New England Highway.

Option W7 would connect Wybong Road (near Overton Road) to Kayuga Road and then cross the Hunter River with a new bridge and link to an upgraded Burton Lane connecting to the New England Highway. Combined with the Inner-west link options (IW1 / 2B) Option W7 could provide a continuous link between Bengalla Link Road and New England Highway and provide a western local bypass of Muswellbrook township.

Option W2 was considered in the 2015 MARNP (referred to as the Western Link) but recommended to forgo this link in favour of a local road connection between Dorset Road and Castlerock Road, as it was seen to offer little advantage to travel time or vehicle demands.

Consideration of the link options (Options W2/W3 or W7) as part of a future western corridor could provide broader road network benefits including travel efficiency for mine, transport and equestrian industries and improved network redundancy and resilience.





Figure 4.3: **Options W2/W3 – Wybong Road to New England Highway**

Option W2 – Wybong Road to Dorset Road

Description:

W2 connects Wybong Road to Castlerock Road and the Northern Link proposed by Mt Pleasant Mine to connect with Dorset Road.

Length: 6.8km (4.6km Wybong Road to Castlerock Road, 2.2km Castlerock Road to Kayuga Road)

Cross-section: Two-way, two-lane Type 3 cross section with 7.4m sealed carriageway (3.7m lanes) and 2.5m sealed shoulders

Intersections: New intersection at Wybong Road and upgraded intersection at Kayuga Road

Structures: NIL

Constraints: Route runs near mine's active infrastructure area. Further investigation will need to identify a route that avoids (or minimises) impacts on future mine operations. This could potentially be along the boundary of Mt Pleasant and West Muswellbrook mines.

Cost: \$47M (Cardno 2015).

Strengths:

- The link would form an integral part of the western corridor providing a link between Golden Highway and New England Highway west of Muswellbrook township
- As part of the western corridor provides a more direct route for equine thoroughbred transport that is away from the congestion and noise impact associated with heavier traffic through Muswellbrook township
- Improves access for mine related traffic and reduces reliance on Bengalla link road
- Reduces reliance on Kayuga Road bridge
- The complete link to New England highway could act as an OSOM/hazardous material bypass on Muswellbrook township.



Option W3 - Dorset Road to New England Highway

Description:

W3 connects Dorset Road to New England Highway and is an alternative route to Dorset Road, Kayuga Street, and links with Stair Street and intersecting with New England Highway 1.3km south of Aberdeen. The link would also connect to Dartbrook Road providing a connection for Equine CIC west of the New England Highway.

Length: 7km of new road, and 3km widening of existing road (Stair Street)

Cross-section: Two-way, two-lane Type 3 cross section with 7.4m sealed carriageway (3.7m lanes) and 2.5m sealed shoulders

Intersections: New intersection at Kayuga Road and intersection upgrade at New England Highway

Structures: Two existing bridge structure over Dartbrook Creek and Hunter River

Constraints: Potential load and width limitations on the two bridge structures for OSOM vehicles. Sections of Stair Street may be private road.

Cost: \$53.0M.

Strengths:

- The link completes the northern section of the Western corridor
- As part of the Western corridor, provides an alternative transport route for Thoroughbred west of the New England Highway and Muswellbrook township
- Alternative route provides improved road network redundancy and reliance
- Reduced travel times
- Improves mine related traffic travel times to/from the north with less reliance on Bengalla Road.

Weaknesses:

 Minor travel time benefit compared to existing route via Dorset Road and Invermein Street. The alternative would be to upgrade these roads.

Option W7 – Wybong Road to New England Highway via Burton Lane

Description:

Option W7 connects Wybong Road to New England Highway providing an alternate route to W2 / W3. The route would connect Wybong Road at Overton Road and travel along the eastern boundary of the Mt Pleasant Mine, then intersecting with Kayuga Road. From Kayuga Road the route would head west crossing over the Hunter River then travel along Burton Lane to New England Highway.

Length: 6.4km, 3.9km of new road and 2.5km of existing road widening and upgrade (Burton Road)

Cross-section: Two-way, two-lane Type 3 cross section with 7.4m sealed carriageway (3.7m lanes) and 2.5m sealed shoulders

Intersections: Two new intersections at (1) Wybong Road/Overton Road, (2) Kayuga Road and intersection upgrade at New England Highway

Structures: Bridge required over Hunter River, approximately 100m long.

Constraints: This option would require construction within the flood plain and bridging over Hunter River with potential to impact on the flow of flood water.



Cost: \$40M

Strengths:

- The link would form an integral part of the western corridor providing a link between Golden Highway and New England Highway west of Muswellbrook township
- As part of the western corridor provides a more direct route for equine thoroughbred transport that is away from the congestion and noise impact associated with heavier traffic through Muswellbrook township
- Significantly shorter length and less cost compared to W2/W3 combined option
- Route aligns better with the proposed Muswellbrook Bypass
- Improved travel times to Mangoola, Bengalla mines from the north of Muswellbrook compared to W2/W3 option
- Provides an alternative route to bypass Kayuga Bridge
- Alternative route provides improved road network redundancy and reliance
- Improves mine related traffic travel times to/from the north with less reliance on Bengalla Road.
- The complete link to New England highway could act as an OSOM/hazardous material bypass on Muswellbrook township.

Weaknesses:

- Section of the route travels through flood plain and may impact on the flow of flood waters (requiring further investigation)
- May have some property impacts (requiring further investigation).



4.3.3 Edderton Road

4.3.3.1 Options E1/E2 – Edderton Road North

Mt Arthur Mines has a conditional requirement to reconstruct Edderton Road to its current alignment at the completion of the mining activities. An alternative option is to not reinstate the road to its original alignment (at completion of the mining activities) and instead redirect the construction dollars to a new road link between Denman Road and Bengalla Link Road. The two options are shown in Figure 4.4.



Figure 4.4: Options E1/E2 – Edderton Road North

Option E1 – Reinstate Edderton Road Alignment

Description:

Mt Arthur Mines is currently constructing the northern realignment of Edderton Road to allow continued coal extraction to the south-west. On completion of the mining activity, Mt Arthur Mines is required to reinstate the northern section of Edderton Road back to its current alignment.

Length: 4.0 km of new road on original alignment

Cross-section: Two-lane, two-way distributor/collector road 7.0m seal pavement plus 2.0m seal shoulders

Intersections: new intersection at New England Highway

Structures: NIL

Constraints: NIL

Cost: \$50M.

Strengths:

- Retains existing road alignment closer to Muswellbrook
- Reduced travel time for movements to/from Muswellbrook township and towards New England Highway to the east compared to the realigned route.

Weaknesses:

- Doesn't align with possible Western corridor
- Cost to rebuild Edderton could be used elsewhere on the road network for greater benefit.



Muswellbrook Mine Affected Road Network Plan Review

Option E2 – Retain Edderton Road Northern Deviation

Description:

As an alternative to replacing the road on its original alignment, Option E2 retains the new alignment to form part of the Western corridor. Under this arrangement the funds allocated to rebuild Edderton Road could be reallocated towards construction of the Denman Road to Bengalla Road Link (Option W1).

Length: 4.4M

Cross-section: Two-lane, two-way distributor/collector road 7.0m seal pavement plus 2.0m seal shoulders

Intersections: New intersection at Denman Road

Structures: NIL

Constraints: NIL

Cost: \$50M reallocated.

Strengths:

- When combined with Western corridor it forms an integral part of the western corridor providing a link between Golden Highway and New England Highway west of Muswellbrook township, and provide travel time saving for transport movements between Equine CICs
- Improves access for mine related traffic and reduces reliance on Bengalla link road
- The link in combination with Bengalla Link Road and Wybong would provide an OSOM vehicle bypass of Golden Highway restrictions on Denman Bridge
- Provides additional network redundancy and resilience.

Weaknesses:

Less road network benefit if not done in combination with Denman Road to Bengalla Link road.

4.3.4 Inner-West Link

4.3.4.1 Options 2B/IW1 Bengalla Link Road to Wybong Road



Figure 4.5: Options 2B/IW1 Bengalla Link road to Wybong Road



Option 2B – Bengalla Link Road (via Overton Road) to Wybong Road

Description: The 2B route connects Bengalla Link Road to Wybong Road via Overton Road. It would require a new intersection at Bengalla Link Road and bridge over the main railway line and widening of Overton Road.

Length: 3.5km new road, and upgrade of Overton Road

Cross-section: Local collector road – two-lane, two-way, 7.0m sealed width with 1.0m sealed shoulders

Intersections: New intersection with Bengalla Link Road

Structures: New road bridge over the rail line and Overton Road bridge over Mt Pleasant rail spur

Constraints: Mt Pleasant Mines proposed a new rail loop that feeds off the main railway line and runs parallel to Overton Road before crossing over Wybong Road. This proposal includes a deviation of Overton Road and new bridge over the proposed railway.

Cost: \$23M (Cardno 2015).

Strengths:

- Identified as a high-medium priority in 2015 MARNP
- Travel and time efficiency savings for mine related traffic
- Added network redundancy by providing a secondary route to Denman Road and access to New England Highway
- Reduces traffic demands on Wybong Road west of Overton Road.

Weaknesses:

• Road and bridge ramping in flood plain (Cardno 2015).

Option IW-1 – Bengalla Link Road (west of rail line via Overton Road) to Wybong Road

Description: Option IW-1 stays north of and runs parallel to the main railway line avoiding the need for a new road bridge.

Length: Approximately 4.5km of new road and upgrade of Overton road

Cross-section: Local collector road – two-lane, two-way, 7.0m sealed width with 1.0m sealed shoulders

Intersections: New intersection with Bengalla Link Road

Structures: Bridge over Bengalla rail loop and Overton Road bridge over Mt Pleasant rail spur

Constraints: Major constraint is the Bengalla Mine rail loop and conveyor. This option may only be possible when Bengalla Mine closes or if there is a discontinuation or relocation of the current conveyor/rail loop.

Mt Pleasant Mine's proposed a new rail loop to feeds off the main railway line and runs parallel to Overton Road before crossing over Wybong Road. This proposal includes a deviation of Overton Road and new bridge over the proposed railway. The route also parallels a section of Bengalla Link Road.

Cost: Not costed.

Strengths:

- Avoids road bridge over main rail line
- Potential road access provided to heritage homestead


- Added network redundancy by providing a secondary route to Denman Road and access to New England Highway
- Reduces traffic demands on Wybong Road west of Overton Road.

Weaknesses:

- Additional road construction and maintenance costs compared to Option 2B
- Construction would most likely need to be delayed until mining is completed or the rail spur is discontinued
- High Cost.



4.3.5 Wybong Network

4.3.5.1 Wybong Post Office Road

Expanded extraction of Mangoola Mine to the north would necessitate closure of the eastern half of Wybong Post Office Road. To maintain connectivity to Wybong Road, Wybong Post Office Road would be realigned to run along the western boundary of the mine. An alternative option is to close Wybong Post Office Road near Yarraman Road. The two options are shown in Figure 4.6.



Figure 4.6: Options W4/W5 – Wybong Post Office Road

Option W4 – Realign Wybong Post Office Road

Description: Option W4 seeks to minimise changes to the road network by realigning Wybong Post Office road from the east of the Wybong Community Hall. This realignment redirects traffic to the south, where it connects with Wybong Road, requiring a new intersection.

Length: The realignment has an approximate length of 1.5km and would replace the existing 2.35km stretch of road designated to be closured for the Mangoola Mine expansion

Cross-section: Local access two-lane two-way road with 8.2m of seal width including 1m of formalised shoulder lanes on both sides.

Intersections: One new intersection at Wybong Road

Structures: N/A

Constraints: Residential land in the proposed realignment corridor, although this land is owned by Mangoola

Cost: Mangoola Mine will be responsible for the cost to design and construct the realignment of Wybong Post Office Road.

Strengths:

• Minimal change to the existing road network allowing for continuation of current level of service.

Weaknesses:

• Cost burden on MSC to continue maintenance of Wybong Post Office Road.



Option W5 – Close Wybong Post Office Road

Description: Option W5 would close Wybong Post Office Road just east of the Wyong Community Hall and divert the mine-funded works proposed to realign Wybong Post Office Road to upgrade Yarraman Road between the Wybong Post Office Road and Wybong Road. The work would include widening Yarraman Road to a two-lane two-way local road including upgrades to flood immunity at Wybong Creek.

Length: 3.15km of existing road to be brought up to Council standards

Cross-section: Local collector/distributor, two-lane two-way with 8.2m seal width including 1m of formalised shoulder on both sides.

Intersections: None

Structures: Wybong Creek bridge to aid in flood immunity

Constraints: Traffic would now be reliant on Yarraman Road for access to Muswellbrook/Denman via Wybong Road. Yarraman Road currently faces flooding issues due to inadequate road infrastructure. Access to properties on Wybong Post Office Road would be limited to private access only.

Cost: \$13M to upgrade Yarraman Road.

Strengths:

- Improves the Yarraman Road infrastructure and addresses flooding issues at Wybong Creek
- Improves access and provides more community benefit compared to Option W4
- Land use benefits through re-establishment of Wybong community centred around the Community Hall
- Reduces maintenance costs for Council to maintain road that is used for access to mine owned properties

Weaknesses:

 Minor increase in travel time for movements between Yarraman Road to the north and Wybong Road to the east.



4.3.5.2 Reedy Creek Road

The 2015 MARNP recommended upgrading Reedy Creek Road (and Wybong Road west) to improve connectivity from the north-west sector to the Main Road Network. In conjunction with this upgrade Wybong Road between Golden Highway and Reedy Creek road would be closed to through traffic.



Figure 4.7: Reedy Creek Road Upgrade

Option 3D - Reedy Creek Road Upgrade

Description:

Option 3B upgrades the existing Reedy Creek Road from a local road to a collector road, which would form the western end of the east-west Wybong Road corridor. As part of this option, Wybong Road west of Reedy Creek Road would be closed to through traffic and classified down to a local road (or closed completely). Reedy Creek Road would then form part of an assigned OSOM vehicle route until such a time as the Denman bridge over the Hunter is replaced or upgraded for access by these larger vehicles.

Length: 1.4km

Cross-section: The desired cross-section is a two-lane, two-way road, Type 3 Collector/Distributor Road

Intersections: A minor intersection upgrade/reconfiguration required at Wybong Road. A major intersection upgrade required at Golden Highway including possibly moving the intersection further west of the Reedy Creek bridge to improve safety and to accommodate turn-treatments.

Structures: Requires minor culverts over minor creek crossings.

Constraints: The close proximity of the Reedy Creek Road / Golden Highway intersection to the Wybong Creek Bridge (see Figure 4.8) impacts on intersection sight distance and the limits the ability to upgrade the intersection with protected turning lanes.





Figure 4.8: Reedy Creek Road / Golden highway Intersection

Cost: Indicative cost \$12M (Cardno 2015) to widen Reedy Creek Road, plus intersection upgrades.

Strengths:

- At present, mine traffic is required to travel east on Golden Highway, Denman Road and Bengalla Link Road to access the mines. The upgrade would address environmental approval conditions restricting mine related traffic using Reedy Creek Road and Wybong Road west
- The upgrade and maintenance costs would be significantly less than upgrading the 4.8km section of Wybong Road between Golden Highway and Reedy Creek Road to acceptable standard
- Traffic would remain on the main road network (i.e. Golden Highway) for longer
- Upgrade would accommodate OSOM vehicles using the Wybong/Bengalla Link.

Weaknesses:

- Potential property impacts
- Mining approval conditions currently restrict mine related traffic using Reedy Creek Road.
- Considerable community opposition to diverting Wybong Road west traffic via Reddy Creek Road.



Option W6 – Upgrade Wybong Road between Golden Highway and Reedy Creek Road

Description:

Option W6 propose to keep Reedy Creek Road between Sandy Hollow and Reedy Creek Road open and upgrade the road to improve safety and travel time efficiency. Based on the road conditions assessment, minor to major works (minor pavement widening, shoulder widening, resurfacing and culvert installation at causeway) would be required to upgrade the road to an acceptable standard.

Length: 4.8km

Cross-section: The desired cross-section is a two-lane, two-way road, Type 3 Collector/Distributor Road

Intersections: Two existing intersections

Structures: Culvert crossing at Pheeney's Creek

Constraints: Causeway (see Figure 4.9)

Cost: \$13.4M

Strengths:

- Existing route
- No property impacts
- Avoid potential costly upgrade to Reedy Creek Road / Golden Highway intersection

Weaknesses:

- Road condition is below average requiring minor to major upgrade
- Some undulating sections of road
- Section through bush (approx. 1.3km west of Reedy Creek Road Intersection) has very narrow shoulders with no guard rail providing a narrow road width for heavy haulage vehicles



Figure 4.9: Causeway on Reedy Creek Road



4.4 Other Road Infrastructure Issues

4.4.1 Kayuga Bridge

The 2015 MARNP investigated options to improve capacity of the Kayuga Bridge. This bridge is a single lane Iron Lattice Bridge built in 1881 and is of heritage value to the community. The 2015 MARNP reported that:

'In relation to heavy vehicles utilizing this route, Kayuga Bridge is not currently weight restricted; however, it is a one lane timber structure of considerable age. Heavy vehicles utilise the bridge via Aberdeen Street and Kayuga Road, to access Wybong Road as a short cut to travel west along Wybong Road and beyond. These vehicles are most likely serving mining and agricultural activity in the northern and north-western localities, and possibly some Daracon Quarry vehicles (from Sandy Creek Road) and local bus services.

Notwithstanding any prohibition placed on mine related traffic utilising this route, it is apparent that this section of road (including Kayuga Bridge and Aberdeen Road) currently carries significant traffic volumes and these will continue to increase due to the efficiencies this route offers (for access to Wybong Road and beyond from the New England Highway and for access to the Muswellbrook town centre).'

The 2015 MARNP investigated three potential options (see Figure 4.10) to address traffic issues at this bridge:

- **Option 1A** Extend Wybong Road north to New England Highway
- Option 1B Extend Wybong Road to Aberdeen Street
- Option 1C Replace Kayuga Bridge.



Source: 2015 MARNP (Cardno)

Kayuga Bridge Options Figure 4.10:



The assessment of the three options identified that considerable works were required within floodway and the loss of productive agricultural lane for Options 1A and 1B and recommended replacement of the existing bridge with a new two-lane bridge, and an estimated cost of \$7M.

Given the heritage significance of the bridge it is highly unlikely (or reasonable) that the bridge would be demolished and replaced. An alternative option could be to retain the existing bridge and construct a new bridge beside the existing bridge. The new bridge could be designed to match the look of the existing bridge. The existing bridge could continue to operate in a couplet arrangement with the new bridge or alternatively dedicated to a pedestrian/cycle bridge.

Further investigation and heritage assessments are required to further develop these options. It is also noted that the bridge is under RMS jurisdiction. From recent discussions between TfNSW and MSC, we understand that TfNSW would not consider building another bridge at this site.

4.4.2 Hunter River Bridge at Denman

The 2015 MARNP reported that the Hunter River Bridge at Denman is not currently load limited. However, the bridge superstructure is a barrier to the movement of oversize vehicles due to its limited width and height. In the absence of the widening of the bridge by the TFNSW, it will be necessary to ensure that a suitable alternative route is available. The current alternative route is via Wybong Road/Bengalla Link Road/Thomas Mitchell Drive to the New England Highway.

In 2013 Regional Development Australia and Infrastructure New South Wales released the Hunter Economic Infrastructure Plan (HEIP). The plan was funded by the Commonwealth for the purpose of *ensuring the region has an integrated plan that assists mining communities, improves export capacity and supports the Hunter's future economic growth.* It was developed to enable a whole of supply chain view of mining related activities in the Hunter region. The study identified capacity constraints and the impact on mining-related freight and recommended 13 road projects, one of which is the upgrade of the Golden Highway through Denman or construction of a Denman Bypass as shown in Figure 4.11. Notably, neither of these options considered the Hunter River bridge and its limitation for OSOM vehicles.



Source: HEIP (2013)

Figure 4.11: Golden Highway Upgrade Options Through Denman



The NSW Freight and Ports Strategy identifies the freight task in NSW to nearly double by 2031 and the forecast yearly truck tonnage is expected to increase through Denman by 79%.

As discussed in Section 2.10.4 the bridge over the Hunter River restricts access to OSOM vehicles which are required to bypass via Wybong Road. Future planning of the Golden Highway, by TFNSW, should therefore consider inclusion of either an upgrade or replacement of the Hunter River Bridge at Hunter River.

4.4.3 Thomas Mitchell Drive

Thomas Mitchell Drive continues to be the most trafficked road in Muswellbrook carrying around 9,200 vehicles per day (vpd) between Denman Road and the industrial estate.

In 2015 GHD prepared the Thomas Mitchell Drive Contributions Study for the Department of Planning and Environment. The study was commissioned to establish a contributions framework and allocate funding to the upgrade and ongoing maintenance of Thomas Mitchell Drive. The report recommended that 39.1% of road funding for upgrades and maintenance be apportioned to four mines as follows:

•	Mangoola	-	2.8%
•	Bengalla	-	6.2%
•	Mt Arthur	-	25.4%
•	Former Drayton South	-	4.7%
•	Total	-	39.1%

The Department of Planning and Environment has adopted this report and applied the funding model to recent conditions of approvals.

Thomas Mitchell Drive performs an important strategic link in the local road network linking the Denman Road (state road) and New England Highway (National Highway). The route bypasses to the longer and slower moving route via the New England Highway and through South Muswellbrook.

Thomas Mitchell Drive exhibits criteria that warrants classification as a state road. These include:

- It forms a critical link between a state and national highway and closure to through traffic is not an option
- It links major commercial, industrial and residential urban areas and ports within Newcastle and Sydney
- It is a primary through-traffic route carrying significant volumes of traffic
- Within the local context, it is major freight corridor

As such, the recommendation of the 2015 MARNP that Thomas Mitchell Drive be reclassified as a state road is supported.



4.5 Options Assessment

An options matrix was created to assess the traffic, environmental and industry/land use impacts, as well as the cost of each network improvement option. The following parameters were used to assess each option:

- Network Redundancy: Refers to providing spare capacity in the road network, whereby the road has the ability to cater for more traffic than current demands
- Network Resilience: The adaptability of the road network, where vehicles can travel via an alternate route if the desired road is closed/unavailable
- Travel Time: Refers to the amount of time it takes for a vehicle to travel from Point A to Point B
- *Property:* The selling or movement of residential property as a result of network improvements.
- Agricultural: Impact on farms located along the Hunter River
- Flood: Whether new roads/realigned roads will be impacted by flooding (flood overlays)
- Natural Environment: Whether the road network will disrupt national parks and/or large parklands
- Mines and Other Industries: The impact of network upgrades on vehicle movements for economic industries such as mining, equine and agriculture
- Community: The long-term movements of traffic that may have impacts on community.

The scoring system used to assess the above parameters in the options matrix is separated into positive impacts (\checkmark) and negative impacts (\succcurlyeq):

- Low benefit/impact (✓ / ≭)
- Medium benefit/impact (✓✓ / ✗✗)
- High benefit/impact (✓✓✓ / ✗✗✗)
- Neutral benefit/impact (**0**)

For the purpose of qualitive evaluation, relative costs have been scored between high (\$\$\$), medium (\$\$) and low (\$)

The assessment is presented in Table 4.2.



Table 4.2: Options Assessment

Option		TRAFFIC ENVIRONMENTAL						DUSTR AND U	SE			
		Travel Time	Property	Agricultural	Flood	Natural	Mines	Other	Community	Cost	Comments	
Option W1 – Denman to Bengalla Link	✓ ✓ ✓	✓ ✓ ✓	×	x x	×	x	✓ ✓	✓ ✓ ✓	✓ ✓	\$\$\$	Provides additional network resilience and reduced reliance on Bengalla Link Road. Continuation of this link would form a western corridor and provide an alternative transport route between Equine CICs and for freight reducing heavy vehicle movements through town. Route aligns with the realigned Edderton Road. (Recommended Option)	
Option 3B – Denman to Roxburgh/Mangoola Road	~	~	×	×	×	×	✓ ✓	0	~	\$\$	Facilitates movement of vehicles to/from the north-west and provides an alternative travel path to Bengalla Road link. Fewer network benefits compared to W1.	
Option W8 – Bengalla Link Road to Wybong Road	✓ ✓	✓ ✓	sc	x	0	0	✓ ✓	~	~	\$	Provides a more direct link to the north west on Wybong Road from Bengalla Link Road, providing some travel time savings. (Recommended Option)	
Option W2 – Wybong Road to Dorset Road	> > >	✓ ✓	×	0	~	0	✓ ✓	✓ ✓ ✓	✓ ✓	\$\$	This link forms part of a western corridor and would provide network benefits through improved resilience and redundancy, with less reliance on Kayuga bridge. It would provide an alternative route for mine related trips to the north towards Aberdeen and Scone and Equine transport. Further investigation would be required to define a route that avoids or minimises impacts to mine active infrastructure areas.	
Option W3 – Dorset Road to New England Highway	✓ ✓	✓ ✓	×	×	~	0	✓ ✓	✓ ✓	~	\$\$	Completes the northern section of the western corridor with similar benefits to W2. Some property impacts through Dorset to Kayuga section. Provides an alternative transport route between Equine CICs.	
Option W7 – Wybong Road to New England Highway	✓ ✓ ✓	✓ ✓ ✓	×	x x	✓ ✓	0	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	\$	This link forms part of a western corridor and would provide network benefits through improved resilience and redundancy and would provide an alternative route to the Kayuga bridge. The link has potential to connect with the future Muswellbrook Bypass and provide an effective bypass of Muswellbrook township for heavy vehicles, equestrian transport and OSOM vehicle. It is a much short route than the W2 / W3. Further investigation is required to investigate the impacts of this option as it travels across the Hunter River Flood Plain. (Recommended Option)	

Muswellbrook Mine Affected Road Network Plan Review

Option		FFIC	EN	VIRO	MENT	AL	IN L	DUSTR AND U	RY / SE			
		Travel Time	Property	Agricultural	Flood	Natural	Mines	Other	Community	Cost	Comments	
Option E1 – Reinstate Edderton Road Alignment	0	✓ ✓	0	0	0	0	0	✓ ✓	~	\$\$	No change to network resilience however travel time to/from town is improved with reinstatement of the road alignment	
Option E2 – Retain Edderton Road Northern Deviation	✓ ✓	✓ ✓	0	0	0	0	~	✓ ✓	~	N/A	Forms part of the western corridor. Travel time benefit is achieved with the western corridor. There is opportunity to redirect funds set aside to rebuild Edderton Road to other network improvements such as the Denman to Bengalla link. (Recommended Option)	
Option 2B – Bengalla Link Road (via Overton Road) to Wybong Road	✓ ✓	~	x	0	0	0	× ×	~	~	\$\$\$	Provides traffic benefits through a link between Bengalla Road and Wybong Road, increasing network resilience and reducing demands on Bengalla Link Road. Provides an alternative to Kayuga bridge. (Recommended Option)	
Option IW-1 – Bengalla Link Road (west of rail line via Overton Road) to Wybong Road	✓✓	~	×	0	0	0	✓ ✓	~	~	\$\$\$	Would provide similar benefits to Option 2B however the route is complicated by the Bengalla Rail Loop and therefore unlikely is the near term.	
Option W4 – Realign Wybong Post Office Road	0	×	0	0	0	0	0	0	0	\$	Minimal changes to the road network or network resilience. Slightly increase travel times however affects very low volumes. The realigned road is unlikely to be used by the mines. As most of the properties along Wybong PO Road are now owned by the mines, there is minimal community benefit in keeping this road open to through traffic.	
Option W5 – Close Wybong Post Office Road	~	~	~	0	✓ ✓	0	0	~	× ×	\$	Upgrade Yarraman Road between the Wybong Post Office Road and Wybong Road would improve network resilience for properties north of Wybong PO road including improved flood access across Wybong Creek. (Recommended Option)	
Option 3D – Reedy Creek Road Upgrade	~	✓ ✓	x x	×	✓ ✓	0	~	~	~	\$\$	Forms the western end of the east-west Wybong Road corridor. An upgraded Reedy Creek Road could accommodate mine related traffic (removing current restrictions) and provide for OSOM vehicles but would impact increase traffic volumes and impact amenity of local residents. Option may also require a realigned intersection with Golden Highway and property impacts.	

Option		TRAFFIC ENVIRONMENTAL				INDUSTRY / LAND USE					
		Travel Time	Property	Agricultural	Flood	Natural	Mines	Other	Community	Cost	Comments
Option W6 – Upgrade Wybong Road between Sandy Hollow and Reedy Creek Road	~	* *	0	0	×	×	* *	~	× × ×	\$\$	Upgrade to an existing collector/distributor road requiring minor pavement widening, shoulder widening and resurfacing. The option is more in line with community expectations than the alternative option to close the road and upgrade Reedy Creek Road. (Recommended Option)

Muswellbrook Mine Affected Road Network Plan Review

5.ROAD NETWORK PLAN

5.1 Context

The review of the 2015 MARNP identifies a number of changes in relation to roads potentially impacted by mining activity. It also reviewed the objectives of the project in the context of a long-term road network plan for Muswellbrook LGA and surrounding area. The review has somewhat shifted the focus of the plan from impact and mitigation to one that considers the long-term needs of the community, with the following key objectives:

- Maintain the road network to retain value, quality and capacity
- Provide a safer road environment
- Optimise the efficiency and reliability of moving people and goods
- Meet the needs of the present and future land use development
- Ensure a functional 'legacy' road network that is resilient to potential change and supporting of the long-term local and regional transport needs
- Provide network redundancy for incidents and emergency situations.

Improving safety, network resilience and connectivity is at the forefront of the plan's development as is the consideration of broader industry and transport needs, including freight, OSOM vehicles, transport of equine thoroughbreds, mine-related travel and access to essential services.

The plan takes the known impacts of proposed mining activity on local roads, and proposed mitigation strategies, natural and physical constraints and considered how these changes could be augmented to improve the overall road network to meets the overarching objectives. The recommended actions contained in the Road Network Plan seek to improve travel efficiency and road safety and improve the overall level of network connectivity and resilience.

5.2 Key Network Recommendations

5.2.1 Western Corridor

A key element of the revised MARNP is the inclusion of a western corridor. This corridor would connect Golden Highway through Edderton Road deviations with and new link to Bengalla Road then extending north from Wybong Road to Dorset Road and connecting to New England Highway just south of Aberdeen. The key strategies (see Figure 5.1) to develop this link are:

- 1. Connect Denman Road to Bengalla Link Road (Option W1)
- 2. Connect Wybong Road to New England Highway (Option W7)
- Connect Castlerock Road to Dorset Road (funded by Mt Pleasant Mines to offset closure of Castlerock Road)
- 4. Retain Edderton Road on its northern deviation to align with new Denman Road to Bengalla Road link
- 5. Upgrade Edderton Road (excluding proposed deviations) to an appropriate standard including bridging Saddlers Creek

5.2.2 Inner West Link

Connecting Bengalla Link Road to Wybong Road would complete an inner west link improving travel efficiency for traffic between Thomas Mitchell Drive and the mines. It would provide additional network



redundancy by reducing demands on the western section of Bengalla Link Road, the eastern end of Wybong Road and Kayuga Road. The key strategy to develop this link is:

6. Connect Bengalla Link Road to Wybong Road (Option 2B).

5.2.3 Wybong Post Office Road Closure

To address the closure of Wybong Post Office Road:

- 7. Close Wybong Post Office Road immediately east of the Wybong Community Hall
- 8. Upgrade Yarraman Road between Wybong Post Office Road and Wybong Road (Option W5).

5.2.4 Wybong Road

To improve safety, travel efficiency and OSOM capacity of Wybong Road:

- 9. Upgrade Wybong Road between Sand Hollow and Reedy Creek Road to Collector Road standard (Option W6)
- 10. Manage Wybong Road (Sandy Hollow to Bengalla Link Road) as a designation OSOM vehicle route
- 11. Widen sections of Wybong Road to ensure an acceptable and consistent standard.

5.2.5 General Connectivity and Integration

To improve connectivity and integration with the main road network:

- 12. Consult with Transport for New South Wales to:
 - a. Investigate and plan a bypass of Denman
 - b. Investigate and plan an upgrade (or new) bridge crossing of the Hunter River at Denman to accommodate oversize vehicles

5.2.6 Road Network Consistency

To ensure roads are appropriate and consistent for their intended use:

- 13. Adopted the future road network hierarchy shown in Figure 5.2
- 14. Consult with TFNSW to reclassify Thomas Mitchell Drive as a state road
- 15. Reclassify the following roads as collector roads:
 - a. Edderton Road
 - b. Wybong Road
- 16. Adopt Austroads Geometric Design standards for new roads and road upgrades.





Figure 5.1: Road Network Plan

Muswellbrook Mine Affected Road Network Plan Review



Figure 5.2: Recommended Future Road Network

Muswellbrook Mine Affected Road Network Plan Review

Project: P4287 Version: 004

5.3 Triggers and Priorities

The 2015 MARNP tabled the timing and responsibility for the implementation of the road network improvements and noting that these were linked to various mine applications, approvals and government initiatives. The following table lists the previous (2015) initiatives in *italics* and provides further comments/updates (where relevant) considering changes to the proposed mining operations and road network plan initiatives.

Recommended Initiative	Comment	Priority / Timing
Upgrade Wybong Road (west) to local road standard	The upgrading of Wybong Road (West) is required to improve travel efficiency and safety as traffic generating development in the west results in increased vehicle usage. Responsibility for the upgrading of this road should be linked to new and expanding mines in the north and west of the Shire and contributions or works should be proportional to the demand created by any new development in this area. The road should be upgraded to a "Collector" Road standard to address road safety issues and traffic use	Medium Priority / Medium Term
Reclassify Thomas Mitchell Drive	Current and forecast traffic volumes indicate that Thomas Mitchell Drive will continue to operate as an important arterial road warranting State Government care and control.	High Priority / Short Term
Edderton Road Temporary Replacement and final reconstruction.	Current and forecast traffic volumes on Edderton Road do not justify the upgrading of this road. However, the accident history is disproportionately high relative to the number of vehicles. The pavement width and road alignment are of significant concern in relation to road user safety. The cost of diverting the northern and southern sections of the road to facilitate coal extraction will be considerable and will result in a less efficient road alignment. Consideration should be given to the closure of the road and the redirection of funding (or works) to improve the arterial road network. This initiative should be taken up with the respective mines. The proposal by the mines should be considered a temporary solution to allow mining to proceed. The long-term requirement preferred by the Road Authority is that the road be reconstructed generally in its current location on completion of mining activity. Edderton Road is expected to perform a higher function (Collector Road) is the revised road network plan. Consideration should be given to retaining the Edderton Road northern diversion in lieu of constructing the Denman Road to Bengalla Road link	High Priority / Medium Term
Consult with TFNSW on Golden Highway Improvements	Strategies to address current and potential problems associated with the Golden Highway need to be discussed at an early juncture to facilitate the long term planning of efficiencies, cost savings and safety improvements to the Golden Highway. The priority focus in discussions with TFNSW should be the bypass of Denman and upgrade of the bridge over Hunter River to accommodate oversize vehicles	High Priority / Long Term
Kayuga Bridge Replacement	The replacement of the current one lane timber structure with a two lane concrete bridge able to carry larger vehicles, is considered critical to providing efficient access for both mine-related and local vehicles coming to and from the west in the short and long term. Responsibility for the replacement of the Kayuga Bridge lies with the TFNSW. The bridge has heritage significance and is unlikely to be removed.	Low Priority / Medium Term
Construct Southern Link Road (Wybong Road to Bengalla Link Road)	A pre-requisite to the closure of Wybong Road to facilitate coal extraction (in Year 9 of the Mt Pleasant Mine operation), will be the construction of the Southern Link Road. The construction of the proposed Southern Link Road would be in lieu of the proposed Northern and Western Link Roads previously proposed in the Mt Pleasant Mine application. The Southern Link offers travel efficiencies and significant cost savings to the mine. As such, this initiative should be taken up with Coal and Allied in relation to a Modification to the Consent. Construction of the Southern Link Road would remain the responsibility of Mt Pleasant Mine. Should the Mt Pleasant	N/A



	Mine not proceed, the closure of Wybong Road will not occur and the Southern Link Road would not be required. In this circumstance, Wybong Road from the Bengalla Link Road to Kayuga Road will need to be upgraded to maintain a safe and efficient movement of vehicles over this section of road to a standard appropriate to accommodate anticipated traffic volumes from background growth and new mines proposed further to the west. Closure of Wybong Road is no longer proposed, and therefore the southern link is not required.	
Upgrade Reedy Creek Road and Golden highway Intersection	Responsibility for the upgrading of this road and its intersection with the Golden Highway should be linked to new and expanding mines in the north and west of the Shire and contributions or works-in-kind should be proportional to the demand created by new development. The closure of Wybong Road west of Reedy Creek Road is no longer supported, nor is there a need to upgrade Reedy Creek Road for higher	N/A
Construct Wybong Road to New England Highway	The construction of Wybong Road to New England Highway will form a part of the western corridor and provide an efficient link between Golden Highway, Denman Road and New England Highway. Responsibility for the upgrading of this road should be linked to new and expanding mines in the north and west of the Shire and contributions or works should be proportional to the demand created by any new development in this area.	High Priority / Medium Term
Construction Denman Road to Bengalla Link Road	The construction of Denman Road to Bengalla Link Road will form a part of the western corridor and provide an efficient link between Golden Highway, Denman Road and New England Highway. Responsibility for the upgrading of this road should be linked to new and expanding mines in the north and west of the Shire and contributions or works should be proportional to the demand created by any new development in this area.	High Priority / Long Term
Construct Bengalla Link Road to Wybong Road	The construction of the Bengalla Link Road to Wybong Road will from part of a northwest corridor and provide improved connections and travel time savings between the mines and Muswellbrook / Thomas Mitchell Drive. Responsibility for the upgrading of this road should be linked to new and expanding mines in the north and west of the Shire and contributions or works should be proportional to the demand created by any new development in this area.	Medium Priority / Medium Term
Close Wybong Post Office Road and Upgrade Yarraman Road	As the majority of properties along Wybong Post Office Road are mine owned (with some local properties at the western end) there is limited benefit in diverting the road when the eastern section is closed for mine expansion. Consideration should be given to closing this road permanently and upgrading Yarraman Road.	Medium Priority / Short Term



6. NEXT STEPS

6.1 Next Steps

The next steps in the Muswellbrook MARNP Project will involve:

- Comprehensive traffic surveys of the road network including mine related traffic demands and travel patterns
- Updating the 2015 SATURN base traffic model to a 2019 Base
- Developing a future year traffic model including the proposed new road links to determine traffic demands, distribution and composition
- Assessing key intersection capacities based on forecast (model outputs) future traffic demands.

6.2 Monitoring and Review

As stated in the 2015 MARNP the plan will need to be a 'dynamic document' responding over time to the performance of the roads within the network, and to changing circumstances affecting the likely rate of growth in demand on the road network. A five (5) year cycle of performance review is considered accepted practice consistent with State Government directives for Council's to review their planning instruments to maintain currency. To ensure that contributions imposed on development are properly justified (i.e. based on best available information), traffic surveys and analysis should be undertaken on a regular basis. The traffic model should be updated when changes to existing mines occur or new mines are proposed so that the impact of the mine and mitigation strategies can be tested and evaluated.



7.REFERENCES

Muswellbrook Mine Affected Roads Network Plan – Cardno (2015) Hunter River Flood Study (Muswellbrook to Denman) - Worley Parsons Road Transport Management Framework and Principles – Austroads (2017) Notice of Amendment of a Development Consent (Mach Energy) Nov 2018 - NSW DPE Mount Pleasant Operation Rail Modification Environmental Assessment – Mach Energy (Dec 2017) Hunter Economic Infrastructure Plan – Infrastructure NSW/Regional Development Australia - 2013 Golden Highway Corridor Strategy – Roads and Maritime Services (2016) Thomas Mitchell Drive Contributions Study – Department of Planning and Environment (2015) Muswellbrook Local Environmental Plan (LEP) 2009 Review Discussion Paper - Muswellbrook Shire Council (2018) Muswellbrook Local Strategic Planning Statement 2018-2038 – Muswellbrook Shire Council (2018) Muswellbrook Industrial Lands Audit – Cardno (2015) Mangoola Coal Continues Operations Project Traffic and Transport Report – GHD (2019 Maxwell Project Road Transport Assessment – The Transport Planning Partnership (2019) Golden Highway Upgrade at Winery Hill – Review of Environmental Factors – RMS 2018 New England highway Muswellbrook Bypass Options Report - RMS 2018





Appendix A: 2015 Muswellbrook MARNP – Road Network Plans Muswellbrook Mine Affected Roads Stage 1 - Road Network Plan



Cardno

27 March 201527 August 2015





Cardno

27 March 201527 August 2015

2

Muswellbrook Mine Affected Roads Stage 1 - Road Network Plan



Figure 6-3 Road Network Plan (Western Sector)

27 March 201527 August 2015

Cardno



Appendix B: Local Road Condition Observations



Wybong Road Condition Assessment

Section 1 – Approx. 4.8km from Golden Hwy to Reedy Creek Road Intersection

Overall Condition Assessment – 'Below Average'

- Typical formation = 2 x 3.2m lanes with 1.0m shoulders
- Condition of road surface is ok with minor pothole and patch repairs.
- Road edges appear rough and broken in places from heavy vehicles dropping tyres off the pavement.
- Road shoulders are narrower then Type 3 section and need to be trimmed and widened where possible to achieve suitable space to avoid heavy haulage vehicles.
- Suggest resurfacing to improve skid resistance and trafficability
- Cause way dip in road approx. 900m east of Golden Hwy intersection. Dip is very uncomfortable at posted speed limit (100km) and poses a safety issue for all vehicles. Recommend the dip is removed with the install of culverts
- Section through bush (approx. 1.3km west of Reedy Creek Road Intersection) has very
 narrow shoulders with no guard rail providing a narrow road width for heavy haulage
 vehicles. Recommend shoulders are cleared of vegetation, a suitable safety barrier installed
 on tighter bend and the shoulders widened to allow vehicles to pull off the road an allow
 heavy haulage past

Minor to major works (minor pavement widening, shoulder widening, resurfacing and culvert installation at causeway) required to this section to meet the intent of the Ultimate Network plan



Edge condition adjacent to Golden Highway intersection





Causeway Dip



Traveling West from Reedy Creek Road. Road widening, shoulder clearing, potential barriers

Section 2 – Approx. 4.5 from Reedy Creek Road to Yarraman Road Intersection

Overall Condition Assessment – 'Below Average'

- Typical formation = 2 x 3.2m lanes with 1.0m shoulders with the shoulder narrowing through windy section either side of the causeway dip.
- The small cause way dip in the road (approx. 3.6km east of Reedy Creek Road) is very uncomfortable at posted speed limit (100km/h) and poses a safety issue for drivers. Recommend the cause way dip is replaced with a culvert to facilitate driver comfort and improve safety
- Condition of road surface is generally ok to with minor pothole and patch repairs except for first 300m east of Reedy Creek Road where surface condition is poor and significantly potholed.
- Road edges vary from being clean and acceptable (approx. 600m east of Reedy Creek Road) to poor, rough and broken.
- Road shoulders are narrow and require widening to achieve suitable space for heavy haulage vehicles.
- Shoulders either side of causeway dip are over-grown and require widening.

Minor to major works (minor pavement widening, shoulder widening, resurfacing and culvert installation at causeway) required to this section to meet the intent of the Ultimate Network plan



Causeway dip



Looking West along Wybong Road at Reedy Creek Intersection



Looking East from Reedy Creek Road intersection



Section 3 – Approx. 5.3km from Yarraman Road to 1.10km east of Wybong PO Road.

Overall Condition Assessment – 'Poor'

- Typical formation = 2 x 3.2m lanes with 1.0m shoulders
- Road from Yarraman Road intersection to existing bridge (approx. 300m) is in ok condition. Narrow slightly at approach to bridge
- Bridge over Wybong Creek is narrow (3.2m lanes) however in good condition. Approaches use MELT barrier system (no longer accepted by RMS however allowed to be retained if in good condition). Bridge may require upgrading if road becomes heavy haulage route.
- Road from Wybong Creek bridge to Wybong PO Road intersection is narrow (generally 3.0 3.2m lanes with 0.5 -1.0m shoulders) with the surface condition becoming poor, full of repaired potholes, patch repairs and longitudinal cracks/rutting within 0.5-1.0m of the road's edges. Would require significant road edge and should work (including clearing and trimming of vegetation) to bring up to spec.
- There is a pipe culvert approx. 1.0km east of the Wybong Creek bridge. The culverts headwalls are very close to the road formation and need to be extended to achieve desired formation and shoulder widths.
- Wybong PO Road intersection needs resurfacing. Current surface condition is poor and slick due to vehicle movements.
- Shoulders need to be cleared and widened

Significant works would be required to this section to meet the intent of the Ultimate Network plan









Section 4 – Approx. 6.0km from Wybong PO Road to Spring Creek.

Overall Condition Assessment – 'Average'

- From approx. 1.1km east of Wybong PO Road, the road widens to approx. 3.2 3.5m lanes with min 1.0m shoulders.
- Road is clearly line marked making it easier to see the road edge
- Surface condition is good with no major signs of potholing or repairs.
- The intersection with the Mangoolla Mine may require resurfacing soon. The wearing course appears thin with the binder now starting to rise to the surface of the aggregate.
- There is some isolated longitudinal potholing present in the centre line of Wybong road adjacent to the Castle Rock Road intersection. Minor works required to repair. Road width (lanes and shoulders) is good.
- Bridge over Spring Creek appears new and in good condition

Only very minor works would be required (isolated pothole repairs and resurfacing at intersections) to meet the intent Ultimate Network plan.



Section 5 – Approx. 4.7km from Spring Creek to Bengalla Road/Wybong Road Intersection. Overall Condition Assessment – 'Good Condition'
- Road is in good condition with nominal 3.5m lanes and 1.0 1.5m shoulders.
- Surface condition is good with no signs of potholing or repairs.

No works are considered needed to this section of road to meet the intent of the Ultimate Network plan



Section 6 – Approx. 1.6km from Bengalla Road/Wybong Road Intersection to Mt Pleasant Mine Intersection.

Overall Condition Assessment – 'Good Condition'

- Road is in good condition with nominal 3.5 3.7m lanes and 2.0 2.5m shoulders.
- Surface condition is good with no signs of potholing or repairs.

No works are considered needed to this section of road to meet the intent of the Ultimate Network plan



Section 7 - Approx. 8.0km from the Mt Pleasant Mine Intersection to Kayuga Road Intersection

Overall Condition Assessment – 'Below Average'

- Typical formation = 3.0m lanes with 0.5 1.0m shoulders
- The first 3.5km of road surface is in poor condition with significant potholing repairs, patch repairs, edge damage and shoulder erosion.
- From the 3.5km mark to Louges lane, the road condition is generally better however still narrow (3.2m lanes) with minimal shoulders.
- major works (pavement widening, shoulder rectification and resurfacing) is required to this section to meet the intent of the Ultimate Network plan
- Overton Road intersection has poor sight distance to the east. This is primarily due to the crest in Wybong Road and the adjacent road cutting.
- Minor to major works may be required to upgrade sight distance and intersection safety pending on final approved speed environment and future traffic volumes
- The existing bridge directly east of Louges Lane appears to be in good condition however is narrow (approx. 6.0 – 6.4m wide) if it is to be used for future higher traffic volumes. Upgrades works may need to be considered.
- Kayuga Road intersections is ok with a general width of approx. 6.5m and 1.0m shoulders.

Generally Minor works (shoulder widening and resurfacing) is all that would be required to for this section of road to meet the intent of the Ultimate Network Plan











Looking east from Overton Road



Looking West from Overton Road



Bridge East of Louges Lane





Looking West along Wybong Road from Kayuga Intersection



Looking North from Kayuga Intersection



Looking South from Kayuga Intersection

Edderton Road Condition Assessment (3.5km from Denman Road intersection to 'Dipper' Causeway)

Section 1 – Approx 2.1km from proposed new Denman Road intersection works

Overall Condition Assessment – 'Poor Condition'

- Typical formation = 5.5 6.0m sealed pavement, no line marking, narrow (0.5 1.0m) shoulders
- Surface condition is poor with significant pothole repairs, patch repairs and edge damage caused by traffic falling off sealed section of road.
- An existing culvert located approx. 4.5km for Denman Road intersection has no shoulders, no barriers, very rough and patch repaired surface.

Generally some major to significant works would be required to this section (pavement widening, shoulder widening, install of barriers over culvert, culvert extension and full milling and resurfacing) to meet the intent of the Ultimate Network plan and make the road safe.



Looking at current road works for new Edderton – Denman Road link



Looking South from approx proposed works junction



Looking south at existing large culvert



Looking north at existing large culvert



Looking south at existing large culvert



Looking South from approx. Section 1-2 junction

Section 2 – Approx. 1.6km

Overall Condition Assessment – 'Below Average'

- Typical formation = 6.0 6.5m sealed pavement, with centre and edge line markings. Shoulders are approx. 1.0m wide.
- Surface condition is ok with some minor pothole repairs.
- Pavement edges appear good with no signs of traffic damage.

Minor works would be required to this section (shoulder widening and potential resurfacing) to meet the intent of the Ultimate Network plan and make the road safe.



Looking south from Section 1-2 junction





Looking South from Section 2-3 junction

Section 3 – 1.7km

Overall Condition Assessment – 'Poor Condition'

- Typical formation = 5.5 6.0m sealed pavement, no line marking, narrow (0.5 1.0m) shoulders
- Surface condition is poor with pothole repairs, patch repairs and edge damage caused by traffic falling off sealed section of road.

Minor to Major works would be required to this section (pavement widening, shoulder widening and resurfacing) to meet the intent of the Ultimate Network plan and make the road safe.



Section 4 – 1.7km

Overall Condition Assessment – 'Below Average'

- Typical formation = 6.0 6.5m sealed pavement, no line marking with good shoulders (min 1.0m)
- Surface condition is good with no signs of potholing or repairs.

Minor works would be required to this section (minor pavement and shoulder widening) to meet the intent of the Ultimate Network plan and make the road safe





Reedy Creek Road Condition Assessment

Overall Condition Assessment – 'Below Average'

- Typical formation is approx. 6.0m wide sealed formation with narrow 0.5 1.0m shoulders.
- No line marking with surfacing rough and in ordinary condition.
- Intersection with Denman Road has poor sight distance to the east due to proximity of a bridge.
- Intersection with Wybong Road is large. Intersection can be improved with clearing of vegetation and minor shoulder work. East corner appears to be regularly cut by traffic leaving Wybong Road.
- Existing culvert approx. 1km from Denman Road intersection that may require widening. To meet intended network formation.
- Shoulders need to be trimmed and cleared of vegetation.

Potentially on Minor works (minor pavement widening, shoulder widening, resurfacing) required to this road to meet the intent of the Ultimate Network plan



Looking at Denman Road from Reedy Creek Road



Looking east from Reedy Creek Road / Denman road Intersection



Looking North along Reedy Creek Road



Looking North at culvert on Reedy Creek Road



Looking south from Culvert



Looking South at Reedy Creek Road from Wybong Road



Cut intersection corner



Looking West from Reedy Creek Road/Wybong Road intersection

Yarraman Road Condition Assessment

Overall Condition Assessment – 'Poor Condition'

- Typical road formation of approx. 4.0 4.5m wide sealed section with 0.5m unsealed shoulders.
- Evidence of vehicles dropping tyres off sealed section regularly
- Edge condition is very poor
- Road bends have poor sight distance due to overgrown vegetation
- Existing causeway crossing has poor sight distance on each approach
- Causeway is narrow (approx. 3.5m) with no side post markers
- Road formation from top of northern causeway approach is in ok condition and would only require minor road widening.

Generally major works (pavement and formation widening, shoulder widening, resurfacing, vegetation clearing and a potential bridge over the causeway) required to Yarraman Road to meet the intent of the Ultimate Network plan



Looking from Yarraman Road to intersection with Wybong Road



Looking North along Yarraman Road









Looking from the Northern approach at the causeway



Causeway culverts



Looking south along Yarraman Road from Wybong PO Road intersection



Wybong PO Road



Appendix C: Cost Estimates

Muswellbrook Mine Affected Road Network

Summary of Costs - Castlerock Link Road to New England Highway Assumptions

8.6 km of Type 3 Road

2 lane pavement with 2.0m shoulder

Nine minor pipe culverts

Two minor box culvert crossings

Two bridge crossings

	Item	Estimate (\$) (excluding contingency)	Co: %	ntingency Amount (\$)	Estimate (\$) (including Contigency)	% of Total Estimate
1.0	Project Development	5.5.5				
1.1	Concept Design & Reporting	\$769.435.43	30%	\$230.830.63	\$1.000.266.05	
1.2	Project Management Services	\$57,707.66	30%	\$17,312.30	\$75,019.95	
1.3	Client Representation	\$5,770.77	30%	\$1,731.23	\$7,502.00	
	Sub Total	\$832,913.85	30%	\$249,874.15	\$1,082,788.00	2.0%
2.0	Investigation and Design					
2.1	Investigation and Design	\$769,435.43	30.00%	\$230,830.63	\$1,000,266.05	
2.2	Project Management Services	\$57,707.66	30.00%	\$17,312.30	\$75,019.95	
2.3	Client Representation	\$5,770.77	30.00%	\$1,731.23	\$7,502.00	
	Sub Total	\$832,913.85	30%	\$249,874.15	\$1,082,788.00	2.0%
3.0	Property Acquisitions					
3.1	Professional Services	\$86,000.00	30%	\$25,800.00	\$111,800.00	
3.2	Property Acquisition Costs	\$1,720,000.00	30%	\$516,000.00	\$2,236,000.00	
3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.4	Project Management Services	\$111,800.00	30%	\$33,540.00	\$145,340.00	
3.5	Client Representation	\$86,000.00	30%	\$25,800.00	\$111,800.00	
	Sub Total	\$2,003,800.00	30%	\$601,140.00	\$2,604,940.00	4.9%
4.0	Public Utility Adjustments					
4.1	Design, Approval & Construction	\$194,301.88	30%	\$58,290.56	\$252,592.44	
4.2	Project Management Services	\$15,544.15	30%	\$4,663.25	\$20,207.40	
4.3	Client Representation	\$7,772.08	30%	\$2,331.62	\$10,103.70	
	Sub Total	\$217,618.10	30%	\$65,285.43	\$282,903.53	0.5%
5.0	Construction					
5.1	Preliminaries	\$585,025.00	30%	\$175,507.50	\$760,532.50	
5.2	Environmental	\$825,721.00	30%	\$247,716.30	\$1,073,437.30	
5.3	Earthworks	\$4,766,000.00	30%	\$1,429,800.00	\$6,195,800.00	
5.4	Drainage - Culvert Crossings	\$950,000.00	30%	\$285,000.00	\$1,235,000.00	
5.5	Pavements	\$23,220,000.00	30%	\$6,966,000.00	\$30,186,000.00	
5.6	Structures - Bridge	\$3,600,000.00	30%	\$1,080,000.00	\$4,680,000.00	
5.7	Intersections	\$550,000.00	30%	\$165,000.00	\$715,000.00	
5.8	Landscaping	\$344,000.00	30%	\$103,200.00	\$447,200.00	
5.9	Site Management	\$177,179.00	30%	\$53,153.70	\$230,332.70	
6	Project Management Services	\$1,671,500.00	30%	\$501,450.00	\$2,172,950.00	
6.1	Client Representation	\$167,150.00	30%	\$50,145.00	\$217,295.00	
	Sub Total	\$36,856,575.00	30%	\$11,056,972.50	\$47,913,547.50	89.6%
6.0	Handover	¢040 740 00	200/	¢10100001	ALA 000 00	
6.1	Project Data & Performance	\$349,743.38	30%	\$104,923.01	\$454,666.39	
0.2		\$38,860.38	30%	\$11,658.11	\$50,518.49	
0.3		\$3,886.04	30%	\$1,105.81	\$5,051.85	1 09/
	Sub Total	\$392,469.79 \$41 126 210 58	30%	\$117,746.94	\$510,238.72 \$53,477,203,76	100.0%
	i otar Estimate	φ41,130,310.30			φJJ,411,2UJ.10	100.070

Indicative Cost Estimate (\$ Million)

\$53.48

Muswellbrook Mine Affected Road Network

Summary of Costs - Bengalla Link (Bengalla Road to Denman Road) Assumptions

3.3 km of Type 2 Road

2 lane pavement with 1.5m shoulder

Three triple cell pipe culverts

Two culvert crossings - various sizes

Two bridge crossings (One over the river, one over the existing rail corridor)

	Item	Estimate (\$) (excluding	Cor	ntingency	Estimate (\$) (including	% of Total
		contingency)	%	Amount (\$)	Contigency)	Estimate
1.0	Project Development					
1.1	Concept Design & Reporting	\$343,254.66	30%	\$102,976.40	\$446,231.05	
1.2	Project Management Services	\$25,744.10	30%	\$7,723.23	\$33,467.33	
1.3	Client Representation	\$2,574.41	30%	\$772.32	\$3,346.73	
	Sub Total	\$371,573.17	30%	\$111,471.95	\$483,045.12	2.0%
2.0	Investigation and Design					
2.1	Investigation and Design	\$343,254.66	30.00%	\$102,976.40	\$446,231.05	
2.2	Project Management Services	\$25,744.10	30.00%	\$7,723.23	\$33,467.33	
2.3	Client Representation	\$2,574.41	30.00%	\$772.32	\$3,346.73	
	Sub Total	\$371,573.17	30%	\$111,471.95	\$483,045.12	2.0%
3.0	Property Acquisitions					
3.1	Professional Services	\$32,500.00	30%	\$9,750.00	\$42,250.00	
3.2	Property Acquisition Costs	\$650,000.00	30%	\$195,000.00	\$845,000.00	
3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.4	Project Management Services	\$42,250.00	30%	\$12,675.00	\$54,925.00	
3.5	Client Representation	\$32,500.00	30%	\$9,750.00	\$42,250.00	
	Sub Total	\$757,250.00	30%	\$227,175.00	\$984,425.00	4.1%
4.0	Public Utility Adjustments					
4.1	Design, Approval & Construction	\$86,680.47	30%	\$26,004.14	\$112,684.61	
4.2	Project Management Services	\$6,934.44	30%	\$2,080.33	\$9,014.77	
4.3	Client Representation	\$3,467.22	30%	\$1,040.17	\$4,507.38	
	Sub Total	\$97,082.13	30%	\$29,124.64	\$126,206.76	0.5%
5.0	Construction					
5.1	Preliminaries	\$263,156.25	30%	\$78,946.88	\$342,103.13	
5.2	Environmental	\$371,426.25	30%	\$111,427.88	\$482,854.13	
5.3	Earthworks	\$1,882,500.00	30%	\$564,750.00	\$2,447,250.00	
5.4	Drainage - Culvert Crossings	\$900,000.00	30%	\$270,000.00	\$1,170,000.00	
5.5	Pavements	\$7,475,000.00	30%	\$2,242,500.00	\$9,717,500.00	
5.6	Structures - Bridge	\$4,000,000.00	30%	\$1,200,000.00	\$5,200,000.00	
5.7	Intersections	\$650,000.00	30%	\$195,000.00	\$845,000.00	
5.8	Landscaping	\$130,000.00	30%	\$39,000.00	\$169,000.00	
5.9	Site Management	\$79,698.75	30%	\$23,909.63	\$103,608.38	
6	Project Management Services	\$751,875.00	30%	\$225,562.50	\$977,437.50	
6.1	Client Representation	\$75,187.50	30%	\$22,556.25	\$97,743.75	
	Sub Total	\$16,578,843.75	30%	\$4,973,653.13	\$21,552,496.88	90.3%
6.0	Handover					
6.1	Project Data & Performance	\$156,024.84	30%	\$46,807.45	\$202,832.30	
6.2	Project Management Services	\$17,336.09	30%	\$5,200.83	\$22,536.92	
6.3	Client Representation	\$1,733.61	30%	\$520.08	\$2,253.69	
	Sub Total	\$175,094.55	30%	\$52,528.36	\$227,622.91	1.0%
	Total Estimate	\$18,351,416.75			\$23,856,841.78	100.0%

Indicative Cost Estimate (\$ Million)

\$23.86

Muswellbrook Mine Affected Road Network

Summary of Costs - Edderton Rd Section 1 Assumptio

2.1 km of Type 2 (Edderton) Road Shoulder & Verge Works both sides for extent of upgrade Mill and place additonal DGB across existing formation 2 Coat Seal across new and existing pavement sections One large & 2 minor culvert extensions

	Item	Estimate (\$) (excluding	Co	ntingency	Estimate (\$) (including	% of Total
		contingency)	%	Amount (\$)	Contigency)	Estimate
1.0	Project Development	* 4 4 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	000/	* ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	\$400.000.0 7	
1.1	Concept Design & Reporting	\$106,909.98	30%	\$32,072.99	\$138,982.97	
1.2	Project Management Services	\$8,018.25	30%	\$2,405.47	\$10,423.72	
1.3	Client Representation	\$801.82	30%	\$240.55	\$1,042.37	0.00/
	Sub Total	\$115,730.05	30%	\$34,719.01	\$150,449.06	2.0%
2.0	Investigation and Design	\$400.000.00	00.00%	* 00.070.00	\$400.000.0 7	
2.1	Investigation and Design	\$106,909.98	30.00%	\$32,072.99	\$138,982.97	
2.2	Project Management Services	\$8,018.25	30.00%	\$2,405.47	\$10,423.72	
2.3	Client Representation	\$801.82	30.00%	\$240.55	\$1,042.37	0.0%
	Sub Total	\$115,730.05	30%	\$34,719.01	\$150,449.06	2.0%
3.0	Property Acquisitions	* 0.00	0.00/	\$0.00	* 0.00	
3.1	Professional Services	\$0.00	30%	\$0.00	\$0.00	
3.2	Property Acquisition Costs	\$0.00	30%	\$0.00	\$0.00	
3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.4	Project Management Services	\$0.00	30%	\$0.00	\$0.00	
3.5	Client Representation	\$0.00	30%	\$0.00	\$0.00	
	Sub Total	\$0.00	30%	\$0.00	\$0.00	0.0%
4.0	Public Utility Adjustments		/			
4.1	Design, Approval & Construction	\$26,997.47	30%	\$8,099.24	\$35,096.71	
4.2	Project Management Services	\$2,159.80	30%	\$647.94	\$2,807.74	
4.3	Client Representation	\$1,079.90	30%	\$323.97	\$1,403.87	
	Sub Total	\$30,237.17	30%	\$9,071.15	\$39,308.31	0.5%
5.0	Construction	* • - - • • • • • • • • • • • • • • • • • • •	0.001			
5.1	Preliminaries	\$85,706.25	30%	\$25,711.88	\$111,418.13	
5.2	Environmental	\$120,968.25	30%	\$36,290.48	\$157,258.73	
5.3	Earthworks	\$493,500.00	30%	\$148,050.00	\$641,550.00	
5.4	Drainage - Culvert Crossing	\$120,000.00	30%	\$36,000.00	\$156,000.00	
5.5	Pavements	\$4,200,000.00	30%	\$1,260,000.00	\$5,460,000.00	
5.6	Structures	\$0.00	30%	\$0.00	\$0.00	
5.7	Intersections	\$0.00	30%	\$0.00	\$0.00	
5.8	Landscaping	\$84,000.00	30%	\$25,200.00	\$109,200.00	
5.9	Site Management	\$25,956.75	30%	\$7,787.03	\$33,743.78	
6	Project Management Services	\$244,875.00	30%	\$73,462.50	\$318,337.50	
6.1	Client Representation	\$24,487.50	30%	\$7,346.25	\$31,833.75	
	Sub Total	\$5,399,493.75	30%	\$1,619,848.13	\$7,019,341.88	95.4%
6.0	Handover					
6.1	Project Data & Performance	\$48,595.44	30%	\$14,578.63	\$63,174.08	
6.2	Project Management Services	\$5,399.49	30%	\$1,619.85	\$7,019.34	
6.3	Client Representation	\$539.95	30%	\$161.98	\$701.93	
	Sub Total	\$54,534.89	30%	\$16,360.47	\$70,895.35	1.0%
	Total Estimate	\$5,661,191.01			\$7,359,548.32	100.0%

Indicative Cost Estimate (\$ Million)

\$7.36



Summary of Costs - Edderton Rd Section 2

Assumptions

1.6 km of Type 2 (Edderton) Road

Shoulder & Verge Works both sides for extent of upgrade

2 Coat Seal across new and existing pavement sections

Contingency % Amount (s) Contingency % Amount (s) Contingency Exitiat 1.0 Project Development \$60,249,42 30% \$18,074.83 \$778,324.25 \$5,874.32 1.2 Project Management Services \$4518.71 30% \$135.56 \$587.43 \$5,874.32 2.0 Investigation and Design \$66,220.00 30% \$19,566.00 \$84,786.00 2.0% 2.1 Investigation and Design \$60,249.42 30.00% \$18,074.83 \$78,324.25 \$2.2 2.2 Project Management Services \$44,18.71 30.00% \$135.56 \$587.43 2.3 Client Representation \$451.87 30.00% \$135.56 \$587.43 3.0 Property Acquisitions \$451.87 30.00% \$135.56 \$587.43 3.1 Profestional Services \$0.00 30% \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 </th <th></th> <th>Item</th> <th>Estimate (\$) (excluding</th> <th>Cont</th> <th>ingency</th> <th>Estimate (\$) (including</th> <th>% of Total</th>		Item	Estimate (\$) (excluding	Cont	ingency	Estimate (\$) (including	% of Total
1.0 Project Development 1.1 Concept Design & Reporting \$60,249.42 30% \$18,074.83 \$78,324.25 1.2 Project Management Services \$4,518.71 30% \$13,55.61 \$5,874.32 1.3 Client Representation \$65,220.00 30% \$13,55.61 \$5,874.32 2.0 Investigation and Design \$66,220.00 30% \$13,55.61 \$5,874.32 2.1 Investigation and Design \$60,249.42 30.00% \$18,074.83 \$78,324.25 2.2 Project Management Services \$4,518.71 30.00% \$13,55.61 \$5,874.32 2.3 Client Representation \$65,220.00 30% \$13,55.61 \$5,874.32 3.0 Project Management Services \$0,000 \$13,55.61 \$5,874.32 3.1 Professional Services \$0,00 30% \$0,00 \$0,000 3.2 Property Acquisition Costs \$0,00 30% \$0,00 \$0,000 3.2 Project Management Services \$0,00 \$0,00 \$0,00 <t< th=""><th>1.0</th><th>Project Development</th><th>contingency</th><th>70</th><th>Amount (ຈ)</th><th>Contigency)</th><th>Estimate</th></t<>	1.0	Project Development	contingency	70	Amount (ຈ)	Contigency)	Estimate
1. Concept Design & Reporting \$40,243,42 30% \$10,074,53 \$76,324,35 1.2 Project Management Services \$4,18,71 30% \$135,56 \$587,43 Sub Total \$65,220,00 30% \$19,566,00 \$84,786,00 2.0% 2.0 Investigation and Design \$60,249,42 30,00% \$18,074,83 \$778,324,25 2.2 2.1 Investigation and Design \$60,249,42 30,00% \$13,55.61 \$5,874,32 2.2 Project Management Services \$4,518.71 30,00% \$13,55.61 \$5,874,32 2.3 Client Representation \$45,18.71 30,00% \$13,55.61 \$5,874,32 3.0 Project Management Services \$45,18.71 30,00% \$13,55.61 \$5,874,32 3.1 Professional Services \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 3.2 Property Acquisition Costs \$0,00 30% \$0,00 \$0,00 \$0,00 \$0,00 3.5 Client Representation \$0,00 <t< td=""><td>1.0</td><td>Concert Development</td><td>¢60.040.40</td><td>200/</td><td>¢10.074.02</td><td>¢70.004.05</td><td></td></t<>	1.0	Concert Development	¢60.040.40	200/	¢10.074.02	¢70.004.05	
1.2 Project Management Services 34,318,71 30% \$1,353,61 \$5,674.32 1.3 Client Representation \$451.87 30% \$135.56 \$587.43 2.0 Investigation and Design \$66,229.42 30.00% \$18,074.83 \$778,324.25 2.2 Project Management Services \$451.87 30.00% \$135.56 \$587.43 2.3 Client Representation \$451.87 30.00% \$135.56 \$587.43 2.4 Project Management Services \$451.87 30.00% \$135.56 \$587.43 2.3 Client Representation \$451.87 30.00% \$135.56 \$587.43 3.1 Profery Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments </td <td>1.1</td> <td>Concept Design & Reporting</td> <td>\$60,249.42</td> <td>30%</td> <td>\$18,074.83</td> <td>\$78,324.25</td> <td></td>	1.1	Concept Design & Reporting	\$60,249.42	30%	\$18,074.83	\$78,324.25	
1.3 Client Representation \$3451.83 30% \$135.36 \$367.43 Sub Total \$65,220.00 30% \$19,566.00 \$84,786.00 2.0% 2.0 Investigation and Design \$60,249.42 30.00% \$18,074.83 \$76,324.25 2.2 Project Management Services \$45,18.71 30.00% \$135.56 \$587.43 2.3 Client Representation \$451.87 30.00% \$135.56 \$587.43 Sub Total \$65,220.00 30% \$19,566.00 \$84,786.00 2.0% 3.0 Property Acquisitions \$65,220.00 30% \$10,000 \$80,62,790,00	1.2	Project Management Services	\$4,518.71	30%	\$1,355.01	\$5,874.3Z	
Investigation and Design \$55,20,00 30% \$19,366,00 \$64,766,00 20% 2.0 Investigation and Design \$60,249,42 30,00% \$18,074,83 \$78,324,25 2.2 Project Management Services \$4,518,71 30,00% \$13,55.61 \$5,874,32 2.3 Client Representation \$451,87 30,00% \$13,55.66 \$587,43 Sub Total \$65,220,00 30% \$19,566,00 \$60,00 3.0 Property Acquisitions \$65,220,00 30% \$19,566,00 \$0,00 3.1 Professional Services \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 3.1 Professional Services \$0,00 30% \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 3.1 Project Management Services \$0,00 30% \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00 \$0,00<	1.3	Client Representation	\$451.87	30%	\$135.50	\$387.43	2.09/
2.0 investigation and Design \$\$60,249,42 30,00% \$\$18,074.83 \$\$78,324.25 2.1 investigation and Design \$\$60,249,42 30,00% \$\$13,55.61 \$\$587.43 2.2 Project Management Services \$\$45,18.71 30,00% \$\$13,55.61 \$\$587.43 2.3 Client Representation \$\$65,220.00 30% \$\$19,566.00 \$\$84,786.00 2.0% 3.0 Property Acquisitions \$\$65,220.00 30% \$\$10,00 \$\$0.00 \$\$0.00 3.1 Proferty Acquisition Costs \$\$0.00 30% \$\$0.00 \$\$0.00 3.4 Project Management Services \$\$0.00 30% \$\$0.00 \$\$0.00 3.5 Client Representation \$\$0.00 30% \$\$0.00 \$\$0.00 3.5 Verijeet Management Services \$\$15,214.50 30% \$\$182.57 \$\$19,778.85 4.1 Design, Approval & Construction \$\$15,214.50 30% \$\$182.57 \$\$791.15 4.3 Client Representation \$\$608.58 30% \$\$182.57 <		Sub Total	\$65,220.00	30%	\$19,566.00	\$84,786.00	2.0%
2.1 Investigation and Design \$\$0,24,94,2 30.00% \$\$18,074.83 \$\$76,324.25 2.2 Project Management Services \$\$4,518.71 30.00% \$\$13,556 \$\$587.43 2.3 Client Representation \$\$65,220.00 30% \$\$135,56 \$\$587.43 3.0 Property Acquisitions \$\$65,220.00 30% \$\$10,074.83 \$\$587.43 3.1 Professional Services \$\$0.00 30% \$\$135,56 \$\$887.43 3.1 Professional Services \$\$0.00 30% \$\$0.00 \$\$0.00 3.2 Property Acquisition Costs \$\$0.00 30% \$\$0.00 \$\$0.00 3.4 Project Management Services \$\$0.00 30% \$\$0.00 \$\$0.00 3.5 Client Representation \$\$0.00 30% \$\$0.00 \$\$0.00 4.1 Design, Approval & Construction \$\$15,214.50 30% \$\$4,564.35 \$\$19,778.85 4.2 Project Management Services \$\$17,040.24 30% \$\$12,27 \$\$1791.15 4.1 <	2.0	Investigation and Design	¢00.040.40	20.000/	¢40.074.00	¢70.004.00	
2.2 Project Management Services \$4,518.71 30.00% \$1,355.61 \$5,674.32 2.3 Client Representation \$65,220.00 30% \$19,566.00 \$84,786.00 2.0% 3.0 Property Acquisitions \$65,220.00 30% \$19,566.00 \$84,786.00 2.0% 3.1 Professional Services \$0.00 30% \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.3 Property Release Credit \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments \$15,214.50 30% \$4,564.35 \$19,778.85 4.1 Design, Approval & Construction \$11,217.16 30% \$365.15 \$15,82.31 4.2 Project Management Services \$1,1,217.16 30% \$24,564.35 \$19,778.85	2.1	Investigation and Design	\$60,249.42	30.00%	\$10,074.03	\$70,324.23	
2.3 Client Representation \$431.87 30.00% \$135.56 \$587.43 Sub Total \$65,220.00 30% \$19,566.00 \$84,786.00 2.0% 3.0 Property Acquisitions \$65,220.00 30% \$0.00 \$84,786.00 2.0% 3.1 Professional Services \$0.00 30% \$0.00	2.2	Project Management Services	\$4,518.71	30.00%	\$1,355.61	\$5,874.32	
Still Total \$65,220.00 30% \$19,565.00 \$84,766.00 2.0% 3.0 Property Acquisitions 2.0% </td <td>2.3</td> <td>Client Representation</td> <td>\$451.87</td> <td>30.00%</td> <td>\$135.56</td> <td>\$587.43</td> <td>0.0%</td>	2.3	Client Representation	\$451.87	30.00%	\$135.56	\$587.43	0.0%
3.0 Property Acquisitions Image: Figure Acquisitions 3.1 Professional Services \$0.00 30% \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.3 Property Release Credit \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments \$0.00 \$15,214.50 30% \$4,564.35 \$19,778.85 4.1 Design, Approval & Construction \$15,214.50 30% \$365.15 \$1,582.31 4.3 Client Representation \$608.58 30% \$182.57 \$791.15 5.0 Construction \$68,872.00 30% \$20,451.60 \$88,623.60 5.1 Preliminaries \$48,300.00 30% \$20,451.60 \$88,623.60 5.2 Environmental \$68,172.00 30% \$20,451.60 <td>2.0</td> <td>Sub I otal</td> <td>\$65,220.00</td> <td>30%</td> <td>\$19,566.00</td> <td>\$84,786.00</td> <td>2.0%</td>	2.0	Sub I otal	\$65,220.00	30%	\$19,566.00	\$84,786.00	2.0%
3.1 Professional Services \$0.00 30% \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.3 Property Release Credit \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 Sub Total \$0.00 30% \$0.00 \$0.00 Automatic Services 4.1 Design, Approval & Construction \$15,214.50 30% \$4,564.35 \$19,778.85 4.2 Project Management Services \$1,217.16 30% \$365.15 \$1,582.31 4.3 Client Representation \$608.58 30% \$182.57 \$791.15 Sub Total \$17,040.24 30% \$5,112.07 \$22,152.31 0.5% 5.0 Construction \$14,490.00 \$62,790.00 \$62,790.00 \$20,451.60 \$88,623.60 \$28,48,00.00 \$3,120,00.00 \$3,120,00.00 \$3,120,000.00 \$3,120,000.00 \$5. <td>3.0</td> <td>Property Acquisitions</td> <td>¢0.00</td> <td>0.00/</td> <td>\$0.00</td> <td>¢0.00</td> <td></td>	3.0	Property Acquisitions	¢0.00	0.00/	\$0.00	¢0.00	
3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.3 Property Release Credit \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 Sub Total \$0.00 30% \$0.00 \$0.00 Sub Total \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments \$15,214.50 30% \$4,564.35 \$19,778.85 4.1 Design, Approval & Construction \$15,214.50 30% \$455.15 \$1,582.31 4.2 Project Management Services \$1,217.16 30% \$512.07 \$22,152.31 0.5% Sub Total \$17,040.24 30% \$5112.07 \$22,152.31 0.5% 5.0 Construction \$68,8172.00 30% \$14,490.00 \$62,790.00 \$20,451.60 \$88,623.60 \$384,800.00 \$30.00 \$30.00 \$30.00 \$30.00 \$30.00 \$30.00 \$30.00	3.1	Professional Services	\$0.00	30%	\$0.00	\$0.00	
3.3 Property Release Credit \$1.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 4.1 Design, Approval & Construction \$15,214.50 30% \$4,564.35 \$19,778.85 4.2 Project Management Services \$1,217.16 30% \$365.15 \$1,582.31 4.3 Client Representation \$608.58 30% \$182.57 \$791.15 5.0 Construction \$17,040.24 30% \$20,451.60 \$88,623.60 5.1 Preliminaries \$48,300.00 \$0% \$14,490.00 \$62,790.00 5.2 Environmental \$68,172.00 30% \$88,800.00 \$384,800.00 5.3 Earthworks \$296,000.0	3.2	Property Acquisition Costs	\$0.00	30%	\$0.00	\$0.00	
3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 Sub Total \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments \$0.00 \$0.00 \$0.00 \$0.00 4.1 Design, Approval & Construction \$15,214.50 30% \$4,564.35 \$19,778.85 4.2 Project Management Services \$1,217.16 30% \$365.15 \$1,582.31 4.3 Client Representation \$608.58 30% \$182.57 \$791.15 Sub Total \$17,040.24 30% \$5,112.07 \$22,152.31 0.5% 5.0 Construction \$48,300.00 30% \$14,490.00 \$62,790.00 5.1 Preliminaries \$48,300.00 30% \$20,451.60 \$88,623.60 5.3 Earthworks \$296,000.00 30% \$88,800.00 \$384,800.00 \$364,800.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 \$0.00 \$0.00 \$	3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.5 Client Representation \$0.00 30% \$0.00 \$0.00 \$0.00 4.0 Public Utility Adjustments \$0.00	3.4	Project Management Services	\$0.00	30%	\$0.00	\$0.00	
Sub Total \$0.00 30% \$0.00 \$0.00 0.0% 4.0 Public Utility Adjustments 0.0% \$0.00 0.0% 4.1 Design, Approval & Construction \$15,214.50 30% \$4,564.35 \$19,778.85 4.2 Project Management Services \$1,217.16 30% \$365.15 \$1,582.31 4.3 Client Representation \$608.58 30% \$182.57 \$791.15 Sub Total \$17,040.24 30% \$5,112.07 \$22,152.31 0.5% 5.0 Construction \$17,040.24 30% \$14,490.00 \$62,790.00 5.1 Preliminaries \$48,300.00 30% \$14,490.00 \$62,790.00 5.2 Environmental \$68,172.00 30% \$20,451.60 \$88,623.60 5.3 Earthworks \$296,000.00 30% \$0.00 \$0.00 5.4 Drainage - Culvert Crossing \$0.00 \$0.00 \$0.00 \$0.00 5.5 Pavements	3.5	Client Representation	\$0.00	30%	\$0.00	\$0.00	0.00/
4.0 Public Utility Adjustments	4.0	Sub I otal	\$0.00	30%	\$0.00	\$0.00	0.0%
4.1 Design, Approval & Construction \$15,214.50 30% \$4,564.35 \$19,778.85 4.2 Project Management Services \$1,217.16 30% \$365.15 \$1,582.31 4.3 Client Representation \$608.58 30% \$182.57 \$791.15 Sub Total \$17,040.24 30% \$5,112.07 \$22,152.31 0.5% 5.0 Construction \$48,300.00 30% \$14,490.00 \$62,790.00 5.1 Preliminaries \$48,300.00 30% \$14,490.00 \$62,790.00 5.2 Environmental \$68,172.00 30% \$20,451.60 \$88,623.60 5.3 Earthworks \$296,000.00 30% \$80.00 \$384,800.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$720,000.00 \$3,120,000.00 5.5 Pavements \$2,400,000.00 30% \$0.00 \$0.00 \$0.00 5.6 Structures \$0.00 30% \$0.00 \$0.00 \$0.00	4.0	Public Utility Adjustments	A (F A (f A A A A A A A A A A	0.001	* 4 - * 4 - - -	A (A - - - - -	
4.2 Project Management Services \$1,217.16 30% \$365.15 \$1,582.31 4.3 Client Representation \$608.58 30% \$182.57 \$791.15 Sub Total \$17,040.24 30% \$5,112.07 \$22,152.31 0.5% 5.0 Construction \$1,982.31 \$1,040.24 30% \$1,420.00 \$22,152.31 0.5% 5.1 Preliminaries \$48,300.00 30% \$14,490.00 \$62,790.00 5.2 Environmental \$68,172.00 30% \$20,451.60 \$88,623.60 5.3 Earthworks \$296,000.00 30% \$88,800.00 \$384,800.00 5.4 Drainage - Culvert Crossing \$0.00 \$0.00 \$0.00 \$0.00 5.5 Pavements \$2,400,000.00 30% \$720,000.00 \$3,120,000.00 5.6 Structures \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	4.1	Design, Approval & Construction	\$15,214.50	30%	\$4,564.35	\$19,778.85	
4.3 Client Representation \$608.58 30% \$182.57 \$791.15 Sub Total \$17,040.24 30% \$5,112.07 \$22,152.31 0.5% 5.0 Construction \$68,300.00 30% \$14,490.00 \$62,790.00 5.1 Preliminaries \$48,300.00 30% \$14,490.00 \$62,790.00 5.2 Environmental \$68,172.00 30% \$20,451.60 \$88,623.60 5.3 Earthworks \$296,000.00 30% \$88,800.00 \$384,800.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$720,000.00 \$3,120,000.00 5.5 Pavements \$2,400,000.00 30% \$720,000.00 \$3,120,000.00 5.6 Structures \$0.00 \$0.00 \$0.00 \$0.00	4.2	Project Management Services	\$1,217.16	30%	\$365.15	\$1,582.31	
Sub Total \$17,040.24 30% \$5,112.07 \$22,152.31 0.5% 5.0 Construction 0.5% 0.5% 0.5% 0.5% 0.5% 0.5%	4.3	Client Representation	\$608.58	30%	\$182.57	\$791.15	
5.0 Construction \$48,300.00 30% \$14,490.00 \$62,790.00 5.1 Preliminaries \$68,172.00 30% \$20,451.60 \$88,623.60 5.3 Earthworks \$296,000.00 30% \$88,800.00 \$384,800.00 5.4 Drainage - Culvert Crossing \$0.00 \$0% \$0.00 \$0.00 5.5 Pavements \$2,400,000.00 30% \$720,000.00 \$3,120,000.00 5.6 Structures \$0.00 \$0.00 \$0.00 \$0.00		Sub Total	\$17,040.24	30%	\$5,112.07	\$22,152.31	0.5%
5.1 Preliminaries \$48,300.00 30% \$14,490.00 \$62,790.00 5.2 Environmental \$68,172.00 30% \$20,451.60 \$88,623.60 5.3 Earthworks \$296,000.00 30% \$88,800.00 \$384,800.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 5.5 Pavements \$2,400,000.00 30% \$720,000.00 \$3,120,000.00 5.6 Structures \$0.00 \$0.00 \$0.00 \$0.00	5.0	Construction	* 40,000,00	000/	* 44.400.00	* ~~ ~ ~ ~	
5.2 Environmental \$68,172.00 30% \$20,451.60 \$88,623.60 5.3 Earthworks \$296,000.00 30% \$88,800.00 \$384,800.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 5.5 Pavements \$2,400,000.00 30% \$720,000.00 \$3,120,000.00 5.6 Structures \$0.00 \$0.00 \$0.00	5.1	Preliminaries	\$48,300.00	30%	\$14,490.00	\$62,790.00	
5.3 Earthworks \$296,000.00 30% \$88,800.00 \$384,800.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 5.5 Pavements \$2,400,000.00 30% \$720,000.00 \$3,120,000.00 5.6 Structures \$0.00 30% \$0.00 \$0.00	5.2	Environmental	\$68,172.00	30%	\$20,451.60	\$88,623.60	
5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 5.5 Pavements \$2,400,000.00 30% \$720,000.00 \$3,120,000.00 5.6 Structures \$0.00 30% \$0.00 \$0.00	5.3	Earthworks	\$296,000.00	30%	\$88,800.00	\$384,800.00	
5.5 Pavements \$2,400,000.00 30% \$720,000.00 \$3,120,000.00 5.6 Structures \$0.00 30% \$0.00 \$0.00	5.4	Drainage - Culvert Crossing	\$0.00	30%	\$0.00	\$0.00	
5.6 Structures \$0.00 30% \$0.00 \$0.00 \$0.00	5.5	Pavements	\$2,400,000.00	30%	\$720,000.00	\$3,120,000.00	
	5.6	Structures	\$0.00	30%	\$0.00	\$0.00	
5.7 Intersections \$0.00 30% \$0.00 \$0.00	5.7	Intersections	\$0.00	30%	\$0.00	\$0.00	
5.8 Landscaping \$64,000.00 30% \$19,200.00 \$83,200.00	5.8	Landscaping	\$64,000.00	30%	\$19,200.00	\$83,200.00	
5.9 Site Management \$14,628.00 30% \$4,388.40 \$19,016.40	5.9	Site Management	\$14,628.00	30%	\$4,388.40	\$19,016.40	
6 Project Management Services \$138,000.00 30% \$41,400.00 \$179,400.00	6	Project Management Services	\$138,000.00	30%	\$41,400.00	\$179,400.00	
6.1 Client Representation \$13,800.00 30% \$4,140.00 \$17,940.00	6.1	Client Representation	\$13,800.00	30%	\$4,140.00	\$17,940.00	
Sub Total \$3,042,900.00 30% \$912,870.00 \$3,955,770.00 94.5%		Sub Total	\$3,042,900.00	30%	\$912,870.00	\$3,955,770.00	94.5%
	6.0	Handover	A07 000 10	000/	0.045.00	ADE 004 00	
b. I Project Data & Performance \$27,386.10 30% \$8,215.83 \$35,601.93 0.0 Data & Performance \$27,386.10 30% \$60,000 \$60	0.1	Project Data & Performance	\$27,386.10	30%	\$8,215.83	\$35,601.93	
b.2 Project initial gement Services \$3,042.90 30% \$912.87 \$3,955.77 0.0 Object Dispacement Services \$004.00 0004<	6.2	Project Management Services	\$3,042.90	30%	\$912.87	\$3,955.77	
b.3 Client Representation \$304.29 30% \$91.29 \$395.58	6.3		\$304.29	30%	\$91.29	\$395.58	4.00/
Sub lotal \$30,733.29 30% \$9,219.99 \$39,953.28 1.0%		Sub Total	\$30,733.29	30%	\$9,219.99	\$39,953.28	1.0%
lotal Estimate \$3,221,113.52 \$4,187,447.58 100.0%		Total Estimate	\$3,221,113.52			\$4,187,447.58	100.0%

Indicative Cost Estimate (\$ Million)

\$4.19



Summary of Costs - Edderton Rd Section 3 Assumptio

1.7 km of Type 2 (Edderton) RoadShoulder & Verge Works both sides for extent of upgradeMill and place additonal DGB across existing formation2 Coat Seal across new and existing pavement sections

	Itom	Estimate (\$) (excluding	Con	tingency	Estimate (\$) (including	% of Total
	item	contingency)	%	Amount (\$)	Contigency)	Estimate
1.0	Project Development					
1.1	Concept Design & Reporting	\$84,425.59	30%	\$25,327.68	\$109,753.27	
1.2	Project Management Services	\$6,331.92	30%	\$1,899.58	\$8,231.50	
1.3	Client Representation	\$633.19	30%	\$189.96	\$823.15	
	Sub Total	\$91,390.70	30%	\$27,417.21	\$118,807.91	2.0%
2.0	Investigation and Design					
2.1	Investigation and Design	\$84,425.59	30.00%	\$25,327.68	\$109,753.27	
2.2	Project Management Services	\$6,331.92	30.00%	\$1,899.58	\$8,231.50	
2.3	Client Representation	\$633.19	30.00%	\$189.96	\$823.15	
	Sub Total	\$91,390.70	30%	\$27,417.21	\$118,807.91	2.0%
3.0	Property Acquisitions					
3.1	Professional Services	\$0.00	30%	\$0.00	\$0.00	
3.2	Property Acquisition Costs	\$0.00	30%	\$0.00	\$0.00	
3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.4	Project Management Services	\$0.00	30%	\$0.00	\$0.00	
3.5	Client Representation	\$0.00	30%	\$0.00	\$0.00	
	Sub Total	\$0.00	30%	\$0.00	\$0.00	0.0%
4.0	Public Utility Adjustments					
4.1	Design, Approval & Construction	\$21,319.59	30%	\$6,395.88	\$27,715.47	
4.2	Project Management Services	\$1,705.57	30%	\$511.67	\$2,217.24	
4.3	Client Representation	\$852.78	30%	\$255.84	\$1,108.62	
	Sub Total	\$23,877.95	30%	\$7,163.38	\$31,041.33	0.5%
5.0	Construction					
5.1	Preliminaries	\$67,681.25	30%	\$20,304.38	\$87,985.63	
5.2	Environmental	\$95,527.25	30%	\$28,658.18	\$124,185.43	
5.3	Earthworks	\$399,500.00	30%	\$119,850.00	\$519,350.00	
5.4	Drainage - Culvert Crossing		30%	\$0.00	\$0.00	
5.5	Pavements	\$3,400,000.00	30%	\$1,020,000.00	\$4,420,000.00	
5.6	Structures	\$0.00	30%	\$0.00	\$0.00	
5.7	Intersections	\$0.00	30%	\$0.00	\$0.00	
5.8	Landscaping	\$68,000.00	30%	\$20,400.00	\$88,400.00	
5.9	Site Management	\$20,497.75	30%	\$6,149.33	\$26,647.08	
6	Project Management Services	\$193,375.00	30%	\$58,012.50	\$251,387.50	
6.1	Client Representation	\$19,337.50	30%	\$5,801.25	\$25,138.75	
	Sub Total	\$4,263,918.75	30%	\$1,279,175.63	\$5,543,094.38	95.4%
6.0	Handover					
6.1	Project Data & Performance	\$38,375.27	30%	\$11,512.58	\$49,887.85	
6.2	Project Management Services	\$4,263.92	30%	\$1,279.18	\$5,543.09	
6.3	Client Representation	\$426.39	30%	\$127.92	\$554.31	
	Sub Total	\$43,065.58	30%	\$12,919.67	\$55,985.25	1.0%
	Total Estimate	\$4,470,578.10			\$5,811,751.53	100.0%

Indicative Cost Estimate (\$ Million)

\$5.81



Summary of Costs - Edderton Rd Section 4

Assumptions

1.7 km of Type 2 (Edderton) Road

Shoulder & Verge Works both sides for extent of upgrade

2 Coat Seal across new and existing pavement sections

1.0 Project Development Standard (%) Standard (%) Standard (%) 1.1 Concept Design & Reporting \$54,015.01 30% \$19,204.50 \$83,219.51 1.3 Client Representation \$48,01.13 30% \$144.03 \$624.15 1.3 Client Representation \$48,01.13 30% \$19,204.50 \$83,219.51 2.0 Investigation and Design \$44,001.13 30.00% \$19,204.50 \$83,219.51 2.1 Investigation and Design \$64,015.01 30.00% \$19,204.50 \$83,219.51 2.2 Project Management Services \$44,801.13 30.00% \$19,204.50 \$83,219.51 3.0 Property Acquisitions \$440.01 30.00% \$14.0.3 \$624.15 3.0 Property Acquisition Costs \$0.00 \$0.00 \$0.00 \$0.00 3.1 Project Management Services \$0.00 \$0.00 \$0.00 \$0.00 3.4 Project Management Services \$0.00 \$0.00 \$0.00 \$0.00 3.4 Proje		Item	Estimate (\$) (excluding	Cont %	ingency Amount (\$)	Estimate (\$) (including Contigency)	% of Total Estimate
Instructure Super Evention State State 1.2 Project Management Services \$4,801.13 30% \$1,440.34 \$62,41.6 1.3 Client Representation \$44,801.13 30% \$1,440.34 \$62,41.6 2.0 Investigation and Design \$54,801.13 30.00% \$19,204.50 \$83,219.51 2.1 Investigation and Design \$64,015.01 30.00% \$19,204.50 \$83,219.51 2.2 Project Management Services \$4,801.13 30.00% \$1440.33 \$624.15 2.3 Client Representation \$480.11 30.00% \$1440.33 \$624.15 3.0 Project Management Services \$0.00 \$0.00 \$0.00 3.1 Project Management Services \$0.00 \$0.00 \$0.00 3.2 Project Management Services \$0.00 \$0.00 \$0.00 3.3 Project Management Services \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 \$0.00 \$0.00 \$0.00	10	Project Development		/0	Amount (ψ)	Sound Sound State	
1.2 Project Management Services \$4,801.13 30% \$1.44.03 \$6,241.46 1.3 Client Representation \$490.11 30% \$14.40.34 \$62,215 2.0 Investigation and Design \$64,015.01 30.00% \$19,204.50 \$83,219.51 2.1 Investigation and Design \$64,015.01 30.00% \$14.40.34 \$62,241.66 2.2 Project Management Services \$440.11 30.00% \$14.40.34 \$62,241.66 2.3 Client Representation \$400.11 30.00% \$144.03 \$62,241.66 3.1 Profestional Services \$0.00 30% \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.2 Property Regresentation \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$24,060 \$0.00 4.1 Design, Approval & Construction \$16,165,41 \$0% \$4,484,62 \$21,015.03 4.2 Projec	1.0	Concept Design & Reporting	\$64 015 01	30%	\$19 204 50	\$83 219 51	
1.2 Client Representation \$480.11 30% \$14.403 \$52.15 Sub Total \$59,26.25 30% \$20,768.87 \$90,085.12 2.0% 2.0 Investigation and Design \$64,015.01 30.00% \$19,204.50 \$83,219.51 2.2 Project Management Services \$48.01.13 30.00% \$14.40.3 \$62.41.6 2.3 Client Representation \$48.01.13 30.00% \$14.40.3 \$62.41.6 3.0 Project Management Services \$48.01.13 30.00% \$14.40.3 \$62.41.6 3.0 Property Acquisition Costs \$60.00 30% \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$30.00 \$0.00 4.1 Design, Approval & Construction \$16,165.41 30% \$48.489.62 \$21,015.03 4.2	12	Project Management Services	\$4 801 13	30%	\$1 440 34	\$6,241,46	
Sub Total \$59,296.25 30% \$20,788.87 \$90,085.12 2.0% 2.0 Investigation and Design \$64,015.01 30.00% \$19,204.50 \$83,219.51 \$2.0% 2.2 Project Management Services \$44.01.13 30.00% \$144.03 \$62,411.6 2.3 Client Representation \$480.11 30.00% \$144.03 \$62,411.6 3.0 Property Acquisitions \$480.11 \$0.00 \$50.00 \$50.00 3.1 Professional Services \$0.00 30% \$20,788.87 \$90,085.12 2.0% 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 \$0.00 3.3 Property Acquisition Costs \$0.00 30% \$0.00	1.2	Client Representation	\$480 11	30%	\$144.03	\$624 15	
2.0 Investigation and Design Display Display 2.1 Investigation and Design \$64,015.01 30.00% \$19,204.50 \$83,219.51 2.2 Project Management Services \$4,801.13 30.00% \$144.0.34 \$62,411.66 3.0 Property Acquisitions \$480.11 30.00% \$20,788.87 \$90,085.12 2.0% 3.0 Property Acquisitions \$40.00 30% \$0.00 \$0.00 \$0.00 3.1 Professional Services \$0.00 30% \$0.00 \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 \$0.00 3.3 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 </td <td></td> <td>Sub Total</td> <td>\$69.296.25</td> <td>30%</td> <td>\$20,788,87</td> <td>\$90.085.12</td> <td>2.0%</td>		Sub Total	\$69.296.25	30%	\$20,788,87	\$90.085.12	2.0%
2.1 Investigation and Design \$64,015.01 30.00% \$19,204.50 \$83,219.51 2.2 Project Management Services \$4,401.13 30.00% \$1,440.34 \$62,211.66 3.0 Project Management Services \$440.11 30.00% \$1,440.34 \$624.15 3.0 Property Acquisitions \$69,294.25 \$0% \$20,788.87 \$90,085.12 2.0% 3.1 Professional Services \$0.00 30% \$0.00 \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 5.0 Clent Representation \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments \$14,65.41 30% \$4,849,62 \$21,015.03 4.2 Project Management Services \$1,293.23 30% \$387.97 \$1,681.20 4.3 Client Representation \$18,4105.26 30% \$54.41.58 \$23,535.83 0.5	2.0	Investigation and Design					
2.2 Project Management Services \$4,801.13 30.00% \$1,440.34 \$62,41.46 2.3 Client Representation \$480.11 30.00% \$144.03 \$624.15 3.0 Property Acquisitions \$90,085.12 2.0% \$90,085.12 2.0% 3.1 Professional Services \$0.00 30% \$0.00 \$0.00 \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00	2.1	Investigation and Design	\$64,015.01	30.00%	\$19,204.50	\$83,219.51	
2.3 Client Representation \$480.11 30.00% \$144.03 \$624.15 Sub Total \$69,296.25 30% \$20,788.87 \$90,095.12 2.0% 3.0 Property Acquisitions \$0.00 30% \$0.00 \$0.0	2.2	Project Management Services	\$4,801.13	30.00%	\$1,440.34	\$6,241.46	
Sub Total \$69,296.25 30% \$20,788.87 \$90,085.12 2.0% 3.0 Property Acquisitions 30% \$0.00 <t< td=""><td>2.3</td><td>Client Representation</td><td>\$480.11</td><td>30.00%</td><td>\$144.03</td><td>\$624.15</td><td></td></t<>	2.3	Client Representation	\$480.11	30.00%	\$144.03	\$624.15	
3.0 Property Acquisitions 1 Professional Services \$0.00 30% \$0.00 \$0.00 3.1 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 \$0.00 3.2 Property Release Credit \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments \$0.00 \$0.00 \$0.00 \$0.00 4.1 Design, Approval & Construction \$16,165,41 30% \$387.97 \$1,681.20 4.2 Project Management Services \$12,93.23 \$30% \$543.62 \$21,015.03 4.2 Project Management Services \$14,29.23 \$30% \$387.97 \$1,681.20 4.3 Client Representation \$464.62 30% \$15,395.63 \$66,714.38 5.1 Preliminaries \$51,318.75 30% \$21,729.83 \$94,162.58		Sub Total	\$69,296.25	30%	\$20,788.87	\$90,085.12	2.0%
3.1 Professional Services \$0.00 30% \$0.00 \$0.00 3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.3 Property Release Credit \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments 4 4 1 Design, Approval & Construction \$16,165.41 30% \$4,849,62 \$21,015.03 4.2 Project Management Services \$12,93.23 30% \$387.97 \$1,681.20 4.3 Client Representation \$646.62 30% \$13.93.8 \$840.60 5.0 Construction \$14,105.26 30% \$15,395.63 \$66,714.38 5.1 Preliminaries \$51,318.75 30% \$15,395.63 \$66,714.38 5.2 Environmental \$72,432.75 30% \$20.00 \$40,865.00 5.4 Drainage - Culvert Crossing \$0.00 \$0.00 \$0.00	3.0	Property Acquisitions					
3.2 Property Acquisition Costs \$0.00 30% \$0.00 \$0.00 3.3 Property Release Credit \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 5 Client Representation \$0.00 30% \$0.00 \$0.00 Sub Total 4.0 Public Utility Adjustments \$0.00 \$0.00 \$0.00 \$0.00 4.1 Design, Approval & Construction \$16,165,41 30% \$387.97 \$1,681.20 4.2 Project Management Services \$12,93.23 30% \$133.98 \$24,568.3 0.5% 5.0 Construction \$16,165,41 30% \$15,395.63 \$26,6714.38 \$23,568.3 0.5% 5.2 Environmental \$72,432.75 30% \$21,729.83 \$84,162.58 \$366,714.38 5.3 Earthworks \$314,500.00 30% \$50.00 \$0.00 \$0.00 \$0.00 \$3,315,000.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	3.1	Professional Services	\$0.00	30%	\$0.00	\$0.00	
3.3 Property Release Credit \$0.00 30% \$0.00 \$0.00 3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 4.0 Public Utility Adjustments \$0.00 \$0.00 \$0.00 \$0.00 4.1 Design, Approval & Construction \$16,165,41 30% \$4,849,62 \$21,015,03 4.2 Project Management Services \$14,1293,23 30% \$\$4,849,62 \$\$21,015,03 4.2 Project Management Services \$14,1293,23 30% \$\$193,98 \$\$840,60 5.0 Construction \$16,165,41 30% \$\$15,395,63 \$\$66,714.38 5.0 Construction \$\$15,318,75 30% \$\$15,395,63 \$\$66,714.38 5.2 Environmental \$\$72,432,75 30% \$\$21,728,33 \$\$94,162,58 5.3 Earthworks \$\$314,500,00 30% \$\$0.00 \$\$0.00 5.4 Draiaage - Culvert Crossing	3.2	Property Acquisition Costs	\$0.00	30%	\$0.00	\$0.00	
3.4 Project Management Services \$0.00 30% \$0.00 \$0.00 3.5 Client Representation \$0.00 30% \$0.00 \$0.00 \$0.00 3.6 Client Representation \$0.00 30% \$0.00 \$0.00 \$0.00 4.0 Public Utility Adjustments \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 4.1 Design, Approval & Construction \$16,165,41 30% \$4,849,62 \$21,015,03 4.2 Project Management Services \$1,293,23 30% \$387.97 \$1,681,20 4.3 Client Representation \$646,62 30% \$193,98 \$840,60 5.0 Construction \$18,105,26 30% \$21,729,83 \$844,162,58 5.1 Preliminaries \$51,318,75 30% \$21,729,83 \$94,182,58 5.2 Environmental \$72,432,75 30% \$20,000 \$408,850,00 5.4 Drainage - Culvert Crossing \$20,000 30% \$0.00 \$33,315,000,00 <td< td=""><td>3.3</td><td>Property Release Credit</td><td>\$0.00</td><td>30%</td><td>\$0.00</td><td>\$0.00</td><td></td></td<>	3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.5 Client Representation \$0.00 30% \$0.00 \$0.00 Sub Total \$0.00 30% \$0.00 \$0.00 \$0.00 4.0 Public Utility Adjustments 4.1 Design, Approval & Construction \$16,165,41 30% \$4,849,62 \$21,015,03 4.2 Project Management Services \$1,293,23 30% \$387.97 \$1,681,20 4.3 Client Representation \$646,62 30% \$193,98 \$840,60 Sub Total \$12,93,23 30% \$15,395,63 \$66,714,38 5.0 Construction \$51,318,75 30% \$15,395,63 \$66,714,38 5.1 Preliminaries \$51,318,75 30% \$21,729,83 \$94,162,58 5.3 Earthworks \$314,500,00 30% \$20,00 \$0,00 5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 5.4 Bardement \$15,542,55 30% \$20,400,00 \$88,400,00 5.8	3.4	Project Management Services	\$0.00	30%	\$0.00	\$0.00	
Sub Total \$0.00 30% \$0.00 \$0.00 0.0% 4.0 Public Utility Adjustments 5.00 \$0.00 \$0.0% \$0.00 \$0.0% 4.1 Design, Approval & Construction \$16,165.41 30% \$4,849.62 \$21,015.03 \$4,681.20 4.2 Project Management Services \$1,293.23 30% \$193.98 \$840.60 5.0 Construction \$16,165.241 30% \$5,431.58 \$23,536.83 0.5% 5.0 Construction \$18,105.26 30% \$15,395.63 \$66,714.38 \$23,536.83 0.5% 5.2 Environmental \$72,432.75 30% \$21,729.83 \$94,162.58 \$36,000 \$408,850.00 \$408,850.00 \$408,850.00 \$408,850.00 \$40,000 \$5,943,350.00 \$40,000 \$3,315,000.00 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000 \$0,000	3.5	Client Representation	\$0.00	30%	\$0.00	\$0.00	
4.0 Public Utility Adjustments Image: State Structure State State Structure State State State Structure State Stat		Sub Total	\$0.00	30%	\$0.00	\$0.00	0.0%
4.1 Design, Approval & Construction \$16,165.41 30% \$4,849.62 \$21,015.03 4.2 Project Management Services \$1,293.23 30% \$387.97 \$1,681.20 4.3 Client Representation \$646.62 30% \$193.98 \$840.60 5.0 Construction \$18,105.26 30% \$5,431.58 \$223,536.83 0.5% 5.0 Construction \$18,105.26 30% \$5,431.58 \$23,536.83 0.5% 5.1 Preliminaries \$51,318.75 30% \$15,395.63 \$66,714.38 5.2 Environmental \$72,432.75 30% \$21,729.83 \$94,162.58 5.3 Earthworks \$314,500.00 30% \$0.00 \$0.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 5.6 Structures \$0.00 30% \$0.00 \$0.00 \$0.00 5.7 Intersections \$0.00 30% \$20,400.00 \$88,400.00 \$0.00 5.8 Landscaping \$68,000.00 30% \$4,626.88 \$20,204.93 \$	4.0	Public Utility Adjustments					
4.2 Project Management Services \$1,293.23 30% \$387.97 \$1,681.20 4.3 Client Representation \$646.62 30% \$193.98 \$840.60 Sub Total \$18,105.26 30% \$5,431.58 \$23,536.83 0.5% 5.0 Construction 5.1 Preliminaries \$51,318.75 30% \$15,395.63 \$66,714.38 5.2 Environmental \$72,432.75 30% \$21,729.83 \$94,162.58 5.3 Earthworks \$314,500.00 30% \$94,350.00 \$408,850.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$765,000.00 \$3,315,000.00 5.5 Pavements \$2,550,000.00 30% \$765,000.00 \$3,315,000.00 5.6 Structures \$0.00 30% \$20,400.00 \$88,400.00 5.7 Intersections \$66,000.00 30% \$20,400.00 \$88,400.00 5.8 Landscaping \$66,000.00 30% \$4,662.68 \$20,204.93 6 Project Management Services \$14,662.50 30% \$4,3987.	4.1	Design, Approval & Construction	\$16,165.41	30%	\$4,849.62	\$21,015.03	
4.3 Client Representation \$646.62 30% \$193.98 \$840.60 Sub Total \$18,105.26 30% \$5,431.58 \$23,536.83 0.5% 5.0 Construction \$18,105.26 30% \$15,395.63 \$23,536.83 0.5% 5.1 Preliminaries \$51,318.75 30% \$15,395.63 \$66,714.38 5.2 Environmental \$72,432.75 30% \$21,729.83 \$94,162.58 5.3 Earthworks \$314,500.00 30% \$90.00 \$408,850.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 5.5 Pavements \$2,550,000.00 30% \$0.00 \$0.00 5.6 Structures \$0.00 30% \$20,000 \$0.00 5.7 Intersections \$0.00 30% \$20,000 \$88,400.00 5.8 Landscaping \$66,00.00 30% \$4,662.68 \$20,204.93 6.1 Client Representation \$14,662.50 30% \$4,398.	4.2	Project Management Services	\$1,293.23	30%	\$387.97	\$1,681.20	
Sub Total \$18,105.26 30% \$5,431.58 \$23,536.83 0.5% 5.0 Construction \$51,318.75 30% \$15,395.63 \$66,714.38 \$52,520,000 \$54,21,729.83 \$94,162.58 \$53,250,000 \$94,350,00 \$408,850,00 \$54,21,729,83 \$94,162.58 \$53,250,000,00 \$0% \$94,350,00 \$408,850,00 \$54,4162,58 \$53,2550,000,00 \$00% \$0,00 \$50,000,00 <td>4.3</td> <td>Client Representation</td> <td>\$646.62</td> <td>30%</td> <td>\$193.98</td> <td>\$840.60</td> <td></td>	4.3	Client Representation	\$646.62	30%	\$193.98	\$840.60	
5.0 Construction 5.1 Preliminaries \$\$1,318.75 30% \$15,395.63 \$66,714.38 5.2 Environmental \$72,432.75 30% \$21,729.83 \$94,162.58 5.3 Earthworks \$314,500.00 30% \$94,350.00 \$408,850.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$90.00 \$408,850.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$90.00 \$0.00 5.5 Pavements \$2,550,000.00 30% \$0.00 \$3,315,000.00 5.6 Structures \$0.00 30% \$0.00 \$0.00 5.7 Intersections \$0.00 30% \$20,400.00 \$0.00 5.8 Landscaping \$68,000.00 30% \$44,662.68 \$20,204.93 6 Project Management Services \$146,62.50 30% \$44,398.75 \$19,061.25 6.1 Client Representation \$14,662.50 30% \$8,729.32 \$37,827.05		Sub Total	\$18,105.26	30%	\$5,431.58	\$23,536.83	0.5%
5.1 Preliminaries \$\$51,318.75 30% \$\$15,395.63 \$\$66,714.38 5.2 Environmental \$72,432.75 30% \$\$21,729.83 \$\$94,162.58 5.3 Earthworks \$\$314,500.00 30% \$\$94,350.00 \$\$408,850.00 5.4 Drainage - Culvert Crossing \$\$0.00 30% \$\$0.00 \$\$0.00 5.5 Pavements \$\$2,550,000.00 30% \$\$765,000.00 \$\$3,315,000.00 5.6 Structures \$\$0.00 30% \$\$0.00 \$\$0.00 5.7 Intersections \$\$0.00 30% \$\$0.00 \$\$0.00 5.8 Landscaping \$\$68,000.00 30% \$\$0.00 \$\$88,400.00 5.8 Landscaping \$\$68,000.00 30% \$\$4,662.68 \$\$20,204.93 6 Project Management Services \$\$14,662.500 30% \$\$4,398.75 \$\$19,061.25 6.1 Client Representation \$\$14,662.500 30% \$\$4,398.75 \$\$19,061.25 6.2 Project Data & Performance \$\$29,097.73 30% \$\$8,729.32 \$\$37,827.05 6.2 Pro	5.0	Construction					
5.2 Environmental \$72,432.75 30% \$21,729.83 \$94,162.58 5.3 Earthworks \$314,500.00 30% \$94,350.00 \$408,850.00 5.4 Drainage - Culvert Crossing \$0.00 30% \$0.00 \$0.00 5.5 Pavements \$2,550,000.00 30% \$765,000.00 \$3,315,000.00 5.6 Structures \$0.00 \$0% \$0.00 \$0.00 5.7 Intersections \$0.00 30% \$0.00 \$0.00 5.8 Landscaping \$68,000.00 30% \$20,400.00 \$88,400.00 5.8 Landscaping \$68,000.00 30% \$4,662.68 \$20,204.93 6. Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$43,987.50 \$190,612.50 6.0 Handover \$3,233,081.25 30% \$86,729.32 \$37,827.05 \$44,203,005.63 94.5% 6.0 Handover \$3,233.08 30% \$8,699.92 \$4,203.01 \$32,654.12 \$30%	5.1	Preliminaries	\$51,318.75	30%	\$15,395.63	\$66,714.38	
5.3 Earthworks \$314,500.00 30% \$94,350.00 \$408,850.00 5.4 Drainage - Culvert Crossing \$0.00 \$0.00 \$0.00 \$0.00 5.5 Pavements \$2,550,000.00 30% \$765,000.00 \$3,315,000.00 5.6 Structures \$0.00 30% \$0.00 \$0.00 5.7 Intersections \$0.00 30% \$0.00 \$0.00 5.8 Landscaping \$68,000.00 30% \$20,400.00 \$88,400.00 5.9 Site Management \$115,542.25 30% \$44,662.68 \$20,204.93 6 Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$4,398.75 \$19,061.25 6.0 Handover \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 \$442	5.2	Environmental	\$72,432.75	30%	\$21,729.83	\$94,162.58	
5.4 Drainage - Culvert Crossing \$0.00 \$0.00 \$0.00 \$0.00 5.5 Pavements \$2,550,000.00 \$0.00 \$3,315,000.00 5.6 Structures \$0.00 \$0.00 \$0.00 5.7 Intersections \$0.00 \$0.00 \$0.00 5.8 Landscaping \$68,000.00 \$0.00 \$0.00 5.9 Site Management \$15,542.25 30% \$4,662.68 \$20,204.93 6 Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$4,398.75 \$190,612.50 6.1 Project Data & Performance \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover \$3,233,08 30% \$969,924.38 \$4,203,005.63 94.5% 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 6.3 Client Representation \$32,231 <td>5.3</td> <td>Earthworks</td> <td>\$314,500.00</td> <td>30%</td> <td>\$94,350.00</td> <td>\$408,850.00</td> <td></td>	5.3	Earthworks	\$314,500.00	30%	\$94,350.00	\$408,850.00	
5.5 Pavements \$2,550,000.00 30% \$765,000.00 \$3,315,000.00 5.6 Structures \$0.00 30% \$0.00 \$0.00 5.7 Intersections \$0.00 30% \$0.00 \$0.00 5.8 Landscaping \$68,00.00 30% \$20,400.00 \$88,400.00 5.9 Site Management \$15,542.25 30% \$4,662.68 \$20,204.93 6 Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$4,398.75 \$19,061.25 Sub Total \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover \$3,233,081.25 30% \$8,729.32 \$37,827.05 \$37,827.05 6.2 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 \$4,203.01 6.3 Client Representation \$32,33.08 30% \$969.92 \$4,203.01 \$32,654.12 30% \$96.99 \$420.30 \$420.30 Sub T	5.4	Drainage - Culvert Crossing	\$0.00	30%	\$0.00	\$0.00	
5.6 Structures \$0.00 \$0.00 \$0.00 5.7 Intersections \$0.00 \$0.00 \$0.00 5.8 Landscaping \$68,000.00 \$0% \$20,400.00 \$88,400.00 5.9 Site Management \$15,542.25 30% \$4,662.68 \$20,204.93 6 Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$44,398.75 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$44,398.75 \$190,612.50 6.0 Handover \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 \$4,203.01 6.2 Project Management Services \$3,233.08 30% \$96.99 \$42.03.01 \$32,654.12 30% \$9,796.24 \$42,450.36 1.0% \$3,422,433.12	5.5	Pavements	\$2,550,000.00	30%	\$765,000.00	\$3,315,000.00	
5.7 Intersections \$0.00 \$0.00 \$0.00 5.8 Landscaping \$68,000.00 30% \$20,400.00 \$88,400.00 5.9 Site Management \$15,542.25 30% \$4,662.68 \$20,204.93 6 Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$44,398.75 \$19,061.25 Sub Total \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 6.3 Client Representation \$32,33.1 30% \$96.99 \$420.30 Sub Total \$32,654.12 30% \$9,796.24 \$42,450.36 1.0%	5.6	Structures	\$0.00	30%	\$0.00	\$0.00	
5.8 Landscaping \$68,000.00 30% \$20,400.00 \$88,400.00 5.9 Site Management \$115,542.25 30% \$4,662.68 \$20,204.93 6 Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$4,398.75 \$19,061.25 Sub Total \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 6.3 Client Representation \$32,654.12 30% \$96.99 \$420.30 Sub Total \$32,654.12 30% \$9,796.24 \$42,450.36 1.0%	5.7	Intersections	\$0.00	30%	\$0.00	\$0.00	
5.9 Site Management \$15,542.25 30% \$4,662.68 \$20,204.93 6 Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$4,398.75 \$19,061.25 Sub Total \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 6.3 Client Representation \$32,33.1 30% \$96.99 \$420.30 Total Estimate \$3,422,433.12 \$0% \$9,796.24 \$44,04,053.06 1.0%	5.8	Landscaping	\$68,000.00	30%	\$20,400.00	\$88,400.00	
6 Project Management Services \$146,625.00 30% \$43,987.50 \$190,612.50 6.1 Client Representation \$14,662.50 30% \$4,398.75 \$19,061.25 Sub Total \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover \$29,097.73 30% \$8,729.32 \$37,827.05 6.1 Project Data & Performance \$29,097.73 30% \$969.924.38 \$44,203,005.63 94.5% 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 6.3 Client Representation \$32,33.13 30% \$96.99 \$420.30 Sub Total \$32,654.12 30% \$9,796.24 \$42,450.36 1.0%	5.9	Site Management	\$15,542.25	30%	\$4,662.68	\$20,204.93	
6.1 Client Representation \$14,662.50 30% \$4,398.75 \$19,061.25 Sub Total \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover \$3,233,081.25 30% \$8,729.32 \$37,827.05 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.922 \$4,203.01 6.3 Client Representation \$323.31 30% \$969.99 \$420.30 Total Fetimate	6	Project Management Services	\$146,625.00	30%	\$43,987.50	\$190,612.50	
Sub Total \$3,233,081.25 30% \$969,924.38 \$4,203,005.63 94.5% 6.0 Handover 94.5% 94.5% 94.5% 94.5% 94.5% 94.5% 94.5%	6.1	Client Representation	\$14,662.50	30%	\$4,398.75	\$19,061.25	
6.0 Handover 6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 6.3 Client Representation \$32,331 30% \$96.99 \$4420.30 Total Estimate		Sub Total	\$3,233,081.25	30%	\$969,924.38	\$4,203,005.63	94.5%
6.1 Project Data & Performance \$29,097.73 30% \$8,729.32 \$37,827.05 6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 6.3 Client Representation \$32,331 30% \$96.99 \$420.30 Sub Total \$32,654.12 30% \$9,796.24 \$42,450.36 1.0% Total Estimate \$3,422,433.12 \$12 \$100.0%	6.0	Handover					
6.2 Project Management Services \$3,233.08 30% \$969.92 \$4,203.01 6.3 Client Representation \$32,331 30% \$96.99 \$420.30 Sub Total \$32,654.12 30% \$9,796.24 \$42,450.36 1.0% Total Estimate	6.1	Project Data & Performance	\$29,097.73	30%	\$8,729.32	\$37,827.05	
6.3 Client Representation \$323.31 30% \$96.99 \$420.30 Sub Total \$32,654.12 30% \$9,796.24 \$42,450.36 1.0% Total Estimate \$3,422,433.12 S0% \$4,440.163.06 100.0%	6.2	Project Management Services	\$3,233.08	30%	\$969.92	\$4,203.01	
Sub Total \$32,654.12 30% \$9,796.24 \$42,450.36 1.0% Total Estimate \$3,422,433.12 \$4,440,163.06 1.00.0%	6.3	Client Representation	\$323.31	30%	\$96.99	\$420.30	
Total Estimate 53/22/23/22 1 1 1 64/4/0.462.06 400.00/		Sub Total	\$32,654.12	30%	\$9,796.24	\$42,450.36	1.0%
Iotal Estimate \$\phi\\$,422,433.12 \$\phi\\$4,443,103.00 100.0%		Total Estimate	\$3,422,433.12			\$4,449,163.06	100.0%

Indicative Cost Estimate (\$ Million)

\$4.45

Muswellbrook Mine Affected Road Network

Summary of Costs - Edderton Rd South Option 1 Assumptions

5.6 km of Type 2 (Edderton) Road

2 lane pavement with 2m shoulder

One minor pipe culvert Five culvert crossings - various sizes

One bridge crossing

	Itom	Estimate (\$) (excluding	Co	ntingency	Estimate (\$) (including	% of Total
	item	contingency)	%	Amount (\$)	Contigency)	Estimate
1.0	Project Development					
1.1	Concept Design & Reporting	\$461,034.96	30%	\$138,310.49	\$599,345.44	
1.2	Project Management Services	\$34,577.62	30%	\$10,373.29	\$44,950.91	
1.3	Client Representation	\$3,457.76	30%	\$1,037.33	\$4,495.09	
	Sub Total	\$499,070.34	30%	\$149,721.10	\$648,791.44	2.0%
2.0	Investigation and Design					
2.1	Investigation and Design	\$461,034.96	30.00%	\$138,310.49	\$599,345.44	
2.2	Project Management Services	\$34,577.62	30.00%	\$10,373.29	\$44,950.91	
2.3	Client Representation	\$3,457.76	30.00%	\$1,037.33	\$4,495.09	
	Sub Total	\$499,070.34	30%	\$149,721.10	\$648,791.44	2.0%
3.0	Property Acquisitions					
3.1	Professional Services	\$28,500.00	30%	\$8,550.00	\$37,050.00	
3.2	Property Acquisition Costs	\$1,110,000.00	30%	\$333,000.00	\$1,443,000.00	
3.3	Property Release Credit	-\$540,000.00	30%	-\$162,000.00	-\$702,000.00	
3.4	Project Management Services	\$37,050.00	30%	\$11,115.00	\$48,165.00	
3.5	Client Representation	\$28,500.00	30%	\$8,550.00	\$37,050.00	
	Sub Total	\$664,050.00	30%	\$199,215.00	\$863,265.00	2.7%
4.0	Public Utility Adjustments					
4.1	Design, Approval & Construction	\$116,422.97	30%	\$34,926.89	\$151,349.86	
4.2	Project Management Services	\$9,313.84	30%	\$2,794.15	\$12,107.99	
4.3	Client Representation	\$4,656.92	30%	\$1,397.08	\$6,053.99	
	Sub Total	\$130,393.73	30%	\$39,118.12	\$169,511.84	0.5%
5.0	Construction					
5.1	Preliminaries	\$359,056.25	30%	\$107,716.88	\$466,773.13	
5.2	Environmental	\$506,782.25	30%	\$152,034.68	\$658,816.93	
5.3	Earthworks	\$2,770,500.00	30%	\$831,150.00	\$3,601,650.00	
5.4	Drainage - Culvert Crossings	\$1,500,000.00	30%	\$450,000.00	\$1,950,000.00	
5.5	Pavements	\$13,875,000.00	30%	\$4,162,500.00	\$18,037,500.00	
5.6	Structures - Bridge	\$1,750,000.00	30%	\$525,000.00	\$2,275,000.00	
5.7	Intersections	\$400,000.00	30%	\$120,000.00	\$520,000.00	
5.8	Landscaping	\$222,000.00	30%	\$66,600.00	\$288,600.00	
5.9	Site Management	\$108,742.75	30%	\$32,622.83	\$141,365.58	
6	Project Management Services	\$1,025,875.00	30%	\$307,762.50	\$1,333,637.50	
6.1	Client Representation	\$102,587.50	30%	\$30,776.25	\$133,363.75	
	Sub Total	\$22,620,543.75	30%	\$6,786,163.13	\$29,406,706.88	91.8%
6.0	Handover	\$000 F3 (3)	0.00/	***	\$070 (CC	
6.1	Project Data & Performance	\$209,561.34	30%	\$62,868.40	\$272,429.75	
6.2	Project Management Services	\$23,284.59	30%	\$6,985.38	\$30,269.97	
6.3	Client Representation	\$2,328.46	30%	\$698.54	\$3,027.00	4.00/
	Sub Total	\$235,174.40	30%	\$70,552.32	\$305,726.72	1.0%
	I otal Estimate	\$24,648,302.55			\$32,042,793.32	100.0%

Indicative Cost Estimate (\$ Million)

\$32.04

Muswellbrook Mine Affected Road Network

Summary of Costs - Edderton Rd South Option 2 Assumptions

> 3.7 km of Type 2 (Edderton) Road 2 lane pavement with 2m shoulder Three large pipe culverts Two box culverts

One Bridge Crossings

74,000m2 land acquisition

	Item	Estimate (\$) (excluding	Cor	ntingency	Estimate (\$) (including	% of Total
	item	contingency)	%	Amount (\$)	Contigency)	Estimate
1.0	Project Development					1
1.1	Concept Design & Reporting	\$318,630.76	30%	\$95,589.23	\$414,219.98	1
1.2	Project Management Services	\$23,897.31	30%	\$7,169.19	\$31,066.50	1
1.3	Client Representation	\$2,389.73	30%	\$716.92	\$3,106.65	
	Sub Total	\$344,917.79	30%	\$103,475.34	\$448,393.13	2.0%
2.0	Investigation and Design					1
2.1	Investigation and Design	\$318,630.76	30.00%	\$95,589.23	\$414,219.98	1
2.2	Project Management Services	\$23,897.31	30.00%	\$7,169.19	\$31,066.50	1
2.3	Client Representation	\$2,389.73	30.00%	\$716.92	\$3,106.65	
	Sub Total	\$344,917.79	30%	\$103,475.34	\$448,393.13	2.0%
3.0	Property Acquisitions					1
3.1	Professional Services	\$10,000.00	30%	\$3,000.00	\$13,000.00	1
3.2	Property Acquisition Costs	\$740,000.00	30%	\$222,000.00	\$962,000.00	1
3.3	Property Release Credit	-\$540,000.00	30%	-\$162,000.00	-\$702,000.00	1
3.4	Project Management Services	\$13,000.00	30%	\$3,900.00	\$16,900.00	1
3.5	Client Representation	\$10,000.00	30%	\$3,000.00	\$13,000.00	l
	Sub Total	\$233,000.00	30%	\$69,900.00	\$302,900.00	1.4%
4.0	Public Utility Adjustments					1
4.1	Design, Approval & Construction	\$80,462.31	30%	\$24,138.69	\$104,601.01	1
4.2	Project Management Services	\$6,436.99	30%	\$1,931.10	\$8,368.08	1
4.3	Client Representation	\$3,218.49	30%	\$965.55	\$4,184.04	L
	Sub Total	\$90,117.79	30%	\$27,035.34	\$117,153.13	0.5%
5.0	Construction					1
5.1	Preliminaries	\$251,737.50	30%	\$75,521.25	\$327,258.75	1
5.2	Environmental	\$355,309.50	30%	\$106,592.85	\$461,902.35	1
5.3	Earthworks	\$2,427,000.00	30%	\$728,100.00	\$3,155,100.00	1
5.4	Drainage - Culvert Crossings	\$660,000.00	30%	\$198,000.00	\$858,000.00	1
5.5	Pavements	\$9,250,000.00	30%	\$2,775,000.00	\$12,025,000.00	1
5.6	Structures - Bridge	\$1,500,000.00	30%	\$450,000.00	\$1,950,000.00	1
5.7	Intersections	\$400,000.00	30%	\$120,000.00	\$520,000.00	1
5.8	Landscaping	\$148,000.00	30%	\$44,400.00	\$192,400.00	1
5.9	Site Management	\$76,240.50	30%	\$22,872.15	\$99,112.65	1
6	Project Management Services	\$719,250.00	30%	\$215,775.00	\$935,025.00	1
6.1	Client Representation	\$71,925.00	30%	\$21,577.50	\$93,502.50	
	Sub Total	\$15,859,462.50	30%	\$4,757,838.75	\$20,617,301.25	93.1%
6.0	Handover					
6.1	Project Data & Performance	\$144,832.16	30%	\$43,449.65	\$188,281.81	l
6.2	Project Management Services	\$16,092.46	30%	\$4,827.74	\$20,920.20	l
6.3	Client Representation	\$1,609.25	30%	\$482.77	\$2,092.02	
	Sub Total	\$162,533.87	30%	\$48,760.16	\$211,294.03	1.0%
	Total Estimate	\$17,034,949.75			\$22,145,434.68	100.0%

Indicative Cost Estimate (\$ Million)

\$22.15

Muswellbrook Mine Affected Road Network

Summary of Costs - Reedy Creek Road

Assumptio

1.5 km of Type 1 Road

Minor shoulder & Verge Works for extent of upgrade

2 Coat Seal across new and existing pavement sections

Minor Intersection Upgrades each end

One minor culvert installation

	ltem	Estimate (\$) (excluding	Cont	tingency	Estimate (\$) (including	% of Total
1.0	Project Development	contingency)	%	Amount (\$)	Contigency)	Estimate
	Concert Decign & Deporting	¢55 474 00	200/	¢16 550 00	¢74 706 00	
	Concept Design & Reporting	\$00,174.00 ¢4.129.05	20%	\$10,002.22	\$71,720.20 \$5,270,47	
	Client Depresentation	φ4,130.00 ¢442.04	30%	\$1,241.42	\$0,079.47 \$527.05	
1.3	Client Representation	\$413.81	30%	\$124.14	\$037.90 \$77.642.70	2.0%
20	Investigation and Design	\$39,123.9Z	30 /0	φ17, 3 17.70	\$77,043.70	2.0 /0
	Investigation and Design	¢55 174 06	20.00%	¢16 550 00	¢71 706 00	
	Dreiget Management Services	\$33,174.00 ¢4.429.05	30.00%	\$10,552.22	\$71,720.20 \$5,270,47	
	Client Representation	φ4,130.00 ¢412.01	20.00%	\$1,241.42 \$124.14	\$0,079.47 \$527.05	
2.3	Cilent Representation	\$413.01 \$50,725,02	200/	\$124.14	\$007.90 \$77.642.70	2.0%
3.0	Broporty Acquisitions	\$09,120.9Z	30%	φ1 <i>1,</i> 91 <i>1.1</i> 0	\$77,043.7U	2.0%
2.1	Professional Services	¢0.00	20%	\$0.00	00.02	
22	Property Acquisition Costs	\$0.00 ¢0.00	30%	\$0.00	\$0.00 \$0.00	
3.2	Property Acquisition Costs	\$0.00 ¢0.00	20%	\$0.00	\$0.00 ¢0.00	
0.0	Property Release Credit	\$0.00 ¢0.00	20%	\$0.00	\$0.00	
3.4	Client Representation	\$0.00	20%	\$0.00	\$0.00 \$0.00	
3.5	Cilent Representation	\$0.00	20%	\$0.00	\$0.00	0.0%
10	Bublic Utility Adjustments	\$U.UU	30%	\$0.00	ş0.00	0.0%
4.0	Public Otility Adjustments	¢12 022 84	20%	¢/ 170.95	¢19,110,70	
4.1	Design, Approval & Construction	¢1.114.62	20%	φ4,179.00 ¢224.20	\$10,112.70 \$1,440.02	
4.2	Client Penrecentation	φ1,114.00 ¢557.21	20%	\$334.39	\$1,445.02 \$704.51	
4.5	Sub Total	\$37.31 \$15.604.79	30%	\$4 681 44	¢724.31	0.5%
5.0	Construction	\$10,004.7 <i>9</i>	30 /0	φ 4 ,001.44	\$20,200.22	0.5 /0
5 1	Preliminaries	\$44 231 25	30%	\$13,269,38	\$57 500 63	
52	Environmental	\$62,429,25	30%	\$18,728,78	\$81 158 03	
5.3	Farthworks	\$202,500.00	30%	\$60,750,00	\$263,250,00	
5.0	Drainage - Culvert Crossing	\$20,000,00	30%	\$6,000,00	\$26,000,00	
55	Pavements	\$1 875 000 00	30%	\$562,500,00	\$2,437,500,00	
5.0	Structures	\$0.00	30%	\$0.00	¢2,+07,500.00 \$0.00	
57	Intersections	\$400,000,00	30%	\$120,000,00	\$520,000,00	
5.8	Landscaping	\$30,000,00	30%	\$9,000,00	\$39,000,00	
5.9	Site Management	\$13,395,75	30%	\$4 018 73	\$17 414 48	
6	Project Management Services	\$126,375,00	30%	\$37 912 50	\$164 287 50	
61	Client Representation	\$12,637,50	30%	\$3 791 25	\$16 428 75	
	Sub Total	\$2 786 568 75	30%	\$835,970,63	\$3 622 539 38	94.5%
60	Handover					
6.1	Project Data & Performance	\$25.079 12	30%	\$7,523,74	\$32,602 85	
6.2	Project Management Services	\$2.786 57	30%	\$835.97	\$3.622.54	
6.3	Client Representation	\$278 66	30%	\$83.60	\$362.25	
	Sub Total	\$28,144,34	30%	\$8,443,30	\$36.587.65	1.0%
	Total Estimate	\$2,949,769.72			\$3,834,700.64	100.0%
					+-,,	

Indicative Cost Estimate (\$ Million)

\$3.83

Muswellbrook Mine Affected Road Network

Summary of Costs - Wybong Road Section 1

Assumptio

4.8 km of Type 3 Road

Shoulder & Verge Works for extent of upgrade

2 Coat Seal across new and existing pavement sections

Intersection Upgrade at GWH not required

One major culvert installation

	ltem	Estimate (\$) (excluding	Con	tingency	Estimate (\$) (including	% of Total
	item	contingency)	%	Amount (\$)	Contigency)	Estimate
1.0	Project Development					
1.1	Concept Design & Reporting	\$192,754.49	30%	\$57,826.35	\$250,580.83	
1.2	Project Management Services	\$14,456.59	30%	\$4,336.98	\$18,793.56	
1.3	Client Representation	\$1,445.66	30%	\$433.70	\$1,879.36	
	Sub Total	\$208,656.73	30%	\$62,597.02	\$271,253.75	2.0%
2.0	Investigation and Design					
2.1	Investigation and Design	\$192,754.49	30.00%	\$57,826.35	\$250,580.83	
2.2	Project Management Services	\$14,456.59	30.00%	\$4,336.98	\$18,793.56	
2.3	Client Representation	\$1,445.66	30.00%	\$433.70	\$1,879.36	
	Sub Total	\$208,656.73	30%	\$62,597.02	\$271,253.75	2.0%
3.0	Property Acquisitions					
3.1	Professional Services	\$0.00	30%	\$0.00	\$0.00	
3.2	Property Acquisition Costs	\$0.00	30%	\$0.00	\$0.00	
3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.4	Project Management Services	\$0.00	30%	\$0.00	\$0.00	
3.5	Client Representation	\$0.00	30%	\$0.00	\$0.00	
	Sub Total	\$0.00	30%	\$0.00	\$0.00	0.0%
4.0	Public Utility Adjustments					
4.1	Design, Approval & Construction	\$48,675.38	30%	\$14,602.61	\$63,277.99	
4.2	Project Management Services	\$3,894.03	30%	\$1,168.21	\$5,062.24	
4.3	Client Representation	\$1,947.02	30%	\$584.10	\$2,531.12	
	Sub Total	\$54,516.42	30%	\$16,354.93	\$70,871.35	0.5%
5.0	Construction					
5.1	Preliminaries	\$154,525.00	30%	\$46,357.50	\$200,882.50	
5.2	Environmental	\$218,101.00	30%	\$65,430.30	\$283,531.30	
5.3	Earthworks	\$888,000.00	30%	\$266,400.00	\$1,154,400.00	
5.4	Drainage - Culvert Crossing	\$550,000.00	30%	\$165,000.00	\$715,000.00	
5.5	Pavements	\$7,200,000.00	30%	\$2,160,000.00	\$9,360,000.00	
5.6	Structures	\$0.00	30%	\$0.00	\$0.00	
5.7	Intersections	\$0.00	30%	\$0.00	\$0.00	
5.8	Landscaping	\$192,000.00	30%	\$57,600.00	\$249,600.00	
5.9	Site Management	\$46,799.00	30%	\$14,039.70	\$60,838.70	
6	Project Management Services	\$441,500.00	30%	\$132,450.00	\$573,950.00	
6.1	Client Representation	\$44,150.00	30%	\$13,245.00	\$57,395.00	
	Sub Total	\$9,735,075.00	30%	\$2,920,522.50	\$12,655,597.50	94.5%
6.0	Handover					
6.1	Project Data & Performance	\$87,615.68	30%	\$26,284.70	\$113,900.38	
6.2	Project Management Services	\$9,735.08	30%	\$2,920.52	\$12,655.60	
6.3	Client Representation	\$973.51	30%	\$292.05	\$1,265.56	
	Sub Total	\$98,324.26	30%	\$29,497.28	\$127,821.53	1.0%
	Total Estimate	\$10,305,229.14			\$13,396,797.88	100.0%

Indicative Cost Estimate (\$ Million)	\$13.40
---------------------------------------	---------

Muswellbrook Mine Affected Road Network

Summary of Costs - Wybong Rd Section 2

Assumptio

4.6 km of Type 3 Road

Shoulder & Verge Works both sides for extent of upgrade

2 Coat Seal across new and existing pavement sections

One minor culvert installation

Item	Estimate (\$) (excluding	Co	ntingency	Estimate (\$) (including	% of Total
	contingency)	%	Amount (\$)	Contigency)	Estimate
1.0 Project Development					
1.1 Concept Design & Reporting	\$173,871.97	30%	\$52,161.59	\$226,033.56	
1.2 Project Management Services	\$13,040.40	30%	\$3,912.12	\$16,952.52	
1.3 Client Representation	\$1,304.04	30%	\$391.21	\$1,695.25	
Sub Tot	al \$188,216.40	30%	\$56,464.92	\$244,681.33	2.0%
2.0 Investigation and Design					
2.1 Investigation and Design	\$173,871.97	30.00%	\$52,161.59	\$226,033.56	
2.2 Project Management Services	\$13,040.40	30.00%	\$3,912.12	\$16,952.52	
2.3 Client Representation	\$1,304.04	30.00%	\$391.21	\$1,695.25	
Sub Tot	al \$188,216.40	30%	\$56,464.92	\$244,681.33	2.0%
3.0 Property Acquisitions					
3.1 Professional Services	\$0.00	30%	\$0.00	\$0.00	
3.2 Property Acquisition Costs	\$0.00	30%	\$0.00	\$0.00	
3.3 Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.4 Project Management Services	\$0.00	30%	\$0.00	\$0.00	
3.5 Client Representation	\$0.00	30%	\$0.00	\$0.00	
Sub Tot	al \$0.00	30%	\$0.00	\$0.00	0.0%
4.0 Public Utility Adjustments					
4.1 Design, Approval & Constructio	n \$43,907.06	30%	\$13,172.12	\$57,079.18	
4.2 Project Management Services	\$3,512.57	30%	\$1,053.77	\$4,566.33	
4.3 Client Representation	\$1,756.28	30%	\$526.88	\$2,283.17	
Sub Tot	al \$49,175.91	30%	\$14,752.77	\$63,928.68	0.5%
5.0 Construction					
5.1 Preliminaries	\$139,387.50	30%	\$41,816.25	\$181,203.75	
5.2 Environmental	\$196,735.50	30%	\$59,020.65	\$255,756.15	
5.3 Earthworks	\$851,000.00	30%	\$255,300.00	\$1,106,300.00	
5.4 Drainage - Culvert Crossing	\$30,000.00	30%	\$9,000.00	\$39,000.00	
5.5 Pavements	\$6,900,000.00	30%	\$2,070,000.00	\$8,970,000.00	
5.6 Structures	\$0.00	30%	\$0.00	\$0.00	
5.7 Intersections	\$0.00	30%	\$0.00	\$0.00	
5.8 Landscaping	\$184,000.00	30%	\$55,200.00	\$239,200.00	
5.9 Site Management	\$42,214.50	30%	\$12,664.35	\$54,878.85	
6 Project Management Services	\$398,250.00	30%	\$119,475.00	\$517,725.00	
6.1 Client Representation	\$39,825.00	30%	\$11,947.50	\$51,772.50	
Sub Tot	al \$8,781,412.50	30%	\$2,634,423.75	\$11,415,836.25	94.5%
6.0 Handover					
6.1 Project Data & Performance	\$79,032.71	30%	\$23,709.81	\$102,742.53	
6.2 Project Management Services	\$8,781.41	30%	\$2,634.42	\$11,415.84	
6.3 Client Representation	\$878.14	30%	\$263.44	\$1,141.58	
Sub Tot	al \$88,692.27	30%	\$26,607.68	\$115,299.95	1.0%
Total Estimat	e \$9,295,713.49			\$12,084,427.53	100.0%

Indicative Cost Estimate (\$ Million)

\$12.08



Summary of Costs - Wybong Rd Section 3

Assumptio

5.3 km of Type 3 RoadShoulder & Verge Works both sides for extent of upgradeMill and place additonal DGB across existign formation2 Coat Seal across new and existing pavement sectionsOne minor culvert installation

	Item	Estimate (\$) (excluding	Con	tingency	Estimate (\$) (including	% of Total
1.0	Project Dovelopment	contingency	70	Amount (\$)	contigency	LStimate
1.0	Concept Design & Reporting	\$263.864.08	30%	\$70,150,22	\$3/3 023 31	
1.1	Project Management Services	\$203,004.00 \$10,780,81	30%	\$5,036,04	\$95,025.31 \$25,726,75	
1.2	Client Popresentation	¢107808	30%	\$5,950.94 \$503.60	¢20,720.70 ¢2,572,67	
1.5	Sub Total	\$285 632 87	30%	\$85 689 86	φ2,072.07 \$371 322 73	2.0%
20	Investigation and Design	φ203,032.07	30 /0	403,003.00	<i>4311,322.13</i>	2.0 /0
2.0	Investigation and Design	\$263 864 08	30.00%	\$70 150 22	\$343 023 31	
2.1	Project Management Services	\$10 780 81	30.00%	\$5 936 94	\$25,726,75	
2.3	Client Representation	\$1 978 98	30.00%	\$593.69	\$2 572 67	
2.0	Sub Total	\$285.632.87	30%	\$85,689,86	\$371.322.73	2.0%
3.0	Property Acquisitions	¢100,001.01	0070		ţor ŋollino	210 / 0
3.1	Professional Services	\$0.00	30%	\$0.00	\$0.00	
3.2	Property Acquisition Costs	\$0.00	30%	\$0.00	\$0.00	
3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.4	Project Management Services	\$0.00	30%	\$0.00	\$0.00	
3.5	Client Representation	\$0.00	30%	\$0.00	\$0.00	
	Sub Total	\$0.00	30%	\$0.00	\$0.00	0.0%
4.0	Public Utility Adjustments					
4.1	Design, Approval & Construction	\$66,632.34	30%	\$19,989.70	\$86,622.05	
4.2	Project Management Services	\$5,330.59	30%	\$1,599.18	\$6,929.76	
4.3	Client Representation	\$2,665.29	30%	\$799.59	\$3,464.88	
	Sub Total	\$74,628.23	30%	\$22,388.47	\$97,016.69	0.5%
5.0	Construction					
5.1	Preliminaries	\$211,531.25	30%	\$63,459.38	\$274,990.63	
5.2	Environmental	\$298,561.25	30%	\$89,568.38	\$388,129.63	
5.3	Earthworks	\$1,245,500.00	30%	\$373,650.00	\$1,619,150.00	
5.4	Drainage - Culvert Crossing	\$30,000.00	30%	\$9,000.00	\$39,000.00	
5.5	Pavements	\$10,600,000.00	30%	\$3,180,000.00	\$13,780,000.00	
5.6	Structures	\$0.00	30%	\$0.00	\$0.00	
5.7	Intersections	\$0.00	30%	\$0.00	\$0.00	
5.8	Landscaping	\$212,000.00	30%	\$63,600.00	\$275,600.00	
5.9	Site Management	\$64,063.75	30%	\$19,219.13	\$83,282.88	
6	Project Management Services	\$604,375.00	30%	\$181,312.50	\$785,687.50	
6.1	Client Representation	\$60,437.50	30%	\$18,131.25	\$78,568.75	
	Sub Total	\$13,326,468.75	30%	\$3,997,940.63	\$17,324,409.38	95.4%
6.0	Handover				•	
6.1	Project Data & Performance	\$119,938.22	30%	\$35,981.47	\$155,919.68	
6.2	Project Management Services	\$13,326.47	30%	\$3,997.94	\$17,324.41	
6.3	Client Representation	\$1,332.65	30%	\$399.79	\$1,732.44	
	Sub Total	\$134,597.33	30%	\$40,379.20	\$174,976.53	1.0%
	Total Estimate	\$13,972,362.71			\$18,164,071.52	100.0%

	Indicative Cost Estimate (\$ Million)	\$18.16
--	---------------------------------------	---------



Summary of Costs - Wybong Rd Section 4 Assumptio

6 km of Type 3 Road Patch repair and re-seal only for pavement Six minor culvert installations

	Item	Estimate (\$) (excluding	Cont	tingency	Estimate (\$) (including	% of Total
4.0	Project Development	contingency)	%	Amount (\$)	Contigency)	Estimate
1.0	Concert Development	¢07 606 47	200/	¢0.051.55	¢25 756 70	
1.1	Concept Design & Reporting	\$27,505.17	30%	\$0,231.33	\$33,730.7Z	
1.2	Client Depresentation	\$2,062.69	30%	\$010.07	\$2,001.75	
1.3	Client Representation	\$206.29	30%	\$01.89	\$208.18	2.0%
2.0	Sub Total	\$29,774.35	30%	\$6,932.30	\$30,700.00	2.0%
2.0	Investigation and Design	¢27.505.17	30.00%	¢9 251 55	¢35 756 72	
2.1	Project Management Services	¢27,505.17	20.00%	φ0,201.00 ¢610.07	¢35,750.72	
2.2		φ2,002.09 ¢206.20	20.00%	φ010.07 ¢61.90	φ2,001.75 ¢260.10	
2.3	Cheric Representation	\$200.29 \$20.774.25	200/	\$01.09	¢200.10	2.0%
3.0	Broporty Acquisitions	\$2 3 ,114.33	30%	\$0,932.30	\$30,700.05	2.0%
3.0 2.1	Property Acquisitions	¢0.00	200/	00.02	00.02	
2.1	Property Acquisition Costs	00.00	200%	\$0.00	\$0.00	
3.2	Property Release Credit	\$0.00 \$0.00	30%	\$0.00	\$0.00 ¢0.00	
3.3 2.4	Property Release Credit	\$0.00 \$0.00	200%	\$0.00	\$0.00 \$0.00	
3.4 2.5	Client Depresentation	\$0.00 \$0.00	200%	\$0.00	\$0.00 \$0.00	
3.5	Sub Total	\$0.00 \$0.00	30%	\$0.00	\$0.00 \$0.00	0.0%
4.0	Bublic Utility Adjustments	φ0.00	30 /8	φ 0. 00	φ0.00	0.076
4.0	Design Approval & Construction	\$6 0/5 75	30%	\$2 083 73	\$0,020,48	
4.1	Project Management Services	φ0,943.73 ¢555.66	30%	\$2,003.73 \$166.70	\$9,029.40 \$722.36	
4.2	Client Popresentation	\$333.00 \$277.83	30%	\$100.70 \$22.35	\$722.30 \$261.18	
4.5	Sub Total	\$7 779 24	30%	¢03.33	\$301.18 \$10.113.01	0.5%
5.0	Construction	ψι,ιισ.24	3070	ψ2,000.11	φ10,110.01	0.070
5.1	Preliminaries	\$22,050,00	30%	\$6 615 00	\$28 665 00	
5.2	Environmental	\$31 122 00	30%	\$9,336,60	\$40,458,60	
5.3	Earthworks	\$0.00	30%	\$0.00	\$0.00	
5.4	Drainage - Culvert Crossing	\$240.000.00	30%	\$72.000.00	\$312.000.00	
5.5	Pavements	\$900.000.00	30%	\$270.000.00	\$1,170,000,00	
5.6	Structures	\$0.00	30%	\$0.00	\$0.00	
5.7	Intersections	\$0.00	30%	\$0.00	\$0.00	
					1	
5.8	Landscaping	\$120,000.00	30%	\$36,000.00	\$156,000.00	
5.8 5.9	Landscaping Site Management	\$120,000.00 \$6.678.00	30% 30%	\$36,000.00 \$2,003.40	\$156,000.00 \$8,681.40	
5.8 5.9 6	Landscaping Site Management Project Management Services	\$120,000.00 \$6,678.00 \$63,000.00	30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00	\$156,000.00 \$8,681.40 \$81,900.00	
5.8 5.9 6 6.1	Landscaping Site Management Project Management Services Client Representation	\$120,000.00 \$6,678.00 \$63,000.00 \$6,300.00	30% 30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00 \$1,890.00	\$156,000.00 \$8,681.40 \$81,900.00 \$8,190.00	
5.8 5.9 6 6.1	Landscaping Site Management Project Management Services Client Representation Sub Total	\$120,000.00 \$6,678.00 \$63,000.00 \$6,300.00 \$1,389,150.00	30% 30% 30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00 \$1,890.00 \$416,745.00	\$156,000.00 \$8,681.40 \$81,900.00 \$8,190.00 \$1,805,895.00	95.4%
5.8 5.9 6 6.1 6.0	Landscaping Site Management Project Management Services Client Representation Sub Total Handover	\$120,000.00 \$6,678.00 \$63,000.00 \$6,300.00 \$1,389,150.00	30% 30% 30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00 \$1,890.00 \$416,745.00	\$156,000.00 \$8,681.40 \$81,900.00 \$8,190.00 \$1,805,895.00	95.4%
5.8 5.9 6 6.1 6.0 6.1	Landscaping Site Management Project Management Services Client Representation Sub Total Handover Project Data & Performance	\$120,000.00 \$6,678.00 \$63,000.00 \$6,300.00 \$1,389,150.00 \$12,502.35	30% 30% 30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00 \$1,890.00 \$416,745.00 \$3,750.71	\$156,000.00 \$8,681.40 \$81,900.00 \$8,190.00 \$1,805,895.00 \$16,253.06	95.4%
5.8 5.9 6 6.1 6.0 6.1 6.2	Landscaping Site Management Project Management Services Client Representation Sub Total Handover Project Data & Performance Project Management Services	\$120,000.00 \$6,678.00 \$63,000.00 \$6,300.00 \$1,389,150.00 \$12,502.35 \$1,389.15	30% 30% 30% 30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00 \$1,890.00 \$416,745.00 \$3,750.71 \$416.75	\$156,000.00 \$8,681.40 \$81,900.00 \$8,190.00 \$1,805,895.00 \$16,253.06 \$1,805.90	95.4%
5.8 5.9 6 6.1 6.0 6.1 6.2 6.3	Landscaping Site Management Project Management Services Client Representation Sub Total Handover Project Data & Performance Project Management Services Client Representation	\$120,000.00 \$6,678.00 \$63,000.00 \$6,300.00 \$1,389,150.00 \$12,502.35 \$1,389.15 \$138.92	30% 30% 30% 30% 30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00 \$416,745.00 \$3,750.71 \$416.75 \$41.67	\$156,000.00 \$8,681.40 \$81,900.00 \$8,190.00 \$1,805,895.00 \$16,253.06 \$1,805.90 \$180.59	95.4%
5.8 5.9 6 6.1 6.0 6.1 6.2 6.3	Landscaping Site Management Project Management Services Client Representation Sub Total Handover Project Data & Performance Project Management Services Client Representation Sub Total	\$120,000.00 \$6,678.00 \$63,000.00 \$6,300.00 \$1,389,150.00 \$12,502.35 \$1,389.15 \$138.92 \$14,030.42	30% 30% 30% 30% 30% 30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00 \$416,745.00 \$3,750.71 \$416.75 \$41.67 \$4 ,209.12	\$156,000.00 \$8,681.40 \$81,900.00 \$8,190.00 \$1,805,895.00 \$16,253.06 \$1,805.90 \$18,05.90 \$18,239.54	95.4%
5.8 5.9 6.1 6.0 6.1 6.2 6.3	Landscaping Site Management Project Management Services Client Representation Sub Total Handover Project Data & Performance Project Management Services Client Representation Sub Total Total Estimate	\$120,000.00 \$6,678.00 \$63,000.00 \$1,389,150.00 \$12,502.35 \$1,389.15 \$138.92 \$14,030.42 \$1,456,477.93	30% 30% 30% 30% 30% 30% 30% 30%	\$36,000.00 \$2,003.40 \$18,900.00 \$416,745.00 \$3,750.71 \$416.75 \$41.67 \$4,209.12	\$156,000.00 \$8,681.40 \$81,900.00 \$8,190.00 \$1,805,895.00 \$16,253.06 \$1,805.90 \$18,05.90 \$18,239.54 \$1,893,421.31	95.4% 1.0% 100.0%



Summary of Costs - Wybong Rd Section 7

Assumptio

8 km of Type 3 Road

Shoulder & Verge Works both sides for extent of upgrade

Mill and place additonal DGB across existign formation

2 Coat Seal across new and existing pavement sections

One major culvert installation

Five minor culvert installations

One Bridge Widening (Rosebrook Creek)

	Item	Estimate (\$) (excluding	Cont %	tingency	Estimate (\$) (including	% of Total Estimate
1.0	Project Development		/0		Series (
1.0	Concept Design & Reporting	\$421,309,35	30%	\$126 392 81	\$547 702 16	
12	Project Management Services	\$31 598 20	30%	\$9 479 46	\$41,077,66	
1.2	Client Representation	\$3 159 82	30%	\$947.95	\$4 107 77	
	Sub Total	\$456,067,37	30%	\$136 820 21	\$592 887 58	2.0%
20	Investigation and Design	¢ recijeer ier	0070	U 100,020,210	\$00 <u>1</u> ,001100	210 /0
21	Investigation and Design	\$421 309 35	30.00%	\$126 392 81	\$547 702 16	
22	Project Management Services	\$31 598 20	30.00%	\$9 479 46	\$41 077 66	
2.3	Client Representation	\$3 159 82	30.00%	\$947.95	\$4 107 77	
	Sub Total	\$456.067.37	30%	\$136.820.21	\$592.887.58	2.0%
3.0	Property Acquisitions				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
3.1	Professional Services	\$0.00	30%	\$0.00	\$0.00	
3.2	Property Acquisition Costs	\$0.00	30%	\$0.00	\$0.00	
3.3	Property Release Credit	\$0.00	30%	\$0.00	\$0.00	
3.4	Project Management Services	\$0.00	30%	\$0.00	\$0.00	
3.5	Client Representation	\$0.00	30%	\$0.00	\$0.00	
	Sub Total	\$0.00	30%	\$0.00	\$0.00	0.0%
4.0	Public Utility Adjustments					
4.1	Design, Approval & Construction	\$106,391.25	30%	\$31,917.38	\$138,308.63	
4.2	Project Management Services	\$8,511.30	30%	\$2,553.39	\$11,064.69	
4.3	Client Representation	\$4,255.65	30%	\$1,276.70	\$5,532.35	
	Sub Total	\$119,158.20	30%	\$35,747.46	\$154,905.66	0.5%
5.0	Construction					
5.1	Preliminaries	\$337,750.00	30%	\$101,325.00	\$439,075.00	
5.2	Environmental	\$476,710.00	30%	\$143,013.00	\$619,723.00	
5.3	Earthworks	\$1,880,000.00	30%	\$564,000.00	\$2,444,000.00	
5.4	Drainage - Culvert Crossing	\$650,000.00	30%	\$195,000.00	\$845,000.00	
5.5	Pavements	\$16,000,000.00	30%	\$4,800,000.00	\$20,800,000.00	
5.6	Structures (Bridge Widening)	\$450,000.00	30%	\$135,000.00	\$585,000.00	
5.7	Intersections	\$0.00	30%	\$0.00	\$0.00	
5.8	Landscaping	\$320,000.00	30%	\$96,000.00	\$416,000.00	
5.9	Site Management	\$102,290.00	30%	\$30,687.00	\$132,977.00	
6	Project Management Services	\$965,000.00	30%	\$289,500.00	\$1,254,500.00	
6.1	Client Representation	\$96,500.00	30%	\$28,950.00	\$125,450.00	
	Sub Total	\$21,278,250.00	30%	\$6,383,475.00	\$27,661,725.00	95.4%
6.0	Handover					
6.1	Project Data & Performance	\$191,504.25	30%	\$57,451.28	\$248,955.53	
6.2	Project Management Services	\$21,278.25	30%	\$6,383.48	\$27,661.73	
6.3	Client Representation	\$2,127.83	30%	\$638.35	\$2,766.17	
<u> </u>	Sub Total	\$214,910.33	30%	\$64,473.10	\$279,383.42	1.0%
	Total Estimate	\$22,309,542.94			\$29,002,405.83	100.0%

Indicative Cost Estimate (\$ Million)

\$29.00



Summary of Costs - Yarraman Rd

Assumptio

3.2 km of Type 1 Road

Shoulder & Verge Works both sides for extent of upgrade Mill and place additonal DGB across existign formation

2 Coat Seal across new and existing pavement sections

Minor intersection upgrade at Wybong Road

One Bridge/major culvert Installation

7,500m2 land acquisition

	Item	Estimate (\$) (excluding	Con %	tingency	Estimate (\$) (including	% of Total
1.0	Project Dovelopment	contingency)	70	Amount (\$)	contigency)	LStimate
1.0	Concept Design & Reporting	\$188 503 23	30%	\$56 550 97	\$245.054.20	
1.1	Project Management Services	\$100,505.25 \$17,137,77	30%	\$1 241 32	\$243,034.20 \$18,379.06	
1.2	Client Popresentation	¢14,137.74	30%	¢4,241.32	¢10,379.00 ¢1 937 01	
1.5		\$1,413.77 \$204.054.74	30%	\$61,216,42	\$1,037.91 \$265.271.17	2 0%
20	Investigation and Design	φ 204,0 34.74	30 /0	901,210.42	\$203,271.17	2.0 /6
2.0	Investigation and Design	\$188 503 23	30.00%	\$56 550 97	\$245.054.20	
2.1	Project Management Services	¢100,505.25	30.00%	¢1 241 22	¢18,270,06	
2.2	Client Representation	¢14,137.74	30.00%	¢4,241.32	¢1 837 01	
2.5	Sub Total	\$1,413.77 \$204.054.74	30.00 %	\$61 216 42	\$265 271 17	2.0%
3.0	Property Acquisitions	φ 204,004. 74	30 /0	ψ01,210. 1 2	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	2.070
3.1	Professional Services	\$3,750,00	30%	\$1 125 00	\$4,875,00	
3.1	Property Acquisition Costs	\$75,000,00	30%	\$22,500,00	\$97.500.00	
3.3	Property Release Credit	φ/ 3,000.00 \$0.00	30%	\$0.00	00.00 00.02	
3.4	Project Management Services	\$4,875,00	30%	\$1.462.50	\$6 337 50	
3.5	Client Representation	\$3,750,00	30%	\$1,402.00	\$4,875.00	
0.0	Sub Total	\$87 375 00	30%	\$26 212 50	\$113 587 50	0.9%
4.0	Public Utility Adjustments	φ01,010.00	0070	<i>\\</i> 20,212.00	¢110,001.00	0.070
4 1	Design Approval & Construction	\$47 601 83	30%	\$14 280 55	\$61 882 37	
42	Project Management Services	\$3,808,15	30%	\$1 142 44	\$4 950 59	
4.3	Client Representation	\$1 904 07	30%	\$571.22	\$2 475 29	
	Sub Total	\$53,314.04	30%	\$15.994.21	\$69.308.26	0.5%
5.0	Construction					
5.1	Preliminaries	\$149,730.00	30%	\$44,919.00	\$194,649.00	
5.2	Environmental	\$211.333.20	30%	\$63.399.96	\$274,733,16	
5.3	Earthworks	\$688,000.00	30%	\$206,400.00	\$894,400.00	
5.4	Drainage - Culvert Crossing	\$30,000.00	30%	\$9,000.00	\$39,000.00	
5.5	Pavements	\$5,760,000.00	30%	\$1,728,000.00	\$7,488,000.00	
5.6	Structures (bridge over Wybng Cr)	\$1,750,000.00	30%	\$525,000.00	\$2,275,000.00	
5.7	Intersections	\$200,000.00	30%	\$60,000.00	\$260,000.00	
5.8	Landscaping	\$128,000.00	30%	\$38,400.00	\$166,400.00	
5.9	Site Management	\$45,346.80	30%	\$13,604.04	\$58,950.84	
6	Project Management Services	\$427,800.00	30%	\$128,340.00	\$556,140.00	
6.1	Client Representation	\$42,780.00	30%	\$12,834.00	\$55,614.00	
	Sub Total	\$9,432,990.00	30%	\$2,829,897.00	\$12,262,887.00	94.5%
6.0	Handover					
6.1	Project Data & Performance	\$85,683.29	30%	\$25,704.99	\$111,388.27	
6.2	Project Management Services	\$9,520.37	30%	\$2,856.11	\$12,376.47	
6.3	Client Representation	\$952.04	30%	\$285.61	\$1,237.65	
	Sub Total	\$96,155.69	30%	\$28,846.71	\$125,002.39	1.0%
	Total Estimate	\$9,981,788.53			\$12,976,325.09	100.0%

Indicative Cost Estimate (\$ Million)

\$12.98


Appendix D: Concept Plans



REVISION	DESCRIPTION	ISSUED	VER'D APP'D	DATE	CLIENT	CONSULTANT		ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK		PROJECT
1	ISSUED FOR INFORMATION	JK	CS	11.10.19	- muswellbrook			NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE	NORTHROP	MUSWELLBROOK MINE AF
		-			shire council	BITZIOS	וער 🗸 וו	TRANSFERRED ELECTRONCALLY		ROAD NETWORK
				-				AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.	Newcastle	
								0 100 200 300 400m	Level 1, 215 Pacific Hwy, Charlestown NSW 2290	
					DRAWING NOT TO BE USED FOR CONSTRUCTION	THE COPYRIGHT OF THIS DRAWING REMAINS WITH	SCALE 1:8000@		Ph (02) 4943 1777 Email newcastle@northrop.com.au	
					UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	NORTHROP CONSULTING ENGINEERS PTY LTD	3.0		ABN 81094433100	

									D	RAWING NO	TO BE U	SED FOR CON	STRUCTION	THE	COPYRIGH	HT OF THIS		REMAINS	WITH	SCALE 1:100	10@A1				Ph	(02) 4943	ABN 810	newcastle(94 433 100	@northrop)	o.com.au					
1	ISSUED FOR INFORMATION					JK	CS	11.10.1	19		shire	wellbrook council	¢			BIT	zios			\bigcirc	COMMENCING NORTHROP USABILITY, TRANSFERR THIS DRAWI AND MAY BI	WORK. ACCEPTS NO RES COMPLETENESS I ED ELECTRONICA NG MAY HAVE BI INCOMPLETE IF 10 20	PONSIBILITY IR SCALE OF LLY EN PREPARE COPIED TO BL 30	FOR THE DRAWINGS D USING CO ACK & WH	s In LOUR, HITE 50m)N	New 5 Pacific Hwy	castle	IR wn NSW	OP 2290	M	USWEL	LBROOK ROAD NE	MINE AI	FFE
NMV	DESCRIPTION	521				ISSUED	VER'D APP'	D DAT	E CLIEN	T				CONSU	LTANT						ALL DIMENS	ONS TO BE VERI	ED ON SITE	BEFORE		_					PROJE	CT			
STEEL		BEN	IGALL	A LIN	KLC	DNG S	ECTIO	N																											
	VERTICAL	G: 2.4% L: 14.376			R	: 6221.3 <: 62.2 100.000			-					G: -0.85 L: 180.62	% 24									R	8: 14349.4 K: 143.5 : 150.000				_						
DESIGNED	HORIZONTAL											25																							
DOIN'T I	CHAINAGE	0.000	20.000	40.000	50.000 60.000		80.000	100.000	114.376	14.0.000	150.000	160.000	180.000	200.000	220.000	240.000	250.000	260.000	280.000	295.000 300.000	320.000	000 075	350.000	360.000	380.000	400.000	4,20.000	440.000	4,45.000	460.000	430.000	500.000	520.000	540.000	550.000
	DEPTH	0.000	0.400	0.026	-0.091		0.042	0.127	0.151	0.261	0.291	0.286	0.313	0.283	0.181	0.066	0.087	0.036	-0.097	-0.224	-0.197	757 0	0.433	0.395	-0.060	0.126	-0.034	-0.196	-0.187 -0.208	-0.262	-0.129	-0.092	240.0	0.061	0.054
JOB MAN	EXISTING LEVELS	133.038	132.169	132.121	132.051 131.804		131.454	131.14.1	130.992 130.896	130.689	130.584	130.514	130.336	130.216	130.168	130.132	130.036	130.011	129.994	130.008 130.005	129.815	129.062	129.043	129.04.7	129.457	129.253	129.423	129.622	129.662	129.745	129.671	129.693	129.612	129.657	129.694
AGER: C.S.	DESIGN LEVELS	133.038	132.569	132.14.7	131.960 131.790		131.497	131.268	131.143	130.950	130.875	130.800	130.649	130.499	130.348	130.198	130.123	130.048	129.897	129.784	129,618	120 516	129.476	129.442	129.397	129.379	129.388	129.426	129.440	129.484	129.542	129.601	129.660	129.718	129.748
MITH	VERTICAL 1:200 HORIZONTAL 1:1000.000 Datum 115.000																																		
VERIFIER:			-		VC 100	00m, K 6 D. 1.6%	52.21		-											-			,	VC 150	요.0년n군K 143.4 A.B는 19%	9			-						

-0.8%

CH 114.38

IP CH 64.38 IP RL 131.52

STORMWATER TO BE CONSTRUCTED IN LOW POINT OF ROAD PROFILE.

CH 295.00

85 621 - UM

CH 445.00



I.P. CH 0.00 RL 133.04

-2.4%

CH 14.38

		1						in a minute hori	DEN		NE 1131014
			CHO	O TO CH	720				850		DEVICION
E	CTED	DRAWING TIT	ANGA		ROAD		ſ	OB NUMBER	L19164	14	
				NOT	r FO	R	СС	NS	ruc	T	ON
_		L: 281.933									-
		6.03%									-
								B: 352* 15	14"		
								L: 1370.7	153		

		0.3%								CH 726.93
129.777	129.836	129.894	129.953	110.0E1	130.041	130.070	130.129	130.187	130.246	130.266
129.753	129.891	130.165	130.444	130.534	130.445	130.334	130.205	130.209	130.250	130.251
0.024	-0.056	-0.271	-0.491	-0.522	-0.4.05	-0.264	-0.076	-0.022	-0.004	0.015
560.000	580.000	600.000	620.000	640.000	650.000	660.000	630.000	700.000	720.000	726.933
							L: B: 3	1370.753		







			/								
129.929	129.903	129.891	129.878	129.852	129.827	129.801	129.776	129.763	129.750	10C 0CF	C71'671
120.614	120.772	126.018	129.756	129.618	129.502	129.518	129.472	129.525	129.548	00000	663.631
9.315	9.132	3.873	0.122	0.235	0.325	0.283	0.303	0.238	0.202	12 Y U	1.471
1320.000	134.0.000	1350.000	1360.000	1380.000	14,00.000	14,20.000	1440.000	14,50.000	1460.000		10000
				1370.753							
				NO	T FC	OR C	ONS	TF	ิรบ	СТІ	ON
ECTED	DRAWIN	B	ANG		K ROAD	U.	JOB NUMBE	R NL	191	644	
					-50				3-2		REVISION
							D	RAWING	S SHEET	SIZE = A1	



430	1/200	J II								
2060	2000		145.0 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	Ites 1000	2160	0012	1480 0011 0011	100 Mar 1	2143	YEA a
		523	991	215	960		57		218	
96 140.6	49 141.6	48 142.5	46 143.5	144.5	10 144.9	19 145.4	53 146.4	73 147.4	83 14.8.3	
50 141.0	36 142.2	58 143.2	00 144.3	36 145.2	14 145.7	1.921 0.4	18 14.6.9	61 14.7.8	148.6	
7.0-000	9.0 - 0.6	100 -0.64	000 -0.80	00 -0.76	00 -0.71	100 -0.64	000 -0.50	-0.44	00 - 0.30	
2060.C	2080.0	2100.0	2120.0	214.0.0	2150.0	2160.0	2180.0	2200.0	2220.0	
R: 5	0									
CTED	DRAWING TIT	TLE			OF	R C	ONS JOB NUMBER	TRU	CTI	ON
		CH1	480 TO C	H2220			DRAWING NU	MBER	044	REVISION
							DR	U3-3	SIZE = A1	1



Bas				ISSO ISSO	0757 2920	020 1250 1250 1250 1250 1250 1250 1250 1	0051 2960	0601 0000 000 000 000 000 000 000 000 00	2271 3020 1997 1990	420 010E 144.0	1750 3390 FB	101E (410	0015 100 100 100 100 100 100 100 100 100	to under	150				
ANAGER. C.SMITH VERIFIER.	54167 		VC 150.00m K 33.1 A.D. 45%	8		CH 309187	CH 312156		95 1216 HJ dl 95 1216 HJ dl VC 100.00m, K 32 A.D. 3.1%	2.69	CH 322156	10 SACE H J GI	0 RL 136 25						
JOB MA	11.11.2011	7 145.020	2 143.720	7 141.482	9 140.543	c2.1.99.297 5 139.297 5 139.018	8 138.332	1 137.698	8 137.186 5 136.797	136.529	136.384	0 136.310 8 136.273	- 156.294						
J.KIDD 65 151.727	255 150.501 14.9.15 20 14.9.15 20 14.0.15 20	07 145.62	52 14.3.77; 20 14.2.22	51 14.1.23(11 14.0.851	14 0.55	11.251 150.115 118 139.315 138.995	14 138.256 16 138.183	87 137.61 ¹ 11 137.416	137.24 99 136.895	4.4 136.571	90 136.57/ BS 136.56/	480 136.79 45 136.518	G7:961						
DESIGNED:	0.000 -0.9	0.000 -0.6	0.000 -0.0	0.000 0.2	0.00 -0.0	1.865 -0.0 1.865 -0.0	0.000 0.07	0.000 0.08	0.000 -0.0	0.000 -0.0	1.556 -0.1	0.000 -0.4	0.0						
2900	292 294, 294, 295, 295, 295, 295, 295, 295, 295, 295	298	R R L: 303.912 B: 049° 43' 58"	305(306	309 310(312(314.	3154.894 316	320 00 00 00 00 00 00 00 00 00 00 00 00 0	3218.531 3218.531 322 8 7 7	72E 36.604 25° 25' 30"	22						
415 T -8.0%			R: 3318.2 K: 332 L: 150.000			e L	-3.4%		R: 3268.8 K: 32.7 L: 100.000			6 -0.4% L: 33.579							
REVISION DESCRIPTION			ISSUED VER'D APP'D	DATE	CLIENT			CONSULTA	NT		P	ALL DIM	ENSIONS TO BE VERIFIED ON SITE BEFORE		DTUDOF	PRO			
					1	muswellb shire coun	rook cil		BITZI	os	∇	ADACHAR USABILI TRANSF THIS OR AND MA	VENERATING REPORTED AT TWO THE TY, COMPLETENESS OR SCALE OF DRAWINGS ERRED ELECTRONICALLY AVING MAY HAVE BEEN PREPARED USING COLOUR Y BE INCOMPLETE IF COPIED TO BLACK & WHITE		Newcastle	i "	ROAD NETWORK	CH2900 TO CH3533.63	
					DRAWING NOT UNLESS VERIFIC	TO BE USED FOR ATION SIGNATURI	CONSTRUCTION HAS BEEN ADD	THE COL ED NORT	PYRIGHT OF THIS DRA HROP CONSULTING EN	WING REMAINS WIT	H SCALE 1	1000@A1	10 20 30 40 50m	Ph (02) 4943 1777 A	Email newcastle@northrop.com.au 3N 81 094 433 100	u			DRAWING SHEET SIZE = A1





		1.P. CH 0.00	IP CH 52 53	IP RL 337.59	125		1119	R	1	24117	05.57						2/]];		EL.	Pr-				1	27	
JOB MANAGER: JOB MANAGER VERIFIER. VERIFIER	VERTICAL 1400 HORIZONTAL 12000.000 Datum 250.000	-	VC 80.00 A.D.	т, К 11.06 -7.2%	92.53 CH 97.61	VC 150.00 A.D.	т, К 13.20 11.4%	CH 240.49	CH 29117 CH 429-33	U d c d c VC 100.00n A.D1	h, K 9.94	CH 391.17		-95			CH 510 51	vc	15012 H) dl 200 00m, K A D. 112%	17.82	OB 15 UIM						7%
0	DESIGN LEVELS	339.482 339.031	337.051		333.265 332.715 332.458	328.083	325.602	325.000	325.013	442.026	218.626	319.905	315.147	310.368	305,629		299.871	000000000000000000000000000000000000000	293.600	292.054	291.910 292.059	292.732	293.585	294.437	295.290	296.143	
DESIGNE	EXISTING LEVELS	339.482 339.058	400.73E		333.14.5 332.882 332.551	327.899	325.504	324.762	324.811 325.485	PIC.626	<u>954.455</u>	320.129	315.010	310.478	305,834		300.533	115.142	293.787	292.14.9	292.039	292.962	293.563	294.203	295.491	296.123	
ESIGNED:	DEPTH	0.000 -0.026	240.0		0.120 -0.167 -0.093	0.184	0.098	0.238	0.203	512.0-	-0.627	-0.224	0.137	-0.090	-0.205		-0.662	-0.161	-0.187	-0.095	-0.129	-0.230	0.021	0.235	-0.201	0.020	
0	CHAINAGE	0.000	50.000		92.534 97.608 100.000	150.000	200.000	247.608	250.000 291.166	300.000	321100	400.000	450.000	500.000	550.000		610.509	000.000	700.000	750.000	800.000 810.509	850.000	000.006	950.000	000.000	020.000	
DRAWN: DRAWN		C	ASTL	E ROC	K LINK	ROAD L	ong se	CTION						4					Billoor	1					- I		
REVISION 1	DESCRIPTION ISSUED FOR INFORMATION				JK	CS	DATE 11,10.19	DRAWING UNLESS VE	NOT TO BE US	vellbrook council ED FOR CONSTRU	CTION N ADDED	THE COPYRIGE NORTHROP		ZIOS DRAWING REMA	AINS WITH	SCALE 12000(ALL DRENSIONS TO B COMMENCING WORK NORTHROP ACCEPTS IN USABILITY, COMPLETE TRANSFERED ELECTR TRANSFERED ELECTR TINS DRAWNG MAY H AND MAY BE INCOMPLI 0 20 D A1	E VERIFED ON SITE NO RESPONSIBILITY NESS OR SCALE OF RONICALLY. AVE BEEN PREPARE ETE IF COPIED TO BL 40 60	BLFORE FOR THE DRAWINGS ID USING COLOUR, ACK & WHITE 80 100m	Leve Ph (02)	NO Ne 1, 215 Pacific I 4943 1777 En ABN 8	RTTH ewcastle Hwy, Charlestor nail newcastle 31 094 433 100	IROP wn NSW 2290 @northrop.com.au	MUS	WELLBRO ROAD	OK MINE A NETWORK	FE







											NOTION	ONSTRUCT	
REVISION	DESCRIPTION	ISSUED VE	R'D APP'D	DATE CL	IENT	CONSULTANT		ALL DMENSIONS TO BE VERIFIED ON SITE BEFORE		PROJECT	DRAWING TITLE	JOB NUMBER	
1	ISSUED FOR INFORMATION	јк	CS	11,10.19	muswellbrook	BITZIOS		NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABLITY, COMPLETENESS OR SCALE OF DRAWINGS		MUSWELLBROOK MINE AFFECTED ROAD NETWORK	CASTLEROCK ROAD -	NL191644	•
					sine council	- And a second second second		THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR.	Newcastle		NEW ENGLAND HWY LINK	DRAWING NUMBER	REVISION
								0 20 40 60 80 100m	Level 1, 215 Pacific Hwy, Charlestown NSW 2290		CH 1400 - CH 2950	C04 20	1
					DRAWING NOT TO BE USED FOR CONSTRUCTION	THE COPYRIGHT OF THIS DRAWING REMAINS WITH	SCALE 1:200		Ph (02) 4943 1777 Email newcastle@northrop.com.au			004.20	
					UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	NORTHROP CONSULTING ENGINEERS PTY LTD			ABN 81 094 433 100			DRAWING SHEET SIZE =	A1

NOT FOR CONSTRUCTION



					0%				
27 48 776	673	160	546	132		619	501		592
212 245.0 015 242.9	791 240.6	535 236.16)74 231.64	265 227.15		144 272.6	218.10		14.4 213.5
38 246. 71 244.	17 241	75 236.6	231.0	8 226.2		15 221.7	6 217.5		53 214.
845 -1.0	000 -1.1	-0.4	000 0.57	000 0.86		000 0.87	000		000 -0.5
2624.	2650.	2700.1	2750.	2800.		2850.	2900.		2950.
ECTED	DRA	WING TITLE CAST NEW EI CH	NOT LEROCK F NGLAND H 1400 - CH	FOR ROAD - WY LINK 2950	C		NL191 NUMBER C04.	644 21	REVISION 1



0 20 40 60 80 100m

SCALE 1:2000@ A1



THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

-1.2%									
75.463	14.858	14.253	73.64.8	73.04.3		72.438	71.833		71.228
175.254 1	174.784 1	174.373	173.759	113.227 1		172.515 1	171.662		171.099 1
0.209	0.075	-0.120	-0.11	-0.184		-0.077	0.171		0.129
4150.000	4200.000	4250.000	4300.000	4350.000		4400.000	4450.000		4500.000
			NOT	FOR	C	ONS	STRU	CTI	ON
CTED	DRAWIN	CASTL	EROCK R	DAD -		JOB NUMB	NL1916	644	
		NEW EN CH 2	GLAND HW 1950 - CH 4	Y LINK 500		DRAWING	C04.3	30	REVISION
							DRAWING SHEET	SIZE = A1	



	NOT FOR	CONSTRUCT	ION
FCTED	DRAWING TITLE	JOB NUMBER	
	NEW ENGLAND HWY LINK	DRAWING NUMBER	REVISION
	CH 4500 - CH 6050	C04.40	1
		DRAWING SHEET SIZE =	41







	NOT FOR	CONSTRUCT	ION
CTED	DRAWING TITLE CASTLEROCK ROAD -	JOB NUMBER NL191644	
	NEW ENGLAND HWY LINK CH 6050 - CH 7600	C04.50	REVISION
		DRAWING SHEET SIZE = A	A1



ECTED	DRAWING TITLE	JOB NUMBER	
	NEW ENGLAND HWY LINK	DRAWING NUMBER	REVISION
	CH 7600 - CH 8592	C04.60	1
		DRAWING SHEET SIZE = A	1





EXISTING 'DIPPER'
WITH LARGE
0 PROVIDE
ICTION WITH
AD ALIGNEMENT

018ha s FOR CTURE	1%	AEP

NOT	FOR	CONSTRUCTION	1
			•

ECTED	EDDERTON ROAD REALIGNMENT OPTIONS OVERALL PLAN	NL191644	
		DRAWING NUMBER	REVISION 1
		DRAWING SHEET SIZE	= A1



	NOT FOR C	ONSTRUCTION
TED	TYPICAL ROAD SECTIONS	NL191644 DRAWING NUMBER C05-1 DRAWING SHEET SIZE = A1

TYPICAL "BELOW AVERAGE" ROAD UPGRADE DETAIL.
NOT FOR CONSTRUCTION
Image: Note of the construction in the constructing in the constructing in the constructing in the constructing in