



Banana Shire Council

Alternate Route Options for Gibihi Road

Summary - Review of Alternate Design Options

Rev 1 September 2018

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1. Introduction

Dawson Mine is currently operated by Anglo Coal (Dawson) Pty Ltd (Anglo), and has been operational since 1961. The mine comprises three open cut pits, with Gibihi Road passing across the Dawson Central pit. The Gibihi Road has been closed since 2017. Significant longitudinal ground cracking along Gibihi Road was reported on 10th November 2017. The road was closed to traffic, and Anglo's investigations concluded that the geological failure under the road was too deep and extensive to repair the existing road.

Anglo engaged Hatch Limited (Hatch) to undertake the concept design of a number of options to replace Gibihi Road on alternative alignments to the north and south of the pit. Options to the south crossed existing mine workings and were ruled out early in the options assessment process.

GHD's role was to review the engineering being undertaken by Anglo and Hatch to provide feedback on behalf of BSC. This document provides a review and comparison between two Hatch design concepts alignments being:

- Leichardt Highway via Three Chain Road to Dawson Highway
- Leichardt Highway via Three Chain Road to Theodore Moura Road.

Figure 1 provides a locality map of the area around Gibihi Road.

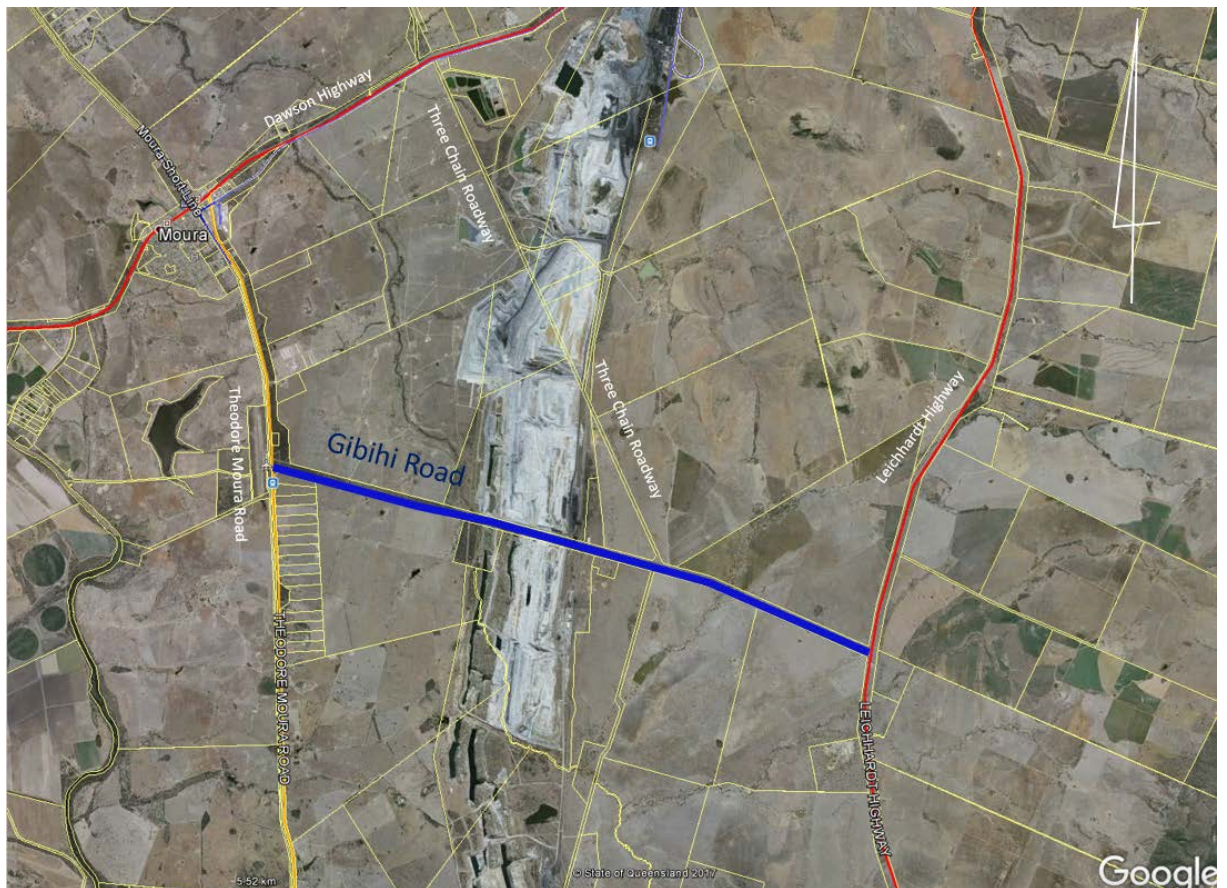


Figure 1 Gibihi Road Locality Plan

1.1 Key Project Participants

The key stakeholders for the project are:

- Anglo Coal (Dawson) Pty Ltd – Mine Operator (Anglo)
- Hatch Ltd – Anglo's Engineering Consultant/Contractor (Hatch)
- Banana Shire Council (BSC) – Local Government Roads Manager
- GHD Pty Ltd - Independent engineer (GHD).

1.2 Purpose of Report

The purpose of this report was to review the development of route options to replace the critically damaged section of Gibihi Road across the Anglo Coal Dawson Mine south east of Moura. The review has been undertaken against BSC's design standards and the general requirements of the BSC for the operation of the new replacement link.

The contents of this report will be presented to BSC for approval prior to issuing the direction to Hatch and Anglo with respect to the design works.

1.3 Scope of Report

The scope of this report includes:

- Assessment of the design of the proposed road diversion options prepared by Hatch based on community consultation feedback.
- Provision of design feedback on the Hatch design works proposed for the re-provisioning of Gibihi Road to Banana Shire Council.
- Provide feedback to Hatch and Anglo with permission form Banana Shire Council.

1.4 Limitations

This report: has been prepared by GHD for Banana Shire Council and may only be used and relied on by Banana Shire Council for the purpose agreed between GHD and the Banana Shire Council as set out in this report.

GHD has prepared this report on the basis of information provided by Anglo, Hatch and others. This information has not been independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Basis of Design

GHD has undertaken a high level review of the alternative road options documented as provided by Anglo and Hatch to review the basis of design provided.

2.1 Traffic

Hatch have undertaken a high level traffic study of the Gibihi Road area to establish the traffic counts on the proposed replacement Gibihi Road route. Anglo have adopted a traffic volume of 900 vehicles per day for the proposed Gibihi Road replacement.

2.2 General Road Design Criteria

The Hatch report outlines the following general road design criteria to replace the damaged section of Gibihi Road.

Table 1 General Road Design Criteria

Design Element	Criteria	Reference
Road Class	Rural Major collector	CMDG - Geometric Road Design D1, Table
Posted Speed	100 km/h with reductions where necessary ¹ CMDG - Geometric Road Design D1- Table D1.21.05	
Design vehicle	B-triple	-
Design life	30 years (design life for different elements are as specified in the relevant sections)	Austrroads Part 3, Table 4.1
Flood Immunity	1 in 20 years (5% AEP)	CMDG - Geometric Road Design D1- Table D1.21.05

1. Posted speed through Dawson Mine lease will be restricted to 80 km/h.

GHD notes that the design vehicle is a B-triple road train. This design standard applies from the Dawson Highway/Theodore Road through the mine but will stop east of the mine where Three Chain Road meets Gibihi Road. Given that GrainCorp's preferred haulage vehicle is a B-triple, there is potentially economic benefit in extending the allowable route to the Leichhardt Highway in the longer term to allow grain to be transported to their Moura grain depot. State and Federal Government funding has been previously available for such economic development projects.

2.3 Design Standards

Hatch have provided an initial set of design criteria based generally on the Capricorn Municipal Design Guidelines (CMDG). AUSTRROADS Guide to Road Design series provides a sound design basis where CMDG is silent. The intersection of the Dawson Highway and Three Chain Road will need to be in accordance with the requirements of the Department of Transport and Main Roads (TMR).

The proposed option designs by Hatch generally coincided with the design requirements stipulated in CMDG.

3. Options Development

3.1 Options Being Considered

A number of route options are being considered to replace the Gibihi Road connection as follows:

- Kianga Road – various options.
- Northern Access – alternative route along the eastern side of the mine, connecting to the Dawson Highway
- Three Chain Road along the eastern side of the mine and across the pit leading to either:
 - The Dawson Highway
 - Theodore Road.

An initial route options assessment has already been undertaken by Anglo in consultation with BSC. Two initial route options have been eliminated as follows:

- X** Kianga Road alignment is located across the previously worked and rehabilitated section of the mine and is currently in use as a temporary unsealed section. The route is longer and the long term maintenance due to the subsidence of the rehabilitated mine is a deterrent to BSC.
- X** The Northern Access routes are located along the eastern side of the mine and connect to the Dawson Highway. The length of the route is longer, passes through operating sections of the mine and an adjacent high voltage Ergon substation, has poor alignment, includes numerous rail crossings, and is not preferred due to the reduced safety to Anglo and Ergon workplaces and the potential delays to traffic due to shunting trains.

This leaves the Three Chain Road alignment options. This route has been broken down for this assessment by GHD into of three main sections for which various options will be considered:

- Section 1 - Three Chain Road running along the east side of the mine north of Gibihi Road
- Section 2 - Connection across the mine
- Section 3 – West side of mine to either Dawson Highway or Theodore Road.

Three options have been considered in this report for Section 3 of the route being:

- Option 3 i) – Connection to the Dawson Highway
- Option 3 ii) – Connection to Theodore Road south of the Cotton Gin
- Option 3 iii) – Connection to Theodore Road (Herzog Road) near Moura (GHD suggested option)



3.2 Section 1 - Three Chain Road East of the Mine to Gibihi Road

Originally located within Three Chain Road reserve to south, but then pushed across to mine land – new reserve (dashed).

Two alignment options were presented by Hatch for the northern section of road at the Borehole Creek crossing within private property being Options A and Option B.

Option B is preferred by GHD as the curve radii for the 90 degree end is significantly larger and it crosses the conveyor lines at near 90 degrees making a clean crossing. Issues still have to be resolved regarding environmental and land acquisition to finalise the alignment.



3.3 Section 2 - Three Chain Road through the Mine

The route across the mine is set by the constraints of the operation of the mine and conveying Borehole Creek across the mine. The alignment is curve linear with some tight bends. As the road crosses the operating mine at this point, Anglo have first call on the alignment to satisfactorily address Borehole Creek and mine operations. A slower speed limit is acceptable over the shorter distance. New road requires changes to mine operation permit.

3.4 Section 3 - Western Side of the Mine to Moura

The section of the proposed route between the western side of the mine and Moura has three options:

- I. Three Chain Road connection to the Dawson Highway
- II. Three Chain Road connection to Theodore Road near Olam Cotton Gin.
- III. Three Chain Road connection to Theodore Road near Herzog Road

The connection to the existing Three Chain Road across the mine from the east will transfer additional traffic onto Three Chain Road and the intersection with the Dawson Highway for all three options. The WestSide gas field will be impacted by all three route options. A summary response is contained in section 4.1.



3.4.1 Option 3 i) - Three Chain Road Connection Dawson Highway

This option to the Dawson Highway utilises an existing road reserve which contains an existing formed road. The distance from the Leichhardt Highway intersection of Gibihi Road to Moura appears to be one on the shorter routes, however the route now crosses a rail line in close proximity to the Dawson Highway connection, requiring approvals from Aurizon and TMR for the construction the road.

The intersection of the Three Chain Road and Dawson Highway has an Aurizon line 12.5 m from the stop bar. Large trucks have potential to queue across the rail line at the intersection which is not safe.

The Dawson Highway currently has a channelized right turn (CHR) lane for vehicles entering into Three Chain Road. The geometry of this intersection however joins with that of the intersection of Theodore Baralaba Road which has an additional intersection in close proximity, making the upgrade of the Three Chain Road intersection a larger design task.

Aurizon will be required to approve any alterations to the proposed intersection.

Westside Gas impacts

This route option also impacts the gas field with WestSide stating that a pipeline that runs parallel with the existing Three Chain Road west and will not be affected, however it will require protection where it crosses the Dawson Highway intersection. The estimated cost of these works are \$385,000 Excl. GST.

3.4.2 Option 3 ii) - Three Chain Rd to Theodore Rd (south of Cotton Mill)



The public concern resulting from the closure of the road has been because of the extra distance that the public needs to travel between the Leichhardt Highway and Moura. The current proposed route that joins Theodore Road south of the cotton mill would appear to be significantly longer for the dormitory education and grain transportation based trips, but would suit the cotton haulage trips.

The route has a number of challenges to overcome including:

- Avoiding the mine memorial
- Endangered regional ecosystem vegetation in the stock route along Theodore Road Reserve which requires clearing
- Endangered regional ecosystem vegetation at the creek crossing
- Construction through the Hillview dam.
- A large creek crossing
- Gas infrastructure from the WestSide gas field

The route bears south west in order to remain on lands already owned by Anglo, avoiding the requirement to acquire land from other parties which can be a risk to the cost and delivery timeline of the project.

Hatch investigations concluded that the Kianga Creek crossing will require a bridge to meet hydraulic and environmental requirements.

The alignment crosses a significant portion of gas well infrastructure under the control of WestSide and is in close proximity to a compressor station. WestSide was contacted to seek advice with respect to the protection requirements for their mains. WestSide have responded to Anglo with a feasibility level estimate of the risks and costs to enable the route to pass through their gas field. In summary, WestSide have indicated the following issues:

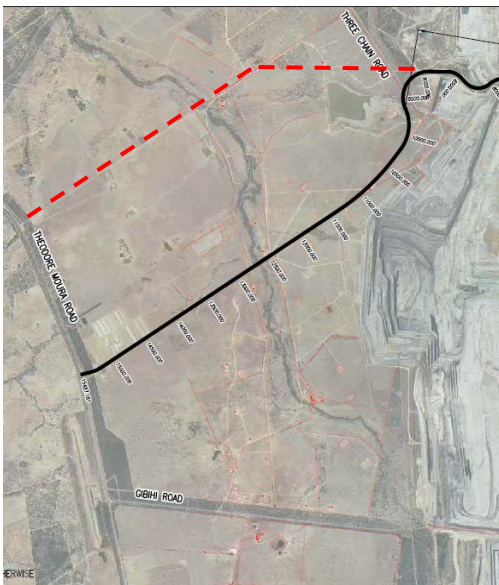
1. A 100km/h road running close to gas lines presents a high risk to the gas lines.
2. Cost of relocating gas lines and wells, lost production, etc. estimated at \$15M
3. Potential for the need to relocate Hillview processing plant estimated at \$50M
4. Time delays are expected to undertake the works which are yet to be confirmed but could be 6-12 months.

This presents a significant risk to the feasibility and timeline to deliver the project.

This route option needs to clear a path through the vegetation on the Theodore Road stock route for the connection to the road, which is controlled vegetation under the Vegetation Management Act. This presents a risk to the project in obtaining approvals to clear.

GHD Assessment: This is not a preferred route as the distance is longer for the majority of trips to Moura, as well as containing a number of project risks that need to be closed out for the route to proceed.

3.4.3 Option 3 iii) - Three Chain Rd to Theodore Road (near Herzog Road)



GHD requested consideration of an alternative option for Option 3 iii) to be considered which joins Theodore Road 350 m south of Herzog Road in Moura. This route has a potentially high degree of community benefit given the shorter distance of travel to Moura and a safer low speed intersection. The provision of this road alignment will have to deal with additional challenges such as:

- Property acquisition for the road reserve
- Gas infrastructure from the WestSide gas field, and
- A large creek crossing with potential clearing of native vegetation.

This proposed route is similar to the Three Chain Road Connection to Theodore Road (Option 3 ii) discussed in Section 3.4.2, but the road alignment deviates from Three Chain Road and connects to Theodore Moura Road further north. The modified alignment

continues west to the northern property boundary of Lot 3 RP6195003 and continues parallel to this property boundary connecting to Theodore Moura Road..

3.5 Intersection Designs

The proposed new alignment options will require connections back onto the existing road network, being either the Dawson Highway controlled by the TMR, or the Moura Theodore Road controlled by BSC.

3.5.1 Theodore Moura Road

The proposed connection back to the Theodore Moura Road for the options would be similar to the existing intersection.

3.5.2 Dawson Highway Three Chain Road Intersection

The current Dawson Highway Three Chain Road intersection is a Channelised intersection with auxiliary lanes for the right and left turns into Three Chain Road. The key issue with the current intersection is that the distance between the hold line at the stop sign in Three Chain Road to the rail level crossing is only 12.5 m, which means the trailer of trucks queued at the intersection are parked across the rail lines with nowhere to go if a train happens along. This is known as short stacking.

Proposed Intersection

The type of intersection proposed by Hatch on behalf of Anglo is a Seagull pattern intersection as indicated in Figure 2. This is similar to the current intersection, only that the vehicles turning right out of Three Chain Road have their own lane on the Dawson Highway and have to merge with the through traffic once up to speed. This is the safest type of intersection for an un-signalised intersection, as it removes the 90 degree side impact from the left side for vehicles turning right out of Three Chain Road.

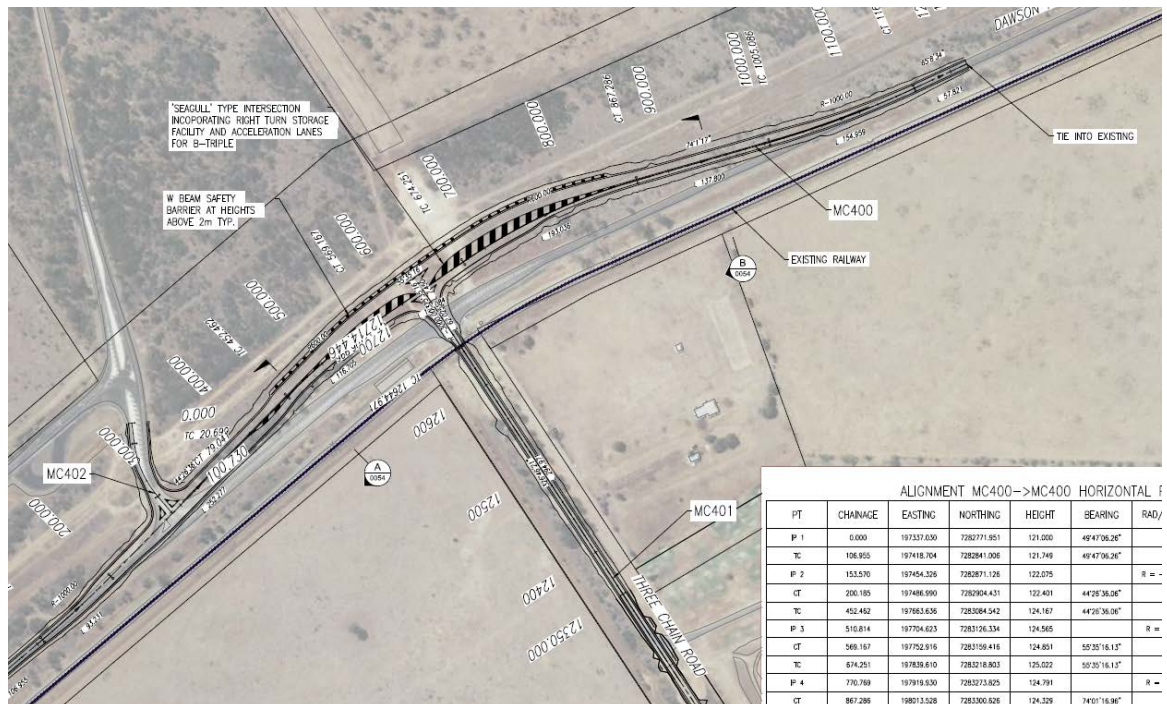


Figure 2 Concept Plan Dawson Highway Intersection

The Hatch concept plan on drawing set prefixed H357151-00000-223-292 has been sent to TMR for initial review and initial verbal comments.

4. Stakeholders

The key stakeholders for the selection of the Gibihi Road replacement options have been identified as:

- WestSide Corporation
- Department of Transport and Main Roads
- Aurizon
- Banana Shire Council
- Olam Moura Gin
- Queensland Nitrates Pty Ltd
- Community.

Other stakeholders include:

- Adjacent impacted Landowners (land acquisitions etc.)
- Civil Construction Contractor
- Affected adjacent businesses.

More information is to be developed with the project.

4.1 WestSide Corporation

WestSide Corporation (WestSide) operate a gas field on the western side of the mine. The gas field has a network of high pressure gas lines that feeds gas from the gas well heads to a central Hillview processing plant, located not far from where the proposed Three Chain Road crosses the mine for the new route.

WestSide wrote to the BSC on the 25 June 2018, stating that they had spoken to Anglo personnel expressing concerns of locating a 100 km/h road within close proximity to gas wells and high pressure gas compression equipment, and the serious safety concerns for WestSide personnel and the public alike. All alignment options are affected by the gas infrastructure, with the impacts becoming greater the further the option is to the south.

Anglo received correspondence from Westside Corporation dated 21 August 2018 regarding constructing a roadway over and through the gas field. The letter considered the various road options outlining the risks and their opinion of costs around construction and operation of each road option. The costs to relocate also include anticipated shut down and production losses. The estimated costs of altering the gas infrastructure for each road option is as indicated in Table 2.

Table 2 Estimated cost for Infrastructure Alteration and Losses

Option (Report Option)	Route	Cost
1 (3 i)	Dawson Highway Intersection Option	\$ 385,000
2 (3 ii)	Theodore Moura Road Intersection Option (Cotton Gin Exit)	\$ 15,128,400
3 (3 iii)	Theodore Moura Road Intersection Option (Wonga Exit)	\$ 13,385,000

WestSide’s letter also identified the following impacts and risks:

It is Westside's view that placing a 100km/hr road through the middle of an active gas field (with continuous light and heavy vehicle activity) represents an unacceptable health and safety risk.

Unidentified Gas Infrastructure - There is potential for unidentified gas pipelines installed by others prior to Westside involvement in the gas field which could have cause injury, death and damage to property during construction. As a consequence Westside, Anglo American, Banana Shire Council or the RPEQ Engineering firm will not accept any responsibility or liability for rectification, damage to property or injury.

The Banana Shire Council had discussions with the WestSide representatives regarding the feasibility of constructing and operating roads through the gas fields to the west of the Mine.

WestSide reiterated the issues around cost, safety and disruption and confirmed their discussions in a formal letter to Council. WestSide further stated in the BSC letter of the 28 August that:

The proposal as outlined will likely cause a significant increase in the safety risks of operating in the Moura area for our personnel and the general public. Our operations and facilities have been designed based on the current lay of the land and existing hazard offsets and are not designed to operate in a way conducive to the proposed realignment.

Westside is concerned as to why this proposal, with it risk to life, property and environment, is being considered whilst less non-contentious options exist. Therefore Westside respectfully requests that the option in question be discarded from consideration.”

These safety concerns to the workers of WestSide, road Contractors, and BSC maintenance staff is a serious consideration of Banana Shire Council in deciding on the option for the route.

4.2 Department of Transport and Main Roads (TMR)

Anglo have been dealing directly with the TMR with respect to the design of the intersection of Three Chain Road and the Dawson Highway for Option i) on the proposed route. TMR received the proposal warmly outlining the issues associated with the intersection such as the short stacking across the rail line. Further, TMR briefed Anglo on the additional considerations with the new intersection design including alterations to the intersection of Theodore Baralaba Road and the Dawson Highway.

TMR further commented on the technical requirements of the intersection if the design was to proceed to approval for construction stage, in particular to the provision for B-triple trucks from Queensland Nitrates Pty Ltd (QNP). TMR also queried whether the rail could be realigned to improve the alignment of the Dawson Highway.

4.3 Aurizon

Aurizon attended the initial meeting with Anglo and TMR providing photos of a QNP B-triple road train carrying ammonium nitrate stacked across the rail line at the intersection. So any proposal improving the intersection to remove this risk to their track and rolling stock was good news. Aurizon have advised they need 46 metres between the stop line and the rail corridor to prevent short stacking.

4.4 Queensland Nitrates Pty Ltd (QNP)

QNP operate an ammonia Nitrate Plant on Three Chain Road. Anglo stated that they had positive talks with QNP about upgrading of the intersection of Three Chain Road and the Dawson Highway.

Further discussion are likely as the project develops.

4.5 Olam Moura Gin

Olam Moura Gin (Olam) was approached by Anglo regarding Option 3 ii) for section 3 of the proposed route. Olam requested that the Option 3 ii) alignment be located well away from the side boundary of the Cotton Gin site, and did not take up an offer for a side access into the Cotton Gin site.

5. Cost Estimates

Capital cost estimates have been provided for the two Hatch options for the route. The cost of construction for the road replacement will be met by Anglo. Consideration of the cost has little effect on Council other than depreciation; however, a smaller spend on the road has less impact on one of the area's largest employers. The capital cost of the two options excluding below the line costs are indicated in Table 3.

Table 3 Capital costs

Section	Dawson Highway Option	Theodore Road Option
Eastern Section – Conveyor Overpass to Gibihi Road	\$5,725,000	\$5,725,000
Mine Section - Mine Crossing to Conveyor Overpass	\$12,422,000	\$12,422,000
Western Section – Dawson Highway Section including WestSide gas	\$9,574,000	\$27,788,240
Owners Costs*	\$6,201,630	\$11,481,310
Contingencies 25%	\$6,752,000	\$14,354,137
Estimated Project Cost	\$40,674,630	\$71,770,687

* Costs include below the line costs such as legal, accounting, permitting and approvals, acquisitions, logistics, project management, engineering, other service relocations, corporate and contingencies.

The Dawson Highway Three Chain Road option has a significantly smaller capital cost than the Theodore Road options. This is predominantly due to the rectification of Gas infrastructure and bridge crossings over Kianga Creek.

6. Project Approvals

A number of approvals will be required by Anglo in order for the road works and construction of the new Gibihi Road route to proceed.

Types of approvals include:

- Land owner
- Statutory
- Asset owner.

6.1 Land Acquisition

Land acquisition is required in some instances to provide a right of way for the roadway along the proposed routes. Land acquisitions can add to the risk and delay the commencement of works on the new road, and should not be taken for granted until contracts are signed and transfer dates locked in. The following land title review is based upon Anglo being the principal for the project, acquiring the land through their obligation to replace the current Gibihi Road.

6.1.1 Section 1 – Three Chain Road East of Mine to Gibihi Road

The construction of Three Chain Road north from Gibihi Road will predominantly be on the Anglo property and road reserve up until it turns to cross the mine. Anglo states that the land acquisition negotiations are progressing positively and at this point appear to be low risk.

6.1.2 Section 2 – Three Chain Road through Mine

The road reserve for the proposed road across the mine will have to be dedicated and incorporated into the Anglo Mining Permit. Anglo does not see an impediment to this occurring. Approvals are required under the Mine Permit for the road to traverse the mine lease, which also appear to be low risk.

6.1.3 Section 3 - Western side of the mine to Moura

Currently there are currently no specific land acquisitions identified for road way for the Option 3 i) or Option 3 ii). Option 3 ii) is located on land owned by Anglo.

Private land acquisitions are required for Option 3 iii). Land owners have been resisting approaches by Anglo to acquire the land for the road corridor. Anglo and BSC have stated that it is preferred not to undertake compulsory land acquisition, **essentially ruling out Option 3 iii).**

6.2 Statutory Approvals

Statutory approvals are generally required for changes to infrastructure and to address impacts of the road construction on the environment.

6.2.1 Infrastructure Approvals

Should Anglo undertake the construction works for the replacement road, an Operational Works application maybe required to be lodged by Anglo to BSC for the construction of the road. This may involve referral of the application to the TMR and Aurizon. Approvals for changes/impacts to infrastructure may also apply under the Transport Infrastructure Act. Anglo are confident there are no major impediments to these approvals.

6.2.2 Environment and Heritage Approvals

Environmental approvals are required for the completion of the project at Local, State and Federal Government Levels. The relative Acts are:

1. Nature Conservation Act 1992
2. Environment Protection and Biodiversity Conservation Act (EPBC) 1999
3. Planning Act 2016
4. Vegetation Management Act 1999
5. Fisheries Act 1994
6. Queensland Heritage Act 1992
7. Water Act 2000.

Hatch commissioned EMM Consulting (EMM) to undertake an environmental and heritage assessment of the site producing a report titled, “Environmental and Cultural Heritage Constraints Assessment, Ecological and heritage values of a proposed road upgrade” (23 July 2018).

Table 4 Comparison of Approvals required of Option 3 i) and 3 ii)

Environmental Issue	Option 3 i) Dawson Highway	Option 3 ii) Theodore Road
Disturbing significant riparian habitat	Avoided	Likely with construction of Kianga Creek crossing
Clearing of mapped remnant vegetation Remnant RE11.4.9b Brigalow TEC	-	Potentially impacting Brigalow Threatened Ecological Community (TEC) in the stock route Clearing approval needed under the Vegetation Management Act
<i>S. elachophyllum</i> , <i>Solanum dissectum</i> EVNT flora species, one is EPBC listed (Nature Conservation Act, Environment Protection and Biodiversity Conservation Act 1999.)	Located in close proximity to the road corridor with potential for direct and indirect impacts. Impacts can be avoided with careful design, construction and operational management.	-
Essential Habitat (Vegetation Management Act)	Potential Habitat for Ornamental Snake, to be confirmed.	Likely habitat for ornamental Snake, to be confirmed.
Cultural Artefacts	No cultural heritage constraints were identified, unlikely as already disturbed area.	Highest chance of occurrence in sections of remnant vegetation.
Waterway Barrier Works (Fisheries Act)	-	Crossing of Kianga Creek major and high level fish passage Provisions needed for fish passage, Development Application required is accepted development requirements not met

Note: EVNT = Endangered, Vulnerable or Near Threatened species -

TEC = Threatened Ecological Community (TEC)

The study carried out by EMM is based on the high level layouts from Hatch and would require further refinement for the design to enable the production of a definitive list of approvals and consequent risks to the project associated with each road option.

Of the environmental issues listed above by EMM, most of the approvals required would appear to be of an acceptable risk for either road alignment and take similar periods to be assessed.

7. Programming of Replacement Road

Delivery programs (Gantt charts) for the completion of the replacement of Gibihi Road for the two options with road connections to the Dawson Highway and Theodore Road (Option 3 ii) were provided by Hatch on 11 September 2018. Programs include: site investigation, design, approvals, tendering, construction

The Dawson Highway option 3 i)

- Start May 2018
- Completion December 2019

Theodore Moura Road Option 3 ii)

- Start September 2018
- Completion October 2020

The reason for the difference in the start date is due to obtaining legal access to enter private property and the gas fields in order to undertake detailed site investigations such as survey, geotechnical investigations and further environment and cultural heritage surveys.

Hatch's program for the Dawson Highway connection is approximately 10 months shorter than the Theodore Moura Road option (ignoring the different start times). This is mostly due to:

- Legal access for site investigations
- A two month approvals period required with WestSide to alter gas infrastructure, and
- A further 4 month period to carry out modifications of the gas pipelines and infrastructure to provide a corridor with acceptable risk for construction of a road through the gas field.

With the anticipated road delivery period for the Theodore Road connection option taking some 10 months longer than the Dawson Highway Option, the Dawson Highway connection option is the preference of the BSC. Hatch's program will be updated as the project develops further.

8. Route Option Comparison

The alternative route for Gibihi Road is broken up into three sections as described earlier. There is a minor variation for Section 1 of the proposed route of which the 100km/h route is preferred. This section of road is common to all three route options. The route through Section 2 of the mine is set by the constraints of the mine.

The only Section of the road alignment which requires some consideration is section three of the proposed replacement route between the mine crossing and either the Dawson Highway or Theodore Road. Three options have been presented for this section, being the connection from the proposed Three Chain Road across the Mine to:

- I. The Dawson Highway via Three Chain Road
- II. Theodore Road south of the Cotton Mill
- III. Theodore Road near Herzog Road.

Table 5 provides a summary of the issues that may affect the decision. Further development of the issues is required to form a fair opinion.

Table 5 Route Section 3 Options Comparison

Section 3 option connection to ...	Distance to Moura*	Cost	Approvals Required #	Land Acquisition	Impacts WestSide Gas Field	Delivery timing – yet to be quantified	Risk Assessment
Option 3 i) Dawson Highway	8.8 km	\$40,674,630	TMR – intersection design and construction Transport Infrastructure Act (TIA) Aurizon – additional traffic across Rail Line (TIA) BSC – Works on Roads/Operational Works Planning Act (PA)	Minor rail reserve – difficult.	Minor – impact of mains running crossing Dawson Highway - \$285,000. No known mains under the Three Chain Road.	Potentially delays due to formalising design of Dawson Highway Intersection	Low risk. Risks being in the costs and delays associated with the approval and construction of the Dawson Highway Intersection. High speed intersection with connection road at 100km/k speed zone.
Option 3 ii) Theodore Road south of the Cotton Mill	10.2 km	\$71,770,687	TMR – intersection design and construction (TIA) Aurizon – additional traffic across the rail line (TIA) BSC – Works on Roads/Operational Works (PA) Nature Conservation Act – clearing of stock route Vegetation Management Act – Clearing of vegetation - difficult Fisheries Act – crossing two creeks	Nil – predominantly on Anglo owned land.	Significant – alignment passes close to the main gas compressor station, impacting major feed pipes (\$15M) and potential risk to the gas plant itself (\$50M). Risk from unknown major gas pipes being struck by construction. Very high risk to project from both safety and costs.	Ten month longer delivery period delays due to: <ul style="list-style-type: none">InvestigationsProtection of gas mainsEnvironmental approvals Delays unacceptable to Public	Significant risks: <ul style="list-style-type: none">Gas field alteration delays and significant Work Health and Safety risk to WestSide Contractor and BSC workers.Environmental approvals for creeks and stock routeLonger route not preferred by majority of road usersHigh speed intersection with connection road
Option 3 iii) Theodore Road near Herzog Road	7.6 km	Not Costed	TMR – intersection design and construction (TIA) Aurizon – additional traffic across the rail line (TIA) BSC – Works on Roads/Operational Works (PA) Land owner – land acquisition Vegetation Management Act – Clearing of vegetation - moderate Fisheries Act – crossing one creek - minor	Numerous private properties to be acquired. Owners resisting negotiation to acquire land. Option ruled out due to potential need for compulsory land acquisition.	Moderate - alignment passes through the fringe of the field (\$13.5M). Lesser number of pipelines crossed, not impacting the gas plant. Risk from unknown major gas pipes being struck by construction. High risk to project from both safety and costs.	Potentially significant delays due to formalising land acquisitions and protection of gas mains.	Significant risks: <ul style="list-style-type: none">Gas field alteration delays and significant Work Health and Safety risk to WestSide Contractor and BSC workers.Environmental approvals for Creeks and stock route Lower risk: <ul style="list-style-type: none">Low speed intersection in 60 km/h zone in Moura

* Intersection of Theodore Road and Dawson Highway

Initial list – formal list to be provided by Anglo /Hatch

9. Conclusions

9.1 Basis of Design

The basis of design for the road is generally acceptable, with the horizontal alignments provided to date complying with the CMDG requirements. The new road will be designed to cater for a B-triple road train which will require a broader consideration of design standards.

9.2 Options consideration

Through a process of consultation with Council, Anglo have settled on a route for the reconstruction of Gibihi Road using Three Chain Road from the east of the mine across the mine. This route avoids the majority of potential subsidence associated with the road across rehabilitated mining areas.

Two Anglo and one GHD options were considered for this third section of the road to connect back into the road network at either the Dawson Highway or Moura-Theodore Road:

- i) Three Chain Road connection to Dawson Highway
- ii) Three Chain Road connection to Theodore Road near cotton mill
- iii) Three Chain Road connection to Theodore Road near Herzog Road (GHD)

With the connection of the new road to existing constructed section of Three Chain Road, all three options will impact the intersection of the Dawson Highway with additional traffic, triggering an upgrade of the intersection requiring TMR and Aurizon approvals.

Proposed Option i) is located in the existing Three Chain Road reserve along the existing road formation which avoids a lot of the constraints in the area including environmental approvals and major gas field impacts.

Proposed Option ii) connects back onto the Theodore Road south of the Cotton Gin. The route is the longest back to Moura. This option has significantly more risk with respect to the environmental approvals required, though the habitats identified are isolated and hence less valuable. This option requires the most significant alteration of the WestSide gas field infrastructure which potentially poses *very high risk* to the project in the areas of safety, cost and time delays, and for that reason is not preferred.

Proposed Option iii) connects back onto the Theodore Road near Herzog Road. The route is shortest distance back to Moura. It requires less alteration of the WestSide gas field infrastructure which potentially poses a *high risk* to the project in the areas of safety, cost and time delays. The route requires the acquisition of the road reserve from private land owners who have not reacted favourably to Anglo to acquire the corridor. Anglo and BSC have indicated that their preference would be not to proceed with compulsory land acquisitions and hence this option is not preferred because of the inherent difficulties with compulsory acquisition.

9.3 Stakeholders

WestSide has provided feedback on the potential alignments of a road to be constructed through their gas field to the west of the mine. WestSide have indicated that there is significant risk to persons building and traversing the road options across the web of high pressure gas lines, as well as to their own personnel and equipment maintaining the wells and pipelines during the operation of the road. WestSide also identified that there may be unknown mains pre-WestSide ownership of the infrastructure which present a significant risk to persons constructing the road, with the consequences of such a strike being potentially fatal.

TMR have been receptive to the concept plans for the upgrade of the intersection of the Dawson Highway and Three Chain Road to mitigate the impacts of the additional traffic. Approvals will be ongoing as the design proceeds through to the construction phase.

Aurizon has reviewed the Dawson Highway option and support the upgrade to the intersection to prevent short stacking across the rail line.

10. Recommendations

It is recommended that the Three Chain Road to Dawson Highway Intersection Option be adopted as the preferred option for the following:

1. Least impact on stakeholders and minimal land acquisition
2. Least impact on the environment, cultural heritage and associated approvals periods
3. Least exposure to the costs and risks associated with relocation of the gas infrastructure and a safer option for construction and operation of the roadway
4. Shortest lead time for design, construction and approvals
5. Travel distance to Moura comparable to the other options
6. TMR and Aurizon are generally supportive of the concept design and prepared to accept the recommendation for a Seagull intersection upgrade at the Dawson Highway
7. Generally the lowest risk option.

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