

APPENDIX V

Traffic and Transport Assessment





CLIENTS | PEOPLE | PERFORMANCE

Vista Gold Australia Pty Ltd

Mt Todd Gold Project Traffic and Transport Impact Assessment

June 2013



This Traffic and Transport Assessment Report ("Report"):

- 1. Has been prepared by GHD Pty Ltd ("GHD") for Vista Gold Australia Pty Ltd (Vista Gold); and*
- 2. May only be used for the purpose of informing the Environment Impact Statement for the Mt Todd Gold Project (and must not be used for any other purpose).*

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in Section 3 Methodology.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"), as specified in Section 3 Methodology and throughout this Report.

GHD excludes liability for errors in, or omissions from, this Report arising from or in connection with any of the assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation. GHD has not, and accepts no responsibility or obligation to update this Report to account for events or changes occurring subsequent to the date that the Report was signed.



Contents

Glossary of Terms	i
Executive Summary	ii
1. Introduction	1
1.1 Background	1
1.2 Project Overview	1
1.3 Scoping Requirements	3
2. Legislative Framework	4
2.1 Northern Territory Legislation	4
2.2 Northern Territory Policy	5
2.3 Northern Territory Strategies	5
2.4 Road Permits	6
3. Methodology	7
4. Existing Conditions	8
4.1 Study Area	8
4.2 Existing Road Network	8
4.3 Intersections	12
4.4 Traffic Volumes	14
4.5 Casualty Crash History	15
4.6 Railway Line	17
4.7 Public Transport	17
4.8 Truck Facilities	18
4.9 Local Community	18
4.10 Existing Conditions Summary	18
5. Proposal	20
5.1 Overview	20
5.2 Workforce	20
5.3 Accommodation	21
5.4 Estimated Traffic Generation	21
5.5 Proposed Haulage Routes	24
6. Potential Impacts	26



6.1	Cumulative Traffic Volumes	26
6.2	Road Network Capacity Assessment	27
6.3	Intersection Assessments	31
6.4	Road Network Infrastructure	34
6.5	Road Safety	35
6.6	Potential Impacts Summary	36
7.	Management Measures	37
7.1	Intersection Upgrades	37
7.2	Traffic Management	37
7.3	Haulage Compliance Measures	37
7.4	Management of Driver Fatigue	38
7.5	Incident Management	38
8.	Conclusions and Recommendations	39
8.1	Conclusions	39
8.2	Recommendations	39
9.	References	40

Table Index

Table 1	Traffic Volume Data (DLP 2009)	14
Table 2	Percentage Heavy Vehicles (DLP 2009)	14
Table 3	Observed traffic growth rates (derived from DLP data, 2009)	15
Table 4	Recorded accidents by accident type (derived from DLP data, 2011)	15
Table 5	Estimated Vehicle Trip Ends (VTE) per phase for Mt Todd Mine	24
Table 6	Estimated Construction Traffic Distribution for Mt Todd Mine	25
Table 7	Estimated Operation Traffic Distribution for Mt Todd Mine	25
Table 8	Estimated Cumulative Traffic Volumes (Construction)	26
Table 9	Estimated Cumulative Traffic Volumes (Operation)	27
Table 10	Level of Service descriptors (Austroads, 2009)	28
Table 11	Stuart Highway Level of Service factors	28
Table 12	Traffic Capacity Assessment, Stuart Highway	29
Table 13	Edith Falls Road Level of Service factors	30
Table 14	Traffic Capacity Assessment, Edith Falls Road	30



Table 15	Estimated Peak Turning Movements (Construction), Stuart Highway / Edith Falls Road	31
Table 16	Estimated Peak Turning Movements (Operation), Stuart Highway / Edith Falls Road	31
Table 17	Estimated Peak Turning Movements (Construction), Edith Falls Road / Jatbula Road (Mine Access Road)	33
Table 18	Estimated Peak Turning Movements (Operation), Edith Falls Road / Jatbula Road (Mine Access Road)	33

Figure Index

Figure 1	Project Location	2
Figure 2	Study Area Transport Network	9
Figure 3	Stuart Highway typical two-lane two-way cross section	10
Figure 4	Stuart Highway dual carriageway cross section at Edith Falls Road intersection, view to south	10
Figure 5	Edith Falls Road typical two-lane two-way cross section, creek crossing, view to west	10
Figure 6	Edith Falls Road typical two-lane two-way cross section, view to west	10
Figure 7	Jatbula Road (Mine Access Road) typical cross section, view to north	11
Figure 8	Jatbula Road (Mine Access Road) cross section – localised poor pavement condition, view to north	11
Figure 9	Internal Mine Roads, sealed section of roads	11
Figure 10	Internal Mine Roads, unsealed sections of roads	11
Figure 11	Sight distances at the Stuart Highway / Edith Falls Road intersection, view to south on Stuart Highway	12
Figure 12	Sight distances at the Stuart Highway / Edith Falls Road intersection, view to north on Stuart Highway	12
Figure 13	Sight distances at the Edith Falls Road / Jatbula Road (Mine Access Road) intersection, view to east on Edith Falls Road	13
Figure 14	Sight distances at the Edith Falls Road / Jatbula Road (Mine Access Road) intersection, view to west on Edith Falls Road	13
Figure 15	Edith Falls Road level crossing, view to west	13
Figure 16	Edith Falls Road level crossing, view to east of flashing lights and on-road warning signage	13
Figure 17	Study Area Road Crashes (01/06/2006 – 01/06/2011)	16



Glossary of Terms

Throughout this report the following terms or acronyms are referred to:

- ▶ *At-grade crossing* – A crossing of rail line and roadway at one level, without overpass or underpass.
- ▶ *Diverge taper* – A diverge taper is used on multi-lane carriageways when the number of traffic lanes is increased, i.e. from one lane into two lanes.
- ▶ Intersection treatment types:
 - *AUL* – Auxiliary left-turn treatment on the major road, i.e. additional short left-turn only lane;
 - *AUR* – Auxiliary right-turn treatment on the major road, i.e. shared through and right-turn lane and additional through-lane for overtaking vehicles;
 - *BAL* – Basic left-turn treatment on the major road, i.e. shared left-turn and through lane with minor widening of the shoulder;
 - *BAR* – Basic right-turn treatment on the major road, i.e. shared through and right-turn lane with minor widening of the shoulder;
 - *CHL* – Channelised left-turn treatment on the major road, i.e. additional short left-turn only lane separated from through traffic by painted chevrons and island; and
 - *CHR* – Channelised right-turn treatment on the major road, i.e. additional short right-turn only lane separated from through traffic by painted chevrons and island.
- ▶ *Merge taper* – A merge taper is used on multi-lane carriageways when the number of traffic lanes is reduced, i.e. from two lanes into one lane.
- ▶ *Priority control intersection* – The intersection of two or more roads with right of way for traffic managed by signage or line markings rather than traffic signals.
- ▶ vph – vehicles per hour.



Executive Summary

This document presents the Transport Assessment for the Draft Environmental Impact Statement (EIS) of the Mt Todd Gold Project. The scoping requirements for the EIS set out considerations regarding the potential transport impacts associated with the construction, operation and closure of the project.

Potential impacts of the Project on capacity, intersection operations, safety and broader road network infrastructure for critical construction and operation phases are assessed.

The existing conditions of the transport network within the Project area are characterised by:

- ▶ Significant seasonal variation in traffic volumes on the Stuart Highway, with peak period dry season daily volumes observed to be up to 50% higher than daily average volumes for the year;
- ▶ Substantial spare capacity in the road network, with Stuart Highway and Edith Falls Road operating at the highest Level of Service standard;
- ▶ Relatively high proportion of heavy vehicles compared to typical arterial road network conditions;
- ▶ Duplicated and divided intersection of Stuart Highway and Edith Falls Road adequately providing for the separated movement of turning vehicles from through movement vehicles; and
- ▶ Road crash history with a high representation of single vehicle collisions, though not at any one location.

The construction of the project may have short-term adverse effects on the existing road network through the addition of construction related traffic. These impacts would be localised and short-term. The risks of these impacts are considered and could appropriately be mitigated through the implementation of measures, such as a Traffic Management Plan.

The traffic forecast to be generated by the operational phase of the Project is expected to have a negligible operational impact on the road network. No reduction in Level of Service or intersection performance is anticipated.

Additional risks and impacts associated with the operational phase of the Project will be manageable through the application of applicable minor localised infrastructure upgrades, management plans and management systems (including a Traffic Management Plan, Fatigue Management Plan and Incident Management Plan). Documentation will be produced in accordance with appropriate legislation and approved codes of practice.



1. Introduction

1.1 Background

GHD has been commissioned by Vista Gold Australia Pty Ltd (Vista Gold) to prepare a Draft Environmental Impact Statement (EIS) to assess the proposed re-establishment and operation of the Mt Todd Gold Mine.

The Mt Todd Gold Project (the Project) is located approximately 55 kilometres (km) northwest of Katherine, and approximately 250 km southeast of Darwin in the Northern Territory (Figure 1).

Pegasus Gold Australia Pty Ltd operated the Mt Todd mine from 1993 to 1999. The project closed as a result of technical difficulties and low gold prices. A joint venture, comprising Multiplex Resources Pty Ltd and General Gold Resources Ltd, bought the deeds to the mine in 1999 and operated it until July 2000. Vista Gold acquired concession rights in 2006. A Pre-feasibility Study for the Project is being completed by Vista Gold. Project information contained in this report has been supplied by Vista Gold from the Pre-feasibility Study.

This report has been prepared as part of the EIS and contains an assessment of the traffic and transport related issues relevant to the re-establishment of the Mt Todd Gold Mine.

1.2 Project Overview

This Project comprises the mining of gold ore from the existing Mt Todd Gold Mine – Batman Pit (previously mined and now in care and maintenance).

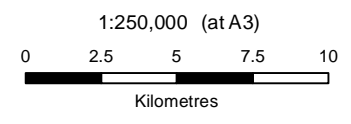
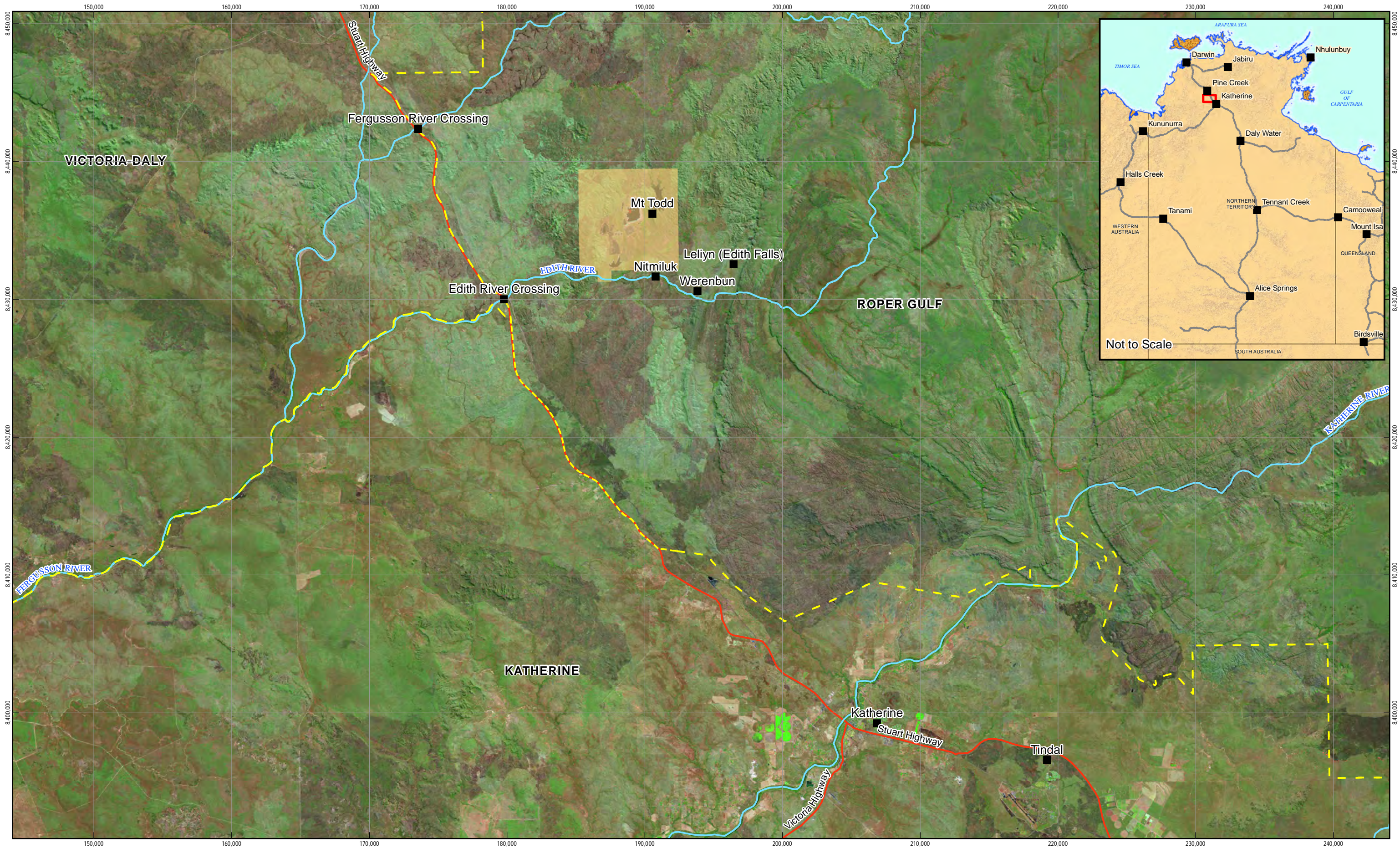
Mining will be an open-pit truck and shovel operation, using large haul trucks, hydraulic shovels and front end loaders to transport materials to the crusher, stockpiles, Run of Mine (ROM) pad and waste dump. Extracted ore, will be processed in an ore processing plant where it will be crushed, milled and then carbon in leach (CIL) leached followed by adsorption, desorption and recovery leading to gold dore (unrefined gold). Approximately 17.8 million tonnes per annum (Mtpa) of ore will be processed. Gold dore will be transported for onward secure shipment to a refinery.

Mine construction is will occur over a two year period (including pre-production operations during six months in construction year 2) and employ a workforce of up to 450. Transport associated with mine construction will include workforce transport to and from site by bus and light vehicle, and plant, equipment and construction materials transported to the site by a combination of standard and oversize heavy vehicles.

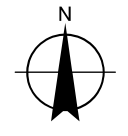
Mine production is expected to occur over a further 13 year period. Transport associated with mine operation and maintenance will include:

- ▶ Transport to and from site, primarily by bus, of a workforce that will peak at 350;
- ▶ Fuel, oil, chemicals and consumables transported to site by heavy vehicle; and
- ▶ Transport from site of gold dore by armoured vehicle.

Closure will occur over a four year period. Vehicle usage during this time will be low and significantly less than that occurring during the construction and production phases.



Map Projection: Universal Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia
 Grid: Map Grid of Australia 1994, Zone 53



LEGEND	
■ Place Names	- - - LGA Boundaries
— Major Roads	■ Mt Todd Mineral Leases
— Rivers	



Vista Gold Australia Pty Ltd
 Mt Todd Gold Project

Job Number	43-21801
Revision	1
Date	29 May 2013

Project Location

Figure 1



1.3 Scoping Requirements

Guidelines for the preparation of an EIS for the Mt Todd Gold Project were released by the NT EPA (formerly the Department of Natural Resources, Environment, the Arts and Sport (NRETAS)) in September 2011. Section 10.6 of the Guidelines stipulates that traffic and transport issues are to be addressed as follows:

- ▶ *Details of the existing transport infrastructure at locations likely to be impacted by the proposal;*
- ▶ *Description of transport systems and methods to convey all site traffic (including materials, workers and product) to and from the site (both during construction and operation) including:*
 - *Type, size and number of vehicles required during all phases of the proposal;*
 - *The estimated volumes, tonnage, composition, origin and destination of traffic generated by the proposal;*
 - *Estimated times of travel; and*
 - *Additional road infrastructure works required including site access and signage.*
- ▶ *Description of transport systems and methods to convey any product to proposed markets;*
- ▶ *Description of any proposed haul roads, including length, location, land requirements, tenure and acquisition requirements;*
- ▶ *Description of construction methods and timeframes for any proposed private and public haul roads;*
- ▶ *Description of how the project will, or has the potential to, impact on transport infrastructure during construction and operational phases. In addition, description of possible transport impacts as a result of the proposal including issues such as dust and road traffic noise;*
- ▶ *Describe proposed safeguards, management and monitoring strategies that will be implemented to minimise potential transport impacts during construction and operation including, but not limited to:*
 - *Methods for complying with any relevant road vehicle axle limits;*
 - *Methods for securing loads;*
 - *Measures to reduce any road traffic noise impacts;*
 - *Consultation with local communities affected by transport impacts;*
 - *Traffic management; and*
 - *Management of driver fatigue.*
- ▶ *Consultation undertaken with relevant regulatory agencies; and*
- ▶ *Necessary approvals required.*

In addition, points of consideration raised by the Road Network Division during the consultation process are also addressed. These comprise:

- ▶ *Transport of dangerous goods;*
- ▶ *Increases in traffic on Stuart Highway and Edith Falls Road;*
- ▶ *The crossing of the Stuart Highway and Adelaide-Darwin railway line;*
- ▶ *Measures to address road safety in remote areas;*
- ▶ *Incident management; and*
- ▶ *Contributions by Vista Gold to the maintenance of roads used as haul routes.*



2. Legislative Framework

2.1 Northern Territory Legislation

2.1.1 Control of Roads Act

The Control of Roads Act provides that, subject to the Planning Act and the Local Government Act, the control, care and management of all public roads in the Northern Territory vests with the Minister. This Act outlines the process by which public roads can be opened and closed. Any public or gazetted roads that are required to be opened or closed as a result of construction or operation of the mine would be required to follow the provisions of the Act.

2.1.2 Traffic Act

The objective of this Act is to regulate traffic, which includes provisions in relation to the erection and operation of traffic control devices. Traffic control devices refer to signals, signs or markings displayed for the purpose of regulating, warning or guiding traffic. Under the Act, consent from the applicable competent authority is required prior to the erection and operation of traffic control devices.

2.1.3 Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act, 2010

The object of this Act and associated regulations is to regulate the transport of dangerous goods on land in order to promote public safety and protect property and the environment, achieved within a nationally consistent context.

The provisions of this Regulation reflect, with minor modifications, the provisions of the Model Subordinate Law on the *Transport of Dangerous Goods by Road or Rail 2007* prepared by the National Transport Commission.

The Regulation establishes a system of standards and licensing for the transport of dangerous goods by road and rail and also applies the Australian Code for the Transport of Dangerous Goods by Road and Rail to such transport.

This Act makes provision for safety in the transport of dangerous goods by road and rail. Involvement in the transport of dangerous goods by road or rail includes, but is not limited to, being the consignee of dangerous goods, loading or unloading dangerous goods that have been transported or the importation or arrangement to import dangerous goods.

2.1.4 Work Health and Safety (National Uniform Legislation) Act 2011

The Northern Territory *Work Health and Safety (National Uniform Legislation) Act 2011* commenced on 1 March 2012, and represents a movement by state and territory governments towards harmonising work health and safety legislation across Australia. Under the Act, approved codes of practice provide practical guidance to meeting legislative obligations.

Of relevance to this transport assessment is the approved Northern Territory Code of Practice in Fatigue Management. It is a voluntary code of practice for fatigue management for road transport with the objective to provide operators with a basic set of key principles to be applied.



2.2 Northern Territory Policy

2.2.1 Traffic Management at Work Sites, Department of Planning and Infrastructure, 2009

The objective of this policy is to change the construction philosophy from closing roads and using detours to manage construction adjacent to the roadside under operating traffic conditions.

The policy states that all rehabilitation projects shall be constructed while the road is open to traffic. The requirements are to:

- ▶ Obtain all necessary approvals, clearances and permits (including material sources, water sources, camp grounds and turn around areas for construction traffic and nominate these areas in the specification);
- ▶ Provide public notification in advance of any works;
- ▶ Implement a Compliant Traffic Management Plan, including restricted working hours if necessary;
- ▶ Ensure regular auditing of project for compliance; and
- ▶ Consider environmental protection and preservation of sacred and heritage sites in all rehabilitation and other road work projects.

Vista Gold is not proposing to alter gazetted roads.

2.2.2 Road Traffic Noise on Northern Territory Government Controlled Roads, Department of Planning and Infrastructure, 2006

The objective of this policy is to achieve an appropriate balance between providing efficient road transport infrastructure and controlling the adverse effects of road traffic noise on adjacent land uses. The policy sets out target road traffic noise objectives for particular types of road situations for residential and noise-sensitive land uses adjacent to arterial roads. It is noted that for an existing arterial road with planned significant development (e.g. addition of regular heavy vehicles onto Stuart Highway), there is no target and no required action.

2.3 Northern Territory Strategies

2.3.1 Northern Territory Road Safety Strategy 2004 – 2010: Reduced Road Trauma

The NT Road Safety Strategy is aimed at reducing the number, severity and cost of road crashes in the NT. The Strategy aims to achieve a 40% reduction on current road fatalities, consistent with targets set nationally. The four key objectives designed to meet the challenge of reducing road trauma include:

- ▶ A safer road network, by ensuring planning, design, construction, development, maintenance and management of the road network enhances and supports good road safety principles and practices;
- ▶ Safer road users, by enhancing and legislating education, driver training and enforcement programs, as well as improving and supporting marketing activities to promote and influence long term community behavioural change with respect to speeding, alcohol and other drugs, fatigue, seatbelts and vulnerable road users. In addition to this, also ensuring adequate infrastructure to promote and enhance cycling as an alternative method of transportation and one which minimises the potential road safety risk;



- ▶ Safer vehicles, by advocating and supporting new technological features in vehicles to enhance, maximise and maintain protection for both vehicle occupant(s) and other road users in the event of a serious crash; and
- ▶ Effective emergency response, by enhancing communication skills and access to crash sites, particularly in remote locations, to enable timely first aid and care to the critically injured during the golden hour post-crash.

2.4 Road Permits

2.4.1 Permit to Work Within the Road Reserve, Department of Construction and Infrastructure, 2011

An application must be submitted to the Department of Construction and Infrastructure if works are to occur within an NT Government road reserve. This is expected to apply to any required upgrades of intersections on Stuart Highway. The application must be accompanied by a Traffic Management Plan and associated documents for approval.

2.4.2 Permit for Oversize and Overmass Vehicles, Department of Planning and Infrastructure, 2007

The Motor Vehicles Act and Motor Vehicles (Standards) Regulations specify maximum dimensional and mass limits for vehicles which may travel on public roads in the Northern Territory with permits required for exemptions to be granted. Over-dimensional and over-mass loads require consideration of the width, alignment and impact on the roads and bridges, traffic conditions and proximity of roadside and overhead obstacles. These conditions will vary widely throughout the NT and, therefore, so will the conditions imposed on the permit for travel.



3. Methodology

The following tasks have been undertaken to complete the traffic and transport assessment:

- ▶ Review of existing information, reports and investigations:
 - Visit to the project area on a typical day to establish the existing traffic conditions, identify any safety and accessibility issues along the route and identify any heavy vehicle facilities;
 - Review of legislation, reports and existing data related to the project including review of traffic data available for the project area;
 - Assessment of recent crash history for the project area; and
 - Review of other existing conditions information including public transport and local community information within the vicinity of the project area to inform the impact assessment.
- ▶ Consultation with the Department of Lands Planning and the Environment (DLPE) (formerly Department of Lands and Planning), Road Network Division, and with the community via public consultation processes;
- ▶ Estimates of traffic generation and distribution associated with the construction and operation of the Mt Todd mine:
 - Proposed transport activities associated with each stage of the project have been provided by Vista Gold.
- ▶ Undertake an impact assessment of the Project for construction, operation and closure. The assessment considers:
 - Assessment of staff transportation;
 - Impacts on road network capacity and impacts on key intersections;
 - Potential effects on road network infrastructure;
 - Assessment and potential impact identification of the proposed access routes; and
 - Impacts on a range of road safety issues.
- ▶ Following an assessment of the potential project traffic and transport impacts, recommendations for management and mitigation measures for identified impacts have been made.



4. Existing Conditions

4.1 Study Area

The Mt Todd Gold Project is located approximately 55 kilometres northwest of Katherine, and approximately 250 kilometres southeast of Darwin in the Northern Territory. The Mt Todd mine site is located approximately 10 kilometres east of Stuart Highway, off Edith Falls Road. The mine site access is via Jatbula Road, a restricted mine access road.

The extent of the study area for this traffic and transport assessment is shown in Figure 2. Key elements within the study area include:

- ▶ Stuart Highway;
- ▶ Edith Falls Road;
- ▶ Jatbula Road (private mine access road); and
- ▶ Adelaide – Darwin railway line.

4.2 Existing Road Network

4.2.1 Stuart Highway

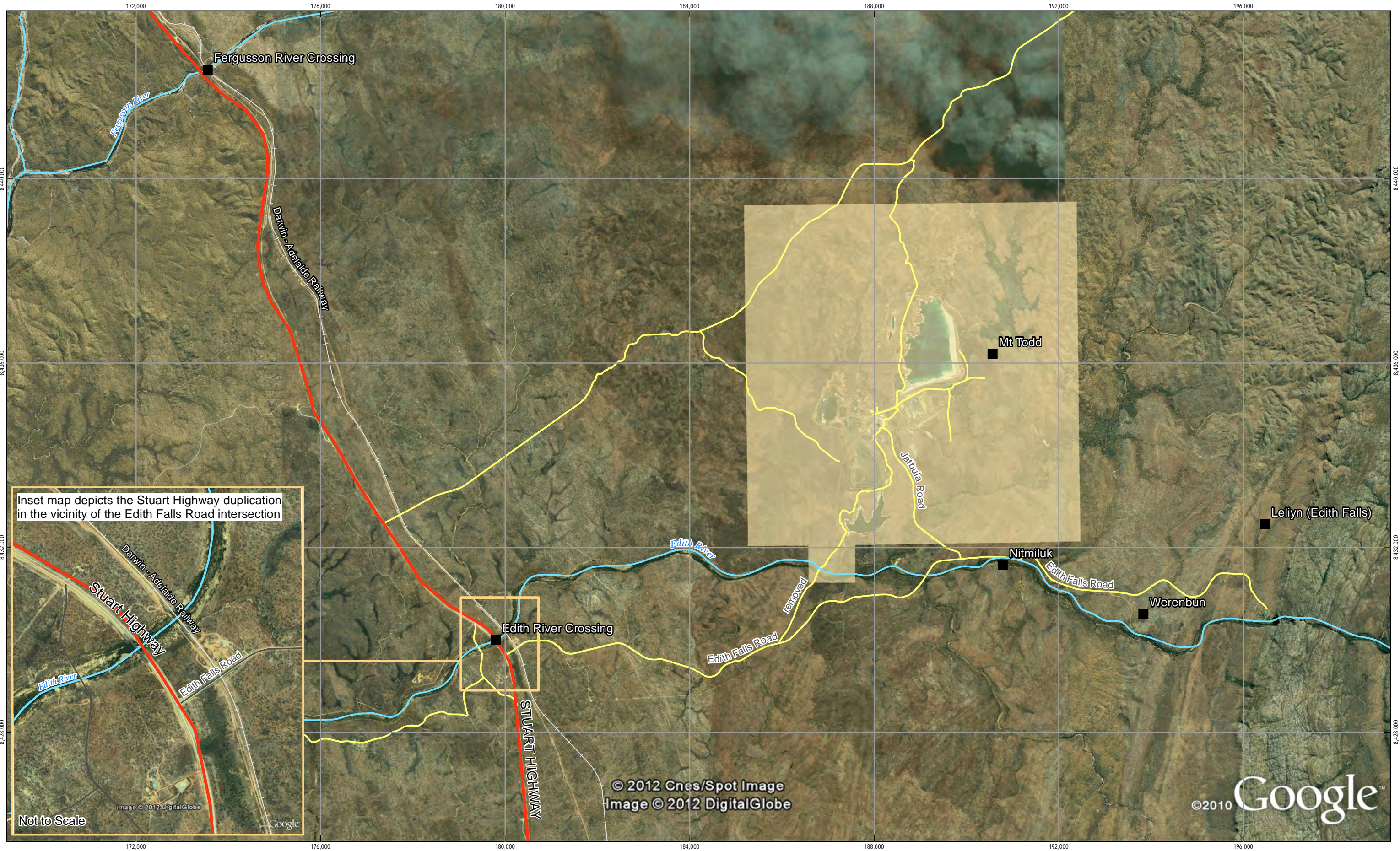
The Stuart Highway is a national highway extending approximately 2,700 kilometres from Darwin, NT to Port Augusta, SA. Within the study area, the Stuart Highway is a Declared Road controlled by DLPE. The Stuart Highway will provide connections from the major population centres to the mine.

The Highway has a 130km/h posted speed limit in the vicinity of the project and is generally a two-lane, two-way road with a seal width of 7 metres and unsealed or grassed shoulders varying between 2.5 and 5 metres in width. A typical cross section is shown in Figure 3. However in the vicinity of the intersection with Edith Falls Road, the Stuart Highway widens to a four-lane, two-way road which provides overtaking opportunities (Figure 4). In the vicinity of Edith Falls Road, the Highway has a 15 metre wide median with 3.5 metre wide right-turn and left-turn lanes. The road reserve at this location has a width of approximately 36 metres.

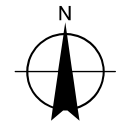
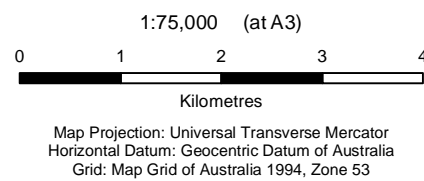
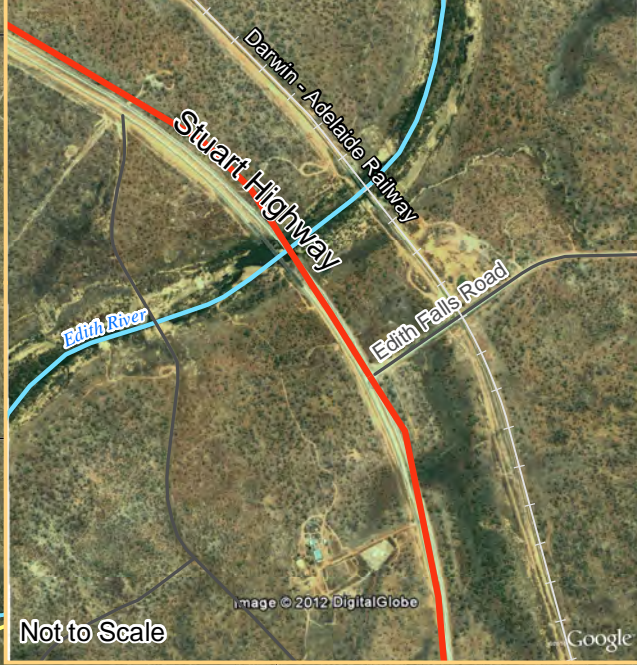
The dual carriageway section of Stuart Highway is approximately 3.25 kilometres long, extending about 750 metres to the south of the intersection and about 2.5 kilometres to the north of the intersection. The left-turn lane from the north into Edith Falls Road is approximately 180 metres long.

Sight distance along the Highway is good and typically exceeds one kilometre, with the exception of the Edith Falls Road intersection where sight distance is reduced to 850 metres to the south due to the horizontal curvature of the road (refer Section 4.3). This exceeds the Austroads desirable minimum stopping sight distance value of 257 metres for a 130km/h road.

There is no lighting provided along the road in the vicinity of the Edith Falls Road intersection; however, guide posts provide delineation for night time driving.



Inset map depicts the Stuart Highway duplication in the vicinity of the Edith Falls Road intersection



LEGEND

 Place Names	Railway
Highway	Rivers
Pre-existing track	Mt Todd Mineral Leases



Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	1
Date	29 May 2013

Study Area Transport Network

Figure 2



Figure 3 Stuart Highway typical two-lane two-way cross section



Figure 4 Stuart Highway dual carriageway cross section at Edith Falls Road intersection, view to south

4.2.2 Edith Falls Road

Edith Falls Road is a two-way, two-lane road which connects the Stuart Highway with Edith Falls. Within the study area, Edith Falls Road is a Declared Road controlled by DLPE. The road is utilised mainly by local residents and tourists, and intersects with Jatbula Road (Mine Access Road), which is the main access road into the mine site. The road has a typical cross section width of 7 metres (2 x 3.5 metres lanes) and the shoulders are a mix of rocks, grass and crushed rock with a width between 2.0 metres and 2.5 metres. The posted speed limit along the road is 80km/h.

Roadside signage indicates that Edith Falls Road is subject to flooding, and alternative measures may need to be considered for emergency site access during a flood event. There is no lighting provided along the road, although guide posts provide delineation for night time driving. Cross sections of Edith Falls Road are shown in Figure 5 and Figure 6.



Figure 5 Edith Falls Road typical two-lane two-way cross section, creek crossing, view to west



Figure 6 Edith Falls Road typical two-lane two-way cross section, view to west

4.2.3 Jatbula Road (Mine Access Road)

Jatbula Road is a private access road and will provide the main point of access to the mine. Jatbula Road is a two-way road with no line marking and a speed limit of 80km/h. Seal widths along Jatbula Road vary from 7.5 to 8 metres and in most cases shoulder widths are less than 1 metre due to embankments on the side of the road, or the presence of rocks and debris. Pavement conditions along Jatbula Road vary, sections of the road are considered to be very poor, particularly in the area 1.2 kilometres north-west of Edith Falls Road. Roadside signage in this vicinity indicates that Jatbula Road is also subject to flooding. Figure 7 and Figure 8 present cross section images of Jatbula Road.



Figure 7 Jatbula Road (Mine Access Road) typical cross section, view to north



Figure 8 Jatbula Road (Mine Access Road) cross section – localised poor pavement condition, view to north

4.2.4 Internal Mine Roads

Jatbula Road (Mine Access Road) continues within the mine site as an internal road. Conditions along the internal mine roads vary, sections range between sealed and dirt roads. Figure 9 and Figure 10 present indicative existing conditions of the internal mine roads.



Figure 9 Internal Mine Roads, sealed section of roads



Figure 10 Internal Mine Roads, unsealed sections of roads

4.3 Intersections

4.3.1 Stuart Highway/Edith Falls Road

The Stuart Highway/Edith Falls Road intersection is a Give Way sign controlled T-intersection, where Stuart Highway is the major movement. At the intersection the Stuart Highway is a four-lane, two-way divided road with a median width of 15 metres. An Auxiliary Left Turn (AUL) treatment facilitates left turn movements from the northern approach of the highway and a Channelised Right Turn (CHR) treatment facilitates right turn movements from the highway at the southern approach. The separation of turning traffic from the through lanes on both the northbound and southbound carriageways makes provision for the deceleration of turning vehicles.

The width of the median of Stuart Highway allows for vehicles turning right from Edith Falls Road to perform a two-stage crossing of the intersection, i.e. waiting at the median after crossing the southbound carriageway before entering the northbound carriageway.

Sight distances to the south and north along the Stuart Highway from the intersection are shown in Figure 11 and Figure 12 respectively. Sight distances are observed to be approximately 850 metres in both directions on Stuart Highway. This is greater than the desirable minimum stopping sight distance value of 257 metres for a 130km/h road, as per Table 5.4 of Austroads Guide to Road Design Part 3: Geometric Design.



Figure 11 Sight distances at the Stuart Highway / Edith Falls Road intersection, view to south on Stuart Highway



Figure 12 Sight distances at the Stuart Highway / Edith Falls Road intersection, view to north on Stuart Highway

4.3.2 Edith Falls Road/Jatbula Road (Mine Access Road)

The Edith Falls Road / Jatbula Road (Mine Access Road) intersection is a Give Way sign controlled T-intersection, where Edith Falls Road is the major movement. A short Auxiliary Left Turn lane provides for left turn movements from Edith Falls Road into Jatbula Road (Mine Access Road) from the west and a basic right-turn treatment on the major road (BAR) provides for right turns from a shared right-turn and through lane from the east. A rural basic left turn treatment on the minor road (BAL) treatment provides for left and right turn movements exiting Jatbula Road (Mine Access Road).

Sight distances to the east and west along Edith Falls Road at the Jatbula Road (Mine Access Road) intersection are shown in Figure 13 and Figure 14. To the east from the intersection, sight distances are restricted to approximately 600 metres due to the horizontal curvature of the road. To the west from the intersection, sight distances are restricted to approximately 70 metres, limited by a dip in the road. This is less than the desirable minimum stopping sight distance value of 114 metres, as per Table 5.4 of Austroads Guide to Road Design Part 3: Geometric Design. There are existing warning signs on Edith Falls Road on the approach to the intersection.



Figure 13 Sight distances at the Edith Falls Road / Jatbula Road (Mine Access Road) intersection, view to east on Edith Falls Road



Figure 14 Sight distances at the Edith Falls Road / Jatbula Road (Mine Access Road) intersection, view to west on Edith Falls Road

4.3.3 Edith Falls Road Level Crossing

An at-grade level crossing of the single track Adelaide - Darwin Railway line is located on Edith Falls Road approximately 280 metres west of the Stuart Highway / Edith Falls Road intersection (see Figure 15 and Figure 16). The crossing is controlled by flashing lights.



Figure 15 Edith Falls Road level crossing, view to west



Figure 16 Edith Falls Road level crossing, view to east of flashing lights and on-road warning signage



4.4 Traffic Volumes

4.4.1 Recorded Traffic Volumes

Traffic volume information collected by the Road Network Division of DLPE has been provided for relevant observation locations to the project area for 2009, the most recently available full year of data. The records present daily average two-way volumes for each month. Significant seasonal variability of traffic volumes is observed, primarily due to the wet and dry seasons. For that reason, traffic volume data for Stuart Highway and Edith Falls Road in Table 1 lists the minimum, maximum and average daily two-way volumes. The maximum recorded daily volumes are considerably below typical capacity for a two-lane highway, which could be expected to carry up to 1,800 vehicles per hour (one way) in uninterrupted flow conditions.

Table 1 Traffic Volume Data (DLP 2009)

Road Name / Location	Minimum recorded daily traffic (two-way)	Maximum recorded daily traffic (two-way)	Average daily traffic (ADT) (two-way)	ADT Station
Stuart Highway / 2 km north of Kakadu Highway	668 (February 2009)	1,570 (July 2009)	1,070 (2009)	RDVDP005
Stuart Highway / 20 km north of Katherine River Bridge	907 (January 2009)	1,930 (July 2009)	1,312 (2009)	RKVDP001
Edith Falls Road / 2 km east of Stuart Highway	N/A	N/A	175 (2009) ¹	RKVDC033

¹ 2009 traffic volume data for ADT Station RKVDC033 only available for March – April

4.4.2 Percentage Heavy Vehicles

Classified vehicle counts are undertaken at fixed ADT stations for selected periods of the year. Heavy vehicle data obtained from the DLP indicates a relatively high proportion of heavy vehicles on Stuart Highway, as presented in Table 2. No further breakdown of heavy vehicles is available.

Table 2 Percentage Heavy Vehicles (DLP 2009)

Road Name / Location	Percentage LV (two-way)	Percentage HV (two-way)	Record Period (Days)	ADT Station
Stuart Highway / 2 km north of Kakadu Highway	74.3%	25.7%	November 2009 (14)	RDVDP005
Stuart Highway / 20 km north of Katherine River Bridge	84.0%	16.0%	March & April 2009 (28)	RKVDP001
Edith Falls Road / 2 km east of Stuart Highway	90.5%	9.5%	March & April 2009 (28)	RKVDC033

4.4.3 Background Traffic Growth Rates

Background traffic growth rates sourced from existing traffic count data are shown in Table 3. The low observed background traffic growth rates on the existing road network are likely due to the rural nature of the study area.



Table 3 Observed traffic growth rates (derived from DLP data, 2009)

Road Name / Location	Count Dates	Average Growth Rate (p.a.)	ADT Station
Stuart Highway / 2 km north of Kakadu Highway	2000 - 2009	0.8%	RDVDP005
Stuart Highway / 20 km north of Katherine River Bridge	2000 - 2009	2.7%	RKVDP001
Edith Falls Road / 2 km east of Stuart Highway	2001 - 2009	-1.7% ¹	RKVDC033

¹ Incomplete data for the comparison period

4.5 Casualty Crash History

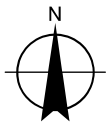
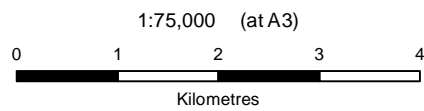
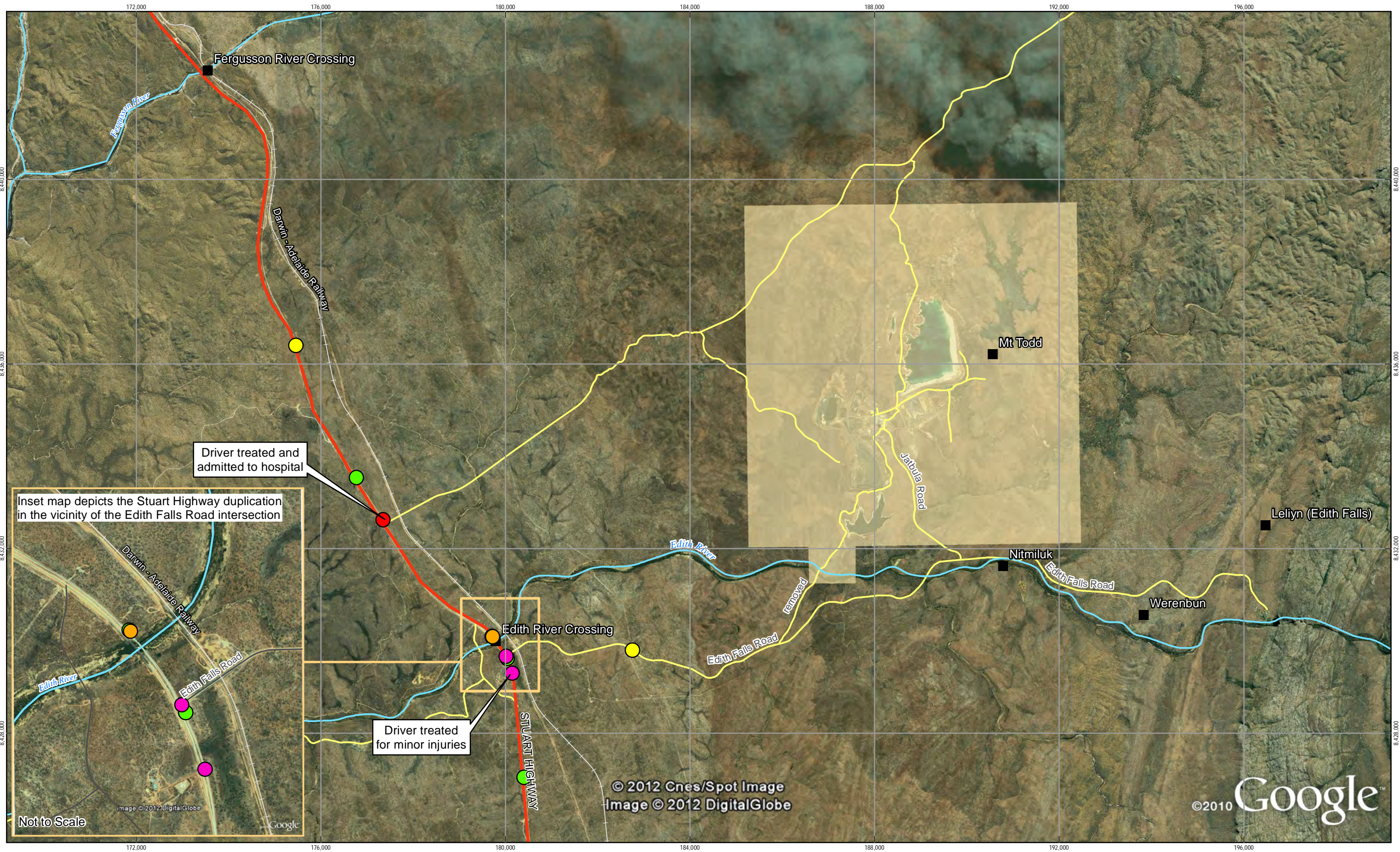
Crash data provides an indication of the road safety performance of an area, and can assist in determining existing road safety deficiencies.

A review of the crash history for the Stuart Highway and Edith Falls Road in the vicinity of the project area has been undertaken, from north and south of Edith Falls Road on Stuart Highway, to east of Jatbula Road (Mine Access Road) on Edith Falls Road. The crash history review has been collated for the five year period between June 2006 and June 2011 and was sourced from DLPE.

There have been nine crashes on Stuart Highway in the Project area, and 10 across the Project area. All recorded crashes have been single vehicle incidents. Of these, one crash resulted in hospital admission and another in minor medical treatment. No other injuries were recorded. Table 4 disaggregates the recorded accidents by accident type and Figure 17 depicts the location of crashes that have occurred on the Stuart Highway and Edith Falls Road.

Table 4 Recorded accidents by accident type (derived from DLP data, 2011)

Type	Stuart Highway	Edith Falls Road	Total
Overtaken	4	-	4
Ran off road	2	-	2
Hit animal	2	1	3
Hit fixed object	1	-	1
Total	9	1	10



LEGEND

- | | | | |
|---------------|--------------------------|-------------------------|--------------------|
| ■ Place Names | — Railway | ● Vehicle Accident Type | ● HIT OTHER ANIMAL |
| — Highway | — Pre-existing track | ● HIT CATTLE/BUFFALO | ● OVERTURNED |
| — Rivers | ■ Mt Todd Mineral Leases | ● HIT FIXED OBJECT | ● RAN OFF ROAD |



Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number | 43-21801
Revision | 1
Date | 29 May 2013

Study Area Road Crashes

Figure 17



The crash review for the Stuart Highway revealed ten crashes that occurred over the five-year period. The following summarises the ten crashes:

- ▶ Two 'ran off road' crashes occurred on the Stuart Highway, one near the Stuart Highway / Edith Falls Road intersection and one near Edith River (approximately 800 metres south of the Edith Falls Road intersection). Both crashes involved only one vehicle and occurred one year apart (in 2010 and 2011). The crash near Edith River resulted in a class 2 injury (treated and admitted to hospital). Both crashes occurred during daylight conditions;
- ▶ Four 'overturned' crashes occurred on the Stuart Highway within the assessed area. Specifically, these crashes occurred 20 metres north of the Edith River Bridge, 50 metres south of Edith Falls Road, approximately 18 kilometres north of Edith Falls Road and 2.6 kilometres south of Edith Falls Road. Two crashes involved northbound vehicles and two crashes occurred during both daylight and night conditions. No injuries were recorded;
- ▶ Two 'hit animal' crashes on Stuart Highway north of Edith Falls Road. One crash occurred in 2008 approximately 21 kilometres to the north. One crash occurred in 2010 approximately 17 kilometres to the north which resulted in minor injury requiring treatment. Both crashes occurred outside of daylight hours;
- ▶ One additional 'hit other animal' crash occurred in 2008 along Edith Falls Road. The vehicle was travelling eastbound and collided with the animal approximately 3 kilometres from the Stuart Highway / Edith Falls Road intersection. The accident occurred at night, no injuries were recorded; and
- ▶ One 'hit fixed object' crash occurred in 2007 north of the Edith River Bridge. The crash involved one vehicle and occurred during daylight hours. No injuries were recorded.

The crash history review indicates no pattern of specific road safety deficiencies in the Project area. However, the prevalence of single vehicle accidents highlights the concern regarding the potential influence of driver fatigue and decrease to alertness on road crashes.

Additionally, the crash history review has revealed no road crashes associated with the Darwin to Adelaide railway line crossing of Edith Falls Road.

4.6 Railway Line

The single track Darwin to Adelaide railway line runs parallel to the Stuart Highway within the Project area. Interstate passenger services and container and bulk freight services operate between Darwin and Adelaide along the line. Six services a week operate from Darwin to Adelaide, with additional bulk train services operating between regional mine sites and the Port of Darwin. The Ghan passenger service also operates two return services per week.

4.7 Public Transport

A key initiative of the NT Integrated Regional Transport Strategy is to "support passenger bus services in remote and regional areas, including services linking Growth Towns to major centres and outstations to Growth Towns" (DLP, 2010).

Regional bus services currently exist from the Katherine town centre to the communities of Beswick, Ngukurr and Lajamanu. The expansion of regional bus services is proposed over the next two years to include the communities of Numbulwar and Borroloola. An assessment of the feasibility of a town bus service for the greater Katherine area using existing public and private bus services is also proposed within the Integrated Regional Transport Strategy.



No current or proposed public transport routes exist within the Project area. Due to the rural nature of the Project area, public transport is not expected to be an influencing factor on Project generated traffic.

4.8 Truck Facilities

Parking for heavy vehicles is currently facilitated in the northbound direction on Stuart Highway, approximately five kilometers north of Edith Falls Road. The truck rest stop has a sealed surface, though does not provide for any amenities. The rest stop was constructed in 2009, and is considered to provide for adequate acceleration, deceleration and sight distances on approach and departure.

4.9 Local Community

4.9.1 Katherine

Katherine is the largest township within vicinity of the Mt Todd Gold Project. It is the fourth largest town in the Northern Territory, located approximately 312 kilometres south-east of Darwin on the Katherine River. The Katherine town council covers an area of 17.3 km² with a residential population of 6,094 in 2011.

4.9.2 Werenbun Community

Werenbun Community (also known as Barnjaru) is an outstation located approximately 60 kilometres by road from Katherine and along the Edith Falls Road. The community lies in the Roper Gulf Shire local government area and has a population of approximately 20-30 people. The outstation consists of permanent and semi-permanent residences with water and power supply. Road access to the outstation is via Edith Falls Road.

4.10 Existing Conditions Summary

This section has set out the existing conditions of the transport network within the Project area. Key findings of the existing conditions assessment include:

- ▶ Stuart Highway is typically a two-lane two-way road within the Project area, though increases to a four-lane two-way road for approximately 3.5 kilometres in the vicinity of Edith Falls Road, which is considered to provide additional highway capacity and overtaking opportunities;
- ▶ There is significant seasonal variation in traffic volumes on the Stuart Highway, with peak period dry season daily volumes observed to be approximately 50% higher than daily average volumes for the year. Heavy vehicles make up approximately 20% of total daily volumes, which is considered to be relatively high compared to typical arterial roads;
- ▶ The intersection of Stuart Highway and Edith Falls Road allows for the separation of turning traffic from the through lanes on both the northbound and southbound carriageways, hence makes provision for the deceleration of turning vehicles with adequate sight distance;
- ▶ On Edith Falls Road at the intersection with Jatbula Road (Mine Access Road) a short AUL treatment provides for left turn movements and a BAR treatment provides for right turns, providing for the deceleration of turning vehicles with adequate sight distance;
- ▶ In the five year analysis period, there have been 10 crashes across the Project area, including nine on Stuart Highway. Of these, one crash resulted in admission to hospital and one in minor treatment. All crashes were single vehicle collisions, including three accidents with animals;



- ▶ The Darwin-Adelaide rail line, which runs parallel to the highway within the Project area, has an at-grade crossing with Edith Falls Road. Flashing lights and associated signage are present at this location. No casualty crashes associated with the rail crossing have been observed in the past five years of available data; and
- ▶ No current or proposed public transport routes exist within the Project area. Due to the rural nature of the Project area, public transport is not expected to be an influencing factor on Project generated traffic.



5. Proposal

5.1 Overview

In order to assess the potential impact of the construction and operation of the Project, consideration of the traffic generation associated with these activities is required.

The Project includes two key infrastructure components: the Mt Todd mine site and the accommodation for construction and operation works, which is assumed to be located within 25km, and south of, the mine site.

Traffic generation for the construction of the Project will be dependent on the program of the construction contractor. For the purposes of undertaking this assessment, an understanding of the proposed transport activities associated with each stage of the Project has been established with Vista Gold.

The traffic volumes have been developed based on estimates and consideration of:

- ▶ Volume of plant and equipment required for construction of the Project;
- ▶ Volume of materials required for construction of the Project;
- ▶ Anticipated workforce numbers and daily fluctuations of movement of employees to and from site;
- ▶ Type and number of vehicles needed to transport plant, equipment, materials and employees to site;
- ▶ Likely routes for delivery of plant, equipment and materials; and
- ▶ Proposed construction schedule and timing of delivery of plant, equipment and materials.

For the mine site, consideration has been made to the construction, operating and decommissioning activities. The following provides an overview of the proposed development phases for the mine:

- ▶ Pre-mining site preparation such as reclamation of existing infrastructure and mine facilities;
- ▶ Construction of Ore Processing Plant, Water Treatment Plant, Power Station, and supporting infrastructure including sumps, decant towers, collection ditches, sludge disposal cell, equalisation pond and tailings storage facilities;
- ▶ Mining and processing of ore over a period of 13 years from the existing Batman Pit, LGO stockpile and Heap Leach; and
- ▶ Mine closure through rehabilitation of disturbed areas and ongoing treatment of acid and metalliferous drainage (AMD).

5.2 Workforce

The construction workforce is expected to peak at around 450. This workforce would be the responsibility of a construction contractor. Current understanding of construction works is that they will take place largely between 6am to 6pm, with construction workers working 12 hour shifts with rotating shift patterns based on 7 x 7 day roster. Administration and management personnel will work a standard 5 x 2 day roster.

The mine workforce including operations, maintenance, engineering, geological and support personnel, is expected to peak at around 350. This workforce will be employed by Vista Gold. It is assumed that mine operations will be 24 hour, split across two shifts (6:00am to 6:00pm and 6:00pm – 6:00am).



It is expected that around 40 personnel would be required for the decommissioning and closure phase of the Project.

5.3 Accommodation

The 450 construction personnel will be housed in a purpose built camp. The location of this camp is still to be determined but it is likely to be located within 25km of the mine on a site to be acquired by Vista Gold.

The operations workforce of 350 is expected to comprise 60 personnel drawn from the region with the remaining 290 personnel being new. Initial work indicates that these personnel could be accommodated as follows:

- ▶ 70 workers at the construction camp. This would accommodate mainly fly-in / fly-out (FIFO) and drive-in / drive-out (DIDO) personnel and provide an ability to quickly increase capacity to house overflow peak period personnel to meet mining needs or maintenance shut downs;
- ▶ 120 workers (family households with or without children) in a mixture of:
 - new three and four bedroom houses located on existing vacant Katherine and regional land;
 - existing (renovated if required) houses located in Katherine and regionally; and
 - small contained development on Katherine land, subject to real estate availability at the time of the arrangement.
- ▶ 100 workers located in a Katherine based single person accommodation facility.

The ultimate accommodation strategy adopted will be developed following further discussions with local and territory government agencies.

For the decommissioning and closure phase, the 40 workers would be housed in either the previous FIFO / DIDO accommodation or in the Katherine based single person accommodation.

In order to conservatively assess the impacts of generated traffic, it has been assumed that the above accommodation sites are located south of Edith Falls Road resulting in similar traffic movements to access the mine site.

5.4 Estimated Traffic Generation

Traffic generated by the Mt Todd mine site will relate initially to construction activity and then to the ongoing operation of the mine prior to decommissioning. The greatest traffic impact generated by the Project is expected to be associated with the construction phase of the Project, however construction activities are not expected to exceed 24 months' duration and accordingly; the construction traffic impact would be relatively short term. In contrast, the operational impact of ongoing traffic generated by the mine activity is relatively minor in the context of the existing road network traffic volumes, but it will extend for a further 15 years.

5.4.1 Construction and Commissioning

Actual traffic generated by the construction of the Project would principally be associated with the transport of construction machinery and equipment to site, import and disposal of materials by trucks and the removal of machinery post-construction. Traffic would also be generated by worksite contractors accessing the site across the workday.



The volume of traffic would ultimately depend on the program and staging of construction, where an increased rate of construction would result in higher traffic volumes on the network each day but over a shorter overall period.

The main construction and commissioning activities for the Mt Todd mine are anticipated to extend over 24 months and would comprise:

- ▶ Demolition and disposal of existing process plant and other facilities such as gate house;
- ▶ Construction of temporary facilities (i.e. lay down areas, offices, workshops, etc);
- ▶ Construction camp (located within 25km of the mine site but not on the mine site, and subject to separate approval);
- ▶ On site concrete batch plant;
- ▶ Administration and plant site buildings including:
 - Mine and plant workshops, warehouses and maintenance facilities;
 - Offices, medical facilities and training facilities;
 - Security gate house, weighbridge etc;
 - Crib room and ablutions; and
 - Laboratory.
- ▶ Ore processing plant;
- ▶ Power station;
- ▶ Water treatment plant (WTP);
- ▶ Sludge disposal cell and equalisation pond;
- ▶ Site roads;
- ▶ Pumps and pipelines; and
- ▶ New sumps, decant towers, decant ponds, collection ditches and diversions.

It is assumed that 90% of construction personnel will be transported to the site by bus and the remaining 10% will drive in private vehicles. This allows for the possibility that some workers will need to move around the site by light vehicle and are therefore likely to drive to site. It is also assumed that sufficient 30-seat buses will be available to transport workers to and from the site.

At peak construction, up to an additional fifty heavy vehicle deliveries per day are anticipated, delivering plant and associated materials. In addition to standard 19.5 metre rigid trucks, this would also include any oversize vehicles.

Based on the above, up to 127 heavy vehicle trips (of which 24 are personnel buses) and up to 60 light vehicle trips are anticipated per day during peak construction of the mine. Based on typical construction activities, it is assumed that 30% of personnel movements (light and heavy vehicles) and 10% of heavy vehicle delivery movements would occur in the typical peak hour.



5.4.2 Mining and Processing

Activities associated with the generation of traffic during the operation of the mine will principally be the transport of mine personnel, and the delivery of reagents, fuel and explosives.

It is assumed that mine operations will be 24 hour, split across two shifts (6:00am – 6:00pm and 6:00pm – 6:00am). It is anticipated that mine personnel would be transported between accommodation and the mine site by 30 seat buses, transporting personnel by 12 bus trips (six buses in each direction per shift). It is assumed that around 7% of the workforce will require a light vehicle whilst on site and therefore will drive to and from the mine.

Diesel will be stored on-site for mining equipment and owner vehicles. Refuelling facilities will be provided in the heavy vehicle workshop area for the vehicles belonging to the operation. It is anticipated that up to 90,000L of diesel will be used daily. Diesel is assumed to be transported to the mine site by two deliveries per day via triple road tankers.

Various reagents for mixing and processing in the Ore Processing Plant and materials for use around the mine would also be transported to site. The following assumptions have been made in consultation with Vista Gold regarding transportation to site:

- ▶ Sodium cyanide, 13,668tpa, transported to site as a solid in a vendor bulk sparging unit by seven heavy vehicle deliveries per week;
- ▶ Sodium hydroxide, 710tpa, transported to site in 1t bags by four deliveries per week;
- ▶ Flocculant, 266tpa, transported to site as a solid powder by four heavy vehicle deliveries per week;
- ▶ Sodium metabisulfite, 12,958tpa, transported to site as powder in 20 foot containers by four heavy vehicle deliveries per week;
- ▶ Hydrochloric acid, 1,441tpa, transported to site in 1,150kg Intermediate Bulk Containers by four deliveries per week;
- ▶ Activated carbon, 355tpa, supplied to site in 500kg bulk bags by five deliveries per week;
- ▶ Lead nitrate, -1,775tpa, transported to site in 1t bags by two delivery per week;
- ▶ Quick lime, 16,153tpa, transported to site in in 20 foot containers by four deliveries per week;
- ▶ Fluxes, 3.6tpa, transported to site palletised to approximately 1t per pallet by one truck delivery per week;
- ▶ Waste oil would be stored and transported off site by two heavy vehicle collections per week;
- ▶ Blasting materials, 3000 tpa, transported to site by three heavy vehicle deliveries per week; and
- ▶ Mill balls, 16,901tpa, transported to site in 20 foot containers by six B-triple deliveries per week.

The dore product would be stored in a secure area on-site prior to transport to Darwin by one armoured truck delivery per week.

On the basis of the above, up to 47 light vehicle trips and 47 (including rounding of vehicle numbers) heavy vehicle trips are anticipated per day during peak operation of the mine site. Based on an understanding of the operational activities for the mine, it is assumed that during a typical peak hour 50% of bus trips (buses delivering staff to site at the beginning of a shift and also returning staff that have just completed their shift), 25% of light vehicle personnel trips and 10% of all other trips would occur.



5.4.3 Closure and Rehabilitation

A maximum of 40 personnel will be required for the rehabilitation and closure phase and the generation of traffic will consequently be less than that assessed for the construction and commissioning of the mine.

Consequently, the assessment of traffic impacts for rehabilitation and closure is considered to be adequately considered through the assessment for construction and commissioning of the mine.

5.4.4 Estimated Traffic Generation Summary

The traffic generation estimates for the construction and operation phases of the Mt Todd mine, as considered above, are listed in Table 5.

Table 5 Estimated Vehicle Trip Ends (VTE) per phase for Mt Todd Mine

Phase	Trips per day		Trips per typical peak hour	
	Light Vehicles (vte)	Heavy Vehicles (vte)	Light Vehicles (vte)	Heavy Vehicles (vte)
Construction and Commissioning	60	127	18	18
Mining and Processing Operation	47	47	12	14

5.5 Proposed Haulage Routes

It is highly likely that some of the mine equipment and process plant materials and equipment will arrive via the Port of Darwin. From the Port, they would be transported to site via the Stuart Highway.

During all phases of the mine, access to the mine site is proposed from Jatbula Road (Mine Access Road), via Edith Falls Road and Stuart Highway. Generated traffic is to be distributed across the network. Key origins and destinations for mine-associated traffic are anticipated to be Katherine to the south and the Darwin area to the north.

Approximate distances along each road to be used for haulage are as follows:

- ▶ Darwin to Edith Falls Road via Stuart Highway – approximately 275km;
- ▶ Katherine to Edith Falls Road via Stuart Highway – approximately 42km; and
- ▶ Stuart Highway to Jatbula Road via Edith Falls Road – approximately 11km.

It is not anticipated that any widening or land acquisition will be required along these roads, except for any localised improvements to mitigate impacts as identified in Section 6.

5.5.1 Construction and Commissioning

Plant, equipment and materials associated with construction are anticipated to be transported to the mine site from the north, including greater Darwin and the Port of Darwin. Additionally, 50% of the heavy vehicle VTEs for personnel are expected to be from the north. Accordingly, the remainder of trips, including light vehicle trips transporting personnel, are expected to be from the south at Katherine.



On this basis, at peak construction it is estimated that 114 heavy vehicle trips will have origins and destinations to the north and 14 heavy vehicle trips to the south. Two-way light vehicle trips are estimated to be up to 60 trips per day to the south of the mine site. The distribution of trips is summarised in Table 6.

Table 6 Estimated Construction Traffic Distribution for Mt Todd Mine

Origin / Destination	Two-way movements per day		Two-way movements per typical peak hour	
	Light Vehicles (vte)	Heavy Vehicles (vte)	Light Vehicles (vte)	Heavy Vehicles (vte)
North, including Darwin	-	114	-	14
South – Katherine	60	14	18	4
Total	60	128	18	18

5.5.2 Mining and Processing

It is proposed that mine personnel will be transported to site by bus from accommodation in Katherine and possibly Pine Creek. It is estimated that of the light vehicle trips transporting other personnel, 90% of trips will be to Katherine with the remainder to the north. All heavy vehicle deliveries and collections of the various reagents for mixing and processing, blasting materials, waste oils and dore product are assumed to be originating from or destined to the north.

On this basis, the distribution of light vehicles and heavy vehicles is estimated as listed in Table 7.

Table 7 Estimated Operation Traffic Distribution for Mt Todd Mine

Origin / Destination	Trips per day		Trips per typical peak hour	
	Light Vehicles (vte)	Heavy Vehicles (vte)	Light Vehicles (vte)	Heavy Vehicles (vte)
North, including Darwin	5	23	1	2
South – Katherine	42	24	11	12
Total	47	47	12	14



6. Potential Impacts

Following a review of the existing conditions and an understanding of the anticipated construction and operation traffic generation, an assessment of the Project impacts has been undertaken. This assessment includes road network capacity, key intersections, road network infrastructure, and road safety issues. As outlined in Section 5.4.3 the traffic generated during closure and rehabilitation will be significantly less than that experienced during construction. Accordingly, an assessment of the traffic impacts during construction is considered to be a conservative assessment of the 'worst case'.

Recommendations for management and mitigation measures for identified impacts are addressed in Section 7 of this report.

6.1 Cumulative Traffic Volumes

An overview of the origins and profile for total traffic generated by the construction and operation of the Mt Todd mine site is outlined in Section 5. This section identifies the cumulative traffic impact of both facilities in construction and operation. As the construction program would be determined by the Construction Contractor(s), it has conservatively been assumed that the peak construction activities and associated traffic movements would coincide for the Mt Todd mine site.

Given that the construction and operation activities have different areas of geographical impact and occur over different timeframes, the traffic volumes are described separately below.

6.1.1 Construction

Table 8 indicates that the majority of generated traffic is expected to be concentrated on Stuart Highway south of Edith Falls Road and on Edith Falls Road east of Stuart Highway. Most of this traffic is expected to be heavy vehicles.

Table 8 Estimated Cumulative Traffic Volumes (Construction)

Location	Peak Daily Traffic Generation		Typical Peak Hour Traffic Generation	
	Light Vehicles (vte)	Heavy Vehicles (vte)	Light Vehicles (vte)	Heavy Vehicles (vte)
Stuart Hwy, north of Edith Falls Rd	-	114	-	14
Stuart Hwy, south of Edith Falls Rd	60	14	18	4
Edith Falls Rd, east of Stuart Hwy	60	127	18	18

6.1.2 Operation

Table 9 indicates that, as for the construction phase, the majority of generated traffic is expected to be concentrated on Stuart Highway south of Edith Falls Road and on Edith Falls Road east of Stuart Highway. There is expected to be a fairly even split of light and heavy vehicles.



Table 9 Estimated Cumulative Traffic Volumes (Operation)

Location	Peak Daily Traffic Generation (two-way)		Typical Peak Hour Traffic Generation (two-way)	
	Light Vehicles (vte)	Heavy Vehicles (vte)	Light Vehicles (vte)	Heavy Vehicles (vte)
Stuart Hwy, north of Edith Falls Rd	5	23	1	2
Stuart Hwy, south of Edith Falls Rd	42	24	11	12
Edith Falls Rd, east of Stuart Hwy	47	47	12	14

6.2 Road Network Capacity Assessment

This section assesses the extent of impact that traffic volumes associated with the Project are expected to have on the operation of the arterial road network, i.e. reduction in the Level of Service. When the Project generated traffic is clear of intersections, it would be expected to behave in the same way as any other vehicle in the traffic stream. The exception to this is for vehicles carrying over dimensional loads, which are addressed in Section 6.4.1.

Level of Service (LOS) is a measure of operational conditions within a stream of traffic, where LOS A indicates free flowing travel. For this assessment, the approach outlined in the Highway Capacity Manual (Transportation Research Board, 2000) has been adopted. However, for a definition of LOS, Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis (2009) provides a description for each Level of Service, as outlined in Table 10. The actual traffic capacities associated with each Level of Service are dependent on a range of determinants including speed limits, terrain, geometry, lane widths and percentage of heavy vehicles.

It is considered appropriate to assess the Level of Service on Stuart Highway and Edith Falls Road to consider the potential capacity impacts.

6.2.1 Stuart Highway

The current Level of Service for Stuart Highway in the vicinity of the Project has been determined based on the traffic data, the assumptions outlined in Table 11 and the guidance provided in Highway Capacity Manual (Chapter 20).



Table 10 Level of Service descriptors (Austroads, 2009)

Level of Service	Descriptors
A	Is a condition of free flow in which individual drivers are virtually unaffected by the presence of other drivers. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
B	Is in the stream of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than with Level of Service A.
C	Is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
D	Is close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
E	Occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause break-down.
F	Is in the zone of forced flow. Flow break-downs occur, and queuing and delays result.

Table 11 Stuart Highway Level of Service factors

Determinant	
Traffic volume (ADT)	1,930
Peak hour percentage of ADT (assumption)	10%
Percentage of heavy vehicles	20%
Terrain (site observations)	Level
Directionality during typical peak hour (assumption)	Even directionality
Percentage of road with available sight distance less than 450 metres (site observations)	Up to 10%

Based on the above and in accordance with the assessment outlined in the Highway Capacity Manual (Chapter 20), it is considered that Stuart Highway currently operates at LOS A during the peak hour.

The additional traffic generated in the peak hour as estimated in Table 8 and Table 9 would apply to Stuart Highway. Table 12 outlines the anticipated change to peak period two-way traffic volumes on Stuart Highway as a result of the construction and operation of the Mt Todd mine. Subsequently, the impact on the operation of the arterial network from additional traffic associated with the Project can be considered through Level of Service.



Table 12 Traffic Capacity Assessment, Stuart Highway

		Stuart Highway / 2 km north of Kakadu Highway	Stuart Highway / north of Edith Falls Road	Stuart Highway / 20 km north of Katherine River Bridge
Maximum recorded average daily traffic (ADT)		1,570 (July 2009)	< 1,900 ¹	1,930 (July 2009)
Estimated peak hour volume		157	190	193
Existing peak hour LOS		LOS A	LOS A	LOS A
Construction	Estimated maximum peak hour traffic generation	14	14	22
	Estimated resultant peak hour volumes	171	204	215
	Resultant peak hour LOS	LOS A	LOS A	LOS A
Operation	Estimated maximum peak hour traffic generation	2	2	22
	Estimated resultant peak hour volumes	160	193	215
	Resultant peak hour LOS	LOS A	LOS A	LOS A

¹ Due to absence of data at this location, two-way volumes have been conservatively extrapolated from existing network volume data in the vicinity

Summary

During the peak construction period, the results of the above analysis indicate that the Level of Service along Stuart Highway is expected to be maintained at LOS A both north and south of Edith Falls Road.

During the operation of the mine, the analysis indicates that the Level of Service on Stuart Highway is also expected to be maintained at LOS A. This represents unchanged peak period operational characteristics of the Highway, where LOS A indicates free flowing travel.

6.2.2 Edith Falls Road

The current Level of Service for Edith Falls Road in the vicinity of the Project has been determined based on the traffic data, the assumptions outlined in Table 13 and the guidance provided in the Highway Capacity Manual (Chapter 20).



Table 13 Edith Falls Road Level of Service factors

Determinant	Details
Traffic volume (ADT)	175
Peak hour percentage of ADT (assumption)	10%
Percentage of heavy vehicles	10%
Terrain (site observations)	Level
Directionality during typical peak hour (assumption)	Even directionality
Percentage of with available sight distance less than 450 metres (site observations)	Up to 20%

Based on the above and in accordance with the assessment outlined in the Highway Capacity Manual (Chapter 20), it is considered that Edith Falls Road currently operates at LOS A during the peak hour.

The additional traffic generated in the peak hour as estimated in Table 8 and Table 9 would apply to Edith Falls Road. Table 14 outlines the anticipated change to peak period two-way traffic volumes on Edith Falls Road as a result of the construction and operation of the Mt Todd mine. Subsequently, the impact on the operation of the arterial network from additional traffic associated with the Project can be considered through Level of Service.

Table 14 Traffic Capacity Assessment, Edith Falls Road

		Edith Falls Road / 2 km east of Stuart Highway
Maximum recorded average daily traffic (ADT)		175 (2009)
Estimated peak hour volume		18
Existing peak hour LOS		LOS A
Construction	Estimated maximum peak hour traffic generation	36
	Estimated resultant peak hour volumes	54
	Resultant peak hour LOS	LOS A
Operation	Estimated maximum peak hour traffic generation	25
	Estimated resultant peak hour volumes	43
	Resultant peak hour LOS	LOS A

Summary

During the peak construction phase, the results of the analysis indicate that the Level of Service along Edith Falls Road is expected to be maintained at LOS A. The two-way roadway capacity for Edith Falls Road associated with LOS A is estimated to be 230 vehicles per hour (vph). Consequently, there is estimated to be significant capacity for Edith Falls Road to operate at free flowing travel.



During the operation phase, the analysis indicates that the Level of Service on Edith Falls Road is also expected to be maintained at LOS A. This represents unchanged peak period operational characteristics of the roadway, where LOS A indicates free flowing travel.

6.3 Intersection Assessments

The safety and operation of intersections is an important consideration for the Project. The operation and safety of an intersection has the potential to influence where the Project will generate additional traffic volumes for extended periods of time and where there is a significant change to the traffic composition of turning vehicles.

It is noted the Stuart Highway is a key national highway and has a posted speed limit of 130km/h in the vicinity of the Project. Accordingly, the introduction of turning heavy vehicles with slower rates of acceleration and deceleration onto Stuart Highway needs to be appropriately assessed and managed for efficient operations and road safety.

6.3.1 Stuart Highway / Edith Falls Road

At the intersection with Edith Falls Road, Stuart Highway is a four-lane, two-way divided road with a median width of 15 metres. An AUL treatment facilitates left turn movements from the north-west approach of the highway and a CHR treatment facilitates right turn movements from Stuart Highway at the south-west approach. Estimated turning volumes during construction and operation are shown in Table 15 and Table 16 respectively.

Table 15 Estimated Peak Turning Movements (Construction), Stuart Highway / Edith Falls Road

	Light vehicles	Heavy vehicles	Total vehicles
Construction			
Left turn from Stuart Highway	0	7	7
Right turn from Stuart Highway	18	4	22
Left turn from Edith Falls Road	0	0	0
Right turn from Edith Falls Road	0	7	7

Table 16 Estimated Peak Turning Movements (Operation), Stuart Highway / Edith Falls Road

	Light vehicles	Heavy vehicles	Total vehicles
Operation			
Left turn from Stuart Highway	1	1	2
Right turn from Stuart Highway	8	6	14
Left turn from Edith Falls Road	2	6	8
Right turn from Edith Falls Road	1	1	2



Existing conditions

This is a priority controlled T-intersection. Stuart Highway at this location is a dual carriageway with a 15m median. Turning lanes are provided for the left and right turns onto Edith Falls Road and these are approximately 180m and 270m long respectively. It is assumed these cater for deceleration from 130km/h, rather than for storage capacity.

Edith Falls Road is a two-lane two-way road. Although separate left and right turn lanes onto Stuart Highway are not provided, the throat of the intersection is probably wide enough to accommodate two vehicles side by side at the give way line. Street lighting is not provided at the intersection.

Sight distance and safety

Sight distances to the north and south along the Stuart Highway from the intersection are shown in Figure 11 and Figure 12. Sight distances are observed to be approximately 850 metres in both directions. Sight distance requirements are given in Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections. The required distances assuming a reaction time of 2.5 seconds are:

- ▶ Stopping Sight Distance (SSD) – 275m;
- ▶ Safe Intersection Sight Distance (SISD) – 383m;
- ▶ Approach Sight Distance (ASD – value for trucks has been used) – 275m; and
- ▶ Minimum Gap Sight Distance (MGSD) – 305m for a right turn (this is the maximum distance given in Austroads).

The available distances are all greater than these and are therefore acceptable.

Capacity

The width of the median on Stuart Highway at this location allows for vehicles less than 15 metres in length turning right from Edith Falls Road to perform a two-stage crossing of the intersection, i.e. waiting in the median after crossing the southbound carriageway before entering the northbound carriageway. For longer vehicles, such as the expected quad B-doubles, which are up to 25 metres long, right turns will have to be made in one movement and this is dependent on there being enough gaps in traffic on Stuart Highway.

As presented in Table 12, two-way traffic volumes on Stuart Highway are expected to be approximately 204vph in the peak hour. Assuming a uniform flow rate, this equates to approximately one vehicle every 17 seconds on average. In this location, the Stuart Highway is four lanes two-way with a wide median which will allow through vehicles to overtake vehicles accelerating up to the posted speed from the minor road. As such, a left turn vehicle turning from the minor road would require a 5 second gap to enter the traffic stream while a right turning vehicle would require an 8 second gap to enter the traffic stream due to the additional crossing distance. It is considered that 17 seconds is adequate to allow vehicles to turn onto the highway without experiencing undue delay.

Deceleration lanes

There are currently deceleration lanes for left and right turn movements into Edith Falls Road. The right turn lane is approximately 270m long, while the left turn lane is approximately 180m long.



Figure 4.9 of Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections provides guidance on the type of turning treatment required. For a major road flow of 204vph and a turning volume of 22vph (see Table 15 and Table 16) the figure indicates that BAL and BAR type treatments are required. As the existing treatments (CHL and CHR) are two steps higher than those required by Austroads, these are considered to be satisfactory.

6.3.2 Edith Falls Road / Jatbula Road (Mine Access Road)

Table 17 and Table 18 respectively show estimated turning volumes during construction and operation.

Table 17 Estimated Peak Turning Movements (Construction), Edith Falls Road / Jatbula Road (Mine Access Road)

	Light vehicles	Heavy vehicles	Total vehicles
Construction			
Left turn from Edith Falls Road	18	11	29
Right turn from Jatbula Road	0	7	7

Table 18 Estimated Peak Turning Movements (Operation), Edith Falls Road / Jatbula Road (Mine Access Road)

	Light vehicles	Heavy vehicles	Total vehicles
Operation			
Left turn from Edith Falls Road	9	7	16
Right turn from Jatbula Road	3	7	10

Existing conditions

This is a priority controlled T-intersection. Edith Falls Road at this location is a two-way two-lane single carriageway road. Left and right turn lanes are provided, although the right turn lane is a BAR type and therefore consists of widening on the left hand side to allow vehicles to pass stationary vehicles waiting to turn right from the through lane. The left turn is a CHL type and is approximately 100m long. Street lighting is not provided at the intersection.

Sight distance and safety

Visibility to the left from Jatbula Road is approximately 600m, limited by the horizontal curvature of Edith Falls Road. Visibility to the right is approximately 70m, limited by a dip in the road, which partially obscures approaching vehicles for a brief time. It is noted that visibility for truck drivers would be greater than these distances due to their higher ride height.

Sight distance requirements in Austroads guidelines are:

- ▶ Stopping Sight Distance (SSD) – 151m;
- ▶ Safe Intersection Sight Distance (SISD) – 226m;
- ▶ Approach Sight Distance (ASD) – 151m; and
- ▶ Minimum Gap Sight Distance (MGSD) – 250m for a right turn.



The available sight distance to the left satisfies all these criteria, but the sight distance to the right does not. Substandard visibility increases the potential for crashes and mitigation measures should be implemented to reduce the road safety risk. There are existing 'T-intersection' warning signs on Edith Falls Road on the approach to the intersection. Given the very low volumes on both roads, and the presence of warning signs on the approach to the intersection, it is considered that there are no other practical or cost-effective mitigation measures to physically improve visibility (i.e. such as regrading the road).

Capacity

As there is no median in which to wait when turning right, all turns onto Edith Falls Road must be made in one movement, which is dependent on there being enough gaps in traffic. As shown in Table 14, traffic volumes on Edith Falls Road are expected to be approximately 54vph in the peak hour. Assuming a uniform flow rate, this equates to approximately one vehicle every 67 seconds. For a right hand turn from a minor road, a 14 to 40-second gap is required for the turning vehicle not to interfere (i.e. slow) with the major road traffic. In addition, the guideline also states that a gap of 5 seconds is acceptable for a vehicle to turn right into a stream of traffic, however the approaching vehicle may be required to slow. It is considered that the average gap of 67 seconds is adequate to allow vehicles (including heavy vehicles) to turn onto the major road without experiencing undue delay.

Deceleration lanes

There is currently a channelised deceleration lane for the left turn movement into Jatbula Road which is approximately 100m long. The right turn lane is a BAR type treatment with widening on the left hand side of the road.

Figure 4.9 of Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections provides guidance on the type of turning treatment required. For a major road flow of 54vph and a turning volume of 29vph (Table 17 and Table 18) the figure indicates that BAL and BAR type treatments are required. As the existing left turn treatment is a CHL type and the right turn treatment is a BAR type, these are considered to be satisfactory.

6.4 Road Network Infrastructure

6.4.1 Over-dimensional loads

During the construction phase it is possible that over-dimensional vehicles will be used to deliver over-sized components to the mine. Where these loads are excessively wide, long, or restrict the haulage vehicle to speeds more than 20km/h lower than the posted speed limit, it is recommended that the vehicles be escorted. Additionally, consideration should be given to using traffic controllers to manage turning movements at intersections.

It is anticipated that this issue will be fully investigated in the Traffic Management Plan.

6.4.2 Rail crossing

As noted in the Existing Conditions, Section 4.6, an at-grade level crossing of the single track Darwin - Adelaide Railway line is located on Edith Falls Road approximately 280 metres east of the Stuart Highway / Edith Falls Road intersection. The crossing is controlled by flashing lights.



Construction and operation traffic associated with the Mt Todd mine would be expected to increase the exposure of vehicles to the rail crossing. While there would be an increase over existing crossing movements, it is considered that the existing flashing lights are adequate to control vehicles at the rail crossing.

6.4.3 Load sensitive assets

Load sensitive assets typically refer to bridges or culverts with lower load limits within the road network. The existing conditions review within the study area did not identify load sensitive assets. Confirmation of the absence of assets that could be impacted could be made through consultation with the DLPE prior to construction.

6.4.4 Pavement deterioration

Heavy vehicles contribute the greatest proportion of wear on road surfaces. The forecast increase in heavy vehicles (and, importantly, axle repetitions) is expected to increase the rate of deterioration of the road surface. However, the expected increase in vehicle volumes due to the development of the mine is low and the condition and age of the road surfaces (beyond a visual inspection) are unknown at this stage. It is therefore not possible to quantify the impacts of the increase in truck volumes on the road surface.

It is recommended that the existing condition of road pavements be established shortly before construction commences a programme of pavement monitoring and rehabilitation be developed to identify and deal with any significant deterioration.

6.5 Road Safety

6.5.1 Fatigue

Driver fatigue in NT is particularly important given the Territory's remote operating environment, the distances travelled, the remoteness and lack of facilities or services between major population centres, and climatic extremes (DLP, 2001).

As noted in Section 2.1.4, a new legal framework under the *Work Health and Safety (National Uniform Legislation) Act 2011* and associated Regulations and Codes of Practice came into effect on 1 March 2011. Under the Act, the Northern Territory Road Transport Fatigue Management Code of Practice is a voluntary code to provide a basic set of principles to be applied in the management of fatigue in the workplace.

Fatigue is a common problem in both short and long distance truck driving. This loss of alertness is accompanied by poor judgement, slower reactions to events, and decreased skill, such as in vehicle control. It affects the efficiency, effectiveness and safety of a driver's performance in carrying out the driving task.

The transportation of material associated with the construction and operation of the Mt Todd mine may expose drivers to fatigue. It is considered likely that Vista Gold would be directly responsible for a limited proportion of the transportation task during operation of the facilities. Notwithstanding, it is anticipated that as part of its operational health and safety obligations, a driver fatigue management plan will be developed to reduce the impacts of fatigue.



6.5.2 Haulage Routes

Vehicles that operate within legal size and mass limits are permitted to travel without special permission on any road in the Northern Territory. For vehicles which exceed these limits (including their load), special permits are required and pilot or escort vehicles may also be required. The permit would place limits on the roads a vehicle can use, depending on its size and mass.

A permit for the use of over-dimensional or over-mass vehicles will need to be sought from the NT Government prior to using them in either the construction or operational phases of the Project. It is anticipated that this issue will be investigated fully in the Traffic Management Plan.

6.5.3 Incidents

The management of incidents is generally the responsibility of the emergency services. See Section 7.5 for further details.

6.6 Potential Impacts Summary

The investigations detailed above indicate that the construction and use of the mine will have no adverse impacts on the road network in terms of safety or performance. The existing conditions of the road pavements should be established and a programme of road pavement monitoring and rehabilitation should be developed to mitigate the impacts on road surfaces of mining activities.



7. Management Measures

Following an assessment of the potential Project traffic and transport impacts in Section 6 of this report, this section outlines recommendations for management and mitigation measures for identified impacts.

7.1 Intersection Upgrades

It is considered that upgrades to existing intersections will not be required.

7.2 Traffic Management

A detailed Traffic Management Plan (TMP) should be prepared and approved prior to construction works taking place or to the operation of the mine. The TMP should address both the construction and operational phases.

7.2.1 Construction Traffic Management

The TMP should address:

- ▶ Haulage routes;
- ▶ Requirement for over-dimensional permits;
- ▶ Requirement for traffic controllers;
- ▶ Community consultation strategy; and
- ▶ Dates and times of construction.

7.2.2 Operations Traffic Management

The TMP should address:

- ▶ Haulage routes;
- ▶ Requirement for over-dimensional permits;
- ▶ Community consultation strategy; and
- ▶ Dates and times of operation.

7.3 Haulage Compliance Measures

7.3.1 Road Axle Limits

Road pavements are typically designed to withstand a certain number of axle repetitions, which are forecast for the design life of the road. Minor maintenance is required during this time. The number of axle repetitions is based on the number of heavy vehicle axles that are expected to pass over the road during its life; light vehicle axles are not counted as they typically cause negligible damage to a road surface compared to a heavy vehicle.

The additional number of heavy vehicles forecast to be generated by the mine is expected to increase the rate at which the road pavements wear. However, without knowing the current condition of the road pavement, nor its age, it is not possible to state what impact this increase in volume will have.



A pavement condition monitoring program could assist in identifying any deterioration to the pavement condition over the period of the mine operations. A baseline condition assessment prior to mine construction and commissioning could establish the existing condition of those public roads which are to form part of haulage routes.

7.3.2 Securing Loads

It is expected that loads being transported to and from the mine would be secured in accordance with the relevant legislation. All vehicles must be correctly licenced and compliant with relevant legislation.

7.3.3 Hazardous Goods

There are both international and local standards for the movement of cyanide and other hazardous substances. It is expected that the movement of these substances will be carried out in accordance with the relevant Northern Territory legislation. This issue will be dealt with in the Traffic Management Plan and should consider, but not be limited to, the following:

- ▶ Sensitive land uses (e.g. schools) on proposed haul routes;
- ▶ Times of day for haulage to minimise potential conflicts;
- ▶ Traffic volumes on proposed haul routes; and
- ▶ Sensitive infrastructure such as tunnels and bridges.

7.3.4 Tracking of Dirt

Measures to minimise the tracking of dirt off site will be implemented at access gates. The controls may include exit rumble grids or wheel wash facilities, sweeping of sealed roads to remove deposited material where applicable, and/or stabilisation of site roads/tracks with aggregate where appropriate.

7.4 Management of Driver Fatigue

The potential impacts of driver fatigue due to the transport of materials associated with the construction and operation of the Mt Todd mine could be managed through the appropriate implementation of a Fatigue Management System. This may be in accordance with the Northern Territory Road Transport Fatigue Management Code of Practice.

7.5 Incident Management

It is expected that adherence to relevant guidelines and legislation regarding the movement of hazardous substances and the securing of loads, along with the implementation of the engineering measures recommended in Section 6 of this report, will minimise the occurrence and severity of any incident that may occur.

Incidents, by their very nature, cannot be predicted. Despite the best efforts to reduce their occurrence, they can never be eliminated completely. In these circumstances it would be beneficial to refer to an agreed Incident Management Plan which sets out how to deal with various types of incidents. Often the emergency services will be responsible for dealing with incidents on the roads.

It is expected that an incident management plan will be prepared to set out the ways in which Vista Gold and the emergency services should respond to a variety of incident scenarios.



8. Conclusions and Recommendations

This study has assessed the impacts of the proposed gold mine north west of Katherine in the Northern Territory. In so doing, the study has considered:

- ▶ The existing conditions of the relevant road network for the purposes of establishing a bench mark against which to assess the impacts of the proposed development;
- ▶ The traffic generated by the proposed development and the impacts it will have on the operational and safety performance of relevant roads and intersections, and in particular the impact of large numbers of heavy and over-dimensional vehicles;
- ▶ The measures required to mitigate the identified impacts;
- ▶ The issues associated with the movement of hazardous substances;
- ▶ Traffic management measures during construction and operation; and
- ▶ Other miscellaneous issues.

8.1 Conclusions

The broad conclusions of this study are:

- ▶ The mine is expected to generate approximately 187 and 94 vehicles per day during the construction and operation phases respectively. This translates to approximately 36 and 26 vehicles in the peak hours during the construction and operation phases respectively;
- ▶ The traffic forecast to be generated by the proposed developments is expected to have a negligible impact on the road network, with no anticipated reduction in Level of Service or intersection performance;
- ▶ It is likely that the additional heavy vehicles generated by the proposed development will increase the rate of wear of road surfaces. However, due to the condition and age of these road surfaces being unknown at this stage it is not possible to estimate the impact that the generated traffic may have;
- ▶ Minor localised upgrades to road infrastructure will be required to mitigate the identified impacts;
- ▶ Road safety is not expected to suffer disproportionately as a result of the proposed developments;
- ▶ It is anticipated that traffic during the construction and operation phases can be adequately managed with the appropriate plans in place; and
- ▶ Any incidents that occur can be adequately managed with the appropriate plans in place.

8.2 Recommendations

The following recommendations to mitigate the identified impacts are made:

- ▶ Existing conditions of road pavements should be established prior to construction commencing and a programme of road pavement monitoring and rehabilitation should be developed; and
- ▶ Management plans for construction and operational traffic, incidents and driver fatigue should be developed through a Traffic Management Plan, Fatigue Management Plan and Incident Management Plan.



9. References

Austrroads 2009, *Guide to Road Design Part 3: Geometric Design*, Austrroads, Sydney.

Austrroads 2009, *Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections*, Austrroads, Sydney.

Austrroads 2009, *Guide to Traffic Management Part 3: Traffic Studies and Analysis*, Austrroads, Sydney.

Department of Infrastructure, Planning and Environment 2004, *Northern Territory Road Safety Strategy*, Department of Infrastructure, Planning and Environment, Darwin.

Department of Lands and Planning 1998, *Northern Territory Code of Practice in Fatigue Management*, Department of Lands and Planning, Darwin.

Department of Lands and Planning 2009, *Annual Traffic Report*, Department of Lands and Planning, Darwin.

Department of Lands and Planning 2010, *NT Integrated Regional Transport Strategy – Transport in our regions*, Department of Lands and Planning, Darwin.



GHD



Level 5, 66 Smith Street
Darwin NT 0800

T: (08) 8982 0100 F: (08) 8981 1075 E: drwmail@ghd.com.au

© **GHD 2013**

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	M. Weir, T. Frodsham	K Fitzpatrick		I McCardle		4/6/2013