

Great South Land Minerals Ltd

ONSHORE SEISMIC SURVEY TRAFFIC MANAGEMENT PLAN

February 2006
Project No. 1377.001



GREAT SOUTH LAND
MINERALS
LIMITED



**SCIENTISTS
ENGINEERS
MANAGERS &
FACILITATORS**



PREFACE

LIMITATIONS STATEMENT

This Traffic Management Plan (TMP) has been prepared in accordance with the scope of services agreed upon between SEMF Pty Ltd (SEMF) and Great South Land Minerals Ltd (GSLM) (the client). To the best of SEMF's knowledge, the report presented herein represents the Client's intentions at the time of printing of the report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in the actual project and its impact differing from that described in this report.

In preparing this report SEMF has relied upon data, surveys, analysis, designs, plans and other information provided by the client, and other individuals and organisations referenced herein. Except as otherwise stated in this report, SEMF has not verified the accuracy or completeness of such data, surveys, analysis, designs, plans and other information.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third parties.

This report does not purport to provide legal advice. Readers should engage professional legal advisers for this purpose.

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Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



FOREWORD

Function of the Traffic Management Plan

This Traffic Management Plan (TMP) has been prepared to support Great South Land Minerals (GSLM) in their application for approval to the Department of Infrastructure, Energy and Resources (DIER), to undertake an onshore seismic survey over Tasmanian Basin.

The seismic survey will be the largest onshore seismic survey ever conducted in Tasmania. GSLM is committed to ensuring that there are no detrimental impacts on the natural environment resulting from survey operations. The TMP aims to address the requirements of DIER, prior to permits being issued to allow GSLM to undertake the seismic survey.

The TMP also provides information on public contact procedures and the infrastructure and environmental management techniques that will be employed by GSLM during the survey.

The proposed seismic survey and associated activities fall under the jurisdiction of Mineral Resources Tasmania (MRT) and the *Mineral Resources Development Act 1995*.

Role in the Approval Process

The TMP will support GSLM's applications for approval to DPIWE, DIER, and MRT to undertake an extensive seismic survey in Tasmania.



EXECUTIVE SUMMARY

GSLM is planning to undertake an extensive seismic survey in Tasmania utilising approximately 1,446km of existing roads. The seismic survey will use vibroseis trucks to assist in the exploration for onshore oil and gas deposits within the untested Tasmania Basin. A similar survey on a smaller scale was carried out by GSLM in 2001, which indicated the presence of large geological structures that could contain oil and gas. One of the objectives of the proposed 2006 survey is to undertake further research on these geological structures previously identified.

This TMP has been developed to assist GSLM in obtaining permits from DIER to undertake an onshore seismic survey in Tasmania during 2006. The seismic survey is proposed to travel along existing roads within southeastern Tasmania.

This report complies with the conditions of the DIER G2 Contract Management Plan and provides:

- A description of how the seismic survey will be undertaken;
- Information on Public Contact and how this will be managed by GSLM;
- Details of the Environmental Management approach that will be followed by GSLM and Terrex Seismic Pty Ltd;
- A detailed Traffic Management Plan (including signage layouts) to be used during the line surveying and pegging process, and during the seismic survey.



TABLE OF CONTENTS

1	INTRODUCTION	7
	1.1 The Proponent.....	7
	1.2 History of the Project	7
	1.3 Project Timeframes	7
	1.4 Approvals	8
	1.5 Consultation	8
	1.5.1 State Government Consultation	8
	1.5.2 Local Government Consultation.....	8
	1.5.3 Community Consultation.....	8
	1.6 Structure of this Report.....	8
2	SEISMIC SURVEY LOGISTICS	10
	2.1 Introduction.....	10
	2.2 Seismic Survey Methodology	10
	2.3 Public Contact	11
	2.3.1 Impact on Public Events	11
	2.3.2 Provision of Information	11
	2.4 Environmental Management.....	11
	2.4.1 Environmental Screening Reports.....	11
	2.4.2 Environmental Management Plan	13
	2.4.3 DIER Requirements.....	14
3	TRAFFIC MANAGEMENT PLAN.....	15
	3.1 Introduction.....	15
	3.2 References.....	15
	3.3 Regulations	15
	3.4 Proposed Work.....	15
	3.5 Proposed Hours of Operation	16
	3.6 Proposed Program	16
	3.7 Proposed Survey Vehicles.....	16
	3.8 Training	16
	3.9 Traffic Control Equipment.....	16
	3.10 Roads Affected by the Survey	17
	3.11 Delays In Property Access.....	18
	3.12 Terrex Site Supervisors	18
	3.13 Communication	18
	3.14 Site records	18
	3.15 Public Safety	19
	3.16 Traffic Requirements	19
	3.17 Road Closures.....	19



3.18	Targa Tasmania	19
3.19	Emergency Services Access	20
3.19.1	Emergency Procedures	20
3.19.2	Accidents	20
3.20	Approvals	20
3.21	Traffic management signage layout.....	20

FIGURES

Figure 1: Greening Australia 'Enviromark' sign.

TABLES

Table 1: Proposed seismic survey timetable.

Table 2: Brief Description of the TMP Report Structure.

Table 3: DIER managed conservation sites.

Table 4: Classification of State Roads.

Table 5: State roads travelled on during proposed seismic survey.

PLATES

Plate 1: Bitumen road after vibrating by seismic survey truck.

Plate 2: Gravel road after vibrating by seismic survey truck.

APPENDICES

Appendix A – List of State Roads Affected by the Seismic Survey

Appendix B – DIER Conservation Sites

Appendix C – RPT Traffic Control at Work Sites Code of Practice (2004)

Appendix D – RTP Road Hazard Management Guide

Appendix E – DIER G2 Contract Management Plan

Appendix F – TMP Signage Layouts



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



ABBREVIATIONS

DIER	Department of Infrastructure, Energy and Resources
DPIWE	Department of Primary Industries, Water and Environment
DTPHA	Department of Tourism, Parks, Heritage and the Arts
EMP	Environmental Management Plan
GSLM	Great South Land Minerals Ltd
km	kilometre
km ²	square kilometre
MRT	Mineral Resources Tasmania
RPT	Roads and Public Transport Division of DIER
SEMF	SEMF Holdings Pty Ltd
TALSC	Tasmanian Aboriginal Land and Sea Council
Terrex	Terrex Seismic Pty Ltd



1 INTRODUCTION

1.1 THE PROPONENT

The proponent is Great South Land Minerals Ltd (GSLM). GSLM is a fully owned subsidiary company of Empire Energy Corporation International (Empire Energy). GSLM is a Tasmania onshore oil and gas exploration company, and holds Special Exploration Licence 13/98 (SEL 13/98), comprising of 15,035km². The exploration licence may be partially relinquished or converted to a retention or mining lease at any time during the period it remains in force.

Great South Land Minerals Ltd
GPO Box 1603
Hobart, Tasmania 7001

Project Manager: Nicole Chesterman

Terrex Seismic Pty Ltd (Terrex) will be contracted by GSLM to undertake the seismic survey.

1.2 HISTORY OF THE PROJECT

The Tasmania Basin is an untested petroliferous (oil and gas producing) basin. The use of seismic surveys to identify prospective geological structures that could contain oil or gas is an established technique.

In 2001, GSLM and Terrex completed an onshore seismic survey covering 660km over the Central Highlands, Northern Midlands, and southeastern Tasmania. The initial interpretation, coupled with prior studies by GSLM, established that large geological structures exist south of Launceston and under the Central Highlands region. These structures are believed to have the potential to be petroleum traps.

In 2006, GSLM will undertake a larger onshore seismic survey, covering approximately 1,446km, which will be based on public roads. Approximately 1,100km of the survey will expand the regional coverage of seismic data, and 300km is aimed at more closely defining geological structures previously identified from the 2001 survey.

1.3 PROJECT TIMEFRAMES

The seismic survey will be undertaken in early in 2006, starting in April. The survey will take approximately 4 months to complete. Data interpretation will occur throughout the survey. A provisional timetable for the survey is outlined in Table 1. The seismic survey is proposed to start in the north of Tasmania, however the order in which the seismic lines are surveyed is subject to several factors e.g. the occurrence of public events such as Targa Tasmania and weather conditions.

Table 1: Proposed seismic survey timetable.

Activity	Duration	Timing
Preparatory works	1 month	Early March 2006
Seismic acquisition	3-4 months	Early April - July 2006
Demobilisation	2 weeks	July 2006



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



1.4 APPROVALS

The main legislative requirements that apply to the approval of this redevelopment is the *Mineral Resources Development Act 1995*. All operations fall under the jurisdiction of MRT, and will follow the Mineral Exploration Code of Practice and Special Exploration Licence conditions. Furthermore, MRT has also indicated that it is a condition that GSLM liaise with all other relevant authorities, including DPIWE and DIER.

1.5 CONSULTATION

A proactive consultation approach has been adopted with briefings regarding the seismic survey and operations being regularly undertaken with key stakeholders. The major stakeholder groups are as follows:

- State Government Agencies;
- Local Government; and
- The general public.

1.5.1 State Government Consultation

GSLM has consulted with several State Government departments, and the divisions, which have provided comments include but are not limited to:

- Department of Primary Industry, Water and Environment;
- Department of Tourism, Park, Heritage and the Arts; and
- Department of Infrastructure, Energy and Resources.

Other State government agencies and community groups, which have been consulted include:

- Mineral Resources Tasmania; and
- Tasmanian Aboriginal Land and Sea Council.

1.5.2 Local Government Consultation

GSLM has undergone extensive consultation with local Councils, in order to ensure that the councils are informed about the regional seismic survey planned for February 2006. Each council has been briefed regarding the seismic survey, how the survey will be carried out and the possible impacts of the survey. Councils have also been provided with information booklets to be provided to the general public.

1.5.3 Community Consultation

GSLM acknowledges the value of community input into carrying out an extensive exploration program such as a seismic survey. The methods used by GSLM to ensure public awareness of the seismic survey are outlined in Section 2.3.

Wherever practical, GSLM has aligned seismic lines along public roads. In cases where this is not possible, GSLM will consult with private landowners prior to and during the survey.

1.6 STRUCTURE OF THIS REPORT

A brief description of the structure of this report is provided in Table 2 below.



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



Table 2: Brief Description of the TMP Report Structure

Section Heading	Brief Description of the Information Provided
Foreword	A brief description of the function of the TMP and the information it contains.
Executive Summary	A summary of the proposed seismic survey and information provided in the report in support of the environmental and planning approvals.
1.0 Introduction	Description of the proponent, the projects history, a list of relevant legislation, and consultation that has been undertaken by the proponent.
2.0 Seismic Survey Logistics	Description of the logistics of the seismic survey, and outlines environmental management measures that will be implemented.
3.0 Traffic Management Plan	Description of the TMP that Terrex and GSLM will follow during the seismic survey.



2 SEISMIC SURVEY LOGISTICS

2.1 INTRODUCTION

GSLM has been granted an approval in principal for the undertaking of the seismic survey in the State Road reservation areas by DIER, with the requirement of GSLM to provide further information regarding public contact, traffic management, environmental management and a list of State roads that will be affected. This section presents the logistics and methods of the seismic survey, and the environmental management measures that will be undertaken by GSLM and Terrex during the seismic survey.

2.2 SEISMIC SURVEY METHODOLOGY

Onshore seismic surveys use seismic energy generated through dropping or vibrating a heavy mass on the earth's surface or through detonation of explosive charges. GSLM will use vibroseis trucks, whereby a vibrating baseplate is lowered to the ground and the weight of the truck is then placed over the vibrating baseplate.

The energy from the vibration radiates outwards in all directions from the vibrating baseplate. When the seismic waves reach geological formations with different structural properties the seismic waves are reflected or refracted. The seismic waves are recorded at the surface by geophones placed on the ground. The structure of subsurface geological structures are mapped by interpreting the variations in the times taken for the seismic waves to return to different points along the surface after reflection from the geological structure.

The vibration plate does not jump on or pound the road surface and as a result, there is no damage to the structural integrity of the road. This is illustrated below; the two photos indicate the lack of damage to both sealed and unsealed roads after the seismic trucks have vibrated the road (Plates 1 and 2). The proposed seismic survey will not have a detrimental impact on roads and this was demonstrated in 2001 during the previous seismic survey conducted by GSLM using the same equipment.

Terrex will adjust the survey point intervals as necessary during the seismic survey to ensure that the survey will not be undertaken directly over culverts or bridges to prevent the possibility of the survey damaging these structures.

Plate 1: Bitumen road after vibrating by seismic survey truck



Plate 2: Gravel road after vibrating by seismic survey truck





2.3 PUBLIC CONTACT

2.3.1 Impact on Public Events

The seismic survey will be conducted on public roads, and therefore could affect public events that also utilise the public road system. GSLM is committed to working with local councils and government to identify any public events scheduled for the same time as the survey. The seismic survey has some degree of flexibility and without the need for seismic lines to be surveyed in a specific order, GSLM will coordinate the surveying of seismic lines to avoid clashes with public events.

As of the 6th February, GSLM does not have a confirmed survey schedule and as a result is somewhat limited in identifying public events that are planned to occur at the same time as the survey. Pegging of survey lines is anticipated to begin in mid-March, with the actual survey commencing in early April and finishing in late July. GSLM has been actively liaising with local councils and this will continue in earnest once a survey schedule is confirmed, and throughout the survey process.

Targa Tasmania is a well-known public event that has been identified by GSLM to occur within the proposed survey time period, with the planned route of Targa Tasmania passing along several roads that are included in the seismic survey. GSLM will ensure that any roads that are identified as part of the survey and that also form part of the Targa Tasmania route will not be surveyed during Targa Tasmania operations. GSLM will liaise with Targa Tasmania and relevant local councils to facilitate this process.

2.3.2 Provision of Information

GSLM has undertaken an extensive public contact program to ensure that the general public is well informed of how the survey will be carried out and the significance of the research.

To ensure public awareness and comment prior to and during the survey in 2006, the following measures will be undertaken:

- Information and schedule information in Local Government Gazettes
- Information and schedule information as Public Notices in local newspapers (e.g. The Mercury, The Advocate, The Examiner)
- Articles in local newspapers;
- Extensive media campaign including news interviews following the commencement of the survey;
- Provision of public information brochures available through Local Government Councils and from GSLM; and
- Information provided on website: <http://www.greatsouthlandminerals.com>

2.4 ENVIRONMENTAL MANAGEMENT

2.4.1 Environmental Screening Reports

Seismic lines can be easily deviated to avoid affecting environmental values such as threatened species of plants or animals, or significant native vegetation.

As part of the seismic survey planning process, environmental screening reports for the sections of State roads that the survey is proposed to travel along has been undertaken using the Roads and Public Transport Division (RPT) environmental database. The environmental screening reports provide information regarding threatened species, archaeological sites, habitat values, and environmental threats for the land within the road



**Onshore Seismic Survey Traffic Management Plan
Great South Land Minerals Ltd**



reserve. The reports also clearly identifies any vegetation communities that are managed by DIER.

Threatened Plant Communities

DIER is responsible for the management of a large area of land incorporated in its roadside reserve system. Roadside reserves vary due to factors including their shape and size, variety of users and impacts, tenure and primary use as a transport corridor. Many of DIER's roadsides contain patches of remnant vegetation that present valuable populations of rare and threatened plant species; priority vegetation communities; corridors for wildlife movement; wildlife habitat; and old growth/heritage trees. DIER is obliged to protect and conserve plant and animal species listed under state and federal legislation as threatened species or critical habitat. A number of critical species and habitats have been identified as being a priority for pro-active management in the State roadside reserve network. These occur where roadside populations are important to the conservation of the species, where the adjacent vegetation has been destroyed or is vulnerable to farming practices.

The environmental screening reports indicated that are 7 sites of high conservation priority that are managed by DIER along the State roads that GSLM propose to conduct the seismic survey on. A summary of these sites and the required management approaches is provided in Table 3. Maps showing the location of these sites, detailed information, and the GPS coordinates are provided in Appendix B.

Table 3: DIER managed conservation sites.

State Road	Location on State Road	Proposed Seismic Line	Conservation Site	DIER Requirements
Midlands Hwy	Link 57 (2.95-2.98)	TB02-EB	14	No operations to occur within this area without consulting DIER Environmental Planner
Tasman Hwy	Link 36 (8.2-9.13)	TB02-FE	39, 40, 41	No operations to occur within this area without consulting DIER Environmental Planner
Tasman Hwy	Link 38 (0.00-0.45)	TB02-FB	42, 43	No operations to occur within this area without consulting DIER Environmental Planner
Tunnack MR	Link 57 (2.67-2.77)	TB02-BG	Population of <i>Lepidium hyssopifolium</i> *	No operations to occur within this area without consulting DIER Environmental Planner

*Note: This site does not have a DIER conservation site number.

Greening Australia has developed a series of markers called 'Enviromark' (Figure 1). These markers have been installed at the start and end of each of the DIER conservation sites. The conservation sites are generally the area from the back of the table drain to the fence boundary, not including any areas maintained for road safety.



Figure 1: Greening Australia 'Enviromark' sign.

During surveying and pegging out the seismic lines by Terrex, the conservation areas managed by DIER will be clearly marked using a specific flagging tape. GSLM will ensure that the Terrex personnel are aware of the significance of these areas and the required DIER management measures as indicated in Appendix B.

To avoid detrimental environmental impacts on all plant communities present on the sides of the roads, Terrex will ensure that the seismic trucks only pull over for rest breaks etc in established areas such as gravelled pull off areas. These will be clearly identified by the surveyors during the line pegging process.

Aboriginal Heritage

Environmental screening reports also provide information on the location of Aboriginal heritage sites. Several Aboriginal heritage sites were identified in the screening reports that could occur within the areas that the seismic survey will be occurring.

To ensure protection of the Aboriginal heritage sites during the seismic survey, the Aboriginal Heritage Office (Department of Tourism, Parks, Heritage and the Arts, DTPHA) and the Tasmanian Aboriginal Land and Sea Council (TALSC) have been consulted.

An assessment of the possible conflict between heritage sites and the seismic survey DTPHA and TALSC is currently underway and appropriate management measures will be identified. GSLM will continue to liaise with DTPHA and TALSC during survey preparation and during the actual survey

European Heritage

Numerous European heritage sites were identified as occurring within the roadside reserve along State roads that the seismic trucks will be travelling along. However, as the seismic survey operation will remain on the road verge or within areas currently disturbed by road maintenance operations, there will be no impact on these heritage sites.

2.4.2 Environmental Management Plan

The Threatened Species Unit (TSU) of DPIWE has granted GSLM with approval in principal for the undertaking of the seismic survey in the State Road reservation areas, with the requirement for GSLM to identify areas where threatened species could be impacted on by the seismic survey. A consultant botanist has reviewed the seismic lines



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



and the possible impacts on known plant communities. A separate Environmental Management Plan (EMP) has been developed to ensure that there will be no detrimental impacts on threatened species during the seismic survey. GSLM will ensure that all personnel associated with the seismic survey are familiar with the EMP and are aware of the importance of protecting threatened species.

2.4.3 DIER Requirements

Once seismic survey operations commence, GSLM will be required to maintain contact with Stephanus Vermaak, DIER, to ensure that the seismic survey does not impact on State roads or the roadside reserve plant communities. It is possible that the seismic lines will change prior to and during the survey. Should this occur, Stephanus Vermaak will be the first point of contact.



3 TRAFFIC MANAGEMENT PLAN

3.1 INTRODUCTION

The utilisation of public roads for the vast majority of the seismic survey results in potential hazards arising related to traffic management. To address the requirements of the Roads and Public Transport Division (RPT) of DIER, a traffic management plan has been developed in conjunction with GSLM and the Traffic Engineering Branch of RPT. The traffic management plan complies with the RPT Traffic Control at Work Sites Code of Practice 2004 (and associated revisions) (Appendix C), refers to the RPT Road Hazard Management Guide (Appendix D), and reference to the specifications detailed in the DIER G2 – Contract Management Plan (Appendix E) are made.

This Traffic Management Plan (TMP) has been prepared for Terrex for survey work to be undertaken along approximately 1400km of State, Local Government, Forestry Tasmania and private roads in the central and southeastern region of Tasmania.

The purpose of the plan is to safely manage the movement of vehicles past the site of survey work.

3.2 REFERENCES

This TMP has been prepared in accordance with the requirements of Australian Standard AS 1742.3-2002 (Manual of Uniform Traffic Control Devices – Traffic Control Devices for Works on Roads) and Traffic Control at Work Sites – Department of Infrastructure, Environment and Resources Code of Practice, June 2004.

3.3 REGULATIONS

All vehicle movements are subject to the relevant laws and legislation governing the use of vehicles on public roads. These include but are not limited to:

- Tasmanian Vehicle and Traffic Act 1999
- Tasmania Traffic (General and Local) Regulations 1956, and relevant amendments
- Australian Standard AS 1742.3-2002
- Traffic Control at Work Sites – DIER Code of Practice, June 2004

3.4 PROPOSED WORK

The work to be undertaken by Terrex comprises a seismic survey associated with the exploration of natural oil and gas deposits.

The seismic survey is carried out using a low energy acoustic source (vibrois) generated with Hemi 44, 44,000 lb peak force vibrator units. Three units truck mounted units will be used during the survey.

The acoustic source will be placed at 20 metre intervals along predefined seismic source lines. The source will be stopped for approximately 45 seconds at each interval. Where possible, the vibrator units will be positioned off the road.

Cables and geophones required along the source lines for recording of seismic data are positioned and retrieved in multi-phased operations by two separate work crews at the front and rear of the works site.

Prior to the seismic survey being undertaken, a survey crew travels the proposed source line and installs survey pegs for the seismic crew to follow. This will occur at least 2 to 3 weeks in advance of the seismic survey.



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



All works will be restricted to one side of the road reserves and survey trucks will not stop at intersections.

3.5 PROPOSED HOURS OF OPERATION

The proposed working hours of the survey crews will be daylight hours for seven days per week.

At the completion of the survey each day, all vehicles will be driven to Terrex's place of accommodation for that evening. Only rarely may the trucks with vibrator units be left in the vicinity of the current area of survey, however, the trucks would only be left in an area safe to do so and not at the side of the road.

3.6 PROPOSED PROGRAM

The survey work is scheduled to commence in early April 2006 (subject to Terrex's operational constraints). The expected completion date, based on surveying approximately 10km of source line per day, is late July 2006

As the survey work proceeds, the project completion date will be reviewed and updated information provided to DIER and other authorities as required.

3.7 PROPOSED SURVEY VEHICLES

Initial pegging of the source line will require one work vehicle with two other vehicles required for management of traffic movements past the work site (Refer Signage Layouts in Appendix F).

The seismic data survey will involve three active seismic vibrator units, two personnel carriers and six 4WD utilities, as well as one truck used for recording of the seismic survey data. The personnel carriers and recording truck are not shown in the appended Signage Layout plans.

The vibrator unit trucks are all terrain, six wheel drive vehicles approximately 9.5m long, 3.3m high and 2.4m wide.

3.8 TRAINING

Terrex is committed to organising relevant training for the seismic crew with the appropriate State bodies prior to the commencement of the survey. If time does not permit, Terrex will organise for a State contractor to work with the seismic crew.

In order to manage the possible impacts associated with vehicle use during the seismic survey, all vehicles will be maintained in good mechanical condition and carry appropriate State Road Traffic Act Regulation and National Heavy Vehicle Accreditation Scheme (HVAS) Notices. Terrex will also ensure that drivers will take special precautions on road sections where line of sight is limited.

Prior to the commencement of the survey, the key Terrex personnel will undertake the traffic management training course facilitated by the Tasmanian Building and Construction Industry Training Board as required by the Traffic Control at Work Sites Code of Practice.

Inductions for all survey personnel prior to the commencement of work will include traffic management, safety and environmental training.

3.9 TRAFFIC CONTROL EQUIPMENT

Signs and delineators will be installed in accordance with AS1742.3 and the DIER Traffic Control at Work Sites Code of Practice 2004. Signage will be supplied by Terrex.

Signs will be removed at the completion of each days work.



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



Signs and devices will be examined each day to ensure they are in good mechanical condition, are clean and will remain effective during the works.

Following erection, personnel will carry out a functional inspection of signs and devices before and after opening to traffic.

All Terrex vehicles will be fitted with flashing yellow lights and an illuminated flashing arrow sign as required.

All personnel within the survey area will be wearing high visibility clothing.

3.10 ROADS AFFECTED BY THE SURVEY

There are 35 proposed survey lines that traverse southeastern Tasmania. The survey will be undertaken along State, Local Government, Forestry Tasmania and private roads.

State roads are categorised into 5 Classes as described in Table 4.

Table 4: Classification of State Roads.

Road Class	Type	Speed Limit	Width	Vehicles per day
Category 1	Trunk Roads	Up to 110 km/hr	3.5m wide lanes min 2.0m wide shoulder	At least 2500 v per day with some sections more than 5000 v per day
2	Regional Freight Roads	100 km/hr	3.5m wide lanes min 1.6m shoulder	Average between 1000 and 5000v per day
3	Regional Access Roads	80 km/hr	3.0m lanes 1.0m wide shoulder	Average between 1000 and 5000v per day
4	Feeder Roads and	60 km/hr	2.75m wide lanes and 0.6m shoulder	Average below 1000 v per day
5	Other State Roads	60 km/hr	Sealed and unsealed	Comprise lower volume roads, forestry and property access roads

The 17 State roads along which the survey will be undertaken have been identified and are presented in Table 5.

Table 5: State roads travelled on during proposed seismic survey.

State Road	Road Class / Category
Midland Highway	1
Tasman Highway	3 / 4
Arthur Highway	3
Channel Highway	3 / 4
Huon Highway	2 / 4
Lyell Highway	2 / 3
Tunnack Main Road	5
Glen Huon Main Road	5



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



State Road	Road Class / Category
Lollara Main Road	5
Nicholls Rivulet Main Road	5
Lake Leake Main Road	5
Poatina Main Road	4
Fingerpost Main Road	3
Ranelagh Secondary Road	5
Lake Highway	4
Mud Walls Secondary Road	5
Marlborough Secondary Road	5

The relevant link and chainages for each State road that the survey will pass over are provided in Appendix A. Individual seismic lines may traverse along or across the State roads.

Local government roads vary in formation width and have a speed limit generally of 60 or 80 km/hr. The local government roads comprise both sealed and unsealed pavements and shoulders.

Forestry Tasmania roads are categorised in 4 classes – primary 2 lane access, semi-main 2 lane access, all weather single lane access, or seasonal single lane access.

3.11 DELAYS IN PROPERTY ACCESS

It is not expected property owners will be adversely delayed in gaining access to properties off roads along which the survey is being undertaken. If a seismic test has already started opposite a property entrance point at the time property access is required, the delay should be no longer than 1 minute.

3.12 TERREX SITE SUPERVISORS

The Terrex supervisor nominated for this project is Richard Barnes (08 9434 4388).

Terrex will designate site supervisors prior to the commencement of any survey related operations. The site supervisors will be responsible for the supervision and organisation of the survey crews and vehicles and have on-site responsibility for the implementation of the Traffic Management Plan. The site supervisors will ensure that safety is maintained while achieving best efficiencies and works practices.

3.13 COMMUNICATION

Communication across the site of works between Terrex personnel is available by the use of Mobile telephones, UHF radios and VHF radios, including portable 2-way radios.

3.14 SITE RECORDS

The Site Supervisor or his nominated delegate is responsible for generating and maintaining the following site records.

Site records include:

General

- Site toolbox meetings
- Daily diaries



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



Quality

- Procedural checklists
- Inspection records
- Test records
- As constructed details
- Subcontractors quality records
- Site quality audits

Safety

- Site safety assessments
- Daily traffic safety audits
- Site personnel inductions
- Site Safety Audits
- Accident/incident investigations

Environmental

- Environmental site assessments
- Site environmental audits

Daily recording related to the works site will be undertaken in accordance with the requirements of AS 1742.3.

3.15 PUBLIC SAFETY

Public safety will be maintained during the survey work by implementing the following processes:

- Public access to the site will be controlled using relevant signage on footways and cycleways.
- Existing footpaths will be maintained for pedestrian use during the works and protected crossing points provided as required.
- Access past the site will be controlled in accordance with the traffic management plan.
- Lighting for public safety will not be required as the survey work will not be undertaken outside daylight hours.

Whilst it is not expected that there will be any significant lengths of defined footways or cycleways along the majority of the route of the survey any requirement to provide warning to pedestrians or cyclists will be assessed by Terrex's site supervisor.

3.16 TRAFFIC REQUIREMENTS

Wherever possible, two way traffic past the site of work will be maintained.

As part of the general site management, traffic volumes and delay durations will be monitored to minimise problems and determine if there is unreasonable inconvenience caused to road users.

3.17 ROAD CLOSURES

There will not be a need to close any roads to undertake the survey.

3.18 TARGA TASMANIA

Targa Tasmania will be held from the 25th to 30th April.



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



GSLM will ensure that no seismic survey or initial pegging is undertaken along the stage routes of Targa on the day of racing.

3.19 EMERGENCY SERVICES ACCESS

It is imperative that access is maintained for emergency services vehicles at all times during the works and movement of these vehicles past the site will be given preference over the undertaking of the survey work and also movement of other vehicles. Emergency vehicles will not be impeded by the works.

3.19.1 Emergency Procedures

Constant monitoring of the progress of works and road conditions will be required to avoid potential delays to other road users.

In the event that a traffic delay occurs the process will be:

- Site Supervisor develops Management Plan to control the delay
- Survey Contractor is notified of requirements
- The necessary authorities are advised of the plan
- Site Supervisor instigates plan and works proceed

3.19.2 Accidents

Any transport or traffic emergencies i.e.; vehicle breakdown, vehicle accident, vehicle fire, major environmental incident, serious accident causing injury, or other life threatening situation noticed by Terrex personnel will be actioned by:

- Raising the alarm by informing the Site Supervisor and/or emergency services
- Assisting if able to do so (e.g. First aid treatment)
- Awaiting further instructions from the Site Supervisor
- Only returning to the site when the "all clear " is given by the Site Supervisor
- Only leaving the accident site when the "all clear " is given by the Site Supervisor or the controlling public authority
- All site personnel are responsible to ensure that details of the incident are reported to the Site Supervisor.

3.20 APPROVALS

The GSLM is responsible for obtaining approval of the TMP from the relevant authority prior to commencing the works. The TMP documentation will shall be supplied to the site supervisors/ team leaders prior to the commencement of works.

Prior to issuing any changes to the TMP, the approval of the relevant authority will be sought.

3.21 TRAFFIC MANAGEMENT SIGNAGE LAYOUT

Traffic Management Signage Layouts have been prepared for both the initial pegging and survey work and the seismic survey work (Appendix F)

As the work being undertaken is treated as short term and low impact work, a risk assessment has been undertaken in accordance with AS1742.3. The risk assessment is provided in Appendix G.



Onshore Seismic Survey Traffic Management Plan Great South Land Minerals Ltd



Five signage layouts have been prepared for each of the initial survey and seismic survey work, representing the 5 state road categories (Category 4 & 5 on the same layout) and also the local government, forestry and private roads.

The signage requirements shown reflect what would be the typical requirement, however, the site supervisor will need to constantly assess traffic volumes, road widths, road conditions and sight distances etc. in order to evaluate whether additional control measures are required.

In the case of 'Other Roads – Private', where there is expected to be no traffic past the work site and therefore signage and warning devices required would only need to be the minimum to ensure the safety of the contractors personnel during works.

The site supervisor will be responsible for coordinating the placement of warning signs on roads intersecting the survey route to provide warning to approaching traffic. In most cases a Workers (T1-5) sign will be appropriate in this instance.



APPENDICES

Appendix A:
List of State Roads Affected by Seismic Survey.....

Appendix B:
DIER Conservation sites.....

Appendix C:
RPT Traffic Control at Work Sites Code of Practice

Appendix D:
RPT Road Hazard Management Guide.....

Appendix E:
DIER G2 Contract Management Plan

Appendix F:
TMP Signage Layouts.....

Appendix G:
Seismic Survey Risk Assessment.....



**Onshore Seismic Survey Traffic Management Plan
Great South Land Minerals Ltd**



Appendix A:

List of State Roads Affected by Seismic Survey

STATE ROADS PROPOSED TO BE USED DURING SEISMIC SURVEY

State Road Name	State Road Number	Link(s) (& chainage sections)	Corresponding seismic line
Tunnack MR	1138	5 (0-7.02), 57 (0-11.50), 94 (0-3.79)	TB02-BG
		5(2.38-5.21)	TB02-EC
		crosses at 94(0.00)	TB02-EA
Nicholls Rivulet MR	1248	5(0-6.30), 94(0-11.46)	TB02-CG
Lake Leake MR	1442	05(0-4.12), 17(0-11.89), 36 (0-9.63), 48 (0-4.03), 58 (0-7.34), 70 (0-7.05), 84 (0-8.09), 94 (0-5.45)	TB02-FA
		line ends at 36(2.39)	TB02-EL
Poatina MR	1604	05(0-5.80), 12(0-7.41), 25(0-11.52), 40(0-11.17), 54(0-5.03)	TB02-BA
Fingerpost MR	1691	5(0-7.38)	TB02-EQ
Ranelagh SR	2072	5(0.00-2.69)	TB02-CF
Lake Hwy	2100	49 (0.00-0.80)	TB02-BA
		crosses at 18(0.00)	TB02-BB
Mud Walls SR	2290	crosses at 44(1.71)	TB02-BI
Midland Hwy	0087	57(2.96-4.63)	TB02-EB
		43(5.5-7.11)	TB02-ED
		49 (5.55-5.73)	TB02-EE
		49 (5.35-5.55)	TB02-EF
		starts at 57(0.00)	TB02-EI
		crosses at 43(0.04)	TB02-BG
		crosses at 55(4.52)	TB02-EK
		crosses at 57(3.64)	TB02-EL
Tasman Hwy	0113	crosses at 62(10.11)	TB02-EM
		11 (8.82-9.94), 12(0-8.43), 15(0-9.63), 16(0- 11.30), 18(0-5.22)	TB02-EP
		18 (0-10.54), 20 (0-10.91), 23 (0-8.81), 25 (0- 9.93), 27 (0-10.15), 29 (0-10.36), 31 (0-8.44), 33 (0-10.24), 36 (0-9.13)	TB02-FE
		38(0-10.29), 40(0-11.77), 42(0-10.16)	TB02-FB
		line ends at 18(5.22)	TB02-EO
Arthur Hwy	0142	5(0-7.27), 9(0-7.00)	TB02-EQ
Channel Hwy	0155	82(0.00-8.77), 94(0.00-8.75)	TB02-CF
		18(0-10.40), 29(0-1.87)	TB02-CH
		69(8.90-10.88), 82(0.00-0.43)	TB02-CG
		9(6.94-7.45)	TB02-CI
Huon Hwy	0168	crosses at 18(10.40)	TB02-CG
Huon Hwy	0168	17 (0-9.51), 26 (0.00-2.49)	TB02-CD
Marlborough SR	2443	crosses at 44(9.06)	TB02-AA
Lollara MR	1196	5 (0.00-3.64)	TB02-CD
Lyll Hwy	0197	08 (0-7.69), 12 (0-11.32), 14 (0-7.32), 16 (0-6.58), 20 (0-10.71), 23 (0-0-7.28), 25 (0-7.07), 28 (0- 8.84), 30 (0-6.82), 33 (0-7.30), 35 (0-10.76), 38 (0- 11.50), 43 (0-7.51), 46 (0-7.37)	TB02-BD
		crosses at 28(0.00)	TB02-BB
		crosses at 51(0.00)	TB02-BH



**Onshore Seismic Survey Traffic Management Plan
Great South Land Minerals Ltd**



Appendix B:
DIER Conservation sites

APPENDIX 1a: Grid Coordinates for Conservation Sites (GDA 94)

Conservation Site No.	Project Management Category	Species Site No.	Side	EASTING START	NORTHING START	EASTING END	NORTHING END
1	Orchids	1	R	571,030.50	5,236,111.40	570,977.80	5,235,971.50
2	Orchids	2	R	573,151.50	5,242,508.70	574,000.30	5,241,300.00
3	Viminaria juncea	1	L+R	601,560.40	5,341,913.10	601,583.90	5,341,816.20
4	Eucalyptus morrisbyi	1	R	541,211.00	5,243,731.50	541,202.30	5,243,682.30
5	Lepidium hyssopifolium	1	R	518,081.59	5,283,099.00	518,044.10	5,283,455.30
6	Lepidium hyssopifolium	2	L	527,560.10	5,259,871.80	527,430.10	5,259,994.40
7	Lepidium hyssopifolium	3	L	517,445.10	5,286,772.60	517,382.30	5,286,850.30
8	Lepidium hyssopifolium	5	L	TBA			
9	Lepidium hyssopifolium	6	L	604,466.40	5,402,346.60	604,506.20	5,402,376.90
10	Austrodanthonia popinensis	1	L	522,123.60	5,272,829.50	522,206.10	5,272,862.10
11	Austrodanthonia popinensis	2	L+R	520,246.10	5,276,816.20	518,924.20	5,278,802.10
12	Austrodanthonia popinensis	3	L+R	516,944.10	5,290,470.80	516,637.30	5,291,478.90
13	Austrodanthonia popinensis	4	L+R	515,782.20	5,292,509.00	514,774.70	5,296,949.10
14	Austrodanthonia popinensis	5	L+R	539,980.50	5,345,892.00	539,975.30	5,345,921.50
15	Tunbridge Grassland	8	R	534,115.60	5,333,542.40	534,280.90	5,333,655.30
16	Tunbridge Grassland	4	L	534,115.60	5,333,542.40	534,280.90	5,333,655.30
17	Tunbridge Grassland	9	L	534,414.20	5,333,803.30	534,493.80	5,333,985.40
18	Tunbridge Grassland	2	L	534,913.70	5,334,891.60	535,218.80	5,335,346.80
19	Tunbridge Grassland	3	R	534,913.70	5,334,891.60	535,048.20	5,335,101.50
20	Tunbridge Grassland	7	L	535,417.00	5,335,571.10	535,551.50	5,335,780.50
21	Tunbridge Grassland	6	R	535,499.60	5,335,695.40	535,524.80	5,335,738.40
22	Tunbridge Grassland	1	L	535,632.70	5,335,906.10	535,820.40	5,336,200.40
23	Tunbridge Grassland	5	R	535,660.30	5,335,947.70	535,768.40	5,336,115.20
24	Holyman Avenue Grassland	1	R	539,186.90	5,257,440.90	539,924.60	5,257,723.40
25	Holyman Avenue Grassland	2	L	539,186.90	5,257,440.90	539,924.60	5,257,723.40
26	Wanstead Grassland	1	L	538,476.40	5,363,596.50	538,426.50	5,363,737.60
27	Wanstead Grassland	2	R	538,459.40	5,363,643.40	538,426.50	5,363,737.60
28	Wanstead Grassland	3	L	538,239.30	5,364,306.30	538,040.60	5,364,923.60
29	Wanstead Grassland	4	R	538,161.50	5,364,543.40	538,070.60	5,364,828.60
30	Avoca Grasslands	1	R	549,158.90	5,371,044.90	549,541.60	5,371,152.60
31	Avoca Grasslands	2	R	549,791.30	5,371,135.10	549,890.70	5,371,125.30
32	Avoca Grasslands	3	R	550,135.40	5,371,080.30	550,309.80	5,370,983.20
33	Avoca Grasslands	4	R	550,828.50	5,370,872.30	550,928.20	5,370,887.10
34	Avoca Grasslands	5	R	551,125.60	5,370,916.90	551,869.80	5,370,968.10
35	Avoca Grasslands	6	R	552,266.30	5,370,918.00	552,363.90	5,370,895.66
36	Avoca Grasslands	7	R	552,809.20	5,370,888.40	553,059.00	5,370,898.10
37	Avoca Grasslands	8	R	553,158.80	5,370,905.00	553,743.90	5,371,035.70
38	Avoca Grasslands	9	R	554,383.00	5,371,136.30	555,482.50	5,371,111.30
39	Tasman Highway Lake Leake Junction	1	R	587,669.00	5,343,311.60	587,416.10	5,343,730.30
40	Tasman Highway Lake Leake Junction	2	L	587,416.10	5,343,730.30	587,124.20	5,344,048.50
41	Tasman Highway Lake Leake Junction	3	L	587,594.40	5,343,442.00	587,470.10	5,343,659.50
42	Tasman Highway Lake Leake Junction	4	L	587,124.20	5,344,048.50	587,140.00	5,344,243.50
43	Tasman Highway Lake Leake Junction	5	R	587,165.40	5,344,368.30	587,134.70	5,344,483.90

APPENDIX 1b: Road Link Map Locations for Conservation Sites (DIER)

Conservation Site No.	Project Management Category	Species Site No.	Road No.	Side	Start Link No	Start Chainage	End Link No.	End Chainage
1	Orchids	1	A0142	R	73	4.65	73	4.8
2	Orchids	2	A0142	R	56	3.5	56	5.05
3	Viminaria juncea	1	A2632	L+R	51	8.45	51	8.55
4	Eucalyptus morrisbyi	1	A2069	R	5	10	5	10.05
5	Lepidium hyssopifolium	1	A0087	R	20	0.45	20	0.81
6	Lepidium hyssopifolium	2	A0029	L	5	6.2	5	6.39
7	Lepidium hyssopifolium	3	A0087	L	20	5	20	5.1
8	Lepidium hyssopifolium	5	A1125	L	47	6.49	47	6.5
9	Lepidium hyssopifolium	6	A0113	L	53	10.32	53	10.37
10	Austrodanthonia popinensis	1	A2289	L	5	1.96	5	2.05
11	Austrodanthonia popinensis	2	A0087	L+R	15	2.6	15	5
12	Austrodanthonia popinensis	3	A0087	L+R	20	8.85	20	9.91
13	Austrodanthonia popinensis	4	A0087	L+R	24	1.35	24	5.95
14	Austrodanthonia popinensis	5	A0087	L+R	57	2.95	57	2.98
15	Tunbridge Grassland	8	A0087	R	49	9.10	49	9.30
16	Tunbridge Grassland	4	A0087	L	49	9.10	49	9.30
17	Tunbridge Grassland	9	A0087	L	49	9.50	49	9.70
18	Tunbridge Grassland	2	A0087	L	55	0.20	55	0.75
19	Tunbridge Grassland	3	A0087	R	55	0.20	55	0.45
20	Tunbridge Grassland	7	A0087	L	55	1.05	55	1.30
21	Tunbridge Grassland	6	A0087	R	55	1.20	55	1.25
22	Tunbridge Grassland	1	A0087	L	55	1.45	55	1.80
23	Tunbridge Grassland	5	A0087	R	55	1.50	55	1.70
24	Holyman Avenue Grassland	1	A0113	R	7	12.00	7	12.80
25	Holyman Avenue Grassland	2	A0113	L	7	12.00	7	12.80
26	Wanstead Grassland	1	A0087	L	68	7.10	68	7.25
27	Wanstead Grassland	2	A0087	R	68	7.15	68	7.25
28	Wanstead Grassland	3	A0087	L	68	7.85	68	8.50
29	Wanstead Grassland	4	A0087	R	68	8.10	68	8.40
30	Avoca Grasslands	1	A1125	R	21	1.15	21	1.55
31	Avoca Grasslands	2	A1125	R	21	1.80	21	1.90
32	Avoca Grasslands	3	A1125	R	21	2.15	21	2.35
33	Avoca Grasslands	4	A1125	R	21	2.90	21	3.00
34	Avoca Grasslands	5	A1125	R	21	3.20	21	3.95
35	Avoca Grasslands	6	A1125	R	21	4.35	21	4.45
36	Avoca Grasslands	7	A1125	R	21	4.90	21	5.15
37	Avoca Grasslands	8	A1125	R	21	5.25	21	5.85
38	Avoca Grasslands	9	A1125	R	21	6.50	21	7.60
39	Tasman Highway Lake Leake Junction	1	A0113	R	36	8.20	36	8.69
40	Tasman Highway Lake Leake Junction	2	A0113	L	36	8.69	36	9.13
41	Tasman Highway Lake Leake Junction	3	A0113	L	36	8.35	36	8.60
42	Tasman Highway Lake Leake Junction	4	A0113	L	38	0.00	38	0.20
43	Tasman Highway Lake Leake Junction	5	A0113	R	38	0.33	38	0.45

THREATENED SPECIES HABITAT

TIME RESTRICTED SLASHING

- Mowing/ Slashing** DO NOT MOW OR SLASH during November, December or January. Mow or slash this area between February and October only. Do not mow or slash with wet ground.
- Drain cleaning** Clean drains as required but minimise the disturbed area. Remove spoil from the site and dispose of in a designated area (not on native vegetation).
- Scraping /Grading** DO NOT scrape or grade beyond the table drain in this area.
- Removal of material** DO NOT remove any material from this area, apart from drain spoil, unless it is essential. This material is likely to contain threatened plants, bulbs or seeds.
- Stockpile & Parking** DO NOT stockpile materials or park within this area.
- Pruning** DO NOT prune any plants here unless it is essential for safety or sightlines.
- Clearing, Digging & Construction** ABSOLUTELY NO construction, clearing or digging is to occur within this area.
- Weeding** DO NOT spray herbicide behind the furniture in this area. No other weed control actions to be done in this area.
- Machinery and Equipment** Avoid bringing machinery into road reserves in Threatened Species Habitat areas. If machinery has to be brought in it must be cleaned of any soil contamination before entering to avoid weed transport.
- Where is it** Site 14 is on the Midland Highway around the southern turn-off to Ross.
- Description of Values** Rare native grasses occur in this area. There may be specific active management at this site but it also requires some modification of routine maintenance activities to protect and encourage rare native plants.
- Management** Work in Threatened Species Habitat Areas is permitted by a Public Authority Management Agreement. Placement of Enviromark field markers assists in identification of these areas. Please report any damaged or apparently missing Enviromark field markers to the DIER Environmental Planner ph 6233 8753.

Threatened Species

14

Time Restricted
SLASHING

HIGH PRIORITY CONSERVATION SITES

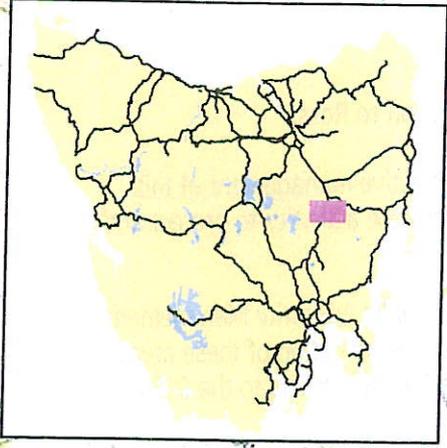
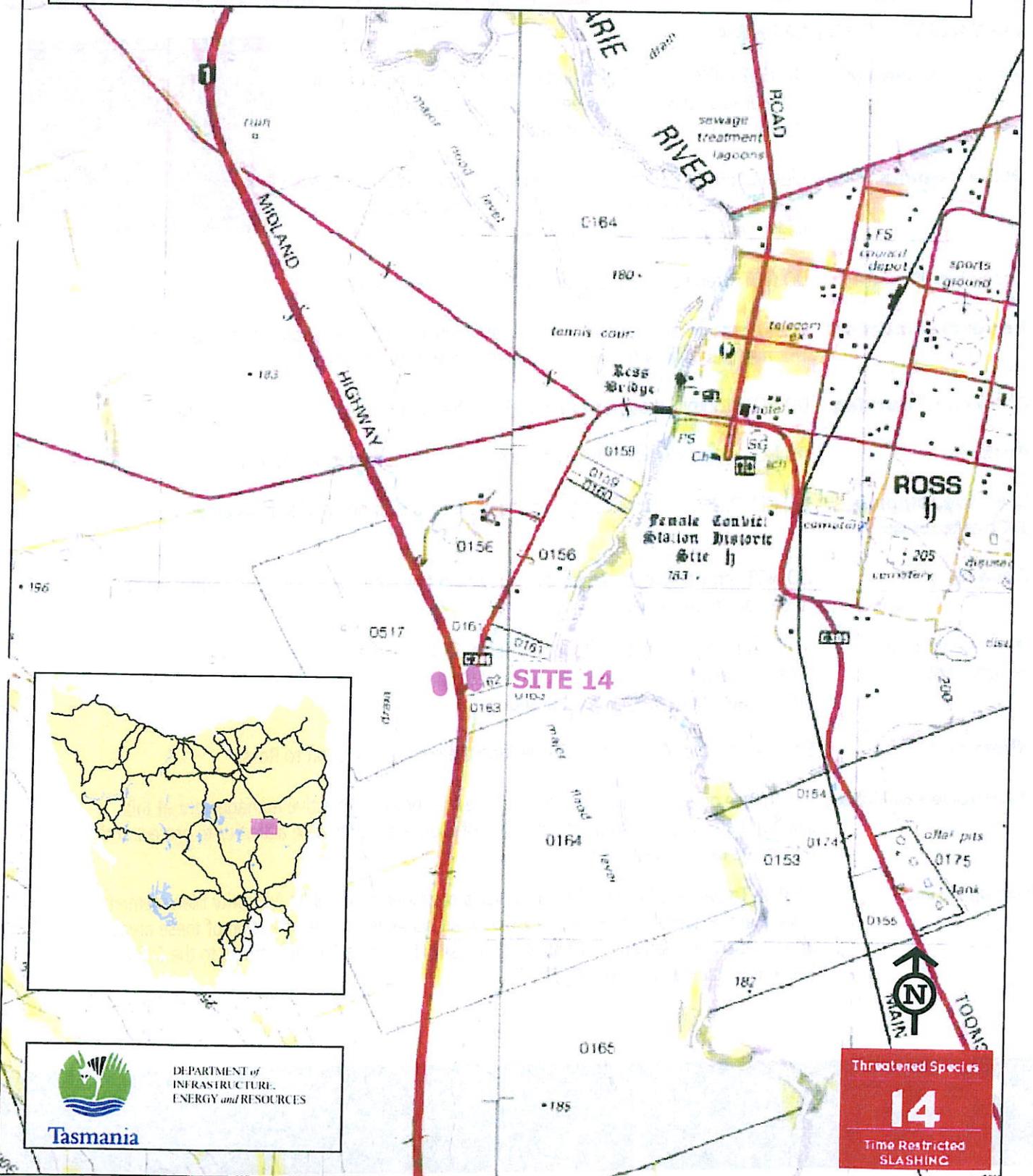
SITE NUMBER 14

Where it is:

Site 14 is on the Midland Highway around the southern turn-off to Ross.

Description:

Rare native grasses occur in this area.



Threatened Species
14
Time Restricted
SLASHING

Background mapping used under license from DPIWE and is copyright

THREATENED SPECIES HABITAT

DISTANCE RESTRICTED SLASHING

- Mowing/ Slashing** DO NOT MOW OR SLASH behind the furniture. Slash between the pavement and furniture only. Do not mow or slash when the ground is wet.
- Drain cleaning** Clean drains as required but minimise the disturbed area. Remove spoil from the site and dispose of in a designated area (not on native vegetation).
- Scraping /Grading** DO NOT scrape or grade beyond the table drain in this area.
- Removal of material** DO NOT remove any material from this area, apart from drain spoil, unless it is essential. This material is likely to contain threatened plants, bulbs or seeds.
- Stockpile & Parking** DO NOT stockpile materials or park within this area.
- Pruning** DO NOT prune any plants here unless it is essential for safety or sightlines.
- Clearing, Digging & Construction** ABSOLUTELY NO construction, clearing or digging is to occur within this area.
- Weeding** DO NOT spray herbicide behind the furniture in this area. No other weed control actions to be done in this area.
- Machinery and Equipment** Avoid bringing machinery into road reserves in Threatened Species Habitat areas. If machinery has to be brought in it must be cleaned of any soil contamination before entering to avoid weed transport.
- Where is it** Site 39 is on the Tasman Highway at the Lake Leake Road junction.
- Description of Values** Rare native shrubs occur in this area. There may be specific active management at this site but it also requires some modification of routine maintenance activities to protect and encourage rare native plants.
- Management** Work in Threatened Species Habitat Areas is permitted by a Public Authority Management Agreement. Placement of Enviromark field markers assists in identification of these areas. Please report any damaged or apparently missing Enviromark field markers to the DIER Environmental Planner ph 6233 8753.

Threatened Species

39

Distance Restricted
SLASHING



HIGH PRIORITY CONSERVATION SITES

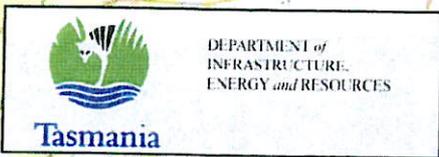
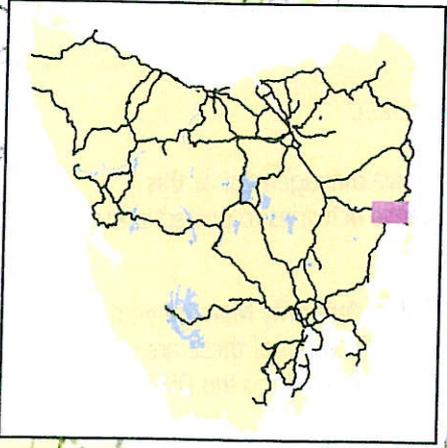
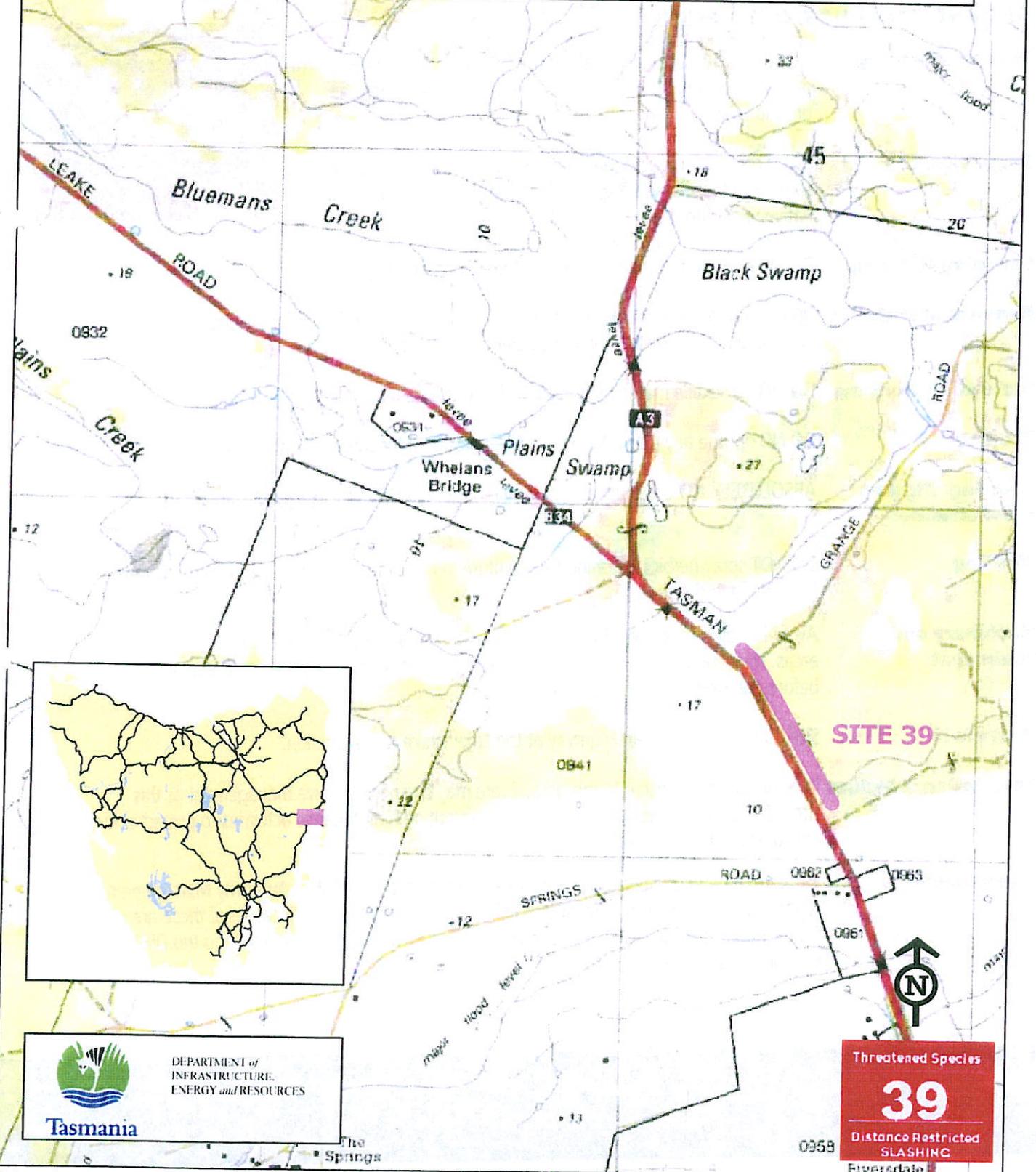
SITE NUMBER 39

Where it is:

Site 39 is on the Tasman Highway south of the Lake Leake Main Road junction.

Description:

Rare native shrubs occur in this area.



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THREATENED SPECIES HABITAT

TIME RESTRICTED SLASHING

- Mowing/ Slashing** DO NOT MOW OR SLASH during November, December or January. Mow or slash this area between February and October only. Do not mow or slash when the ground is wet.
- Drain cleaning** Clean drains as required but minimise the disturbed area. Remove spoil from the site and dispose of in a designated area (not on native vegetation).
- Scraping /Grading** DO NOT scrape or grade beyond the table drain in this area.
- Removal of material** DO NOT remove any material from this area, apart from drain spoil, unless it is essential. This material is likely to contain threatened plants, bulbs or seeds.
- Stockpile & Parking** DO NOT stockpile materials or park within this area.
- Pruning** DO NOT prune any plants here unless it is essential for safety or sightlines.
- Clearing, Digging & Construction** ABSOLUTELY NO construction, clearing or digging is to occur within this area.
- Weeding** DO NOT spray herbicide behind the furniture in this area. No other weed control actions to be done in this area.
- Machinery and Equipment** Avoid bringing machinery into road reserves in Threatened Species Habitat areas. If machinery has to be brought in it must be cleaned of any soil contamination before entering to avoid weed transport.
- Where is it** Site 40 is near the Tasman Highway/Lake Leake Rd junction.
- Description of Values** Rare plants occur in this area. There may be specific active management at this site but it also requires some modification of routine maintenance activities to protect and encourage rare native plants.
- Management** Work in Threatened Species Habitat Areas is permitted by a Public Authority Management Agreement. Placement of Enviromark field markers assists in identification of these areas. Please report any damaged or apparently missing Enviromark field markers to the DIER Environmental Planner ph 6233 8753.

Threatened Species

40

Time Restricted
SLASHING



HIGH PRIORITY CONSERVATION SITES

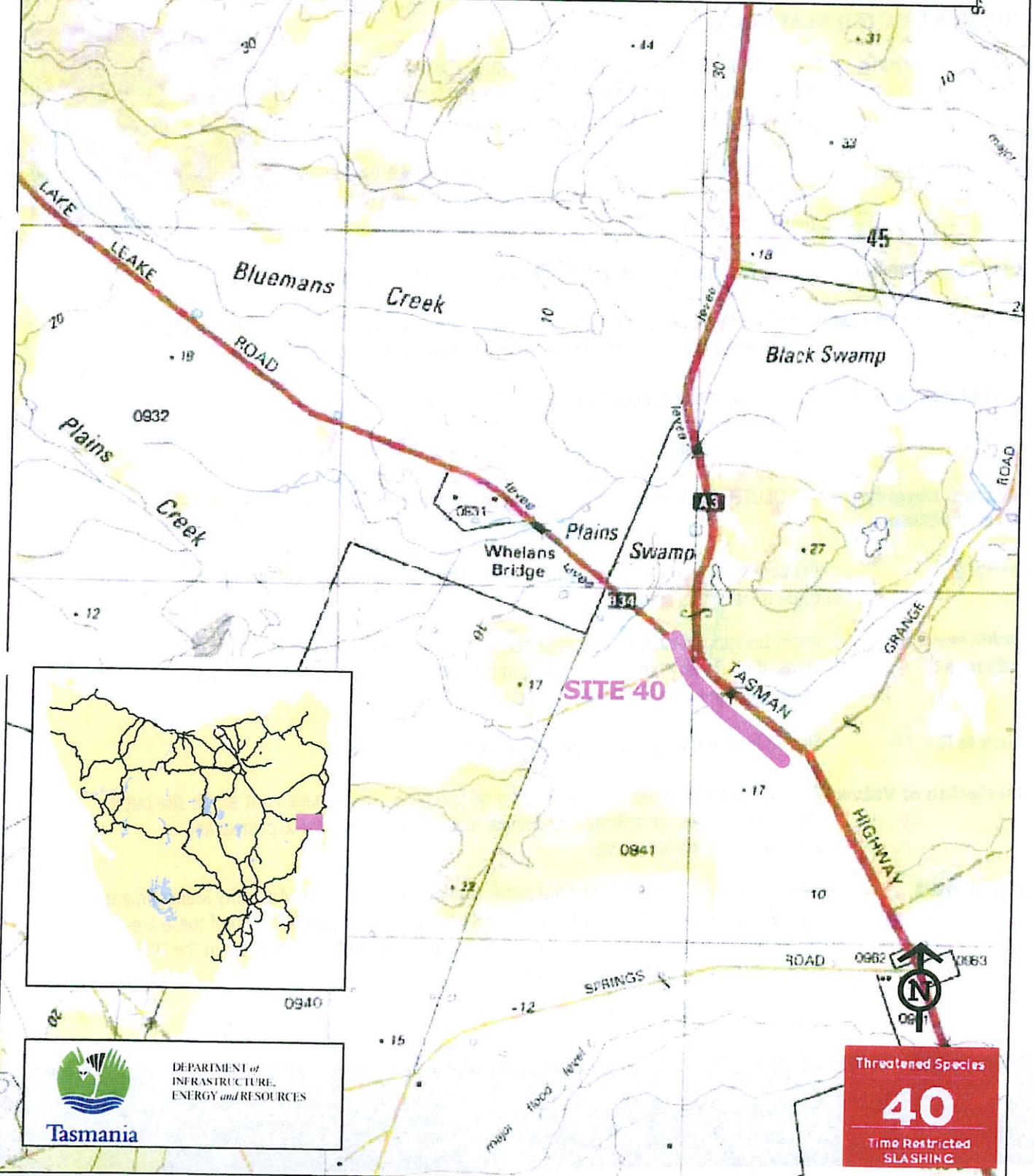
SITE NUMBER 40

Where it is:

Site 40 is near the Tasman Highway and Lake Leake Main Road junction.

Description:

Rare plants occur in this area.



THREATENED SPECIES HABITAT

DISTANCE RESTRICTED SLASHING

- Mowing/ Slashing** DO NOT MOW OR SLASH behind the furniture. Slash between the pavement and furniture only. Do not mow or slash when the ground is wet.
- Drain cleaning** Clean drains as required but minimise the disturbed area. Remove spoil from the site and dispose of in a designated area (not on native vegetation).
- Scraping /Grading** DO NOT scrape or grade beyond the table drain in this area.
- Removal of material** DO NOT remove any material from this area, apart from drain spoil, unless it is essential. This material is likely to contain threatened plants, bulbs or seeds.
- Stockpile & Parking** DO NOT stockpile materials or park within this area.
- Pruning** DO NOT prune any plants here unless it is essential for safety or sightlines.
- Clearing, Digging & Construction** ABSOLUTELY NO construction, clearing or digging is to occur within this area.
- Weeding** DO NOT spray herbicide behind the furniture in this area. No other weed control actions to be done in this area.
- Machinery and Equipment** Avoid bringing machinery into road reserves in Threatened Species Habitat areas. If machinery has to be brought in it must be cleaned of any soil contamination before entering to avoid weed transport.
- Where is it** Site 41 is on the Tasman Highway at the Lake Leake Road junction.
- Description of Values** Rare native shrubs occur in this area. There may be specific active management at this site but it also requires some modification of routine maintenance activities to protect and encourage rare native plants.
- Management** Work in Threatened Species Habitat Areas is permitted by a Public Authority Management Agreement. Placement of Enviromark field markers assists in identification of these areas. Please report any damaged or apparently missing Enviromark field markers to the DIER Environmental Planner ph 6233 8753.

Threatened Species

41

Distance Restricted
SLASHING



HIGH PRIORITY CONSERVATION SITES

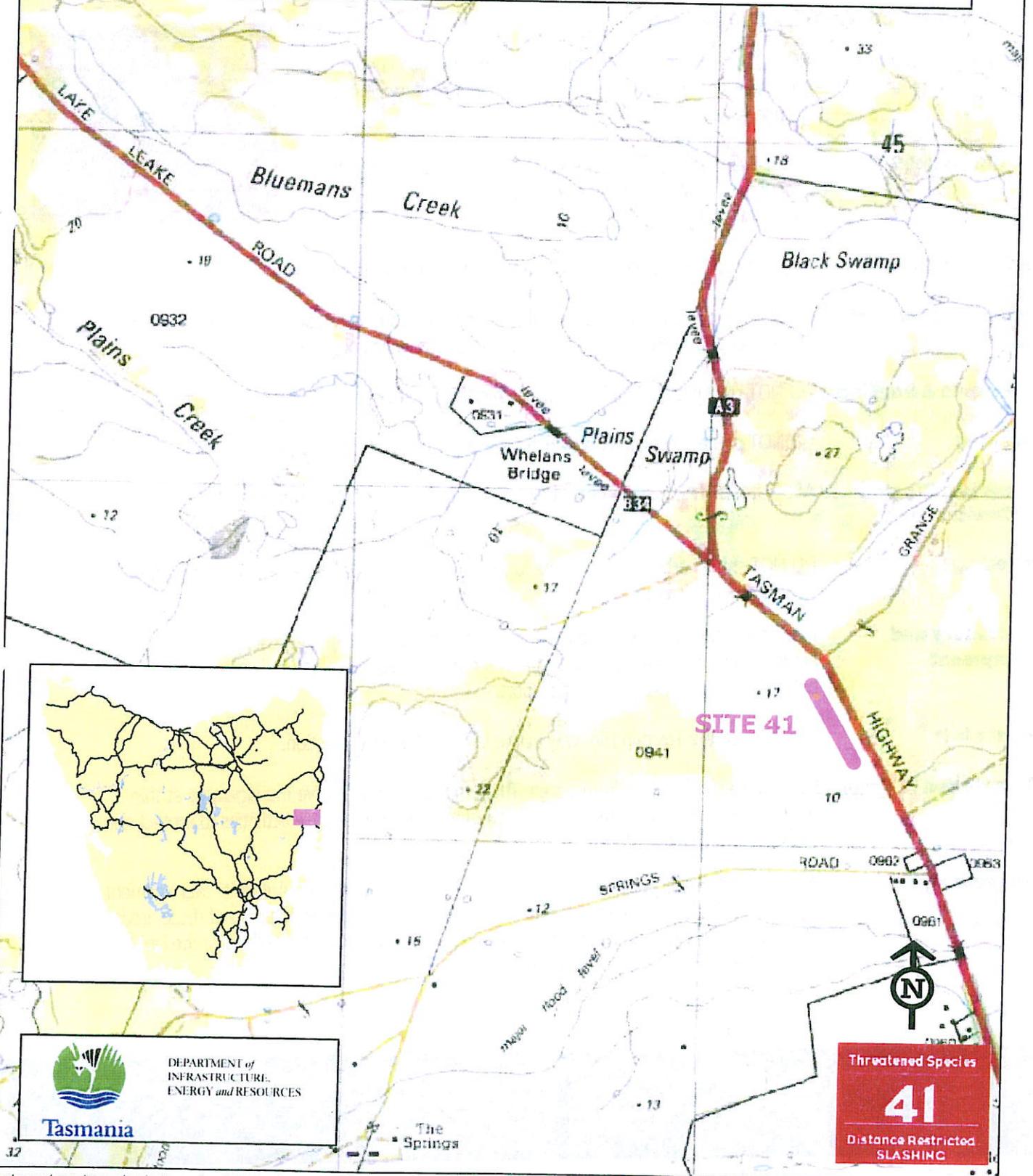
SITE NUMBER 41

Where it is:

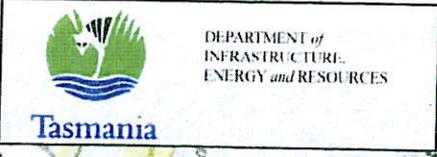
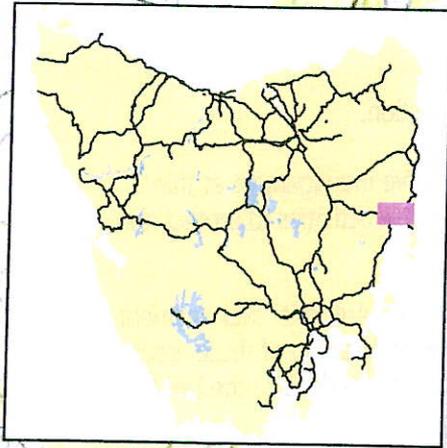
Site 41 is on the Tasman Highway south of the Lake Leake Main Road junction.

Description:

Rare native shrubs occur in this area.



MAJORS



Threatened Species

41

Distance Restricted
SLASHING

Background mapping used under license from DPIWE and is copyright

THREATENED SPECIES HABITAT

DISTANCE RESTRICTED SLASHING

- Mowing/ Slashing** DO NOT MOW OR SLASH behind the furniture. Slash between the pavement and furniture only. Do not mow or slash when the ground is wet.
- Drain cleaning** Clean drains as required but minimise the disturbed area. Remove spoil from the site and dispose of in a designated area (not on native vegetation).
- Scraping /Grading** DO NOT scrape or grade beyond the table drain in this area.
- Removal of material** DO NOT remove any material from this area, apart from drain spoil, unless it is essential. This material is likely to contain threatened plants, bulbs or seeds.
- Stockpile & Parking** DO NOT stockpile materials or park within this area.
- Pruning** DO NOT prune any plants here unless it is essential for safety or sightlines.
- Clearing, Digging & Construction** ABSOLUTELY NO construction, clearing or digging is to occur within this area.
- Weeding** DO NOT spray herbicide behind the furniture in this area. No other weed control actions to be done in this area.
- Machinery and Equipment** Avoid bringing machinery into road reserves in Threatened Species Habitat areas. If machinery has to be brought in it must be cleaned of any soil contamination before entering to avoid weed transport.
- Where is it** Site 42 is on the Tasman Highway at the Lake Leake Road junction.
- Description of Values** Rare native shrubs occur in this area. There may be specific active management at this site but it also requires some modification of routine maintenance activities to protect and encourage rare native plants.
- Management** Work in Threatened Species Habitat Areas is permitted by a Public Authority Management Agreement. Placement of Enviromark field markers assists in identification of these areas. Please report any damaged or apparently missing Enviromark field markers to the DIER Environmental Planner ph 6233 8753.

Threatened Species

42

Distance Restricted
SLASHING

HIGH PRIORITY CONSERVATION SITES

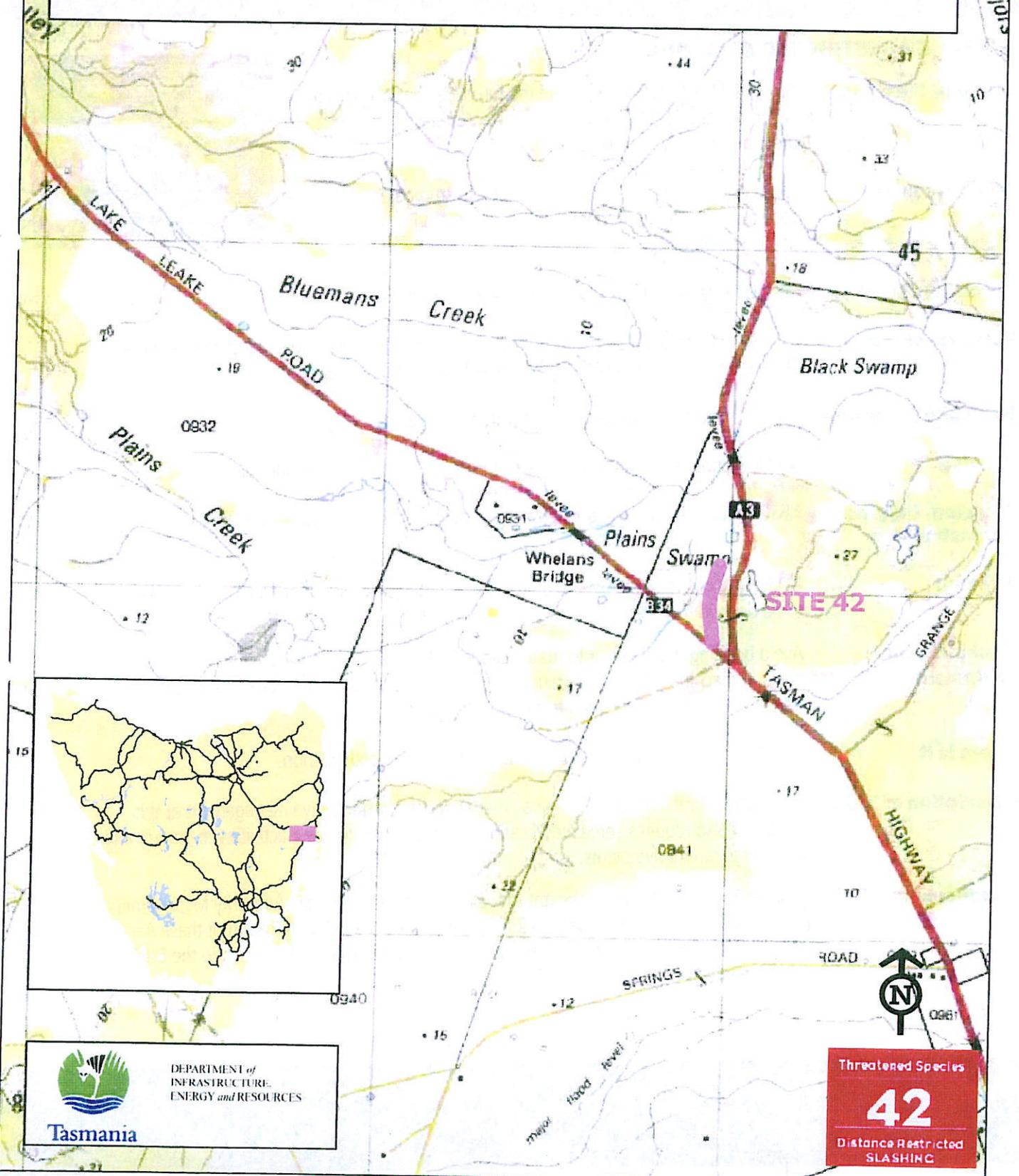
SITE NUMBER 42

Where it is:

Site 42 is on the Tasman Highway near the Lake Leake Main Road junction.

Description:

Rare native shrubs occur in this area.



Background mapping used under license from DPIWE and is copyright

THREATENED SPECIES HABITAT

Threatened Species

43

NO SLASHING

NO SLASHING

- Mowing/ Slashing** DO NOT MOW OR SLASH this area.
- Drain cleaning** Clean drains as required but minimise the disturbed area. Remove spoil from the site and dispose of in a designated area (not on native vegetation).
- Scraping /Grading** DO NOT scrape or grade beyond the table drain in this area.
- Removal of material** DO NOT remove any material from this area, apart from drain spoil, unless it is essential. This material is likely to contain threatened plants, bulbs or seeds.
- Stockpile & Parking** DO NOT stockpile materials or park within this area.
- Pruning** DO NOT prune any plants here unless it is essential for safety or sightlines.
- Clearing, Digging & Construction** ABSOLUTELY NO construction, clearing or digging is to occur within this area.
- Weeding** DO NOT spray herbicide behind the furniture in this area. No other weed control actions to be done in this area.
- Machinery and Equipment** Avoid bringing machinery into road reserves in Threatened Species Habitat areas. If machinery has to be brought in it must be cleaned of any soil contamination before entering to avoid weed transport.
- Where is It** Site 43 is on the Tasman Highway south of the Lake Leake road junction.
- Description of Values** A range of rare shrubs and herbs grow in this area. There may be specific active management at this site but it also requires some modification of routine maintenance activities to protect and encourage rare native plants.
- Management** Work in Threatened Species Habitat Areas is permitted by a Public Authority Management Agreement. Placement of Enviromark field markers assists in identification of these areas. Please report any damaged or apparently missing Enviromark field markers to the DIER Environmental Planner ph 6233 8753.





**Onshore Seismic Survey Traffic Management Plan
Great South Land Minerals Ltd**



Appendix C:
RPT Traffic Control at Work Sites Code of Practice

**DEPARTMENT OF INFRASTRUCTURE,
ENERGY AND RESOURCES**

**TRAFFIC CONTROL
AT
WORK SITES**

CODE OF PRACTICE

JUNE 2004

TRAFFIC CONTROL AT WORK SITES

CODE OF PRACTICE

Contents

	Page
Contents	
1. Introduction	
2. Authority to Erect Signage at Work Sites.....	
3. General Safety Considerations.....	
4. Responsibility for Traffic Control	
5. Traffic Control Devices for use at Work Sites.....	
6. Specific Requirements for Traffic Control Devices	
7. Variations to Practice	
8. Training Requirements.....	
9. Work Site Audits	
10. Contact Details	

1. INTRODUCTION

This Code of Practice describes the minimum level of traffic control to be provided when establishing and maintaining work sites on roads in Tasmania. By following the requirements of the Code safe road environments can be provided for all workers and all road users whether they are motorists, cyclists or pedestrians including people with disabilities. This Code must be used as the primary reference by road owners, contractors, utility providers and individual persons who work on roads and manage a work site.

To comply with this Code, workers who are responsible for work sites require training to set levels of accreditation. Training courses are available to ensure the required signage standard is achieved that complies with this Code, relevant Tasmanian legislation and Australian Standard 1742.3 – “Traffic Control Devices for Works on Roads”

In recent times the AS 1742.3 has been revised. It is accompanied by a collection of Field Guides to illustrate the layout of signs and devices at typical work sites in order to provide a simplified and uniform interpretation of signing procedures for use at work sites.

The Department of Infrastructure, Energy and Resources (DIER), in conjunction with the Tasmanian Building and Construction Industry Training Board (TBCITB), has an accredited training course ‘Safety at Roadworks’. It is mandatory for all workers responsible for traffic control at work sites to be trained before working on the roads. The names of the current training providers can be obtained from the TBCITB.

Under Section 8(1) of the *Roads and Jetties Act 1935*, all State highways and subsidiary roads are under the control and direction of the Minister for Infrastructure, Energy and Resources. The Minister has the responsibility for the construction and maintenance of a highway or main road as declared. To ensure the meeting of obligations under the Act and to provide for the safety of persons lawfully using the highways and main roads it is a requirement that all persons, organisations and utility providers obtain approval prior to commencing work within the road reserve of any highway or main road.

Under Section 59 of the *Traffic Act 1925*, the Transport Commission is responsible for the approval of all traffic signs and traffic control signals used on the Tasmanian road network (State and Council roads). Where the work will be on a State highway or main road, that approval will be given on the condition that work site traffic control is carried out in accordance with this Code.

The Transport Commission’s responsibility for approval of traffic control devices also extends to traffic control on all other roads and it is able to authorise Local Councils and prescribed authorities to erect, establish, display, alter or take down particular traffic signs or traffic control signals on Council roads and other roads open to and used by the public. Consequently, all road owners and prescribed authorities must carry out traffic control at work sites in accordance with this Code. Any contractor or other person carrying out works on a road must obtain approval for this from the road owner.

This Code has been produced as a stand alone document for use in the field. It is also covered in a chapter of the Tasmanian Code of Practice for the Installation of Traffic Control Devices. The Tasmanian Code of Practice describes the required use of all types of traffic control devices and required traffic management practices.

2. AUTHORITY TO ERECT SIGNAGE AT WORK SITES

Legislative Provisions

Section 59 of the *Traffic Act 1925* gives the Transport Commission the authority to issue directions to any highway authority or prescribed authority to erect, establish or display any traffic sign or traffic control signal.

Schedule 6 – Part 4 (1) of the *Traffic (Road Rules) Regulations 1999* lists the Prescribed Authorities for the purpose of Section 59 of the *Traffic Act 1925*.

Under section 21(3) of the *Local Government (Highways) Act 1982* the Councils have a responsibility subject to the *Traffic Act 1925*, for the care, control, and management of their roads.

The *Traffic (Road Rules) Regulations 1999* set out the laws that all road users, including workers, must comply with. Road Rule 310 sets out provisions where workers on a road may not need to comply with the road rules in certain circumstances.

For the purpose of the Road Rules: “**roadworks**” means:

- (a) Construction or maintenance of a road; or
- (b) Road cleaning; or
- (c) Installation or maintenance work authorised under another law of this jurisdiction on, above, below or alongside a road; or
- (d) Installation or maintenance of a traffic control device, traffic-related item or traffic monitoring device; or
- (e) A traffic survey authorised under another law of this jurisdiction; or
- (f) A road survey test.

For the purpose of this Code, works that require traffic control shall not be limited to this definition and include any works on a road.

A duty of care under common law, as well as statute law applies to anyone who is carrying out works on a road which is open to traffic, to take all reasonable measures to prevent accident or injury to persons carrying out the operations and also to members of the public lawfully using the road. Part of this duty of care involves the implementation of appropriate traffic control to alert road users of possible danger for as long as the works are being carried out.

Authorisation to Road Authorities or Prescribed Authorities

In accordance with Section 59 of the *Traffic Act 1925*, the Department’s Chief Traffic Engineer, through delegation from the Transport Commission, provides DIER and all Councils within Tasmania the authority to erect, establish and display traffic signs and traffic-control signals for roadworks in accordance with this Code of Practice. Prescribed Authorities as set out in Schedule 6 Part 4 (1) of the *Traffic (Road Rules) Regulations 1999* can also be provided with similar authority.

Traffic Control at Work Sites Code of Practice

Authorisation to Others

All contractors and other organisations that need to carry out works on a road must have approval to do so, either from DIER, the various local Councils as the road owner, or the Prescribed Authority.

A MANDATORY CONDITION OF ANY APPROVAL ISSUED BY DIER, LOCAL COUNCILS OR PRESCRIBED AUTHORITIES FOR WORK TO BE CARRIED OUT BY ITS STAFF OR OTHERS WILL BE THAT TRAFFIC CONTROL MUST BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THIS CODE.

3. GENERAL SAFETY CONSIDERATIONS

Working on a road is an activity that creates potential hazard to both road users and workers. Road users are at risk when adequate precautions are not taken to enable them to safely negotiate work sites. Workers are often exposed to potential hazards due to the close proximity of traffic. Consequently, working on a road is an activity that can give rise to danger and prosecution if reasonable care is not taken to protect the road users and the workers.

The aim of this Code is to:

- establish standardised procedures for traffic control at work sites on Tasmanian roads,
- provide for the safety of road users and workers, and
- minimise the disruption and inconvenience to road users as a result of the works.

When undertaking works on a road, particular attention must be given to addressing the needs and expectations of all road users. Road users are not limited to motorists and can include the following:

- pedestrians, including school children and people with disabilities;
- cyclists;
- emergency vehicles.

The requirements of road users other than motorists can often be overlooked when undertaking works with much of the attention being focused on the management of vehicles through and around the work site.

All road users expect a minimum level of inconvenience as they negotiate works sites. For this reason traffic control at work sites is of paramount importance and the signage at all work sites must be as simple as possible, interpreted uniformly throughout Tasmania and in accordance with this Code.

The selection and use of the correct signs and devices associated with traffic control at work sites is also important to ensure the safety of road users and the workers. It is essential the signs and devices are in good condition and are not displayed inappropriately when there is no activity at a work site.

4. RESPONSIBILITY FOR TRAFFIC CONTROL

This section of the Code refers to the various levels of planning described in AS 1742.3 for all work sites. It is the responsibility of the person, organisation or utility provider undertaking works on a road to ensure traffic management plans adequately provide for the safety of road users and workers. **However, the ultimate responsibility for this lies with the road owner (or its delegated officer) or the Prescribed Authority.**

4.1 Responsibility of the Road Owner or Prescribed Authority (Agencies)

The agency that is responsible for undertaking or authorising construction or maintenance on roads (or bridges) shall ensure that reasonable care is taken to:

- minimise the risk or injury to all road users or the damage to their property as a result of such operations;
- warn the public of the prevailing conditions;
- guard and delineate and where necessary illuminate, works which may pose a hazard; and
- avoid unnecessary long delays or detours which could inconvenience the public.

There is also a statutory obligation on the agencies and its contractors to provide a working environment and a system of work that is safe for its employees.

4.2 Responsibilities of Supervisory Personnel

Supervisory personnel employed by the agency or agency contractors carrying out construction, maintenance or other works which require the use of traffic control devices need to observe the following principles:

- be mindful of their agency's and their own personal responsibilities to provide safe and convenient travelling conditions for all road users and safe working conditions for personnel and plant under their control;
- they and personnel under their control must at all times be courteous to and considerate of the needs of the travelling public;
- ensure that the personnel assigned to place, maintain and remove signs and devices are aware of and meet their responsibilities;
- ensure that the personnel under their control have a safe and appropriately managed work environment;
- maintain an up-to-date practical knowledge of the requirements of work site traffic management; and
- be prepared to seek expert assistance in planning the management of major roadworks that are likely to be outside of their expertise.

4.3 Responsibilities of Workers

All employees have an obligation under the *Workplace Health and Safety Act 1995* to ensure that the workplace is safe. In relation to the management of work sites, workers:

- need to be mindful of their agency's and their own personal responsibilities to provide safe and convenient travelling conditions for all road users and safe working conditions for personnel and plant under their control;
- must at all times be courteous to and considerate of the needs of the travelling public;
- when assigned to place, maintain and remove signs and devices, need to be aware of and meet their responsibilities;
- must maintain an up-to-date practical knowledge of the requirements of work site traffic control; and
- should be prepared to seek expert assistance for the application of the management of any works that are likely to be outside of their expertise.

Traffic Control at Work Sites Code of Practice

4.4 Principles of Work Site Management

No matter how brief the occupation of a work site may be, proper consideration must be given to the management of the site to:

- provide adequate warning of changes in the road surface or in driving conditions and of personnel and/or plant engaged in work on the road; and
- adequately instruct and guide road users safely through, around or past the work site.

Three basic principles which must be observed when using signs and devices for the management of works are:

- **erect and display** before work commences
- **regularly check** for effectiveness and maintenance in a satisfactory condition; and
- **remove from the work site** as soon as practicable. However, appropriate signs must remain in place until all work (including any bituminous surfacing, removal of loose stones and line marking) has been completed and any obliterated pavement markings have been reinstated.

Similar principles shall be applied to the signing of a road hazard caused by circumstances outside of the control of the road authority.

Inappropriate use of signs and devices can lead to road users disregarding signs that are displayed legitimately at other sites and on other occasions. Inappropriate use of speed limit signs may result in the unnecessary prosecution of drivers for failing to comply with a regulatory requirement.

5. TRAFFIC CONTROL DEVICES FOR USE AT WORK SITES

This section of the Code sets out the application of AS 1742.3 throughout Tasmania for the effective implementation of and compliance with Acts and Regulations relating to works on roads, having regard to both proper traffic control, the safety of road users and those engaged in works.

It also provides a means of ensuring all workers, with the appropriate approval to erect, establish, display, alter or take down traffic control devices (traffic signs or traffic-control signals) will do so in a uniform manner throughout the State and to a standard that is acceptable to DIER.

In general the provisions of AS 1742.3 and its associated Field Guides shall be applied to all work sites throughout Tasmania, subject to the specific requirements or variations set out in this Code.

Published field guides for traffic control at works on roads include:

HB 81.1	Part 1:	Short-term urban works, daytime only
HB 81.2	Part 2:	Short-term rural works, daytime only
HB 81.3	Part 3:	Mobile works
HB 81.4	Part 4:	Short-term night works
HB 81.5	Part 5:	Works on unsealed roads
HB 81.6	Part 6:	Bituminous surfacing works
HB 81.7	Part 7:	Short-term works on freeways
HB 81.8	Part 8:	Long-term partial closures and detours on urban roads
HB 81.9	Part 9:	Long-term partial closures and detours on rural roads

Traffic Control at Work Sites Code of Practice

The principles established in AS 1742.3 must be adapted to suit each particular work site. AS 1742.3 sets out minimum requirements to provide for the safety of road users and workers. In some situations it may be necessary to carry out additional action not covered by AS 1742.3 to ensure the requirements of relevant state legislation such as the *Disability Service Act 1993* and the *Workplace Health and Safety Act 1995* are adequately addressed.

This Code must be complied with unless, in a particular case, circumstances arise calling for a departure from the Code in the interests of better traffic management or safety. In such cases approval from DIER - Traffic Standards Branch shall be given to any variation to this Code before the work is commenced.

6. SPECIFIC REQUIREMENTS FOR TRAFFIC CONTROL DEVICES

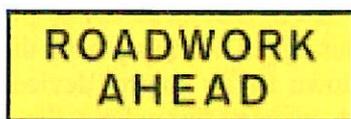
It is a current requirement that all signs used at work sites are to have Class 1 retroreflective material. A phase-in period for this requirement is as follows:

- from 31 December 2003, all road signs at work sites displayed at night shall have Class 1 material
- from 31 December 2004, all road signs at all work sites shall have Class 1 material.

6.1 Traffic Signs

Specific requirements for the use of certain regulatory and associated road works signing are set out below:

- (a) **“Roadwork Ahead” (T1-1) sign.** This sign must be used to give advance warning of all long term work sites (where the works occur day and night and may be left unattended. If the works are on a bridge a ‘Bridgework Ahead’ sign shall be used. The sign may be used at short term works where additional warning is considered necessary.



- (b) **“Workers Ahead” (T1-5) sign.** This sign must be used to warn of the presence of personnel. This sign must only be displayed when personnel are actually **working** or are visible to traffic and **must be removed when workers have left** the work area or there is no visible work activity.



Traffic Control at Work Sites Code of Practice

- (c) **“Prepare to Stop” (T1-18) sign.** This sign must only be used where traffic may be required to stop in compliance with a portable or temporary fixed traffic signal, or a direction by a traffic controller. When portable signals are not being used, or traffic controllers are not controlling traffic, the signs must be removed. This sign is **not to be used as part of a multi message sign or with any other sign** except a signals ahead (T1-30) sign.



- (d) **“Traffic Hazard Ahead” (T1-10) sign.** This sign can be used for **EMERGENCY SITUATIONS ONLY** when an unexpected event causes a hazard. It is to be replaced with more appropriate signs, generally within 24 hours.



- (e) **“Speed Limit” (R4-1) sign.** Reduced speed limits can be applied to a work site only **while the conditions requiring changed driving speeds exist**. They must be removed immediately the need no longer exists. The speed limits must reflect the level of activity, reduced road space and proximity of potential hazards. They must be consistent with driver expectations and must not be unrealistic to the extent that a significant number of motorists do not comply. In situations where speed limits have been created during short-term works, the speed limit signs are to be covered or removed after working hours. The use of 40 km/h limits should be avoided, but where this is not possible, they must be kept to the minimum length sufficient to allow a safe working area.



Traffic Control at Work Sites Code of Practice

GUIDE TO SELECTION OF APPROPRIATE WORK SITE SPEED LIMIT

Speed Limit	Criteria
40 km/h	Used where the normal speed limit is 60 or 70 km/h and where: <ul style="list-style-type: none"> • traffic is required to mingle with operating plant, or • workers are within 1.2 metres of the trafficable area and no physical barrier exists and MINIMUM LENGTH OF ZONE MUST BE 200 METRES.
60 km/h	Used where the normal speed limit is 80 km/h, and where: <ul style="list-style-type: none"> • workers on foot or plant are operating within 3 metres but not less than 1.2metres of the trafficable area, and no physical barrier exists, or • a traffic controller is being used, or • a traffic hazard exists, e.g. unsealed section of a sealed road, or fresh bituminous seal has just been laid, or MINIMUM LENGTH OF ZONE MUST BE 300 METRES.
60 km/h buffer	Used on the approach to a 40km/h speed zone where approach speeds would otherwise be 80km/h or greater, and: <ul style="list-style-type: none"> • the buffer zone is normally to be 200 metres in length, and the buffer zone only applies in the one direction with the permanent, or a higher speed limit applying in the reverse direction.
80 km/h	Used where the need for a lower speed limit does not exist, but: <ul style="list-style-type: none"> • there is some significant disturbance to alignment or pavement surface, which makes unrestricted high rural speeds undesirable on safety grounds, or • in advance of temporary traffic signals, and MINIMUM LENGTH OF ZONE MUST BE 400 METRES.
80 km/h buffer	Used on the approach to a 60 km/h speed zone where approach speeds would otherwise be 100 km/h or greater, and <ul style="list-style-type: none"> • the buffer zone is normally to be 300 metres in length but no longer than 400 metres, and the buffer zone only applies in the one direction with the permanent speed limit applying in the reverse direction.

APPLICATION REQUIREMENTS:

- **All speed limit signs at work sites** shall be 'B' size (600mm x 800mm), but where special circumstances warrant on rural highways, 'C' size (900mm x 1200mm) signs may need to be used as the first speed limit sign.
- **Speed restriction signs (R4-1)** shall not be attached to a "Roadwork Ahead" sign (T1-1). Where the speed limit sign is necessary it is always to be placed at least 50 metres beyond the "Roadworks Ahead" sign. An exception to this is in rural situations where the first 80km/h speed limit sign together with a "Road Work" sign is to be placed some 250metres in advance of the "Roadwork Ahead" sign..
- **Overnight use** of 40 km/h speed limits in permanent 60 or 70 km/h speed zones and 60 km/h speed limits within permanent 100 and 110 km/h speed zones shall only be permitted in exceptional cases with the specific approval of the road owner. Overnight use of 40 km/h speed zones, once work has ceased for the day is not permitted in permanent speed zones of 80 km/h or greater.

Traffic Control at Work Sites Code of Practice

- **Repeater speed limit signs** are to be used over longer work sites or where side road traffic entering the works site needs to be advised of the speed limit. The spacing of repeater signs is to be no greater than 500 metres. However, if speed limit signs are required for very short term and low impact maintenance works the spacing of signs may be increased to one kilometre apart on roads where the works speed limit is 80 km/h.

Speed limits set at work sites only apply to the road upon which the signs indicating the limit are erected. The limits do not apply to any side or intersecting roads unless a speed-limit sign is also erected on those roads. The permanent speed limits of any side and intersecting roads may, however, be coincidentally the same as the limit set at the work site.

- **Roads marked with a centre line** must have speed limit signs and “workers ahead” signs (when these signs are required) placed on both sides of the road. However, signing on these roads may be limited only to the left-hand side where the unobstructed width of the right-hand side of the road is less than 2.5 metres. The decision to reduce the number of signs must be made after a risk assessment by a person accredited in General Work Site Traffic Management, having due regard for the safety of workers and road users.
 - **Speed Limit signs and other traffic signs must not be installed** as a matter of course or days before actual commencement of works. Signs covering the work site should normally be installed immediately before the work commences or on longer term works a day or two before the work commences. They also must be changed as the work site changes over the day or from day to day.
 - **The end of a work site speed limit** should occur as soon as practical after the work area, allowing for any merge/diverge tapers. Signs indicating the return to the permanent speed limit should normally be placed no more than 50 metres (on low speed roads) and 100 metres (on high speed roads) beyond the work site or end of taper.
- (f) **"Road Work" (R4-3) sign.** This sign must be used at all long term work sites where a speed limit is required during periods when works are unattended. The sign is used where it is necessary to establish a speed limit zone (used only on first reducing speed limit sign) but there is no need to display a ‘Workers Ahead’ (T1-5) sign. The sign clarifies that the speed limit zone has been established due to the presence of roadworks.



Traffic Control at Work Sites Code of Practice

6.2 Detours, Side-Tracks and Crossovers

AS 1742.3 sets out the requirements for Detours, Side-Tracks and Crossovers. The following specific requirements shall be observed in relation to the surface condition of detours, side-tracks and crossovers:

- Unsealed pavements shall not be used in built up areas
- Unsealed pavements should not be used in rural areas on roads that carry more than 500 vehicles per day for periods longer than 5 days, or more than 200 vehicles per day for periods longer than 4 weeks.

6.3 Record Keeping

Appendix A of AS 1742.3 sets out requirements for daily recording of the location and type of signs erected. This is a mandatory requirement of this Code.

7. VARIATIONS TO PRACTICE

This Code sets out the minimum requirements for the control of traffic at work sites. Additional precautions may at times be required to achieve the necessary full traffic control at a work site.

Due care must be paid to the *Traffic (Road Rules) Regulations 1999*, the general “duty of care” under common law, the provision of a safe place to work and system of work under the *Workplace, Health and Safety Act 1995*, accessibility for persons with disabilities under the *Workers Compensation Act 1998* and other relevant legislation.

Any variance from the Code of Practice for the sole purpose of enhancing workplace health and safety or to mitigate a workplace hazard or risk must be documented and be in accordance with the requirements of Regulations 17 to 19 inclusive, of the *Workplace Health and Safety Regulations 1988*.

Notwithstanding the need for approval of any variations from the requirements of this Code (see Section 5), specific variations to be followed are:

7.1 Multi Message Signs

Up to three linked messages are permitted on one 1200 x 900mm (minimum) sign provided one of the messages is symbolic and 600 x 600mm in size. The messages must not be conflicting with one another. Where a speed plate is used on such a sign, it must always be closest to traffic and be a full B size annulus and numerals.

7.2 Electronic Message Boards (Variable Message Signs)

There is a requirement to limit the number of components to a message to allow comprehension by passing traffic. To meet this requirement, the message must be limited to the following:

Screen displays -

- The whole message should be contained to one screen display, but it must be no more than two in any situation, and
- On each screen -
 - there must be no more than three lines of words displayed, and
 - the display must be static to allow for motorists' easy comprehension.

Traffic Control at Work Sites Code of Practice

7.3 Bituminous Surfacing Works

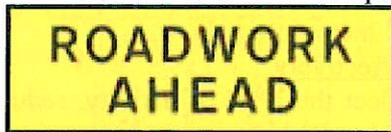
Field guide SAA HB81.6 – 1998 ‘Bituminous surfacing works’ should be adapted to meet the requirements of the work site, having consideration for traffic flow, road geometry and terrain affecting visibility and other prevailing conditions. The following describes arrangements that are to be followed:

(a) Advance warning

Immediately prior to the commencement of the bituminous surfacing works, appropriate warning signs are to be applied to provide adequate warning to motorists of the works.

Roadwork Ahead
(T1-1) sign

Used for long-term works, when leaving the work uncompleted overnight. This sign remains in place until all works are completed, including pavement markings.



Workers Ahead
(T1-5) sign
(Symbolic)

Always used where workers or plant are ACTUALLY on site.



(b) Creating a safe work site and delineating a safe path for users

The work site and the path for traffic to take must be delineated clearly. The field guide SAA HB81.6 should be used to assist with adequately instructing and guiding road user safety through, around or past the work site.

(c) Road condition signs and temporary reflective pavement markers

Loose stones
(T3-9) sign
(Symbolic)

This sign is to be used either during preparation work when there may be loose material on the running surface, or when opening the road to traffic after sealing. The signs are to be left in position until all loose material has been removed.



Traffic Control at Work Sites Code of Practice

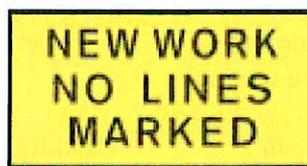
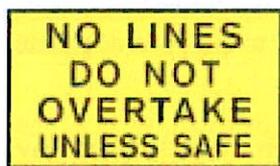
No lines These signs are to be used wherever pavement markings have been removed or will need to be reinstated on a new pavement. The signs are to be left in position until the permanent markings have been reinstated.

(T3-12) Sign

(T3-11) Sign

The "No lines do not overtake unless safe" sign is to be used on two lane roads in situations where the barrier or centreline is missing.

The "New work no lines marked" sign is to be used on multi-lane roads where lane line or lines are missing.



Delineation markers There is a need to temporarily mark centre lines or lane lines, or both, using temporary raised reflective pavement markers at maximum 24 metre intervals.

(d) Using speed limit signs effectively

Work site speed limits must reflect the level of activity, reduced road space and proximity of potential hazards. These need to be consistent with driver expectations and must not be unrealistic to the extent that a significant number of motorists do not comply.

In bituminous surfacing works, speed limit signs must only be introduced and operated whilst the work is being undertaken and where one or more of the following criteria is satisfied:

- the safety of workers may be compromised by the proximity of high speed traffic, and/or
- moving plant shares the road through the work site, and/or
- during sprayed seal works on heavily trafficked roads, and/or
- protection of the seal, until all the loose material has been removed from the running surface [see (e) below], and/or
- the standard of the vertical or horizontal road geometry at the work site is reduced below that of the adjacent sections of the road, and/or
- the safety of vehicles travelling through the work site is otherwise compromised with the permanent speed limit.

Work site speed limit signs must not be used alone but introduced with other signs and devices required by site conditions. They shall be removed or covered immediately work has been completed. They must not remain in place once loose material has been removed even if the permanent pavement markings have not been reinstated.

Guide to the selection of appropriate work site speed limit is set out in Section 6.1 (e) of this Code.

Notwithstanding this, during the period between completion of sealing work and sweeping of loose aggregate, a speed limit of 60 km/h may be applied to the section of newly sealed road. This variation is conditional on the exposure time of traffic to loose aggregate being no longer than that which is set out in Section 7(e)(i) of the Code.

Traffic Control at Work Sites Code of Practice

(e) Minimising the exposure time of works

The aim in any sealing or asphalt work should be to complete the work, remove all loose materials from the road and reinstate all road markings in the minimum possible time.

It is not acceptable practice to impose reduced speed limits, while relying on traffic bedding the aggregate over many days or weeks. Where practicable, a suitable, rolling device should be used to minimise this time.

If the work cannot be completed on the same day then the following should be aimed for:

- (i) remove all loose materials from the running surface, **within one calendar day of sealing**, if the traffic volume is more than 1,000 vehicles per day. Otherwise, remove all loose materials **within five calendar days of sealing**;
- (ii) temporary pavement markers must be installed at the end of each day's work and removed when permanent pavement markings are installed;
- (iii) arrange to have all permanent linemarking and raised pavement markers reinstated:
 - within the **next 3 calendar days**, if the traffic volume is more than 1,000 vehicles per day, or
 - Within the **next week** if the traffic volume is less than 1,000 vehicles per day.

8. TRAINING REQUIREMENTS

To ensure the effective implementation of this Code, nationally accredited training courses are available. One such course has been established by the Tasmanian Building and Construction Industry Training Board.

The course consists of the following modules:

- *Basic Work Site Traffic Management*
- *Traffic Controller*
- *General Work Site Traffic Management*
- *Advanced Work Site Traffic Management*

The following personnel involved in traffic control at work sites must have completed and passed the training modules indicated:

- (a) There must be a site supervisory person accredited in '*Basic Work Site Traffic Management*' on site where the work is being undertaken on the road or road shoulders.
- (b) Where manual traffic control is required, it shall be performed by persons who have been accredited as a '*Traffic Controller*'.
- (c) As a minimum, traffic management plans such as those covered in the SAA handbooks must be certified as appropriate by a person accredited in '*General Work Site Traffic Management*'.
- (d) For works involving more complex traffic arrangements, or staging, or both, i.e. situations requiring more complex traffic control to that covered in the SAA handbooks, traffic management plans shall be prepared by an experienced traffic engineer or person qualified and experienced in '*Advanced Work Site Traffic Management*'.

Re-accreditation is required every three years to keep up with ongoing changes to this Code, AS1742.3 and the SAA field guides.

Traffic Control at Work Sites Code of Practice

9. WORK SITE AUDITS

The road owners and prescribed authorities have responsibility to ensure that work sites are managed in accordance with this Code.

Random safety audits of the traffic control at work sites are, therefore, to be conducted by the road owner or prescribed authority to ensure compliance with this Code in regard to the traffic control devices as well as training accreditation of workers.

Where contractors have been engaged in longer term works, i.e. over one week, it is strongly recommended that a safety audit be conducted within the first two days of the commencement of the works, and again each month if the works extend over several months.

Audits must be conducted by an experienced traffic engineer or person qualified in '*Advanced Work Site Traffic Management*' and also independent of the contractor undertaking the works.

10. CONTACT DETAILS

FOR FURTHER INFORMATION CONTACT:

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Hobart Tasmania 7000
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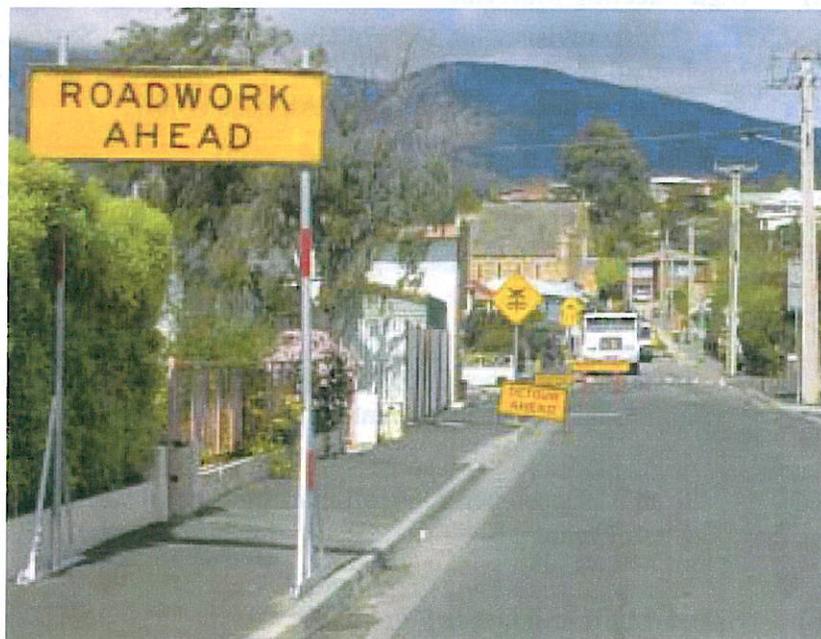
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Technical Advice Sheet

No. 10

TRAFFIC CONTROL AT WORK SITES



1. Introduction

In June 2002 the *Tasmanian Code of Practice for Traffic Control at Work Sites* (the Code) was released.

Since that time there have been large scale improvements to the control of traffic at Tasmanian work sites. It is considered a great deal of learning has occurred on the part of all authorities and contractors involved, and numerous site specific issues have been addressed.

Feedback received from workers in the field has allowed certain variations to the Code, for specific operational issues, to be considered. Feedback has also identified the need for some clarification of the current revision of AS1742.3.

This Technical Advice Sheet describes some new requirements and variations that are to apply to the Code.

2. New Requirements

The following requirements must apply to road signs used at work sites:

(a) Sign Sheeting Material

The latest revision of AS1742.3, published in September 2002, requires all road signs at work sites to meet at least the requirements for Class 1 material as specified in AS/NZS1906.1.

Normal procedure following the introduction of a revised standard requires that it be adopted as effective almost immediately. However, a phase-in period in meeting this particular requirement, has been allowed for as follows:

- from 31 December 2003, all road signs at work sites displayed at night shall have Class 1 material;
- from 31 December 2004, all road signs at all work sites shall have Class 1 material.

(b) Speed-Limit and Other Sign Sizes

All *speed-limit* signs including repeater signs at work sites must be a minimum 'B' size as specified in the Code.

There are no allowances for a size reduction for signs that are displayed individually.

On multi-message sign displays, the *speed-limit* sign size may be reduced, but the size of the annulus and numerals must remain the same as specified for a 'B' size sign. This same requirement (ie: reducing the sign size but not the symbols and legend) on other multi-message signs, must also be applied in accordance with Section 3.3.2 of AS1742.3.

3. Variations to the Code of Practice

Road authorities and contractors should be aware that the new edition of the Field Guides Part 1 and Part 2, complementing AS1742.3, have recently been released by Standards Australia. Road authorities and contractors must be aware that diagrams in each of the Field Guides are a **guide** only and traffic control that is installed at the work site must meet the standard required by the Code of Practice.

Road authorities may allow the following variations to the Code at appropriate locations:

(a) **Roads Marked with a Centre Line**

Section 6 of the Code requires the placement of *speed limit* signs and *workers ahead* signs on both sides of roads marked with a centre line.

Signing on the roads may be limited only to the left-hand side where the unobstructed width of the right-hand side of the road is less than 2.5 metres. The decision to reduce the number of signs must be made after a risk assessment by a person accredited in General Work Site Traffic Management, having due regard for the safety of workers and road users.

(b) **Repeater *Speed Limit* Signs**

Section 6 of the Code requires repeater *speed limit* signs to be placed no more than 500 metres apart. If *speed limit* signs are required for very short term and low impact maintenance works (see AS1742.3 – Section 4.8), the spacing of signs may be increased to one kilometre apart on roads where the works speed limit is 80 km/h. However, where side-road traffic can enter the road on which work is being carried out, additional *speed limit* signs must be placed on both sides of the junction, to inform both left and right turning motorists of the temporary speed limit.

Speed limits set at work sites only apply to the road upon which the signs indicating the limit are erected. The limits do not apply to any side or intersecting roads unless a *speed limit* sign is also erected on those roads. The permanent speed limits of any side and intersecting roads may, however, be coincidentally the same as the limit set at the work site.

(c) Speed Limits at Very Short Term and Low Impact Works

With reference to Section 4.8 of AS1742.3 where the work is being undertaken entirely by a vehicle or machinery, ie: shoulder grading, mowing, etc. and there is no impact upon workers on foot:

- no change to the permanent speed limit is necessary provided the vehicle or machinery can operate clear of moving traffic and use gaps in the traffic to pass any obstructions;
- an 80 km/h speed limit is to be applied where the vehicle or machinery is operating from a traffic lane on a road where the permanent speed limit is 90 km/h or greater;
- a 60 km/h speed limit is to be applied where the vehicle or machinery is operating from a traffic lane on a road where the permanent speed limit is 70 or 80 km/h.

Notwithstanding these provisions, the *workers ahead* sign and other appropriate warning signs, including vehicle mounted warning devices, must be displayed.

(d) Speed Limit on Newly Sealed Roads

Notwithstanding the requirement for setting speed limits described in Section 6(e) of the Code, during the period between completion of sealing work and sweeping of loose aggregate, a speed limit of 60 km/h may be applied to the section of newly sealed road. This variation is conditional on the exposure time of traffic to loose aggregate being no longer than that which is set out in Section 7(e)(i) of the Code.

4. Legal Authorisation

I, Milan Prodanovic, Chief Traffic Engineer in the Department of Infrastructure, Energy and Resources (“the Department”) acting under Section 59(1) of the Traffic Act 1925 pursuant to a delegation from the Transport Commission under Section 10 of the Transport Act 1981, hereby direct the Department and each highway authority to comply with this Technical Advice Sheet in so far as it relates to the installation of signs at work sites on public streets.

Expressions used in this direction have the same meaning as in the Traffic Act.

Milan Prodanovic
CHIEF TRAFFIC ENGINEER

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**Onshore Seismic Survey Traffic Management Plan
Great South Land Minerals Ltd**



**Appendix D:
RPT Road Hazard Management Guide**

Road Hazard Management Guide



DEPARTMENT of
INFRASTRUCTURE,
ENERGY *and* RESOURCES

Contents

1	INTRODUCTION	1
2	KEEPING VEHICLES ON THE ROAD	1
2.1	DELINEATION	1
2.1.1	<i>Linemarking (centre line / edge line)</i>	1
2.1.2	<i>Raised pavement markers</i>	2
2.1.3	<i>Guideposts</i>	3
2.1.4	<i>Warning signs</i>	3
2.1.5	<i>Weather warning systems</i>	4
2.2	ROAD DESIGN ELEMENTS	4
2.2.1	<i>Lane widths</i>	5
2.2.2	<i>Shoulder widths (sealed/unsealed)</i>	5
2.2.3	<i>Horizontal curvature and localised curve widening</i>	6
2.2.4	<i>Vertical alignment</i>	6
2.2.5	<i>Road surface</i>	7
2.2.6	<i>Sight distance</i>	7
2.2.7	<i>Drainage</i>	9
3	DEALING WITH ERRANT VEHICLES	9
3.1	CLEAR ZONES	9
3.2	TYPES OF HAZARDS AND THEIR TREATMENTS	12
3.2.1	<i>Embankments</i>	12
3.2.2	<i>Rigid objects</i>	13
3.2.3	<i>Open drains</i>	15
3.2.4	<i>Bodies of water</i>	18
3.3	SAFETY BARRIERS	18
3.3.1	<i>Decision to install a safety barrier</i>	18
3.3.2	<i>Barrier types</i>	19
3.3.3	<i>Layout of safety barriers</i>	22
3.3.4	<i>Appropriate lengths</i>	22
3.3.5	<i>End treatments</i>	23
3.3.6	<i>Transitions between barrier types</i>	24
3.4	WORKS ZONES	24
	BIBLIOGRAPHY	26

Acknowledgements

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1 Introduction

Road hazard management is an important component of any road design project. Concepts including forgiving roadside design and risk management are important to provide a safe environment for all road users. The intention of this guide is to address road safety elements that focus on “Keeping vehicles on the road” and “Dealing with errant vehicles” on the occasion that vehicles leave the carriageway. This document aims to address many of the issues related to road safety in road design, and direct practitioners to appropriate design standards and practices.

It is expected that most work done with reference to this document will involve maintenance and upgrading of existing roads. While this may limit the road designer’s scope for implementing some of the recommendations listed, a comprehensive upgrade project should involve reference to the guides listed in this Document.

2 Keeping vehicles on the road

This section discusses on-road and roadside features aimed at showing drivers the path that a road takes and helping them keep their vehicles in the running lane.

Roads should be designed with the objective of making it as easy as possible for drivers to keep their vehicles on path. This would be straightforward if the landscape always suited the desired path of the road and there were no financial constraints, but this is rarely the case. In reality a road has to be accommodated within the topography in a cost effective way and this may lead to situations that require departures from the standard. In such cases it becomes necessary to provide additional features designed to help drivers follow the line of the road.

2.1 Delineation

Australian Standard AS1742.2-1994, *Manual of uniform traffic control devices, Part 2 – traffic*

control devices for general use and its amendment, AS1742.2-1994/Amdt 1-1997 sets out requirements of all traffic control devices for use on roads other than freeways. It includes sections on signage for intersection and mid-block locations, pavement markings, and appendices on topics such as calculating advisory speeds for curves.

2.1.1 Linemarking (centre line / edge line)

Centre lines

Centre lines should be marked to separate opposing directions of traffic flow on sealed pavements at least 5.5m wide. On pavements narrower than this the provision of centre lines is not usually provided other than where sight lines for overtaking are deficient. Centre lines may be of the following types:

- separation lines – continuous or broken
- barrier lines – either continuous double lines or single continuous with parallel broken line.

Barrier lines should not be used on pavements of insufficient width where it is not practicable for all vehicles to travel on their side of the line.

Edge lines

Edge lines are used to delineate the edge of the travelled lane. The aim of this delineation is both to discourage travel on the road shoulder and to assist drivers to track the edge of the road. Edge lines are particularly helpful on bends and at night. The minimum sealed pavement width on which edge lines should be installed in Tasmania is 6.4m, although narrower pavements may be provided with edge lines in special circumstances where the lines are considered essential. Edge lines must always be used in conjunction with a centre line (see Clause 4.3.5 of AS 1742.2-1994).

Audiotactile line marking

Edge lines can be provided with raised, transverse bars of thermoplastic material placed

at short intervals (see Figure 1). This practice creates edge lines that provide an audible and tactile warning whenever a vehicle tyre runs over them. The intention of the treatment is to alert the driver to the fact that their vehicle is straying onto the road shoulder and thereby give them a chance to take appropriate action before the vehicle leaves the pavement. Audiotactile edge lines should be considered where there is a recorded history of fatigue related crashes, and may be considered on roads prone to fog.

Some international studies on the effectiveness of using such a treatment have shown run-off-road crash reductions of at least 20% (Ligon et al (1985) cited Dravitzki et al 1998). The effectiveness of the treatment in practice would vary according to individual site conditions.

While the noise generated by audiotactile line marking is usually easily audible in normal passenger cars, it is harder to hear in large vehicles such as four-wheel drives, and is often impossible to hear in trucks. The treatment therefore should not be relied upon to provide warning to heavy vehicle drivers.

Audiotactile edge lines are not mandatory but may be of benefit when it is necessary to warn drivers that they are straying off the carriageway. The absolute minimum seal width required for installation of audiotactile edge lines is 6.6m. This is because at least 0.1m of seal is required outside the edge line. Consult AS 1742.2-1994¹, Section 4 for detailed requirements of various types of pavement markings.

It should be noted that while the noise made by audiotactile edge lines can be of help to drivers, it can also be an annoyance to nearby residents. If these devices are to be installed in areas where roads run close to houses, it may be helpful to inform residents of the proposed installation and its expected safety benefits. It is suggested that such edge lines are not used within 200m of residences.

¹ AS 1742.2-1994 is currently under review. If possible this document should be updated to refer to the new standard.



Figure 1: Audiotactile edge lines on a freeway

2.1.2 Raised pavement markers

Raised pavement markers can be used in conjunction with, or sometimes used instead of painted line markings. Section 4.6 of AS 1742.2-1994 discusses the use of non-retro-reflective and retro-reflective raised pavement markers. Non-retro-reflective pavement markers (NRPMs) may be used in conjunction with raised retro-reflective pavement markers (RRPMs) where it is intended that they simulate marked lines, for example, for lane lines on freeways. NRPMs may also be used at intersections to provide drivers guidance when negotiating the intersection.

RRPMs may be used to augment painted lines or instead of painted lines for the provision of lane lines, separation and barrier lines, edge lines and traffic islands and medians. RRPMs are not obscured at night under wet conditions as the retro-reflective panels sit above the surface and are more prominent than reflectorised painted markings (i.e. paint incorporating glass beads for added reflective capability). In addition, they provide an audible and tactile signal when traversed by vehicle wheels.

It should be noted that while the noise made by RRPMs can be of help to drivers, it can also be an annoyance to nearby residents. If these devices are to be installed in areas where roads run close to houses, it may be helpful to inform residents of the proposed installation and its expected safety benefits.

RRPMs should be used to highlight centre line marking on all Tasmanian rural roads that have a sealed width of at least 6.4m. They should also be applied to the centre lines and outside the edge lines on all National Highway routes and on dual carriageways with no street lighting.

RRPMs are used in various colours as follows:

- **White** markers are used to augment lane lines, separation lines, markings at traffic islands and freeway ramp gore areas.
- **Yellow** markers can be used on the right-hand edge lines of one-way carriageways.
- **Red** markers are used where appropriate to augment left-hand edge lines of two-way and one-way carriageways.
- **Blue** markers are used to mark the location of fire hydrants on roads. In this case a single marker is placed near the road centre line opposite the position of the hydrant on that side of the road.

In areas above the snow line there is a risk that raised pavement markers could be damaged by snow ploughs. For this reason it is recommended that orange snow poles be used instead. Snow poles are designed to be high enough to protrude at least 300mm above expected snow drift levels and their orange colour aids visibility in snow.

2.1.3 Guideposts

Guideposts are used to show the edge of the road and enhance the delineation of the road's path for drivers. They should be installed at a uniform distance from the edge of the road and should be fitted with delineators (see Figure 2). On narrower or lower volume roads where there is insufficient road width to mark a centre line,

guideposts may be the only form of delineation provided.

Requirements for the size, spacing and location of guide posts are detailed in Section 3.2.4 of AS1742.2-1994 document. On straight road sections, guide posts should be arranged in pairs at a spacing of 150m, although this spacing may be amended according to conditions outlined in the standard. The standard also specifies the spacing of guide posts on curves, crests, cuttings, bridges and culverts. Guideposts should be installed to be 1m high above ground level and have a white 100mm wide area for at least the upper 300mm of their height. This 100mm wide area should face oncoming traffic and incorporate a retro-reflective delineator.

Requirements for delineators, including details for mounting on guide posts, safety barrier and snow poles, are described in section 3.2.5 of AS1742.2-1994. A red delineator is used for the left side of the carriageway and white for the right side of the carriageway. Delineators should be of Class 1 material (AS/NZS1906.1-1993) or Class 1A (AS1906.2-1981/Amdt1-1988) where maximum delineation is required.



Figure 2: Guide post and retro-reflective delineators providing delineation of a curve

2.1.4 Warning signs

While guide posts and line marking can be used to delineate the path of a road, some of the more unexpected aspects of the road's geometry will require additional signage to convey their severity and nature to drivers.

Curve warning signs, advisory speed signs and chevron alignment markers (CAMs) are all appropriate treatments for substandard curves (see Figure 3). Warning and advisory speed signs should be used in the first instance, with CAMs only installed at locations where other signage is deemed to give insufficient warning. Section 3.4 of AS1742.2-1994 sets out the requirements for various levels of sign provision.

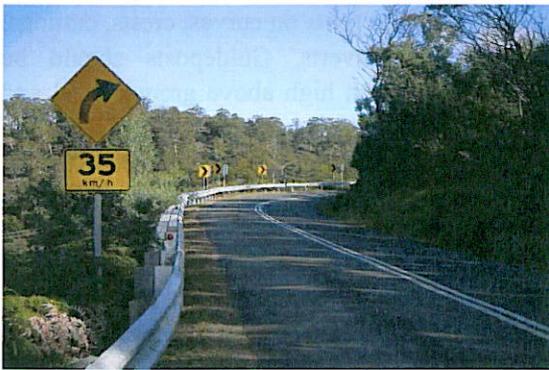


Figure 3: Warning sign, advisory speed sign and chevron alignment markers (CAMs) at a sub standard curve

On sections of road that have curved alignment, an accident history, and that may pass through an environmentally sensitive landscape, it may be desirable to provide an enhanced warning sign at both approaches to the road section (see Figure 4).

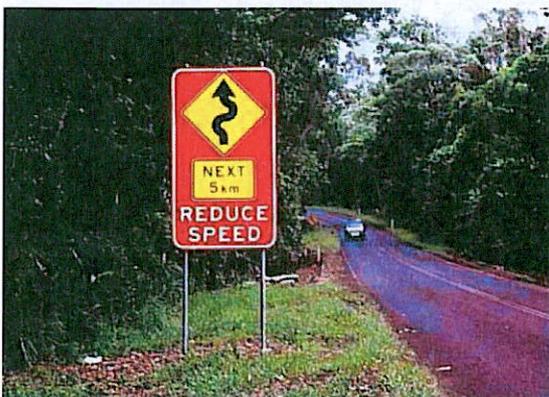


Figure 4: Red background used to emphasise potential hazard

2.1.5 Weather warning systems

A range of conditions related to weather can have an adverse affect on vehicles staying on the

road through their impact on drivers or the road surface. Common conditions include:

- heavy rain
- ice and/or snow
- fog
- water on road
- strong winds.

Weather warning systems may be used on freeway and non-freeway arterial roads where the adverse effects of weather increase the risk of road crashes. Such a system may be as simple as permanent signs, but more complex systems are also possible. For example, an ice warning system can consist of warning lights and signs that are activated by inputs from temperature and humidity sensors. Similarly, a fog warning system could activate advance warning signs and lights in response to inputs from a visibility detection device.

A weather warning system will generally be applicable to a specific location where a particular weather condition, unique to that location, has been identified as a contributor to crash risk. If a system is proposed as a crash countermeasure for a particular site, it is recommended that several years' crash data first be examined to determine that the relevant weather conditions did influence crashes at the site.

2.2 Road design elements

In order to give motorists the best chance of keeping their vehicles on the road, it is necessary to provide a geometric design conducive to safe travel. The principal factor influencing a vehicle's ability to traverse and remain on a particular section of road is the speed of the vehicle. Accordingly, it is necessary to take into account the operating speed of a road section when setting such parameters as curve radii, lane widths, shoulder widths, seal types and drainage.

For full information on the topics in this section the practitioner is referred to the Austroads publications, *Rural Road Design* (2003b) and *Urban Road Design* (2002).

2.2.1 Lane widths

The width of a traffic lane influences the ease with which vehicles can operate in that lane. Higher traffic volumes and higher speeds demand wider lanes to allow more space between passing vehicles, and between vehicles and any roadside objects. Austroads specifies

appropriate lane widths for urban and rural environments in Section 12 of *Urban Road Design* and Section 11 of *Rural Road Design* respectively.

However, the recommended lane widths for the various categories of Tasmanian roads differ from the Austroads requirements and are shown in Table 1. The information in the table has been taken from the draft Tasmanian State Road Hierarchy Target Standards document (October 1999).

Table 1: Recommended lane widths

Road category	1	2	3	4	5
Surface	Sealed	Sealed	Sealed	Sealed	As warranted
Traffic volume (AADT)	Recommended lane widths				
0-1000	N/A	3.0m	3.0m	2.75m	As warranted
1000-2500	N/A	3.0m	3.0m	2.75m	As warranted
2500-5000	3.5m	3.5m	3.0m	3.0m	As warranted
5000 plus	3.5m	3.5m	3.25m	3.0m	As warranted

2.2.2 Shoulder widths (sealed/unsealed)

Apart from its function as a lateral support for the road pavement, a road shoulder is provided as additional road width for a number of traffic-related reasons. The most important of its traffic functions in relation to road management is the provision of a degree of separation between moving traffic and roadside objects. This extra road space, while not intended for regular travel, allows drivers more room to bring their vehicles back under control after inadvertently leaving the traffic lane.

To reduce the incidence and severity of run-off-road crashes it may be desirable to ensure that shoulders are sealed. This will assist errant vehicles to recover should they leave the carriageway. A decision to seal shoulders will depend on the road category, traffic volume and the accident record of the section of road.

The actual width of shoulder sealing will depend on traffic speed, volume and composition, environmental conditions and the nature of the roadside area. Ideally the sealed shoulder width should be between 1.5 and 2.4m as this range was found to be the safest in a recent Austroads investigation carried out by ARRB TR. Section 11.5 of Austroads' *Rural Road Design* (2003b) provides further advice on sealed and unsealed shoulder widths. The information therein is applicable to both rural and urban locations, although shoulders are not usually required in urban settings except for drainage or the storage of broken down vehicles.

However, the draft Tasmanian State Road Hierarchy Target Standards document (October 1999) states specific sealed and unsealed shoulder widths applicable to the various categories of Tasmanian roads, as shown in Table 2.

Table 2: Recommended shoulder widths

Road category	1	2	3	4	5
Surface	Sealed	Sealed	Sealed	Sealed	As warranted
Traffic volume (AADT)	Recommended lane widths				
0-1000	N/A	0.6m sealed	0.3m sealed	0.6m unsealed	As warranted
1000-2500	N/A	1.0m sealed	0.6m sealed	0.3m sealed	As warranted
2500-5000	2.0m sealed	1.5m sealed	1.0m sealed	0.6m sealed	As warranted
5000 plus	2.0m sealed	2.0m sealed	1.0m sealed	1.0m sealed	As warranted

Section 11.5 of *Rural Road Design* provides further advice on sealed and unsealed shoulder widths. The information therein is applicable to both rural and urban locations, although shoulders are not usually required in urban settings except for drainage or the storage of broken down vehicles.

2.2.3 Horizontal curvature and localised curve widening

The careful design of horizontal curves is one of the primary considerations in designing to minimise the danger of roadside hazards. In order for a vehicle to travel around a bend at a certain speed, the horizontal friction between the vehicle and the road pavement must be sufficient to counteract the inertial force that would maintain the vehicle's initial direction. Constructing a bend with as large a radius as the landscape allows is therefore the first step in providing a driveable path. However, it is desirable to have a consistent alignment standard over a section and well designed transitions from generous to tighter alignments.

For the construction of a new road or realignment of an existing road, Chapter 9 of *Rural Road Design* provides guidance on the entire process of designing a road's horizontal alignment.

Widening of the road pavement may be required at curves in the road, dependent on curve radius, lane width and vehicle sizes. One reason for this localised widening is that a vehicle (particularly a

truck or bus) travelling around a curve will occupy more of the lane width than the same vehicle travelling on a straight. This increased width occupied by vehicles also reduces the clearance between vehicles travelling in opposing directions. Extra lane width at curves maintains an acceptable clearance.

The second reason for localised widening on curves is that vehicles typically do not maintain the same lateral position in a curve that they would on a straight. This is due to the requirement that a driver steer through the curve. Some deviation from a perfect path must be expected.

Section 9.10 of *Rural Road Design* discusses localised widening on curves and provides recommended lane widths.

2.2.4 Vertical alignment

Vertical alignment is an important consideration in road design. Flat or almost flat grades should generally be provided where possible. Steep grades become prohibitive or even non-negotiable for heavy vehicles. Flat grades allow all vehicles sharing a road to travel at the same speed. Steep grades, on the other hand, cause different vehicles to travel at different speeds, which creates a higher risk of rear end crashes. Differences in vehicle speeds also contribute to queuing, which may be frustrating to drivers within the queue. Where vertical curves occur in conjunction with horizontal curves extra care in design needs to be taken.

The definition of a 'flat' grade varies according to a road's operating speed. For a speed environment of 100 km/h, a slope of up to five per cent can be considered flat. At lower speeds, steeper grades can be considered flat. The grades listed in Table 3 are taken from Austroads' *Rural Road Design* (2003b) and are suggested maximum grades for various terrain and speed environments. The practitioner must always beware of vertical grades or changes in grade that may impede sight distance. Refer to Section 2.2.6 for further information on sight distance.

Table 3: Maximum grades (%) by speed and terrain

Operating speed (km/h)	Terrain		
	Flat	Rolling	Mountainous
60	6-8	7-9	9-10
80	4-6	5-7	7-9
100	3-5	4-6	6-8
120	3-5	4-6	-
130	3-5	4-6	-

Vertical grades of zero may be provided, although consideration needs to be given to type of drainage provided. Adequate drainage must be provided to prevent water pooling on the road surface during normal levels of rain. Longitudinal drains need to have adequate fall, generally accepted as 0.5 per cent grade.

Chapter 10 of Austroads' *Rural Road Design* (2003b) provides guidance on the design of aspects of vertical alignment issues including grades and vertical curves.

It is recommended that where it is necessary to have a length of steep grade, the length of the section be minimised. Vertical grades of zero to three per cent are considered to have little effect on the operation of all vehicles, while grades in excess of six per cent can have a significant effect on heavy vehicles for travel both uphill and downhill. Safety considerations need also to be addressed in relation to long downhill grades with

regard to the risk of a crash due to brake failure. Where it is necessary to have long steep grades, consideration for the provision of safety features such as passing bays and descending lanes to allow light vehicles to safely overtake slower moving heavy vehicles, or the installation of safety ramps and arrester beds to safely bring a runaway vehicle to rest should be considered. Provision of such features may be particularly relevant to roads with a reasonably high proportion of heavy vehicles. Chapter 13 of Austroads' *Rural Road Design* (2003b) provides guidance on auxiliary lanes for safety and capacity reasons. Section 13.7 provides guidance on the provision of runaway vehicle facilities.

2.2.5 Road surface

A road surface needs to be constructed and maintained to a sufficient standard to ensure adequate skid resistance. The skid resistance of a particular surface is a result of the interaction of surface texture and the presence of moisture. For example, a situation where a pavement can hold water instead of draining properly can contribute to vehicles aquaplaning.

To be sure of the condition of an existing pavement it is necessary to conduct skid resistance measurements as well as an assessment of the level of rutting and the occurrence of potholes. Measurement of skid resistance and rutting can be undertaken using a number of methods, some of which are highly automated and efficient. The decision to act on the results of such measurements is left to the experienced practitioner, however a guide to the use of skid resistance values can be found in the Austroads publication *Guide to the selection of road surfacings* (Austroads 2003a).

Roads with a comparatively high volume of heavy vehicle traffic (usually major link routes) may require a higher standard of construction and maintenance than roads that predominantly carry light vehicles such as cars and vans.

2.2.6 Sight distance

It is important that adequate sight distance is provided whenever possible to allow drivers and

other road users to safely negotiate the road. Sight distance can be affected by the road geometry (horizontal and vertical alignment), terrain (particularly on the inside of horizontal curves) and roadside objects (such as trees and signs). Section 8 of *Rural Road Design* discusses sight distance in general, while section 9.11 looks more specifically at sight distance on horizontal curves. Section 3.4 of AS1742.2-1994 discusses signage of substandard curves.

A number of sight distance types can be calculated, dependant on the driving environment. These include:

- Stopping sight distance – the minimum sight distance that should be available for a driver. As defined by Austroads' *Rural Road Design* (2003b), this is the distance that it takes for a “normally alert driver, travelling at the design speed on a wet pavement, to perceive, react and brake to a stop before reaching a hazard on the road ahead”. Section 8.3 of Austroads' *Rural Road Design* (2003b) looks at stopping sight distance, outlines the method for calculation and provides tables for the minimum car and truck stopping sight distances required for various operating speeds and grades.
- Overtaking sight distance – the distance required by a driver “to safely overtake a slower moving vehicle without interfering with the speed of an oncoming vehicle”. This is only considered for two-lane two-way roads, where an overtaking manoeuvre requires a driver to travel on the wrong side of the carriageway. Section 8.4 of Austroads' *Rural Road Design* (2003b) focuses on overtaking sight distance.
- Manoeuvre sight distance – is the distance required for a driver of a vehicle to react and manoeuvre around an obstacle. Manoeuvre sight distance is less than stopping sight distance and is the absolute minimum sight distance that may be provided. Section 8.5 of Austroads' *Rural Road Design* (2003b) discusses the circumstances in which the use

of manoeuvre sight distance instead of stopping sight distance may be acceptable.

- Headlight sight distance – the distance for which a small unilluminated object is visible in a vehicle's headlights. It is generally limited to 120 to 150m, which corresponds to a safe stopping sight distance for 80 to 90 km/h. Section 8.6 of Austroads' *Rural Road Design* (2003b) looks at headlight sight distance.
- Horizontal curve perception distance – where a horizontal curve exists, drivers need to be aware of the curvature of the road ahead, react and slow down (if necessary) to safely navigate the curve. It needs to be ensured that a driver can see a sufficient length of curve in order to judge its curvature and safely navigate the curve. It is recommended that a curve should not commence just over the crest of a hill. However, where this situation is unavoidable, it needs to be ensured that drivers are aware of the curved road alignment ahead.

Roadside features (such as embankments and vegetation) that limit sight distance should be removed or modified to ensure sufficient stopping sight distance on curves. If this is not practical, speeds should be reduced through such sections to compensate (for example, with warning signs). It is important that roadsides are maintained to ensure that sight distance requirements are sustained, for example by regularly pruning trees and cutting grass.

On substandard curves it may be appropriate to cut benches in high batters (see Figure 5) in order to improve sight distance. Sections 11.7 and 9.11.1 of Austroads' *Rural Road Design* (2003b) discusses design and use of batters and benching.

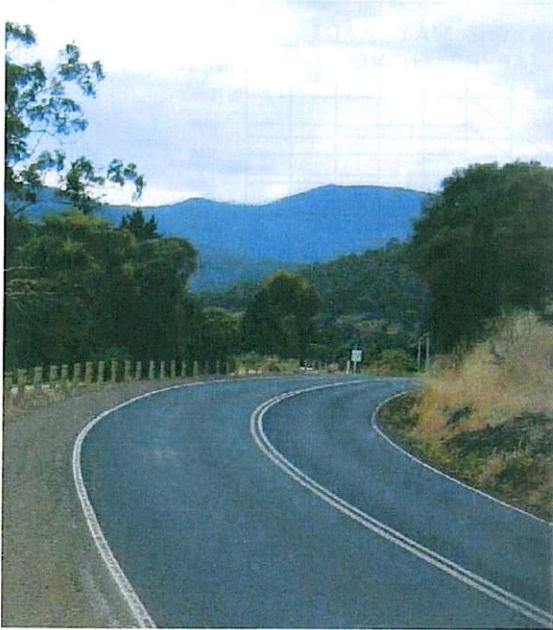


Figure 5: Benching on inside of horizontal curve

2.2.7 Drainage

Drainage of the road surface and surrounding areas is an important consideration for road design. A number of different aspects need be considered with regard to drainage. These include:

- drainage of the road pavement – by providing adequate grade and crossfall so that the pavement is able to drain and pooling of water is avoided, which allows maintenance of skid resistance
- appropriate infrastructure to collect and transfer the water from the pavement, which may include kerb and channel or table drains
- a road reservation that can accommodate water run-off from adjacent land uses.

If constructed along a flow path, a road may need to be designed to be able to handle the run-off from adjacent land for a flood event.

Drainage design at the road design stage requires consideration of flood estimation. Chapter 16 of the Austroads' *Rural Road Design* (2003b) looks into drainage and lists a number of rural flood estimation methods for gauged and ungauged catchments. Similar information is available for urban areas in Chapter 15 of Austroads' *Urban Road Design* (2002).

3 Dealing with errant vehicles

The ideal roadside environment would be completely free of any obstructions to the safe passage of errant vehicles. Such a roadside would prevent injuries in run-off-road crashes by providing drivers with enough space to regain control of their vehicles and stop safely without colliding with any objects or the vehicle rolling over. However, it is usually not possible to construct a road environment completely free of hazards. There is usually a requirement for signage, utility poles and other roadside furniture, and often the topography of the landscape necessitates the provision of cut or fill embankments.

3.1 Clear zones

A clear zone is an area adjacent to the traffic lane that should be kept free from features that would be potentially hazardous to errant vehicles. The clear zone is a compromise between the recovery area for every errant vehicle, the cost of providing that area and the probability of an errant vehicle encountering a hazard. Where economically viable, the clear zone should be kept free of non-frangible hazards and all features that would 'snag' a vehicle or cause it to roll. Alternatively, hazards within the clear zone should be treated to make them safe or be shielded by a safety barrier. Clear zones are measured from the edge of the traffic lane.

Clear zones are intended as a guide to by which practitioners can assess sites, not a prescriptive value. Practitioners may provide a greater or lesser width depending on the risk factors applying to a particular site.

The Austroads method of calculating clear zone widths takes into account traffic volume, 85th percentile speed, curve radius and roadside slope. The use of this method is presented in Section 17.3 of Austroads' *Rural Road Design* (2003b) and the charts that make up the method are reproduced here as Figures 6, 7 and 8. Note that Figure 7 provides a multiplying factor for the output of Figure 8.

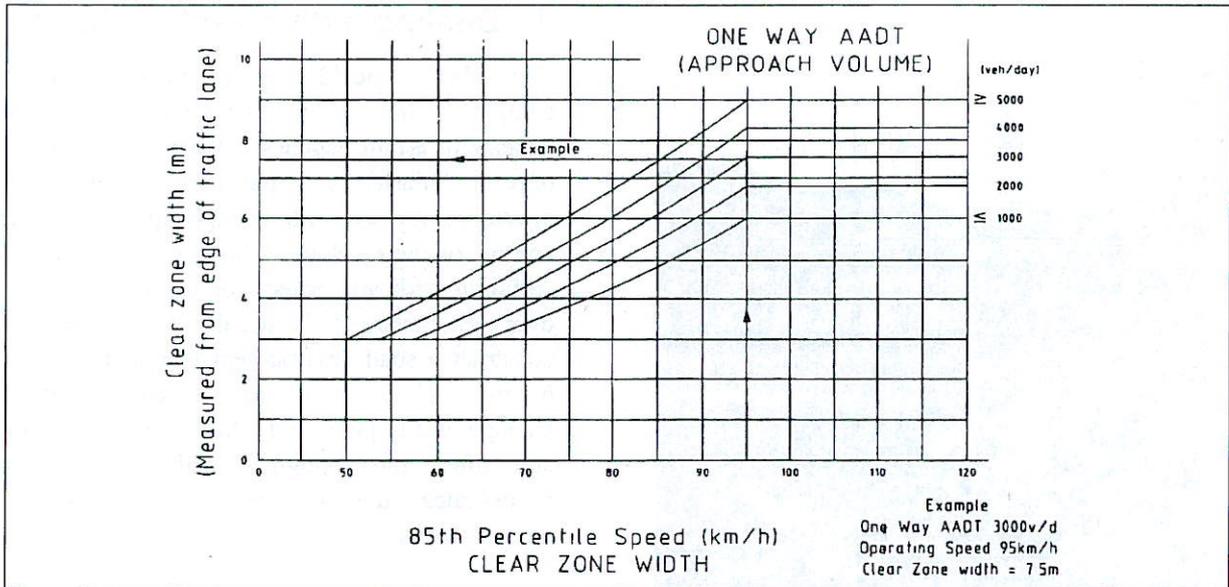


Figure 6: Clear zone width chart (Austroads 2003b)

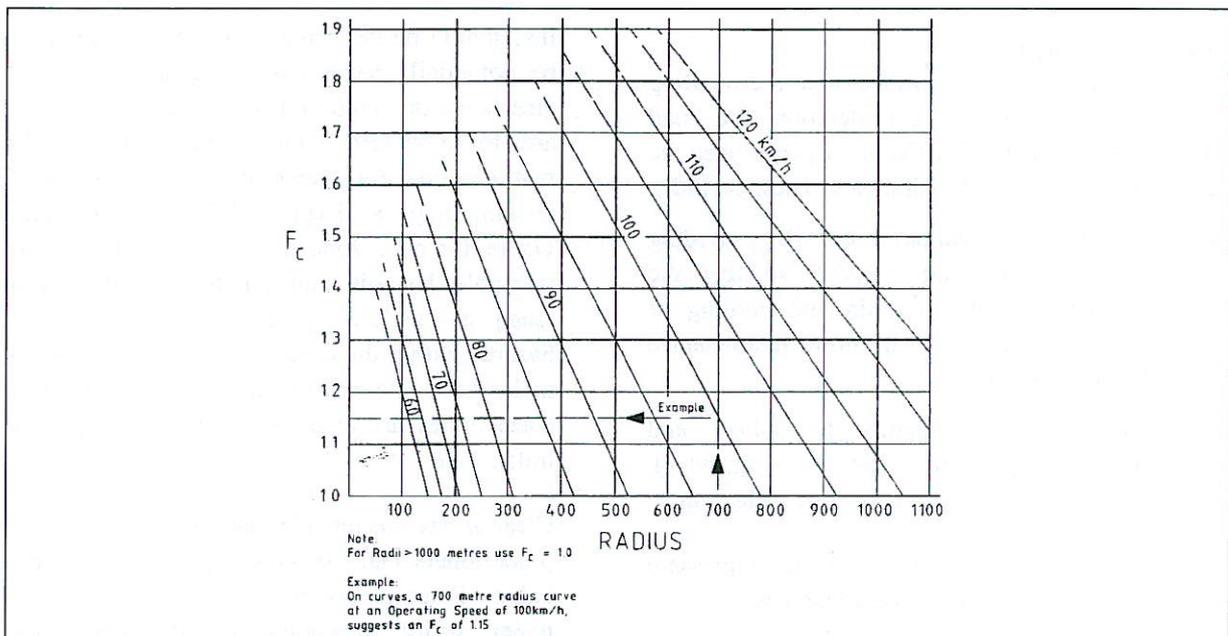


Figure 7: Curve adjustment factors for clear zones (Austroads 2003b)

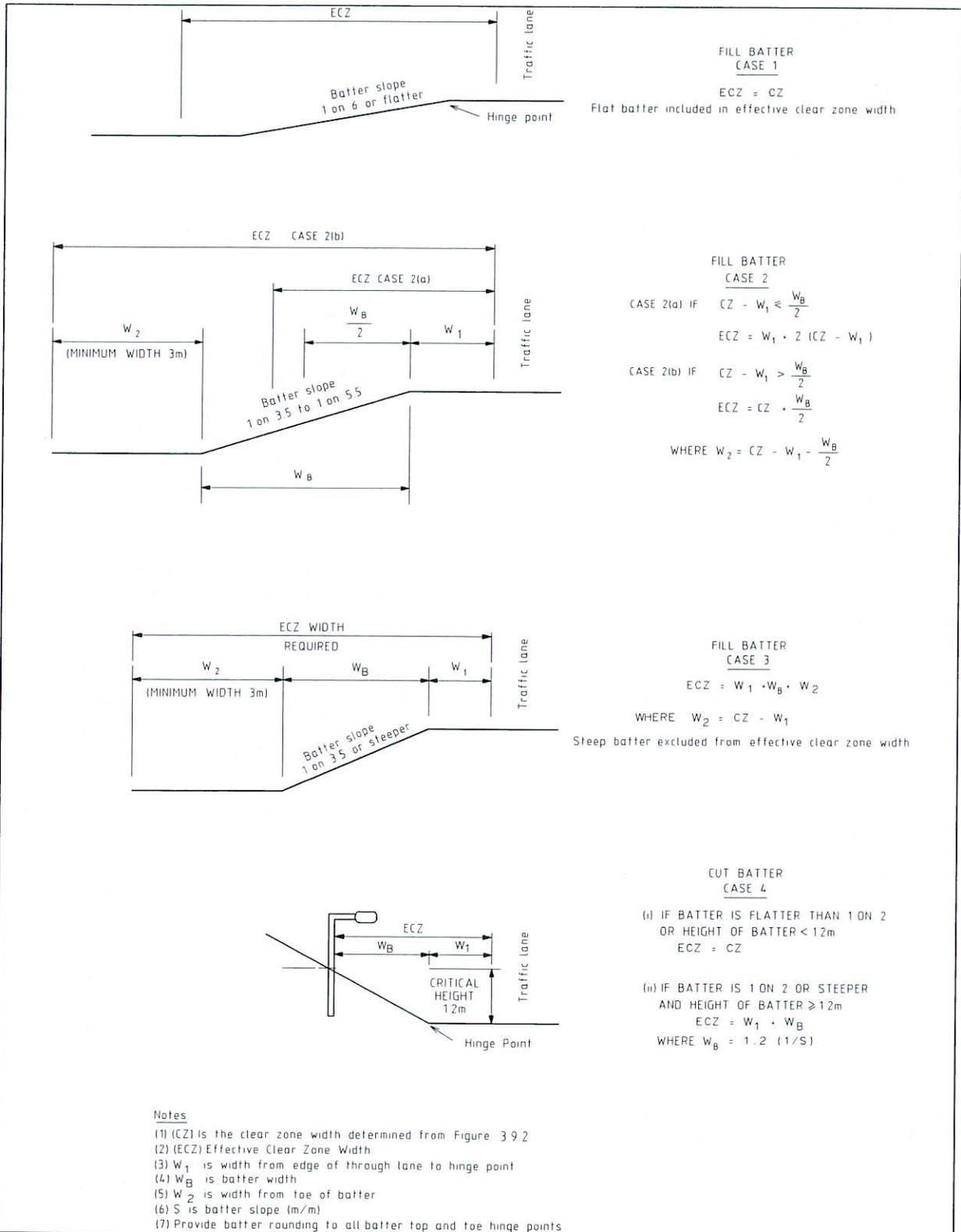


Figure 8: Clear zone widths for batters (Austroads 2003b)

3.2 Types of hazards and their treatments

The following section identifies hazards that may be found in the roadside environment and possible treatments to reduce the risk of these hazards to drivers. For the purpose of hazard identification, the types of hazard that may be encountered in roadsides can be divided into five broad categories:

- embankments
- rigid objects – trees, utility poles, culvert end-walls etc
- medians (cross median crashes)
- open drains
- bodies of water.

Notwithstanding that there are physical, environmental and economic constraints, the preferred treatments (in order of preference) of roadside hazards are:

- removal
- relocation to reduce the chance of them being hit
- redesign so that they can be safely traversed
- redesign to be frangible or break away, or to otherwise reduce severity
- shielding with a traffic barrier or impact attenuator
- delineation of the hazard.

Each option for hazard reduction is to be ranked according to benefit cost analysis techniques and engineering judgement.

Because of the number of variables and complexity of the analysis, computer software such as the following may be used to perform the quantitative analysis associated with the evaluation process:

- Roadside Incident Severity Calculator (RISC) developed by Main Roads Queensland.

- Road Safety Risk Manager (RSRM), a prioritisation program developed by ARRB Transport Research in association with Austroads.
- USA Roadside Safety Analysis Program (RSAP), refer TRB web site (<http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+22-09>).

3.2.1 Embankments

Batter slopes

Section 11.7 of Austroads' *Rural Road Design* (2003b) provides guidance on use and design of batters. It is important that batters are constructed to allow errant vehicles to negotiate the slope safely in the event of a run off road crash. If there is a risk that a batter slope is severe enough to cause an errant vehicle to overturn during a crash, installation of a safety barrier should be considered. Design slopes for both cut and fill batters are listed for arterial and local roads in Table 11.7 of *Rural Road Design*.

One aspect of batter design not covered by the Austroads document is the concept of recoverable, non-recoverable and critical fill batter slopes. These terms refer to the likelihood of a vehicle overturning on various slopes. Practitioners should be aware of these definitions.

After running off the road onto a recoverable batter slope, a driver will usually be able to regain control of the car and return to the road or stop safely. On a non-recoverable slope, the driver is unlikely to be able to return to the road but will be able to stop safely at the bottom of the slope. A critical slope will probably cause the vehicle to overturn.

The AASHTO *Roadside Design Guide* (AASHTO 2002) defines recoverable slopes as flatter than 1 on 4 (ie. a fall of one metre for every four metres of width), non-recoverable as between 1 on 4 and 1 on 3, and critical as steeper than 1 on 3.

Cuttings and rock faces

Cuttings and rock faces are generally expensive to construct. Economic and environmental constraints often result in cuttings being as narrow as possible and prevent the provision of a cutting wide enough to allow for clear zones. Therefore, cuttings and rock faces should be cut to provide a smooth face to act as a rigid barrier, allowing errant vehicles to slide along and stop gradually. Uneven surfaces, may present a hazard to vehicles that happen to run off the road. If a smooth face and approach surface cannot be provided, it may be appropriate to install a barrier to prevent vehicles colliding with an uneven rock surface.

Deep, unprotected drains should not be provided at the base of the cut batter. Effective redirection of vehicles requires a flat even surface approaching the embankment.

3.2.2 Rigid objects

Poles

Poles are a common road furniture item used to support signs (regulatory, warning, guidance, informative), road lighting and various devices. In line with the preferred treatment for roadside hazards (removal), the practitioner's aim should be to minimise the number of poles in the clear zone.

The hazard presented by a roadside pole is related to both its location and type of construction. Both of these contribute to the hazard the pole may pose and the consequences of an errant vehicle hitting the pole.

Where possible, poles should be located such that an errant vehicle is unlikely to hit them. Minimum lateral set back distances for signs and for road lighting poles are specified in Australian Standards AS1742.2 and AS/NZS1158.1.3-1997 respectively.

Sign posts should be designed to be frangible in the event of collision with an errant vehicle, i.e. posts that are designed to fracture, break away, give way or bend such that the damage to a

colliding vehicle and risk of injury to vehicle occupants upon impact is minimised. Small signs are usually supported by posts that deform in a way that causes minimum damage to cars, whereas larger posts and supports (for larger signs) may be provided with mechanisms that are designed to yield in a controlled manner upon impact.

Sign poles

Appendix C of AS1742.2-1994 discusses aspects of longitudinal and lateral placement and mounting height for signs, orientation, post type and selection. Signs should be erected such that sight distance is not compromised. Longitudinally, signs should be located to provide enough warning for a driver to be able to make a decision and respond as necessary. It is also important that signs are spaced far enough apart longitudinally that drivers are able to process the information before encountering another sign.

In a rural setting (unkerbed roads), signs should generally be placed between 2m and 5m from the edge of the outside lane, and at least 600 mm from the road shoulder. Signs should be mounted at a height at least 1.5m above the carriageway level.

In an urban setting (kerbed roads), signs should be located at least 300 mm behind the face of barrier kerbing and 500 mm from mountable or semi-mountable kerbing. Signs should generally be mounted at least 2m above the top of kerb or 2.5m above a footway, to allow for pedestrians and parked vehicles. In some circumstances, signs may be mounted lower than 2m.

Overhead mounted signs are often employed for multi-lane carriageways and freeways. They should generally be mounted a minimum of 5.3m above a carriageway.

Light poles

Appendix B of AS/NZS1158.1.3-1997 discusses the use and placement of rigid and frangible road lighting poles.

Rigid poles do not deform to a great extent, but are designed such that they remain upright after an impact. Alternatively, frangible poles are designed to deform upon vehicle impact. Types of frangible poles include:

- slip base poles – break away at the base upon impact, allowing the vehicle to pass beneath the pole and causing aiming to minimise or avoid injury to vehicle occupants (see Figure 9)
- deformable poles – collapse over the colliding vehicle and are designed to bring the vehicle to a controlled stop at the base of the pole (see Figure 10). Deformable poles are designed to remain in the ground after being hit.

The decision to use slip base poles will depend on the space available and the resultant likelihood that a falling pole would cause injury to other users of the road or roadside area. For example, a slip base pole will usually be inappropriate where pedestrian or cyclist traffic is common because a falling pole would pose an unacceptable risk to those road users.

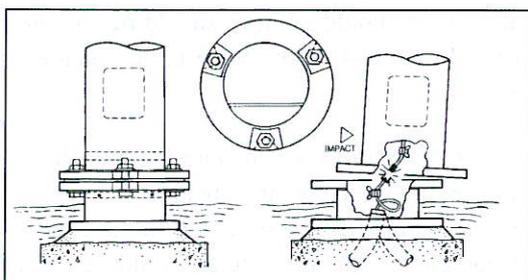


Figure 9: Slip-base pole (Austroads 1988)

Aspects involved in the selection of pole type and set back from carriageway include:

- surrounding land use and pedestrian activity
- speed limit
- whether road is kerbed or unkerbed
- location – mid-block or intersection
- road alignment

- whether pole is to be located behind safety fence or on front of/ behind an obstruction.

Refer to section B6 of Appendix B of AS/NZS1158.1.3-1997 for detailed information.

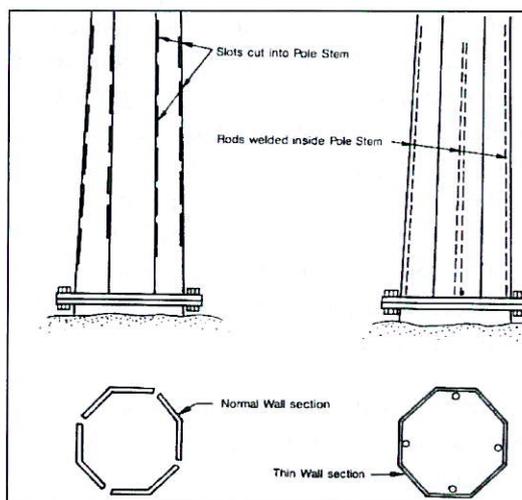


Figure 10: Deformable pole (Austroads 1988)

Other – service poles

Service poles, such as electricity poles, are generally rigid as the consequences of one being toppled over can be very serious. The ideal treatment of service poles is to remove them and relocate services underground. Where this is not possible, service poles should be located where it is unlikely an errant vehicle may hit them. This may involve locating them at the property line (urban and rural) or in an easement (rural).

Trees

Trees greater than 100 mm in diameter located within the clear zone pose a potential hazard to motorists.

New trees should be located outside of the clear zone so that they do not pose a serious roadside hazard risk. Where existing trees are within a clear zone, and are deemed to pose a risk, the first option is to remove the tree. Where this is not feasible it may be appropriate to install safety barrier. Provision of a safety barrier will depend on a number of factors relating to site conditions, accident history, economics and the environment. However, such action should only

be taken where it is determined that collision with the barrier is less severe than collision with the existing hazard (i.e. trees).

It is also important that trees are pruned regularly enough to ensure that any growth does not restrict sight distance.

Minor roadside obstacles (fire hydrants, mail boxes and other roadside hazards)

Minor roadside obstacles should not pose a serious risk to an errant vehicle that may strike the object. Objects containing horizontal rails capable of spearing vehicles (such as post-and-rail fences) can be particularly hazardous. Such objects should be located outside the clear zone or such that impact with the object should not result in a serious crash.

Traffic signals

As for other roadside furniture, traffic lights can pose a hazard for any errant vehicles. They are often necessarily located close to the carriageway of intersections, which could lead to a higher risk of impact, although some measures can be taken to minimise this risk. Such measures include not locating a light pedestal on the outside of a curve, setting poles as far back from the carriageway edge as practicable, minimising the number of poles and joint use of poles. Provision of high skid resistance at intersections can also reduce the risk of a vehicle losing control at an intersection and skidding into traffic pedestals or other roadside hazards.

Culverts

The ends of culverts that cross under the road or are located parallel to the road constitute hazards for motorists. They should be relocated, treated or shielded if within the clear zone.

Parallel to road (driveable treatment)

Driveable treatments need to be installed wherever a culvert exists parallel to the road and within the clear zone (see Figure 11).



Figure 11: Driveable culvert situated parallel to road

Perpendicular to road (headwall treatment)

Culverts that run perpendicular to the road (i.e. run under the road) need to be:

- driveable if the fill batter is of a low enough slope
- protected with an appropriate barrier if the slope is not driveable.

Bridge end posts

Bridge ends need to be designed to prevent vehicles from running into end support posts, being speared by any horizontal bridge members or simply crashing through any approach barrier and being exposed to a hazard (eg roll-over, water course).

Stiffening needs to be provided on the transition from the semi-rigid approach barrier to the rigid bridge structure.

The piers of bridges over roads (at overpasses) should desirably be protected by a crash cushion or safety barrier.

3.2.3 Open drains

A drainage channel is defined as an open drain usually parallel to the highway and within the limits of the highway right of way (AASHTO, 2002). Open drains are present on the majority of rural roadsides and may also exist on urban

freeways. Their primary function is to collect and carry the surface water away from the roadway. Open drains are designed to accommodate run-off from heavy rain storms with minimal highway flooding or damage. Deep drains constructed close to the road may be the most efficient way of removing water but, unless they are of a suitable shape, they are a hazard for errant vehicles that leave the road.

Typical drains can be classified by whether they are designed with abrupt or gradual slope changes. Abrupt slope change designs include vee drains, rounded drains with bottom widths less than 2.4m, and trapezoidal drains with bottom widths less than 1.2 m.

Vehicles leaving the roadway and encroaching into a drain face three hazard areas:

- **Drain front slope.** If the front slope is 1:4 or steeper, the majority of vehicles entering the ditch will be unable to stop and can be expected to reach the bottom.
- **Drain bottom.** Abrupt slope changes can result in errant vehicles colliding with the bottom of the ditch.

- **Drain back slope.** Vehicles travelling through the ditch bottom or becoming airborne from the front slope can collide with the back slope.

The AASHTO Roadside Design Guide (AASHTO 2002) contains figures describing the preferred design for abrupt and gradual change slopes. These figures are presented in this Document at Figure 12 and Figure 13 respectively. Drain cross sections that fall within the shaded region of each of the figures are considered as traversable. These preferable drain designs are not considered hazardous and need not be constructed at or beyond the clear zone distance for a specific roadway.

Drain sections that fall outside the shaded area of the figures are considered non-traversable. As a general rule, these drains should either be:

- reshaped
- converted to a closed system (culvert or pipe)
- located beyond the clear zone
- where appropriate, shielded with a traffic barrier.

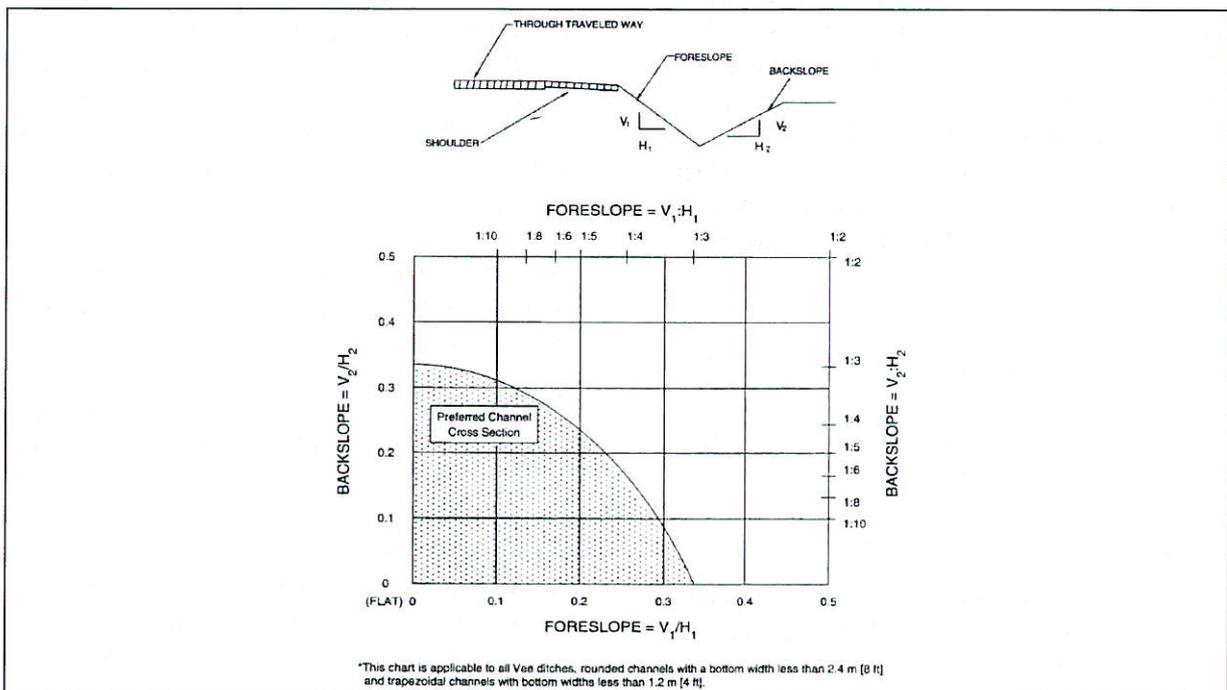


Figure 12: Preferred cross sections for channels with abrupt slope changes (from AASHTO (2002))

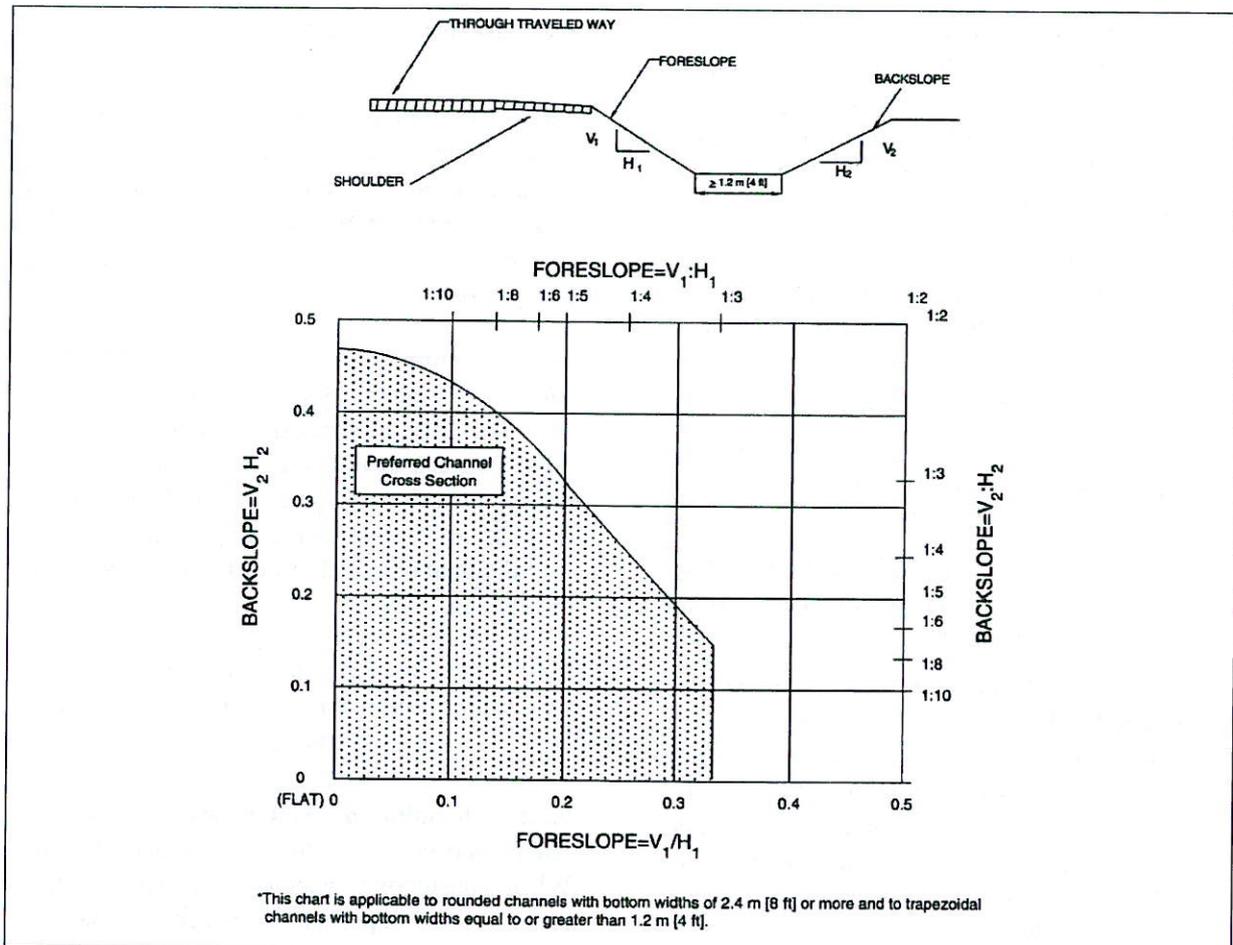


Figure 13: Preferred cross sections for channels with gradual slope changes (from AASHTO (2002))

If the drain bottom and slopes are free of any fixed objects, then non-preferred drain sections may be acceptable for roads or projects where a better treatment is impracticable or uneconomical because of factors such as:

- restrictive right-of-way
- rugged terrain
- resurfacing, restoration or rehabilitation projects where these works result in an unavoidable change to the shape of a drain and it is not feasible to provide a compliant shape
- low volume, low speed roadways.

Drains of both the abrupt and gradual slope designs can funnel a vehicle along the drain bottom. This increases the probability of impact with any fixed objects present on the bottom or side slopes of the drain. Breakaway hardware

may not operate correctly if the vehicle is airborne or sliding sideways when contact is made. For these reasons, non-yielding fixed objects should not be located on the side slopes or bottom of drains.

Back slopes typically occur when roadways are constructed by cutting the existing terrain away to develop the roadbed. If the slope between the roadway and the base of the back slope is 1:3 or flatter, and the back slope is obstacle free, then the back slope may not be a significant hazard regardless of its distance from the roadway. Back slopes that will not provide a relatively smooth redirection or that can cause vehicle snagging should begin outside the clear zone or be shielded. This usually includes rough sided rock cuts when the rough face can cause excessive vehicle snagging.

3.2.4 Bodies of water

Bodies of water should be evaluated with respect to the degree of potential hazard they pose. This will be a combination of the amount of water and its accessibility. The depth may be ranked according to whether

- a vehicle can completely submerge, resulting in the drowning of uninjured non-swimmers, disabled or elderly persons, or infants
- water could fill an upright car to a point where an unconscious or injured driver or passenger would drown (typically / assumed to be a depth of 0.6 m)
- an upside down car would be in water deep enough that an unconscious person would drown (a depth of 0.3 m).

Fast moving bodies of water should be considered to be more hazardous than those that are still. In general, practitioners should carefully consider the risk associated with bodies of water over 0.6 m deep, or water courses with a normal base flow depth greater than 0.6 m, as these could cause a stunned, trapped, or injured occupant to drown.

Other factors to consider include the:

- slope of the vehicle path to the water
- total distance available in which to stop
- persistent or intermittent presence (flooding potential) of the water hazard
- presence of intervening obstructions that would reduce the likelihood of an errant vehicle reaching the water.

The practitioner should visualise the paths that errant vehicles are likely to take in reaching the water. If the water hazard is substantial and the likelihood of errant vehicles reaching that water is high enough, the practitioner should consider providing shielding to prevent access to that course.

3.3 Safety barriers

In instances where a roadside hazard cannot be made safe, removed or relocated, it may be necessary to provide physical protection from the hazard. Safety barriers are available for a variety of applications and this section provides advice on selecting, installing and maintaining safety barriers.

The Australian Standard document "AS/NZS 3845:1999 Road Safety Barrier Systems" discusses various methods of roadside hazard protection and provides direction on the correct use of the different systems. The Standard has been the basis for a number of guidelines written by individual road authorities for use within their jurisdiction.

It should also be noted that the Austroads publication *Safety Barriers* (1987) is currently being reviewed and updated.

3.3.1 Decision to install a safety barrier

Safety barriers are a form of roadside hazard. When considering whether to install a safety barrier, it is important to remember that the barrier will present some danger to the occupants of errant vehicles, and especially to unprotected road users such as motorcyclists. A barrier should only be installed if collision with it will present less of an injury risk to vehicle users and occupants than would result from collision with the roadside hazard that is to be shielded by the barrier.

It is important to consider specifically the danger posed to motorcyclists by both the hazard and the intended safety barrier. As essentially unprotected road users, motorcyclists are particularly vulnerable to unforgiving roadside environments; any obstacle in the path of an errant motorcyclist has the potential to cause severe injury. If it is decided that a safety barrier is necessary at a site, attention should be paid to the design of the barrier to ensure that it poses as little risk as possible to colliding motorcyclists.

3.3.2 Barrier types

The following sections describe a number of roadside safety barriers and end-treatments. This list does not contain all available types of barrier, and the practitioner should be aware that manufacturers continually develop new or improved barrier designs. Accordingly, the information presented here refers to testing procedures, the results of which can be used to determine the suitability of proposed barriers. No barrier should be installed unless it has been shown to meet the applicable standards and can therefore be expected to perform satisfactorily.

Barrier types include rigid barriers, semi-rigid barriers and flexible barriers. Semi-rigid and flexible barriers are preferred as they generally cause less damage to vehicles during a crash, while a rigid barrier is suitable where space is limited and it is placed relatively close to the traffic lane (eg. narrow median).

Where a barrier is essential, the practitioner should bear in mind that barrier posts are the main cause of injury to motorcyclists. Other barrier attributes that are considered to be dangerous to motorcyclists (ATSB 2000) include upper and lower edges (particularly if jagged edges exist), protruding reflectors, low barrier mounting height (as motorcyclists can be thrown over the barrier) and rigid barriers.

Guards have been designed to reduce the severity of motorcycle collisions with barriers. These are available in a range of designs for various types of barrier. They should be considered for use at sites where motorcyclists are subject to high risk of collision with barriers.

Wire rope safety fence

Flexible barriers cause the least damage to vehicles, and pose the smallest risk of injury to vehicle occupants, of all barrier types. Flexible barriers usually consist of cables, held in tension, suspended from closely-spaced posts. The cables may be arranged in a variety of ways, depending on the manufacturer (see cross-section diagrams in Figure 14 and Figure 15).

Such a configuration is commonly known as a wire safety rope barrier. The posts simply support the cables and provide little resistance to a colliding vehicle. When a vehicle strikes a wire rope barrier, the barrier catches the vehicle and brings it to a halt. During a collision a wire rope

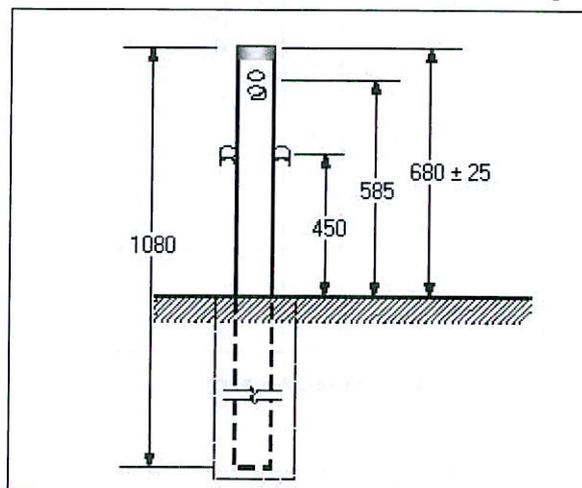


Figure 14: Wire rope safety fence, twisted array

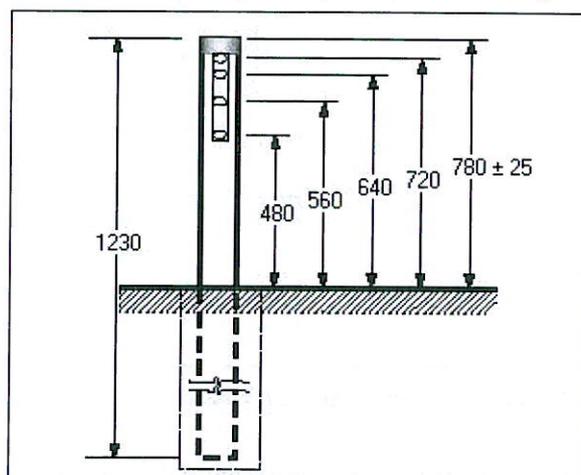


Figure 15: Wire rope safety fence, vertical array

barrier may deflect by more than a metre, meaning that a wire rope installation requires more clear space behind it than is required by a semi-rigid or rigid barrier.

W-beam

One of the most common types of roadside safety barrier on Australian roads is W-beam (Type G4) guard fence. It is a semi-rigid barrier constructed of a steel rail mounted on steel C-channel posts. The profile of the rail resembles

the shape of a 'W' turned on its end (see Figures 14, 15 and 16).

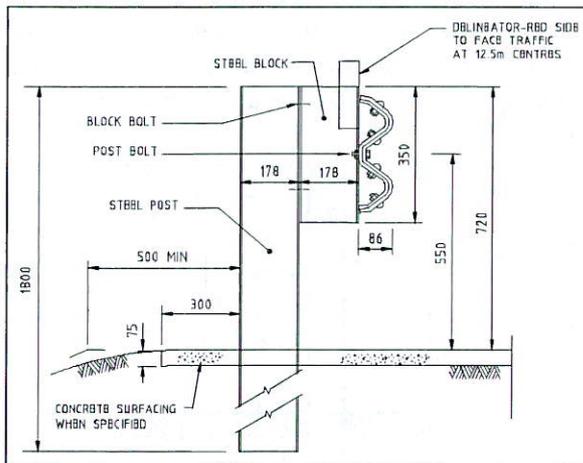


Figure 16: W-beam safety barrier

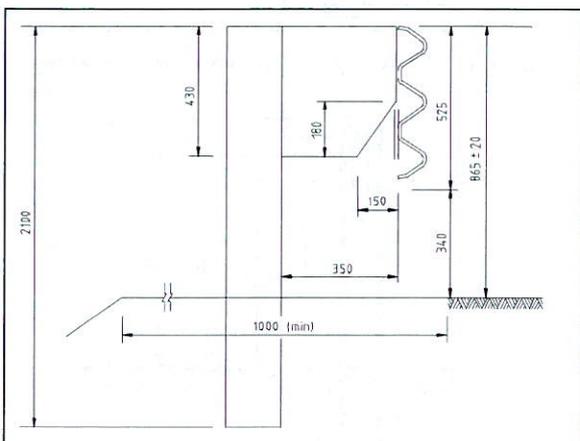


Figure 17: Thrie-beam safety barrier

This type of barrier is designed to deform when struck but to also retain its tensile strength and keep the vehicle from passing through. The deformation of the barrier gradually dissipates the energy of the vehicle impact and aids in redirecting and stopping the vehicle.



Figure 18: W-beam used as a median barrier

Square hollow section

Another type of semi-rigid barrier is the square hollow section barrier. They comprise continuous square hollow sections and weak support posts designed to break away at point of impact to allow the square hollow section to work in tension and allow the errant vehicle to come to rest gradually (see Figure 19). Section 5.4.1.4 of the AASHTO Roadside Design Guide (2002) discusses the box beam barrier.

This type of barrier is no longer recommended by Austroads for use in Australia and should be replaced with wire rope or W-beam safety barrier at the end of its life.



Figure 19: Square hollow section used as a median barrier

Concrete barrier

Concrete barriers belong to the group known as rigid barriers. Rigid barriers are designed to retain their shape and position when struck by a vehicle, thereby requiring no deflection space. Often a rigid barrier is the only appropriate

choice when space is limited, such as the median treatment shown in Figure 21. However, less aggressive barriers should be used where possible

Various types of rigid concrete barrier are shown in Figure 20 below.

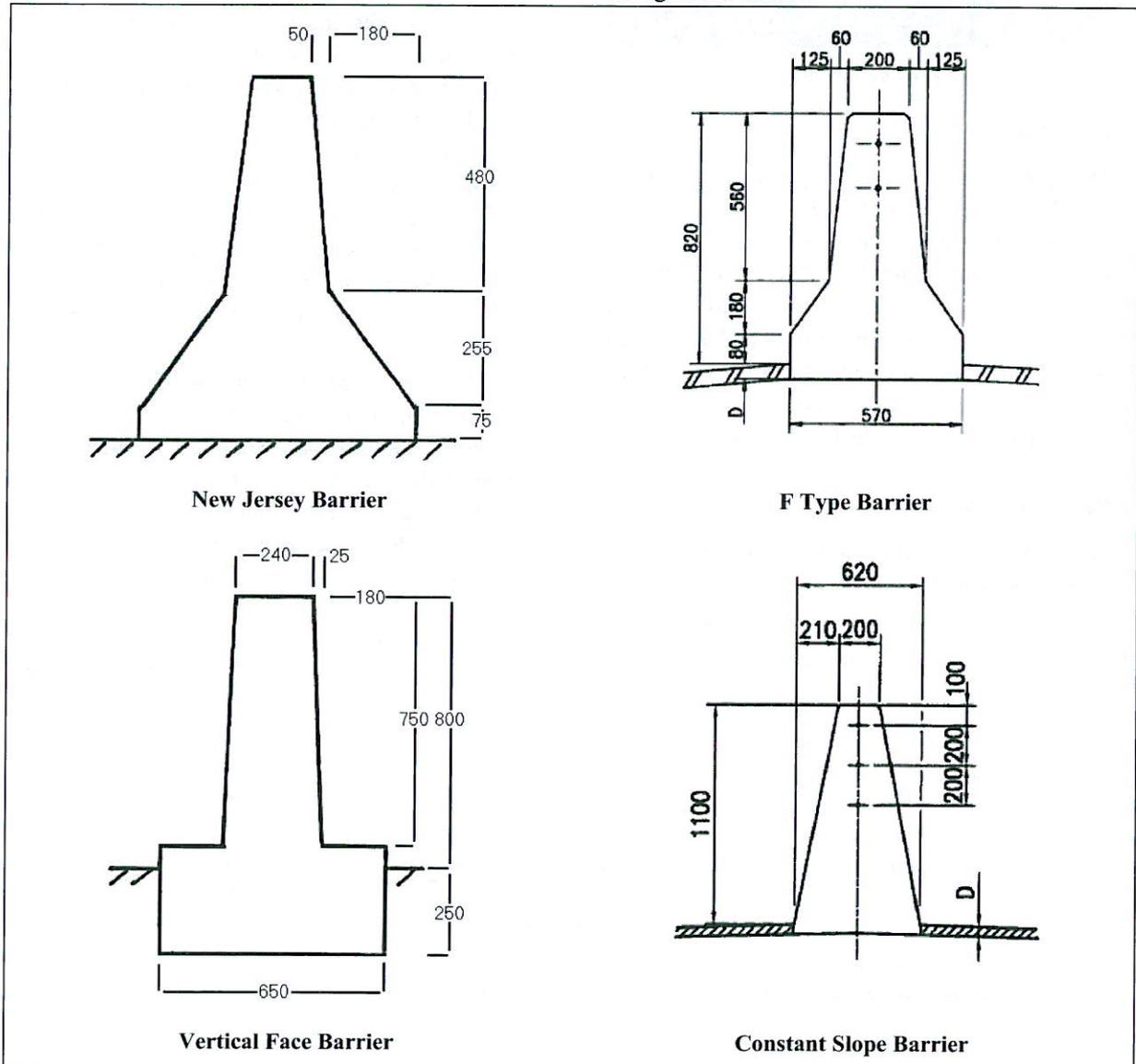


Figure 20: Concrete barrier profiles

The mode of operation of sloping concrete barriers such as New Jersey, F-shape and constant slope barriers is to redirect an errant vehicle and slow it down by forcing it to ride up the side of the barrier.

Concrete barriers and, to a lesser extent, steel beam barriers, can reduce sight distance around bends if not carefully sited. Practitioners should take this into account when specifying barriers on bends and, if possible, take other measures to improve sight distance or warn drivers to take more care of approaching hazards.



Figure 21: Rigid median barrier

Vegetation

An appropriate type of vegetation can slow vehicles down without injuring occupants. It may also be successfully used in conjunction with a manufactured barrier to improve aesthetics. However, vegetation can not be relied upon to act as a reliable continuous barrier, and hence provide protection for motorists. Vegetation can be successful as a headlight screen, particularly on dual carriageways.

Post-and-cable fencing

Post-and-cable fencing is in place along many road sections in Tasmania.

The fencing consists of heavy stranded cable slung between steel I-section posts. Two cables are usually employed, with one cable close to the top of the posts and another cable approximately 250mm below the top cable. The cables are not tensioned.

This type of fencing has not been tested against the criteria in AS3845:1999 and should not be used in any new installations. Any existing installations that require renewal or repair should be removed and replaced with an approved type of safety barrier. W-beam is the suggested replacement for post-and-cable fencing. It is able to be curved to a minimum radius of 3m, making it suitable for the small-radius curves for which post-and-cable fencing has been used in the past.

3.3.3 Layout of safety barriers

An installation of longitudinal safety barrier will usually require a leading terminal, an intermediate section and a trailing terminal. The exact layout of these components will depend on the individual site and barrier type, but the general concept is illustrated in Figure 22.

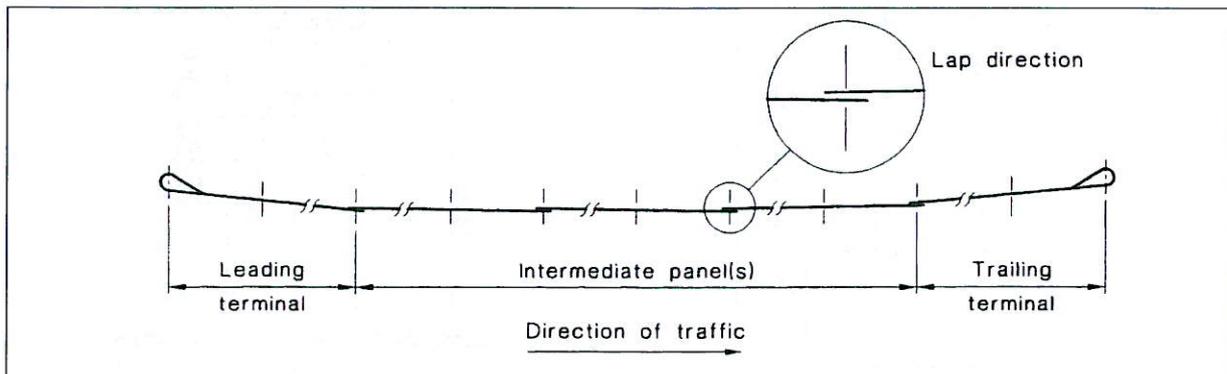


Figure 22: Typical safety barrier layout – plan view (AS3845:1999)

3.3.4 Appropriate lengths

The non-rigid barrier types rely on a degree of tensile strength to enable them to restrain vehicles. They must be of a certain minimum length in order to develop sufficient tension. A barrier that is too short will not be able to deform around a colliding vehicle without breaking off its posts. A recommended minimum length for

any W-beam barrier is 20m plus appropriate end terminals. Practitioners will need to seek advice on minimum lengths directly from barrier manufacturers for specific installations as specifications may vary depending on design.

3.3.5 End treatments

Road safety barrier terminals are covered in section B2.3.11 of AS/NZS 3845:1999. Terminals may be either gating or non gating. *Gating* terminals are designed to allow a vehicle to pass through and come to rest in the clear zone area behind the terminal. Installation of a gating terminal should only be used if a driveable clear zone exists behind the barrier terminal. In other words there should be no hazards behind the gating treatment. If the intended position for a gating terminal is such that a colliding vehicle would pass through the terminal and strike a hazard, the barrier needs to be longer so that the terminal is in front of a more forgiving roadside.

Non-gating terminals are designed to redirect the errant vehicle without allowing it to pass behind the safety barrier. This type of terminal is appropriate if a hazard exists behind the safety barrier.

Terminals for rigid barriers

Unless the approach end of a rigid barrier can be buried in a cut embankment, it will usually be necessary to construct a semi-rigid terminal for the barrier. The junction between the semi-rigid and rigid barriers forms a gradually stiffening surface to guide vehicles onto the rigid barrier after they first make contact with the semi-rigid terminal. Semi-rigid terminals are discussed below.

Where it is necessary to protect road users in head-on impacts with rigid barriers, a crash cushion is the recommended treatment. A crash cushion consists of an arrangement of materials designed to reduce injury in head-on impact with the end of a barrier.

A large range of proprietary crash cushion products are available to suit various site conditions. Many such devices are designed to absorb the impact of a colliding vehicle and then return almost to their full pre-collision position. This design feature enables the unit to function as a crash cushion after a collision. While this feature should not be used as a reason to reduce

maintenance, it does provide a degree of road user protection before repair is undertaken.

Note that it is not acceptable to use a sloped end as a rigid barrier terminal. Such designs **have** been found to increase the risk of colliding vehicles becoming airborne on impact. Where a ramp end exists it should be either removed and replaced with a more appropriate terminal treatment, or shielded by another terminal.

Terminals for semi-rigid barriers

Semi-rigid barriers such as W-beam can be terminated with a number of different terminal designs. The type used in a particular case will depend on the characteristics of the installation.

The breakaway cable terminal (BCTA) is common around Tasmania, although it has been superseded by the slotted breakaway cable terminal (SBCT), which is now the recommended terminal. The SBCT uses weakened timber posts and a slotted W-beam to cause the terminal to break and swing back behind the barrier when struck by a vehicle. The SBCT shown in Figure 23 has a clear, driveable batter behind it.



Figure 23: Slotted breakaway cable terminal (SBCT)

Various other types of terminal are available from a number of commercial manufacturers. The practitioner should consult barrier manufacturers for information regarding appropriate applications. Any terminal used must have met AASHTO's crash test requirements.

Terminals for flexible barriers

Flexible barriers do not require any special terminal treatments. The end of each length of barrier terminates at ground level and does not pose any more injury risk than the rest of the barrier.

3.3.6 Transitions between barrier types

Where two different types of barrier meet, it is necessary for a transition treatment to be constructed at the junction of the two barriers. For example, to connect a W-beam (semi-rigid) barrier to the concrete (rigid) barriers on a bridge requires a transition element stiff enough to ensure that a vehicle sliding along the deforming semi-rigid barrier does not suddenly become snagged on the unforgiving rigid barrier. The transition piece in this case is formed by a progressive stiffening of the W-beam for a short distance leading up to the rigid barrier. The additional stiffness is generated by closer spacing of support posts and nesting of two layers of W-beam. These features are shown in Figure 24.



Figure 24: Semi-rigid (W-beam) to rigid barrier (bridge barrier) transition

A transition between flexible and semi-rigid barriers can be constructed by overlapping the flexible barrier in front of the semi-rigid barrier. A vehicle sliding along the flexible barrier will be travelling in a reasonably straight line and, at the end of the flexible barrier, will continue to slide along the semi-rigid barrier.

A transition from flexible to rigid can be achieved in a similar manner, by overlapping the departure end of the flexible barrier with the start of the rigid barrier. The posts of the flexible barrier will need to be positioned closer together on the approach to the rigid barrier to reduce deflection and thereby prevent a vehicle colliding with the end of the rigid barrier.



Figure 25: Wire rope safety barrier used as a median barrier – in transition with square hollow barrier

3.4 Works zones

During works on or near a roadway, protection of workers needs to be ensured, as well as maintaining a safe environment for pedestrians and motorists. The purpose of any temporary safety barriers at a works zone is therefore to redirect errant vehicles, preventing them from entering the works area, and minimise injury to the vehicle's occupants.

Safety barriers for works zones are designed to be portable, providing for quick installation and removal or relocation.

Works zone barriers may be necessary for a number of reasons:

- preventing vehicles from driving into works areas
- separating opposing flows of traffic on a temporarily constricted carriageway

- protecting incomplete structures from vehicle impact
- reducing or eliminating the need for temporary reductions in speed limit.

The decision to install temporary safety barriers at works zones must be made as part of a full assessment of the traffic management needs of an individual works zone. Such an assessment must be made in accordance with the *Tasmanian Code of Practice for Traffic Control at Works Sites* (DIER 2004). Practitioners should refer to that document for guidance in this area.

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**Onshore Seismic Survey Traffic Management Plan
Great South Land Minerals Ltd**



Appendix E:
DIER G2 Contract Management Plan

DEPARTMENT of INFRASTRUCTURE, ENERGY and RESOURCES, TASMANIA

GENERAL SPECIFICATION

G2 – CONTRACT MANAGEMENT PLAN

February 2005

Contents	Page
G2.1 SCOPE	3
G2.2 SUBMISSION and APPROVALS	3
G2.2.1 Submission	3
G2.2.2 Approvals	3
G2.2.2.1 Use of land not in the Contract Site	3
G2.2.2.2 Pits and Quarries	3
G2.2.2.3 Cartage over Council Roads	3
G2.2.2.4 Traffic Diversions and Detours	3
G2.2.2.5 Rail Crossings	4
G2.3 ENVIRONMENTAL MANAGEMENT	4
G2.3.1 General	4
G2.3.2 Environmental Site Meeting	4
G2.3.3 Noise	4
G2.3.4 Archaeological, Botanical and Heritage Features	4
G2.3.5 Aboriginal Artefacts	4
G2.3.6 Protection Works	4
G2.3.7 Topsoil	5
G2.3.8 Run Off	5
G2.3.9 Hazardous Materials	5
G2.3.10 Site Quarantine	5
G2.3.11 Lighting of Fires	5
G2.3.12 Blasting and Structurally Damaging Processes ♦	5
G2.4 QUALITY	6
G2.4.1 Quality	6
G2.4.2 General	6
G2.4.3 Inspection and Test	6
G2.4.4 Control of Construction Processes	6
G2.4.5 Identification and Traceability	6
G2.4.6 Defective Work	6
G2.4.7 Superintendent's Audits	7
G2.5 OCCUPATIONAL HEALTH AND SAFETY	7
G2.5.1 Occupational Health and Safety - General	7
G2.5.2 Hazard and Risk Assessment	7
G2.5.3 Safety Management Plan	7
G2.5.4 Incident Notification	7
G2.6 TRAFFIC MANAGEMENT ♦	8
G2.6.1 General	8
G2.6.2 Site Plans	8
G2.6.3 Site Classification for Traffic Management	8
G2.6.4 Critical Exposure Sites:	8
G2.6.5 Performance Requirements	9
G2.6.6 Records	9
G2.6.7 Devices	9
G2.6.7.1 Rotating Yellow Lamps	9
G2.6.7.2 Fixed Multi Message Signs ♦	9
G2.6.7.3 Traffic Controllers ♦	10
G2.6.7.4 Delineation of the Traffic Path ♦	10
G2.6.7.5 Work Site Protection ♦	10
G2.6.8 Side Tracks	10

G2.6.8.1 Standard of Side Tracks10
G2.6.8.2 Payment for Side Tracks11
G2.7 PUBLIC CONTACT.....11
G2.8 DURABILITY AND LIFE ASSURANCE PLAN AND PROCEDURES.....11
G2.8.1 Durability and Life Assurance Plan and Procedures11
G2.9 MAINTENANCE PROCEDURES11
G2.9.1 General11
G2.9.2 Works by Other Contractors12
G2.9.3 Maintenance Contractor Responsibilities12
G2.9.4 Maintenance of Trafficked Surfaces12
G2.10 Emergency Contacts.....12
G2.11 HOLD POINTS.....12

ANNEXURE G2.1 PROJECT SPECIFIC DETAILS
ANNEXURE G2.2 TRAFFIC MANAGEMENT DETAILS
ANNEXURE G2.3 SURVEY OF STRUCTURES
ANNEXURE G2.4 NOTICE OF DEFECTIVE WORK

G2.1 SCOPE

This specification sets out the requirements for the Contract Management Plan that shall include the following elements as appropriate for the Contract:

- Environmental Management
- Quality
- Occupational Health and Safety
- Traffic Management
- Public Contact
- Durability and Life Assurance Plan and Procedures
- Maintenance Procedures for the Defects Liability Period.

Aspects to be included are specified in the relevant Australian Standards, Legislation and Regulations as well as this Specification

G2.2 SUBMISSION and APPROVALS

G2.2.1 Submission

Two controlled copies of the Contract Management Plan shall be provided to the Superintendent within 14 days of the Notification of Contract.

G2.2.2 Approvals

G2.2.2.1 Use of land not in the Contract Site

If the Contractor intends to negotiate with any landowner to use any areas outside the road reserve, or the Limits of Contract, for any reason, written authorisation to use that area shall be obtained from:

- (i) the Department of Primary Industry Water & Environment for Crown Land
- (ii) the relevant Local Planning Authority.

A copy of all correspondence shall be given to the Superintendent prior to any works proceeding.

Prior approval of the Superintendent shall be obtained where any site offices, sheds, stores, stock piles, dump sites or working areas are located within the limits of contract and/or the road reservation outside the Limits of Contract.

G2.2.2.2 Pits and Quarries

The Contractor shall provide to the Superintendent evidence of the existence of a licence from Department of Primary Industries, Water & Environment for any quarry or pit, to be used for the purpose of this contract, including any condition placed on that licence, prior to use of any material therefrom.

G2.2.2.3 Cartage over Council Roads

Where the Contractor wishes to cart materials over Council or privately owned roads, including those of semi government authorities, to or from the site for the purposes of this Contract, then the Contractor shall obtain and provide evidence to the Superintendent of approval for cartage from the owners prior to the commencement of work. Further, the Contractor shall pay any levies, tolls and maintenance costs required, to cover reinstatement of damage to, or premature ageing of, those roads, as required by the owners. The cost of meeting any such expenses shall be deemed to have been included in the lump sum or in the relevant rates tendered for the Contract.

G2.2.2.4 Traffic Diversions and Detours

Traffic diversion onto, or closure of, council, private or other Government Authorities roads shall not be permitted until a written authorisation has been obtained by the Contractor from the owners and other relevant authorities with a copy given to the Superintendent seven (7) days prior to use.

The Contractor shall be responsible for the maintenance and repair of any damage to these roads.

G2.2.2.5 Rail Crossings

If the Contractor wishes to gain access at any additional railway crossing points, the Contractor shall notify the Superintendent and make appropriate arrangements with TasRail for a temporary rail crossing licence.

Failure of TasRail to approve an additional crossing shall not be a basis of a claim against the Principal.

G2.3 ENVIRONMENTAL MANAGEMENT

G2.3.1 General

The Environmental Management shall be in accordance with:

- (i) the performance requirements of this Specification,
- (ii) the Tasmanian Environmental Management and Pollution Control Act and Regulations
- (iii) A.S. 14001 Environmental Management Systems Specification and
- (iv) A.S. 14004 Environmental Management Systems General Guidelines

G2.3.2 Environmental Site Meeting

As specified elsewhere the Contractor shall attend an environmental site meeting to ensure that there is full understanding of the environmental protection measures required.

G2.3.3 Noise

The Contractor shall take all practicable measures to minimise noise resulting from his activities. All construction equipment shall be fitted with noise suppressors or silencers of a type recommended by the equipment manufacturer.

Loud hailers shall not be used for routine site communications.

G2.3.4 Archaeological, Botanical and Heritage Features

Any tree or hedge trimming required for the works shall be kept to a minimum.

Where there are a number of trees, shrubs, hedges, grasses and other features both inside and outside the boundary which are to be retained, they shall be treated in accordance with Specification R75. These shall be shown on the drawings, flagged on site or nominated by the Superintendent at the site meeting.

All trees within the new property boundary shall be retained if they fall outside the extent of the earthworks unless otherwise specified. Unnecessary "tidying up" of the bush such as scraping and brush clearing shall not be permitted.

Any disturbance outside the limits of the earthworks as defined in Specification R22 shall incur a penalty of \$1,000 plus a portion of the following rates:

- | | | |
|-----|---|---------------|
| (a) | General areas | \$6,000 / ha |
| (b) | Rare plant areas as indicated by the Superintendent | \$30,000 / ha |

G2.3.5 Aboriginal Artefacts

Should any Aboriginal artefacts be uncovered by the works, the Contractor shall immediately stop works affecting the find site and inform the Superintendent who will arrange for a Consultant to collect, identify and map the artefacts.

G2.3.6 Protection Works

The cost of any environmental protection works such as silt traps or fences, required by other Authorities outside the limits of contract shall be the Contractor's responsibility.

G2.3.7 Topsoil

No topsoil shall be stockpiled on areas of botanical importance which are indicated by preservation fencing type 1 or 2 as defined in Specification R75.

Topsoil shall not be removed from the site.

G2.3.8 Run Off

Run off from areas affected by pollutants such as oil, grease and any other waste material that may adversely affect the area shall be contained and removed from the site.

Stream diversions and dirty run off shall be managed to the satisfaction of DPIWE.

G2.3.9 Hazardous Materials

The Contractor shall prepare incident control procedures to be adopted to identify and control any hazardous materials either found on site or if the site is contaminated by a spill.

G2.3.10 Site Quarantine

The Contractor shall ensure that no soil, organic matter or seeds are transported to or from the site. All earthmoving machinery shall be washed down before entering or leaving the site.

G2.3.11 Lighting of Fires

Fires shall not be lit for any purpose within the limits of contract or road reservation. Outside the road reservation the Contractor shall observe the Fire Service Act and Regulations and other statutory requirements including permission from the Department of Primary Industries, Water & Environment relating to the lighting of fires, and shall give the occupiers of adjoining properties at least 24 hours notice before any burning off is commenced.

G2.3.12 Blasting and Structurally Damaging Processes ◆

The Contractor shall be responsible for any damage to any structures or buildings on or near the site caused by his operations. Blasting shall not be permitted within 500m of a high pressure gas pipeline.

The zone adjacent to earth retaining structures shall be compacted to the same density as the remainder of the fill by use of light mechanical plant using layers of appropriate thickness.

Before using explosives or other processes (including vibrating rollers) with the potential to cause structural damage through ground vibrations, the Contractor shall conduct a survey of all structures which he deems may be subject to any adverse effect from the operation or which may give rise to any claim by an owner. As a minimum, this survey shall include all structures within 200 metres of proposed blasting or use of pile drivers, and 100 metres of proposed use of vibrating rollers of mass greater than 8 tonnes. The survey shall be carried out by a qualified building surveyor, architect or engineer who is covered by Professional Indemnity Insurance.

Ancillary structures such as out buildings, concrete and paved areas, services and vegetation (eg. large trees) shall be part of the main structure survey.

The report for each structure shall be on the forms supplied at Annexure G2.3 or similar. The submission of all reports to the Superintendent is a hold point for the commencement of all other works.

Payment for each report shall be at Schedule Item 8.02.

When blasting is required, the Contractor shall obtain the necessary licences and shall conform to the requirements of the State Explosives Regulations relating to transport, storage, handling and use of explosives. Use of explosives shall also be in accordance with the rules contained in A.S. 2187, Part 1 and Part 2.

The Contractor shall keep records of each firing, showing blasting pattern, quantity and type of explosive used, firing delay, date and time of detonation. Included shall be the quantity of explosives for each delay.

When blasting operations are being carried out, the road shall be closed and appropriate signs erected. Residents within a distance whereby they may feel the blast shall be informed and necessary precautions taken before setting off any blast.

G2.4 QUALITY

G2.4.1 Quality

The Contractor shall plan, develop and maintain a documented quality system in accordance with

- (i) the performance requirements of this Specification,
- (ii) Australian Standard ISO 9001, Quality Management Systems - Requirements.

G2.4.2 General

The Quality elements shall show how the Contractor intends to assure, and be able to demonstrate, that the requirements of the specification are met. No provision of the Contract Management Plan shall over-rule the requirements of the Specifications.

The Contract Management Plan shall describe the application of the Contractor's Quality System to the Contract, and shall include, in particular, details listed in the following clauses.

Project specific items listed in Annexure G2.1 are additional requirements which shall be fully described in the Contractor's Contract Management Plan.

G2.4.3 Inspection and Test

- (i) Inspection and Test Plan

The contractor shall develop inspection and test plans (ITPs) as part of the Contract Management Plan.

- (ii) Registered Laboratories

All quality control tests undertaken by the Contractor shall be performed by laboratories currently registered with NATA for the relevant test, and test reports shall be certified by a NATA accredited signatory.

G2.4.4 Control of Construction Processes

The Contractor shall detail procedures and/or work instructions for construction processes under the contract in the Contract Management Plan.

G2.4.5 Identification and Traceability

Recording systems shall be maintained to provide a traceable link between test data and the subsequent use of that data in the implementation of DIER specifications.

All test data shall be defined in terms of dates and precise locations.

The inspection and test plans shall define the system of recording and oversight of all test and calibration data. It shall cover test data for both incoming and outgoing products.

The Contractor shall maintain data and undertake such statistical analysis and prepare control charts as necessary to demonstrate process control and product compliance as defined in other parts of DIER Specifications. All such process control data shall identify the source of the test data in terms of date of test and test identification.

A registration system shall be implemented to control all calibration requirements, inspection and test plans, incoming and outgoing products, etc.

G2.4.6 Defective Work

The Contractor shall promptly notify the Superintendent of any product and service non-compliance, except where conformance is to be achieved by a continuation of the original process. Notification shall be submitted as a Notice of Non-Compliant Work and shall indicate the proposed method of rectification for approval by the Superintendent.

The Contractor shall use the standard form for Notice of Non-Compliant Work located in Appendix G2.4.

A hold point shall apply prior to covering up rectification work to allow the Superintendent to inspect the work.

G2.4.7 Superintendent's Audits

The Superintendent may carry out at any time an Audit of the Contractor's Systems. Such audits may include system or product compliance audits and require access by the Superintendent to the Contractor's offices, factories or site works.

Where the Superintendent's audit indicates nonconformance in a process or procedure, the Contractor shall submit a proposal for remedial action, for approval of the Superintendent.

Where the Superintendent's audit indicates a nonconformance in a test or measurement which would lead to failure of a lot or batch to satisfy specified requirements for acceptance, then the Contractor shall either:

- i) accept the Superintendent's tests or measurements, and hence submit a proposal for remedial action for approval of the Superintendent
- or ii) carry out repeat tests or measurements, which shall be subject to a process audit by the Superintendent. The results of the repeat tests or measurements shall be used for determining acceptance or otherwise of the lot or batch as defined in the Specification.

In the event that the repeat test or measurement confirms acceptance of the lot or batch by prior testing by the Contractor, with no additional work carried out thereon between the Superintendent's audit and the Contractor's retest, then the Contractor may seek reimbursement of the cost of the retest, and an extension of time if the activity concerned was on the Critical Path for the works.

G2.5 OCCUPATIONAL HEALTH AND SAFETY

G2.5.1 Occupational Health and Safety - General

Occupational Health and Safety provisions shall be in accordance with:

- (i) the performance requirements of this Specification,
- (ii) the Tasmanian Workplace Health & Safety Act and Regulations
- (iii) A.S. 4804 Occupational Health and Safety Management Systems.

This element shall demonstrate that the Contractor has assessed and understood the hazards and risks and has procedures in place to ensure that his Duty of Care to provide a safe workplace for his own workers, sub-contractors and the public during the execution of the Contract is achieved.

G2.5.2 Hazard and Risk Assessment

This element shall include an initial comprehensive hazard identification and risk assessment. In addition to this initial assessment attention is drawn to the requirement of the Regulations to maintain records of risk assessments throughout the Contract as work processes change on the site.

G2.5.3 Safety Management Plan

Tasmanian Workplace Health & Safety Act and Regulations require a Safety Management Plan, in a form approved by the Director, to be submitted to the Workplace Safety Division for projects over \$2million and may require it for smaller projects. Workplace Safety has 10 days to respond to that Plan. Work on site shall not proceed until Workplace Safety has approved the Safety Management Plan. The Safety Management Plan shall form part of the Occupational Health and Safety element of the Contract Management Plan.

G2.5.4 Incident Notification

The Contractor shall provide to the Superintendent, within 7 days of any accident / incident, a copy of the accident / incident report which must include remedial actions to avoid a recurrence of the accident / incident.

G2.6 TRAFFIC MANAGEMENT ◆

G2.6.1 General

The Contractor shall:

- (i) Provide a safe work site for the public and site personnel at all times and in all conditions,
- (ii) Manage traffic flow through the site with delays and inconveniences held within the performance limits of this Specification.

Traffic Management shall be in accordance with:

- (i) The Tasmanian Traffic Act
- (ii) The Tasmanian Traffic (Road Rules) Regulations
- (iii) Traffic Control at Work Sites Code of Practice
- (iv) The performance requirements of this Specification,
- (v) AS 1742 Part 3 and AS/NZS 3845 and
- (vi) Australian Standard Safety at Roadworks handbooks.

The precedence of the documents shall be in the order as listed above.

G2.6.2 Site Plans

Traffic management for all work sites shall cover, as a minimum, the following:

- (i) Details in accordance with AS1742.3 - Section 2,
- (ii) Methods of communication,
- (iii) How the Contractor intends to provide advance warning to the public on delays/diversions ,
- (iv) The staging of works (marked up on plan overlays for each stage of the works),
- (v) How the Contractor proposes to open the site to clear traffic backup,
- (vi) The names and qualification level of all personnel to be involved in traffic control,

Annexure G2.2. and the Form of Tender indicate details of traffic management required at the time of tender.

Traffic volume data is included in Annexure G2.2.

Speed restriction zones shall only be imposed over the localised area as required.

G2.6.3 Site Classification for Traffic Management

Work sites, or each part of a work site where a different traffic management regime is employed, shall be classified as one of the following:

- (i) Critical Exposure Site
- (ii) Non Critical Site

Where the specification includes such a classification, it shall apply.

Where no classification is specified, the Contractor shall classify the site, or part, using the following criteria:

- (i) A Critical Exposure site is one at which Annual Average Daily Traffic exceeds 3,500 vpd (sum of two directions)
- (ii) A Non Critical site is one that is not Critical Exposure. However the requirements of Specification G2.6.5 may require that the site be classed as Critical Exposure.

G2.6.4 Critical Exposure Sites:

For these sites the traffic management shall also include the following:

- (i) Identification by name and mobile telephone number the person who shall be on site at all times during work, in continuous mobile telephone contact with responsibility for implementing the traffic management, monitoring performance achievement and having full authority to cease work or take other emergency action when the procedures do not achieve the performance requirements.
In areas outside mobile phone range either radio or satellite phone contact shall be provided.
- (ii) Special provision for local landowners and businesses and the nature and timing of personal contact to advise of the effects and how and to what extent special needs will be addressed.
- (iii) Information on how any adjacent works by other contractors or statutory authorities are to be coordinated. The Contractor is responsible for obtaining this information.
- (iv) The nature of actions to cover the contingency where procedures do not achieve the requirements of this Specification.

G2.6.5 Performance Requirements

The following requirements shall apply to "long term" work sites, as defined in AS1742.3 Clause 1.4 only.

A delay shall be defined as the actual stoppage time measured from the time at which the first vehicle is stationary.

The duration of stopping for any vehicle shall not exceed 15 minutes where there has been advance warning to the public.

Where there has been no advance warning, the Contractor shall ensure that a stoppage time of 8 minutes is not exceeded. Tenderers shall show how this will be achieved and if not, why not. The Contractor shall employ the method proposed at time of tender or such other method as is needed to achieve this performance requirement unless the tender indicated the requirement would not be achieved and the tender was accepted without amendment.

Advance warning shall be in the form of adequate signage stating "expect delays for the next km from (month/year) to (month/year)". The sign should also advise on alternative routes in association with the signs and devices specified at Section 3 of AS1742.3. These shall be installed at least 7 days prior to work commencing. The signs shall be at each end of a contract or works site

Emergency services such as Police, Ambulance and Fire Brigades shall be advised in writing at least 7 days prior to any planned event likely to cause delays. Emergency contacts are listed on Annexure G2.2.

All media advertisements for traffic delays/diversions will be arranged by the Superintendent on the advice of the Contractor. The Contractor shall provide all details at least 7 days prior to the delay / diversion, together with evidence of all the relevant owner / authority approvals.

G2.6.6 Records

The Contractor shall comply with the guidelines and procedures set out in Appendix A of AS 1742.3.

G2.6.7 Devices

G2.6.7.1 Rotating Yellow Lamps

All construction vehicles being used on the work site shall have activated cab-mounted yellow rotating lamps fitted with a minimum 50w Halogen bulb.

G2.6.7.2 Fixed Multi Message Signs ◆

Fixed multi message signs may be used in accordance with all other requirements of this Specification, Specification R63, The Code of Practice and the following:

- (i) They shall only be used as a temporary sign during daylight working hours.
- (ii) Size shall be minimum 1200 mm x 900 mm.

- (iii) Maximum of three (3) logically linked messages per sign with one minimum 600 mm x 600 mm message plate symbolic.
- (iv) There shall be no conflicting messages used.
- (v) Speed plates shall always be closest to traffic mounted beside the other plate.
- (vi) Colours and Legends shall be in accordance with AS 1742. A road safety message may be white on a blue panel using class 2 sign material.
- (vii) Signs may be double sided.

G2.6.7.3 Traffic Controllers ◆

All personnel involved in traffic control shall have valid current accreditation having attended a recognised Traffic Management course for the relevant level of traffic control.

G2.6.7.4 Delineation of the Traffic Path ◆

Delineation of the traffic path shall be in accordance with AS1742.3. Star pickets shall not be used within 1.2m of traffic.

G2.6.7.5 Work Site Protection ◆

A safe work site shall be provided by the provision of physical separation and protection from traffic where possible. Energy absorbing devices shall be utilised to protect workers at lane closures, or slow moving mobile work sites unless the Contractor can demonstrate that the risk to workers has been adequately addressed by alternative means.

Slow moving mobile work sites are works travelling at 30km/h or less.

Energy absorbing devices include truck-mounted attenuators and temporary road safety barriers.

G2.6.8 Side Tracks

G2.6.8.1 Standard of Side Tracks

Further to AS1742.3 all sidetracks shall:

- (i) Be designed in accordance with AUSTROADS Rural Road Design Guide 1989. Sidetracks in use for more than one week shall be sealed and line marked with temporary pavement markings in accordance with Specification R64.

At least two (2) weeks prior to the construction of the sidetracks the Contractor shall submit to the Superintendent detailed drawings of the proposed sidetracks including all signs and linemarking. Linemarking details shall cover existing and temporary linemarking and the removal of conflicting and temporary linemarking.

The submitted drawings shall have been certified by an Engineer experienced in road design, who has qualifications admitting to Corporate Membership of the Institution of Engineers, Australia.

The submission of the drawings of the sidetracks to the Superintendent does not constitute approval of the design and shall not in any way relieve the Contractor of the responsibility for the satisfactory performance and adequacy of the sidetracks.
- (ii) Have a lateral clearance of at least 1.2 m from any obstruction. In difficult situations, however, the Superintendent may authorise a reduced clearance with an absolute minimum of 600 mm.
- (iii) Have a maximum grade of 6 percent.
- (iv) Be not less than 7 m wide if intended for two lanes of traffic and not less than 3.5 m wide if intended for single lane, one way traffic.
- (v) The design shall provide for a minimum drainage opening as specified elsewhere, or if not specified, a minimum of a one year flood capacity including any necessary rock pitching.
- (vi) Be completely removed and the area reinstated when the works are completed.

G2.6.8.2 Payment for Side Tracks

Where a sidetrack is required by the Specification, payment for the design, construction, maintenance and removal of the sidetrack shall be as per the item in the Schedule of Rates. Where a sidetrack is not required by the Specification, the cost of the design, construction, maintenance and removal of the sidetrack shall be deemed to have been included in the rates for the other items in the Schedule.

G2.7 PUBLIC CONTACT

The Public Contact Element shall detail how the Contractor will communicate with the public and shall include consideration of:

- (1) Protocols for liaising with all stakeholders, including emergency services and the media.
- (2) Who should be consulted / informed.
- (3) Why should they be consulted / informed
- (4) What should be communicated.
- (5) When it should be communicated.
- (6) How it should be communicated.
- (7) Protocols for dealing with public complaints and feedback.

The Contractor shall not issue any information, publication, document or article for publication concerning the project in any media without prior approval of the Superintendent, which shall not unreasonably be withheld. The Contractor shall refer to the Superintendent any enquires concerning the project from any media.

G2.8 DURABILITY AND LIFE ASSURANCE PLAN AND PROCEDURES**G2.8.1 Durability and Life Assurance Plan and Procedures**

This section shall include relevant analysis and testing procedures to be adopted in the design and construction to demonstrate and assure the Principal that the element has been designed and constructed in accordance with the Specifications and that the specified design life and durability will be achieved for the pavement, structure or other element for which a design life is specified.

Documentation to demonstrate that the durability shall be achieved shall form part of the Records. Records shall include any necessary statistical analysis.

Evidence, from the supplier, of compliance with Specification G6 shall be included in the Contract Management Plan. Evidence shall include control charts, quarry inspection records, details of reference specimens, durability test records and production control plans. For pavement materials evidence shall include details identified in Specification R40.

G2.9 MAINTENANCE PROCEDURES**G2.9.1 General**

The scope of the maintenance requirements during the Contract and Defects Liability Period are identified in Appendix G2.1.

The inspection frequency and maintenance procedures necessary for the upkeep of the works for the duration of the Construction and Defects Liability Period shall be detailed in the Contract Management Plan. Within 14 days of the issue of the Certificate of Practical Completion the Contract Management Plan defects identification and remediation procedures and maintenance provisions, where required by the Contract, shall be reviewed and the amended Plan reissued. These shall include the planning, inspecting, reporting, monitoring, executing and controlling of the processes involved in each activity, and note how product verification is to be achieved.

G2.9.2 Works by Other Contractors

The Contractor shall be responsible for the liaison and co-ordination of his work with any other Contractors or Authorities working in the vicinity of any maintenance activities.

G2.9.3 Maintenance Contractor Responsibilities

Where a Maintenance Contractor has been engaged to maintain a section or region of the State Road Network that Contractor shall only be responsible for maintenance of those nominated activities, as advised by the Superintendent, which are within the Limits of Works under road reconstruction or road reinstatement contracts between the date of Possession of Site and the Date of Practical Completion of these contracts.

Following Practical Completion of these other contracts, the Maintenance Contractor will be responsible for maintenance on these contract sites except for minor omissions and defects that are the responsibility of the construction contractor. The Superintendent shall advise of the location, date of possession of site and the date of practical completion for these other contracts and defects nominated to be repaired by the construction Contractor at the issue of the Certificate of Practical Completion.

G2.9.4 Maintenance of Trafficked Surfaces

The Contractor shall maintain, for the passage of the travelling public, all trafficked surfaces in a safe, dust free condition for all users at all times, particularly overnight and during weekends and public holidays.

Any damage resulting from traffic or any other cause shall be made good at the Contractor's expense.

Should the Contractor not carry out this maintenance then, the Superintendent may carry it out and the cost, as determined by the Superintendent, shall be deducted from payment to the Contractor.

All costs associated with this maintenance shall be deemed to have been included in the rates of all items comprising the Schedule of Rates.

G2.10 Emergency Contacts

The Contractor shall provide a 24 hour emergency contact and call out service adequately covering the whole maintenance area or contract site included in the contract to meet the emergency response times in Specification R101 Emergency Requirements. The Contractor shall provide details of names, addresses and telephone contact numbers in the Contract Management Plan.

Any changes to the list provided shall be advised in writing to the Superintendent within 48 hours.

G2.11 HOLD POINTS

Definition: Those points beyond which the work shall not proceed without review and release by the Superintendent.

All hold points identified in the Specification, and in Annexure G2.1, shall be defined in the Contract Management Plan, including information to be supplied at the hold point and who shall be responsible for its approval.

The release of a hold point shall not relieve the Contractor of his responsibility to construct the works in accordance with the Specification.

Except where specifically amended in Annexure G2.1 the following conditions shall apply to hold points.

- the Contractor shall give at least 2 working days prior notice of the Hold Point
- all relevant test and verification results shall be available for inspection by the Superintendent at the time of the Hold Point
- the Contractor shall allow for one working day at the Hold Point for the Superintendent to attend the site and inspect the work and documentation.

The Contractor may initiate additional hold points if considered necessary.

The following hold points are identified in this Specification.

Ref	Description of Holdpoint	Nominated Work not to proceed
G2.4.2	Those specified in Annexure G2.1	
G2.2.2.1	Copies of correspondence with landowners prior to work on their land.	Work on land owned by others.
G2.2.2.1	Prior to siting site offices, sheds, stores or depots.	Site works
G2.2.2.1	Prior to establishing a stockpile in the road reservation.	Establishment of a stockpile in the road reservation.
G2.2.2.2	Prior to using a pit or quarry.	Supply of material from a pit or quarry.
G2.2.2.3	Prior to cartage over Council or private roads.	Cartage over Council or private roads.
G2.2.2.4	Prior to diversion of traffic onto Council or private roads.	Diversion of traffic onto Council or private roads.
G2.3.5	The finding of any Aboriginal artefact.	All work in the area of the find.
G2.3.12	Structural reports prior to commencing all other works.	All work likely to damage structures.
G2.4.4	Prior to changes to procedures and / or work instructions for construction processes.	Changes to procedures and / or work instructions for construction processes.
G2.4.6	Any product and service non-conformance	Works affected by the non-conformance
G2.5.3	Approval of the Safety Management Plan when required by Workplace Safety.	All work
G2.6.5	Prior to any planned delay or diversion of traffic	Delay or diversion of traffic
G2.6.8	Prior to the construction of a sidetrack.	Construction of a sidetrack.

ANNEXURE G2.1 - PROJECT SPECIFIC DETAILS

CONTRACT NO.
 CONTRACT NAME:

ADDITIONAL CONTRACT MANAGEMENT PLAN REQUIREMENTS

ADDITIONAL SUPERINTENDENT'S HOLD POINTS

MAINTENANCE REQUIREMENTS (G2.9)

	During Construction		During Defects Liability	
	Included	Not Included	Included	Not Included
<u>Sealed Pavement</u> Schedule of Rates Items	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> 5.19, 5.20, 5.22, 5.23	<input type="checkbox"/>
<u>Shoulders</u> Schedule of Rates Items	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> 5.21	<input type="checkbox"/>
<u>Traffic Facilities</u> Schedule of Rates Items	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 6.09, 6.15, 6.27	<input checked="" type="checkbox"/>
<u>Drainage</u> Schedule of Rates Items	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 3.37, 3.38, 3.39	<input checked="" type="checkbox"/>
<u>Vegetation</u> Schedule of Rates Items	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 7.08, 7.16, 7.17, 7.18, 7.19	<input checked="" type="checkbox"/>

Where routine maintenance is required during the Defects Liability Period a quantity for the schedule items for the maintenance works must be provided in the payment schedule.

ANNEXURE G2.2 - TRAFFIC MANAGEMENT DETAILS

CONTRACT NO.
 CONTRACT NAME:

(i) TRAFFIC MANAGEMENT DETAILS REQUIRED AT TENDER

None

- How delays of less than 8 minutes, without Advance Warning will be achieved
 - Specification G2.6.5 - For all sites,

(ii) PEAK TIMES

(iii) TRAFFIC VOLUME DATA

(iv) EMERGENCY CONTACTS

Fire Services Tasmania	Ph: (03) 6230 8420	Fax: (03) 6234 1465
Ambulance	Ph: 1800 008 008	Fax: (03) 6230 8515
Police - Officer in Charge	Ph: (03) 6336 3933 (North)	Fax: (03) 6336 3887
	(03) 6230 2260 (South)	Fax: (03) 6230 2261
	(03) 6230 2837 (East)	Fax: (03) 6230 2760
	(03) 6434 5215 (West)	Fax: (03) 6434 5250

Note: Contractor is responsible for establishing boundaries between districts.

Contractor to advise (and to record) all Emergency Services at least seven (7) days prior to any planned event likely to cause delays.

G2 – CONTRACT MANAGEMENT PLAN
ANNEXURE G2.3 - SURVEY OF STRUCTURES

February 2005

Page 1

Contract No.:

Contract Name:

Address:

Date of Inspection:

Property Owner:

Present at Inspection:

(Name and Title)

Description and Age:

General Photo of Location:

Signed

.....
Inspector
covered by Professional
Indemnity Insurance

.....
Contractor

.....
Property Owner

Date:

.....

.....

.....



BUILDING CONSTRUCTION

Exterior Cladding

- | | | | |
|-----------------------|--------------------------|-----------------------------|--------------------------|
| <i>Brick</i> | <input type="checkbox"/> | <i>Suspended slab</i> | <input type="checkbox"/> |
| <i>Block</i> | <input type="checkbox"/> | <i>Timber</i> | <input type="checkbox"/> |
| <i>Weatherboard</i> | <input type="checkbox"/> | <i>Other</i> | |
| <i>Applied Finish</i> | <input type="checkbox"/> | <i>Support System</i> | |
| <i>Other</i> | | <i>.....</i> | |

Foundation Walls

- | | | | |
|--------------------|--------------------------|----------------------------|--------------------------|
| <i>Brick/Block</i> | <input type="checkbox"/> | <i>Box / eaves gutters</i> | <input type="checkbox"/> |
| <i>Concrete</i> | <input type="checkbox"/> | <i>DP's Steel / PVC</i> | <input type="checkbox"/> |

- | | |
|---------------|--------------------------|
| <i>Stone</i> | <input type="checkbox"/> |
| <i>Timber</i> | <input type="checkbox"/> |

Interior Walls

Roof

- | | | | |
|--------------------|--------------------------|----------------------------|--------------------------|
| <i>Steel Tray</i> | <input type="checkbox"/> | <i>P/Board</i> | <input type="checkbox"/> |
| <i>Tiles</i> | <input type="checkbox"/> | <i>Timber</i> | <input type="checkbox"/> |
| <i>Other</i> | | <i>Brick/Block</i> | <input type="checkbox"/> |
| | | <i>Hard Plaster/render</i> | <input type="checkbox"/> |
| | | <i>Other</i> | |

Floors

- | | | | |
|----------------------|--------------------------|---------------------|--------------------------|
| <i>Slab on grade</i> | <input type="checkbox"/> | <i>Ceilings</i> | |
| | | <i>Plasterboard</i> | <input type="checkbox"/> |
| | | <i>Timber</i> | <input type="checkbox"/> |

Hard plaster/render

Other

Windows

Timber

Steel

Aluminium

Other

Dampness

No Sign

Minor Problem

Major Problems

Other

BUILDING CONSTRUCTION

Trees (Yes/No)

Size

< 2 m height

2 - 6 m height

> 6 m height

Future problems

FOR EACH ROOM

4. Floor Plan

5. Ceiling Plan

6. Elevation of each wall

DRAWINGS

(Each drawing to have descriptions as required.)

GENERAL

1. Site Plan

2. Floor Plan (with all rooms numbered)

3. Elevations of all external walls.

Ancillary Structures

Site Drainage

Concrete paths

Asphalt paths

Concrete driveway

Asphalt driveway

Retaining Walls

Out Buildings

Type (Brief Description)

.....

.....

Other

ANNEXURE G2.4
Notice of Non-Compliant Work

Notice of Non-Compliant Work No.

Contract No.: **Date Issued:**

Contract Title:

Contractor:

To
Superintendent
Attention:

Pursuant to the undermentioned clauses of the Contract Conditions, the Contractor notifies that the following is not in accordance with the Contract namely;

Details of your proposed remedial action will be advised by

.....(signature)

Contractor

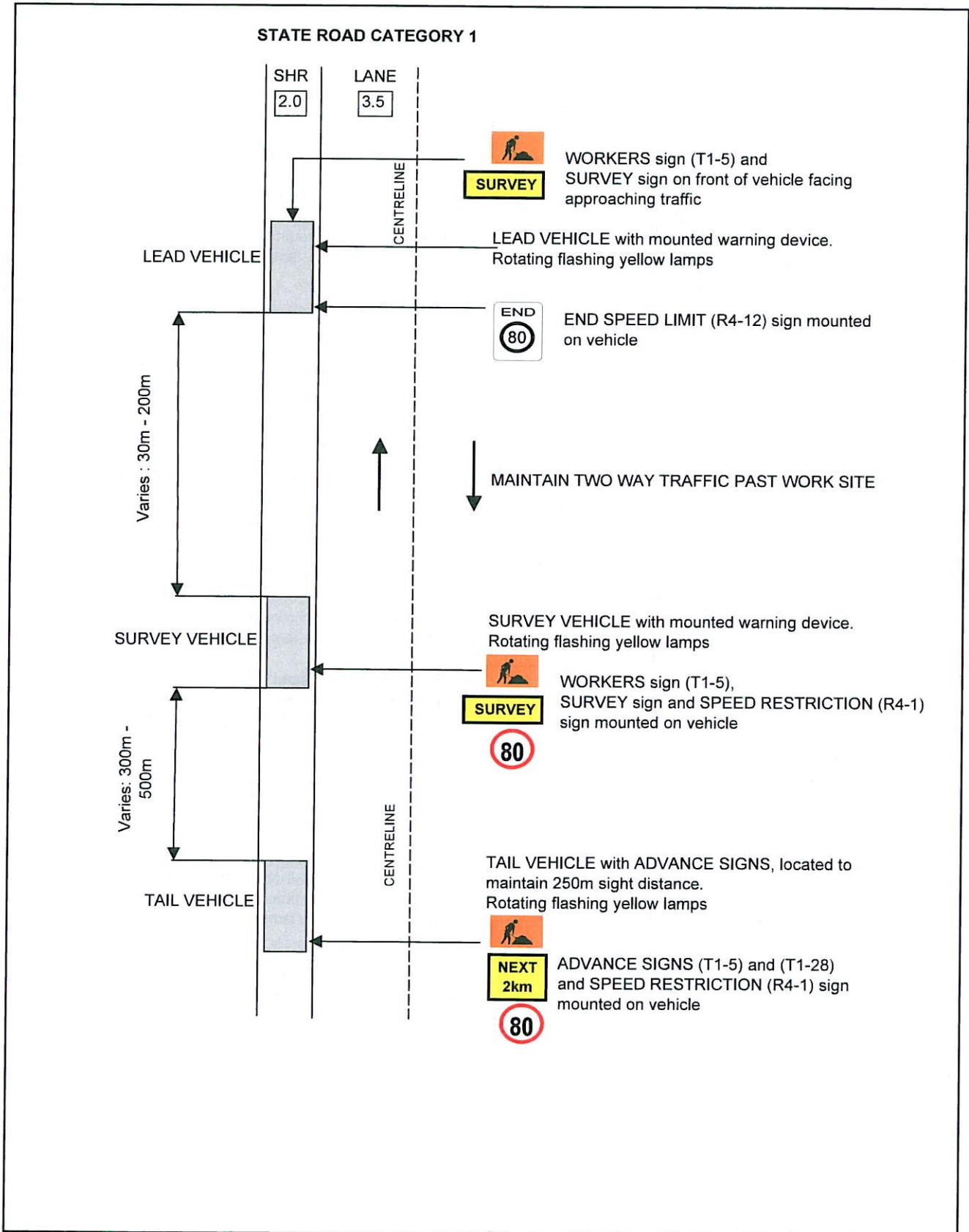
DISTRIBUTION:	PROJECT MANAGER	SUPERINTENDENT
Reference Clauses		
AS 2124	cl.30, 30.3	
AS 4300		
AS 4305		

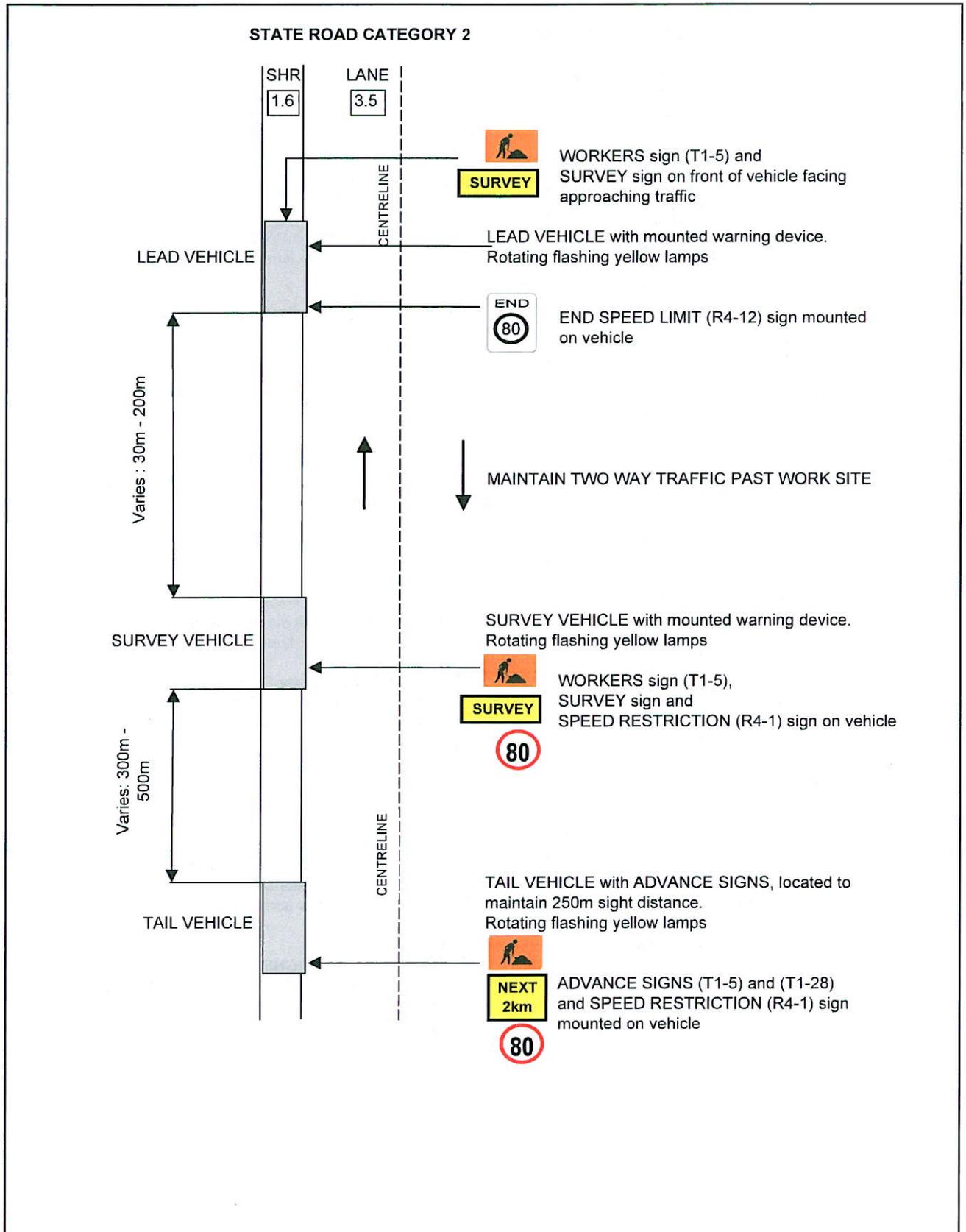


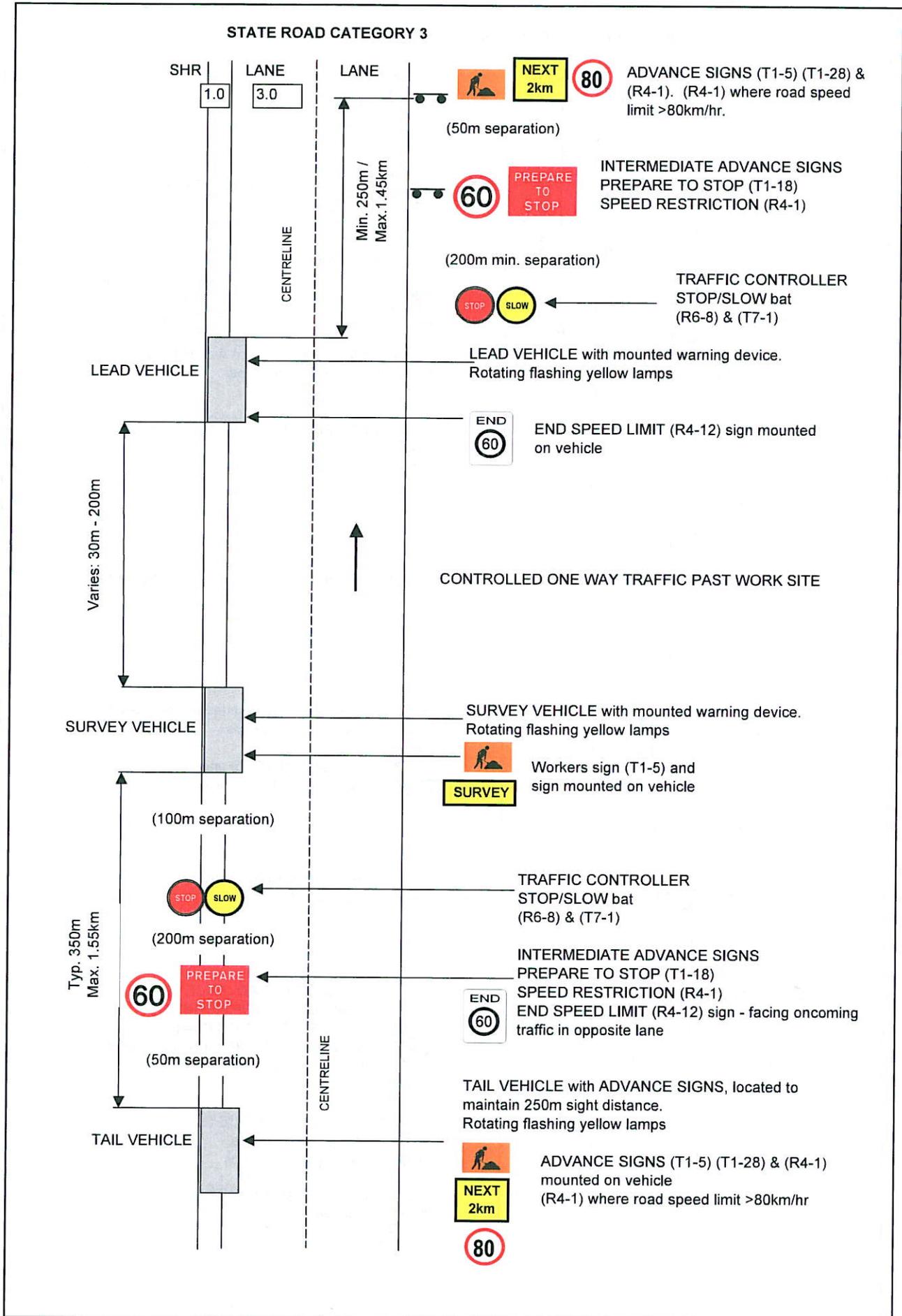
**Onshore Seismic Survey Traffic Management Plan
Great South Land Minerals Ltd**

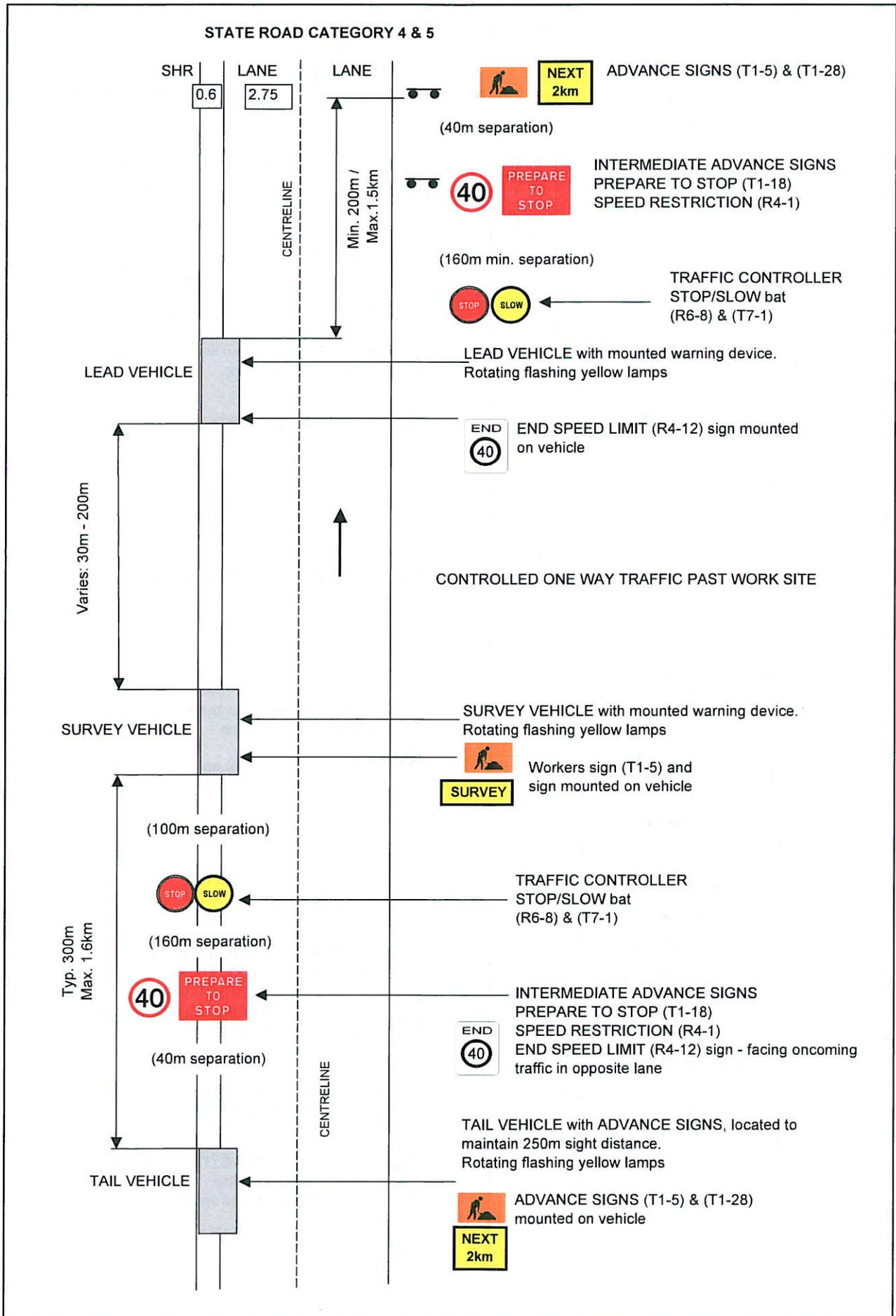


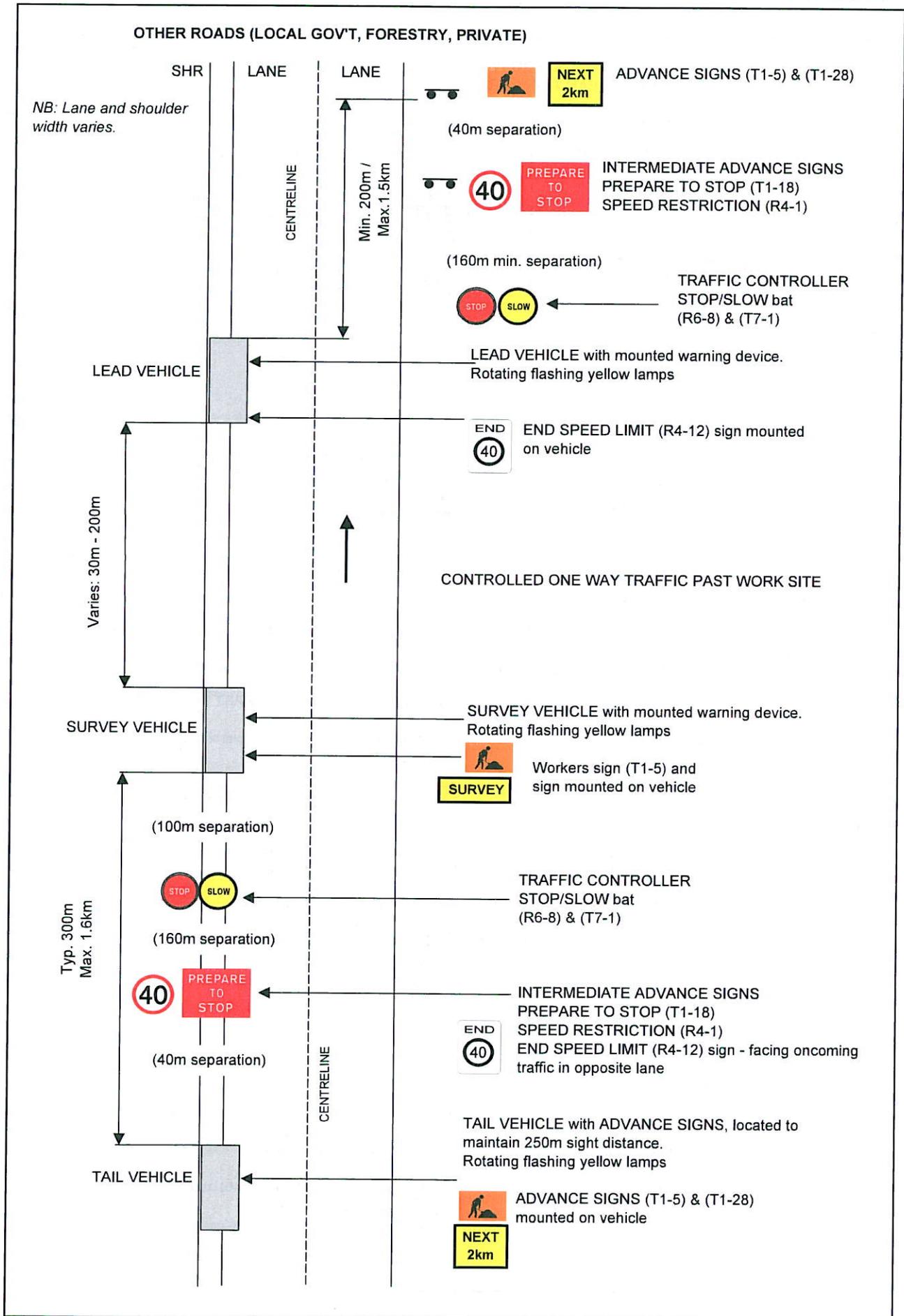
Appendix F:
TMP Signage Layouts

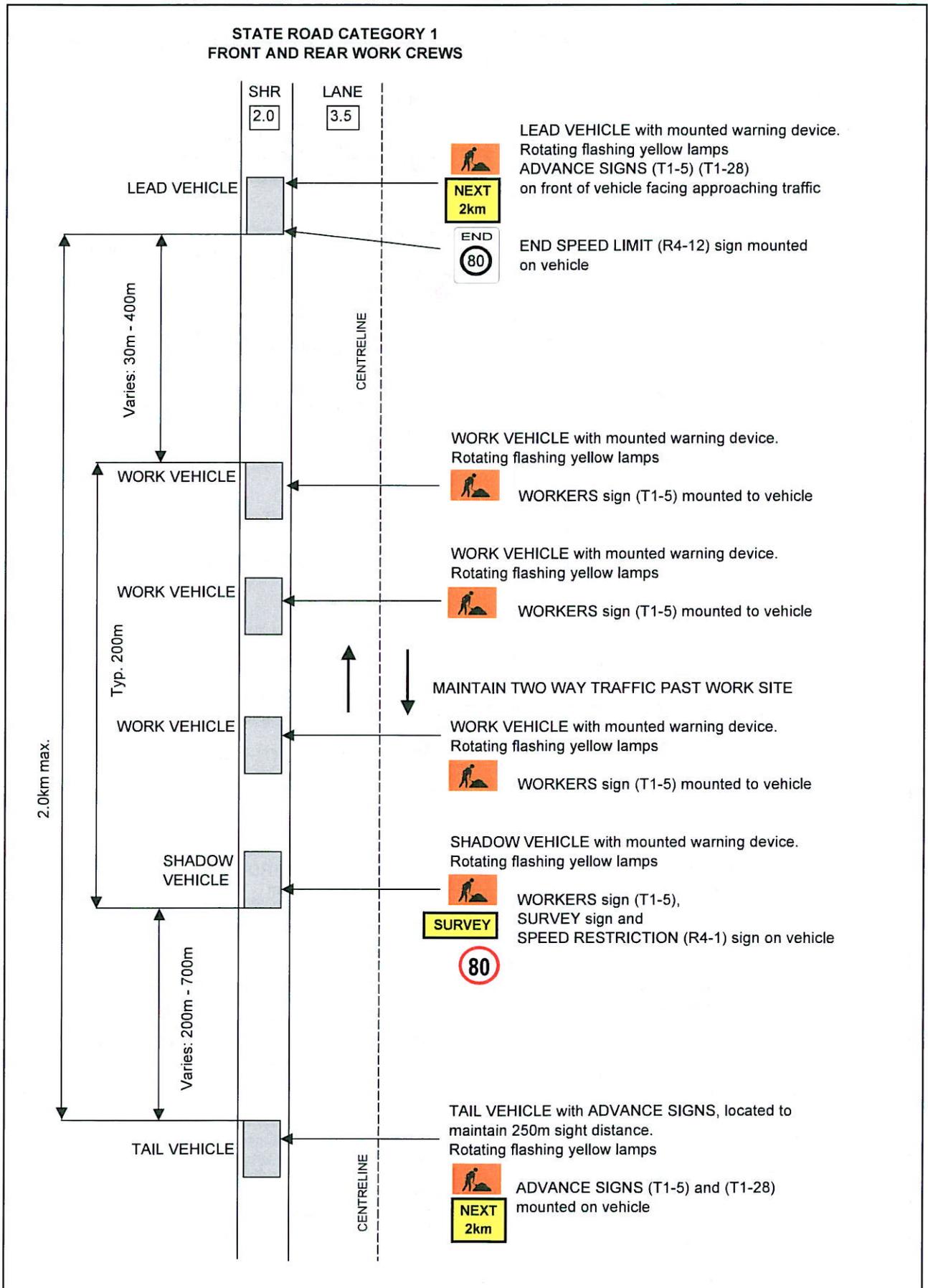


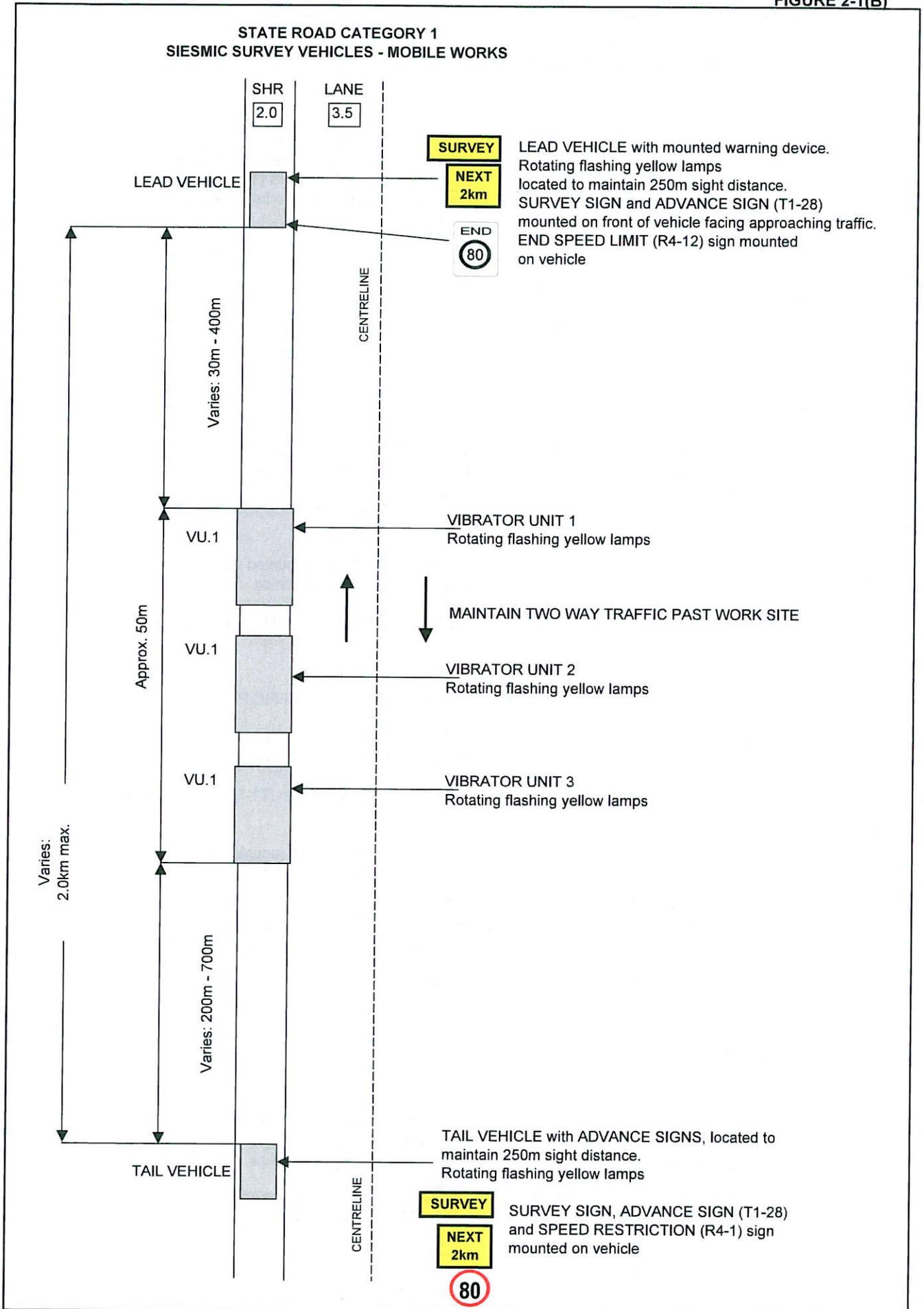




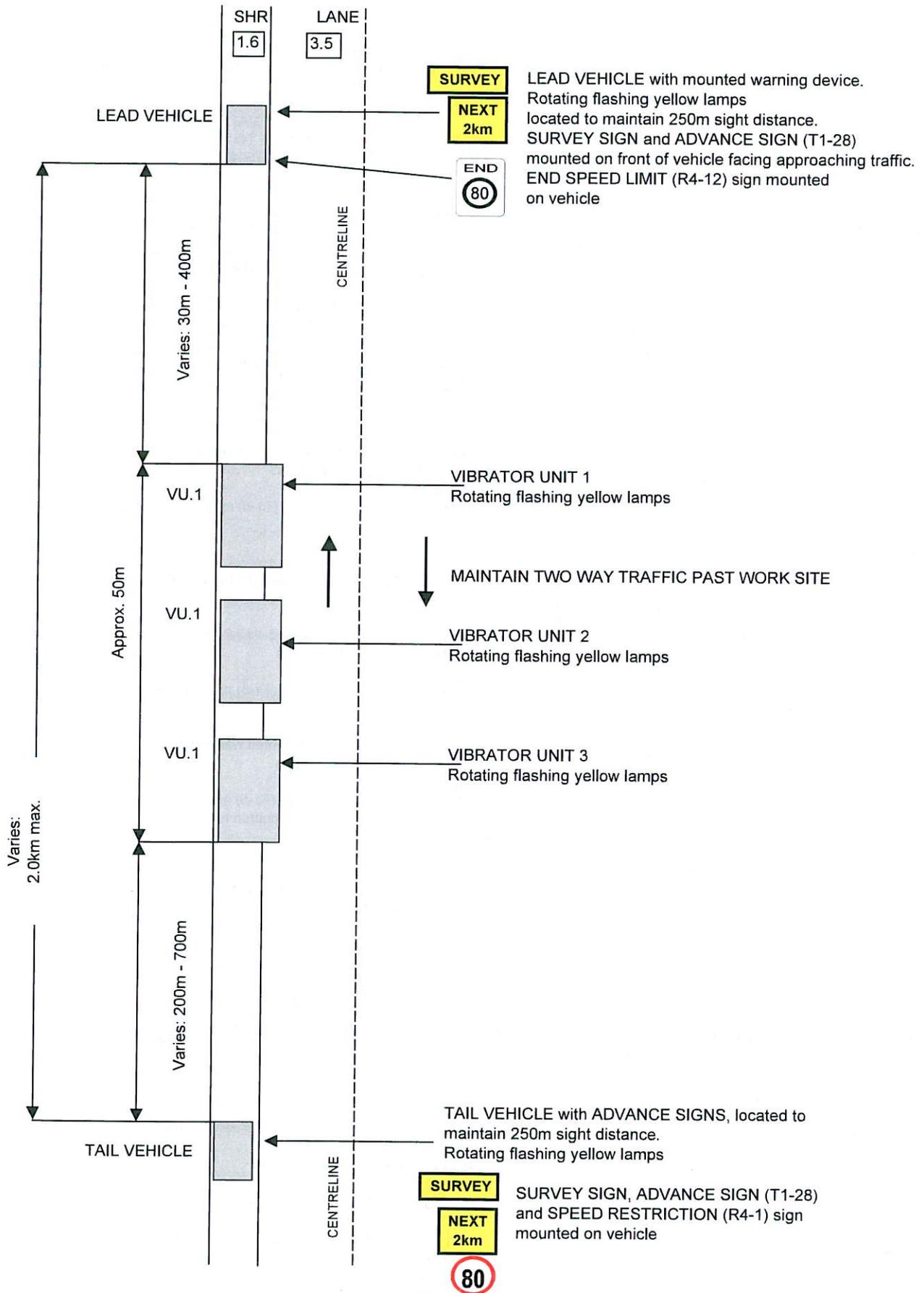


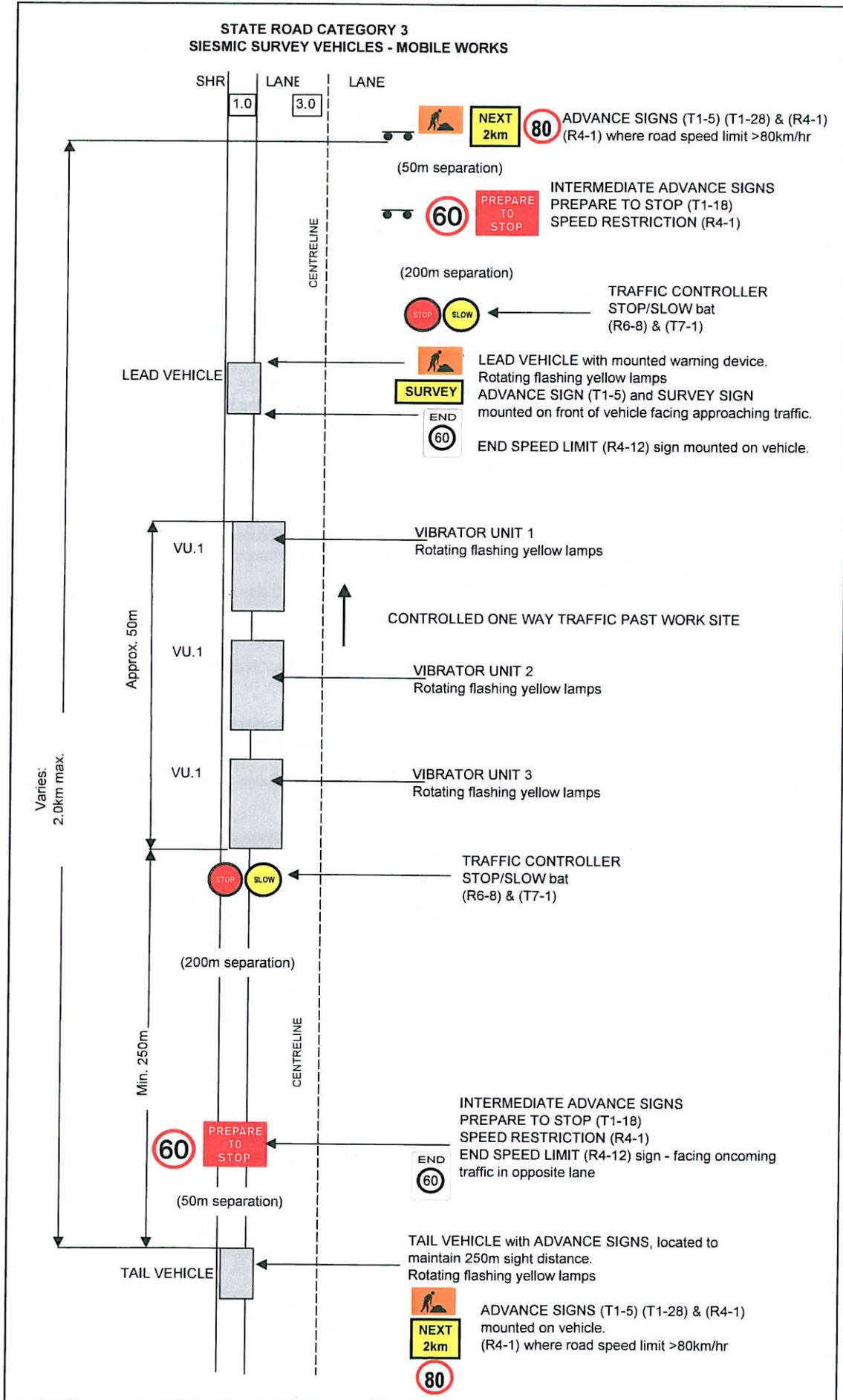


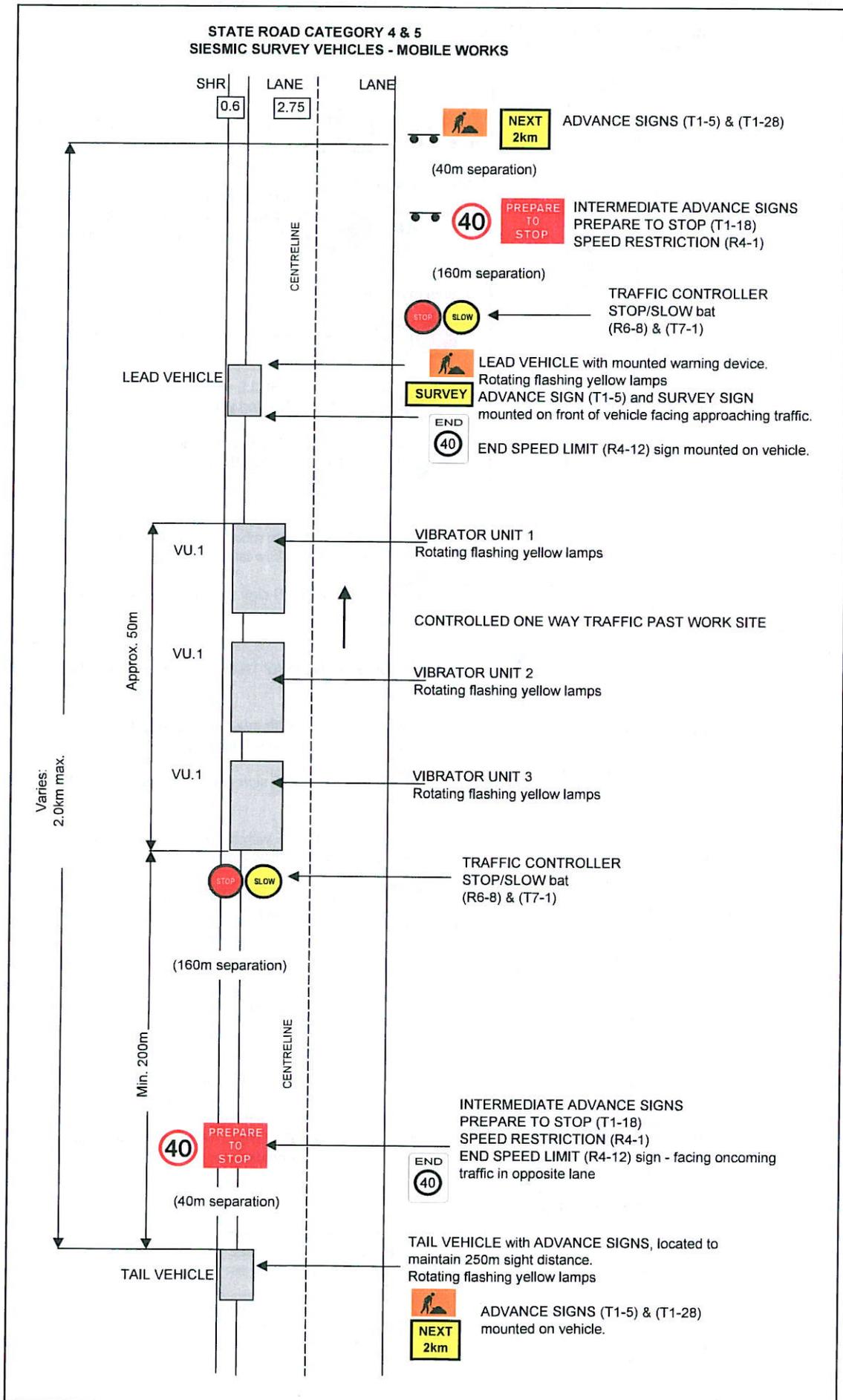


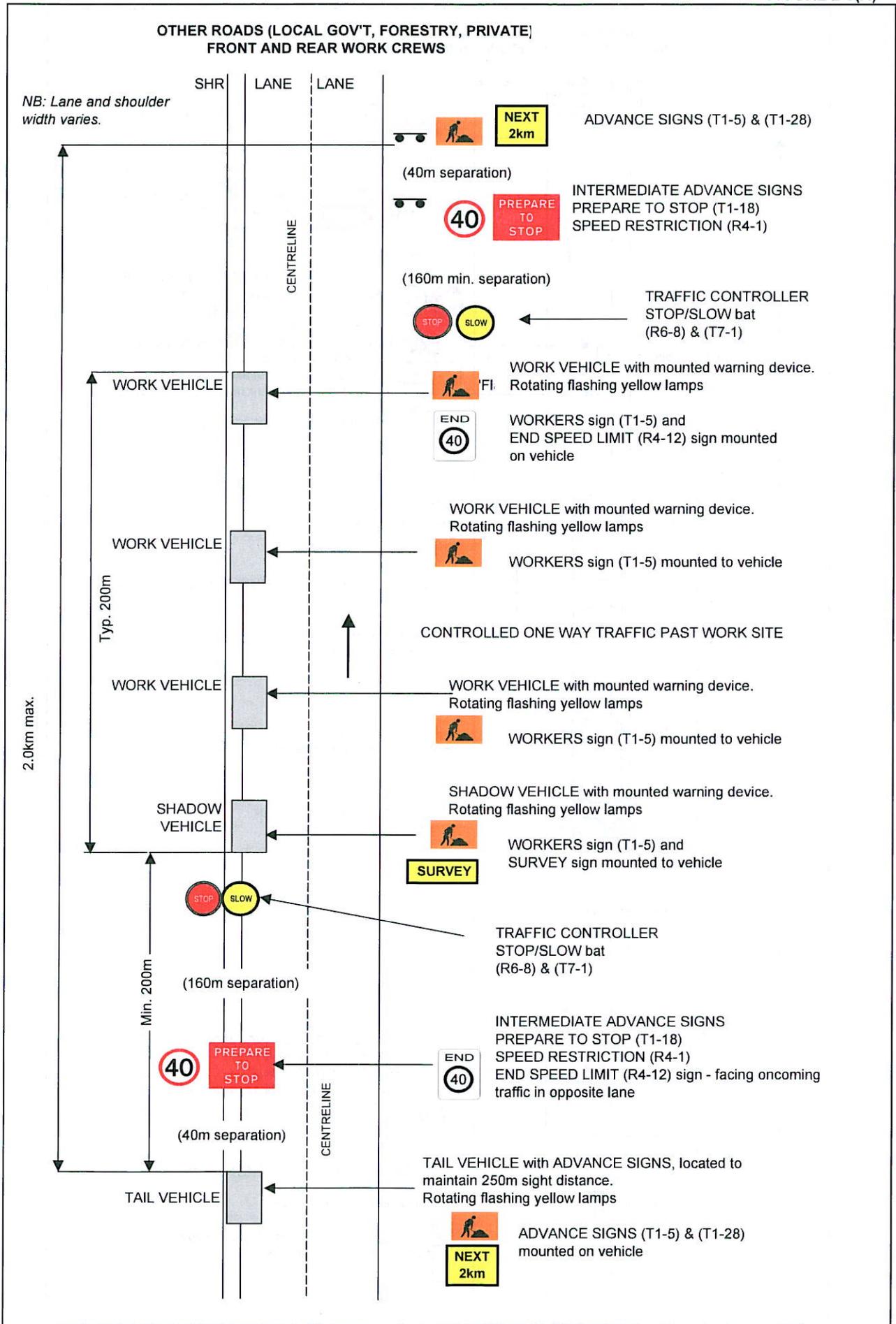


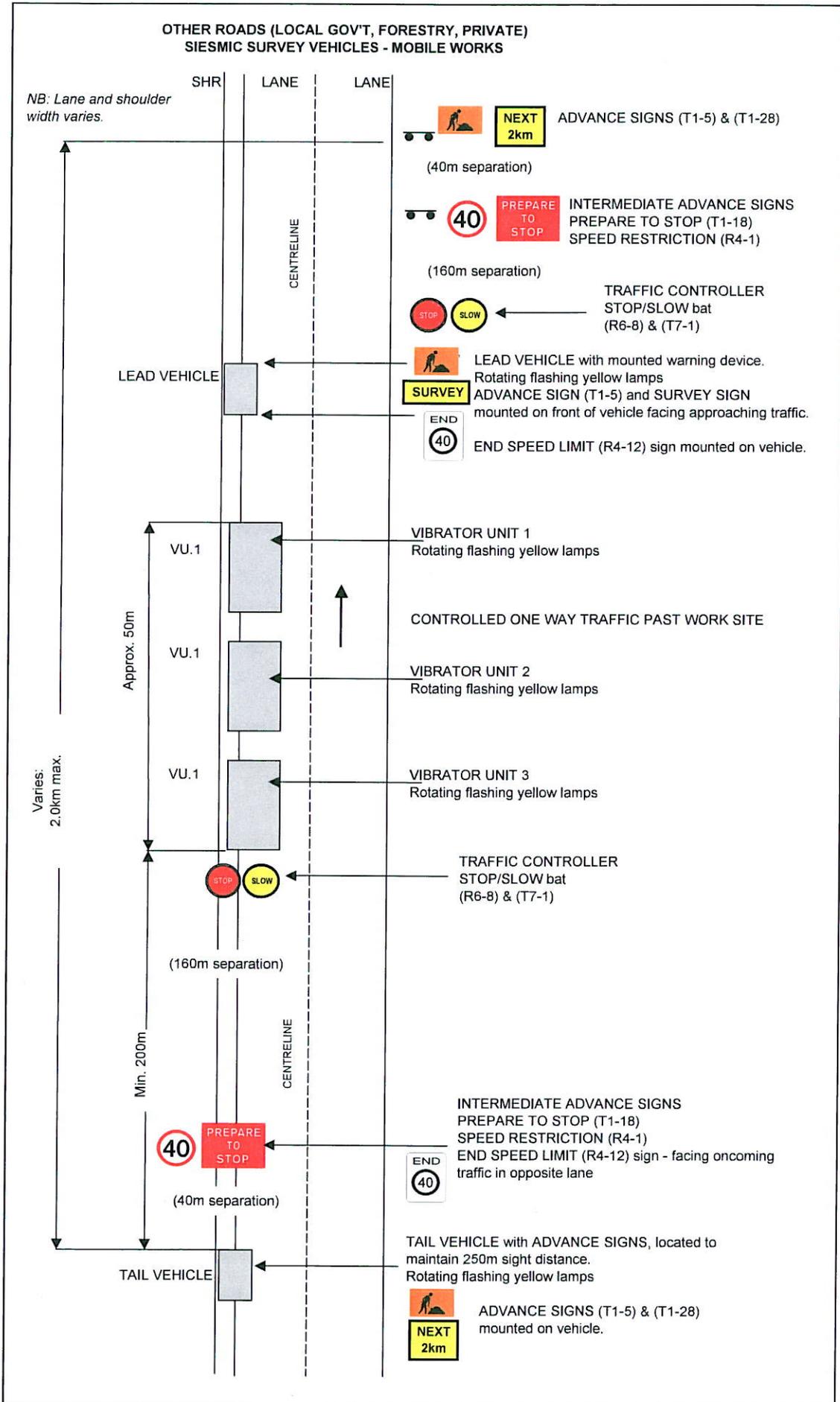
STATE ROAD CATEGORY 2
 SIESMIC SURVEY VEHICLES - MOBILE WORKS













**Onshore Seismic Survey Traffic Management Plan
Great South Land Minerals Ltd**



Appendix G:
Seismic Survey Risk Assessment



Risk Assessment for Road Works

Purpose

Under the Workplace Health and Safety Act 1995, all employers have an obligation to ensure a safe working environment for their employees. Similarly, all employees are required to ensure their workplace is safe. This report has been commissioned to identify the hazards associated with conducting a mobile seismic survey on Tasmanian roads.

Method

The methodology used for this report follows the guidelines set out in Australian Standard for Risk Management AS4360:2004. All potential sources of injury, damage or environmental harm are identified (hazard identification) and a risk assessment conducted for each. Where serious risk is evident, risk control steps are taken to eliminate, reduce or manage the hazards. Relevant Australian Standards to assist in the minimisation of hazards and their consequences are referred to.

Hazard Identification

The following hazard identification and risk assessment technique is based on the scientific principle that in order to change a substances state energy must be applied and transferred. By looking for the energies present we are able to identify all sources of harm.



 <p>Muscular Movement, lifting, posture, strain, etc</p>	<p>Climbing out of vehicles, walking, running, placing sensors in ground, removing sensors from ground, collecting sensors.</p>	 <p>Sound, Noise and Vibration</p>	<p>Very low frequency from seismic trucks (7 to 25 Hz). Amplitude is unknown. Passing traffic, horns, etc</p>
 <p>Gravitational Falling things and falling people</p>	<p>Fall from vehicle, fall into potholes/ditches/etc</p>	 <p>Kinetic Flying particles, dust</p>	<p>Road dust, windy conditions</p>
 <p>Electrical AC/DC, static</p>	<p>Very low voltage sensor equipment.</p>	 <p>Pressure Pressure vessels, pipes and vacuums</p>	<p>Hydraulics on vehicles</p>
 <p>Thermal Hot and Cold</p>	<p>Working in hot/cold temperatures.</p>	 <p>Biological Bacteria, virus, moulds, etc</p>	<p>Snakes, spiders, etc</p>
 <p>Chemical Solids, liquids and gases</p>	<p>Diesel fuel in trucks</p>	 <p>Radiation Sunlight, welding, uranium, heaters</p>	<p>Sunlight</p>
 <p>Fire and Explosion</p>	<p>Possibility of grass/bush fire</p>	 <p>Mechanical Machinery and Vehicles</p>	<p>Passing traffic, moving trucks</p>
 <p>Hand Tools Drills, saws, hammers, etc</p>	<p>None.</p>	 <p>Psychological Mental stresses, tiredness, etc</p>	<p>Work hours, fatigue.</p>
 <p>Housekeeping</p>	<p>None.</p>	 <p>Environmental Weather conditions</p>	<p>Working in hot/cold temperatures, rain, snow, wind, etc</p>



Risk Assessment

Each hazard presents its own risk profile, as some are inherently more dangerous than others. The purposes of a risk assessment is to determine the magnitude of risks presented by each hazard and prioritise risk treatment sequence. The following risk matrix was employed for this task.

		Worst possible consequence				
		Personal Injury	First Aid Treatment	Medical treatment required	Extensive injuries, permanent disability, hospital admission	Fatality of 1 or more people
Environmental impact		No adverse effects	Temporary adverse effects	Long term effects, actions from authorities, community complaints	Major impact, potential revoking of licence, media attention	
Property, plant and equipment damage		Less than \$2,500 damage	\$2,500 to \$25,000 damage	\$25,000 to \$250,000 damage	Above \$250,000 damage	
Frequency (probability * exposure)	Rare Theoretically possible 1/1,000 years	Low Accept risk	Low Accept risk	Medium Workshop risk control measures	High Conduct formal analysis	
	Unlikely Not seen, but foreseeable 1/100 years	Low Accept risk	Medium Workshop risk control measures	Medium Workshop risk control measures	High Conduct detailed, formal analysis	
	Possible Have heard of it happening 1/10 years	Medium Workshop risk control measures	Medium Workshop risk control measures	High Conduct detailed, formal analysis	High Conduct detailed, formal analysis	
	Likely Has happened before 1 / year	Medium Workshop risk control measures	High Conduct formal analysis	Extreme Cease operation & conduct formal analysis	Extreme Cease operation & conduct formal analysis	
	Certain Happens all the time 10 / year	Medium Workshop risk control measures	High Conduct formal analysis	Extreme Cease operation & conduct formal analysis	Extreme Cease operation & conduct detailed formal analysis	

Great South Land Minerals Ltd
Traffic Management Plan Risk Assessment



This process resulted in the following:

Hazard	Consequence	Frequency	Rating	Risk Controls
Climbing out of vehicle	First Aid treatment	Possible	Medium	Handrails and steps on vehicles to assist passengers.
Fall when walking/Running	First Aid treatment	Likely	Medium	Workers reminded to be vigilant while working on the road.
Placing sensors in ground	First Aid treatment	Likely	Medium	Examine method and suggest ways to reduce bending and excessive force.
Removing sensors from ground	First Aid treatment	Likely	Medium	Examine method and suggest ways to reduce bending and excessive force.
Collecting sensors	First Aid treatment	Likely	Medium	Examine method and suggest ways to reduce bending and excessive force.
Noise from passing traffic	Medical treatment	Possible	Medium	Workers should wear ear plugs or muffs.
Low frequency seismic trucks	First Aid treatment	Rare	Low	Workers should keep their distance from seismic trucks where possible.
Falling from vehicles	Medical treatment	Possible	Medium	Handrails and steps on vehicles to assist passengers.
Falling into potholes, ditches, etc	First Aid treatment	Likely	High	Workers reminded to be vigilant while working on the road.
Low voltage sensor equipment	First Aid treatment	Rare	Low	Ensure no higher voltages can make their way onto sensor equipment
Working in high temperatures	Medical treatment	Unlikely	Medium	Workers encouraged wearing lightweight, breathable materials, hats and sunscreen, drinking plenty of fluids, staying in the shade as much as possible and taking regular breaks.
Grass/Bush fire	Fatality	Possible	High	Fire extinguishers are to be readily available. Workers are reminded about smoking hazards and should keep alert to any dangers in the area. Maintain contact with emergency services.

Great South Land Minerals Ltd
Traffic Management Plan Risk Assessment



Hazard	Consequence	Frequency	Rating	Risk Controls
Working in low temperatures	Medical treatment	Unlikely	Medium	Workers encouraged wearing warm, water proof materials, gloves, raincoats etc. Take regular breaks in warm surroundings (trucks?) and eat regularly.
Diesel fuels	Medical treatment	Unlikely	Medium	No smoking near fuels, all fuels stored in suitable containers.
Road dust	First Aid treatment	Likely	Medium	Workers should be encouraged to wear safety glasses or facemasks where dust is a problem. First aid kits are to be equipped with eye wash.
Hydraulics on vehicles	Extensive injuries	Unlikely	Medium	Ensure hydraulic systems in good condition and are serviced regularly. Ensure no personnel are near hydraulic system when in operation.
Snake bite Spider bite	Medical treatment	Likely	High	Ensure first aid kit is available and all workers are trained in the treatment of venomous bites. Have a plan in place to treat victim and contact emergency services.
Sunlight	First Aid treatment	Likely	Medium	All workers are encouraged to wear long sleeve shirts and long trousers. Ensure all workers have access to sun hats, sunscreen and sun glasses.
Fatigue	First Aid treatment	Possible	Medium	Work hours are to be restricted to daylight hours and regular breaks should be taken.
Passing traffic	Fatality	Likely	Extreme	Serious risk of fatality – see traffic management plan.
Moving trucks	Fatality	Likely	Extreme	Serious risk of fatality – see traffic management plan.



Traffic Management Plan

The primary risk identified in this task is passing traffic and moving vehicles. As this presents a risk of fatality to workers, special care must be taken to ensure their safety. In this case normal traffic control methods are not practical due to the constantly mobile nature of the work.

The Australian Standard for Traffic Control Devices (AS1742) recommends the use of an Australian Standard AS4360:2004 (Risk Management) compliant risk assessment for continually mobile works. This report constitutes such an examination. The following risk treatment are designed to reduce the residual risks.

There are a number of factors in this case that reduce the likelihood of injury to workers:

1. Workers perform the majority of their duties on the side of the road, or in the surrounding land
2. Workers are protected from passing traffic by the seismic trucks and associated work vehicles
3. Seismic survey vehicles have flashing light bars to alert passing drivers to the hazards
4. Lead and trailing vehicles are equipped with road work signs and speed limit signs to warn passing motorists of the hazards
5. Workers never remain in relatively high risk areas for long periods due to the constantly moving nature of the work
6. Workers are required to wear high visibility clothing

In addition to these factors we also suggest the following:

1. Ensure vehicle operators are aware of workers presence, stay in view or contact at all times
2. Spotters should be employed to watch for traffic entering the site
3. Workers must ensure trees, shrubs, grasses, etc do not obscure the motorists view
4. If weather conditions jeopardise workers or motorist safety, work will be aborted and postponed until conditions improve.

Required signage

The following signs are recommended to complete the works as safely as possible:

Sign	Schematic	Sign Code	Size (mm)	Quantity
Reduce speed		G9-9B	1800x900	2
Workers		T1-5C	1800x1200	4
Temporary Hazard		T5-4	1500x450	7
Speed restriction		R4-1C	900x1200	1
Stop/Slow Bat		R6-8B T7-1B	600 diameter	3