

An ORDINARY MEETING of LISMORE CITY COUNCIL will be held at
the COUNCIL CHAMBERS, 43 Oliver Avenue, Goonellabah on
Tuesday, 13 December 2011 at 6.00pm

Attachments Excluded From Agenda



Gary Murphy
General Manager

6 December 2011



Attachments

12.4 Coal Seam Gas Exploration on Council Land - Metgasco Application

Attachment 2: Metgasco Review of Environmental Factors Revision 1 dated September 2011 - Seismic Data Acquisition 3

Attachment 3: Application by Metgasco to carry out work in road reserve of Rock Valley Road, Chelmsford Road and Bungabbee Road..... 100

12.8 Asset Management Strategy

Attachment 1: Draft Asset Management Strategy - Lismore City Council 124



Review of Environmental Factors
Metgasco Limited 2010 MET10
Casino-Grafton Seismic Program
Clarence-Moreton Basin, NSW

(In support of Application for Determination under Part 5 of the Environmental
Planning & Assessment Act, 1979)

May 2010
Revision 1 September 2011

TABLE OF CONTENTS

Contact information and declaration

1 Introduction	4
1.1 Locality	4
1.2. Description of the activity	6
1.3. Justification of the activity	11
1.4. Evaluation of alternatives	11
2. Planning context	11
2.1 Licenses and approvals required	11
2.2 Zoning	1
2.3 Stakeholder consultation	12
3. Existing environment	12
3.1 Landforms and geology	12
3.2 Climate	13
4. Environmental impacts and management	13
4.1 Air quality	14
4.2. Water	18
4.3. Soils	18
4.4. Noise and vibration	19
4.5 Flora and fauna protection	19
4.5.1 Threatened Species in the Casino-Grafton Region	19
4.6 Chemical and hazardous substance management	24
4.7 Contaminated Land	25
4.8 Waste minimisation and management	25
4.9 Natural resource use	25
4.10 Impact on the Community	25
4.11 Visual assessment	26
4.12 Heritage	26
4.12.1 Aboriginal heritage	26
4.12.2 Other cultural heritage	27
4.13 Land use	27
4.14 Cumulative environmental impacts	27
4.15 Summary of mitigating measures	29

Metgasco – Casino-Grafton Exploration 2010	Review of Environmental Factors
5. Rehabilitation works	30
6. Summary of impacts and conclusions	30

Figures

Figure 1A Regional view of currently proposed seismic lines around Casino & NSW.....7

Figure 1B Proposed seismic lines at Doubtful Creek & Ettrick north-west of Casino, NSW.....8

Figure 1C Proposed seismic lines at Coaldale & Copmanhurst, North West of Grafton, NSW.....9

Figure 1D Proposed (Phase 2) lines in the Rock-Valley Area North West of Casino, NSW.....10

Figure 2 Existing environment over proposed area (Casino PEL16).....15

Figure 3 Existing environment over proposed area (Casino PEL16)..... 15

Figure 4 Existing environment over proposed area (Rappville PEL13).....16

Figure 5 Existing environment over proposed area (Northern end of Dyraaba PEL13)..... 16

Figure 6 Existing environment over proposed area (Coaldale)..... 17

Figure 7 Existing environment over proposed area (Copmanhurst)..... 17

Attachment 1 – Application to undertake work within the Road Reserve –Rock Valley Area

Metgasco – Casino-Grafton Exploration 2010

Review of Environmental Factors

CONTACT INFORMATION AND DECLARATION

This document was prepared by Metgasco Limited which is the registered holder and operator for Petroleum Exploration Licence No 16, No 13 and No 426. This REF has been prepared utilising the Mineral Resources Division Guidelines for (the) Review of Environmental Factors [ESB18 June 2007] published by the NSW Department of Primary Industry.

Original Prepared by

Mr Benj Beatty
(BA (Socio.)\BSc Hons (Geo.), MAusIMM)

Metgasco Ltd
139-141 Johnston Street
Casino, NSW, 2470

Amended and Submitted by

Mr Peter Stanmore
(Exploration Manager]

Mr Hamish Ramsay
(Land Administration Officer)

Metgasco Ltd
139-141 Johnston Street
Casino, NSW, 2470

This REF refers to land over the Clarence-Moreton Basin of northern New South Wales, and in particular to land in the localities of Casino, Grafton, Dyraaba, Rapville, Leeville, Banyabba West, Copmahurst, and Coaldale, NSW.

The statements and opinions attributable to Metgasco Ltd are given in good faith and in the belief that such statements are neither false nor misleading. In preparing this REF, Metgasco Ltd has considered and relied upon information obtained from the public domain, supplemented by discussions between key Metgasco staff and contractors.

Signed by

For Metgasco Ltd

Signed by

For Metgasco Ltd

Metgasco – Casino-Grafton Exploration 2010

Review of Environmental Factors

Revision 1 September 2011 (Phase 2)

CONTACT INFORMATION AND DECLARATION

This document is submitted by prepared by Metgasco Limited which is the registered holder and operator for Petroleum Exploration Licence No 16.

Metgasco Ltd
 139-141 Johnston Street
 Casino, NSW, 2470

Tel 02 6662 4543
 Fax 02 6662 5158

This REF has been amended utilising the Mineral Resources Division Guidelines for Review of Environmental Factors [ESB18 June 2006] published by the NSW Department of Primary Industry.

Prepared by

Mr Steven Gallop HSE Officer	Metgasco Ltd 139-141 Johnston Street Casino, NSW, 2470	Tel: 02 6662 4543 Fax: 02 6662 5158 Mob: 0418505303
---------------------------------	--	---

Land in respect of which this amendment applies;

The proposed seismic program lies within the Richmond Valley and Lismore City local government areas in close proximity to the towns of Casino and Lismore at three localities within PEL16. A map showing the regional layout of this program is provided as (Fig 1-D).

Declaration

The statements and opinions attributable to Metgasco Ltd are given in good faith and in the belief that such statements are neither false nor misleading. In preparing this REF, Metgasco Ltd has considered and relied upon information obtained from the public domain, supplemented by discussions between key Metgasco staff and contractors. Metgasco has engaged Greenloaning Biostudies to undertake certain work in relation to Revision 1 of this document.

Mrs Alison Martin Director	Greenloaning Biostudies Pty Ltd 93 Wyrallah Road Lismore 2480	Tel: 0266226668 Fax: Mob: 0412049393
-------------------------------	---	--

Signed by: *Steven C Gallop*

Signed by: *Alison Martin*

For Metgasco Ltd

For Greenloaning Biostudies Pty Ltd

1. INTRODUCTION

Metgasco Limited is the Operator and the registered holder for Petroleum Exploration Licence No's 16 PEL 13 and PEL 426 as per the Petroleum (Onshore) Act 1991 in the state of New South Wales.

This document forms an integral part of the Environment Management Plan for the exploration of PEL 16, PEL 13 and PEL 426 and relates specifically to proposed seismic program to be undertaken between Casino and Grafton, NSW.

Current tenement details of Metgasco's acreage holding in the NSW portion of the Clarence-Moreton Basin:

Tenement:	Approx. Size:	Location:
PEL 16	825km ²	Casino, Northern New South Wales
PEL 13	900km ²	South and West of Casino
PEL 426	2850km ²	Grafton.

As a requirement of these titles, Metgasco has also prepared a detailed document, **Safety Management Plan**. A copy of this document is submitted to the Industry and Investment NSW - Mineral Resources as part of the approval process. A site specific **Manual of Emergency Response Procedures** has also been prepared for the current program. Both documents address, *inter alia*, environmental matters, both in regard to the Company's policy in relation to preventative measures, and to procedures to be implemented in the event of emergency situations. Copies of both documents, together with this Review of Environmental Factors, will be on site and accessible to all site personnel.

Revision 1 – Additional Seismic Work - Phase 2

This Revision 1 refers to seismic exploration activities additional to the programme previously approved by the Department of Trade & Investment, Regional Infrastructure and Services NSW (DTIRIS). The proposed additional activities are in the vicinity of Casino - Lismore, NSW and are subsequently referred to as Phase 2 work. The original program is referred to as Phase 1.

1.1 LOCALITY

The proposed seismic program currently consists of a total of approximately 210km over 22 recording lines, at 4 localities within PEL 16, PEL 13 and PEL 426. A map showing the regional layout of this program is given in *Figure 1 (A, B, C)*.

The proposed program consists of eleven lines totalling approximately 120km over the Mackellar and Kingfisher structures in the vicinity of Casino; four lines totalling 26km west of Casino in the Dyaaba area; three lines of 26km between Dyaaba and Ettrick, north-west of Casino; ; four lines totalling 39km at Coaldale and Copmanhurst. Maps showing the proposed line configuration for each locality are given in *Figure 1A to Figure 1C*.

Metgasco Ltd is currently negotiating and finalising land access agreements where necessary.

Due to continuing review of available data and access requirements, Metgasco Ltd may need to alter the seismic lines within +/- 250m of the proposed locations, and may change the number of the proposed

lines; the final seismic layout will, however, be provided to the DPI – MR prior to the commencement of seismic acquisition activities.

Presently available information indicates that the subject land does not fall within any of the eleven categories of land identified in Section 3.2.1 of Guidelines for (the) Review of Environmental Factors [ESB18 March 2006] that would reserve or protect the land for conservation purposes, though proposed lines at Coaldale are proximal to Fortis Creek National Park reserve. Portions of the proposed seismic lines may fall within Crown Land, where the line is situated upon road reserve.

Where variations to the currently proposed plan do occur, Metgasco Ltd will undertake to situate seismic lines in similar environmental settings; that is, in the placement of sites, Metgasco:

- Will place sites on land that is presently zoned *Rural 1(a) Prime Agricultural land* (or similar) and does not pass within any of the eleven categories of land identified in Section 3.2.1 of *Guidelines for (the) Review of Environmental Factors [ESB18 June 2006]*;
- Will not, wherever possible, remove trees or otherwise alter the existing environment, except as described in *Section 1.2* of this document.

Where potential sites do not adhere to these requirements, further approvals will be obtained from the DPI/MR.

Revision 1 – LOCALITY (Phase 2)

The Phase 2 program consists of three additional lines totalling approximately 17.139 km over the Mackellar and Kingfisher structures of Casino. These comprise one line of 1.291 km just north of Casino, one line of 5.658 km from Bentley to Bungabee, encompassing part of the Disputed Plains, and one line of 10.19 km at Rock Valley, northwest of Casino.

Metgasco Ltd is currently negotiating and finalising land access agreements where necessary but the intent of the exploration program is to utilise existing road formations and road verges to the maximum extent possible. A map showing the regional layout of this program is given in *Figure 1-D*.

During the process of continuing review of available data and access requirements, Metgasco Ltd may need to alter the location of seismic lines within +/- 500m, or number of proposed lines. The final seismic layout however, will be provided to the Department of Trade & Investment, Regional Infrastructure and Services NSW (DTIRIS) / Mineral Resources prior to the commencement of seismic acquisition activities. The reasons for altering the alignment of the route would be to avoid sensitive habitat, wet ground or inaccessible section of the route, either because of topographical constraints or lack of approved access by a landowner.

Available information indicates that the subject land does not fall within any of the thirteen categories of land identified in Section 3.2.1 of Guidelines for (the) Review of Environmental Factors [ESB18 March 2006] that would reserve or protect the land for conservation purposes, although the proposed lines at Bungabee and Rock Valley are proximal to Muckleewee Nature Reserve. The proposed line at Bungabee also passes through a portion of the Nature Reserve, but along the alignment of a crown road reserve.

Other portions of the proposed seismic lines may fall within Crown Land, where the line is situated upon road reserve.

Where variations to the currently proposed plan do occur, Metgasco Ltd will undertake to situate seismic lines in similar environmental settings. In determining the placement of sites, Metgasco will undertake to comply with the following standard procedures:

- Sites being located on land that is presently zoned Rural 1(a) Prime Agricultural land (or similar) and does not fall within any of the eleven categories of land identified in Section 3.2.1 of Guidelines for (the) Review of Environmental Factors [ESB18 June 2006];
- Removal of trees or other alterations to the existing environment will be avoided, except as described in Section 1.3 of this document.

Where potential sites do not adhere to these requirements, further approvals will be obtained from the DTIRIS / MR.

1.2 DESCRIPTION OF THE PROPOSED ACTIVITY

The present proposal involves acquisition of seismic data in several areas within PEL13, PEL16 and PEL 426. The activities include surveying and line preparation of the seismic lines followed by a period of seismic data acquisition, which in this case involves recording seismic energy reflected from the subsurface using a vibrator as the energy source. This REF covers all phases of the work.

The seismic lines will be as close as possible to the proposed locations. Grass or crops along the lines will be slashed to allow the vehicular access, to a maximum width of 4.5m. Vehicle movements along the lines will be over pre-existing grassed areas where possible to reduce the risk of erosion; any degradation of the land surfaces will be rehabilitated at the conclusion of activities. Where possible, existing tracks and gates will be utilised; where necessary, alterations will be conducted with the approval of the landholder(s).

Depending on the interpreted nature of the near-surface weathering profile, seismic up-holes may need to be acquired to determine the seismic velocities to the base of weathered layer. Should up-holes be required along the lines, these holes will be drilled at or near line intersections along the proposed lines and will generally be between 15-20m deep. A down-hole phone is then lowered into the hole to measure the travel time of the energy generated on the surface by a small weight drop. This measurement is made at regular intervals of 5m down the hole. After completion of the measurement, the down-hole phone is then retrieved and the hole refilled with cuttings. The number of up-holes required (if any) is not yet determined, and will be a function of data acquisition results.

During the data collection phase, geophones will be set along the lines at approximately 1m spacing to record reflected energy generated by the vibration of a metal plate on the ground; the geophone strings will be 'rolled' along the lines as data collection progresses by removing 10m sections from the tail end and re-connecting them to the head. It would be expected that this stage would progress at a rate of about 8km per day; therefore it is expected that this phase would be conducted over four to six weeks. The objectives of the seismic programs are to provide data for structural and stratigraphic mapping. This will enable the identification and delineation of potential subsurface hydrocarbon traps and gas bearing coal seams that may warrant exploration drilling.

Revision 1 - Additional Detail of Proposed Activity - (Phase 2)

Specialist vehicles that vibrate the ground and generate sound waves of varying frequencies via a metal plate on the ground will be used for the seismic process. The procedure uses a controlled vibration that will not damage structures in close proximity to the signal source. The returning sound waves are recorded by small microphones (geophones) strung together that are laid along the seismic line.



Figure 1A. Proposed seismic, fourteen lines totalling approximately 136km over the Mackellar and Kingfisher structures in the vicinity of Casino, NSW. PEL 16 and PEL 13



Figure 1B. Proposed seismic, three lines totalling approximately 23km near Doubtful Creek & Ettrick, north-west of Casino, PEL 13

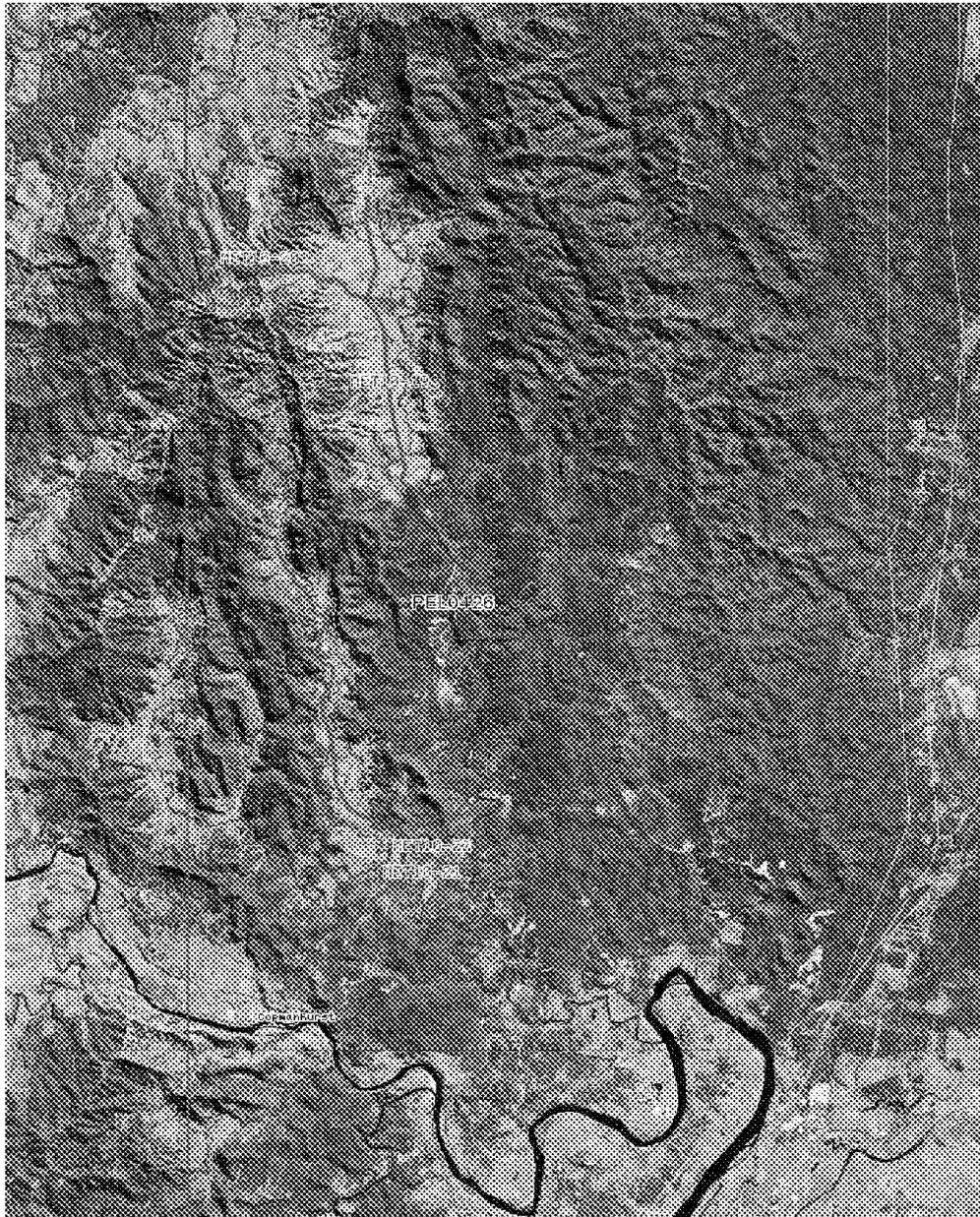
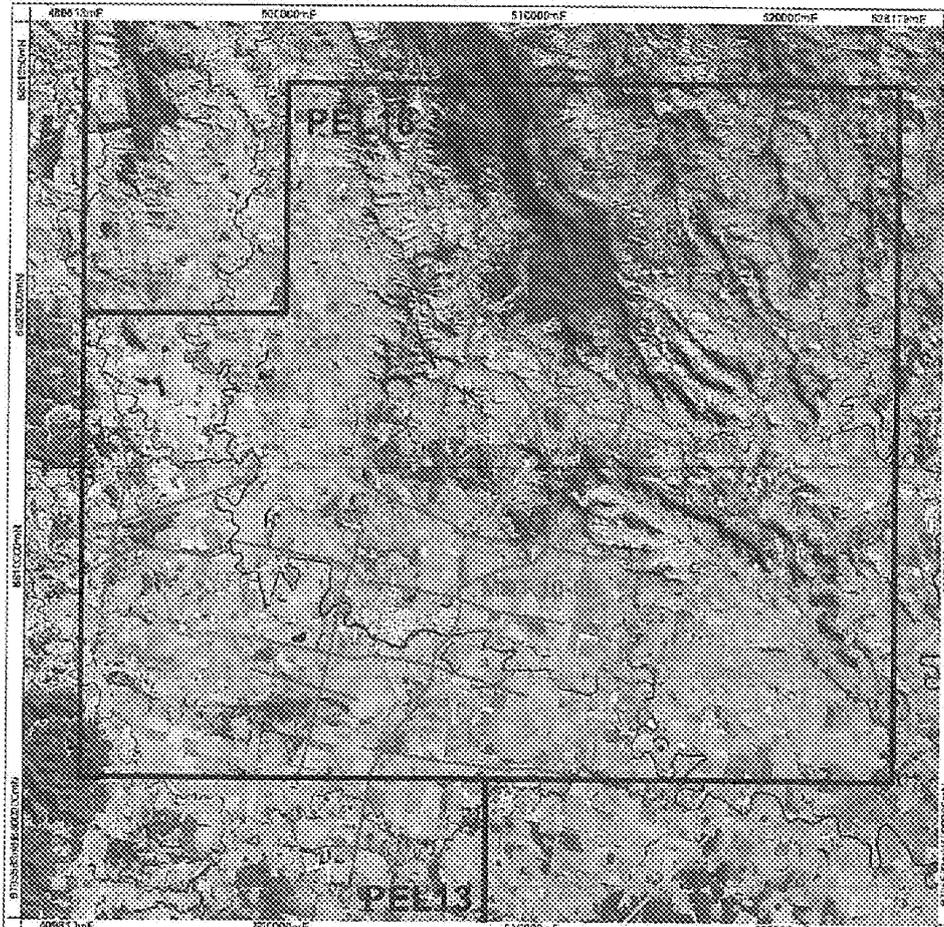


Figure 1C. - Proposed seismic, four lines totalling approximately 41km near Coaldale and Copmanhurst. PEL 426



(Fig 1.D) – Phase 1 (blue) and phase 2 (red) seismic exploration lines in the vicinity of Casino, Northern NSW (SOURCE: GREENLOANING 2011)

1.3 JUSTIFICATION OF THE ACTIVITY

The purpose of PEL 16, PEL 13 and PEL 426 granted under the *Petroleum (Onshore) Act 1991* is to permit the exploration for hydrocarbons. The purpose of the proposed seismic program is the delineation of potential CSG and conventional gas targets. As such the justification for the exploration is:

- The granting and the existence of Permit;
- Its suitability as an exploration site;
- The approved work plan for the permit;
- The intent of the permit holder;
- The consent of the landowner;
- Current and future demand profiles for gas as an alternative to less greenhouse friendly energy sources;
- Current and future demand for natural gas in the region.

Revision 1 Justification of the Activity

In addition to the reasons above for undertaking Phase 1 of this work, the (Phase 2) work is required to:

- Determine and examine the Kingfisher Mackellar Structure, as a means to aid in future planning for more efficient resource recovery both maximising economic benefit and minimising environmental impacts to the area where possible.
- Comply with Work commitments.

1.4 EVALUATION OF ALTERNATIVES

As exploration for the region is in its early stages, no real alternative exists to the effective delineation of subsurface structure and continuous presence of coal identified through exploration drilling. Numerous other sites are available for exploration via drilling, but the program as outlined has been identified by preliminary inspections as being the most suitable for the purposes of being on suitable ground and for effective hydrocarbon exploration.

2.0 PLANNING CONTEXT

2.1 LICENCES AND APPROVALS REQUIRED

Under a Petroleum Exploration Licence granted under the *Petroleum (Onshore) Act 1991*, where the approval of the DPI - Mineral Resources has been granted as a Part V Determination, and Landowner consent has been granted, no further approval is required.

Revision 1 - Additional Detail for licences – (Phase 2)

DPI – name change to the Department of Trade & Investment, Regional Infrastructure and Services NSW (DTIRIS) / Mineral Resources

2.2 ZONING

Due to the broad scope of planned activities, the land in the areas of the proposed lines has a variety of zonings under relevant Local Environment Plans (LEPs); specifically:

- The land at Casino is zoned Rural 1(a) Prime Agricultural land, Rural 1(b) Secondary Agricultural and 2 Township land under the Richmond Valley Council (RVC) LEP.

- The land at Dyraba is zoned Non-Urban 1(a) under the Kyogle Council LEP.
- The land at Rappville is zoned Rural 1(a) Prime Agricultural land under the RVC LEP.
- The land at Copmanhurst & Coaldale is zoned Rural 1(a) Agricultural Protection land and Rural 1(b) General land under the Clarence Valley Council (CVC) Maclean LEP, and Rural 1(a) General land under the CVC Copmanhurst LEP.

Revision 1 - Additional Detail for zoning – (Phase 2)

- Land at Bungabee, zoned Rural 1(a) Prime Agricultural land (RVC LEP) in the southern section and Rural 1 (a) General Rural and 1(r) Riverland's under the LCC LEP in the middle and northern sections of the line.
- Land at Rock Valley, zoned Rural 1 (a) General Rural and 1(r) Riverland's under the LCC LEP.

2.3 STAKEHOLDER CONSULTATION

At this time stakeholder consultation has been limited to consulting with council and local authorities. At this stage of activity and considering the distance from other properties and dwellings, only the immediate properties are likely to be affected by the exploration activities.

Subsequent to approval being granted to undertake a seismic program, local landowners on adjoining properties and council officers will be advised of the detailed activities to take place. Local residents and council officers are aware of Metgasco activities at other sites in the Casino area.

Revision 1 - Additional Detail for stakeholder consultation – (Phase 2)

Metgasco has applied to Lismore Local Council for approval to undertake seismic activities within the road reserves within the Local Government Area. A copy of the approval is included as Attachment 1. Approval of the Kyogle and Richmond Valley Councils was obtained as part of the Phase 1 work.

Subsequent to approval of the Phase 2 work the following the following additional consultation will be undertaken: -

- Access Agreements negotiated with landholders of land on which the seismic activities will be undertaken
- Consent agreement from residents within 200 m of the proposed activity, and
- Consultation with local Aboriginal Land Council.

3.0 EXISTING ENVIRONMENT

3.1 LANDFORMS AND GEOLOGY

Examples of the existing environment for the various proposed localities are shown in *Figure 2* to *Figure 7*. Due to the regional context of the proposed work, a wide variety of local environments will be covered, with most lines being over open, fenced and reasonably level improved pasture, light forestation or along roads in low density rural-residential areas. Gully erosion is not known to be present in the immediate area of any proposed line, though some areas of the region are subject to sheet flow during very heavy rainfall. The lines are serviced by public bitumen and gravelled roads.

There are two major drainage zones over the areas proposed for the seismic program; in the northern half of the basin (around Casino) drainage of the area is part of the Richmond River catchment system. The southern half of the proposed area (around Grafton) is a part of the Clarence River drainage system. While no animals have been seen at the proposed lines, the proximity to drainage areas suggests large fauna may frequent the areas. Birdlife consists of a wide variety of observed species.

Revision 1 - Additional detail – (Phase 2)

For detail on the Landforms and Geology of the area of the Phase 2 work please refer to *Section 3.0 – Existing Environment in Ecological, Cultural and Noise Aspects of Phase 2 Seismic Exploration* Report prepared by Greenloaning Biostudies, attached.

3.2 CLIMATE

The Casino-Grafton area is located between 30-60km inland of north coast of NSW and experiences hot humid summers and mild drier winters. Temperature range from 5°C to 40°C and occasional frosts are experienced. Annual rainfall is about 1200mm, occurring throughout the year, though often associated with thunderstorm activity. Seismic activities will be conducted to provide for this.

The heaviest rainfalls usually occur during April and May in association with cyclonic weather systems that may move south along the eastern Australian coast. Plant growth is most vigorous in summer but can occur all year, although germination may be limited to the period from spring to early autumn.

Revision 1 - Additional detail – (Phase 2)

The study area is subject to a subtropical climate with high summer rainfall and frequent storm activity. Very heavy rainfall events and flood events are not uncommon in the area. The influence of the climate is evident in much of the vegetation occurring in the study area, with substantial moist forest and rainforest elements present, particularly along creeks and drainage lines.

Refer to *Section 3.2 - Climate in Ecological, Cultural and Noise Aspects of Phase 2 Seismic Exploration* Report prepared by Greenloaning Biostudies, attached.

4.0 ENVIRONMENTAL IMPACTS & MANAGEMENT

Clause 82 of the *Environmental Planning and Assessment Regulation, 1994* indicates specific factors which the Department of Primary Industries, Mineral Resources, must take into account in determining the likely environmental impacts of a proposed activity. These factors are addressed below.

Recognising the relatively temporary nature of the activities on-site, those activities will be conducted so as to minimise the disturbance of the existing environment wherever possible with all efforts to preserve the current amenity of the area.

Revision 1 - Additional detail for the Environment Impacts & Management – (Phase 2).

The specific factors specified under Clause 228 of the *Environmental Planning and Assessment Regulation, 2000* which must be taken into account in determining the likely environmental impacts of a proposed activity are addressed below.

Whilst recognising the relatively temporary nature of the activities in any one area and that the majority of any impacts from these activities would be of very short duration, the activities will be conducted so as to minimise the disturbance of the existing environment wherever possible with all efforts to preserve the current amenity of the area.

Mitigation measures to comply with this objective are provided in below clauses of this REF and assessments of potential impacts on threatened species and communities are provided in the Greenloaning Biological report document.

4.1 AIR QUALITY

The activities associated with the seismic data acquisition will have a negligible impact on air quality. Dust may be created by the drilling of the upper 10 to 15 metres of any necessary up-holes. This dust will generally be restricted to the immediate area and is expected to last less than 2 hours.

Vehicle movements may create some dust on adjacent public roads but a project speed limit of 60kmh will be set for any unsealed portions of road used by the contractors to access the project area. This should reduce any dust to better than ambient conditions.

Exhaust emissions from should not lead to significant deterioration of air conditions.

Revision 1 - Air Quality Mitigating Measures for (Phase 2) of the proposed Seismic activities.

- Control of undesirable fugitive dust will be undertaken as necessary using domestic water sprays;
- Contractor inductions mandating max speed limits;
- Engines will not be left running when not specifically required for seismic activities;
- Ensure vehicles are Fit for Purpose & properly maintained to reduce emissions;
- Use of existing roads and tracks where practicable;



Figure 2. Existing environment over proposed area (Casino PEL16)



Figure 3. Existing environment over proposed area (Casino PEL16)



Figure 4. Existing environment over proposed area (Ettrick PEL13)



Figure 5. Existing environment over proposed area (Doubtful Creek PEL13)

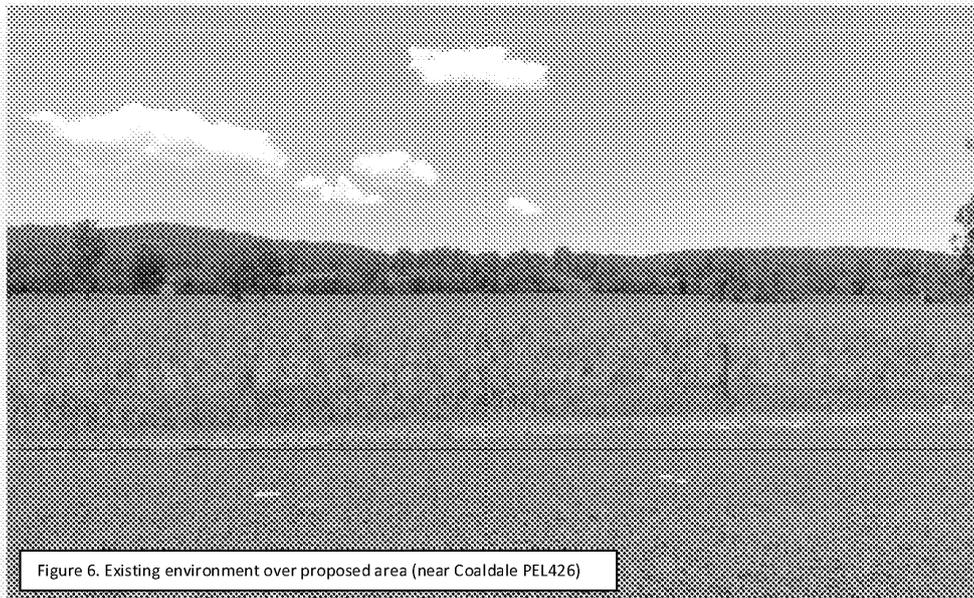


Figure 6. Existing environment over proposed area (near Coaldale PEL426)

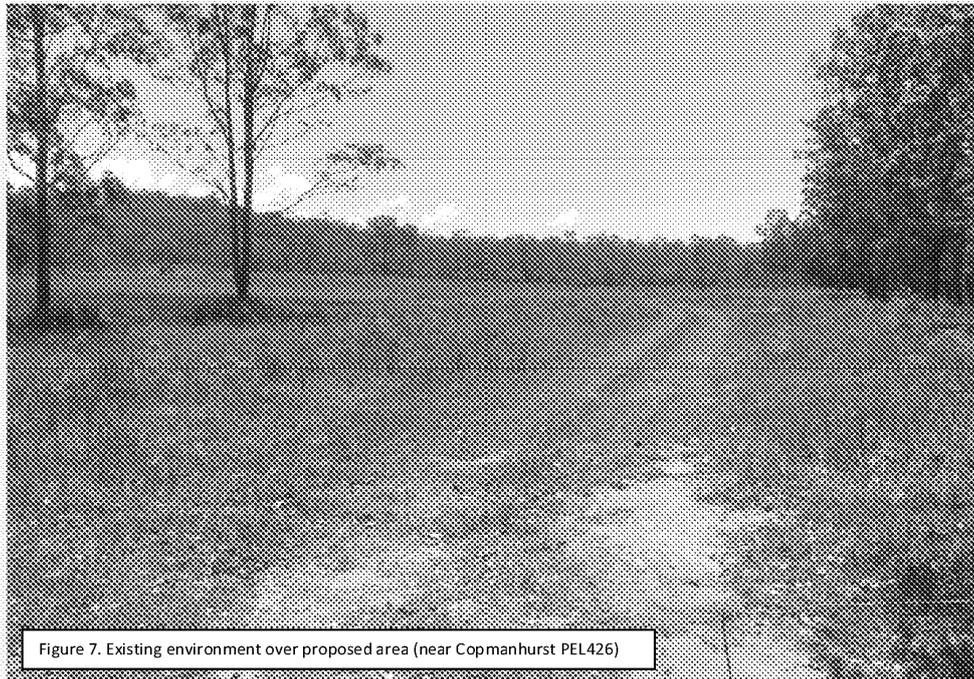


Figure 7. Existing environment over proposed area (near Copmanhurst PEL426)

Revision Photos of the (Phase 2) intended activity work areas sighted in (Appendix A) of the Greenloaning Biostudies attached report.

4.2 WATER

It is not envisioned that the proposed activities will require the use of water or that any water will be produced from any shallow drilled up-holes.

Any water contaminated by hydrocarbons or non-degradable additives will be removed to a council approved disposal site.

Revision 1 - Mitigating Measures for Water Control (Phase 2) of the proposed Seismic activities.

- (Phase 2) seismic project is unlikely to have an impact on natural water courses in the area;
- Sufficient spill management kits will be available in the event of minor fuel or oil spillage; and
- Rehabilitation will be undertaken as soon as practical upon completion of the works; and
- Contaminated water will be controlled at the source.

4.3 SOILS

The soils in the regions selected for the proposed seismic program are derived from weathered igneous and sedimentary rocks, and the yellow clay subsoil is relatively erosion resistant. Any felled vegetation will be mulched at the time and stored in windrows for later rehabilitation, but it is not anticipated that any trees will need removal. Activities requiring the movement of vehicles will be restricted to along the seismic lines or on existing tracks. Any rutting created will be removed on final rehabilitation of the lines.

Storm water runoff and erosion controls

All vehicle tracks will be immediately adjacent to the seismic lines, and will be constructed on existing grass surfaces. In accordance with past practice, the existing surface grasses will be maintained to prevent erosion but may be slashed in order to carry out the work. It is not envisioned that the existing surfaces will be damaged during the timeline of the program, but any disturbances will be rehabilitated. No other erosion control is considered necessary on these tracks.

Where the slope of the proposed seismic lines exceeds 2 degrees, spoon drains and/or cross banks will be constructed in order to disperse water and prevent erosion of the land surfaces, using sand bags or other suitable materials, as advised by the Department of Natural Resources.

No presence of acid sulphate soils is recorded or likely in the area of works. Any areas of acid sulphate soils that might be encountered will be managed in accordance with relevant Local Government Authority (LGA) guidelines that limit such activities and required special measures to be implemented.

Revision 1 Mitigating Measures for Soil Control (Phase 2) of the proposed Seismic activities.

Soil management will include, but not be limited to:

- Wherever possible soil, native grasses (and pasture) will not be disturbed.
- Topsoil will be stockpiled separately prior to any excavation.
- The topsoil will be replaced in the course of site rehabilitation.
- Mulched vegetation will be spread across replaced topsoil as an aid to re-vegetation and to prevent erosion.
- Seeding with native grass seed, harvested on site, will be undertaken where appropriate.

- Compaction of soil by prolonged placement of equipment will be avoided but any area potentially subject to compaction will be rehabilitated by aeration/light ripping and seeding as necessary.
- Field personnel will be educated in the recognition of Potential Acid Sulphate Soils (PASS) (Department of Primary Industries 2011).

4.4 NOISE AND VIBRATION

Activities will be conducted on a 10-12 hours per day (daylight) basis. Noise from activities is expected to be at ambient levels at a distance of 200m from the seismic lines; due to the restricted work hours, it is not envisioned that this will impact on the amenity of the area. If necessary, periodic on-site noise monitoring will be conducted for the duration of the work. Vibration from the data acquisition will not be felt beyond about 30 metres.

Revision 1 - Noise & Vibration (Phase 2) of the proposed Seismic activities.

For detail on Noise and Vibration associated with Phase 2 work please refer to *Section 4.0 – Environmental Impacts and Management in Ecological, Cultural and Noise Aspects of Phase 2 Seismic Exploration* Report prepared by Greenloaning Biostudies, attached.

4.5 FAUNA AND FLORA PROTECTION

- a) No threatened population is likely to be significantly affected by the proposed activities and certainly no viable local population of any species is likely to be placed at the risk of extinction.
- b) No endangered population is likely to be significantly affected by the proposed activities and certainly no viable local population of any species is likely to be placed at the risk of extinction.
- c)
 - i) The proposed activity will have minimal impact on the extent of any ecological community and certainly will not place any locally occurring ecological community at risk of extinction.
 - ii) The proposed activity will have no impact on the composition of any ecological community and certainly will not place any locally occurring ecological community at risk of extinction.
- d)
 - i) No trees will be removed from any proposed site. The proposed activities will have minimal impact on the habitat of any threatened species, population or ecological community and certainly will not place any locally occurring species, population or ecological community at risk of extinction. Within a short time it is expected that the habitat will have completely recovered.
 - ii) The areal extent of the proposed activities is very limited.
 - iii) Any interruption of habitat will be minimal and of short duration.
- e) The proposed activity will not have any significant adverse effect on any critical habitat either directly or indirectly.
- f) The proposed action is consistent with and will be carried out in accordance with a recovery plan.
- g) The proposed action does not constitute or form part of any key threatening process. It will not result in the operation of or increase the impact of any key threatening process.

4.5.1 Threatened Species in the Casino-Grafton Region

A search of the National Parks & Wildlife Atlas of NSW Wildlife has identified no species of significant flora, nor any sightings of vulnerable or endangered faunal species at any proposed site. Several

threatened species of flora and fauna have been recorded across the Casino-Grafton area of New South Wales, and these are listed below.

Fauna

Green and Golden Bell Frog	<i>Litoria aurea</i>	Endangered
Green-thighed Frog	<i>Litoria brevipalmata</i>	Vulnerable
Olongburra Frog	<i>Litoria olongburensis</i>	Vulnerable
Pouched Frog	<i>Assa darlingtoni</i>	Vulnerable
Wallum Froglet	<i>Crinia tinnula</i>	Vulnerable
Fleay's Barred Frog	<i>Mixophyes fleayi</i>	Endangered
Giant Barred Frog	<i>Mixophyes iteratus</i>	Endangered
Loveridge's Frog	<i>Phyllorhina loveridgei</i>	Endangered
Mountain Frog	<i>Phyllorhina richmondensis</i>	Endangered
Eastern Bristlebird	<i>Dasyornis brachypterus</i>	Endangered
Speckled Warbler	<i>Pyrrholaemus saggitatus</i>	Vulnerable
Red Goshawk	<i>Erythrotriorchis radiatus</i>	Endangered
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	Vulnerable
Square-tailed Kite	<i>Lophoictinia isura</i>	Vulnerable
Osprey	<i>Pandion haliaetus</i>	Vulnerable
Blue-billed Duck	<i>Oxyura australis</i>	Vulnerable
Freckled Duck	<i>Stictonetta naevosa</i>	Vulnerable
Magpie Goose	<i>Anseranas semipalmata</i>	Vulnerable
Australasian Bittern	<i>Botaurus poiciloptilus</i>	Vulnerable
Black Bittern	<i>Ixobrychus flavicollis</i>	Vulnerable
Rufous Scrub-bird	<i>Atrichornis rufescens</i>	Vulnerable
Bush Stone-curlew	<i>Burhinus grallarius</i>	Endangered
Beach Stone-curlew	<i>Esacus neglectus</i>	Endangered
Red-tailed Black-Cockatoo	<i>Calyptrorhynchus banksii</i>	Vulnerable
Glossy Black-Cockatoo	<i>Calyptrorhynchus lathamii</i>	Vulnerable
Barred Cuckoo-shrike	<i>Coracina lineata</i>	Vulnerable
Emu	<i>Dromaius novaehollandiae</i>	Endangered
Greater Sand-plover	<i>Charadrius leschenaultii</i>	Vulnerable
Lesser Sand-plover	<i>Charadrius mongolus</i>	Vulnerable
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	Endangered
Brown Treecreeper	<i>Climacteris picumnus</i>	Vulnerable
Wompoo Fruit-Dove	<i>Ptilinopus magnificus</i>	Vulnerable
Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>	Vulnerable
Superb Fruit-Dove	<i>Ptilinopus superbis</i>	Vulnerable
White-eared Monarch	<i>Monarcha leucotis</i>	Vulnerable
Black-browed Albatross	<i>Thalassarche melanophris</i>	Vulnerable
Diamond Firetail	<i>Stagonopleura guttata</i>	Vulnerable
Brolga	<i>Grus rubicunda</i>	Vulnerable
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	Vulnerable
Pied Oystercatcher	<i>Haematopus longirostris</i>	Vulnerable
Comb-crested Jacana	<i>Irediparra gallinacea</i>	Vulnerable
White Tern	<i>Gygis alba</i>	Vulnerable
Little Tern	<i>Sterna albifrons</i>	Endangered
Sooty Tern	<i>Sterna fuscata</i>	Vulnerable
Mangrove Honeyeater	<i>Lichenostomus fasciocularis</i>	Vulnerable
Black-chinned Honeyeater	<i>Melithreptus gularis gularis</i>	Vulnerable

Metgasco – Casino-Grafton Exploration 2010 Review of Environmental Factors

Regent Honeyeater	<i>Xanthomyza phrygia</i>	Endangered
Albert's Lyrebird	<i>Menura alberti</i>	Vulnerable
Olive Whistler	<i>Pachycephala olivacea</i>	Vulnerable
Hooded Robin	<i>Melanodryas cucullata</i>	Vulnerable
Red-tailed Tropicbird	<i>Phaethon rubricauda</i>	Vulnerable
Marbled Frogmouth	<i>Podargus ocellatus</i>	Vulnerable
Grey-crowned Babbler	<i>Pomatostomus temporalis temporalis</i>	Vulnerable
Southern Giant Petrel	<i>Macronectes giganteus</i>	Endangered
Providence Petrel	<i>Pterodroma solandri</i>	Vulnerable
Flesh-footed Shearwater	<i>Puffinus carneipes</i>	Vulnerable
Double-eyed Fig-parrot	<i>Cyclopsitta diophthalma coxeni</i>	Endangered
Swift Parrot	<i>Lathamus discolor</i>	Endangered
Turquoise Parrot	<i>Neophema pulchella</i>	Vulnerable
Eastern Ground Parrot	<i>Pezoporus wallicus wallicus</i>	Vulnerable
Bush-hen	<i>Amaurornis olivaceus</i>	Vulnerable
Painted Snipe	<i>Rostratula benghalensis australis</i>	Endangered
Sanderling	<i>Calidris alba</i>	Vulnerable
Great Knot	<i>Calidris tenuirostris</i>	Vulnerable
Broad-billed Sandpiper	<i>Limicola falcinellus</i>	Vulnerable
Black-tailed Godwit	<i>Limosa limosa</i>	Vulnerable
Terek Sandpiper	<i>Xenus cinereus</i>	Vulnerable
Barking Owl	<i>Ninox connivens</i>	Vulnerable
Powerful Owl	<i>Ninox strenua</i>	Vulnerable
Red-backed Button-quail	<i>Turnix maculosa</i>	Vulnerable
Black-breasted Button-quail	<i>Turnix melanogaster</i>	Endangered
Grass Owl	<i>Tyto capensis</i>	Vulnerable
Masked Owl	<i>Tyto novaehollandiae</i>	Vulnerable
Sooty Owl	<i>Tyto tenebricosa</i>	Vulnerable
Atlas Rainforest Ground-beetle	<i>Nurus atlas</i>	Endangered
Shorter Rainforest Ground-beetle	<i>Nurus brevis</i>	Endangered
Humpback Whale	<i>Megaptera novaeangliae</i>	Vulnerable
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	Vulnerable
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	Vulnerable
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	Vulnerable
Common Planigale	<i>Planigale maculata</i>	Vulnerable
Dugong	<i>Dugong dugon</i>	Endangered
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	Vulnerable
Black-striped Wallaby	<i>Macropus dorsalis</i>	Endangered
Parma Wallaby	<i>Macropus parma</i>	Vulnerable
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	Endangered
Red-legged Pademelon	<i>Thylogale stigmatica</i>	Vulnerable
Beccari's Freetail-bat	<i>Mormopterus beccarii</i>	Vulnerable
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	Vulnerable
Eastern Chestnut Mouse	<i>Pseudomys gracilicaudatus</i>	Vulnerable
Hastings River Mouse	<i>Pseudomys oralis</i>	Endangered
Australian Fur-seal	<i>Arctocephalus pusillus doriferus</i>	Vulnerable
Yellow-bellied Glider	<i>Petaurus australis</i>	Vulnerable
Squirrel Glider	<i>Petaurus norfolkensis</i>	Vulnerable
Koala	<i>Phascolarctos cinereus</i>	Vulnerable
Sperm Whale	<i>Physeter macrocephalus</i>	Vulnerable

Metgasco – Casino-Grafton Exploration 2010 Review of Environmental Factors

Rufous Bettong	<i>Aepyprymnus rufescens</i>	Vulnerable
Long-nosed Potoroo	<i>Potorous tridactylus</i>	Vulnerable
Eastern Tube-nosed Bat	<i>Nyctimene robinsoni</i>	Vulnerable
Black Flying-fox	<i>Pteropus alecto</i>	Vulnerable
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable
Common Blossom-bat	<i>Syconycteris australis</i>	Vulnerable
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	Vulnerable
Hoary Wattled Bat	<i>Chalinolobus nigrogriseus</i>	Vulnerable
Eastern Pipistrelle	<i>Falsistrellus tasmaniensis</i>	Vulnerable
Golden-tipped Bat	<i>Kerivoula papuensis</i>	Vulnerable
Little Bentwing-bat	<i>Miniopterus australis</i>	Vulnerable
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	Vulnerable
Large-footed Myotis	<i>Myotis adversus</i>	Vulnerable
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	Vulnerable
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	Vulnerable
Eastern Cave Bat	<i>Vespadelus trougtoni</i>	Vulnerable
Loggerhead Turtle	<i>Caretta caretta</i>	Endangered
Green Turtle	<i>Chelonia mydas</i>	Vulnerable
Leathery Turtle	<i>Dermochelys coriacea</i>	Vulnerable
White-crowned Snake	<i>Cacophis harriettae</i>	Vulnerable
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	Vulnerable
Stephens' Banded Snake	<i>Hoplocephalus stephensii</i>	Vulnerable
Three-toed Snake-tooth Skink	<i>Coeranoscincus reticulatus</i>	Vulnerable

Flora

Isoglossa	<i>Isoglossa eranthemoides</i>	Endangered
Slender Marsdenia	<i>Marsdenia longiloba</i>	Endangered
Southern Ochrosia	<i>Ochrosia moorei</i>	Endangered
Heart-leaved Star Hair	<i>Astrotricha cordata</i>	Endangered
Heath Wrinklewort	<i>Rutidosis heterogama</i>	Vulnerable
Dwarf Heath Casuarina	<i>Allocasuarina defungens</i>	Endangered
Corokia	<i>Corokia whiteana</i>	Vulnerable
Water Nutgrass	<i>Cyperus aquatilis</i>	Endangered
Cliff Sedge	<i>Cyperus rupicola</i>	Vulnerable
Square-stemmed Spike-rush	<i>Eleocharis tetraquetra</i>	Endangered
Davidson's Plum	<i>Davidsonia jerseyana</i>	Endangered
Smooth Davidson's Plum	<i>Davidsonia johnsonii</i>	Endangered
Tree Guinea Flower	<i>Hibbertia hexandra</i>	Endangered
Bordered Guinea Flower	<i>Hibbertia marginata</i>	Vulnerable
Giant Spear Lily	<i>Doryanthes palmeri</i>	Vulnerable
Waterwheel Plant	<i>Aldrovanda vesiculosa</i>	Endangered
Minyon Quandong	<i>Elaeocarpus sp. Rocky Creek</i>	Endangered
Hairy Quandong	<i>Elaeocarpus williamsianus</i>	Endangered
Hairy Melichrus	<i>Melichrus hirsutus</i>	Endangered
Narrow-leaf Melichrus	<i>Melichrus sp. Gibberagee</i>	Endangered
Acalypha	<i>Acalypha eremorum</i>	Endangered
Jointed Baloghia	<i>Baloghia marmorata</i>	Vulnerable
Sand Spurge	<i>Chamaesyce psammogeton</i>	Endangered
Southern Fontainea	<i>Fontainea australis</i>	Vulnerable
Brush Sauropus	<i>Phyllanthus microcladus</i>	Endangered

Metgasco – Casino-Grafton Exploration 2010 Review of Environmental Factors

Rainforest Cassia	<i>Senna acclinis</i>	Endangered
Thorny Pea	<i>Desmodium acanthocladum</i>	Vulnerable
Pointed Trefoil	<i>Rhynchosia acuminatissima</i>	Vulnerable
Brush Sophora	<i>Sophora fraseri</i>	Vulnerable
Silverbush	<i>Sophora tomentosa</i>	Endangered
Marblewood	<i>Acacia bakeri</i>	Vulnerable
Rupp's Wattle	<i>Acacia ruppii</i>	Endangered
White Lace Flower	<i>Archidendron hendersonii</i>	Vulnerable
Narrow-leaf Finger Fern	<i>Grammitis stenophylla</i>	Endangered
Nightcap Plectranthus	<i>Plectranthus nitidus</i>	Endangered
Swamp Mint-bush	<i>Prostanthera palustris</i>	Vulnerable
Spiny Mint-bush	<i>Prostanthera spinosa</i>	Vulnerable
Stinking Cryptocarya	<i>Cryptocarya foetida</i>	Vulnerable
Crystal Creek Walnut	<i>Endiandra floydii</i>	Endangered
Rusty Rose Walnut	<i>Endiandra hayesii</i>	Vulnerable
Green-leaved Rose Walnut	<i>Endiandra muelleri subsp. bracteata</i>	Endangered
Slender Screw Fern	<i>Lindsaea incisa</i>	Endangered
no common name	<i>Amyema plicatula</i>	Endangered
Onion Cedar	<i>Owenia cepiodora</i>	Vulnerable
Tinospora Vine	<i>Tinospora smilacina</i>	Endangered
Arrow-head Vine	<i>Tinospora tinosporoides</i>	Vulnerable
Ripple-leaf Muttonwood	<i>Rapanea sp. A Richmond River</i>	Endangered
Sandstone Rough-barked Apple	<i>Angophora robur</i>	Vulnerable
Woodland Babingtonia	<i>Babingtonia silvestris</i>	Endangered
Giant Ironwood	<i>Choricarpia subargentea</i>	Endangered
Slaty Red Gum	<i>Eucalyptus glaucina</i>	Vulnerable
Square-fruited Ironbark	<i>Eucalyptus tetrapleura</i>	Vulnerable
Sweet Myrtle	<i>Gossia fragrantissima</i>	Endangered
Weeping Paperbark	<i>Melaleuca irbyana</i>	Endangered
Red Lilly Pilly	<i>Syzygium hodgkinsoniae</i>	Vulnerable
Durobby	<i>Syzygium moorei</i>	Vulnerable
Magenta Lilly Pilly	<i>Syzygium paniculatum</i>	Vulnerable
Peach Myrtle	<i>Uromyrtus australis</i>	Endangered
Square-stemmed Olax	<i>Olax angulata</i>	Vulnerable
Pink Nodding Orchid	<i>Geodorum densiflorum</i>	Endangered
Red-flowered King of the Fairies	<i>Oberonia titania</i>	Vulnerable
Southern Swamp Orchid	<i>Phaius australis</i>	Endangered
Lady Tankerville's Swamp Orchid	<i>Phaius tankervilleae</i>	Endangered
Dark Greenhood	<i>Pterostylis nigricans</i>	Vulnerable
Brown Butterfly Orchid	<i>Sarcochilus dilatatus</i>	Endangered
Hartman's Sarcochilus	<i>Sarcochilus hartmannii</i>	Vulnerable
Blotched Sarcochilus	<i>Sarcochilus weinthalii</i>	Vulnerable
Hairy Jointgrass	<i>Arthraxon hispidus</i>	Vulnerable
Native Milkwort	<i>Polygala linariifolia</i>	Endangered
Tall Knotweed	<i>Persicaria elatior</i>	Vulnerable
Needle-leaf Fern	<i>Belvisia mucronata</i>	Endangered
Basket Fern	<i>Drynaria rigidula</i>	Endangered
Nightcap Oak	<i>Eidothea hardeniana</i>	Endangered
Ball Nut	<i>Floydia praealta</i>	Vulnerable
Banyabba Grevillea	<i>Grevillea banyabba</i>	Vulnerable

Metgasco – Casino-Grafton Exploration 2010 Review of Environmental Factors

Mason's Grevillea	<i>Grevillea masonii</i>	Endangered
Four-tailed Grevillea	<i>Grevillea quadricauda</i>	Vulnerable
Red Boppel Nut	<i>Hicksbeachia pinnatifolia</i>	Vulnerable
Rough-shelled Bush Nut	<i>Macadamia tetraphylla</i>	Vulnerable
Northern Clematis	<i>Clematis fawcettii</i>	Vulnerable
Sweet False Galium	<i>Hedyotis galioides</i>	Endangered
Spiny Gardenia	<i>Randia moorei</i>	Endangered
Cameron's Tarenna	<i>Tarenna cameronii</i>	Endangered
Scented Acronychia	<i>Acronychia littoralis</i>	Endangered
Yellow Satinheart	<i>Bosistoa transversa</i>	Vulnerable
Axe-Breaker	<i>Geijera paniculata</i>	Endangered
Austral Toadflax	<i>Thesium australe</i>	Vulnerable
Small-leaved Tamarind	<i>Diploglottis campbellii</i>	Endangered
Fine-leaved Tuckeroo	<i>Lepiderema pulchella</i>	Vulnerable
Rusty Plum	<i>Amorphospermum whitei</i>	Vulnerable
Moonee Quassia	<i>Quassia sp. Mooney Creek</i>	Endangered
Small-leaved Hazelwood	<i>Symplocos baeuerlenii</i>	Vulnerable
Native Jute	<i>Corchorus cunninghamii</i>	Endangered

Revision 1 – Flora & Fauna in relation to proposed (Phase 2) activities

For detail on Flora and Fauna Protection specific to the area of the Phase 2 work please refer to *Section 4.2 – Flora and Fauna Protection in Ecological, Cultural and Noise Aspects of Phase 2 Seismic Exploration Report* prepared by Greenloaning Biostudies, attached.

4.6 CHEMICAL AND HAZARDOUS SUBSTANCE MANAGEMENT

The Operator has placed strict environmental controls on the proposed activities, including the utilisation of silt fencing (if necessary) and spill kits, constant monitoring of all activities and subsequent rehabilitation of the site. The only potential pollutants on the site will be engine fuels and oils. Due to the expected shallow nature of any required up hole drilling (15-20m depth), it is not envisioned that any drilling additives will be utilised.

In the event of unexpected spills of pollutants, the procedures detailed in the **Emergency Response Plan** will be instigated and the determining authority duly notified. In the event of a fuel spill or similar event presenting potential environmental danger, spill kit materials will be used and additional emergency bunding may be constructed (at the point of the spill).

Procedures to prevent spills and soil contamination (hydrocarbons, drilling chemicals/additives)

It is not envisioned that any additives will be required for the drilling of the up-holes, however the main additives commonly used by Metgasco Ltd in the course of exploration drilling are Potassium Chloride (KCl), Liquid Polymer and Portland cement. Others are avoided where possible. The use of hydrocarbon additives will not be permitted.

The KCl is the same as the farming industry uses as a fertiliser in the course of pasture improvement. The liquid polymer used is widely utilised in the drilling industry and is degradable by both biological action and exposure to weather.

Any and all chemicals on the site will be stored in sealed containers or on pallets, protected from weather and within a bunded area. Hydrocarbons on site will be stored in sealed containers and any spill will be

immediately treated with dryorb type materials. A spill control kit of suitable materials will be kept on site.

Any drilling fluids will be contained within the primary fluid circulation system of the rig.

Revision 1 – Additional mitigation measures for Phase 2 of proposed seismic activities.

- It is not envisioned that any additives will be required for the drilling of any up-holes. In the unexpected even of a drill string becoming stuck in hole, minimal quantities of biodegradable additives will be used to free the drill string.
- Diesel and hydraulic lubricants will be stored in sealed bunded containers and any spill will be immediately treated with dryorb type materials.
- A spill control kit of suitable materials will be kept on location.
- Material Safety Data Sheets (MSDS) for any chemicals will also be kept on location.

4.7 CONTAMINATED LAND

Any soil contaminated by materials introduced by the exploration activities will be removed for disposal at a site determined by the relevant LGA.

4.8 WASTE MINIMISATION AND MANAGEMENT

All waste generated by the activities will be collected and disposed of at sites approved by the relevant LGA. In particular, food wastes will be regularly disposed of in order not to attract vermin.

Sanitation management

Garbage including foodstuffs will be removed weekly to council approved tip. If necessary, a portable toilet will be maintained on site for the duration of the program.

Revision 1 – Additional mitigation measures for Waste Management for Phase 2 of proposed Seismic activities.

- A portable toilet will be maintained at appropriate locations for the duration of the (Phase 2) program.

4.9 NATURAL RESOURCE UTILISATION

It is not envisioned that there will be any demand on natural resources during the program, except for 'blue metal' (basalt gravel) used to seal the top of the drill holes (if applicable), which will be sourced from local quarries. If any water is required, this will be obtained from sources approved by local landowners and/or the relevant LGA. The project's modest electricity requirements (estimated 5kw) will be obtained from on-site generation and will not overtax available supplies.

4.10 IMPACT ON THE COMMUNITY

The nearest sizeable communities to the proposed seismic activities are Casino and Grafton. All seismic activities will be conducted as far from dwellings as possible. The proposed drilling activities, which will be conducted on a 10-12 hour day shift basis, will have minimal aural and visual impact. Unavoidable engine exhaust fumes should be dissipated to well below detectable levels at the nearest residences.

Access to the area is via public sealed or gravelled roads. Noise, engine exhaust and dust from vehicle movements will have negligible impact on dwellings. A **Traffic Management Plan** will be in operation when acquiring seismic along public roads.

Other than restriction of access to the immediate sites for safety purposes, there will be no significant curtailment to beneficial uses of the environment, either during or subsequent to the drilling or data collection phases. The sites have been chosen to avoid intensive land use and will be located in open pasture land or sparsely wooded areas where possible. No access routes will be blocked on the property and some access upgrading will take place in association with the programs. The erection of any temporary fencing around the lines, if necessary, will avoid the potential for injury to livestock.

Work hours and noise

Normal work hours during the drilling and data collections phases will be primarily on a 10-12 hour per day (daylight) basis. There are several residences local to the proposed seismic programs, but due to the restricted working hours, activities should cause no disturbance to residents. All activities will be monitored to ensure noise levels remain within acceptable levels and to prevent undue disturbance to neighbouring residences. Sound level management will be actively employed if necessary.

4.11 VISUAL ASSESSMENT

The sites chosen are screened wherever possible from near-by residences by tree-lines and light to moderately forested areas, undulating topography and the distance between the lines and residences. The rig to be utilised for drilling the blast holes is expected to have a 13 metre high mast which may be observable from a distance.

The occupation of the lines will be for periods of approximately 1-3 days each. After the works are completed the site will be re-vegetated to the pre-existing state. The sites will be maintained with a tidy appearance during activities and every attempt will be made to ensure the site does not detract from the visual amenity of the district during or after the activities.

4.12 HERITAGE

The areas proposed for seismic activity possess no known special or unique attributes in connection with aesthetic, anthropological, archaeological, architectural, cultural, scientific, social or other special values, either for present or future generations.

4.12.1 Aboriginal Heritage

Metgasco utilises a strict Heritage Protection Protocol which it has developed in conjunction with the DII - MR. A search of the National Parks and Wildlife Service's Aboriginal Sites Register database has been lodged to ensure that that no known Aboriginal sites are recorded in or near the proposed seismic lines. In addition, prior to data acquisition activities a meeting will be held with the relevant Aboriginal Land Councils to ensure sites of significance are identified and avoided.

In addition a **Cultural Heritage Protocol** has been adopted by both Metgasco and its agents. This document now forms part of the Exploration Site Supervision Manual and acts as part of the Environmental Management Plan. In particular, the Richmond Valley Council has provided contact details should expert local advice be required at short notice.

Revision 1 – Aboriginal Heritage in relation to proposed (Phase 2) activities

For detail on Aboriginal Heritage specific to the area of the Phase 2 work please refer to *Section 4.3.1 – Aboriginal Heritage in Ecological, Cultural and Noise Aspects of Phase 2 Seismic Exploration Report* prepared by Greenloaning Biostudies, attached.

4.12.2 Other Cultural Heritage

Areas known to contain historical, cultural or anthropological artifacts or 'relics' (as defined by the NSW Heritage Act) have been avoided in selecting the seismic locations. Every effort will be made to avoid disturbing such objects should they be encountered during activities. Pursuant to Section 146 of the Heritage Act, 1977, if any collection of historical objects more than 50 years old is identified during work, their presence is to be notified to local government heritage officers and the state Heritage Council.

Revision 1 – Other Cultural Heritage in relation to proposed (Phase 2) activities

For detail on Other Cultural Heritage specific to the area of the Phase 2 work please refer to *Section 4.3.2 – Cultural Heritage in Ecological, Cultural and Noise Aspects of Phase 2 Seismic Exploration Report* prepared by Greenloaning Biostudies, attached.

Mitigation Measures as per *Section 4.3.3 in Ecological, Cultural and Noise Aspects of Phase 2 Seismic Exploration Report* prepared by Greenloaning Biostudies: -

4.3.3 Mitigation Measures

- Meeting with relevant Aboriginal Land Councils to ensure sites of significance are identified;
- Observation during operations of any other matters and items requiring protection, preservation or avoidance;
- Implementation of Cultural Heritage Protocol; and
- Communication of matters identified above to all working during the proposed activities
- Protection and avoidance of sensitive features.

4.13 LANDUSE

The properties involved are generally used for beef cattle grazing and crops. There are several identified residences located proximal to the proposed seismic programs; however due to the expected low-impact nature of the proposed activities, there should be minimal disturbance to these residents. Where possible, all residences are separated from the lines by forestation, tree lines, topography and/or distance.

4.14 CUMULATIVE ENVIRONMENTAL EFFECTS

Due to the limited duration of the activities and the stringent controls imposed by the operator, no cumulative environmental impact is anticipated as a consequence of the proposed activity. A short term increase in vegetation growth may be expected after rehabilitation due to mulching. The site is expected to be restored to its prior condition within three years of abandonment.

Revision 1 - Mitigation Measures relating to Cumulative Environmental Impacts – (Phase 2) of proposed Seismic activities.

The level of impact overall from the proposed exploration activities is expected to be very low, based on the following factors:

- In the case of Phase 2 work all areas will be restored to their prior condition on completion of the work
- Limited nature of proposed works;
- Avoidance of clearing of trees or understorey;
- Intent to use existing roads and tracks for seismic exploration as much as possible;
- Location of sites away from residences;
- Location of sites away from sensitive sites/habitats;
- Limit of works at any one site to three days;
- Proposed consultation with any landholders/residences to minimise impacts from shift changes;
- Minimal / nil use of additives/chemicals;
- Implementation of best practice safeguards and protocols.

Due to the limited duration of the activities and the stringent controls imposed by the operator, no cumulative environmental impact is anticipated as a consequence of the proposed activity.

A short term increase in vegetation growth may be expected after rehabilitation due to mulching of grass clippings in areas subject to slashing. All areas subject to any disturbance will be restored to their prior condition, the progress of restoration being subject to regular monitoring to ensure successful outcomes.

4.15 SUMMARY OF MITIGATING MEASURES

Mitigation measures will include but not be limited to;

1. Careful site selection to where possible, avoid areas requiring special environmental protection.
2. Observation on site of any matters and items requiring protection, preservation or avoidance.
3. Implementation of Cultural Heritage Protocol.
4. Communication of matters identified by 2 and 3 above to all working on the site.
5. Where possible, preserve the prior environment.
6. Protection and avoidance of sensitive items.
7. Prevention of contamination or other avoidable environmental disturbance.
8. Restoration of the lines to the prior environmental conditions on abandonment, and subsequent inspection.

Revision 1 – Additional Mitigation Measures – (Phase 2) of proposed Seismic activities.

Mitigation Measures as per Section 4.4 in Ecological, Cultural and Noise Aspects of Phase 2 Seismic Exploration Report prepared by Greenloaning Biostudies: -

A range of mitigation measures will be included as standard practice for the proposed activities, these measures including, but not be limited to;

- i. Careful route and drilling site selection (if required), where possible avoiding areas requiring special environmental protection;
- ii. Pre-works surveys of potential Hairy Jointgrass habitat to ensure adverse impacts on this species are avoided;
- iii. Development of Hairy Jointgrass protocols in case the species is detected during the seismic operations;
- iv. Induction of on-site personnel in environmental procedures and recognition of Hairy Jointgrass and Hairy Jointgrass protocols;
- v. Observation during operations of any other matters and items requiring protection, preservation or avoidance;
- vi. Implementation of Cultural Heritage Protocol;
- vii. Communication of matters identified above to all working during the proposed activities;
- viii. Where possible, preserve the prior environment;
- ix. Protection and avoidance of sensitive features;
- x. Prevention of contamination or other avoidable environmental disturbance;
- xi. Restoration of the site's prior environment on abandonment, and subsequent inspection and monitoring; and
- xii. Best practice weed management, following weed control/management protocols to ensure the risk of spreading invasive weed species such as Giant Parramatta Grass is minimised.

With regard to item (xi) above, monitoring will be undertaken at least quarterly in the first 12 months to ensure that any restoration procedures required are progressing satisfactorily. Remedial measures will be undertaken as required if monitoring results indicate unsatisfactory progress. Such measures may include weed control, watering if very dry conditions have impeded grass growth or protection of the area if it has been subject to physical disturbance.

Best practice weed management will include the following procedures:

- Weed management induction for all field personnel, ensuring that there is a clear understanding of the sources and effects of spreading invasive species such as Giant Parramatta Grass;
- Development and use of weed management protocol, outlining personnel, equipment and vehicle hygiene measures; and
- Development and implementation of a reporting mechanism to ensure protocols are being followed appropriately.

5.0 REHABILITATION WORKS

At the conclusion of the program, complete environmental restoration of the lines will be undertaken and no long-term environmental effects are envisaged. The following steps will be undertaken.

Any surface expression of drilled up-holes will be rehabilitated in accordance with requirements of the Department of Industry and Investment NSW- Mineral Resources. Any rutting or surface damage by vehicle movements will be filled in and appropriately contoured.

No rubbish will be buried on site.

Rapid regeneration of the site to its original state will be promoted by backfilling of any excavations and re-spreading of any stockpiled topsoil. If necessary, mulching and seeding with natural grasses will follow. A perimeter fence may be retained until satisfactory flora re-growth has taken place, to protect such re-growth from grazing stock.

Any materials for improvements to tracks and fencing will be removed from the lines when appropriate, unless the property owner requests their retention in writing. Should the property owner request the retention of any such materials, these will be tidily stockpiled away from the activity site.

Revision 1 – (Phase 2) Seismic activities.

- All drilled up-holes will be immediately back filled with original soils and returned to pre-work conditions.

6.0 SUMMARY OF IMPACTS AND CONCLUSION

This REF presents the knowledge of the environment and the potential impacts as they are known at this time. As a consequence of experience with previous exploration activities in the area and the willingness of both Operator and Contractors to minimise all environmental impacts, the operator, Metgasco Ltd, sees no major long term unfavourable impacts that might ensue from the proposed exploration activity.

There will be an impact on the immediate vicinity of the seismic lines for the duration of the program (as described above - Description of the Proposed Activity), however this will be both localised and non-permanent. Similar programs conducted elsewhere have been fully rehabilitated, and indeed the precise location of many former seismic lines is difficult (if not impossible) to detect due to satisfactory rehabilitation. Such locations have not been permanently transformed in any environmentally adverse manner.

Except for the actual period of seismic acquisition, no diminution of aesthetic, recreational, scientific or other environmental quality will result from this proposal. The activity will enhance the scientific value of

Metgasco – Casino-Grafton Exploration 2010

Review of Environmental Factors

the locality by way of its contribution to geological knowledge and an understanding of the region's energy resources.

A future gas production project may, if commercial, have some favourable long term impacts on the economy of the local community and provide energy alternatives that reduce greenhouse impacts from those currently available.

This document and its review form part of the Environmental Management Plan of Metgasco Limited and as such is the subject of continuing updating as additional information is acquired. This version document has been prepared in February 2010.

Metgasco – Casino-Grafton Exploration 2010

Review of Environmental Factors

Attachment 1

Metgasco – Casino-Grafton Exploration 2010

Review of Environmental Factors



all communication to
GENERAL MANAGER

our ref: SB/CR11/21874/CM/R2401-01

your ref:

contact: Mr Steven Bennetts

1 September 2011

Metgasco Ltd
PO Box 5
CASINO NSW 2470

RECEIVED 02 SEP 2011

Attention: Mr Hamish Ramsay

Dear Mr Ramsay

Application to Carry out Work within the Road Reserve -- Rock Valley Area

Reference is made to your application received on August 17, 2011 concerning the above matter. Following assessment of your application, it has been determined that approval be granted for the works subject to the following, which must be submitted to Council prior to any works commencing:

- receipt of payment in full of Council's permit fee
- all works are to be undertaken whilst operating under a suitably designed and accredited Traffic Control Plan (TCP) in accordance with the RTA 'Traffic Control at Works Sites' manual, a copy of which is to be submitted to Council
- a copy of your current Public Liability insurance, which must remain current for the extent of the works, and
- Council to be notified upon completion of the works.

Council also advises that the proposal may result in your company and Council being joined in any public liability claim should an incident occur.

If you require further information in relation to this matter, please contact Council's Rural Works Engineer, Mr Steven Bennetts on 1300 67 83 87.

Yours faithfully

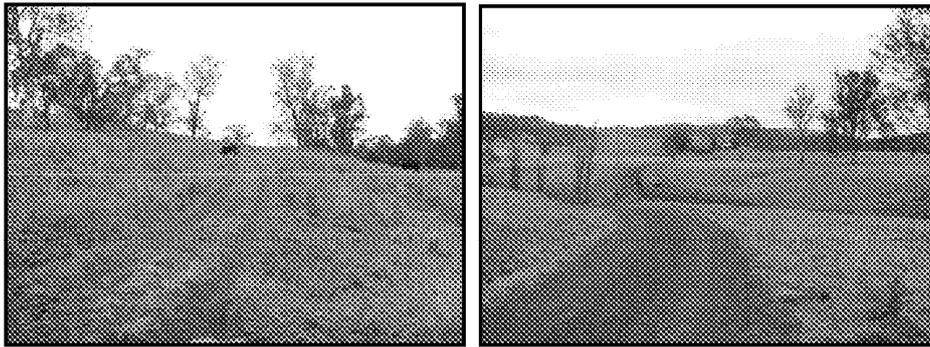
Darren Patch
Manager -- Works

**Attachment 2
Ecological, Cultural and Noise Aspects of Phase 2 Seismic
Exploration
Greenloaning Biostudies Pty Ltd**

Ecological, Cultural and Noise Aspects of
Phase 2 Seismic Exploration

for the

Review of Environmental Factors
Metgasco Limited 2010
MET10 Casino-Grafton Seismic Program
Clarence-Moretton Basin, NSW



Greenloaning Biostudies Pty Ltd
07 September 2011

Greenoaning Biostudies Pty Ltd

2

TABLE OF CONTENTS

1.0	INTRODUCTION	3
1.1	Locality.....	3
1.2	Description of the Activity.....	3
2.0	PLANNING CONTEXT.....	4
2.1	Licences and Approvals required.....	4
2.2	Stakeholder Consultation	4
3.0	EXISTING ENVIRONMENT	5
3.1	Landforms and Geology.....	5
3.2	Climate.....	6
4.0	ENVIRONMENTAL IMPACTS AND MANAGEMENT.....	7
4.1	Noise and Vibration.....	7
4.1.1	<u>Background Noise Levels and Compliance Requirements</u>	7
4.1.2	<u>Interim Construction Noise Guideline</u>	7
4.1.3	<u>Sleep Arousal Level</u>	7
4.1.4	<u>Vibration</u>	7
4.1.5	<u>Mitigation Measures</u>	8
4.2	Flora and Fauna Protection	8
4.2.1	<u>Threatened Fauna</u>	8
4.2.2	<u>Threatened Flora/Endangered Ecological Communities</u>	11
4.2.3	<u>Mitigation Measures</u>	13
4.3	Heritage.....	13
4.3.1	<u>Aboriginal Heritage</u>	13
4.3.2	<u>Cultural Heritage</u>	14
4.3.3	<u>Mitigation Measures</u>	14
4.4	Summary of Mitigation Measures.....	14
5.0	REHABILITATION WORKS.....	16
6.0	SUMMARY OF IMPACTS AND CONCLUSION	16
	REFERENCES AND BIBLIOGRAPHY	17
	APPENDICES	
APPENDIX A	Photographs	
APPENDIX B	Terrax Seismic Vibration Trucks - Vibration & In-Cab Noise Measurements by Heggies	
APPENDIX C	EPBC Protected Matters Search Report	
APPENDIX D	Assessment of Significance as per Section 5A of the EP&A Act	
APPENDIX E	Assesment of Significance as per Threatened Species Assessment Guidelines of the EPBC Act.	

1.0 INTRODUCTION

1.1 Locality

Metgasco Limited (Metgasco) has requested Greenloaning Biostudies to carry out specific desktop reviews and associated studies as part of the preparation of a Review of Environmental Factors (REF) for the exploration of Petroleum Exploration Licence (PEL) 16 (see Figure 1). The required studies comprise assessments of the ecological, cultural heritage and noise aspects of the proposed activities, which relate specifically to Phase 2 of proposed seismic exploration programmes in the vicinity of Casino - Lismore, NSW. This assessment report is required to be suitable for provision as a supporting document to the REF prepared by Metgasco for Phase 1 and Phase 2 of the seismic exploration program.

Available information indicates that the subject land does not fall within any of the eleven categories of land identified in Section 3.2.1 of Guidelines for (the) Review of Environmental Factors [ESB18 March 2006] that would reserve or protect the land for conservation purposes, although the proposed lines at Bungabee and Flock Valley are proximal to Muckleewee Nature Reserve. The proposed line at Bungabee also passes through a portion of the Nature Reserve, but along the alignment of a crown road reserve. Other portions of the proposed seismic lines may fall within Crown Land, where the line is situated upon road reserve.

1.2 Description of the Activity

The proposed activities represent Phase 2 of the exploration programme in this area, Phase 2 works being an amendment of the more comprehensive and already approved sampling programme of Phase 1. This proposed program for Phase 2 consists of three additional lines totalling approximately 17.139 km over the Mackellar and Kingfisher structures of Casino. These comprise one line of 1.291 km just north of Casino, one line of 5.658 from Bentley to Bungabee, encompassing part of the Disputed Plains, and one line of 10.19 km at Flock Valley, north west of Casino. The locations of the proposed Phase 1 lines and the approved Phase 2 lines are indicated on Figure 1. Further details on the technical aspects of the proposed activities are provided in the REF for which this assessment report represents a supporting document.

The intent of the exploration program is to utilise existing road formations and road verges to the maximum extent possible. During the process of continuing review of available data and access requirements, Metgasco Ltd may need to alter the location of seismic lines within +/- 500m, or number of proposed lines. The final seismic layout however, will be provided to the DPI – MR prior to the commencement of seismic acquisition activities. The reasons for altering the alignment of the route would be to avoid sensitive habitat, wet ground or inaccessible section of the route, either because of topographical constraints or lack of approved access by a landowner. The proposed alignment of the seismic lines and the area +/- 500m either side constitutes the study area for the purposes of this assessment document.

2.0 PLANNING CONTEXT

2.1 Licences and Approvals Required

Under section 67 of the Petroleum (Onshore) Act 1991 (NSW), development consent is required under the Environmental Planning and Assessment Act 1979 (NSW) (EPA ACT). Clause 228 of the Environmental Planning and Assessment Regulation, 2000, indicates specific factors which must be taken into account, under Part 5 of the EPA ACT, in determining the likely environmental impacts of a proposed activity. This assessment report specifically addresses the factors referred to in subclause (2), viz:

- (c) any environmental impact on the ecosystems of the locality;
- (e) any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations;
- (f) any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974);
- (g) any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air;
- (h) any long-term effects on the environment;
- (i) any degradation of the quality of the environment,

Part (i) of subclause 2, for the purposes of this assessment report, relates to the assessment of impacts associated with noise factors relevant to the proposed seismic exploration activities.

Part 5A of the EPA ACT, presents the factors that must be taken into account when determining whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats. This assessment report addresses Part 5A and considers the potential for impact on threatened species or communities listed under the Threatened Species Conservation Act 1995 (NSW). Consideration is also given to the potential for impact on threatened species or communities listed under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). The criteria for an assessment of significant impacts on vulnerable species is provided in Policy Statement 1.1 for the EPBC Act - Significant Impact Guidelines: Matters of National Significance (DEH, 2006)

2.2 Stakeholder Consultation

In relation to noise, ecological and heritage aspects associated with the proposed Phase 2 activities, subsequent to approval being granted to undertake a seismic program, stakeholder consultation will be undertaken with local landowners on adjoining properties, local residents and the local Aboriginal Land Council.

3.0 EXISTING ENVIRONMENT

3.1 Landforms and Geology

The area to the north-east of Casino and north-west of Lismore lies within the Richmond River catchment and is approximately 35km inland from the east coast. It is dominated by a series of forested ridges dissecting cleared floodplain grazing areas ranging in elevation from approximately 20 to 500m above sea level.

The study area supports a mixture of riparian rainforest vegetation, open eucalypt woodland and predominantly cleared grazing land comprising native and introduced pasture species. There is an abundance of individual old growth trees throughout the area and weed infestation is also common. These areas, although degraded, represent high habitat value due to the hollow bearing nature of the old growth trees and the dependence of numerous hollow roosting/nesting fauna on such trees.

The dominant land use within the study area is agriculture, primarily cattle grazing although some orchards and cropped areas are interspersed with the pastureland. Forestry operations are also common in the region but are avoided for this seismic programme. Small villages are present along Rock Valley Road but otherwise urban and industrial environments are absent, with the nearest built up area being closest to MET10-09 which is just north of Casino.

The proposed lines are almost entirely situated on public roads with the exception of several short traverses across cleared paddocks at Bungabee (MET10-40) and the southern section of the Rock Valley line (MET10-41). The lines also cross several tributaries and creeks but the line is proposed to cross on existing bridges. MET10-40 will pass near Bungabee Lagoon and several wetland areas but the proposed alignment does not traverse any well formed wetland. A small number of minor drainage lines/gullies are crossed by the line, these typically supporting a moderately dense growth of the native grass species, Swamp Foxtail.

The northern end of MET10-40 is situated near Muckleewee Nature Reserve which adjoins the existing cleared grazing property on which the line is situated. Muckleewee NR contains several known Aboriginal heritage sites, one of which is situated close to the predicted end point of MET10-40 but is within the boundaries of the Nature Reserve. No other known site in the area is within any proximity to the proposed lines.

Figure 1 illustrates the location of the lines and photographs provided in Appendix A indicate the cleared nature of the route and the rural landscape features.

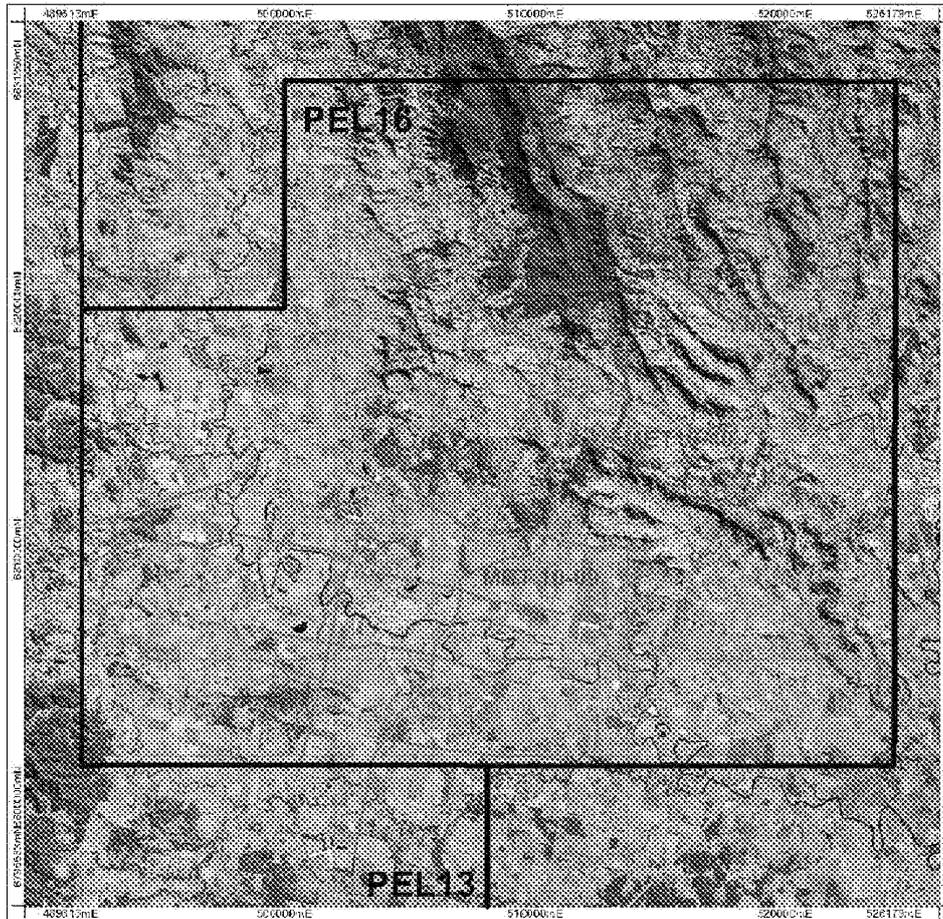


Figure 1 Phase 1 (blue) and phase 2 (red) seismic lines in PEL 16 and 13. (Source: Metgasco 2010)

3.2 Climate

The study area is subject to a subtropical climate with high summer rainfall and frequent storm activity. Very heavy rainfall events and flood events are not uncommon in the area. The influence of the climate is evident in much of the vegetation occurring in the study area, with substantial moist forest and rainforest elements present, particularly along creeks and drainage lines.

4.0 ENVIRONMENTAL IMPACTS AND MANAGEMENT

Noise and Vibration

Background Noise Levels and Compliance Requirements

The proposed activity will generate noise and vibrations as result of:

- Terrex vibroseis trucks during the operational phase of data collection; and
- Support vehicles operating in regular intervals.

Activities will be conducted on a 10-12 hours per day (daylight) basis. Noise from activities is expected to be at ambient levels at a distance of 200m from the seismic lines. However, consideration needs to be given to compliance with the following:

- Interim Construction Noise Guideline, applying to temporary operations;
- Sleep Arousal Level, applying to all operations; and
- Assessing vibration – a technical guideline (DEC2006).

4.1.1 Interim Construction Noise Guideline

According to Section 3 of the Interim Construction Noise Guideline, this operation falls under the category of short-term operations which will not affect individuals or sensitive lands for more than three weeks. The routine seismic survey activities continually move and therefore will not impact any adjacent residence for any period of time beyond three hours. If any up-hole drilling is required, the operation will take approximately 4 hours to complete. A qualitative assessment of assessing the noise level and associated impacts is therefore appropriate for the seismic exploration programme under the 'short term' works category.

As referred to above, as well as being of short term duration in any one area, noise levels are expected to be at ambient levels at a distance of 200m from the seismic lines. In the case of any issues identified by residents/landowners, a procedure for complaints will be followed as required under Section 5 of the guidelines. In addition, as referred to in the Guidelines, all feasible and reasonable measures will be applied as appropriate to minimize noise levels.

4.1.2 Sleep Arousal Level

Sleep Arousal Level noise restriction applies only at night, i.e. between 10 pm and 7 am. The seismic data acquisition will begin no earlier than 6 am, which includes onsite toolbox meetings with staff before commencement of work, and it is not envisaged that noise greater than the ambient noise produced by local traffic will be generated between 6 and 7 am.

4.1.3 Vibration

The workplace health and safety (WH&S) issues and vibration measurements of Terrex Seismic Pty Ltd (Terrex [seismic data collection company contracted by Metgasco]) operational phase were evaluated by Heggies Pty Ltd and documented in a report (see Appendix B). The proposed activities are assessed under section 2.4 of the Vibration Guidelines, intermittent vibration, and the values recorded by Heggies fall within acceptable vibration dose values. The proposed activities are also deemed as short term (less than one week) under the guidelines which require

Greenloaning Biostudies Pty Ltd

8

feasible and reasonable mitigation measures as well as extensive community consultation. Both of these measures will be applied.

Recommendations from Heggies (2009), (Appendix B), are provided on the basis of comparison between operational vibration measurements and Australian Standard AS 2670: Part 2- 1990 "Evaluation of human exposure to whole-body vibration Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz)" and German Standard DIN 4150: Part 3-1999 "Structural vibration Part 3: Effects of vibration on structures". DIN 4150 is used as the preferred standard as safe levels of vibration are ensured that result in no cosmetic damage to structures. This is considered a more desirable standard, rather than 'minimal risk of cosmetic damage' as provided in other international standards.

Recommendations include a conservative minimum distance of 20m between the vibrator and residential buildings be maintained to avoid cosmetic damage. Human comfort limits according to AS 2670 may at times be exceeded when working within 100m of a dwelling though both issues are addressed through consent being provided from residences to Metgasco for seismic data acquisition to be performed within 200m and no closer than 50m of dwellings. At all times, vibration will be minimised insofar as possible through best practice measures, the community will be kept informed of survey works in advance, and any complaints will be promptly addressed. The full report on vibration studies and recommendations is provided in Appendix B.

4.1.4 Mitigation Measures

- (i) In the case of any issues identified by residents/landowners, a procedure for complaints will be established and followed;
- (ii) All feasible and reasonable measures will be applied as appropriate to minimize noise levels;
- (iii) Consent from residences will be acquired for seismic data acquisition to be performed within 200m and no closer than 50m of dwellings;
- (iv) Vibration will be minimised through best practice measures; and
- (v) The community will be kept informed of survey works in advance.

4.2 Flora and Fauna Protection

4.2.1 Threatened Fauna

A list of threatened fauna species generated from the NPWS Wildlife Atlas Database records (OEH 2011) and listed under the Threatened Species Conservation Act 1995 (TSC Act) is provided in Table 4.1. Species also listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) are noted in the table and the results of the Protected Matters Search Report is provided in Appendix C. Although a number of the species listed in Table 4.1 would be expected to occur in the vicinity of portions of the proposed seismic lines, the avoidance of clearing of trees and the predominantly cleared open nature of the areas through which the lines pass renders the potential impacts on threatened fauna and other fauna species as minimal. Photographs presented in Appendix A illustrate the pastureland or roadside habitat, as well as the scattered occurrence of large old growth trees. Indications of the use of one old

Greenocean Biostudies Pty Ltd

9

growth tree in the immediate vicinity of the route by one threatened species, the Yellow-bellied Glider (*Petaurus australis*) was observed (refer to Appendix A) and the majority of old growth trees comprise Forest Red Gums (*Eucalyptus tereticornis*), representing favoured Koala food trees.

Given the low level of activity planned for any one location, the short term nature of the planned activity and the intent to avoid impact to sensitive areas, no adverse effects on any of these species would be predicted. As indicated in the Section 5A Assessments provided in Appendix D, no threats to the survival of any species are likely, habitat will not be fragmented or isolated and no threatening process would be increased by the proposed seismic programme.

Table 4.1 THREATENED FAUNA LISTED UNDER THE TSC Act 1999 WITHIN 15KM OF SUBJECT AREA AS PER NPWS WILDLIFE ATLAS DATABASE SEARCH

Class	Scientific Name	Common Name	Status
Aves			
	<i>Amaurornis olivaceus</i>	Bush-hen	V
	<i>Anseranas semipalmata</i>	Maggie Goose	V
	<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A E (EPBC)
	<i>Botaurus poidoptilus</i>	Australasian Bittern	E1 E (EPBC)
	<i>Burhinus grallarius</i>	Bush Stone-curlew	E1
	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V
	<i>Circus assimilis</i>	Spotted Harrier	V
	<i>Climacteris picumnus</i>	Brown Treecreeper	V
	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V
	<i>Coracina lineata</i>	Barred Quook-shrike	V
	<i>Daphoenositta chrysoptera</i>	Varied Sttella	V
	<i>Dromaius novaehollandiae</i>	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E2
	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1
	<i>Erythrotriorchis radiatus</i>	Red Goshawk	E4A
	<i>Glossopsitta pusilla</i>	Little Lorikeet	V
	<i>Irediparra gallinacea</i>	Comb-crested Jacana	V
	<i>Ixobrychus flavicollis</i>	Black Bittern	V
	<i>Limosa limosa</i>	Black-tailed Godwit	V
	<i>Lophoictinia isura</i>	Square-tailed Kite	V
	<i>Meliphreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V
	<i>Monarcha leucotis</i>	White-eared Monarch	V

Greenoceaning Biostudies Pty Ltd

10

Table 4.1 THREATENED FAUNA LISTED UNDER THE TSC Act 1999 WITHIN 15KM OF SUBJECT AREA AS PER NPWS WILDLIFE ATLAS DATABASE SEARCH

Class	Scientific Name	Common Name	Status
	<i>Ninox connivens</i>	Barking Owl	V
	<i>Ninox strenua</i>	Powerful Owl	V
	<i>Oxyura australis</i>	Blue-billed Duck	V
	<i>Phaethon rubricauda</i>	Red-tailed Tropicbird	V
	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V
	<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V
	<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	V
	<i>Pstratula benghalensis australis</i>	Painted Shipe (Australian subspecies)	EI
	<i>Stagonopleura guttata</i>	Diamond Firetail	V
	<i>Stictonetta naevosa</i>	Freckled Duck	V
	<i>Turnix maculosa</i>	Red-backed Button-quail	V
	<i>Tyto capensis</i>	Grass Owl	V
	<i>Tyto novaehollandiae</i>	Masked Owl	V
	<i>Tyto tenebricosa</i>	Sooty Owl	V
Mammals			
	<i>Aepyprymnus rufescens</i>	Rufous Bettong	V
	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V E (EPBC)
	<i>Macropus parma</i>	Parma Wallaby	V
	<i>Miniopterus australis</i>	Little Bentwing-bat	V
	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V
	<i>Myotis macropus</i>	Southern Myotis	V
	<i>Petaurus australis</i>	Yellow-bellied Glider	V
	<i>Petaurus norfolcensis</i>	Squirrel Glider	V
	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	EI V (EPBC)
	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V
	<i>Phascolarctos cinereus</i>	Koala	V
	<i>Planigale maculata</i>	Common Planigale	V
	<i>Potorous tridactylus</i>	Long-nosed Potoroo	V V (EPBC)
	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V V (EPBC)
	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V
	<i>Sotetanax rueppellii</i>	Greater Broad-nosed Bat	V
Reptiles			

Table 4.1 THREATENED FAUNA LISTED UNDER THE TSC Act 1999 WITHIN 15KM OF SUBJECT AREA AS PER NPWS WILDLIFE ATLAS DATABASE SEARCH

Class	Scientific Name	Common Name	Status
Amphibians	Cacophis harriettae	White-crowned Snake	V
	Litoria brevipalmata	Green-thighed Frog	V
	Mixophyes iteratus	Giant Barred Frog	E1 E (EPBC)

Notes: E - Endangered V - Vulnerable

4.2.2 Threatened Flora/ Endangered Ecological Communities

A list of threatened flora species generated from the NPWS Wildlife Atlas Database records (OEH 2011) and listed under the Threatened Species Conservation Act 1995 (TSC Act) is provided in Table 4.2. Species also listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) are noted in the table and the results of the Protected Matters Search Report is provided in Appendix C. Although a number of the species listed in Table 4.2 would be expected to occur in the general study area, the majority of species would not be expected to occur in the immediate vicinity of the proposed seismic lines. The avoidance of clearing of trees and the predominantly cleared open nature of the areas through which the lines pass also renders the potential for impact on most species highly unlikely. One species however, not listed in Table 4.2 but known to occur in the area is a threatened grass species, Hairy Jointgrass (*Arthraxon hispidus*) is listed as vulnerable under both the TSC Act and EPBC Act. This species occurs in swampy grassland to the east of the Bungabee Road line and is also known to occur in seepage areas on steep hillsides in the region (A. Martin, pers. obs., Greenloaning Biostudies, 2009a, 2009b, 2010a, 2010b). There is some potential for potential habitat for this species to be impacted to some extent and care will therefore be taken to ensure potential habitat for this species is surveyed and any occurrences identified to ensure impacts on the species can be avoided. Specific mitigation measures for the species are provided for this species in Section 4.2.3. Photographs presented in Appendix A illustrate the potential habitat for the Hairy Jointgrass and known habitat for species in the general study area.

Given the low level of activity planned for any one location, the short term nature of the planned activity and the intent to avoid impact to sensitive areas, no adverse impacts on the Hairy Jointgrass or any of the other flora species potentially occurring in the general area would be predicted. As indicated in the Section 5A Assessments provided in Appendix D, no threats to the survival of any species are likely, habitat will not be fragmented or isolated and no threatening process would be increased by the proposed seismic programme. An assessment of significance undertaken according to the guidelines provided in Policy Statement 1.1 for the EPBC Act - *Significant Impact Guidelines: Matters of National Significance* (DEH, 2006), provided in **Appendix E**, also indicate no significant threats to an important population of the Hairy Jointgrass.

In addition, much of the scattered woodland habitat or small patches of vegetation adjacent to the proposed seismic route represent Endangered Ecological Communities (EECs) listed under the TSC Act (refer to Appendix A). The old growth Forest Red Gums (*Eucalyptus tereticornis*)

Greenoaning Biostudies Pty Ltd

12

referred to in Section 3.6.1 are representative of Subtropical Coastal Floodplain Forest in the NSW North Coast and Sydney Basin Bioregions, whilst some of the riparian vegetation with noticeable rainforest elements (refer to Photograph A2) represents Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions. Neither of these communities is listed as Wndangered Ecological Communities under the EPBC Act.

As applied to the threatened flora species, given the low level of activity planned for any one location, the avoidance of any tree removal, the short term nature of the planned activity and the intent to avoid impact to sensitive areas, no adverse impacts on either of these communities would be predicted. As indicated in the Section 5A Assessments provided in Appendix D, no threats to the survival of any species are likely, habitat will not be fragmented or isolated and no threatening process would be increased by the proposed seismic programme.

Table 4.2 THREATENED FLORA LISTED UNDER THE TSC Act 1999 WITHIN 15KM OF SUBJECT AREA AS PER NPWS WILDLIFE ATLAS DATABASE SEARCH

Scientific Name	Common Name	Status
Archidendron hendersonii	White Lace Flower	V
Choricarpia subargentea	Giant Ironwood	EI
Clematis fawcettii	Northern Clematis	V
Corchorus cunninghamii	Native Jute	EI E (EPBC)
Cryptocarya foetida	Stinking Cryptocarya	V V (EPBC)
Cyperus aquatilis	Water Nutgrass	EI
Desmodium acanthocladium	Thorny Pea	V
Eucalyptus glaucina	Saty Red Gum	V
Geijera paniculata	Axe-Breaker	EI
Gossia fragrantissima	Sweet Myrtle	EI
Grevillea hilliana	White Yiel Yiel	EI
Macadamia tetraphylla	Rough-shelled Bush Nut	V V (EPBC)
Melaleuca irbyana	Weeping Paperbark	EI
Myrsine richmondensis	Fipple-leaf Muttonwood	EI
Odenlandia galloides		EI
Owenia cepiodora	Onion Cedar	V V (EPBC)
Phyllanthus microcladus	Brush Sauropus	EI
Polygala linariifolia	Native Milkwort	EI
Prostanthera palustris	Swamp Mint-bush	V
Rhynchosia acuminatissima	Pointed Trefoil	V
Rotala tripartita		EI

Greenoaning Biostudies Pty Ltd

13

Table 4.2 THREATENED FLORA LISTED UNDER THE TSC Act 1999 WITHIN 15KM OF SUBJECT AREA AS PER NPWS WILDLIFE ATLAS DATABASE SEARCH

Scientific Name	Common Name	Status
Senna acclinis	Rainforest Cassia	E1
Sophora fraseri	Brush Sophora	V
Syzygium hodgkinsoniae	Red Lilly Pilly	V
Tinospora smilacina	Tinospora Vine	E1
Tinospora tinoporoides	Arrow-head Vine	V V (EPEC)

Notes: E- Endangered V- Vulnerable

4.2.3 Mitigation Measures

- (i) Careful route and drilling site selection (if required), where possible avoiding areas requiring special environmental protection;
- (ii) Pre-works surveys of potential Hairy Jointgrass habitat to ensure adverse impacts on this species are avoided;
- (iii) Development of Hairy Jointgrass protocols in case the species is detected during the seismic operations;
- (iv) Induction of on-site personnel in environmental procedures and recognition of Hairy Jointgrass and Hairy Jointgrass protocols;
- (v) Observation during operations of any other matters and items requiring protection, preservation or avoidance;
- (vi) Where possible, preserve the prior environment;
- (vii) Protection and avoidance of sensitive features;
- (viii) Prevention of contamination or other avoidable environmental disturbance;
- (ix) Restoration of the site's prior environment on abandonment, and subsequent inspection and monitoring; and
- (x) Best practice weed management, following weed control/management protocols to ensure the risk of spreading invasive weed species such as Giant Parramatta Grass is minimised.

4.3 Heritage

4.3.1 Aboriginal Heritage

A detailed report from the Aboriginal Heritage Information Management System (AHIMS) has been obtained for the locality. The details have been mapped to ensure that no known Aboriginal sites are situated on or close to the proposed seismic lines. In addition, prior to data acquisition activities a meeting will be held with the relevant Aboriginal Land Councils to ensure sites of significance are identified and avoided.

Line MET10-40 stops short of the Muckleewee Nature Reserve where beyond the boundary lies a known Aboriginal camp site. As the line stops prior to the reserve boundary, it is expected that there will be no disturbance to this Aboriginal heritage site but this will be confirmed prior to working in this area. No other Aboriginal sites are proximal to the proposed seismic data collection activities.

4.3.2 Cultural Heritage

A search of the NSW heritage database was conducted and areas known to contain historical, cultural or anthropological artifacts or 'relics' (as defined by the NSW Heritage Act, 1977) have been avoided in selecting the seismic locations. Every effort will be made to avoid disturbing such objects should they be encountered during activities. Pursuant to Section 146 of the Heritage Act, 1977, if any collection of historical objects more than 50 years old is identified during work, their presence is to be notified to local government heritage officers and the state Heritage Council.

A Cultural Heritage Protocol has been adopted by both Metgasco and its agents. This document now forms part of the Exploration Site Supervision Manual and acts as part of the Environmental Management Plan. In particular, the Richmond Valley Council has provided contact details should expert local advice be required at short notice.

4.3.3 Mitigation Measures

- (i) Meeting with relevant Aboriginal Land Councils to ensure sites of significance are identified;
- (ii) Observation during operations of any other matters and items requiring protection, preservation or avoidance;
- (iii) Implementation of Cultural Heritage Protocol; and
- (iv) Communication of matters identified above to all working during the proposed activities
- (v) Protection and avoidance of sensitive features.

4.4 Summary of Mitigation Measures

A range of mitigation measures are to be undertaken as standard practice to ensure minimal impacts from noise and no significant impacts on threatened flora/ fauna and communities or on items of heritage value. These measures include:

- (i) Careful route and drilling site selection (if required), where possible avoiding areas requiring special environmental protection;
- (ii) Development and maintenance of effective communication with local residents and the community, obtaining consent if required and avoiding activities within 50m of any residence;
- (iii) Liaison with relevant Aboriginal Land Councils

Greenloaning Biostudies Pty Ltd

15

- (iv) Pre-works surveys of potential Hairy Jointgrass habitat to ensure adverse impacts on this species are avoided and development of Hairy Jointgrass protocols in case the species is detected during the seismic operations;
- (v) Induction of on-site personnel in environmental procedures and recognition of Hairy Jointgrass and Hairy Jointgrass protocols;
- (vi) Observation during operations of any other matters and items requiring protection, preservation or avoidance;
- (vii) Implementation of Cultural Heritage Protocol;
- (viii) Communication of matters identified above to all working during the proposed activities;
- (ix) Where possible, preservation of the prior environment;
- (x) Protection and avoidance of sensitive features;
- (xi) Prevention of contamination or other avoidable environmental disturbance;
- (xii) Restoration of the site's prior environment on abandonment, and subsequent inspection and monitoring; and
- (xiii) Best practice weed management, following weed control/management protocols to ensure the risk of spreading invasive weed species such as Giant Parramatta Grass is minimised.

With regard to item (xi) above, monitoring will be undertaken at least quarterly in the first 12 months to ensure that any restoration procedures required are progressing satisfactorily. Remedial measures will be undertaken as required if monitoring results indicate unsatisfactory progress. Such measures may include weed control, watering if very dry conditions have impeded grass growth or protection of the area if it has been subject to physical disturbance. Best practice weed management will include the following procedures:

- Weed management induction for all field personnel, ensuring that there is a clear understanding of the sources and effects of spreading invasive species such as Giant Parramatta Grass;
- Development and use of weed management protocol, outlining personnel, equipment and vehicle hygiene measures; and
- Development and implementation of a reporting mechanism to ensure protocols are being followed appropriately.

5.0 REHABILITATION WORKS

At the conclusion of the program, complete environmental restoration of the site will be undertaken and no long-term environmental effects on flora, fauna or cultural heritage are envisaged. The following steps will be undertaken.

- Any surface expression of drilled up-holes will be rehabilitated in accordance with requirements of the Department of Primary Industries - Mineral Resources;
- Any rutting or surface damage by vehicle movements will be filled in and appropriately contoured;
- No rubbish will be buried or left on site;
- Rapid regeneration of the site to its original state will be promoted by backfilling of any excavations and re-spreading of any stockpiled topsoil. If necessary, mulching and seeding with natural grasses will follow. A perimeter fence may be retained until satisfactory flora re-growth has taken place, to protect such re-growth from grazing stock; and
- Any materials for improvements to tracks and fencing will be removed from the site when appropriate, unless the property owner requests their retention in writing. Should the property owner request the retention of any such materials, these will be tidily stockpiled away from the activity site.

Monitoring of rehabilitation areas will be subject to monitoring as described in Section 4.

6.0 SUMMARY OF IMPACTS AND CONCLUSION

This assessment report indicates that there are no significant noise, ecological or heritage constraints relevant to the proposed Phase 2 seismic exploration and there are not likely to be any major long term adverse significant impacts arising from the proposed exploration activity. There will be a short term and localised impact in the immediate vicinity of the seismic lines for the duration of the program. However, noise impacts are expected to be minor, as well as of short duration, and clearing of trees, threatened species habitat, sensitive habitat or cultural features will be avoided.

The range of mitigation measures proposed are expected to ensure overall low levels of impact and disturbance areas will be subject to restoration works. Similar programmes conducted elsewhere have shown rehabilitation works to be completely successful and proposed monitoring of the restoration works will ensure successful outcomes are achieved.

Greenoiling Biostudies Pty Ltd

17

References and Bibliography

- Australian Pipeline Industry Association Working Group & Ecos (Aust) (2009) Code of Environmental Practice. Australian Pipeline Industry Association Ltd. Rev 2
- Department of Environment and Conservation (2004), Threatened Biodiversity Survey and Assessment – Guidelines for Development and Activities: Working Draft 2004’.
- Department of Environment and Conservation (2005a), NSW Threatened Species Legislation Accessed 19/07/09
<http://www.threatenedspecies.environment.nsw.gov.au/legislation.aspx>
- Department of Environment and Conservation, (2006), Assessing Vibration – A Technical Guideline)
- Department of Environment and Climate Change 2005, Ecological Communities, What is an Ecological Community, Accessed 20/12/08,
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/tec_ec_overview.aspx
- Department of Environment and Climate Change 2005b, Threatened Species – Species, Populations and Ecological Communities of NSW, Hairy Jointgrass Profile, Accessed 4/5/09
<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=1006&>
- Department of Environment, and Climate Change (2006) EPBC Act Policy Statement 1.1 Significant Impact Guidelines. Matters of National Environmental Significance Commonwealth of Australia
- Department of Environment and Climate Change (NSW) (2007), Mapped Fauna Corridors, <http://www.maliangane.com/rfplan/maps/12.jpg> Accessed 17/9/08
- Department of Environment and Climate Change 2008, Threatened Species Profiles, Accessed 5-7.07.09
<http://www.environment.nsw.gov.au/edresources/LINKINGDOCThreatenedSpeciesProfiles.htm>
- Department of Environment and Climate Change (2008). Recovery Plan for the Koala *Phascolarctos cinereus* DECC Sydney.
- Department of Environment and Climate Change (2009), Interim
- Construction Noise Guideline. State of NSW and Department of Environment and Climate Change NSW
- Department of the Environment and Heritage, (2006). EPBC Act Policy Statement 1.1, Significant Impact Guidelines (Matters of National Environmental Significance)
- Office of Environment, and Heritage (2011) Wildlife Atlas Database
- Department of Environment, Water, Heritage and the Arts. Approved Conservation Advice. Accessed 12.07.09.
(<http://www.environment.gov.au/cgi-bin/sprat/public/conservationadvice.pl>)

Greenloaning Biostudies Pty Ltd

18

Department of Primary Industries, An Introduction to Acid Sulfate Soils. Accessed 2/09/2011
<http://www.dpi.nsw.gov.au/agriculture/resources/soils/ass/general/introduction>

Department of Primary Industries (1992) Onshore Petroleum Exploration and Production Safety Requirements (first edition August 1992) referred to in Clause 29 of the Petroleum (Onshore) Act 1991 - Regulation.

Ecos Consulting (updated by APIA Working Group) 2009. Code of Environmental Practice: Onshore Pipelines. Australian Pipeline Industry Association: ACT.

Environmental Planning and Assessment Act, 1979 (NSW)

Environmental Planning and Assessment Regulation, 2000 (NSW)

Greenloaning Biostudies , (2009a). 'Metgasco Lions Road Gas Pipeline. Ecological Assessment Report. Flora & Fauna & Aquatic Studies. Part A. Prepared for Unidel Pty Ltd on behalf of Metgasco Limited.

Greenloaning, Biostudies (2009b). 'Metgasco Lions Road Gas Pipeline. Ecological Assessment Report. Flora & Fauna & Aquatic Studies. Part B (Appendices). Prepared for Unidel Pty Ltd on behalf of Metgasco Limited.

Greenloaning, Biostudies, (2010a), Ballina Bypass Sheather's Access Track Realignment and Construction Environmental Assessment. Prepared for Ballina Bypass Alliance

Greenloaning, Biostudies, (2010a), Ballina Bypass Koellner Access Track Realignment Environmental Assessment. Prepared for Ballina Bypass Alliance

National Parks and Wildlife Service NSW (2003). Draft Recovery Plan for the Barking Owl (*Ninox connivens*), NSW NPWS Hurstville.

National Parks and Wildlife Service NSW (2003). Recovery Plan for the Yellow-bellied Glider (*Petaurus australis*), NSW NPWS Hurstville.

Office of Environment, and Heritage (2011) Wildlife Atlas
http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/cma_nsw_popup.html

Parsons and Outhbertson 2001). In North Coast Weeds Advisory Committee 2004, Weeds in Australia. National weeds lists <http://www.weeds.gov.au/weeds/lists/index.html>

Petroleum (Onshore) Act 1991 (NSW)

The Fisheries Management Act 1994
(http://www.austlii.edu.au/au/legis/nsw/consol_act/fma1994193/).

Threatened Species Conservation Act 1995 (NSW)

Greenloaning Biostudies Pty Ltd

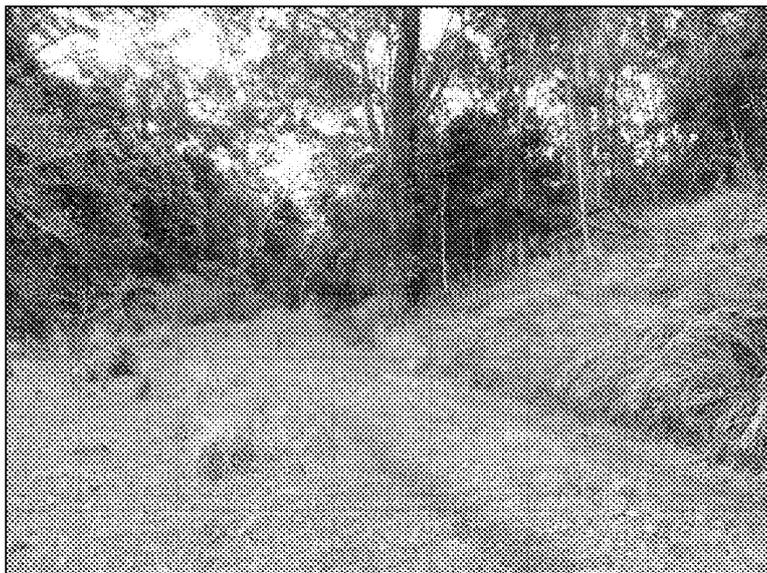
Appendix A

Photographs

Greenloaning Biostudies Pty Ltd

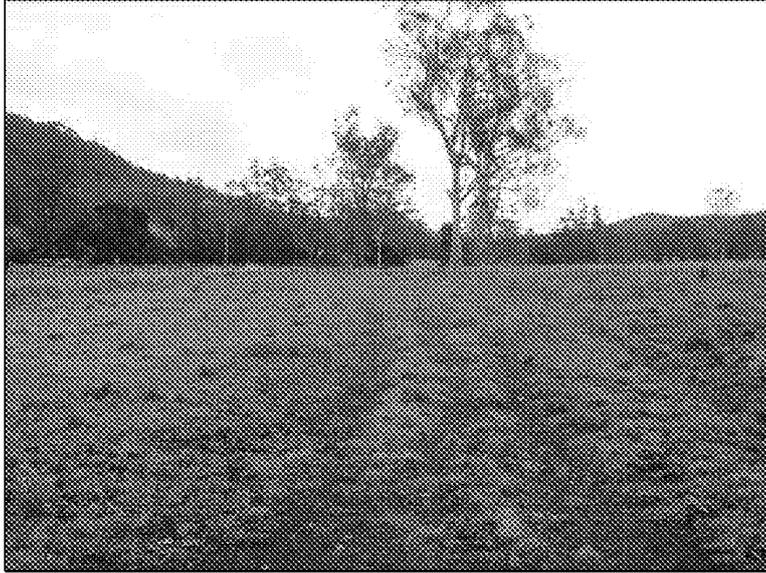


Photograph 1 Looking north along Bungabee Road, MET10-40



Photograph 2 An example of riparian Lowland Rainforest elements (left) parallel to MET10-40, Bungabee Road. This sector is atypical of most of the proposed route, with vegetation in close proximity to the cleared track.

Greenloaning Biostudies Pty Ltd



Photograph 3 Cleared paddock area typical of the country where the proposed seismic lines run off sealed roads, MET10-40

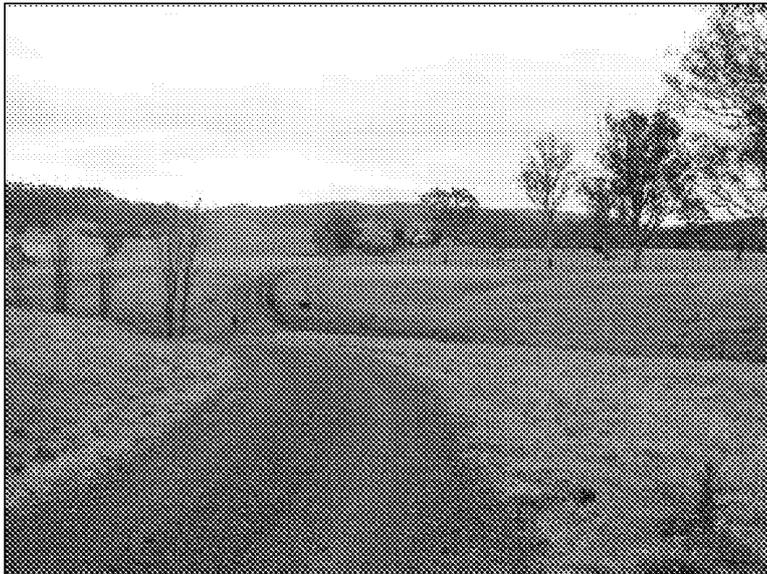


Photograph 4 Yellow-bellied Gider (*Petaurus australis*) feeding scars on large old-growth Red Gum (*Eucalyptus tereticornis*), MET10-40

Greenloaning Biostudies Pty Ltd



Photograph 5 Looking south along the southern most section of MET10-41, Rock Valley



Photograph 6 Looking north along Hayter Road, Rock Valley, MET10-41

Greenloaning Biostudies Pty Ltd



Photograph 7 Potential Hairy-joint Grass (*Arthraxon hispidus*) habitat along Bungabee Road. (note the seepage area along the track)



Photograph 8 An example of Potential Hairy-joint Grass (*Arthraxon hispidus*) habitat around creek lines and waterholes, Bungabee Road.

Greenloaning Biostudies Pty Ltd



Photograph 9

Known habitat of the Hairy Jointgrass in the General Study Area

Greenloaning Biostudies Pty Ltd

Appendix B

Terrex Seismic Vibration Trucks Vibration & In-Cab Noise Measurements by Heggies Pty Ltd



23 February 2009

20-2376 Terrex N&V 20090223

Terrex Seismic Pty Ltd
22 Crockford Street
Banyo QLD 4014

Attention: Gary Butler

Dear Gary

Terrex Seismic Vibration Trucks Vibration & In-cab Noise Measurements

1 Introduction

Heggies Pty Ltd (Heggies) has been engaged by Terrex Seismic Pty Ltd (Terrex) to assess potential Workplace Health and Safety (WH&S) issues associated with the operation of their seismic investigation (vibration) trucks as well as to conduct vibration measurements of the vibrating stage of the investigation works.

This letter report presents the results of the vibration and in-cab noise measurements carried out on Tuesday 17 February 2009, the extent of compliance with WH&S regulations and a discussion on current national and international vibration standards.

2 WH&S Noise Assessment

2.1 Noise Criteria

Noise induced hearing loss typically occurs when individuals are exposed to excessive noise levels for extended periods of time (normally over several months or perhaps years). Sudden hearing damage may also occur when a person is exposed to very high (peak) noise levels of short duration.

The Queensland Workplace Health and Safety Regulation 2008 (Reprint No. 1C) recommends acceptable noise limits for the workplace. The regulation, which is consistent with national and international guidelines, specifies that a place of work is unsafe and a risk to health if any person is exposed to noise levels:

- a. That exceed an 8-hour L_{Aeq} (noise level equivalent) of 85 dBA
- OR
- b. That exceed 140 dBC (peak).

HEGGIES PTY LTD
ABN 29 001 584 612
Ground Floor, Suite 7, 240 Waterworks Road Ashgrove QLD 4060 Australia
PO Box 844 Ashgrove QLD 4060 Australia
Telephone 61 7 3858 4800 Facsimile 61 7 3858 4801
Email brisbane@heggies.com Website www.heggies.com





The 8-hour LAeq or equivalent 8-hour noise level is defined as the steady sound pressure level which, in the course of an 8 hour period, delivers the same A-weighted sound energy as the actual varying noise level experienced by a person in a work environment on any particular representative working day. The peak noise level is the C-weighted peak sound pressure level.

The Regulation specifies that noise measurements are to be carried out in accordance with AS/NZS 1269.1.

2.2 Measured In-cab Noise Levels

To avoid significant interruption to production, in-cab noise measurements were conducted in the middle vibe truck only, however it is likely that the difference in in-cab noise level between each vibe truck would be negligible. The measurements were conducted over short intervals using a SVAN 948 Type 1 sound level meter with the microphone positioned adjacent to the driver's ear. The measured noise levels are summarised in **Table 1**.

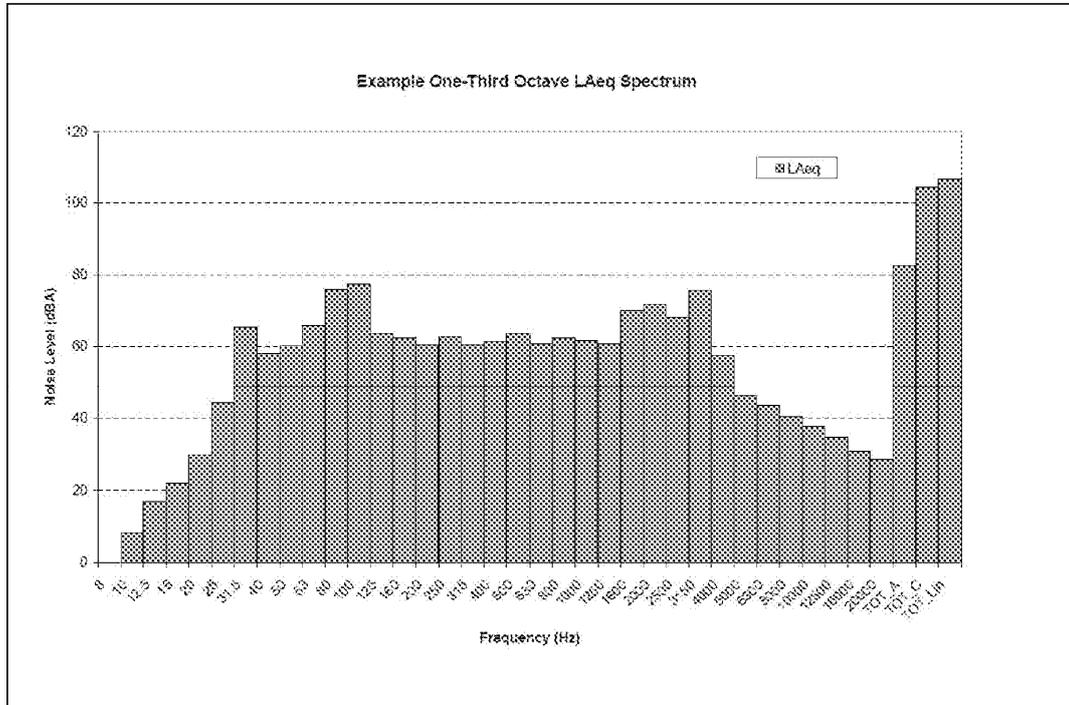
Table 1 In-cab Noise Levels

Activity	LCPeak (dBA)	LAeq (dBA)	LA1 (dBA)	LA10 (dBA)	LA90 (dBA)
Normal operation including vibration and alarms	116	81	88	86	73
Engines running (ie no vibration, alarms or moving)	107	78	83	82	72
Normal operation including vibration and alarms	117	83	90	86	73
Normal operation including vibration and alarms	117	82	90	85	74
Normal operation including vibration and alarms	118	82	91	86	72
Normal operation including vibration and alarms	116	81	89	85	73

An example LAeq spectrum measured inside the cab is presented in **Figure 1**.



Figure 1 One Third Octave LAeq Spectrum Measured Inside Cab



2.3 Compliance Assessment

The measured in-cab LCPeak noise levels in **Table 1** are well below the WH&S limit of 140 dBC.

On the basis of the short-term noise measurement results presented in **Table 1** and assuming an eight hour shift (ie noise exposure period), the eight hour LAeq WH&S limit is currently being complied with. However it is understood that the Terrex vibration truck drivers can potentially work up to 12 hours per day. **Table 2** shows the relationship between the eight hour limit (85 dBA LAeq) and the equivalent exposure limit adjusted for shorter and longer exposure periods.

Table 2 Relationship between Noise Exposure Level and Noise Exposure Duration

Noise Exposure Level (LAeq)	Approximate Duration of Noise Exposure Equivalent to WH&S Regulation Level of LAeq(8 hour) 85 dBA
79 dBA	32 hours
82 dBA	16 hours
84 dBA	12 hours
WH&S Regulation - 85 dBA	8 hours
88 dBA	4 hours
92 dBA	2 hours
95 dBA	1 hour



Table 2 shows that the equivalent noise level limit over a 12 hour exposure period is marginally (1 dBA) above the highest measured LAeq in-cab noise level of 83 dBA. Therefore typical noise exposure levels experienced by Terrex vibration truck crews are compliant with the noise limits over the longer shift duration of 12 hours.

It was noted at the time of the in-cab noise measurements that the driver has control over the volume of the audible vibration alarm. The actual volume level of the alarm has the potential to increase the LAeq noise exposure level over the shift period. Therefore it is important that the drivers maintain a volume level that is low but still adequately audible.

3 Vibration Measurements

3.1 Methodology

The methodology adopted for the vibration survey involved measurement of peak particle velocity (PPV) in three orthogonal axes (longitudinal, vertical and transverse) using an Instantel *DS-677 Minimate Plus* vibration monitor with one triaxial geophone. The Minimate was programmed to record full waveform (1024 samples per second) over an eight second period for the purpose of capturing the entire vibration event.

Vibration measurements were undertaken by Heggies at a range of distances from the trucks whilst undergoing the vibrating stage of the process.

3.2 Vibration Measurement Results

Table 3 presents the results of the vibration measurements in terms of the average peak component particle velocity (PPV) for events at corresponding distances as well as the maximum PPV (and associated frequency and axis) measured at each distance.

Table 3 Vibration Measurement Results

Distance from Nearest HEMI 50 (m)	Average Peak Particle Velocity (mm/s)	Maximum Peak Particle Velocity Event		
		PPV (mm/s)	Frequency (Hz)	Axis
3	23.1	23.1	51	Vertical
5	11.8	15.7	27	Vertical
10	4.4	5.9	27	Vertical
20	2.0	2.9	30	Vertical
40	1.1	1.3	28	Vertical
60	0.7	1.2	32	Longitudinal
80	0.4	0.5	24	Vertical
100	0.3	0.3	24	Vertical
150	0.1	0.1	51	Vertical

The results in **Table 3** have been included in graphical format in **Appendix A**.

3.3 Comparison with Vibration Criteria

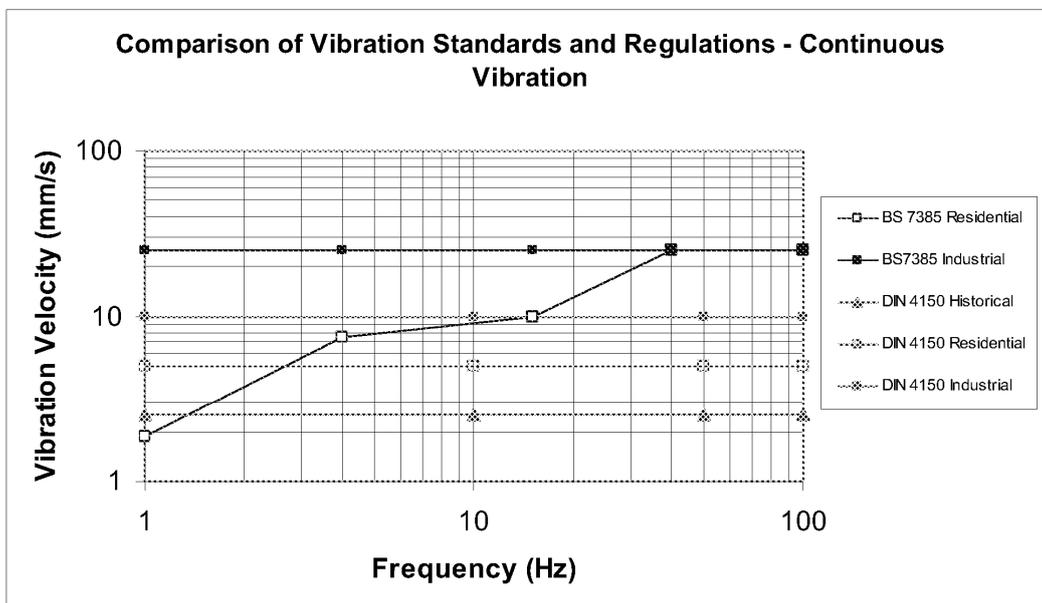
Vibration criteria regularly used by Heggies for assessment of impacts from vibration intensive activities include:



- British Standard BS 7385: Part 2-1993 “Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration”
- British Standard BS 6472: 1992 “Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz)”
- German Standard DIN 4150: Part 3-1999 “Structural vibration Part 3: Effects of vibration on structures”
- Australian Standard AS 2670: Part 2- 1990 “Evaluation of human exposure to whole-body vibration Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz)”

The vibration guide values and limits expressed in the standards listed above are expressed graphically in **Figure 2** for continuous vibration imposed on building structures and in tabular format in **Table 4** for human comfort consideration.

Figure 2 Comparison of Building Standards for Continuous Vibration



BS 7385 sets guide values for building vibration based on the lowest vibration levels above which cosmetic damage has been credibly demonstrated. These levels are judged to give a minimal risk of vibration-induced cosmetic damage, where ‘minimal risk’ for a named effect is usually taken as a 95% probability of no effect

As opposed to the “minimal risk of cosmetic damage” approach adopted in BS 7385, the “safe levels” given in DIN 4150 are the vibration levels up to which no cosmetic damage due to vibration effects has been observed.



Table 4 Peak Vibration Velocity Levels for Human Comfort from AS 2670

Type of Space Occupancy	Time of Day	Peak Vibration Levels in mm/s corresponding to a Low Probability of Reaction	
		Vertical	Horizontal
Critical working areas	Day or Night	0.14	0.4
Residential	Day	0.3 to 0.6	0.8 to 1.5
	Night	0.2	0.6
Offices	Day or Night	0.6	1.7

The vibration measurement results presented in **Table 3** can be used as a guide to assess impacts from Terrex vibration works. For example, to assess the likelihood of cosmetic damage occurring to a residential building in the vicinity of a Terrex survey line, a guide limit of 5 mm/s PPV would apply in accordance with DIN 4150. The results in **Table 3** show that the average PPV level at a distance of 10 m from the nearest vibrator was 4.4 mm/s however the maximum measured PPV level was 5.9 mm/s. Therefore, a conservative minimum separation distance of 20 m should be maintained between the vibrator and the residential building.

Like noise, annoyance resulting from vibration exposure can vary from person to person and in severe cases can lead to feelings similar to that experienced by people annoyed from noise. Some particularly sensitive people may become annoyed when exposed to vibration levels slightly above the threshold of perception. Annoyance can often stem from a feeling of fear and anxiety particularly if the individual is concerned about the potential for damage to property from the vibration.

The AS 2670 human comfort criteria, which is quite low relative to the structural limits, aims to avoid annoyance to receivers. The measured vibration levels in **Table 3** indicate that the human comfort limits may at times be exceeded when working within 100 m of a dwelling. Subsequently it is important that vibration be minimised insofar as possible through best practice measures, the community be kept informed of survey works in advance, and that any complaints are promptly addressed.

For guidance on the effects of vibration on buried pipework, **Table 5** taken from DIN 4150 can be used assuming the pipes have been manufactured and laid using current technology.

Table 5 Guideline Values for Vibration Effects on Buried Pipework

Line	Pipe Material	Guideline Values for Velocity Measured on the Pipe (mm/s)
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50

I trust that the above is sufficient for your present requirements.

Regards

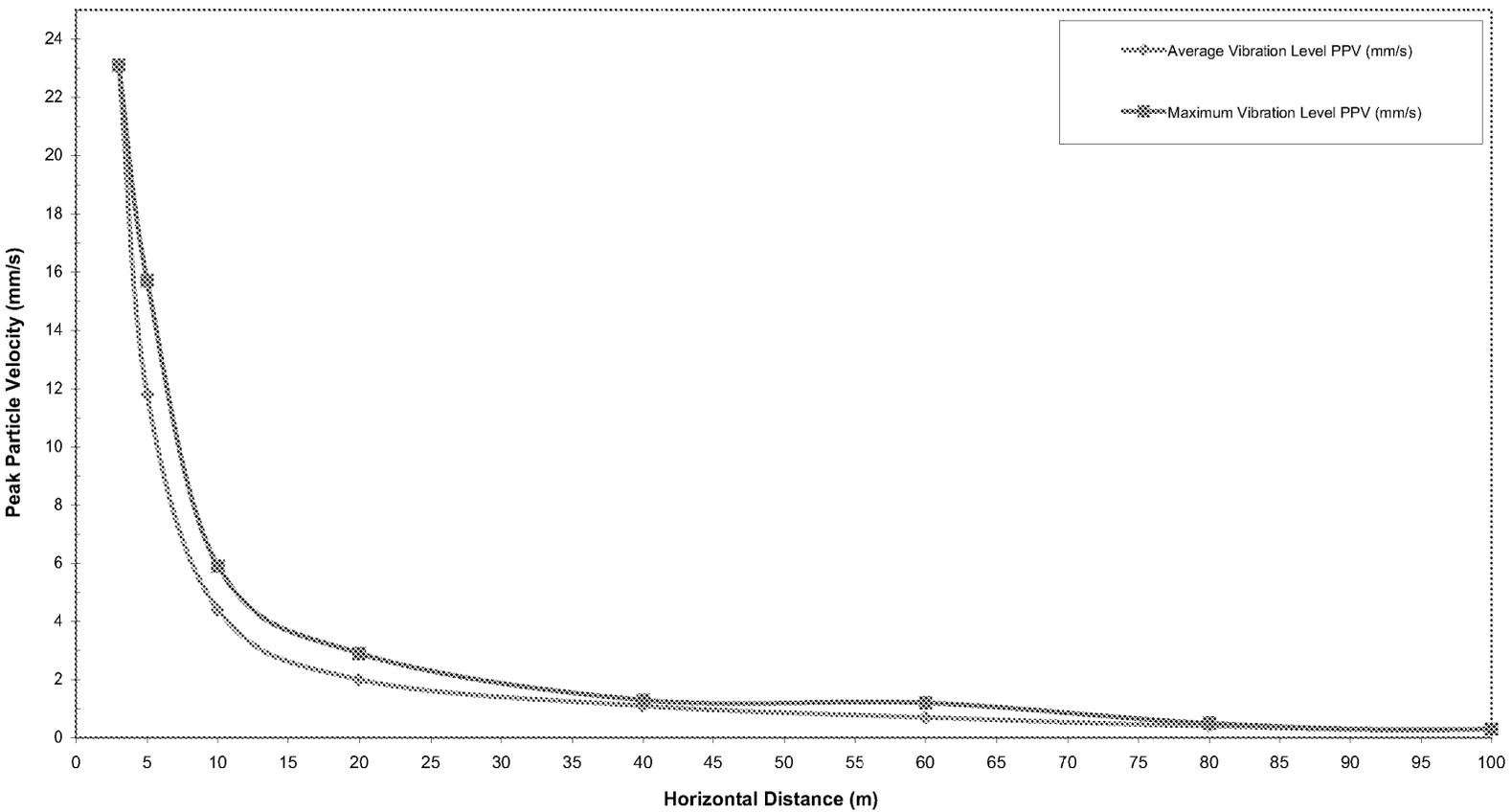
STEVE HENRY

Appendix A

Report 20-2376
Page 1 of 2

Vibration Measurement Results

20-2376 Terrex Seismic Vibration Measurements
Maximum and Average PPV (mm/s)



Greenleaving Biostudies Pty Ltd

Appendix C

EPBC Protected Matters Search Report



Australian Government
Department of Sustainability, Environment,
Water, Population and Communities

EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 16/08/11 12:14:55

Summary

Details

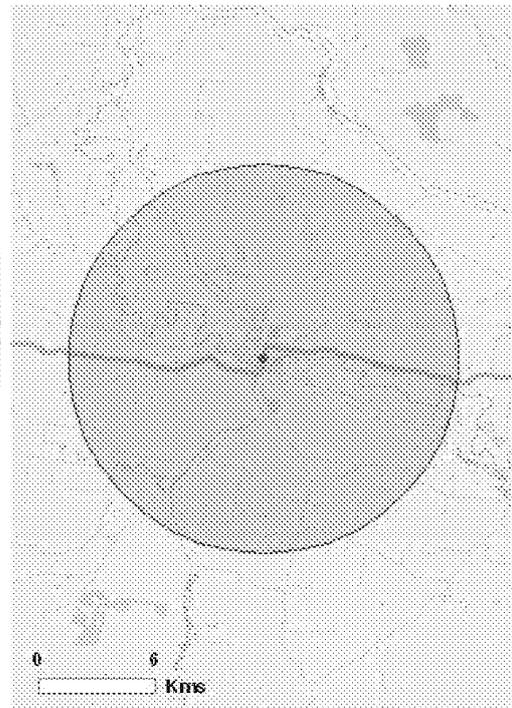
[Matters of NES](#)

[Other matters protected by the EPBC Act](#)

[Extra Information](#)

Caveat

Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 10.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

<u>World Heritage Properties:</u>	None
<u>National Heritage Places:</u>	None
<u>Wetlands of International Significance (Ramsar Wetlands):</u>	None
<u>Great Barrier Reef Marine Park:</u>	None
<u>Commonwealth Marine Areas:</u>	None
<u>Threatened Ecological Communities:</u>	1
<u>Threatened Species:</u>	26
<u>Migratory Species:</u>	16

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

<u>Commonwealth Lands:</u>	5
<u>Commonwealth Heritage Places:</u>	1
<u>Listed Marine Species:</u>	14
<u>Whales and Other Cetaceans:</u>	None

<u>Critical Habitats:</u>	None
<u>Commonwealth Reserves:</u>	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<u>Place on the RNE:</u>	16
<u>State and Territory Reserves:</u>	None
<u>Regional Forest Agreements:</u>	1
<u>Invasive Species:</u>	14
<u>Nationally Important Wetlands:</u>	None

Details

Matters of National Environmental Significance

Threatened Ecological Communities

[\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
<u>White Box-Yellow</u>	Critically	Community may occur within area
<u>Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</u>	Endangered	

Threatened Species

[\[Resource Information \]](#)

Name	Status	Type of Presence
BIRDS		
<u>Anthochaera phrygia</u>		
Regent Honeyeater [82338]	Endangered	Species or species habitat likely to occur within area
<u>Botaurus poiciloptilus</u>		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
<u>Cyclopsitta diophthalma coxeni</u>		
Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat likely to occur within area
<u>Lathamus discolor</u>		
Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
<u>Rostratula australis</u>		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
<u>Turnix melanogaster</u>		
Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area

FROGS

Mixophyes iteratus
Giant Barred Frog, Southern Barred Frog [1944] Endangered Species or species habitat likely to occur within area

MAMMALS

Chalinolobus dwyeri
Large-eared Pied Bat, Large Pied Bat [183] Vulnerable Species or species habitat may occur within area

Dasyurus maculatus maculatus (SE mainland population)
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184] Endangered Species or species habitat may occur within area

Potorous tridactylus tridactylus
Long-nosed Potoroo (SE mainland) [66645] Vulnerable Species or species habitat may occur within area

Pseudomys novaehollandiae
New Holland Mouse [96] Vulnerable Species or species habitat likely to occur within area

Pteropus poliocephalus
Grey-headed Flying-fox [186] Vulnerable Roosting known to occur within area

PLANTS

Allocasuarina defungens
Dwarf Heath Casuarina [21924] Endangered Species or species habitat may occur within area

Arthraxon hispidus
Hairy-joint Grass [9338] Vulnerable Species or species habitat likely to occur within area

Bosistoa selwynii
Heart-leaved Bosistoa [13702] Vulnerable Species or species habitat likely to occur within area

Bosistoa transversa
Three-leaved Bosistoa [16091] Vulnerable Species or species habitat likely to occur within area

Clematis fawcettii
Stream Clematis [4311] Vulnerable Species or species habitat likely to occur within area

Corchorus cunninghamii
Native Jute [14659] Endangered Species or species habitat likely to occur within area

Cryptocarya foetida
Stinking Cryptocarya, Stinking Laurel [11976] Vulnerable Species or species habitat likely to occur within area

Cryptostylis hunteriana
Leafless Tongue-orchid [19533] Vulnerable Species or species habitat may occur within area

Eucalyptus glaucina
Slaty Red Gum [5670] Vulnerable Species or species habitat likely to occur within area

Marsdenia longiloba
Clear Milkvine [2794] Vulnerable Species or species habitat likely to occur within area

Owenia cepiodora
Onionwood, Bog Onion, Onion Cedar [11344] Vulnerable Species or species habitat likely to occur within area

<u>Taeniophyllum muelleri</u> Minute Orchid, Ribbon-root Orchid [10771]	Vulnerable	Species or species habitat may occur within area
<u>Tinospora tinosporoides</u> Arrow-head Vine [5128]	Vulnerable	Species or species habitat likely to occur within area

REPTILES

<u>Coeranoscincus reticulatus</u> Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area
---	------------	--

Migratory Species **[Resource Information]**

Name	Status	Type of Presence
------	--------	------------------

Migratory Marine Birds

<u>Apus pacificus</u> Fork-tailed Swift [678]		Species or species habitat may occur within area
<u>Ardea alba</u> Great Egret, White Egret [59541]		Species or species habitat may occur within area
<u>Ardea ibis</u> Cattle Egret [59542]		Species or species habitat may occur within area

Migratory Terrestrial Species

<u>Cyclopsitta diophthalma coxeni</u> Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat likely to occur within area
---	------------	--

<u>Haliaeetus leucogaster</u> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
--	--	--

<u>Hirundapus caudacutus</u> White-throated Needletail [682]		Species or species habitat may occur within area
---	--	--

<u>Merops ornatus</u> Rainbow Bee-eater [670]		Species or species habitat may occur within area
--	--	--

<u>Monarcha melanopsis</u> Black-faced Monarch [609]		Breeding may occur within area
---	--	--------------------------------

<u>Monarcha trivirgatus</u> Spectacled Monarch [610]		Breeding likely to occur within area
---	--	--------------------------------------

<u>Myiagra cyanoleuca</u> Satin Flycatcher [612]		Breeding likely to occur within area
---	--	--------------------------------------

<u>Rhipidura rufifrons</u> Rufous Fantail [592]		Breeding may occur within area
--	--	--------------------------------

<u>Xanthomyza phrygia</u> Regent Honeyeater [430]	Endangered*	Species or species habitat likely to occur within area
--	-------------	--

Migratory Wetlands Species

<u>Ardea alba</u> Great Egret, White Egret [59541]		Species or species habitat may occur within area
---	--	--

<u>Ardea ibis</u> Cattle Egret [59542]		Species or species habitat may occur within area
---	--	--

<u>Gallinago hardwickii</u> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
---	--	--

Rostratula benghalensis s. lat.

Painted Snipe [889] Vulnerable* Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands **[Resource Information]**

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

- Commonwealth Land - Australian Postal Commission
- Commonwealth Land - Telstra Corporation Limited
- Defence - CASINO GRES DEPOT (Army Training Depot) ; 41 RNSWR CASINO
- Commonwealth Land - Australian Telecommunications Commission
- Commonwealth Land - Defence Service Homes Corporation

Commonwealth Heritage Places **[Resource Information]**

Name	Status
Historic	
<u>Casino Post Office NSW</u>	Nominated place

Listed Marine Species **[Resource Information]**

Name	Status	Type of Presence
Birds		
<u>Anseranas semipalmata</u>		
Magpie Goose [978]		Species or species habitat may occur within area
<u>Apus pacificus</u>		
Fork-tailed Swift [678]		Species or species habitat may occur within area
<u>Ardea alba</u>		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
<u>Ardea ibis</u>		
Cattle Egret [59542]		Species or species habitat may occur within area
<u>Gallinago hardwickii</u>		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<u>Haliaeetus leucogaster</u>		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<u>Hirundapus caudacutus</u>		
White-throated Needletail [682]		Species or species habitat may occur within area
<u>Lathamus discolor</u>		
Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
<u>Merops ornatus</u>		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
<u>Monarcha melanopsis</u>		
Black-faced Monarch [609]		Breeding may occur within area
<u>Monarcha trivirgatus</u>		
Spectacled Monarch [610]		Breeding likely to occur within area
<u>Myiagra cyanoleuca</u>		
Satin Flycatcher [612]		Breeding likely to occur within area
<u>Rhipidura rufifrons</u>		
Rufous Fantail [592]		Breeding may occur within area

Rostratula benghalensis s. lat.
Painted Snipe [889] Vulnerable* Species or species habitat may occur within area

Extra Information

Places on the RNE **[Resource Information]**

Note that not all Indigenous sites may be listed.

Name	Status
Natural	
<u>Richmond River (Casino to Broadwater) NSW</u>	Indicative Place
Historic	
<u>Armstrong Residence NSW</u>	Indicative Place
<u>Casino Roundhouse and Harman Coal Stage NSW</u>	Indicative Place
<u>E S and A Bank (former) NSW</u>	Indicative Place
<u>Manse (former) at rear of present Manse NSW</u>	Indicative Place
<u>Police Station NSW</u>	Indicative Place
<u>St Marks Anglican Church NSW</u>	Indicative Place
<u>St Marys Catholic Church NSW</u>	Indicative Place
<u>St Marys Convent Including Fence and Tree NSW</u>	Indicative Place
<u>St Pauls Presbyterian Church NSW</u>	Indicative Place
<u>Tomki Meat House and Barn NSW</u>	Indicative Place
<u>Westpac Bank NSW</u>	Indicative Place
<u>CBC Bank (Former) Including Residence and Stables NSW</u>	Registered
<u>Casino Courthouse NSW</u>	Registered
<u>Casino Post Office NSW</u>	Registered
<u>Casino Post Office Group NSW</u>	Registered

Regional Forest Agreements **[Resource Information]**

Note that all areas with completed RFAs have been included.

North East NSW RFA, New South Wales

Invasive Species **[Resource Information]**

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Frogs		
<u>Bufo marinus</u>		
Cane Toad [1772]		Species or species habitat likely to occur within area
Mammals		
<u>Felis catus</u>		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<u>Oryctolagus cuniculus</u>		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<u>Vulpes vulpes</u>		

Red Fox, Fox [18] Species or species habitat likely to occur within area

Plants

Alternanthera philoxeroides

Alligator Weed [11620] Species or species habitat likely to occur within area

Cabomba caroliniana

Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Species or species habitat likely to occur within area

Chrysanthemoides monilifera

Bitou Bush, Boneseed [18983] Species or species habitat likely to occur within area

Genista sp. X Genista monspessulana

Broom [67538] Species or species habitat may occur within area

Hymenachne amplexicaulis

Hymenachne, Olive Species or species habitat likely to occur within area
Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]

Lantana camara

Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Species or species habitat likely to occur within area

Lycium ferocissimum

African Boxthorn, Boxthorn [19235] Species or species habitat may occur within area

Pinus radiata

Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] Species or species habitat may occur within area

Rubus fruticosus aggregate

Blackberry, European Blackberry [68406] Species or species habitat likely to occur within area

Salvinia molesta

Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665] Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.86429 153.04568

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Department of Environment, Climate Change and Water, New South Wales](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment and Natural Resources, South Australia](#)
- [Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [Environmental and Resource Management, Queensland](#)
- [Department of Environment and Conservation, Western Australia](#)
- [Department of the Environment, Climate Change, Energy and Water](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia

- [Museum Victoria](#)
- [Australian Museum](#)
- [SA Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Atherton and Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence](#)
- [State Forests of NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

[Accessibility](#) | [Disclaimer](#) | [Privacy](#) | [© Commonwealth of Australia](#) | [Help](#)
Last updated: Thursday, 16-Sep-2010 09:13:25 EST

[Department of Sustainability, Environment, Water, Population and Communities](#)
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111 [ABN](#)

| [Australian Government](#) |

Greenloaning Biostudies Pty Ltd

Appendix D

Assessment of Significance as per Section 5A of the EP&A Act

Greenleaning Biostudies Pty Ltd

Assessment of Significance as per Section 5A of the EP&A Act

Threatened species impact assessment is an integral part of environmental impact assessment. The objectives of Section 5A of the Environmental Planning and Assessment Act 1979 (EP&A Act), the assessment of significance, is to improve the standard of consideration afforded to threatened species, populations and ecological communities, and their habitats through the planning and assessment process, and to ensure that the consideration is transparent.

The factors for assessment that make up a given Section 5A Assessment include the following:

- a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;
- b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;
- c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
 - i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or
 - ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;
- d) In relation to the habitat of a threatened species, population or ecological community:
 - i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;
 - ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and
 - iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;
- e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);
- f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan; and
- g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Greenloaning Biostudies Pty Ltd

The assessments are based on the information gained from the desktop assessments and field surveys conducted to date, in the context of the methodology provided in the body of the report. Information provided by the applicant has also been relied upon.

Section 5A Assessment – Flora and EEC

A total of 27 threatened flora species were identified as occurring within a 15km radius of the subject site as a result of the search of the DECCW Atlas of NSW Wildlife (refer to Table 4.2). None of these records are shown as occurring along the immediate alignment of the proposed seismic lines but a number of records occur within the general study area and proximal to the route alignment. Such species include:

- ✧ Native Jute (*Corchorus cunninghamii*);
- ✧ Rainforest Cassia (*Senna acclinis*);

Clusters of threatened flora records occur within nature reserves and state forests in proximity to the proposed seismic lines. No species listed under the TSC Act however, was detected, during the field survey. As no clearing of trees, shrubs or undergrowth is proposed as part of the exploration activities, no adverse impacts on the threatened species listed in Table 4.2, or their habitat is expected. One species however, not listed in Table 4.2 but known to occur in the general study area in habitat similar to some sections along the proposed seismic lines, is a threatened grass species, Hairy Jointgrass (*Arthraxon hispidus*). This species occurs in swampy grassland approximately four km to the east of the Bungabee Road line and is also known to occur in seepage areas on steep hillsides in the region (A. Martin, pers. obs., Greenloaning Biostudies, 2009a, 2009b, 2010a, 2010b). There is some potential for this species to be impacted to some extent and care will therefore be taken to ensure potential habitat for this species is surveyed and any occurrences identified to ensure impacts on the species can be avoided. Mitigation measures for the species are provided in Section 4.5 of the main body of the report.

As none of these species was detected during the field survey of the subject site, the species have been grouped together for the purpose of the following Section 5A Assessment. Two Endangered Ecological Communities (EECs) have been identified within the subject areas. Old growth red gum (*Eucalyptus tereticornis*) stands are representative of highly modified Subtropical Coastal Floodplain Forest in the NSW North Coast and Sydney Basin Bioregions, whilst some of the riparian vegetation with noticeable rainforest elements represents Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions. The potential impacts on these two communities therefore have been considered in the following Section 5A Assessment

- a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

No threatened species were detected on the subject site and potentially sensitive habitat areas, such as potential Hairy Jointgrass habitat, will be surveyed by a suitably qualified ecologist to eliminate the risk of inadvertently removing a threatened species not detected to date. Hairy-joint Grass (*Arthraxon hispidus*) is the most likely threatened species to occur along the

Greenleaving Biostudies Pty Ltd

proposed seismic route. With thorough implementation of appropriate mitigation measures described in Section 4.2, and given the likelihood of occurrence that any other threatened species known to occur in the vicinity of the subject site is considered to be low, it is considered highly unlikely that the proposed action will impact adversely any locally occurring population of threatened flora such that it is at risk of extinction.

- b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – no listed endangered flora population known to occur in the area.

- c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Subtropical Coastal Floodplain Forest was recorded on the subject site and is chiefly located within the moist gullies and wooded lower paddocks along line MET10-40, particularly adjacent along segments of the northern half of this line. Elements of Lowland Rainforest communities occur along vegetated creek lines along MET10-40 and 41 seismic lines. Clearing of trees and any habitat areas however will be avoided as the proposed activity will be conducted along existing cleared roads and tracks. The proposed seismic activities will thus not intrude on the integrity of either community and therefore will not have an adverse effect on the extent of the ecological community.

- ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The proposed activity will not be modifying the composition of the Subtropical Coastal Floodplain Forest or Lowland Rainforest and therefore its local occurrence is not likely to be placed at risk of extinction.

- d) In relation to the habitat of a threatened species, population or ecological community:

- i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

No threatened flora species or populations were recorded along the proposed seismic lines and the majority are considered unlikely to occur within the cleared habitat typical of the routes, which would generally represent highly marginal habitat under the current uses (i.e subject to heavy grazing or comprising slashed roadside verges). There is potential however for a number of species to occur proximal to the route such as in the nearby riparian habitats and there is also some potential habitat for Hairy Bintgrass in some locations. Given that no clearing of trees or understorey is proposed, no impacts on any species occurring in adjoining habitat are likely. Measures to ensure any occurrences of Hairy Bintgrass are identified and avoided prior to the commencement of works should ensure that habitat for this species is not removed or modified.

Greenleaving Biostudies Pty Ltd

The endangered ecological communities, Subtropical Coastal Floodplain Forest and Lowland Rainforest occurring within the study area and will not be impacted as no areas of these communities are proposed to be removed or modified to any significant extent. The minor potential impacts on the already highly modified ground surface in sectors supporting remnant Forest Red Gums, representative of the Subtropical Coastal Floodplain Forest, are not likely to affect the integrity of this community to any noticeable extent.

- ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed activity does not pose any major threats to the habitat connectivity. No vegetation is likely to be removed therefore the existing vegetation will remain intact and functional.

- iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

No threatened flora species or populations were recorded along the proposed seismic lines and mitigation measures will ensure that any potentially sensitive habitat areas are avoided.

The proposed activity does not conflict with the occurrences of the Endangered Ecological Communities: Subtropical Coastal Floodplain Forest and Lowland Rainforest as no vegetation will be removed, modified, fragmented or isolated as a result of the activity.

- e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no listed critical habitat occurs in the vicinity and consequently none will be affected by the proposed works.

- f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Not applicable – no threatened species were detected on the subject site and consequently the proposed action is considered unlikely to be inconsistent with the objectives or actions of a recovery plan or threat abatement plan. Currently there is no recovery plan for the Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion or Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions.

- g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

In the unlikely event that clearing vegetation is deemed necessary, the action proposed constitutes the following key threatening process as described in Schedule 3 of the TSC Act:

Greenleaving Biostudies Pty Ltd

- Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process).

There is some potential for the proposed activities to increase the risk of infestation of invasive grass species, but this risk will be managed by best practice weed management measures as described in Section 4.2 of the main body of the REF.

Conclusion:

It is considered that the proposed action is unlikely to have a significant impact on listed flora such that further action in the form of a Species Impact Statement and/or Environmental Impact Statement is required. This conclusion is based on the following:

- No threatened flora species or populations have been detected;
- Potential habitat for the majority of the species potentially occurring is marginal under the current land uses; and
- The only EECs, Subtropical Coastal Floodplain Forest and Lowland Rainforest occurring along the route will not be subject to clearing.

Section 5A Assessment – Fauna

A total of 54 threatened fauna species were identified as occurring within a 15km radius of the subject site as a result of the search of the DECCW Atlas of NSW Wildlife (Table 4.1). No records occur along or near the proposed seismic route, although six species have been recorded within 1km of the route including Glossy Black Cockatoo (*Calyptorhynchus lathami*), Black Necked Stork (*Ephippiorhynchus asiaticus*), White Crowned Snake (*Cacophis harriettae*), Koala (*Phascolarctos cinereus*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and the Powerful Owl (*Ninox strenua*).

On the basis of the status and characteristics of the site habitats, the threatened fauna considered most likely to utilise the vicinity of the proposed activities for foraging and roosting are threatened microbat species. There is also a likelihood of Koalas, Grey-headed Flying-foxes and large forest owl species foraging along/over parts of the proposed seismic line routes. The large old growth trees along the northern sectors of Bungabee Road also provide potential nesting habitat for species such as the Masked Owl and indications of use of one such tree by the Yellow-bellied Glider (*Petaurus australis*) was also observed during the filed surveys. No trees however are proposed to be cleared and it is considered highly unlikely that any threatened fauna species is currently dependent on the specific ground habitat proposed for seismic data collection.

- a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

A viable local population of any of the threatened species nominated in Table 4.1 is unlikely to be placed at risk of extinction for the following reasons:

Greenleaving Biostudies Pty Ltd

- No evidence of the presence of any of the nominated species was recorded within the proposed area of disturbance during the site survey and it is considered unlikely that any threatened species is highly dependent on the ground habitat that will be subject to disturbance;
- The highly disturbed and cleared habitat encompassing the proposed seismic routes represents only marginal habitat for ground dwelling species ;
- The removal of trees and understorey will be avoided;
- Any potentially sensitive habitat areas will be avoided; and
- Noise impacts will be very short term and minimised as much as feasible and reasonable.

- b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – no endangered populations of fauna are known to occur in the area of the subject site.

- c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this assessment does not refer to an Endangered Ecological Community (EEC).

- ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this assessment does not refer to an Endangered Ecological Community (EEC).

- d) In relation to the habitat of a threatened species, population or ecological community:

- i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The removal of trees will be avoided and any potentially sensitive habitat areas (swampy areas) will be avoided.

- ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed activity does not pose any threats to the habitat connectivity. No vegetation is likely to be removed and existing vegetation and habitats will therefore remain intact and functional.

Greenleaving Biostudies Pty Ltd

- iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

No threatened fauna habitat will be removed and impacts on ground habitat will be minimal.

- e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no listed critical habitat occurs in the vicinity and consequently none will be affected by the proposed works.

- f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Of the threatened species nominated to have potential to occur on the subject site, recovery plans exist for the large forest owls and for the Koala. In the case of the forest owls, the objectives of the recovery plan relate mainly to the retention and protection of significant/high quality owl habitat. As hollow-bearing trees that would represent such significant habitat are proposed to be retained, no conflict with the recovery plan is expected.

In the case of the Koala, the Recovery Plan for the Koala identifies the conservation of potential Koala habitat as one of its objectives. The removal of potential Koala food trees will be avoided. The avoidance of any impacts on the Subtropical Coastal Floodplain Forest elements, comprising Forest Red Gum, a favoured Koala food tree will also be consistent with the objectives of the Koala recovery plan.

- g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

In the unlikely event that clearing vegetation is deemed necessary, the action proposed constitutes the following key threatening process as described in Schedule 3 of the TSC Act:

- Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process).

Conclusion:

It is considered that the proposed action is unlikely to have a significant impact on threatened fauna such that further action in the form of a Species Impact Statement and/or Environmental Impact Statement is required. This conclusion is based on the following:

- No threatened fauna species or populations are likely to be dependent on the ground habitat subject to disturbance from the proposed seismic data collection activities;
- Potential habitat for many of the species listed in Appendix B is highly degraded and/or marginal;
- Clearing of any trees and vegetation will be avoided; and
- The majority of the proposed activity will be conducted on existing roads, tracks or easements.

Greenloaning Biostudies Pty Ltd

Appendix E

Assessment of Significance as per Threatened Species Assessment Guidelines of the EPBC Act

Greenloaning Biostudies Pty Ltd

E.1. EPBC Act Assessment of Significance

Hairy Jointgrass (*Arthraxon hispidus*) is a low grass species listed as Vulnerable under the EPBC Act and consequently represents a matter of National Environmental Significance (NES) under the Act. As the proposed seismic exploration activities have some potential to impact on potential habitat of this species, a significant impact assessment, as provided in Policy Statement 1.1 for the EPBC Act - Significant Impact Guidelines: Matters of National Significance (DEH, 2006), has been undertaken as a precautionary measure. The criteria for an assessment of significant impacts on vulnerable species under these guidelines are as follows:

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population of a species;
- Reduce the area of occupancy of an important population;
- Fragment an existing important population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of an important population;
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- Introduce disease that may cause the species to decline; or
- Interfere substantially with the recovery of the species.

Each of these criteria has been addressed for Hairy Jointgrass as it may occur within the subject site. Relevant background information for this species relating to local occurrence is contained in the main body of this report, and has been expanded upon in the following assessment.

Greenloaning Biostudies Pty Ltd

E1.1. Hairy Jointgrass (*Arthraxon hispidus*)

Hairy Jointgrass is listed as Vulnerable under the EPBC Act. The species has a wide distribution overseas, occurring from Japan to central Eurasia (DECC, 2005). In Australia the species occurs in south-east Queensland and on the northern tablelands and North Coast of NSW where it exists on the edge of rainforests and in wet eucalypt forest, often near creeks or swamps (DECC, 2005).

A particular stronghold of the species appears to be within the Richmond-Tweed, Murwillumbah and Clarence sub regions of the North Coast Catchment Management Authority (CMA) Bioregion (DECC, 2005). The species is particularly populous associated with the Ballina Local Government area with the DECC Wildlife Atlas, but there are also scattered occurrences in the Lismore – Kyogle area, although the database records at this stage do not fully reflect the known distribution within the study area. The following populations have been identified within the aforementioned CMA sub regions:

- Approximately 32.38ha of habitat in the Lennox Head District (Landmark Ecological Services, 2008);
- Approximately 6.3 hectares of Hairy Jointgrass was recorded within Precinct A of a development in the Cumbalum area (James Warren and Associates 2008);
- An estimated 4.9 hectares of habitat containing the species was detected within Precinct B of a development in the Cumbalum area (Landpartners, 2009);
- Approximately 2.84ha within proximity of the Ballina Bypass Pacific Highway Upgrade (Greenloaning, 2009);
- An estimated 6.78ha associated with the Tintenbar to Ewingsdale Pacific Highway Upgrade (Benwell, 2009);
- Approximately 0.0025ha at Billinudgel (Benwell, 2004);
- Approximately 0.02ha at Koala Beach, Pottsville (Benwell, 2004);
- Approximately 1ha on the Havilah property, Corndale (D. Havilah, pers. obs, 2009); and
- Approximately 0.6ha on the Martin – Greenloaning property, Tuncester, approximately 4 km east of the proposed Bungabee Road seismic liner (J. Bartrim, pers. obs. Feb 2010)

Based on the above population estimates, approximately 55 ha supporting the species is known to occur within the Richmond-Tweed, Murwillumbah and Clarence sub regions of the North Coast (CMA) Bioregion (DECC, 2005). However, as other occurrences are likely to be present on private landholdings, it is considered likely that the total occurrence of Hairy Jointgrass is greater in extent than that estimated above.

Greenloaning Biostudies Pty Ltd

Hairy Jointgrass is known to occur within conservation reserves at Cooloola, Noosa and Carnarvon National Parks but the species is poorly represented within reserves in NSW (Briggs & Leigh, 1996, Bosis, 2009). One historical record of the species is mapped according to the DECC Wildlife Atlas (2009) as occurring within the Ballina Nature Reserve, although the current status of this specimen/ record has not been confirmed recently.

The information below outlines the likely impact on potential habitat and possible occurrences of Hairy Jointgrass from the proposed seismic exploration activities.

For the purposes of this assessment, the Significant Impact Criteria for Vulnerable species as listed in the EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Significance (DEH, 2006) defines an 'Important Population' as a population that is necessary for the species' long-term survival and recovery. This may include populations identified as such in recovery plans that are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/ or
- Populations that are near the limit of the species range.

At this stage, there are no known occurrences of the Hairy Jointgrass within the study area. Based on the current information available on the species biology/ ecology, it is considered there is some potential for occurrence at a few locations along the proposed alignments of the seismic lines for Phase 1, particularly along the Bungabee Road line. In terms of definitions of an 'Important Population', it is relevant to note that any local population of the species occurring within the study area is not near the limit of the species range, known occurrence occurring well to the north west of the study area in the Border Ranges (Greenloaning Biostudies 2009)..

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of a species?

The proposed seismic exploration program, based on current information, will not affect any known areas of Hairy Jointgrass habitat. Any potential habitat for the species occurring along the proposed routes for the seismic lines will be surveyed prior to the commencement of any activities and the route alignment modified accordingly to avoid impact on such habitat. It is therefore highly unlikely the size of any important population will be decreased.

Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population?

Any potential habitat for the species occurring along the proposed routes for the seismic lines will be surveyed prior to the commencement of any activities and the route alignment modified accordingly to avoid impact on such habitat. As such it is considered that the action proposed would be unlikely to reduce an area of occupancy of the local population, particularly given that mitigation measures proposed by the proponent will avoid any impacts to any identified occurrences of Hairy Jointgrass within the study area.

Greenloaning Biostudies Pty Ltd

Is there a real chance or possibility that the action will fragment an existing important population into two or more populations?

The activities proposed are unlikely to fragment any existing important populations. Any potential habitat for the species occurring along the proposed routes for the seismic lines will be surveyed prior to the commencement of any activities and the route alignment modified accordingly to avoid impact on such habitat. It is therefore highly unlikely any population will be impacted.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of a species?

A list of habitat critical to the survival of listed threatened species, as identified by the Commonwealth Environment Minister is recorded in a Register of Critical Habitat. To date, no areas of Critical Habitat have been listed for Hairy Jointgrass.

Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population?

Little is currently known about the breeding cycle of Hairy Jointgrass. It has been assumed that the species reproduces both asexually and by seed (Biosis, 2009). It is considered that the proposed actions would not be likely to create barriers to asexual reproduction or affect seed dispersal as disturbances to grassland habitat will be short term, grassland will be restored and any identified habitat of the species will be avoided.

Is there a real chance or a possibility that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The proposed seismic exploration program, based on current information, will not affect any known areas of Hairy Jointgrass habitat. Any potential habitat for the species occurring along the proposed routes for the seismic lines will be surveyed prior to the commencement of any activities and the route alignment modified accordingly to avoid impact on such habitat. Accordingly it is unlikely that the action would modify, destroy, remove or isolate or decrease the availability or quality of habitat for the species such that it is likely to decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat?

The DECC (2005) lists one of the recovery actions for Hairy Jointgrass as 'Control introduced grasses in areas with known populations'. Best practice weed management protocols will be followed to ensure the risk of spreading invasive weed species such as Giant Parramatta Grass is minimised. (Refer to Section 4.2.3.X). Providing these mitigation measures are adopted and strictly adhered to, it is considered unlikely that the action would result in invasive species that are harmful to Hairy Jointgrass becoming established in surrounding habitat.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

Diseases have not been identified as a threat to populations of Hairy Jointgrass (DECC, 2005) and as such, on the basis of current information on the species and its biology/ecology, it is unlikely that the action proposed will introduce disease that may cause the species to decline.

Greenloaning Biostudies Pty Ltd

Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

Currently there is no recovery plan for Hairy Jointgrass. However, the following actions relevant to protecting the species have been compiled by the DECC (2005):

- Protect habitat from frequent fire;
- Avoid slashing or mowing around rainforest edges;
- Fence habitat remnants to protect from stock;
- Control introduced grasses in areas with known populations; and
- Protect areas of rainforest, wet eucalypt forest and swamp from clearing and development.

In addition, a number of Regional and Local Priority Actions have been identified as part of the Commonwealth Approved Conservation Advice for the recovery of the species. These include:

- Monitoring of known populations to identify key threats, the effectiveness of management actions and the need to adapt them if necessary;
- Identification of populations of high conservation priority;
- Investigation of further formal conservation arrangements, management agreements and covenants on private land, and for crown and private land, investigate inclusion in reserve tenure if possible;
- Enable recovery of additional sites and/or populations;
- Control habitat loss, disturbance and modification; and
- Control invasive weeds, impacts from livestock and impacts from fire.

This action will not contravene the recovery action to 'control habitat loss, disturbance and modification (DECC, 2005)' as any identified occurrences of Hairy Joint Grass habitat will be avoided and thus will not be subject to slashing., habitat will be protected from any disturbance and best practice weed management measures will be implemented.

Conclusion

Impacts to any populations of Hairy Jointgrass are considered unlikely due to the ability to survey potential areas prior to exploration, and modify the work route to avoid the population altogether.

A summary of the assessment of the criteria outlined in the EPBC Act Significant Impact Guidelines (DEH 2006) in relation to the local population of Hairy Jointgrass is provided below in Table E1.

Greenloaning Biostudies Pty Ltd

Table E.1 SUMMARY OF EPBC ASSESSMENT OF SIGNIFICANCE FOR THE HAIRY JOINTGRASS

Significant Impact Criteria	Likelihood of Occurrence		
	Likely	Possible	Unlikely
Would the action lead to a long-term decrease in the size of a population of the species			✓
Would the action reduce the area of occupancy of a population			✓
Would the action fragment an existing population into two or more populations			✓
Would the action adversely affect habitat critical to the survival of the species			✓
Would the action disrupt the breeding cycle of a population			✓
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline			✓
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat			✓
Would the action introduce disease that may cause the species to decline			✓
Would the action interfere substantially with the recovery of the species			✓

Based on the summary of assessments provided in the above table, it is considered that a significant impact to any potential local population of the Hairy Jointgrass associated with the subject site is unlikely. This assessment is further supported by the consideration that mitigation measures to minimise impacts by exotic grasses will be implemented. As such, a referral to SEWPaCon on the basis of significant impacts would not be required.

Metgasco – Casino-Grafton Exploration 2010

Review of Environmental Factors

END of DOCUMENT



LISMORE CITY COUNCIL ABN 60 080 932 837

**APPLICATION TO CARRY OUT WORK
WITHIN THE ROAD RESERVE**

OFFICE USE ONLY

Received by:
Fee Paid:
File No:
Date:

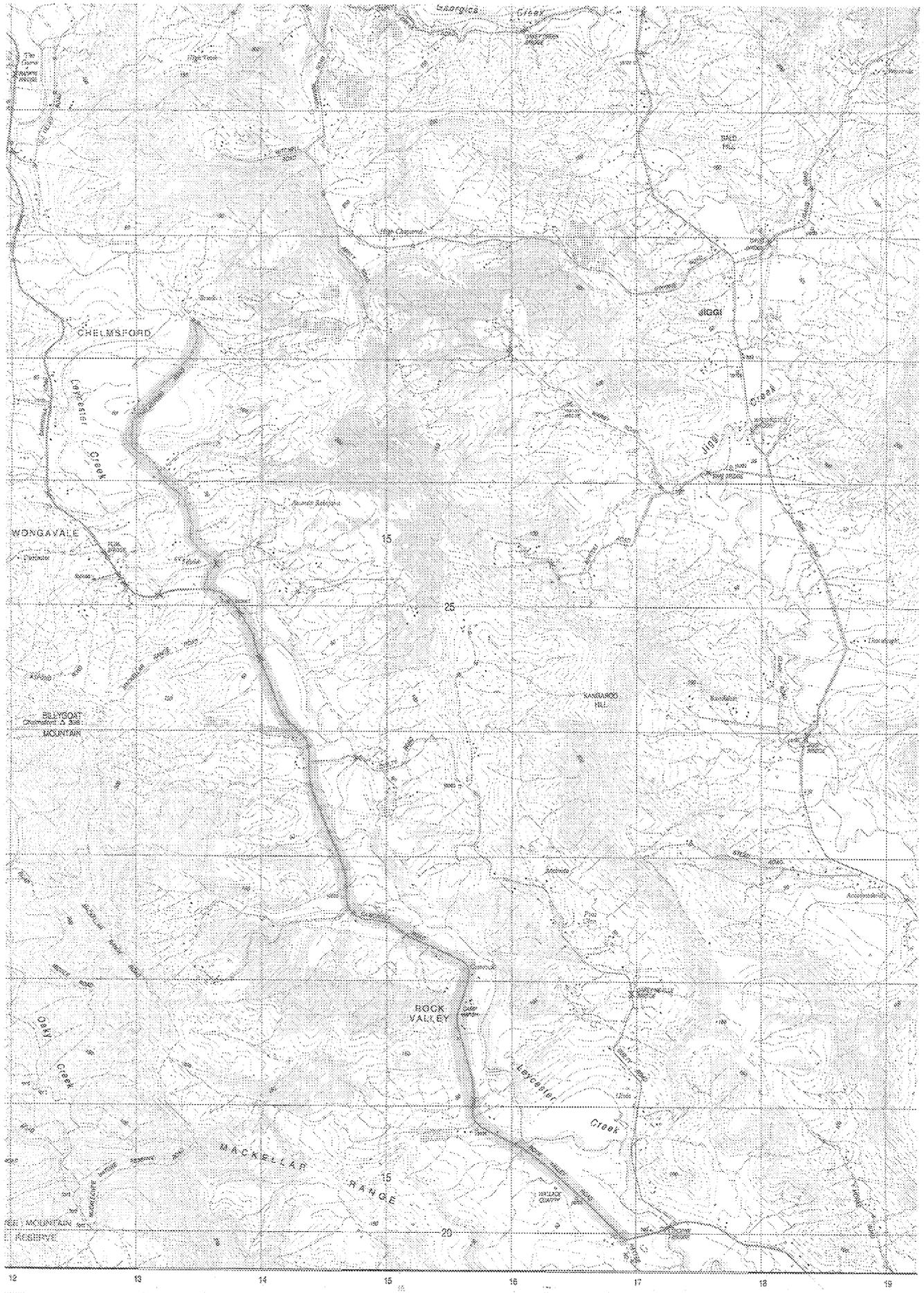
Operations Section, 43 Oliver Avenue, Goonellabah NSW 2480
P O Box 23A, Lismore NSW 2480. Ph. 6625 0561, Fax 6620 1688

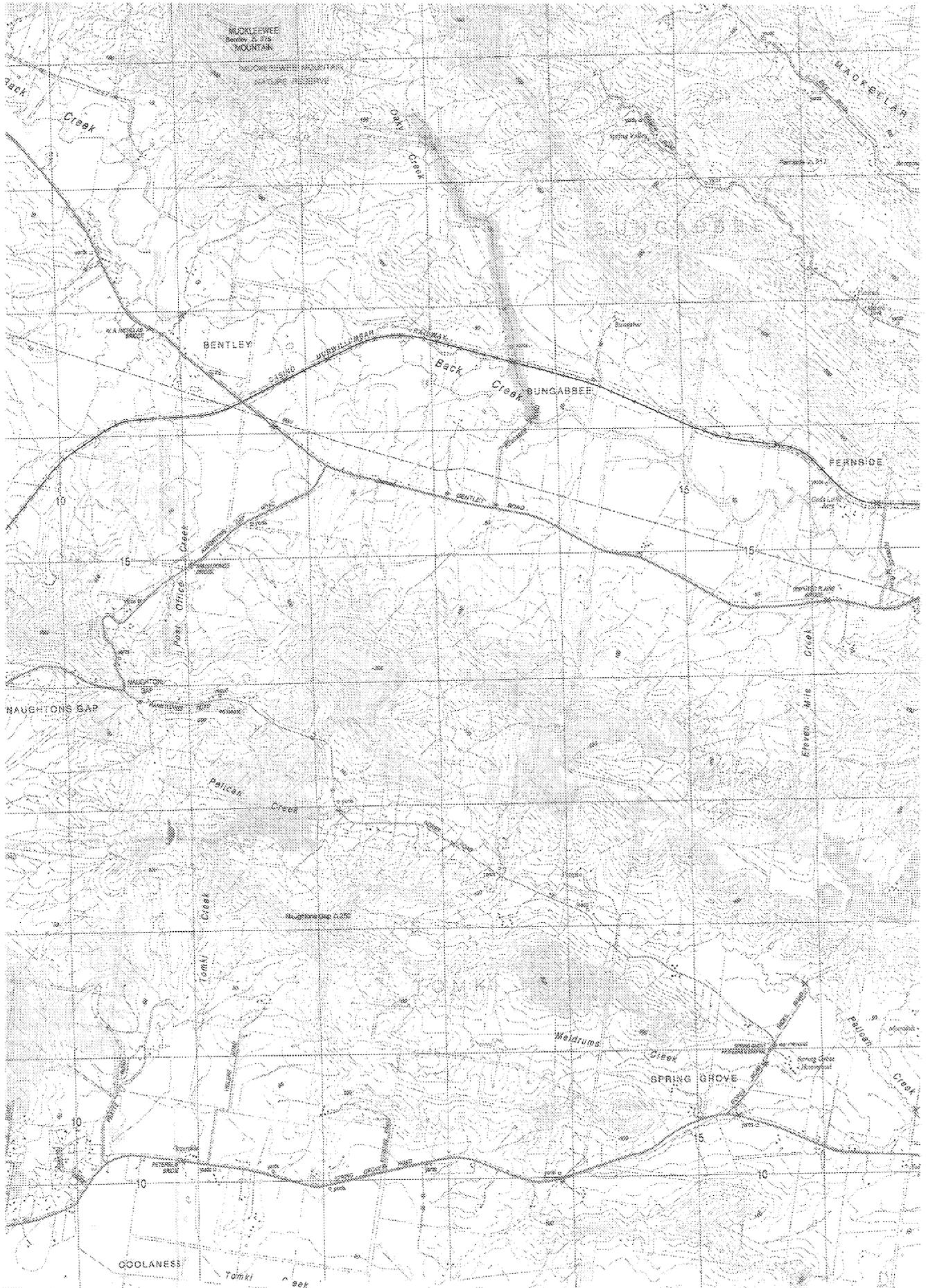
<p>1. Location of Works Street Address (include Street No., Street and Suburb) ALONG ROCK VALLEY & CHELMSFORD ROADS PLUS BUNGABEE ROAD</p>	<p>2. Owner's Details Name in full</p>
<p>3. Applicant's Details Name in full HAMISH RAMSAY Company Name, if applicable METGASCO LTD Postal Address P.O. Box 5 CASINO 2470 Contact Phone Number: OFFICE - 66624543 MOBILE - 0400418733</p>	<p>4. Declaration by Applicant I/We undertake to:</p> <ul style="list-style-type: none"> Construct this work to the satisfaction of the Council; Indemnify the Council against any claims which may arise from damage to persons or property occasioned by the carrying out of the work; Bear the costs associated with the removal or relocation of any works, services or obstructions and to obtain all permits from and pay all fees due to the particular authorities concerned. <p>Signature of Applicant</p>

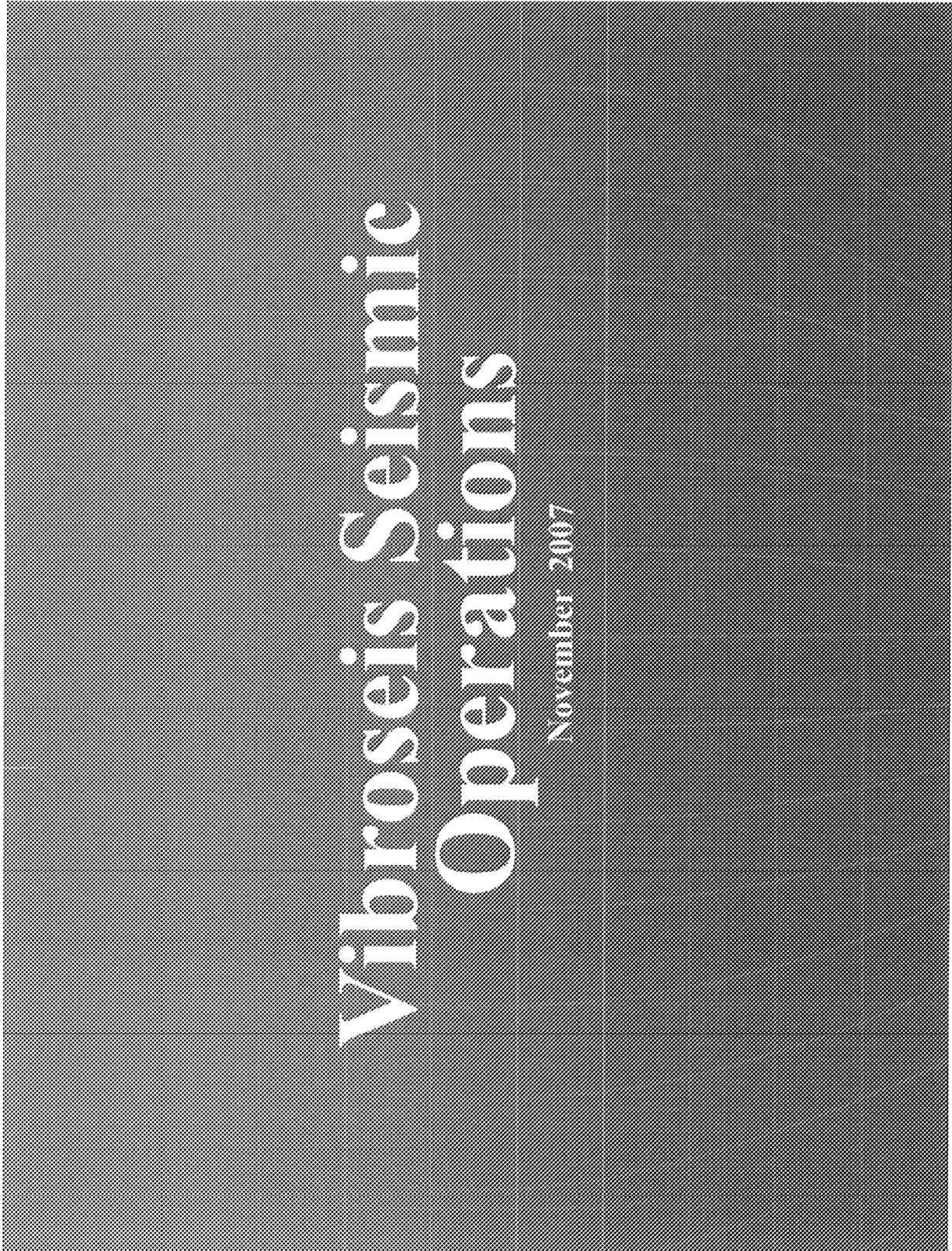
5. Type of Application (Tick appropriate box and complete details)

<p><input type="checkbox"/> Property Access New construction, modification, repair or replacement</p> <p><input type="checkbox"/> Stormwater Connection New construction, modification, repair or replacement</p>	<p><input type="checkbox"/> Include sketch plan showing:</p> <ul style="list-style-type: none"> Location and dimensions of proposed works along the property frontage. Location and type of existing services (eg water meters, fire hydrants, street trees, Telstra boxes etc.). Type of construction and proposed material/surfacing. Other information as requested by Council
<p><input type="checkbox"/> Erect a Hoarding or other structure within the road reserve: DATE AND TIMES REQUIRED: From: ___/___/___ am/pm To: ___/___/___ am/pm</p>	<p><input type="checkbox"/> Include sketch plan showing:</p> <ul style="list-style-type: none"> Location and dimensions of area to be closed off. Type of hoarding to be erected and method of fixing to the ground. Measures or areas set aside for pedestrian movements. Other information as requested by Council.
<p><input type="checkbox"/> To temporarily close a road or section of road DATE AND TIMES REQUIRED: From: ___/___/___ am/pm To: ___/___/___ am/pm</p>	<p><input type="checkbox"/> Include sketch plan showing:</p> <ul style="list-style-type: none"> Location and dimensions of area to be closed off. Traffic Control Plan and measures or areas set aside for pedestrian movements. Other information as requested by Council.
<p><input type="checkbox"/> Other SEISMIC DATA ACQUISITION MAPS ATTACHED</p>	<p><input checked="" type="checkbox"/> Include sketch plan showing:</p> <ul style="list-style-type: none"> Location and dimensions of proposed works. Type of construction and proposed material/surfacing. Other information as requested by Council.

I:\infrastructure services\administration\forms\operations\application to carry out work within road reserve.doc







- A seismic survey is a method of gathering information about the location and characteristics of geological structures beneath the Earth's surface. This information is used to produce maps of structures identifying areas where petroleum deposits are more likely to be found.

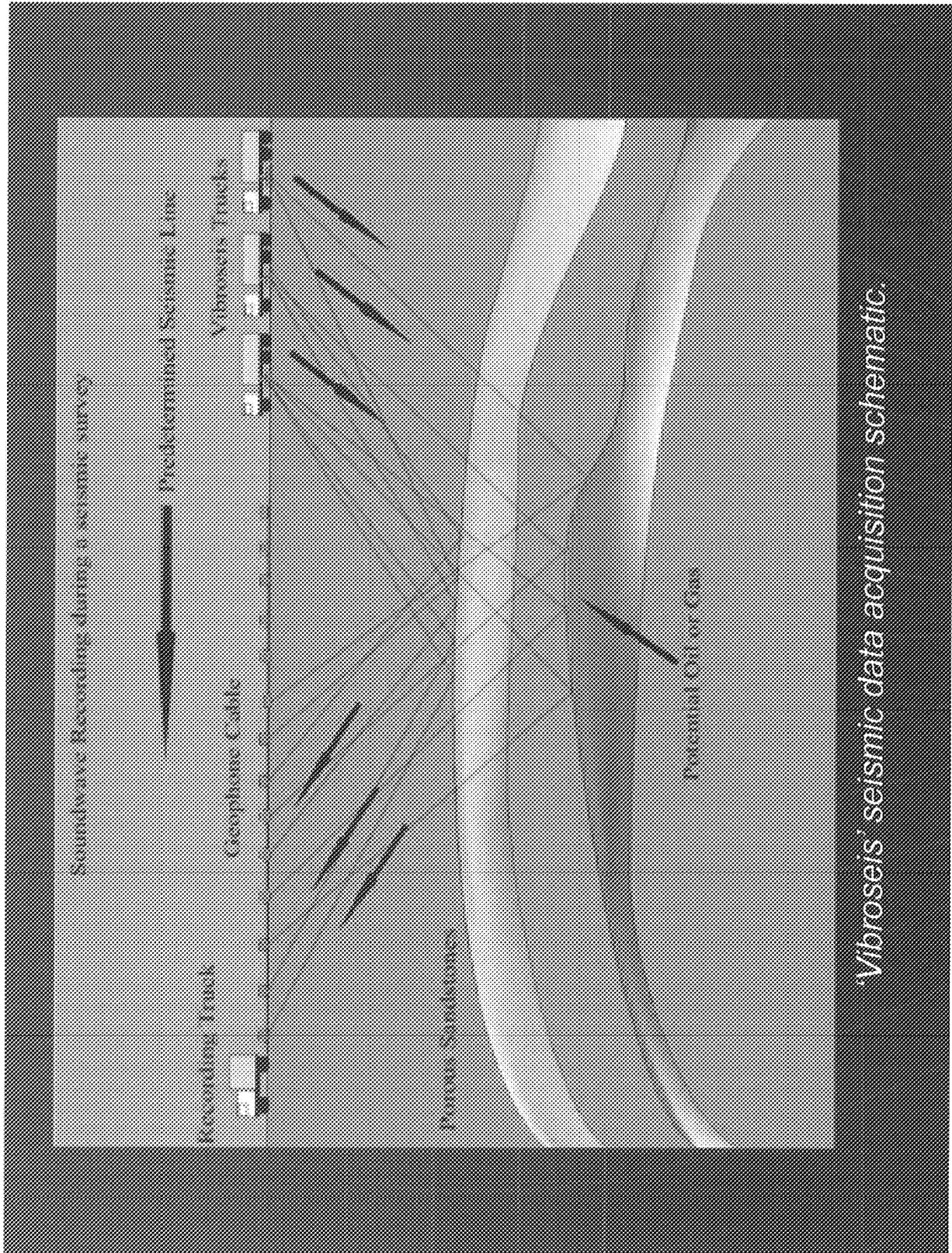
- Exploration companies will employ specialist Vibroseis vehicles (TERREX Seismic) that vibrate the ground and generate sound waves of varying frequencies.

- The vibroseis method was developed in the USA to allow seismic to be acquired in cities and other sensitive environments, negating the need for dynamite to generate the seismic signal, instead, generating a controlled vibration that will not damage structures in close proximity to the signal source.

■ The sound waves propagate through the subsurface layers and are reflected and refracted by the underlying geological structures. The returning sounds waves are recorded by small microphones (geophones) strung together that are laid along a predetermined and prepared path called a seismic line.

■ Thin cables are used to transmit the data from the geophones to a recording vehicle (small van) usually positioned off the roads. The geophones will be spaced several metres apart and comprise small cylinders 5-10 cm in diameter with a spike that is driven into the ground by hand.

■ The array of geophones and connecting cables will be approximately 4-5 km in length and are laid beside the roads. The geophone arrays, Vibroseis trucks and recording vehicles progressively move along the seismic lines in 12m steps at a rate of approximately 8-10km per day.



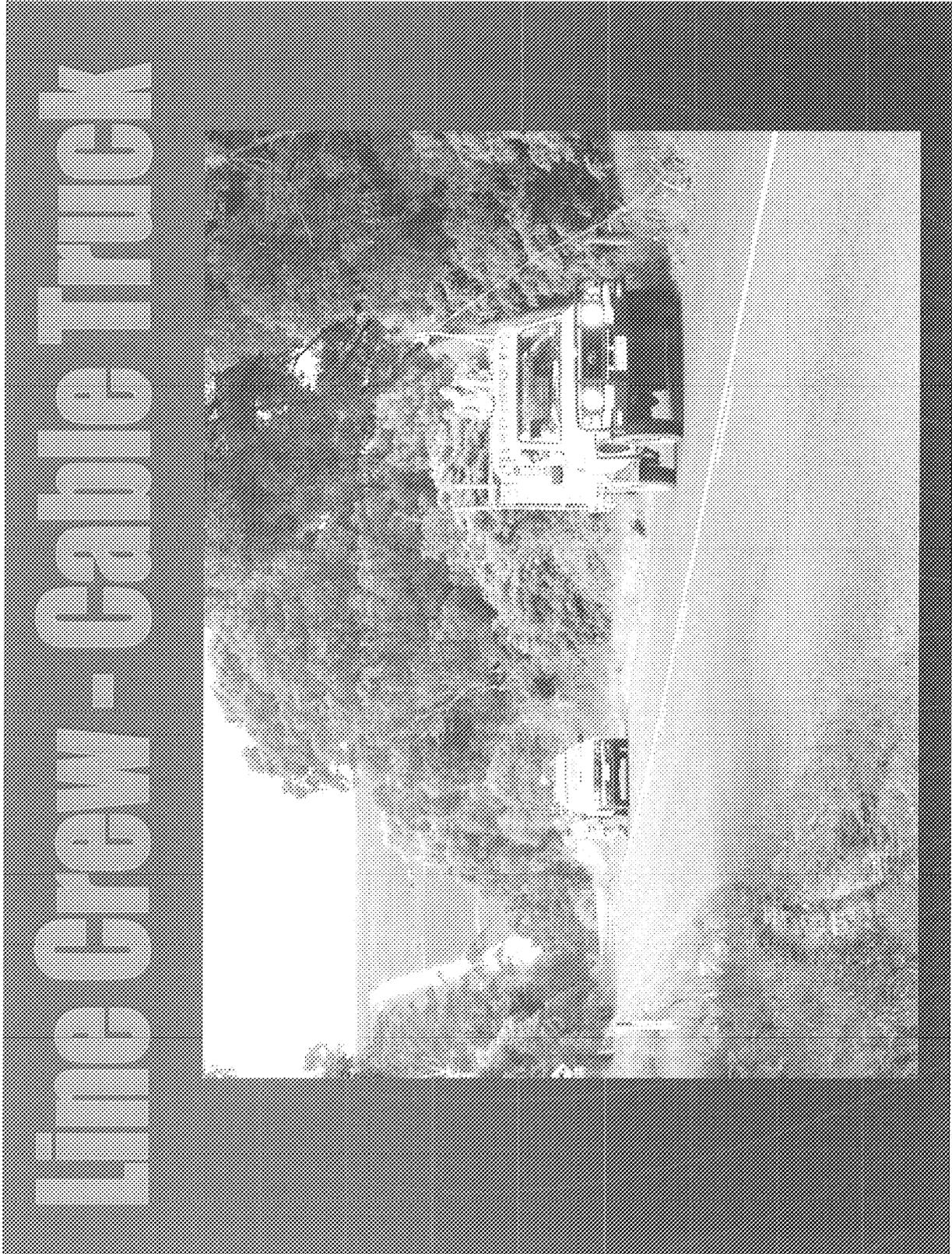
• The recordings of the reflected waves are processed by computers to provide a subsurface image at various depths. The vibrating trucks are quite large and the effective planning and operation of seismic programs is designed to protect the physical environment and existing infrastructure from undue impacts or damage.

• Extreme care is taken during all phases of the program to ensure that the environment surrounding the seismic lines is protected and no undue damage to public or private property is inflicted unnecessarily. Oil & Gas Exploration Companies aim to minimise the environmental impacts associated with its activities.

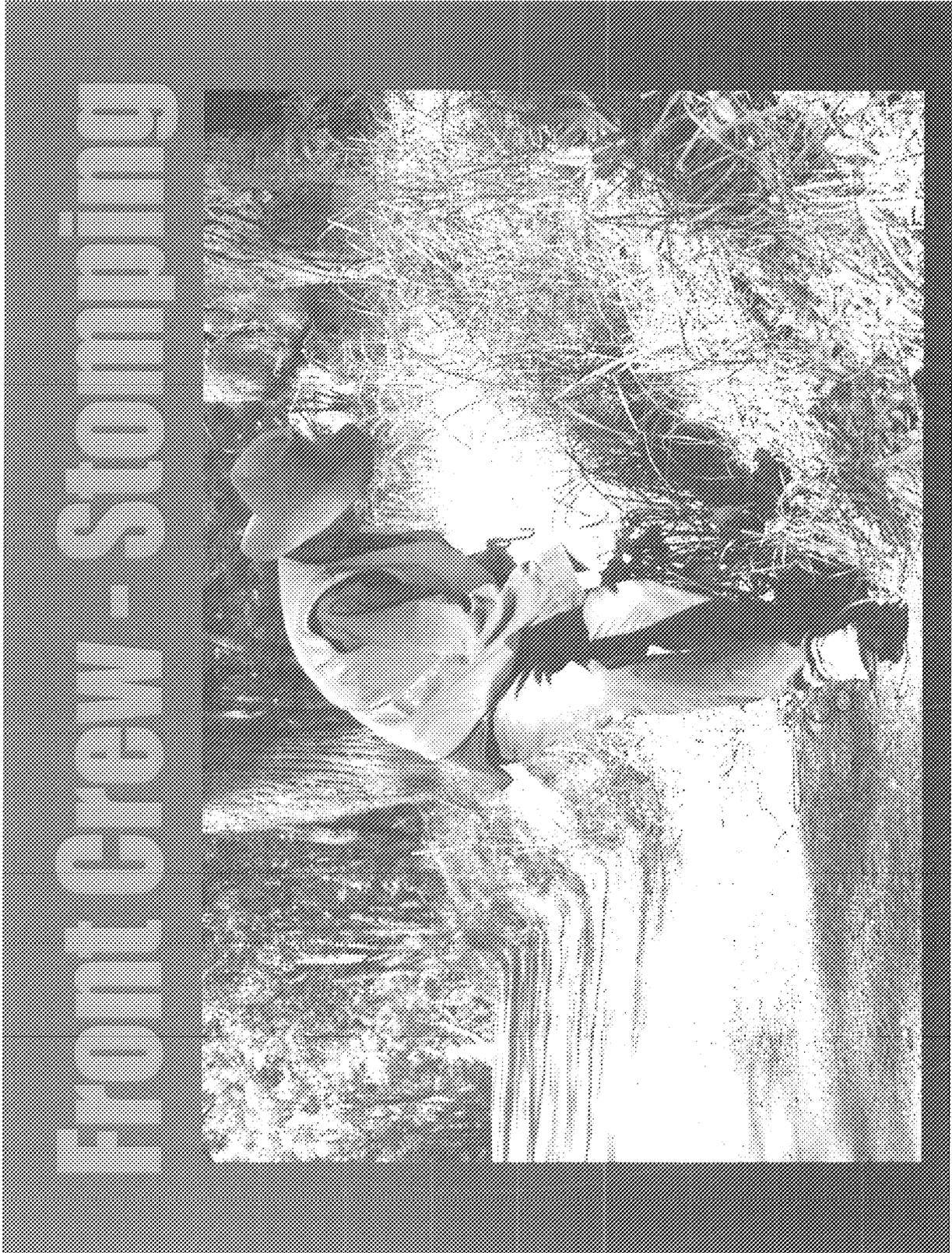


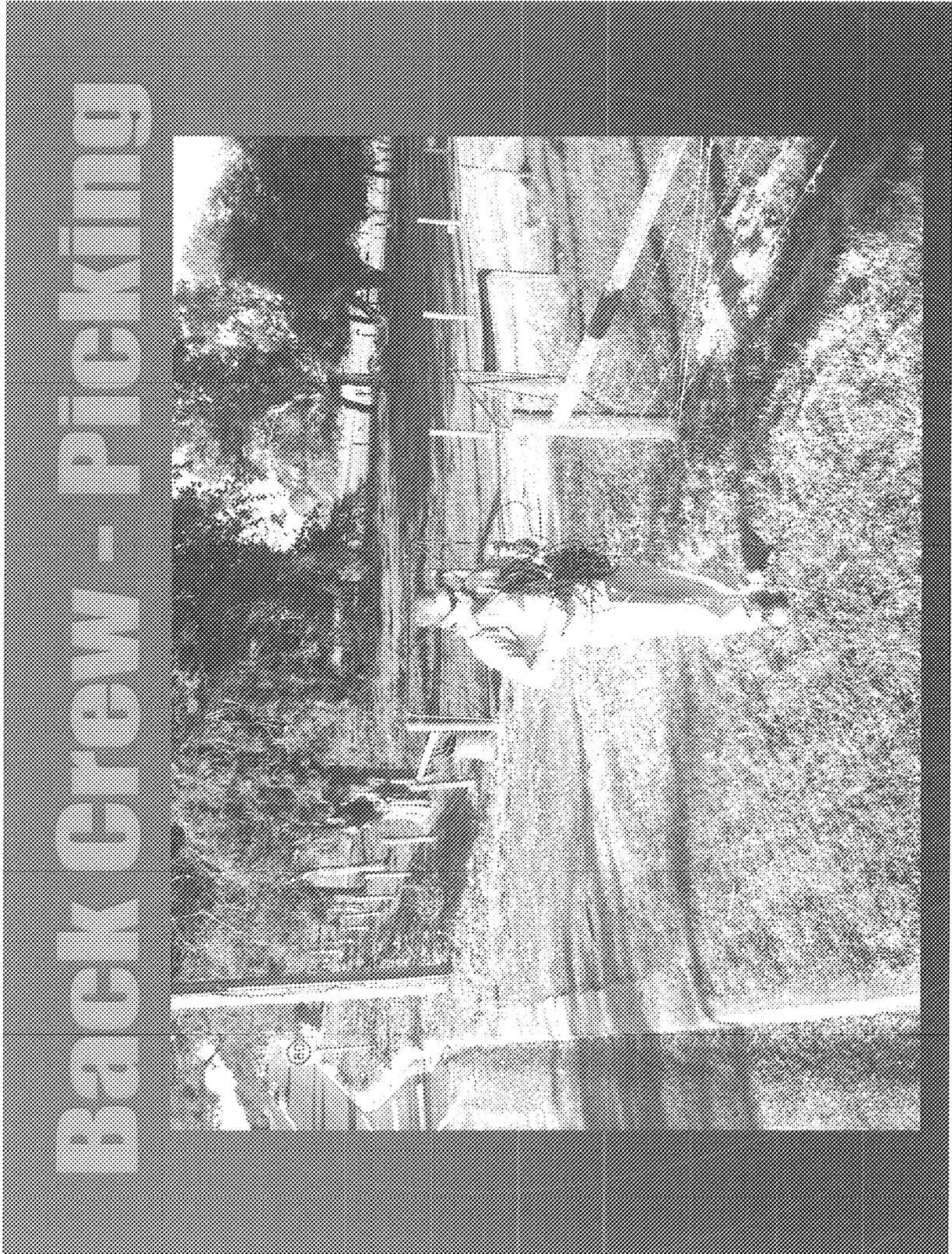
Vibroseis' truck that is used to generate the seismic signal by lowering then vibrating the pad beneath the vehicle onto the ground.

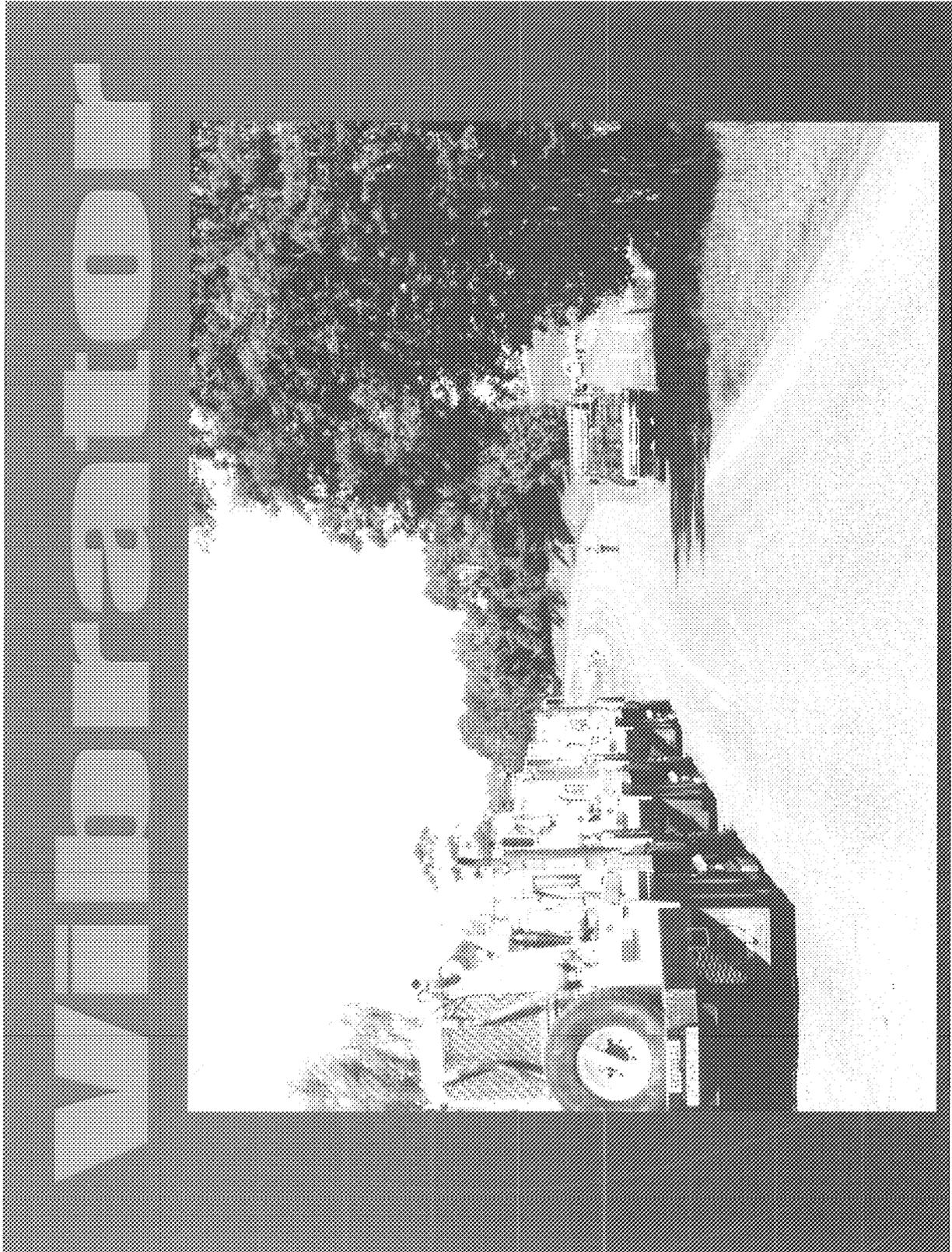


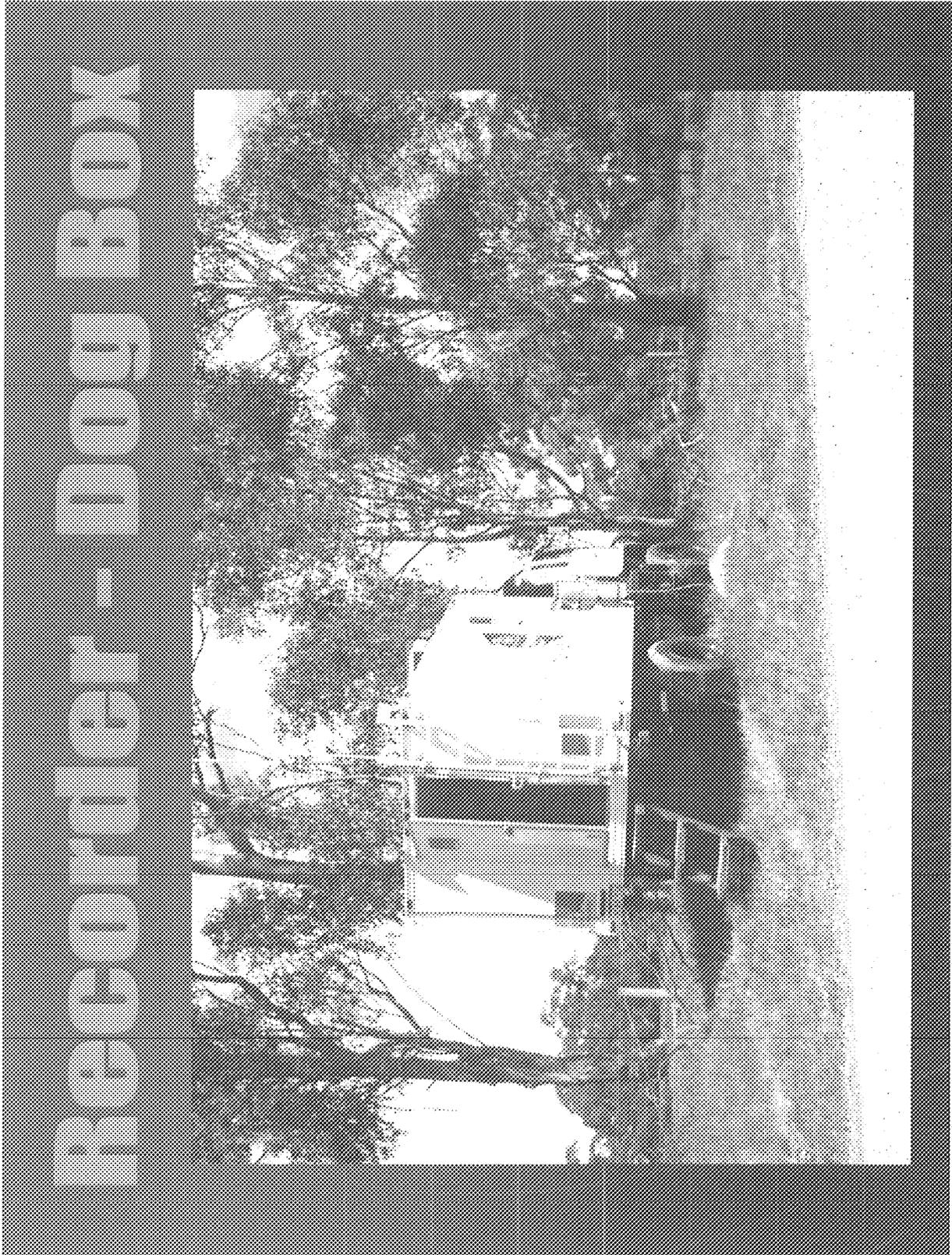














23 February 2009

20-28743 Terrex NOV 20080220

Terrex Seismic Pty Ltd
22 Crockford Street
Banyo QLD 4014

Attention: Gary Butler

Dear Gary

Terrex Seismic Vibration Trucks Vibration & In-cab Noise Measurements

1 Introduction

Heggies Pty Ltd (Heggies) has been engaged by Terrex Seismic Pty Ltd (Terrex) to assess potential Workplace Health and Safety (WH&S) issues associated with the operation of their seismic investigation (vibration) trucks as well as to conduct vibration measurements of the vibrating stage of the investigation works.

This letter report presents the results of the vibration and in-cab noise measurements carried out on Tuesday 17 February 2009, the extent of compliance with WH&S regulations and a discussion on current national and international vibration standards.

2 WH&S Noise Assessment

2.1 Noise Criteria

Noise induced hearing loss typically occurs when individuals are exposed to excessive noise levels for extended periods of time (normally over several months or perhaps years). Sudden hearing damage may also occur when a person is exposed to very high (peak) noise levels of short duration.

The Queensland Workplace Health and Safety Regulation 2008 (Reprint No. 1C) recommends acceptable noise limits for the workplace. The regulation, which is consistent with national and international guidelines, specifies that a place of work is unsafe and a risk to health if any person is exposed to noise levels:

- a. That exceed an 8-hour LAeq (noise level equivalent) of 85 dBA
- OR
- b. That exceed 140 dBC (peak).

HEGGIES PTY LTD

ABN 28 061 584 612
Ground Floor, Suite 7, 240 Waterworks Road Ashgrove QLD 4060 Australia
PO Box 844 Ashgrove QLD 4060 Australia
Telephone 61 7 3858 4800 Facsimile 61 7 3858 4801
Email brisbane@heggies.com Website www.heggies.com





The 8-hour LAeq or equivalent 8-hour noise level is defined as the steady sound pressure level which, in the course of an 8 hour period, delivers the same A-weighted sound energy as the actual varying noise level experienced by a person in a work environment on any particular representative working day. The peak noise level is the C-weighted peak sound pressure level.

The Regulation specifies that noise measurements are to be carried out in accordance with AS/NZS 1269.1.

2.2 Measured In-cab Noise Levels

To avoid significant interruption to production, in-cab noise measurements were conducted in the middle vibe truck only, however it is likely that the difference in in-cab noise level between each vibe truck would be negligible. The measurements were conducted over short intervals using a SVAN 948 Type 1 sound level meter with the microphone positioned adjacent to the driver's ear. The measured noise levels are summarised in **Table 1**.

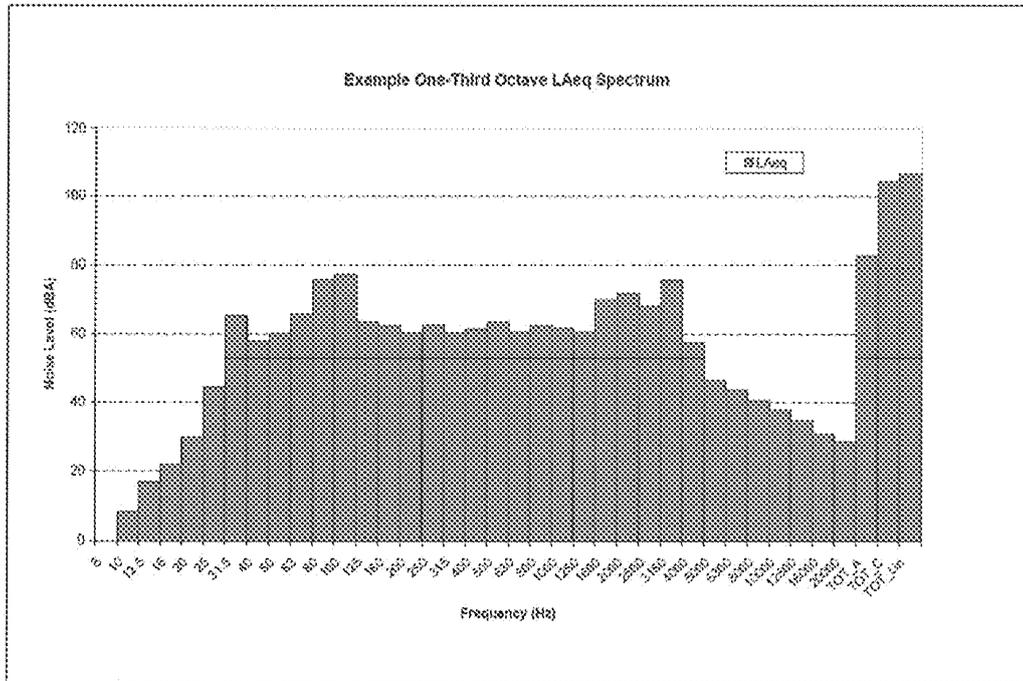
Table 1 In-cab Noise Levels

Activity	LCPeak (dBA)	LAeq (dBA)	LA1 (dBA)	LA10 (dBA)	LA90 (dBA)
Normal operation including vibration and alarms	116	81	88	86	73
Engines running (ie no vibration, alarms or moving)	107	78	83	82	72
Normal operation including vibration and alarms	117	83	90	86	73
Normal operation including vibration and alarms	117	82	90	85	74
Normal operation including vibration and alarms	118	82	91	86	72
Normal operation including vibration and alarms	116	81	89	85	73

An example LAeq spectrum measured inside the cab is presented in **Figure 1**.



Figure 1 One Third Octave LAeq Spectrum Measured Inside Cab



2.3 Compliance Assessment

The measured in-cab LCpeak noise levels in **Table 1** are well below the WH&S limit of 140 dBC.

On the basis of the short-term noise measurement results presented in **Table 1** and assuming an eight hour shift (ie noise exposure period), the eight hour LAeq WH&S limit is currently being complied with. However it is understood that the Terrex vibration truck drivers can potentially work up to 12 hours per day. **Table 2** shows the relationship between the eight hour limit (85 dBA LAeq) and the equivalent exposure limit adjusted for shorter and longer exposure periods.

Table 2 Relationship between Noise Exposure Level and Noise Exposure Duration

Noise Exposure Level (LAeq)	Approximate Duration of Noise Exposure Equivalent to WH&S Regulation Level of LAeq(8 hour) 85 dBA
79 dBA	32 hours
82 dBA	16 hours
84 dBA	12 hours
WH&S Regulation - 85 dBA	8 hours
88 dBA	4 hours
92 dBA	2 hours
95 dBA	1 hour



Table 2 shows that the equivalent noise level limit over a 12 hour exposure period is marginally (1 dBA) above the highest measured LAeq in-cab noise level of 83 dBA. Therefore typical noise exposure levels experienced by Terrex vibration truck crews are compliant with the noise limits over the longer shift duration of 12 hours.

It was noted at the time of the in-cab noise measurements that the driver has control over the volume of the audible vibration alarm. The actual volume level of the alarm has the potential to increase the LAeq noise exposure level over the shift period. Therefore it is important that the drivers maintain a volume level that is low but still adequately audible.

3 Vibration Measurements

3.1 Methodology

The methodology adopted for the vibration survey involved measurement of peak particle velocity (PPV) in three orthogonal axes (longitudinal, vertical and transverse) using an Instantel *DS-677 Minimate Plus* vibration monitor with one triaxial geophone. The Minimate was programmed to record full waveform (1024 samples per second) over an eight second period for the purpose of capturing the entire vibration event.

Vibration measurements were undertaken by Heggies at a range of distances from the trucks whilst undergoing the vibrating stage of the process.

3.2 Vibration Measurement Results

Table 3 presents the results of the vibration measurements in terms of the average peak component particle velocity (PPV) for events at corresponding distances as well as the maximum PPV (and associated frequency and axis) measured at each distance.

Table 3 Vibration Measurement Results

Distance from Nearest HEMI 50 (m)	Average Peak Particle Velocity (mm/s)	Maximum Peak Particle Velocity Event		
		PPV (mm/s)	Frequency (Hz)	Axis
3	23.1	23.1	51	Vertical
5	11.8	15.7	27	Vertical
10	4.4	5.9	27	Vertical
20	2.0	2.9	30	Vertical
40	1.1	1.3	28	Vertical
60	0.7	1.2	32	Longitudinal
80	0.4	0.5	24	Vertical
100	0.3	0.3	24	Vertical
150	0.1	0.1	51	Vertical

The results in **Table 3** have been included in graphical format in **Appendix A**.

3.3 Comparison with Vibration Criteria

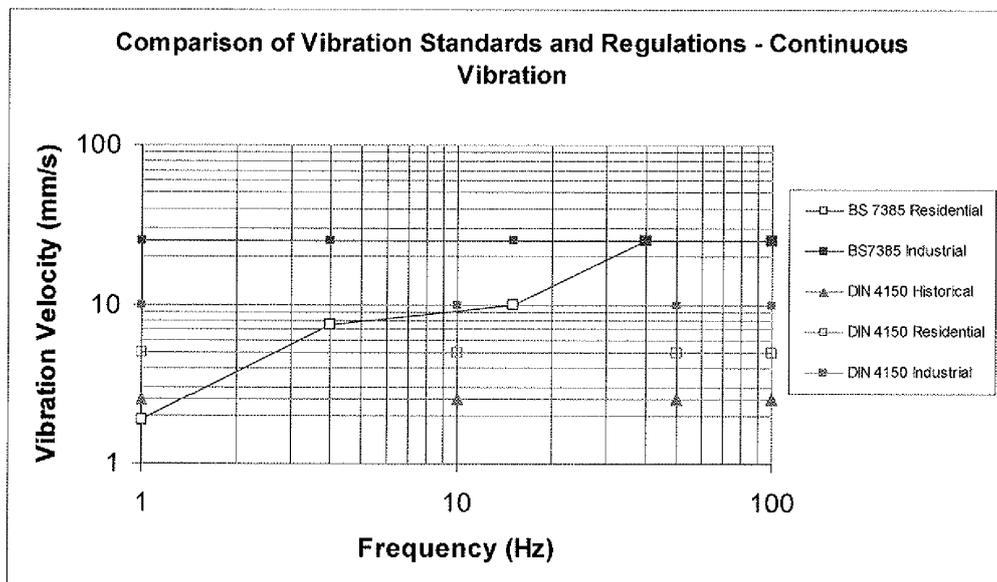
Vibration criteria regularly used by Heggies for assessment of impacts from vibration intensive activities include:



- British Standard BS 7385: Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration"
- British Standard BS 6472: 1992 "Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz)"
- German Standard DIN 4150: Part 3-1999 "Structural vibration Part 3: Effects of vibration on structures"
- Australian Standard AS 2670: Part 2- 1990 "Evaluation of human exposure to whole-body vibration Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz)"

The vibration guide values and limits expressed in the standards listed above are expressed graphically in **Figure 2** for continuous vibration imposed on building structures and in tabular format in **Table 4** for human comfort consideration.

Figure 2 Comparison of Building Standards for Continuous Vibration



BS 7385 sets guide values for building vibration based on the lowest vibration levels above which cosmetic damage has been credibly demonstrated. These levels are judged to give a minimal risk of vibration-induced cosmetic damage, where 'minimal risk' for a named effect is usually taken as a 95% probability of no effect

As opposed to the "minimal risk of cosmetic damage" approach adopted in BS 7385, the "safe levels" given in DIN 4150 are the vibration levels up to which no cosmetic damage due to vibration effects has been observed.



Table 4 Peak Vibration Velocity Levels for Human Comfort from AS 2670

Type of Space Occupancy	Time of Day	Peak Vibration Levels in mm/s corresponding to a Low Probability of Reaction	
		Vertical	Horizontal
Critical working areas	Day or Night	0.14	0.4
Residential	Day	0.3 to 0.6	0.8 to 1.5
	Night	0.2	0.6
Offices	Day or Night	0.6	1.7

The vibration measurement results presented in **Table 3** can be used as a guide to assess impacts from Terrex vibration works. For example, to assess the likelihood of cosmetic damage occurring to a residential building in the vicinity of a Terrex survey line, a guide limit of 5 mm/s PPV would apply in accordance with DIN 4150. The results in **Table 3** show that the average PPV level at a distance of 10 m from the nearest vibrator was 4.4 mm/s however the maximum measured PPV level was 5.9 mm/s. Therefore, a conservative minimum separation distance of 20 m should be maintained between the vibrator and the residential building.

Like noise, annoyance resulting from vibration exposure can vary from person to person and in severe cases can lead to feelings similar to that experienced by people annoyed from noise. Some particularly sensitive people may become annoyed when exposed to vibration levels slightly above the threshold of perception. Annoyance can often stem from a feeling of fear and anxiety particularly if the individual is concerned about the potential for damage to property from the vibration.

The AS 2670 human comfort criteria, which is quite low relative to the structural limits, aims to avoid annoyance to receivers. The measured vibration levels in **Table 3** indicate that the human comfort limits may at times be exceeded when working within 100 m of a dwelling. Subsequently it is important that vibration be minimised insofar as possible through best practice measures, the community be kept informed of survey works in advance, and that any complaints are promptly addressed.

For guidance on the effects of vibration on buried pipework, **Table 5** taken from DIN 4150 can be used assuming the pipes have been manufactured and laid using current technology.

Table 5 Guideline Values for Vibration Effects on Buried Pipework

Line	Pipe Material	Guideline Values for Velocity Measured on the Pipe (mm/s)
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50

I trust that the above is sufficient for your present requirements.

Regards

STEVE HENRY

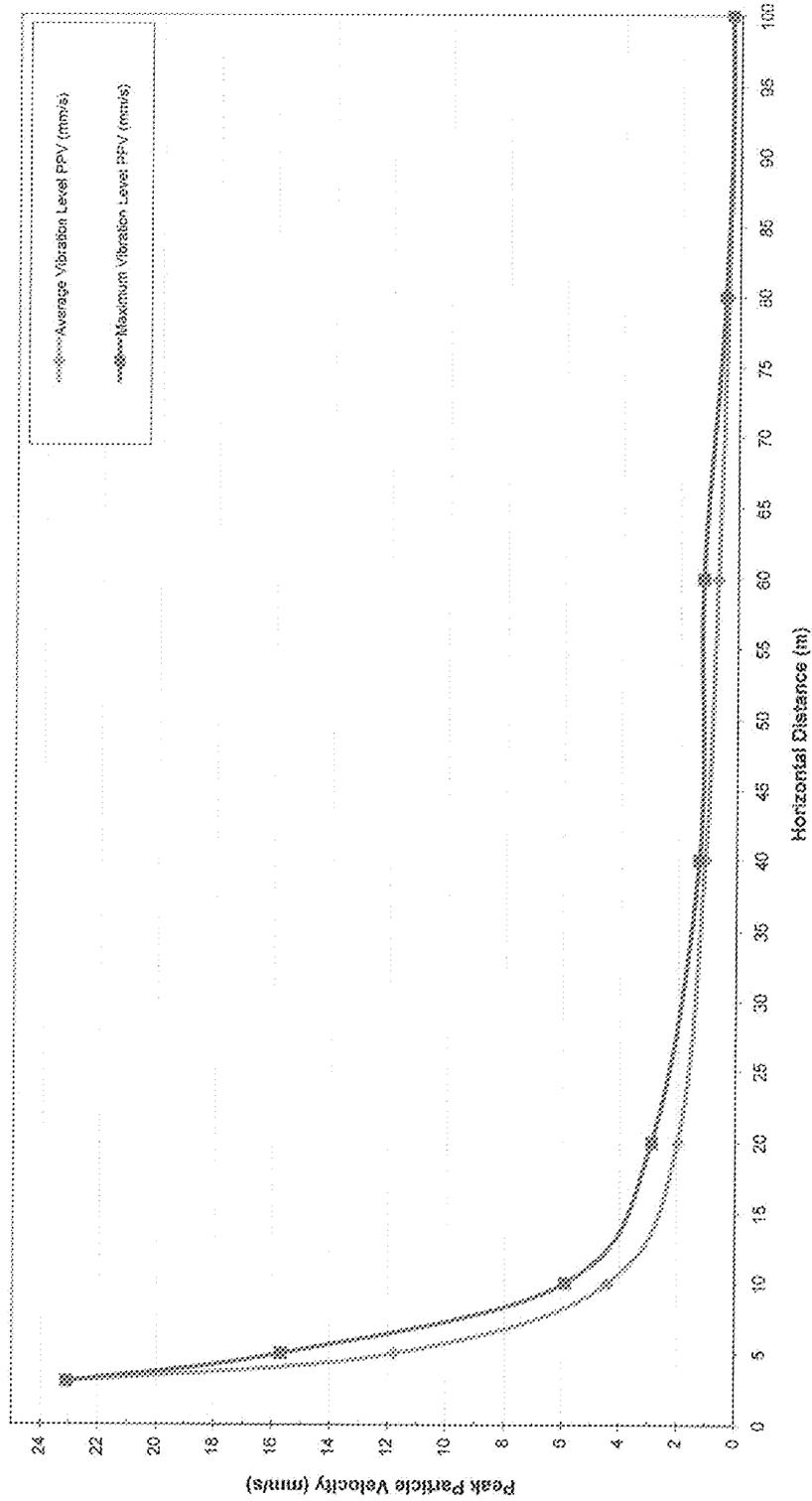
Appendix A

Report 20-2376

Page 1 of 2

Vibration Measurement Results

20-2376 Terrex Seismic Vibration Measurements
Maximum and Average PPV (mm/s)



Lismore City Council



Asset Management Strategy

Adopted by Council on

>

Document Control		Lismore City Council – Asset Management Strategy			
		This is a live Council document and is subject to periodic review. The validity and currency of the document is critical in applying its content as it contains significant asset management and performance data that is “real-time” based.			
Document ID:					
Version No	Date	Revision Details	Author	Reviewer	Approver
1	10/11/2011	Original Version	Assets Engineer		

TABLE OF CONTENTS

<u>INTRODUCTION</u>	4
<u>BACKGROUND</u>	4
<u>The Need for Infrastructure Planning</u>	4
<u>Legislative Requirements</u>	5
<u>ASSET MANAGEMENT PLANNING</u>	7
<u>Key Elements of Asset Management</u>	7
<u>Asset Management Policy</u>	8
<u>Asset Management Strategy</u>	9
<u>Asset Management Plans</u>	10
<u>Levels of Service</u>	13
<u>Expenditure Types</u>	14
<u>Asset Lifecycle Costs</u>	15
<u>Strategic Planning Process</u>	16
<u>Asset Management Systems</u>	18
<u>Integrate and Manage Core Information</u>	18
<u>RISK MANAGEMENT</u>	19
<u>COUNCIL'S INFRASTRUCTURE ASSETS</u>	20
<u>CURRENT STATUS OF ASSET MANAGEMENT PRACTICES</u>	21
<u>Gap Analysis – Asset Management Performance and Capacity</u>	21
<u>Data Collection</u>	27
<u>Council's Delivery & Operational Plan Processes</u>	29
<u>Organisational Capacity and Resourcing</u>	30
<u>KEY STRATEGIES</u>	30
<u>STRATEGY REVIEW</u>	31
<u>IMPROVEMENT AND ACTION PLAN</u>	31

INTRODUCTION

Lismore City Council is responsible for the management of a wide range of infrastructure assets and is faced with the ongoing dilemma of what resources and funds need to be provided to ensure these assets continue to provide the required services to its community in the most cost effective manner for the present and future.

Infrastructure assets are systems (or networks) that serve defined communities where the system as a whole is intended to be maintained indefinitely to a specified level of service by the continuing replacement and refurbishment of its components.

Council's asset base includes assets which are typical to local government such as roads, drains, reserves and buildings as well as assets which are typical to water authorities such as treatment plants, water supply & sewer mains, pump stations and telemetry. These assets are used to provide a range of services to the Lismore City community. The level of service delivered by these assets is largely determined by the manner in which they are maintained and managed.

One of the most important features of infrastructure networks is the degree of inter-dependency, not only within a particular asset network, but also from one network to another. The failure of one component within a network may undermine the ability of other networks to perform (for example a water main burst may disrupt traffic on a town street).

There are a number of factors that require Council to critically assess the way in which it manages these assets. These include:

- Limitations in Council's ability to raise funds;
- Increased pressure from the community for improved service delivery at less cost;
- Changes in legislation requiring the identification, depreciation and fair valuation of infrastructure assets.

BACKGROUND

The Need for Infrastructure Planning

The majority of Council's existing infrastructure stock was built when the provision of essential housing and infrastructure was the priority. During these past periods of infrastructure expansion, little or no analysis was done to determine a strategy to sustain this infrastructure stock by matching future maintenance and renewal expenditures with future

income projections. Additionally there has not been a good understanding of the long term cumulative consequences of decisions to build infrastructure.

Past systems and processes had a focus on optimising the funds allocated in a given year (or the next 2-3 years) but did not analyse the long-term sustainability of managing the existing infrastructure stock. The pattern of infrastructure construction in the past points to a future peak in infrastructure renewal over and above maintenance activities.

The provision of infrastructure is considered one of the most important roles of Council as it strives to provide a safe and functional environment for its community. Ensuring that this important infrastructure is managed in the most effective and efficient manner and continues to meet the needs of our community, in both the short and long term, is a key issue for Council.

Under the Division of Local Government's Integrated Planning and Reporting Framework, agreed levels of service performance will have an accompanying Long Term Financial Plan that aims to fully fund the capital, maintenance and operating costs needed to sustain the agreed service level targets. In order to achieve this, a number of service level scenarios and long term cash flows will need to be created to determine the optimum balance between environmental, economic, social and cultural objectives.

This Asset Management Strategy is a continuation of a process of improving asset management to ensure that Council is able to bring its Infrastructure and Asset Management practices, processes and systems to a reasonable level. This will be required if Council is to successfully implement the visions identified in Council's Community Strategic Plan and Delivery Plan.

Legislative Requirements

Local councils in NSW are required to undertake their planning and reporting activities in accordance with the *Local Government Act 1993* and the *Local Government (General) Regulation 2005*. Council's Asset Management Strategy is also prepared in accordance with the requirements of the 2010 Integrated Planning and Reporting guidelines for NSW (IPR).

Some of the main developments contained in the IPR framework are that Councils are required to develop:

- A 10 year Community Strategic Plan.

- A Resourcing Strategy to implement the strategies within the community strategic plan. This will include asset management planning, long term financial planning and a workforce management planning.
- A four year Delivery Plan covering a council's term in office which indicates what activities it will undertake to implement the strategies.

Under the IPR framework Councils are required to draw together their various plans, to understand how they interact and to plan holistically for the future. The diagrammatic representation of the Integrated Planning and Reporting Framework is shown below.



The Community Strategic Plan (CSP) (10+ years) and Delivery Plan (DP) (4 Years) provide a vehicle for expressing long term community aspirations. However these aspirations cannot be achieved without sufficient resources - time, money, assets and people - to actually carry them out.

The Resourcing Strategy is the point where Council assists the community by sorting out who is responsible for what, in terms of the issues identified in the Community Strategic Plan. Some issues will clearly be the responsibility of Council, some will be the responsibility of other levels of government and some will rely on input from community groups or individuals. The Resourcing Strategy focuses in detail on matters that are the responsibility of Council, and looks generally at matters that are the responsibility of others.

Council's Asset Management Strategy 2010/11-2019/20 is part of its Resourcing Strategy and will primarily focus on fixed physical assets and infrastructure. Subsequent revisions can include unfixed physical assets (plant, materials, library books, equipment) and soft assets (intellectual property, information and technology).

ASSET MANAGEMENT PLANNING

Key Elements of Asset Management

There are many definitions pertaining to asset management in today's society. One of the most common ones cited comes from the International Infrastructure Management Manual which states:

'The goal of infrastructure asset management is to meet a required level of service, in the most cost effective manner, through the management of assets for present and future customers.'

This encapsulates the theory that asset management relies on many disciplines working together to provide a better future for the countless people that rely on the infrastructure that surrounds them. It requires commitment and understanding from all parts of the community from Mayors to Councillors to council staff to ratepayers.

Asset management is a continuous process, covering the full life of the asset. It is seen as a practical and financially responsible means of managing assets through the creation, acquisition, maintenance, operation, rehabilitation and disposal of assets to provide for present and future community needs.

The key elements of successful infrastructure asset management are:

- Providing a defined level of service and monitoring performance;
- Managing the impact of growth through demand management and infrastructure investment;
- Taking a lifecycle approach to developing cost-effective management strategies for the long-term that meet that defined level of service;
- Identifying, assessing and appropriately controlling risks;
- Having a long-term financial plan which identifies required expenditure and how it will be funded.

These elements of asset management are enabled through aspects such as capable staff, effective tools and systems and a commitment to continuous improvement in asset management.

Asset Management Policy

Asset management policy and strategy development translates Council's broad strategic outcomes and plans into specific objectives, targets and plans relevant to a particular portion of Council.

An adopted asset management policy provides the framework which, together with Council's strategic plan, enables the asset management strategy and specific asset management objectives, targets and plans to be produced.

Council has an adopted Asset Management Policy, which includes the following key principles it will consider when making any decisions impacting on infrastructure assets:

- A consistent Asset Management Strategy must exist for implementing systematic asset management and appropriate asset management best-practice throughout all Departments of Council.
- All relevant legislative requirements together with political, social and economic environments are to be taken into account in asset management.
- Asset management principles will be integrated within existing planning and operational processes.
- An inspection regime will be developed and used as part of asset management to ensure agreed service levels are maintained and to identify asset renewal priorities.
- Asset renewals required to meet agreed service levels will be identified in Infrastructure and Asset Management Plans and long term financial plans.
- Asset renewal plans will be prioritised and implemented progressively based on agreed service levels and the effectiveness of the current assets to provide that level of service.
- Service levels will be defined in Infrastructure and Asset Management Plans.
- Through its Operational and Delivery Plan processes, Council will review service levels and provide funding for the agreed service levels.
- Where there is an identified backlog of works for a group of assets, Council will identify the backlog and acknowledge in the level of service that a backlog exists and develop a strategy to deal with the backlog.

- Systematic and cyclic reviews will be applied to all asset classes and are to ensure that the assets are managed, valued and depreciated in accordance with appropriate best practice and applicable Australian Standards.
- Future life cycle costs will be reported and considered in all decisions relating to new services and assets and upgrading of existing services and assets; and incorporated into Council's Long Term Financial Plan.
- Future service levels will be determined in consultation with the community.

For further details refer to Council's Asset Management Policy.

Asset Management Strategy

The purpose of the Asset Management Strategy is to provide direction to developing the ongoing processes for managing infrastructure assets for the next 10 year horizon.

The Asset Management Strategy will continue to evolve as the strategic objectives of Council develop and change. The key steps in this process include reviewing the strategic trends assessing potential impacts on the asset stock, and assessing gaps in the asset knowledge required to prepare the Asset Management Plans and Asset Management Improvement Plans.

It is essential to recognise that asset management is a corporate, not a technical responsibility. The key components of a sound asset management approach cannot be achieved within the individual operational areas of Council alone. Some of the areas where the need for a corporate cooperative can be demonstrated include:

- Sound information and systems;
- Comprehensive asset management planning;
- Community involvement in establishing service standards;
- Rigour in financial assessments; and
- Performance measurement of asset management.

Lismore City Council has an acceptable level of cooperation at the management level to implement good asset management practices. However, the need to develop the internal asset management capacity of Council which is being driven by the NSW Integrated Planning and Reporting requirements creates the need for a formal corporate approach to monitor and guide the integration of planning and asset management.

To enhance Council's commitment to asset management across divisional boundaries an Asset Management Steering Group (AMSG) is required to oversee this important activity. The continuing role of this group will be important in implementing, monitoring and reporting on the corporate approach to asset management.

The role of this group will be to oversee:

- Implementing and monitoring the Asset Management Plans;
- Ensuring that the responsibility for all asset management activities is assigned within the organisation, and that skill levels are sufficient to achieve the required results;
- Coordinating a consistent corporate approach to the preparation of Asset Management Plans;
- Ensuring that the information flow for financial planning and reporting is in place;
- Reporting to Senior Management Team on progress.

Key Strategy 1 – Implementing, monitoring and reporting to the Senior Management Team on the maturity of asset management at Lismore City Council will be the responsibility of the Asset Management Steering Group.

Asset Management Plans

Preparation of Asset Management Plans to provide input into Council's Long Term Financial Plan is an important requirement of the IPR. Guidelines for Asset Management Plans are shown in the Institute of Public Works Engineering (IPWEA) International Infrastructure Management Manual (IIMM). During 2007 the IPWEA commenced workshops specifically to assist council's with preparing Asset Management Plans (NAMS.PLUS). Lismore City Council is part of this program and has access to the templates produced by NAMS.PLUS and these will greatly assist Council in preparing and updating its Asset Management Plans.

Preparation of Asset Management Plans has been approached as a staged process. The ideal Asset Management Plan will only be achieved after many stages of development and knowledge improvement.

The first step in preparing Asset Management Plans is to document existing knowledge and processes and build up to a comprehensive plan through a process of continuous improvement over time.

Asset management planning may be undertaken initially to meet minimum legislative and Council requirements for financial planning and reporting. This is referred to as the 'core' approach to asset management, and provides basic technical management outputs such as statements on current levels of service, forward replacement programmes and associated cash flow projections.

Council is developing core Asset Management Plans for each class of infrastructure assets under its control. These include:

- Transport Asset Management Plan
- Water Asset Management Plan
- Sewer Asset Management Plan
- Stormwater Drainage Asset Management Plan
- Buildings, Land Improvements & Other Structures Asset Management Plan

In general, these core Asset Management Plans will:

- Describe the asset (physical, financial);
- Describe the objective/purpose of the asset;
- Define the current levels of service;
- Describe future demand requirements for service delivery;
- Describe the risks associated with the assets;
- Define the intended time frame (lifecycle) of the asset or key components;
- Include financial information;
- Recognise the decline in service potential;
- State assumptions and confidence levels;
- Outline an improvement program;
- Identify key performance measures;
- Have the firm commitment of the organisation;
- Be reviewed regularly.

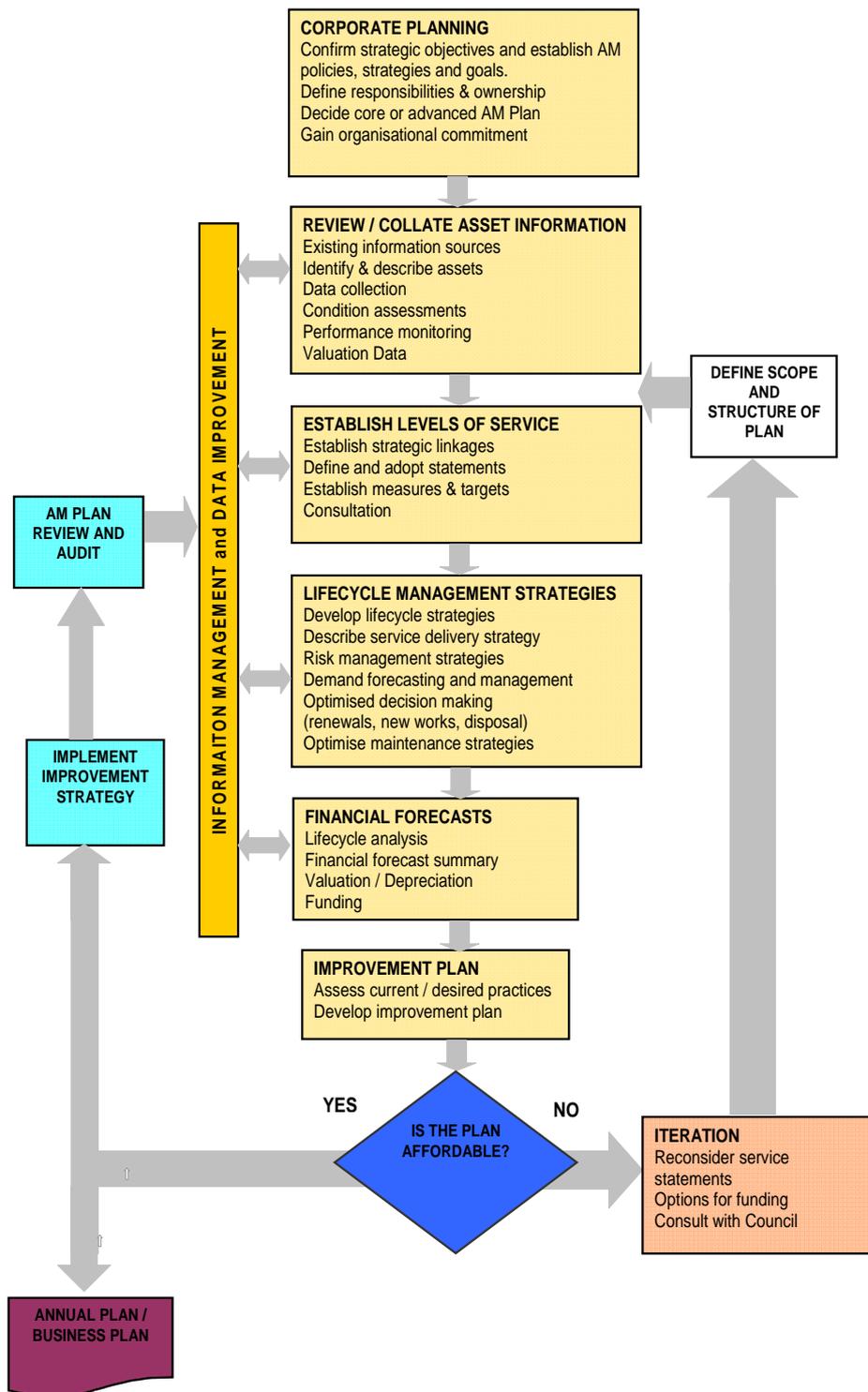
Asset Management Plans are dynamic documents and therefore must be updated periodically to be effective as a management tool and reference document. The plan should

reflect changes in objectives/policies, customer expectations, improvements in asset management systems or data in general.

The level of detail within each plan will depend on the complexity and size of the asset portfolios under consideration. It is important that all Asset Management Plans match the complexity required and are practical, readily understood and useable documents.

The following figure sets out the preferred method of preparation for Asset Management Plans to conform to the International Infrastructure Management Manual.

Key Strategy 2 – Continue to develop and update the Asset Management Plans (AMPs) for the major asset groups to ensure that the Asset Management Strategy and AMPs enable informed decision making and clear communication of the service levels, benefits and risk are associated with the resources available in the Long Term Financial Plan.



Asset Management Planning (International Infrastructure Management Manual, 2006)

Levels of Service

A key objective of Asset Management Planning is to match the levels of service that Council delivers with the levels of service expectations of its customers.

There are two factors that must be managed for every activity and balanced against the comparable need of every other activity. These two factors are the cost of service and the level of service. Asset Management Planning will enable the relationship between the two factors to be determined (the price/quality relationship).

Well defined levels of service can be used to:

- Inform customers of the current level of service provided and any proposed changes to the level of service and the associated cost;
- Measure performance against these defined levels of service;
- Develop Asset Management Strategies to deliver the required level of service;
- Identify the costs and benefits of the services;
- Enable customers to assess suitability, affordability and equity of the services provided.

The core asset management plans being produced by Council will document Council's existing levels of service.

Council should further develop these service levels in Asset Management Plans for each major asset group and link these service levels to the Delivery Plan. This will provide the link between service levels and costs of service delivery, give a tool for community consultation for services, enable Council to make decisions on service levels and costs in setting budgets and rate levels and provide a base for management performance reporting linking service levels and expenditure.

It is essential that Council knows the true costs of service delivery, priorities placed by the community on infrastructure, the service levels that are desired by the community and what level they are willing to pay for.

Key Strategy 3 – Document and improve the information on the relationship between the service level and cost so that future community consultation will be well informed of the options and costs.

Expenditure Types

The nature of works undertaken by Council and knowledge of the type of expenditure is an important requirement for preparing an Asset Management Plan. An Asset Management Plan distinguishes between operations, maintenance, capital renewal, capital upgrade and expansion, which enhance Council's existing operating capacity.

Expenditure on assets should generally be treated as operational/maintenance in the following circumstances:

- It is part of an ongoing, regular or rotational maintenance, repairs and overhaul program.
- It will not significantly increase the service potential or useful life of the asset.
- It relates to repair of localised problems such as subsidence, breaking up, e.g. of part of the road construction.
- The basic qualities of the asset are not being upgraded.
- Whilst relating to the acquisition or upgrading of an asset, it is not material to the total value of the relevant nature/type asset category.

Expenditure on assets should generally be treated as capital expenditure in the following circumstances:

- It is expected to significantly increase the practical capacity or useful life of the asset.
- It is an upgrading of the basic qualities of the asset, e.g. load bearing capacity, width, number of lanes, removal of danger spots, better drainage etc on a road.
- It is a renewal of an existing asset which had reached the point of being unserviceable.
- It is reconstruction of an asset which was destroyed (for example by a natural disaster such as flooding), in which case the carrying value of the destroyed asset is written off.
- It is material to the total value of the relevant nature/type asset category.

For asset management purposes, operational, maintenance and capital expenditure need to be broken down into the following categories:

- Operating – is the expenditure on providing a service, which is continuously required including staff salaries and wages, plant hire, materials, power, fuel, accommodation and equipment rental, on-costs and overheads. Operating expenditure excludes maintenance and depreciation.
- Maintenance – expenditure on an asset which maintains the asset in use but does not increase its service potential or life, e.g. repairing a pothole in a road, repairing the decking on a timber bridge, repairing a single pipe in a drainage network, repair work to prevent early failure of an asset.

- Capital Renewal – expenditure on renewing an existing asset or a portion of an infrastructure network which returns the service potential of the life of the asset up to which it had originally, e.g. resurfacing a sealed road, pavement rehabilitation, resheeting a gravel road, renewing a section of a drainage system, major maintenance on bridge pylons etc.
- Capital Upgrade – expenditure on upgrading the standard of an existing asset or infrastructure network to provide a higher level of service to users, e.g. widening the pavement and sealed area of an existing road, sealing an existing gravel road, replacing drainage pipes with pipes of greater capacity, replacing a timber bridge with a concrete bridge (or one with a greater carrying capacity).
- Capital Expansion – expenditure on extending an infrastructure network to a new group of users, e.g. extending a drainage or road network, etc at the same standard as currently enjoyed by residents. This expenditure is usually limited to new assets such as subdivisions or new links in the network.

Capital upgrade and expansion expenditure adds to future liabilities and does not contribute to the sustainability of the existing infrastructure. These works commit Council to fund ongoing budget liabilities for operations, maintenance, depreciation and finance costs (where applicable) for the life of the asset.

Key Strategy 4 – Identify infrastructure expenditure by both:

- *Expenditure Category i.e. the Asset Group it is associated with; for example, Road Pavement.*
- *Expenditure Type – operating, maintenance, capital renewal, capital upgrade or capital expansion.*

Key Strategy 5 – Develop and adopt an Asset Accounting and Capitalisation Policy that assists in meeting the intention of Fair Value Reporting (AASB116).

Asset Lifecycle Costs

Sometimes the initial capital costs are given too much focus when evaluating asset creation and acquisition options. All lifecycle costs should be recognised in decision making, from planning through to disposal or renewal costs. The long-term operational costs can be a significant component of the assets total lifecycle cost. For example, a rule of thumb for building facilities is that the initial cost will comprise 30% of the total lifecycle costs and recurrent expenditure 70% of total lifecycle costs.

The financial treatment of lifecycle costs is also important for prudent financial and asset management. Capitalisation policies should be clearly defined and followed.

It is critical that Council and the community understand the financial effect of capital project decisions and that if a rate revenue increase is required, this information is known and considered as part of the decision to approve the project.

Key Strategy 6 – Consider the ongoing ownership costs of new capital works proposals in budget deliberations. This is achieved by identifying the renewal and capital upgrade/expansion components of all capital works projects, and providing for the ongoing operational and maintenance requirements.

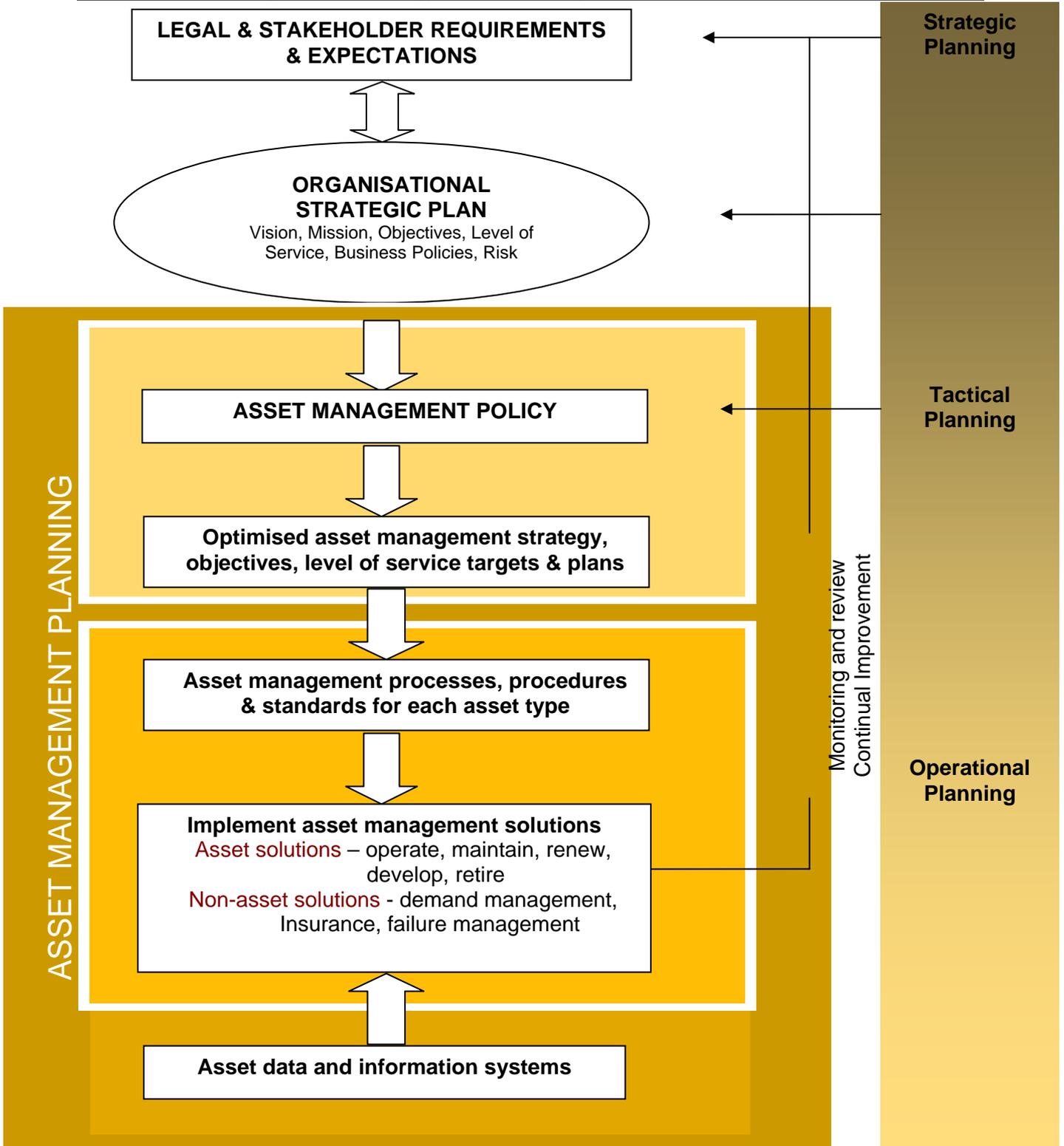
Key Strategy 7 – Develop a funding model which addresses the need for the sustainable renewal of infrastructure and which identifies all asset life cycle costs.

Strategic Planning Process

The scope of asset management activities extends from the establishment of an asset management policy and the identification of service level targets which match stakeholder expectations and legal requirements to the daily operation of facilities required to meet the defined level of service.

The process of linking legal and stakeholder requirements and expectations to implementing the optimum operational activities for Council is achieved through the strategic asset management planning process illustrated in the below figure. Underpinning asset management decision-making at each stage and the monitoring and review process is asset data and asset information systems.

The identification, assessment and control of risk is a key focus at all levels of planning, with the results from this process providing inputs into the asset management strategy, policies, objectives, processes, plans, controls and resourcing.



Strategic Asset Management Planning Process
(International Infrastructure Management Manual, 2006)

Asset Management Systems

Computer based asset management systems are used to store and analyse the significant quantities of asset data collected for asset management purposes. Such systems can also provide connectivity with other corporate information systems and databases. The power of current computing technology enables a comprehensive and cost-effective approach to asset identification, analysis and management. This ability, coupled with the availability of powerful, flexible software, enables complex analysis and reporting functions to be performed.

Council's Asset Management system from Civica (AM) acts as the organisations asset management system. Council is currently in the progress of implementing this system which is a significant project and once completed will be the major driver when the Community Strategic Plan and Financial Plans are determined.

Lismore City Council's objectives in selecting and implementing this asset management system are as follows:

- To have a central repository for all asset data;
- To undertake life cycle management of all Council asset categories;
- To facilitate an asset management culture;
- To reduce the overall costs and risks associated with Council assets;
- To implement a system that is flexible enough to accommodate the variations in the management of the various asset categories;
- To provide the ability to add advanced asset management functionality as the Council matures with respect to asset management;
- To implement an integrated system that will support the concept of once only data entry and be easily interfaced with other corporate applications.

Key Strategy 8 – Annual review of the completeness and accuracy of the data for all major infrastructure classes.

Integrate and Manage Core Information

The development of integrated corporate knowledge relevant to asset management is critical. Any system user should be able to readily access all corporate knowledge about any topic without needing to open multiple applications and manually assemble fragmented data. For example clicking on a property on the GIS should display all information known about

that property, past present and future. This information first needs to be integrated and then managed as a corporate resource. This requires a project to integrate existing systems and create the necessary links and views and then a corporate resource to work in partnership with system owners to manage data integrity, security, access and metadata. The current systems have the functionality but have not yet been fully implemented to provide information to understand and discern trends on customer preference, needs, trends on asset usage and management, maintenance and renewal trends and performance on policy objectives.

Key Strategy 9 – Develop and maintain an integrated corporate knowledge system.

RISK MANAGEMENT

Risk management provides the means by which a Council can measure its risk exposure and take actions to reduce this risk. It should be seen as a core business driver that influences all decision making, rather than an activity undertaken as an isolated process. Therefore, a corporate risk framework should be consistently applied across Council. The framework should identify the criteria against which risk can be evaluated and the responsibilities for managing risk.

Council has incorporated a Statewide Risk Management Audit which has highlighted corporate risk in a number of major corporate areas, such as infrastructure assets, service delivery, human resources, disaster planning, financial, citizen, legislative, management, commercial development and partnerships. For each area identified, a process of developing detailed risk assessments and implementing improvement opportunities is being formulated.

Failure to manage risk correctly could lead to death or injury, financial loss, organisational and operational disruption. Council's risk management process involves evaluating, monitoring risk in our strategic planning, project management, outsourced services and organisational functions ensuring risks associated with these are controlled and acceptable.

Council's Asset Management Strategy in conjunction with the Risk Management Framework and a Risk Management Policy will enable Council to manage risk in a controlled and coordinated manner, while providing the basis for a legal defence in the event of any mishap whilst minimising the probability of a catastrophic infrastructure failure.

Considering the type of assets Council owns it is imperative that a risk analysis is completed for each asset class so critical assets can be identified and risk management procedures put in place.

When adopting a core risk management approach, Council needs to have a clear picture of:

- The services to be delivered;
- Which assets are critical to the delivery of those services;
- What could happen to compromise the continued service delivery or which may have an adverse social, environmental or economic effect;
- The level of risk that is acceptable to Council;
- Options to mitigate all those risks deemed unacceptable.

Key Strategy 10 – Develop and maintain Risk Management Plans for all major asset classes

COUNCIL'S INFRASTRUCTURE ASSETS

As part of the NAMS.PLUS asset management program and Council's ongoing commitment to sustainable asset management, information on asset inventory, renewal costs, renewal expenditure, asset life and intervention criteria is being documented and consolidated to be input into Council's asset management system, AM. This will enable further analysis to be performed to determine the current and future infrastructure funding gap levels.

The identification of the renewal gap will allow Council to predict how much money needs to be spent for the long term on maintenance of Council's assets. This strategy will be an important part of future budget planning.

Council's portfolio of major infrastructure and the estimate of renewal to sustain each asset group is summarised in the following table (analysis as at 30 June 2011).

ASSET SUMMARY				
Asset	Renewal Cost (\$m)	Life Cycle Cost Per Annum (\$m)	Current Shortfall in Life Cycle Expenditure (per annum) (\$m)*	Sustainability Index
Transport	464	7.1	1.7	0.76
Stormwater Drainage	45.1	0.46	0.10	0.78
Buildings, Land Improvements & Other Structures	128	2.8	2.4	0.14
Water	149	2.5	0.91	0.64
Sewer	338	6.0	4.2	0.29
TOTALS	1,124	18.86	9.31	

* Capital renewal/upgrade expenditure was averaged over the 2009/2010 and 2010/2011 financial years to provide a better indication of yearly spending. The expenditure is then taken away from the Life Cycle Cost which gives the Current Shortfall in Life Cycle Expenditure.

The table identifies the total estimated renewal cost of Council's major infrastructure assets to be in excess of \$1,124 Million with the current funding shortfall of approximately \$9.31 Million per annum.

The Sustainability Index is an indicator on Council's current funding levels for infrastructure renewal. A target ratio of 1.0 is desired which indicates that Council is fully funding its asset consumption.

These ratios are likely to improve as data in the asset register is continued to be improved, particularly in relation to reassessing the useful life of these assets.

It is also common that the separation in actual expenditures between operations, maintenance and renewal is not highly developed, and this also will have a significant impact on improving the sustainability ratios.

It is important to continue to reassess this situation as the current ratios indicate that the current level of service being provided cannot be maintained in the longer term.

Whereas it is proposed that these initial results will form the basis of Council's updated 10 year financial plan, a number of improvement opportunities have been identified to further improve the robustness and integrity of the various information.

CURRENT STATUS OF ASSET MANAGEMENT PRACTICES

Gap Analysis – Asset Management Performance and Capacity

This analysis provided by the NAMS.PLUS program of Council's capabilities, is to assist Council in assessing its sustainable asset management capability and identify priority asset management practice areas to assist in developing sustainable asset management improvement plans.

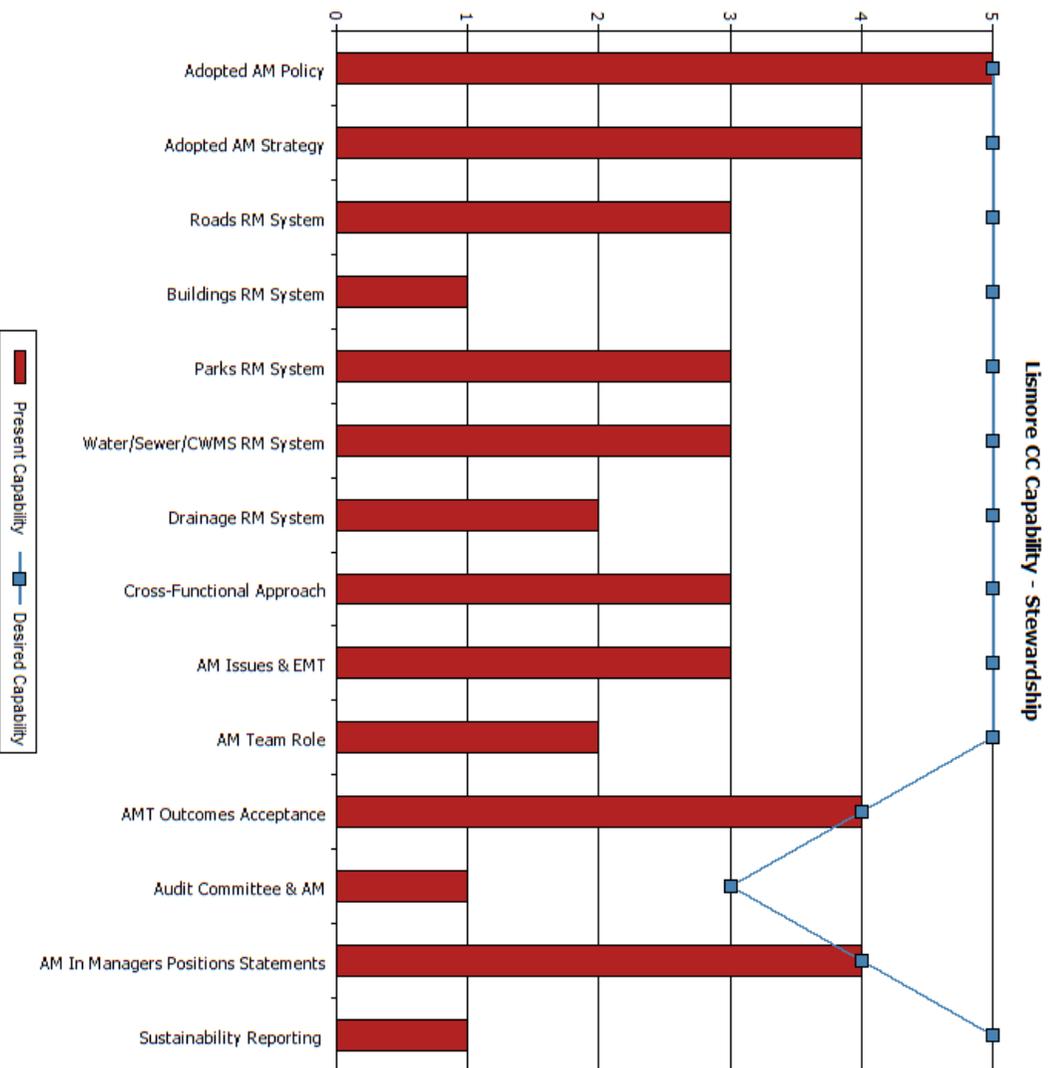
The Capability Gap Analysis provided by the NAMS.PLUS program has been divided into three sections:

- Stewardship;
- Asset Management Planning;
- Financial Planning.

The survey questions relate to sustainable asset management practice areas and ask Council to indicate responses from present answers to the following:

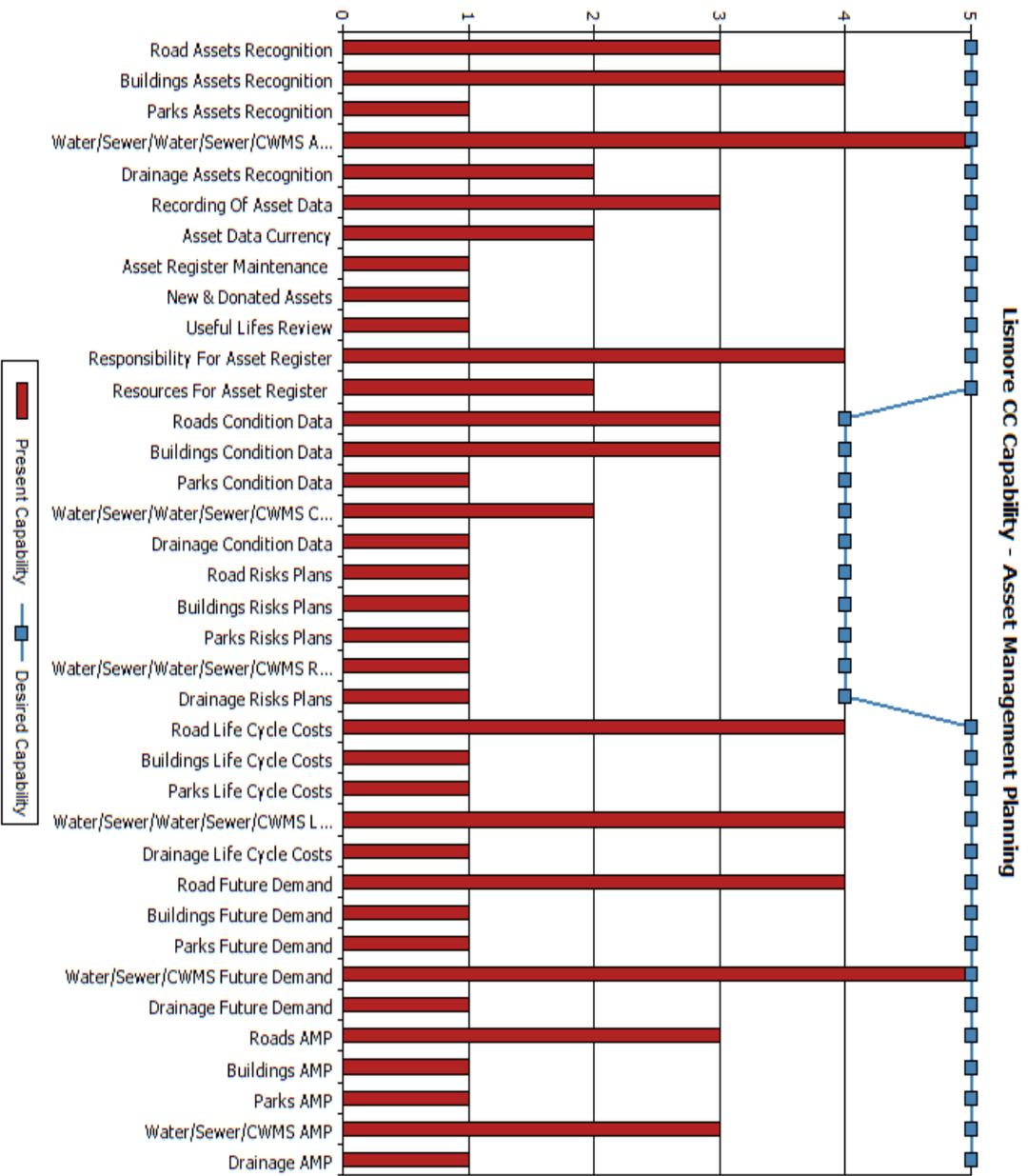
Desired capability to achieve sustainable asset management and meet Local Government Act requirements	What level of capability Council considers is required to achieve sustainable asset management practices and meet the requirements of the Local Government Act.
Present capability	What is the level of capability that Council is at now.
Relative importance of practice area	How does Council rank the importance of each practice area to assist it in achieving sustainable asset management and meet the requirements of the <i>Local Government Act</i> .

Stewardship



Practice Area	Capability
AM Policy	Adopted AM Policy
AM Strategy	Adopted AM Strategy
Risk Management Process	Roads RM System
Risk Management Process	Buildings RM System
Risk Management Process	Parks RM System
Risk Management Process	Water/Sewer/CWMS RM System
Risk Management Process	Drainage RM System
AM Accountability & Responsibility	Cross-Functional Approach
AM Accountability & Responsibility	AM Issues & EMT
AM Accountability & Responsibility	AM Team Role
AM Accountability & Responsibility	AMT Outcomes Acceptance
AM Accountability & Responsibility	Audit Committee & AM
AM Accountability & Responsibility	AM In Managers Positions Statements
Sustainability Reporting	Sustainability Reporting

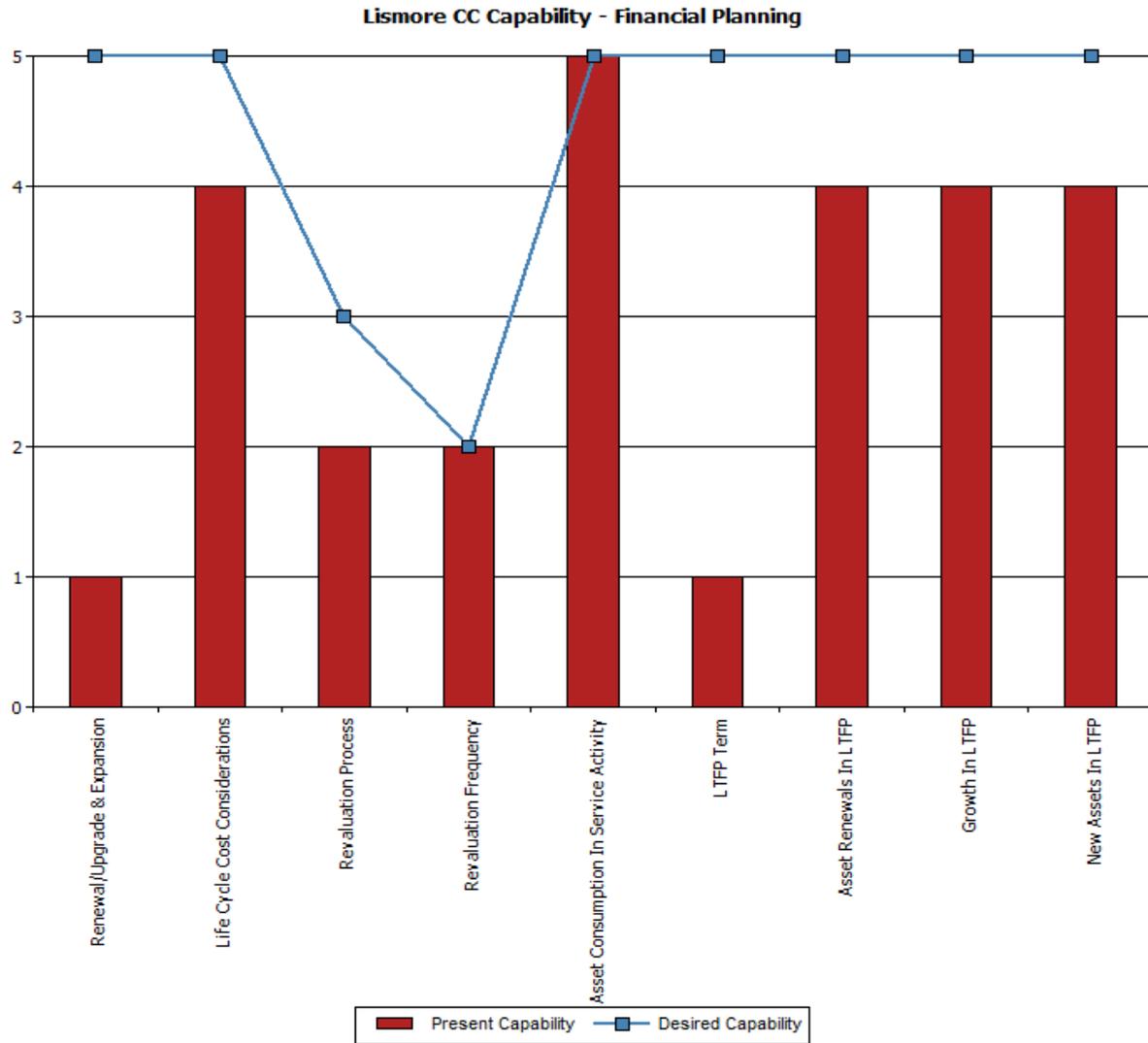
Asset Management Planning



Practice Area	Capability
Asset Identification & Recording	Road Assets Recognition
Asset Identification & Recording	Buildings Assets Recognition
Asset Identification & Recording	Parks Assets Recognition
Asset Identification & Recording	Water/Sewer/Water/Sewer/CWMS Assets Recognition
Asset Identification & Recording	Drainage Assets Recognition
Asset Identification & Recording	Recording Of Asset Data
Asset Identification & Recording	Asset Data Currency
Asset Identification & Recording	Asset Register Maintenance
Asset Identification & Recording	New & Donated Assets
Asset Identification & Recording	Useful Lives Review
Asset Identification & Recording	Responsibility For Asset Register
Asset Identification & Recording	Resources For Asset Register
Asset Identification & Recording	Roads Condition Data
Asset Identification & Recording	Buildings Condition Data
Asset Identification & Recording	Parks Condition Data
Asset Identification & Recording	Water/Sewer/Water/Sewer/CWMS Condition Data
Asset Identification & Recording	Drainage Condition Data
Asset Identification & Recording	Road Risks Plans
Asset Identification & Recording	Buildings Risks Plans
Asset Identification & Recording	Parks Risks Plans
Asset Identification & Recording	Water/Sewer/Water/Sewer/CWMS Risks Plans
Asset Identification & Recording	Drainage Risks Plans
Asset Identification & Recording	Road Life Cycle Costs
Asset Identification & Recording	Buildings Life Cycle Costs
Asset Identification & Recording	Parks Life Cycle Costs
Asset Identification & Recording	Water/Sewer/Water/Sewer/CWMS Life Cycle Costs
Asset Identification & Recording	Drainage Life Cycle Costs
Asset Identification & Recording	Road Future Demand
Asset Identification & Recording	Buildings Future Demand
Asset Identification & Recording	Parks Future Demand
Asset Identification & Recording	Water/Sewer/CWMS Future Demand
Asset Identification & Recording	Drainage Future Demand
Asset Data Maintenance	Roads AMP
Asset Data Maintenance	Buildings AMP
Asset Data Maintenance	Parks AMP
Asset Data Maintenance	Water/Sewer/CWMS AMP
Asset Data Maintenance	Drainage AMP

Practice Area	Capability
Asset Condition Data	Roads Condition Data
Asset Condition Data	Buildings Condition Data
Asset Condition Data	Parks Condition Data
Asset Condition Data	Water/Sewer/Water/Sewer/CWMS Condition Data
Asset Condition Data	Drainage Condition Data
Risk Management	Road Risks Plans
Risk Management	Buildings Risks Plans
Risk Management	Parks Risks Plans
Risk Management	Water/Sewer/Water/Sewer/CWMS Risks Plans
Risk Management	Drainage Risks Plans
Service Levels & Delivery Costs	Road Life Cycle Costs
Service Levels & Delivery Costs	Buildings Life Cycle Costs
Service Levels & Delivery Costs	Parks Life Cycle Costs
Service Levels & Delivery Costs	Water/Sewer/Water/Sewer/CWMS Life Cycle Costs
Service Levels & Delivery Costs	Drainage Life Cycle Costs
Future Demand Impacts	Road Future Demand
Future Demand Impacts	Buildings Future Demand
Future Demand Impacts	Parks Future Demand
Future Demand Impacts	Water/Sewer/CWMS Future Demand
Future Demand Impacts	Drainage Future Demand
Asset Management Plans	Roads AMP
Asset Management Plans	Buildings AMP
Asset Management Plans	Parks AMP
Asset Management Plans	Water/Sewer/CWMS AMP
Asset Management Plans	Drainage AMP

Financial Planning



Practice Area	Capability
Life Cycle Costs & Investment Decisions	Renewal/Upgrade & Expansion
Life Cycle Costs & Investment Decisions	Life Cycle Cost Considerations
Revaluation Process	Revaluation Process
Revaluation Process	Revaluation Frequency
Reporting Asset Consumption	Asset Consumption In Service Activity
Long Term Financial Plan	LTFP Term
Long Term Financial Plan	Asset Renewals In LTFP
Long Term Financial Plan	Growth In LTFP
Long Term Financial Plan	New Assets In LTFP

Capability Gap Analysis

Plots present capability and gap to achieve desired capability for each practice area and calculates a priority for improvement based on importance rankings.

Lismore City Council Gap Analysis																	
Gap Analysis	Assessment Score	Stewardship					Asset Management Planning						Financial Planning				
		Asset Management Policy	Asset Management Strategy	Risk Management Process	AM Accountability & Responsibility	Sustainability Reporting	Asset Identification & Recording	Asset Data Maintenance	Asset Condition Data	Risk Management	Service Levels & Delivery Costs	Future Demand Impacts	Asset Management Plans	Life Cycle Costs in Investment Decisions	Revaluation Process	Reporting Asset Consumption	Long Term Financial Plan
Excellence	5																
Competence	4																
Systematic Approach	3																
Awareness	2																
Needs Improvement	1																
		Current Capability Score									Gap to achieve Desired Capability						
Present Capability		5	4	2.4	2.8	1	3	1.8	2	1	2.2	2.4	1.8	2.5	2	5	3.3
Desired Capability		5	5	5	4.3	5	5	5	4	4	5	5	5	5	2.5	5	5
Gap		0	1	2.6	1.5	4	2	3.2	2	3	2.8	2.6	3.2	2.5	0.5	0	1.7
Importance Weighting		5	5	4.8	4.5	4	5	5	4	5	5	3.6	5	4.5	4.5	5	5
Weighted Gap		0	5	12.5	6.8	16	10	16	8	15	14	9.4	16	11.3	2.3	0	8.5

Priority For Improvement	13	11	4	10	1	6	1	9	2	3	7	1	5	12	13	8
Lismore City Council Gap Analysis																
Priority	Practice Area															
1	Asset Data Maintenance															
2	Asset Management Plans															
3	Sustainability Reporting															
4	Risk Management															
5	Service Levels & Delivery Costs															
6	Risk Management Process															
7	Life Cycle Costs & Investment Decisions															
8	Asset Identification & Recording															
9	Future Demand Impacts															
10	Long Term Financial Plan															
11	Asset Condition Data															
12	AM Accountability & Responsibility															
13	AM Strategy															
14	Revaluation Process															
15	Reporting Asset Consumption															
16	AM Policy															

Data Collection

As at June 2011 Council has data stored in its current asset management system and on Excel spreadsheets that covers the following assets:

- Roads infrastructure;
- Bridges including major culverts;
- Stormwater infrastructure;
- Buildings;
- Land;
- Plant and equipment;
- Parks and reserves;
- Water supply infrastructure;
- Sewerage infrastructure.

In order to improve the integrity of data, assist in managing data in a meaningful manner and to assist Management to make informed decisions regarding maintenance practices and to more efficiently determine capital works programs, Council is currently implementing an integrated total asset management system, AM.

Council has recently or is in the process of undertaking an audit and assessment of its major assets including water, sewerage, property, plant and equipment, land, buildings, roads, bridges and footpaths. This process is likely to be repeated on a three to five year cycle according to the Division of Local Government’s agenda for the valuation of assets at fair value.

The preceding infrastructure assets have a structured criteria assessment utilising condition, age, hierarchy relativity, level of usage and other criteria as appropriate to the type of asset. The assessment will be used to determine the priority for inclusion on Council’s 10 year capital works program.

The table shown below relates to the current and proposed data collection regimes.

ASSET CLASS										
Asset Description	Sealed Roads	Gravel Roads	Water Supply Network	Sewerage Network	Footpaths & Cycleways	Kerb & Gutter	Bridges	Stormwater	Buildings	Play-grounds
Current Inspection Frequency	As Required	As Required	As Required	As Required	1 Year	As Required	As Required	As Required	As Required	1 Year

Proposed Inspection Frequency	3 - 5 Years	3 - 5 Years	As Required	As Required	1 Year	3 - 5 Years	As Required	10 years	1 Year	1 Year
-------------------------------	-------------	-------------	-------------	-------------	--------	-------------	-------------	----------	--------	--------

Historically the gap between sustainable asset replacement and the demand on the asset has been determined on broad principles utilising predicted asset lives. A number of capital works program are currently set within the confines of the Community Strategic Plan using these principles. Funding allocation in Council's Community Strategic Plan does not necessarily match the demand for asset replacement and maintenance however with the implementation of the NAMS.PLUS program and AM the information attained will provide more robust outputs which will further improve Council's Community Strategic Plan and better reflect the real renewal needs of important infrastructure assets.

Council's Delivery & Operational Plan Processes

Lismore City Council's 2008-2018 Community Strategic Plan provides details of Council's strategic focus and future direction. The information contained in this document has evolved from previous community consultation mechanisms, planning documents and also strategies that have been determined by State and Federal Government. Lismore City Council recognises the need for local government reform and has been (in recent years) developing a platform from which it can initiate a strategic and forward planning focus that can provide for and address the future local government needs of the Lismore City community. The Community Strategic Plan reflects the proposed future direction of Council; in that regard a range of future needs and projects have been identified.

The Operational Plan is developed within an overall planning framework, which guides the Council in identifying community needs and aspirations over the long term and converting these into medium and short term goals and objectives.

The long term financial plan summarises the financial impacts of the goals and objectives and determines the suitability of these plans. The long term financial plan focuses on:

- Budget of financial performance (income statement);
- Budget of cash position (cash flow statement);
- Budget of financial position (balance sheet) and
- Budget of capital works.

This strategy will enable improved financial planning by providing opportunity for improved management practices and asset condition information together with improved determination of infrastructure lives, which impact on Council's annual asset depreciation and can significantly affect the required level of funding for asset replacement.

For further details refer to Council's Community Strategic Plan.

Key Strategy 11 – Continue developing the corporate asset register meeting both technical and financial reporting requirements.

Organisational Capacity and Resourcing

In order to implement this strategy it is important that Council undertake the resource assessment so that a staged and monitored program of improvement can be implemented.

KEY STRATEGIES

The following key strategies will be further developed by Council staff representing the major areas of service planning, Council's Senior Management Team and by the examination of Council's existing asset management systems and processes.

They are presented here in order as they have been identified within this document, not in order of priority:

- Key Strategy 1 – Implementing, monitoring and reporting to the Senior Management Team on the maturity of asset management at Lismore City Council will be the responsibility of the Asset Management Steering Group.
- Key Strategy 2 – Continue to develop and update the Asset Management Plans (AMPs) for the major asset groups to ensure that the Asset Management Strategy and AMPs enable informed decision making and clear communication of the service levels, benefits and risk are associated with the resources available in the Long Term Financial Plan.
- Key Strategy 3 – Document and improve the information on the relationship between the service level and cost so that future community consultation will be well informed of the options and costs.
- Key Strategy 4 – Identify infrastructure expenditure by both:
 - Expenditure Category i.e. the Asset Group it is associated with; for example, Road Pavement.
 - Expenditure Type – operating, maintenance, capital renewal, capital upgrade or capital expansion.
- Key Strategy 5 – Develop and adopt an Asset Accounting and Capitalisation Policy that assists in meeting the intention of Fair Value Reporting (AASB116).

- Key Strategy 6 – Consider the ongoing ownership costs of new capital works proposals in budget deliberations. This is achieved by identifying the renewal and capital upgrade/expansion components of all capital works projects, and providing for the ongoing operational and maintenance requirements.
- Key Strategy 7 – Develop a funding model which addresses the need for the sustainable renewal of infrastructure and which identifies all asset life cycle costs.
- Key Strategy 8 – Annual review of the completeness and accuracy of the data for all major infrastructure classes.
- Key Strategy 9 – Develop and maintain an integrated corporate knowledge system.
- Key Strategy 10 – Develop and maintain Risk Management Plans for all major asset classes
- Key Strategy 11 – Continue developing the corporate asset register meeting both technical and financial reporting requirements.

STRATEGY REVIEW

It is intended that this strategy document will have a minor review annually in conjunction with Council's Operational Plan, with major reviews at four year intervals.

IMPROVEMENT AND ACTION PLAN

A key element of this strategy is the Improvement/Action Plan as detailed in Council's Integrated Planning and Reporting documents that will improve the way Council manages its infrastructure assets. This plan captures the main actions defined in the nominated strategies developed as well as the actions defined in the Gap Analysis.

It is imperative that Council carry out the actions defined that align with the strategies and provide the appropriate staff resources to complete the tasks nominated within the given time frames.

AM Practice Area	Task/Strategy	Responsibility	Timeline	Current Status
Asset Data Maintenance	Develop and document a procedure to ensure the asset register is updated monthly/continuously	Assets Engineer	June 2012	Asset register is greater than 2 years out of date

AM Practice Area	Task/Strategy	Responsibility	Timeline	Current Status
	Develop and document a work procedure for asset register maintenance	Assets Engineer	June 2012	No procedure developed
	Develop and document a work procedure for recognising and capitalising new and donated assets	Assets Engineer	June 2012	No procedure developed
	Develop and document a process for reviewing useful lives of assets	Assets Engineer	June 2013	No procedure developed
Asset Data Maintenance	Ensure appropriate resources are allocated to asset data maintenance	Manager Assets & Support Services, Manager Works	Ongoing	Asset register updates are always delayed
	Key Strategy 8 – Annual review of the completeness and accuracy of the data for all major infrastructure classes.	Assets Engineer	Ongoing	No annual review being done
Asset Management Plans	Develop Transport Core Asset Management Plan and adopt as guiding strategy for management of Council's transport assets	Assets Engineer	September 2012	Under development
	Develop Stormwater Drainage Core Asset Management Plan and adopt as guiding strategy for management of Council's stormwater drainage assets	Assets Engineer	June 2012	Planned for development
	Develop Land, Buildings & Other Structures Core Asset Management Plan and adopt as guiding strategy for management of Council's land, buildings & other structures assets	Assets Engineer	June 2012	Planned for development
	Develop Sewerage Services Core Asset Management Plan and adopt as guiding strategy for management of Council's sewerage assets	Assets Engineer	December 2012	Under development
	Develop Water Supply Core Asset Management Plan and adopt as guiding strategy for management of Council's water assets	Assets Engineer	December 2012	Under development

AM Practice Area	Task/Strategy	Responsibility	Timeline	Current Status
	Key Strategy 2 – Continue to develop and update the Asset Management Plans (AMPs) for the major asset groups to ensure that the Asset Management Strategy and AMPs enable informed decision making and clear communication of the service levels, benefits and risk are associated with the resources available in the Long Term Financial Plan.	Asset Management Steering Group	Ongoing	Under development
Sustainability Reporting	Council's financial sustainability to be reported in the Annual Report	Manager Finance	June 2012	No sustainability indicators are developed
Risk Management	Develop and maintain a current listing of asset related risks and risk management treatments linked to capital maintenance programs for all infrastructure assets	Assets Engineer	December 2012	Not developed
	Key Strategy 10 – Develop and maintain Risk Management Plans for all major asset classes	Assets Engineer	December 2012	Not developed
Service Levels & Delivery Costs	Prepare preliminary information for Community Strategic Plan in consultation with Manager Corporate Services	Assets Engineer, Manager Corporate Services	March 2012	Not prepared
	Investigate and document the life cycle costs of services provided for all infrastructure assets	Assets Engineer	December 2012	Have being documented for some services within Transport and Water & Sewer
	Key Strategy 3 – Document and improve the information on the relationship between the service level and cost so that future community consultation will be well informed of the options and costs.	Assets Engineer	Ongoing	Have being documented for some services within Transport and Water & Sewer
Risk Management Process	Develop a system for managing asset related risks either as part of a corporate risk management system or within the Asset Management Plans for all infrastructure assets	Assets Engineer	December 2012	Planned within the next 12 months

AM Practice Area	Task/Strategy	Responsibility	Timeline	Current Status
Life Cycle Costs & Investment Decisions	Develop and implement a procedure where Council can break up capital expenditures into capital renewal, capital upgrade and capital expansion	Assets Engineer, Manager Finance	June 2012	Not developed
	Ensure Council receives and considers life cycle cost information in decisions relating to new/upgrade services and assets	Asset Management Steering Group	Ongoing	Yes for some services and assets
	Key Strategy 4 – Identify infrastructure expenditure by both expenditure category and expenditure type	Assets Engineer, Manager Finance	June 2012	Not developed
Life Cycle Costs & Investment Decisions (con't)	Key Strategy 6 – Consider the ongoing ownership costs of new capital works proposals in budget deliberations. This is achieved by identifying the renewal and capital upgrade/expansion components of all capital works projects, and providing for the ongoing operational and maintenance requirements.	Asset Management Steering Group	Ongoing	Not developed
	Key Strategy 7 – Develop a funding model which addresses the need for the sustainable renewal of infrastructure and which identifies all asset life cycle costs.	Asset Management Steering Group	December 2012	Not developed
Asset Identification & Recording	Review and develop asset hierarchy and suitable attributes down to appropriate asset/component level for all infrastructure assets	Assets Engineer	June 2012	Completed for some assets
	Review, collect and record required asset location, attribute and condition data to appropriate type/component level with target 98% coverage and 98% confidence (ensure all assets incorporated)	Assets Engineer	June 2014	Targets not reached and confidence levels are low
	Develop one asset register which serves Council's financial and technical asset data requirements	Assets Engineer, Manager Information Services	June 2013	Assets are held in numerous technical asset registers

AM Practice Area	Task/Strategy	Responsibility	Timeline	Current Status
	Key Strategy 9 – Develop and maintain an integrated corporate knowledge system	Asset Management Steering Group	June 2014	Not developed
	Key Strategy 11 – Continue developing the corporate asset register meeting both technical and financial reporting requirements.	Asset Management Steering Group	Ongoing	No procedure developed
Future Demand Impacts	Identify and document Council's future demands and impacts on service delivery for all infrastructure assets	Asset Management Steering Group	Ongoing	Have being documented for some services within Transport and Water & Sewer
Long Term Financial Plan	Develop a long term financial plan that covers a 10+ year period	Manager Finance	June 2012	Current financial plan covers a 1 year period
Asset Condition Data	Collect and maintain current and historical condition data and develop a rolling program of condition assessment for all infrastructure assets	Assets Engineer	June 2014	Condition data has been collected for less than 50% of assets. No rolling program has been developed
AM Accountability & Responsibility	Ensure Council has a cross-functional approach to asset management	Asset Management Steering Group	Ongoing	Under development
	Ensure Council's Senior Management Team consider asset management issues at the corporate level	Asset Management Steering Group	Ongoing	Under development
	Develop the Asset Management Teams primary role into the coordination of life cycle asset management activities for all services	Asset Management Steering Group	June 2014	Primary role is capital works prioritisation for some/all services
	Develop a Council Audit Committee and report to as required	Asset Management Steering Group	June 2014	No Audit Committee
	Key Strategy 1 – Implementing, monitoring and reporting to the Senior Management Team on the maturity of asset management at Lismore City Council will be the responsibility of the Asset Management Steering Group.	Asset Management Steering Group	Ongoing	Asset Management Steering Group has been established
AM Strategy	Develop and adopt an Asset Management Strategy	Assets Engineer	December 2011	Under development for Council adoption at the December 2011 meeting

AM Practice Area	Task/Strategy	Responsibility	Timeline	Current Status
Revaluation Process	Future revaluations to be completed part by external valuer and part by Council staff	Assets Engineer, Manager Finance	Ongoing	Revaluations done by external valuer
	Key Strategy 5 – Develop and adopt an Asset Accounting and Capitalisation Policy that assists in meeting the intention of Fair Value Reporting (AASB116).	Manager Finance	June 2012	Not developed
Reporting Asset Consumption	Report asset consumption as an operating expense against the relevant service activity	Manager Finance	Completed	Yes for all service activities
AM Policy	Develop and adopt an Asset Management Policy	Assets Engineer	Completed	Asset Management Policy adopted by Council in 2009