Knowledge gaps and research priorities within the livestock export industry

Project code:	**LIVE.325**
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Date published:	**September 2007**
ISBN:	**9781741913613**

PUBLISHED BY

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NORTH SYDNEY NSW 2059

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

Abstract

Livestock exporting is important from a national perspective because of its positive contribution to livestock prices and regional job creation. Maintenance of this contribution will depend on retention of market access through continuous improvements that assist competitiveness. At another level, realisation of the industry's economic contribution depends on it retaining widespread support because it can deliver socially acceptable standards of animal welfare. The industry's future, therefore, is dependent on maintenance of a fine balance between social and private imperatives. Achieving acceptable welfare outcomes is integrally linked to adherence by exporters to technical standards and guidelines. This study strengthens the technical foundations of the industry by identifying gaps in the knowledge and practices associated with standards, which might be filled by targeted R&D.

Apparent gaps were identified by systematic scrutiny of the supply processes. This scrutiny was facilitated by differentiating the supply lines according to species (sheep or cattle) and length of voyage (long or short haul) and then overlaying each supply line with a detailed framework covering every facet of the export process. This included consignment planning, livestock sourcing, land transporting, feedlot management, vessel preparation and loading and on-board management. Against this background, a cross-section of exporters, managers and industry service providers was interviewed to elicit opinion about issues relating to each of the headings determined by the framework. For each facet of the supply process, conclusions were developed according to the following criteria:

- Whether or not relevant standards and guidelines exist
- Whether or not the framework headings are supported by industry specific R&D
- Whether exporters and other stakeholders view issues relating to the headings as acceptable or contentious
- The extent to which the existing standards and guidelines have an impact on operations
- The extent to which the impacts of the standards and guidelines on export procedures are justified by the contribution they make to superior animal welfare outcomes.

The results allowed numerous R&D recommendations to be developed. The broad nature of the consultation process has resulted in consideration of projects that do not necessarily meet a narrow definition of R&D (for example projects associated with operational or marketing applications). In many cases these recommendations relate more to industry development than to traditional research. The associated recommendations were retained in the final report because of perceived benefits to the industry. Potential projects were prioritised for action according to the five criteria listed above.

Executive Summary

Australia's livestock exporting industry is assisted in its efforts to achieve acceptable animal welfare outcomes by complying with various standards and guidelines that apply to export processes ranging from sourcing animals from farms to eventually discharging them at an overseas port. Industry research and development (R&D) has contributed to the process in two ways. Firstly it has contributed directly to formulation of the standards and guidelines (albeit not yet all of them) and secondly it has provided exporters with knowledge and tools to help them comply with standards and guidelines.

This study strengthens the technical foundations of the industry by identifying gaps in existing standards and guidelines that might be filled by targeted R&D. For each facet of the supply process, gaps were identified and assessed against existing standards and guidelines according to the criteria and possible determinations detailed below:

Criteria	Possible determination
Relevant industry standards and guidelines	Exist / Do not exist
Issues associated with standards and guidelines supported by industry specific R&D	Exists / Lacking
Issues associated with framework headings acceptable from the exporter's and other stakeholder's perspective	Consensus / Some contention / Contentious
Impact of existing standards and guidelines (and/or framework headings) on operational procedures	Low / High
Affect of existing standards and guidelines (and/or framework headings) on animal welfare outcome	Low / High
Inferred R&D priority	Low / Medium / High / Very high

The existence of significant gaps was determined by systematic scrutiny of the supply processes that take livestock from dispersed regions of Australian to some foreign port. The scrutiny was facilitated by differentiating the supply lines according to species (sheep or cattle) and length of voyage (long or short haul) and then overlaying each supply line with a detailed framework covering every facet of consignment planning, livestock sourcing, land transporting, feedlot management, vessel preparation and loading and on-board management. The scope of the project was limited to the point of discharge. As such, issues relating to post discharge procedures were not addressed.

A cross-section of exporters, managers and industry service providers was interviewed to elicit opinion about issues relating to the headings defined by the framework. This work allowed the consultants to arrive at conclusions about the overall quality of the existing standards and guidelines and subsequently the need for further industry specific R&D. The project did not attempt to identify and assess every practice currently employed by Australian livestock exporters. Such an undertaking was deemed too demanding for the resources available. The only practices reported outside the industry standards and guidelines were those found to be particularly contentious and requiring urgent review.

For the purposes of streamlining the reporting, we have presented the frameworks associated with each of the species / voyage duration case studies as appendices. Each case study has been furnished with summary tables that can be found at the end of the framework document. This represents a good starting point for those who do not wish to work through the detail of the

appendix. The use of appendices has allowed us to confine the critical elements of the report to just two chapters. Chapter 1 provides an introduction to the study along with an explanation of the core objectives, methodology and technical terms or concepts used throughout the report. Chapter 2 provides a comprehensive overview of the entire study. The overview includes details of proposed R&D projects that we believe, based on feedback from those stakeholders consulted, will benefit the industry if followed through.

Nineteen projects were identified as being very high priority and were recommended for immediate consideration and these are outlined in detail in section 2.6 (see table of contents) and summarised in Table 1 (at the end of this executive summary). In each case, broad terms of reference are provided.

A larger number of possible projects (or areas that require attention) have been identified and these are summarised in the tables 2.1-2.5. These are equally important to the industry over a slightly longer time frame. Potentially, therefore, this study provides the industry with a reservoir of R&D ideas and proposals that could direct its R&D efforts over the next half decade.

The criteria mentioned above made it a relatively easy process to identify research possibilities. It was more difficult, however, to reach an understanding of how they should be prioritised. R&D should be in keeping with an industry vision statement that identifies where the industry would like to be in five years time and how it intends to get there. To prioritise the research possibilities it was necessary to establish what is considered to be the industry research needs and be consistent with any overall R&D strategy. Research needs were identified in the following areas:

- Research aimed at reducing the risk management of a major incident, and the ability to manage it should it occur.
- Reduction in mortality rates.
- Improvements in other measures of animal welfare.
- Streamlining of commercial procedures.
- Improving the quality of regulation in terms of intent and effectiveness.
- Improving the public's perception of the industry.

The study recommended both general and specific R&D projects and assigned priorities in every case. Specific projects derived from the case studies are referenced to the framework documents via the summary tables. The highest priority projects are identified at Table 1, below.

It should be noted that the terms of reference (and objectives) of the project (see page 7), are quite inward looking and introspective. This has resulted in the "operational" focus referred to earlier. This approach is timely since most of the major issues within the industry have been addressed by industry specific research at some stage in the past. The industry should, however remain open to "blue sky" type projects that have the potential to make a major contribution to the industry. These projects are likely to come from outside the industry and may surface at any time. There are also several issues in the post discharge area that would benefit from R&D funding but these fall outside the scope of this project.

Table 1. High priority research and development issues

High Priority Research Issues	Recommended Way Forward
Refinement of industry regulation	Investigate comparative models of industry regulation with a view to shifting from a mainly prescriptive approach to one that incorporates an outcomes focused approach where appropriate. (See 2.6.1)
Development of Consignment Risk Management Plan Tools (CRMP)	There is a strong case to develop key risk prevention "tools" to support exporters address the major risks involved in each of the major supply chains. These tools should provide "real" risk management and be more than a "paper entry" to meet regulatory requirements. (See 2.6.2)
Perceptions of the industry (the reasons behind the trade)	This falls outside what would traditionally be considered "research', however there is a place for the logistical and cultural reasons behind the livestock export trade to be better documented and explained. This would lend itself to a brief project to ensure that the information is accurate and contemporary. (See 2.6.3)
Linking pre-delivery factors to post delivery performance (Short Haul Cattle)	The short haul trade is characterised by a low mortality rate and has therefore attracted little R&D support. This project is pivotal to the future of this trade and allows the key profit drivers to be identified and further developed. (See 2.6.4)
Innappetance in sheep (causes and preventative strategies)	This project has already been initiated. Industry consultation has confirmed the support for this project and it is recommended that further terms of reference be developed so that the project can be completed in its entirety. (See 2.6.5)
Salmonellosis (early detection and management)	Salmonellosis represents one of the high risk factors facing the industry. Although considerable work has been conducted in regards to prevention, gaps exist in regards to the early detection and early management of an outbreak. (See 2.6.6)
Project revisit (Implementation plans for completed industry research)	Re-visit industry specific R&D for the purpose of identifying where research findings has yet to be adopted. This would culminate in an implementation plan and should allow improvements in industry practices at little additional cost.(See 2.6.7)
The roles of veterinarians and stockmen onboard long haul journeys	The role of stockmen and veterinarians (on long haul voyages) relative to mortality investigation, information dissemination, data collection, onboard trial work and reporting require re-definition. Roles at loading, onboard and on arrival also need to be sharpened and re-defined. (See 2.6.8)
Information Management Systems (IMS)	Recent developments in animal traceability (through NLIS) offer a unique opportunity to develop an integrated Information Management System. This would complement the information that is already gathered as part of the reporting function. LIVE.213 is developing prototype software that facilitates the collection of data from assembly feedlots and vessels. This should be developed into an overall information management system. Issues in regards to the ownership and management of this information need to be resolved. (See 2.6.9)

Table 1. High priority research and development issues (continued)

High Priority Research Issues	Recommended Way Forward
Guidelines for discretionary approval	Many ASEL standards infer discretionary powers on the 'relevant Australian Government Agency'. These powers presume a strong working knowledge of the industry. In the absence of this, supplementary guidelines to specify how the discretion should be exercised are required. A project that addresses both possibilities would assist industry. Discretionary approval might be applicable to other situations that impact on the efficacy of operational procedures. (See 2.6.10)
Preparation of goats prior to export (pre-delivery management)	The industry guidelines require R&D support with a specific focus on the preparation of goats prior to export to help clarify what constitutes domestication and preparation. (See 2.6.11)
Assembly periods (reconciling inconsistencies)	Recent changes to industry regulation in regards to assembly periods are inconsistent with earlier research (Norris et al). More contemporary R&D is required to reconcile these inconsistencies. (See 2.6.12)
Animal segregation (optimising segregation options)	Recent industry events have triggered an interest in horn length and other aspects of segregation. There are, only so many segregation options available. Optimal outcome requires that the most important segregation options be adopted. These need to be identified. (See 2.6.13)
Sourcing restrictions (wt, body condition, age, wool length etc)	R&D is required to address the types of livestock that are affected by sourcing restrictions. These livestock may be exported without significant welfare risks provided they are subjected to specific management procedures. This research is similar in nature to the work suggested in regards to discretional approval. (See 2.6.10 & 2.6.14)
Industry training (assessing competencies and developing skills)	Industry training to date has been limited to brief stockman training and accreditation courses. There is scope to build on these and provide training and accreditation in the form of "continuing education" as well as providing training opportunities to many other members of the industry. (See 2.6.15)
HSRA model (explanation of assumptions and linkages)	Efforts to explain the assumptions and linkages within the model would assist to engender a greater industry acceptance of the model and a better understanding of the linkages between the risk factors and animal performance. (See 2.6.16)
Ventilation design (effectiveness vs capital and operating costs)	Although there is considerable material available to ship owners there is no real consensus in regards to what is the "best" way to deliver air to livestock carried on livestock vessels. This is of particular interest to ship owners contemplating the construction of new vessels. (See 2.6.17)
Heat stress (management of open decks)	Heat stress on open decks is a major risk to the livestock export industry. Although there is information available, there is a need to expand on the "open deck operational guidelines" suggested in the research documents and better extend these to managers and key decision makers. (See 2.6.18)
Minimum airspeed (reconciling AMSA requirements)	There is confusion within the industry in regards to "minimum air velocity", how it is measured, how it relates to such measures as drift velocities, velocity ratios and pen air turnover (as a measure of distance and time). The requirement for a minimum velocity of 0.5 m/sec may be unobtainable in vessels with some ventilation configurations despite having adequate pen air turnover. This inconsistency needs to be reconciled. (See 2.6.19)
Other (further outstanding projects)	Heading 2.6.20 addresses a number of other possible projects that could be considered for research and development.

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1 Project Overview

1.1 Livestock exporting and the role of R&D

Livestock exporting is a major contributor to Australia's livestock economy, earning an average of $830 million annually over the past five years (Hassall & Associates, 2006). If the trade were to close, two thirds of this amount would be permanently lost. Caught up in the losses would be thousand of jobs throughout rural and regional Australia, most particularly in Western Australia and the Northern Territory. Integrally linked to preservation of livestock exporting is the public's understanding of the economic importance of the trade and the weighting placed on animal welfare by all operators and stakeholders participating in, or connected to, the industry.

Delivery of acceptable animal welfare outcomes has been greatly assisted in recent years by research and development (R&D) aimed at multiple aspects of the subject including:

- Determining acceptable physiological and environmental conditions under which livestock can be acceptably transported across land and water
- Formulating and implementing standards that, if applied, will lead to acceptable outcomes
- Introduction of legislation, codes and regulations that combine to harmonise industry practice with community expectations
- Development of complementary risk management strategies and tools that when understood and applied by operators and sub-contractors will result in acceptable animal welfare outcomes
- Development and application of practices, codes, protocols, handbooks and guidelines that complement local standards and regulations and ultimately bring about superior outcomes
- Management of the industry's R&D effort for optimal performance in terms of coverage, relevance, complementary support, uptake and effectiveness.

Extensive consultation with exporters, managers and service providers has made it possible to identify associated knowledge and application gaps that might be beneficially addressed by further R&D. The situation is more fully explained in the next section.

1.2 Project objectives and methodology

The scope of this project is very broad ranging from identification of demonstrative knowledge and application gaps to assessment of the R&D program's capacity to materially assist the industry to achieve its goals. The project has developed a framework (or matrix) to systematically address industry practices within the livestock export process. This framework has been used to address four major objectives:

1. Review information that is available to the industry and identify any inconsistencies between industry guidelines and the research recommendations
2. Identify those parts and activities within the supply chain where formal or widely accepted guidelines do not exist
3. Identify any areas of contention where common practice differs from industry guidelines or where there is a lack of agreement within the industry in regard to a particular practice
4. Identify and prioritise what R&D is required to support existing practices and guidelines.

These objectives have been addressed by investigating the actual circumstances that prevail throughout the Australian livestock exporting industry. Accordingly, the consultants interviewed

a broad cross-section of operators and service providers. On occasions, this process uncovered deficiencies in the prevailing R&D effort. Relevant deficiencies together with recommendations are highlighted throughout the report and conveniently summarised in tables.

Prior to undertaking the industry consultations it was necessary to review existing guidelines and reconcile these with recent industry specific research. Industry guidelines include the Australian Standards for the Export of Livestock (ASEL) *version 2*, the Export Control (Animal) Orders 2004, the Marine Orders Part 43 (Issue 5), the Australian Position Statement of the Export of Livestock, Model Codes for the Welfare of Animals, World Health Organization (OIE) Guidelines, the industry's governance and operating manual, stockman's handbooks and various best practice publications.

Industry specific research has been restricted to R&D projects commissioned by MLA (on behalf of the industry) and completed in the last 10 years. This was broadened to include key research conducted by Norris *et al* in the late 1980's - early 1990's. The study has not attempted to audit current practices or guidelines against research recommendations but inconsistencies and anomalies observed during the consultations were noted and documented in each case study.

Some inconsistencies exist because of unavoidable lags between generation of new knowledge and revision of the guidelines and training prior to adoption etc. In other cases, however, the industry has yet to accept the research findings or the research itself has yet to specify a practical application of its findings. Apart from highlighting the need for all R&D projects to have extension plans, these nuances were observed and reported where relevant.

1.3 Definition of terms

Australia's livestock export industry has distinguished itself by the emphasis it has placed on practices designed to bring about outcomes that are both economically rewarding and socially acceptable. In the case of livestock exporting, socially acceptable outcomes equate to prescribed animal welfare outcomes and are delivered by relatively advanced practices that recognise interactions between journey length, species, the microenvironment and customer preferences.

Many of the terms applied to exporting practices have not been formally defined and are often used interchangeable. It will be useful, therefore, to define several of the concepts and terms most commonly used to ensure a common understanding of their meaning and application.

Risk management approach: This approach puts primary emphasis on management of inherent risk for the purpose of achieving acceptable outcomes. Effective risk management might require the operator to go beyond compliance with routine processes. The approach requires the operator to understand the linkages between causality and consequences and then put in place systems to manage events or incidents (if and when they arise) with the end goal of satisfying outcome targets. Knowledge, education, accreditation, monitoring and constant revision are seen to be primary tools of the risk management approach. Implicitly, the risk management approach places a heavy duty of care on the operator (and all the sub-operators in the supply line) and should be advanced as the best long term solution to addressing the technical complexities involved with livestock exporting. Where appropriate, this study has identified where and when the risk management approach has been applied to achieve acceptable outcomes. This was done for the purpose of assessing whether risk management systems are being applied pre-emptively and in parallel by operators for the purpose of bringing

about better outcomes. The risk-based approach is central feature of the Australian government's 'Position Statement on the Export of Livestock' (see *Industry guidelines*).

Outcomes-based performance measurement: The livestock export industry has developed a heavy reliance on achieving acceptable and measurable outcomes according to particular supply channels and species. In the case of long haul sheep, for example, the major outcome used to measure performance is the mortality rate – above a specified mortality rate, performance is deemed to be unacceptable. In the case of short-haul cattle, the major outcome is currently related to daily weight gain during the voyage while the performance measurement for long haul dairy heifers into China is functionality of the udder. There are, however, a host of mini-outcomes involved that exporters use to meet the regulatory standards. Indeed, behind each prescriptive requirement there is (or should be) a rationale which has an explicit outcome target. This is the essence of an 'outcome based' approach. While the notion of outcome performance is broadly understood and accepted there is not always an overt link between the prescribed management practices and the required outcomes. It should be noted that ASEL does not have an accompanying rationale and as such the reasons behind some of the prescriptive requirements are not self-evident. The outcomes approach requires a clear understanding of (and focus on) the rationale behind any prescriptive requirements. Hence, it can be seen that some management systems presume that adherence to 'prescribed practice' will result in acceptable outcomes while others make achievement of acceptable outcomes an integral part of the system. The outcomes approach is therefore more concerned with the result or effectiveness of an action and less concerned about the action itself. In the case of a risk management approach, processes are applied within the context of incidents, circumstances and risks for the explicit purpose of achieving acceptable outcomes. Further explanation of the differences between the approaches is provided below.

Prescriptive approach: This approach places primary reliance on adherence to a set of processes or actions. Thus operators are instructed as to what they must do to comply and what penalties they might suffer if instructions are not followed. It is presumed that strict adherence to the documentation will result in acceptable outcomes. Characteristically, the prescriptive approach does not attempt to explain or predict the nature and consequences of variations in treatments, etc. Usually, independent experts will have compiled the instructions based on industry specific R&D findings – where they exist – or on industry derived experience – where they do not. The core strength of this approach is seen to be its reliance on independent development of the processes and guidelines and authorised third party scrutiny of performance. Due to the complexity of livestock exporting, however, it is unlikely that instructions can be formulated to cover all contingencies[1]. Conceivably, therefore, an operator might comply with all the processes but still not achieve an acceptable outcome. In this situation the operator could not be judged to be culpable even if enlightened management might have resulted in a more acceptable outcome. On other occasions, compliance might cause the operator to incur higher costs than are necessary to achieve an acceptable outcome. Such problems notwithstanding, compliance with documented processes and guidelines etc is the main method by which operators are expected to achieve acceptable outcomes at this time. Accordingly, the focus of this study is squarely on reviewing and assessing the concurrence between the prevailing documentation (including R&D findings), reported industry practices and actual outcomes.

Industry guidelines: Industry guidelines include the Australian Standards for the Export of Livestock (ASEL) (*version 2)*, the Export Control (Animal) Orders 2004, the Marine Orders Part

[1] For a comprehensive discussion of the relative advantages of prescriptive and risk management approaches see LIVE.117, 'Review of Australian Livestock Export Standards' (2003).

43 (Issue 5), the Australian Position Statement of the Export of Livestock, Model Codes for the Welfare of Animals, World Health Organization (OIE) Guidelines, the industry's governance and operating manual, stockman's handbooks and various best practice publications.

Australian Standards for the Export of Livestock Version 2 (Sept 2006): These standards were developed (with industry assistance) by the Department of Agriculture, Fisheries and Forestry and exist in documented form and on the web at www.daff.gov.au/livestockexportstandards.

A more recent version (*Version 2.1, Dec 2006)* has been released but amendments are minor and have little bearing on this project. (The standards have in fact been modified to accommodate issues relating to segregation). The most recent version also includes the Australian Position Statement on the Export of Livestock.

Export Control (Animals) Orders 2004: These orders set out the arrangements under which the industry is regulated. The order is made under the Export Control Act 1982, and the Export Control (Animals) Regulations 1982. Other aspects are also made under the Australian Meat and Livestock Industry Act 1997. These orders provide the general framework by which the industry is regulated but it also contains quite specific guidelines relating to some areas of the industry. www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf.

Marine Orders Part 43 (Issue 5): The marine orders provide guideline to the owners of vessels that transport livestock. They relate only to vessels that are Australian-registered or those that intend to participate in the export of livestock from Australia. Most of the guidelines relate specifically to the design and operation of the vessel but there are several key regulations that relate directly to livestock, particularly in regards to reporting mortality levels when they exceed reportable levels. Vessels operating from Australia require an Australian Certificate for the Carriage of Livestock (valid for the species of livestock to be carried). The marine orders have a particular interest in ensuring that "livestock services" are adequate and properly maintained. This relates to the penning arrangements, the delivery of fodder and water and the maintenance of the onboard environment. www.amsa.gov.au.

Australian Position Statement on the Export of Livestock: The position statement provides a framework for the development of ASEL. It provides the guiding principles for the development of the Standards and ensures that the Australian approach is consistent with that taken by international bodies (particularly the World Organization for Animal Health (OIE)). www.daff.gov.au/livestockexportstandards.

Model Codes of Practice for the Welfare of Animals: Animal welfare codes have developed on a state by state basis and relate to different species and circumstances. In addition there is a set of national animal welfare codes giving rise to an initiative for the states to support a single national code. (Various)

World Health Organization (OIE) Guidelines: OIE has a precise set of guidelines relating to the export of livestock. These guidelines are well considered and outcome based. The standards (ASEL) are consistent with OIE guidelines.
https://www.oie.int/eng/bien_etre/AW_WG_december2004_eng.pdf

Industry Operating and Governance Manual: The industry operating and governance manual is designed to complement and support the industry standards. It enables exporters to detail their current practices and demonstrate how they meet the standards. They also draw together the regulatory requirements incorporated in the different industry guidelines. The onus is on each exporter to develop his or her own governance manual. For the purposes of the project, an

industry template has been utilised to determine headings within each of the framework documents.

Stockman's Handbooks – Transport of Cattle by Sea (Short & Long Haul Voyages) - March 2006 (Ainsworth, 2006) and Handbook for Shipboard Stockmen and Veterinarians (Sheep and Goats) (Brightling, 2005): These are useful documents designed to support stockman under the auspices of the 'stockman's program' operated by LiveCorp. It reflects the current thinking and experience of onboard stockmen and provides strong guidelines on how to manage key aspects of the export process (from the stockman's perspective). www.livecorp.com.au.

Industry specific research: For the purposes of the project, industry specific research has been restricted to R&D projects commissioned by MLA (on behalf of the industry) and completed in the last 10 years. This was broadened to include key research conducted by Norris *et al* in the late 1980's – early 1990's. The Australian livestock export industry has had in place a dedicated R&D effort since 1990. Subsequently, the R&D effort has been designed to bring about better outcomes in terms of animal welfare, operational efficiency and customer satisfaction. This study makes no presumption that the recommendations stemming from R&D projects are always and necessarily 'best practice' (as defined below). For an R&D recommendation to qualify as 'best practice' it will have met various commercial imperatives such as cost effectiveness and capacity for adoption. This study gives particular attention to any gaps found between R&D recommendations and industry perceptions of best practice.

Overview of industry specific research: An overview of industry specific research has been conducted as part of the project. The original terms of reference required that only the executive summaries and recommendations (of reports) be referred to, in order to assess the degree of scientific support for framework headings. It became immediately clear that this would be inadequate to fulfil the project requirements and consequently a more detailed review has been conducted. It was also evident that in many cases, research findings had not been tailored to the needs of the industry, and although issues had been addressed, they did not necessarily deliver answers to the questions raised by the particular project. Subsequent industry consultation also revealed that many research findings had not been adopted and/or embraced as industry practice. It was considered that much of the completed research should be revisited with a view to determining an appropriate implementation plan. An overview has been undertaken to identify where this may benefit the industry. This is summarised in the tables held within section 2.7. For each project conclusions were drawn after consideration of the following headings:

- *Whether or not the project delivered useful research findings.*
- *Whether or not the findings were tailored to the needs of the industry.*
- *Whether or not the research findings had been adopted by industry.*
- *Whether or not the project would benefit from a revisit to determine an appropriate implementation plan.*

It should be noted that these conclusions were drawn from a relatively superficial review and it is possible that slightly different conclusions might be drawn from a more detailed investigation. The conclusions suffice for the purposes of the project.

Supply chain: The terms 'supply chain', supply line' and 'supply channel' can be used interchangeably. The attraction of 'supply channel' in the case of livestock exporting is that it implies scope within the delivery system to use a variety of methods and techniques to achieve essentially the same outcome. The associated flexibility suggests a broad delivery system, or a channel, as distinct from a narrow delivery system as portrayed by a line or a chain.

Industry framework: An industry framework for each of the supply chains was determined. The industry operating and governance manual was utilised to identify appropriate headings and the industry supply chain was divided consistent with the divisions used by ASEL. Additional headings were added where appropriate and used to systematically address the industry. For the purposes of comprehensive coverage, the industry was divided into the sectors and treated as case studies identified below. Each sector represents a specific supply channel that confronts essentially different issues. For reporting purposes, each supply channel has been treated as a stand-alone case study and a separate framework developed accordingly. These exist as separate documents in the appendix. Post discharge issues were not been addressed by this project as its scope did not extend beyond the point of discharge.

- *Long Haul Cattle*
- *Long Haul Sheep*
- *Short Haul Cattle*
- *Special Cases*

Scientific support: For the purposes of the project, scientific support refers to the industry specific research described above. It is acknowledged that many of the industry guidelines may have support in the wider scientific world. For them to be useful to the industry they need to be accessed, collated and made available to the industry in a suitable form. This project has identified where efforts to achieve this would be of benefit to the industry. From a more general point of view scientific support refers to science based principles or findings generated by experimental methods that lend support to a particular practice or system. Conceivably the industry has in place practices that are supported by 'science' or scientific principles but did not stem directly from an industry specific R&D project.

Industry consultation: Extensive industry consultation was undertaken to meet the project objectives. This was conducted with exporters, industry regulators and service providers. A large number of persons were contacted. Consultation revealed some surprising findings. Firstly there was a disconcerting lack of ownership displayed by many industry participants when it came to industry R&D. Furthermore it was evident that there was an equally disconcerting lack of adoption of research findings. Also, there were two quite distinct viewpoints amongst those consulted. The first viewpoint placed an overwhelming emphasis on animal welfare issues with little concern for operational issues. This contrasted with the other viewpoint that acknowledged welfare concerns but also shared a strong awareness of operational issues. Initially this division made it difficult to make sense of the consultation process particularly when the assessment criteria was limited to the existence (or otherwise) of industry guidelines and/or the existence (or otherwise) of industry specific scientific support. The process was made easier by embracing an approach promoted by the Australian Animal Welfare Strategy advisory committee (AAWS, 2006) which, in part, suggests that issues (heading or guidelines) should be rated according to their impact on animal welfare. To achieve a balance, each issue (heading or guideline) was assessed in regards to the extent to which it impacted on operational procedures. This balanced view facilitated the identification of research needs and priorities. It also provides a platform from which industry guidelines can be refined (with the assistance of R&D) to preserve the overarching requirement to deliver economic benefits to the economy in general (Hassall and Associates, 2004) and at the same time address animal welfare.

Industry consensus: Whilst it is acknowledged that not everybody may have been consulted, there was remarkable consistency among those who were consulted and even where views differed, these differences were often divided consistently. Consensus was determined and described by applying the following ratings: 'consensus', 'some contention' or 'contentious'.

While consensus regarding the use of a practice might not mean that the practice is the 'best' from a scientific perspective, we have, in this study to placed heavy emphasis on evidence of a 'consensus position'.

Impact on operational procedures: As mentioned previously, this heading was necessary to make sense of the consultation process. The determination (low/high) was made on the basis of consultation process and reflected the views of those consulted. There was a commonly held misconception that industry concern about the "impact on operational procedures" is driven primarily by profit motives and concerns about additional costs. In fact, the primary concern is about logistics and the degree to which a difficult job is made more difficult by unnecessary logistical impositions that themselves increase the likelihood of adverse outcomes.

Affect on welfare outcome: As mentioned, the AAWS advisory committee promoted this approach. The determination (low/high) was also made on the basis of consultation process and reflected the views of those consulted.

Knowledge gaps and inconsistencies: The project has a heavy responsibility to identify significant knowledge gaps and associated R&D needs. Gaps will be identified through consultation with operators and the observations of service providers and interested parties.

R&D priority: The criteria mentioned above made it a relatively easy process to identify research requirements. It was more difficult, however, to reach an understanding of how they should be prioritised. R&D should be in keeping with an industry vision statement that identifies where the industry would like to be in five years time and how it intends to get there. This vision will also need to decide on such issues as 'prescriptive' versus 'outcome focussed' regulation. To prioritise the research possibilities it was necessary to establish what is considered to be the industry research needs and be consistent with any overall R&D strategy. Research needs were identified in the following areas:

- *Risk management for the purpose of avoiding major incidents, as well as the ability to manage incidents when they occur. N.B. It is noted that there are several areas where there is still a high risk of a major incident despite the prescriptive requirements that are in place.*
- *Reduction in mortality rates.*
- *Improvements in other measures of animal welfare.*
- *Streamlining of commercial procedures.*
- *Improving the quality of regulation in terms of intent and effectiveness.*
- *Improving the public's perception of the industry.*

Research priorities were also guided by (and hopefully consistent with) components of the "Live Export R&D strategic plan" conducted by Hassall and Associates in 2003 (Hassall and Associates, 2003).

Minimum standards: These are practices influenced by production and cost imperatives and give no special consideration to additional effort or cost that might be needed to achieve acceptable welfare outcomes. As a general rule, 'minimum standards' have not been researched to determine whether they are adequate for delivering higher order outcomes or how they might be enhanced.

Current practices: These are practices currently in use and could fall anywhere between minimum and best practice. In every case it is the specific practice that is most relevant. For research findings to be adopted it is often necessary for them to be refined to the point of being

a demonstrable practice. When discussing current practices it is useful to define their status relative to other times and places. Current practices are particularly relevant to this study as they formed the basis of many of the consultations with operators.

Best practice: Used in its strictest sense, this management principle asserts there is a technique, method, process, activity, incentive or reward that is more effective at delivering a particular outcome than any other technique, method or process, etc. For the purposes of this study, however, there is no assertion that the required outcome can only be achieved by one technique, method, process or activity. Particular exporters will vary practices from one consignment to another, from one season to another, with different destinations etc etc. Different exporters will also often have different practices making the determination of 'best practice' elusive. Depending on the circumstances confronting a particular supply channel and species, there might be several pathways or practices by which an acceptable outcome can be achieved. Thus 'best practice' in the case of the livestock export industry will usually be a flexible and evolving management technique that ultimately meets or exceeds a particular measurable outcome. Whilst a given best practice might have been recommended by R&D this will not be the case every time. Some best practices might have achieved their status by virtue of being derived by practical experiences and adopted by leading edge operators. Implicitly, best practice will recognise inherent risk and will be cost effective because its application does not, by itself, threaten the viability of the business.

Research and Development (R&D): A conventional definition of R&D covers activities aimed at generating new or original knowledge (research), using similar techniques to scientific research, and the exploitation of this new knowledge (development). R&D may be classified into basic research (longer term, no specific application) strategic research (focused to address identified problems or in the expectation of beneficial applications) applied research (addressing specific applications or identifying new ways of achieving predetermined objectives) and experimental development (creation of new or improved materials, products, processes or services). Some of the issues canvassed in this report are not strictly R&D – they might be better described as marketing or training and/or industry development. This project has used a broader definition of R&D including all of the conventional components identified above and in addition incorporating consideration of materials, products, processes or services that do not necessarily entail new or original knowledge. The key aspect in this additional component has been identification of areas in the live export industry where the application of such materials, products, processes or services may have a direct benefit on the industry through areas such as operations and marketing for example. In any event, the industry's R&D committee is probably best placed to consider the associated issues and determine whether an organised initiative is warranted.

R&D communication: It was found that many industry (particularly operational) participants struggle with scientific jargon and it was necessary in many cases for the team members to take industry concerns and tailor them into a research context. Currently there is no established process for industry to convey its research needs to the research organisations. There was also evidence of a failure to effectively communicate research findings. The commissioning of this project is in itself recognition of a 'communication problem'. It is suggested that a continuous (or at least more regular) communication process be established.

1.4 Industry framework

For the purposes of comprehensive coverage, the industry has been divided into the following sectors and treated as case studies.

- Long Haul Cattle
- Long Haul Sheep
- Short Haul Cattle
- Special Cases

Each sector represents a specific supply channel that confronts essentially different issues. For reporting purposes, each supply channel has been treated as a stand-alone case study and a separate framework developed accordingly. This has resulted in some repetition but the approach is justified on the grounds of 'client utility' (since most operators are interested in a particular supply channel).

Each framework allows each of the supply channels to be specified and analysed in terms of use and access to appropriate technical knowledge. The quantity and quality of technology available at critical points along the supply channel will reveal the system's capacity to achieve acceptable outcomes as well as knowledge gaps and the need for additional R&D to remedy the situation.

Further division within each sector is consistent with the current Australian Standards for the Export of Livestock (ASEL) though these were broadened slightly to include other factors that may affect voyage outcomes. Identification of these factors necessitated a review of other industry guidelines contained in operations and governance manuals and in stockman manuals. Thus ASEL has been used as the basis for identifying and investigating critical points in the export process but has been supplemented by manuals and guidelines known to be used by operators.

The five standards that have been used to dissect the livestock exporting supply channel include:

1. Sourcing and on-farm preparation of livestock
2. Land transport of livestock
3. Management of livestock in registered premises
4. Vessel preparation and loading
5. On-board management of livestock.

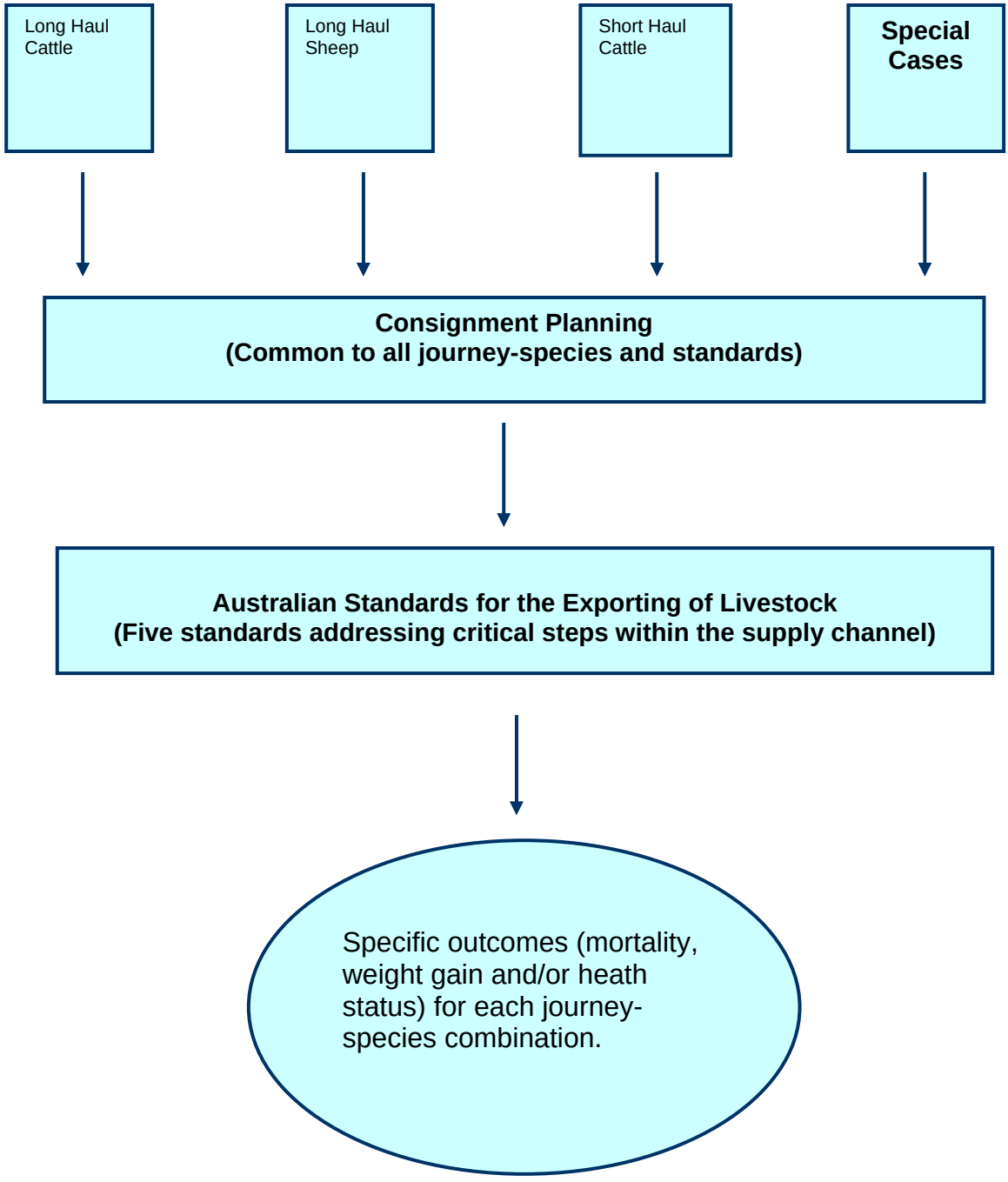
It was also recognised that common to every supply channel is a Consignment Plan. Consequently, consignment planning has been included as an initial heading in each of the identified supply channels. Aspects of the consignment plan are detailed in the industry governance and operating manual.

ASEL, the governance manual and the other industry guidelines have been used to determine further headings within each of the identified supply channels. Appropriate performance outcomes have also been determined according to animal welfare and commercial imperatives. These imperatives vary between supply channels. In the case of short haul cattle sold on a delivered weight basis, the key outcome is weight gain (or bodyweight change) during transit which in most cases also reflects key aspects of welfare. Transit weight gain is less relevant in the case of integrated operations. In the case of the long haul sheep trade, the key outcome is more often the mortality rate.

Accordingly we have developed a framework that endeavours to put all aspects of the supply chain into perspective. The framework that has been applied to each case study is contained in the appendices that follow chapter 2. . Each case study has been furnished with summary tables that can be found at the end of the framework document. This represents a good starting point for those who do not wish to work through the detail of the appendix.

An important aspect of the framework is ‘herringbone’ diagrams that effectively summarise the components within each framework. The herringbone is designed to capture the linearity of the export process (i.e., from start to finish) but also the linkages that occur within each phase. With consignment risk management planning (CRMP) for example, it is possible to identify steps or phases that need to be examined in detail. Against each of these is a particular key factor or risk that should be addressed in terms of ‘technical solutions’ that may or may not present as a knowledge gap requiring additional R&D. In the case of Lodgement and Approval of the CRMP, the key factor is timeliness. Figure 1 outlines the basic components of the industry frameworks.

Figure 1. Industry framework



2 Conclusions and Recommendations

2.1 General

Australia holds a unique position as a livestock exporter. It has become established in several important markets with a reputation for disease free, high quality livestock supported by effective infrastructure and efficient suppliers.

The short haul cattle trade supplies the South East Asian market with cattle from northern Australia. South East Asian countries have a strong demand for beef and are able to finish and process cattle relatively cheaply. This complements the situation in northern Australia where finishing quality feed and large-scale abattoirs are either scarce or absent.

The Middle East has a strong demand for both live cattle and sheep, with this demand being driven by religious and cultural preferences. There is no reason to believe that this demand will change in the foreseeable future. Australia has the production capacity and logistical skills to retain its position as the region's major supplier of livestock.

Australia has also developed a reputation as a supplier of disease-free dairy cattle (mostly Friesian). The economic benefits of the trade are significant to both livestock producers and the community generally and were recently quantified (Hassall & Associates, 2006). The Australian Government has acknowledged the contribution of livestock exports to the rural community and pledged qualified support for the industry, despite a degree of community opposition.

To maximise its economic strengths, the livestock export industry must be able to source livestock with the minimal geographic and temporal constraints. At the same time, industry regulation must bring about animal welfare outcomes that are socially acceptable and cost effective. Thus R&D has an important role in ensuring that industry regulation is supported by science and is ultimately effective.

It should be noted that relatively little of ASEL is supported by direct industry research findings at this time. It is unreasonable to expect that every aspect of the standards should be validated by controlled experimentation since research funds are scarce and have to be applied in a way that provides 'value for money'. The industry will, over time, build a scientific support base for all aspects of the supply chain but until then, it is necessary to prioritise R&D to address those standards that place operational constraints on the industry without delivering significant welfare outcomes. Efforts have also been made to identify areas where animal welfare outcomes may be achieved through other means (for example the use of effective vaccination to reduce disease).

Effective regulation also requires some level of flexibility and discretionary powers. The livestock export process is not a rigid production line that adheres to a sequence of totally predictable steps. The process is complex since it confronts variations in weather, livestock source, livestock type and out of sequence events. Consequently, literal interpretation of the industry standards and a reliance on a totally prescriptive approach can result in sub optimal outcomes. There are many examples where these situations may develop within the industry. Appropriate action in the face of risky situations requires a strong working knowledge of the industry and the support of the regulatory hierarchy.

Recognition by the study of the direct link between particular R&D projects and either standards or guidelines has been hampered by the absence of an adoption strategy that might explicitly identify such links. The absence of an industry extension service might also explain why many

exporters did not express high expectations in regards to how research may benefit the 'private' needs of the industry and highlighted the need to carefully develop research findings to the point of practical application. Furthermore, research recommendations have sometimes failed to consider their broader implications. There is a strong case for many of these projects to be revisited by a small industry-based task force to review the findings and better tailor them to the needs of the industry.

Another situation that was highlighted throughout the course of our investigations was the under-utilisation of several resources within the industry. This applies primarily to the onboard veterinarians (and, to a lesser extent, onboard stockmen) but also to stevedores and / or wharf-side personnel. There is a need to re-define the roles of stockmen and veterinarians onboard (long haul voyages) in regards to mortality investigation, reporting functions, daily animal care, data collection, onboard monitoring, participation in onboard research, roles during loading, roles on arrival at destination and roles during discharge. Erosion of the stockman's program have given rise to questions about who owns much of the voyage-generated information and what should be done with it once compiled. Project LIVE.123 (in progress, House, 2006) suggests that most of the information should be owned by exporters but made available to industry to be collated and/or analysed to both identify and solve problems. This issue could be administered under what might be loosely termed the "onboard program" (which could be seen as an extension of the original stockman's program).

Most criticism of the industry is currently focused on aspects of animal welfare. Industry has done its utmost to address these issues and the regulatory function is aimed primarily at delivering welfare-based outcomes. Better public understanding of the drivers behind the trade may, however, achieve more in terms of engendering a positive perception of the trade than simply delivering outcomes that have been set at some arbitrary level. Market-orientated research that better documents the religious, economic, cultural and logistical reasons behind the trade could be seen as an important priority to complement the industry media initiatives that are already in place.

The preceding discussion suggests that research needs to be aimed at achieving the following outcomes:

1. Risk management for the purpose of avoiding major incidents, and/or incident management to minimise losses and demonstrate competence. (It was noted that there were several areas where there is still a high risk of a major incident).
2. Reductions in mortality rates
3. Improvements in other measures of animal welfare
4. Streamlining of commercial procedures
5. Improving the quality of regulations in terms of effectiveness
6. Improving the public's perception of the industry.

These are considered to be the key research needs of the industry. To prioritise these (and specific research initiatives under these headings) it is necessary to have an over-arching strategy that is tied to a long term vision for the industry. To this end, a 'Live Export R&D Strategic Plan' was completed by Hassall & Associates (Hassall, 2003). While this has assisted it is suggested that industry and the R&D program work together to develop a more detailed plan.

By and large, the R&D program has already addressed the major issues of the industry but it is noted that much of the research has been reactive to industry events. To date, research of a

more strategic nature (such as the review of ALES (Whan et al, 2003)) has had little opportunity to surface.

To prioritise research requirements it has been necessary to make judgements in regards to the current needs of the industry. Intensive consultation has allowed the researchers to assess the current sentiments of exporters, service providers and others that support the industry. Prioritisation has also taken heed of other factors such as competition from other livestock suppliers and current export activity. The terms of reference for this study stipulated extensive consultations to identify research priorities. The chief concern of most people consulted (whether from industry or government) was regulation and/or industry standards. Based on the feedback received, this makes research aimed at improving regulation and streamlining commercial procedures a high priority. The project's terms of reference also reflect a preoccupation with the industry standards and to this extent they are consistent with the industry sentiments observed during consultations. Table 2.1 shows the high priority issues that apply generally to the livestock export industry.

Table 2.1: General – High Priority Research Initiatives

Key Issue (General) – High Priority	Recommended Way Forward
Refinement of industry regulation	Investigate comparative models of industry regulation to identify a way to shift from a totally prescriptive approach to one that incorporates an outcome focus, (see possible research projects – 2.6.1 Outcomes focused regulation).
Implementation plans for completed industry research	Much of the industry specific R&D has generated findings that are not yet well tailored to the needs of the industry. If re-visited, much of this research could be used to improve industry practices at low cost. Implementation would follow (see possible research projects – 2.6.7 Project revisit).
Guidelines for discretionary approval	Many ASEL standards infer discretionary powers on the 'relevant Australian Government Agency'. To be applied beneficially, these powers must be administered by officers with a strong working knowledge of the industry. Alternatively, further guidelines might be required to specify how the discretion should be exercised. A project that addresses both possibilities would assist industry. Discretionary approval might have application to other situations that have a high impact on operational procedures. This is relevant to the outcomes focused approach inherent in the proposed project 2.6.1. Outcomes focused regulation as well as risk management. (See possible research projects – 2.6.10 Guidelines for discretional approval).
Public perception (explanation of the reasons behind the live animal trade) *Clearly this is not technical R&D but any action might be directed by the industry's R&D committee*	The social acceptability of livestock exporting might improve if the public were to gain a better understanding of its origins and drivers including cultural and religious factors. A better understanding of these factors among Australians might enhance acceptance of the industry, particularly if animal welfare issues were addressed concurrently. Different reasons support both the short haul cattle trade to South East Asia and the demand for dairy replacements (see possible research projects – 2.6.3 Perceptions of the industry).
Better definition of the roles of veterinarians and stockmen onboard long haul journeys	There is a need to re-define the roles of stockmen and veterinarians onboard (long haul voyages) in regards to mortality investigation, monitoring, data collection and reporting, daily animal care, land roles during loading, onboard and arrival. Such activities are strongly linked to research projects involving data collection and analysis (see – 2.6.8 Onboard Program)

2.2 Long haul cattle (LHC)

The following tables show the key issues and possible actions applicable to the long haul cattle case. High priority issues are identified in Table 2.2.1 while 'medium' priority issues are shown in Table 2.2.2. For a comprehensive list of all the issue that might warrant some investigation, the reader is encouraged to study the appendices and summary tables.

Table 2.2.1: Long Haul Cattle – High Priority Research Initiatives

Key Issue (LHC) – High Priority	Recommended Way Forward
Development of 'species specific' support for consignment risk management planning (CRMP) that includes planning of contingency response (LHC appendix 1.2.2)	Assist exporters by adding R&D support to consignment risk management plans. Project would provide detail that demonstrates a real knowledge of each of the risks (within the long haul cattle trade) and the ability to manage incidents should they occur (i.e. avoidance of incidents and minimisation of losses in the event of an incident. (See 2.6.2 Development of CRMP tools).
Water deprivation times (LHC appendix 1.4.1)	This is an important area that is currently under review (AHW.005). It would be in the industry's interest to actively monitor the progress of this project.
Ventilation (LHC appendix 1.7.2)	More research is required to determine what is best in terms of effectiveness versus capital and operating costs. (See 2.6.17 Ventilation design).
Thermoregulation/Heat stress (LHC appendix 1.7.2)	Several issues are addressed under this heading. The main issue is in regards to better explanation of the industry 'heat stress risk assessment' model. (See 2.6.16 HRSA model – explanation of assumptions and linkages).
Daily and end of voyage reporting (LHC appendix 1.7.6)	There are several issues associated with voyage reporting. It is suggested that these be addressed as part of a project aimed at re-defining roles for veterinarians and stockmen onboard livestock vessels (see 2.6.8 Onboard program). There may also be overlap with a suggested project aimed at developing information management systems (see 2.6.9 Information Management Systems).
Contingency planning (LHC appendix 1.7.7)	This is an integral part of the overall risk management approach. Further detail is required in regards to overall risk management and response. It is suggested that this is addressed in the project aimed at developing CRMP tools (see above 2.6.2 Development of CRMP tools).
Outcome based focus (LHC 1.8.1-1.8.6)	The development of outcome focus requires further detail with the focus being on the effectiveness of an action rather than on the action itself. These aspects are better explained in the project aimed at better defining the outcome based approach (see 2.6.1 Outcome focused regulation)

Table 2.2.2: Long Haul Cattle – Medium Priority Research Initiatives

Key Issue (LHC) – Medium Priority	Recommended Way Forward
Review of importing country protocols (LHC appendix 1.2.1)	This is currently under review by an industry sub committee. R&D support could be required to build a case to support recommended changes to importing country protocols. (Refer to appendix).
Review of Model Codes (LHC appendix 1.3.1)	The model codes are currently under review in a bid to amalgamate the large number of codes associated with individual states into a single set of National Codes. It would be in the industry's interests to actively monitor these developments.
Sourcing restrictions in regards to weight range, etc (LHC appendix 1.3.1)	A review of weight restrictions is required to determine if it is possible to source animals outside the current range provided they are managed appropriately. This investigation could be packaged with an overall investigation into discretionary approval and/or investigations into other sourcing restrictions (see possible research projects – 2.6.10 Guidelines for discretional approval and 2.6.14 Sourcing restrictions).
Sourcing restrictions in regards horn length (LHC appendix 1.3.1)	Horn length is primarily an issue in regards to segregation but there is some contention about how horn length should be measured. This should be addressed at the same time as the segregation issues (see possible research projects – 2.6.10 Guidelines for discretional approval and 2.6.13 Animal segregation (optimising segregation options)).
Livestock identification (LHC 1.3.4)	Developments within the cattle industry have provided possibilities that have yet to be utilised by live exporters and/or overseas receivers. Investigation to assess whether new industry identification systems have the capacity to deliver to the requirements of the trade (i.e. visual ID plus electronic ID for animal history). (Refer to appendix and 2.6.9 Information Management Systems).
Feed and water curfews (prior to trucking) (LHC appendix 1.4.1)	This is currently under investigation and a final report is pending. Extended curfews due to transport times are a more contentious issue. There is some confusion when it comes to whether or not the weight referred to by ASEL stocking density restrictions is a curfew weight or full weight. (See LIVE.122A)
Segregation (on trucks) (LHC appendix 1.4.2)	The most contentious segregation issue is in relation to horns. However there are other possible segregations applying to trucking, assembly, loading and onboard. It is suggested that the issue of segregation be addressed as part of an overall project looking at optimising the welfare of animals by utilising segregation options (see 2.6.13 Animal segregation (optimising options)).
Penning arrangements (on trucks) (LHC appendix 1.4.2)	Again the contention is mainly in regards to horns. It is suggested that the issue be addressed as part of an overall project looking at optimising the welfare of animals by utilising segregation options and/or how animals should be penned, (see 2.6.13 Animal segregation (optimising segregation options)).
Loading densities (on trucks) (LHC appendix 1.4.2)	As above.
Staff and training (LHC appendix 1.5.2)	This particular heading refers to staff working within the registered premises. However, the development of industry based training program (including competency assessment) is required. (See 2.6.15 Industry training)

Table 2.2.2: Long Haul Cattle – Medium Priority Research Initiatives (cont)

Key Issue (LHC) – Medium Priority	Recommended Way Forward
Penning arrangements, stocking density, isolation of livestock and design of pens and handling facilities (LHC appendix 1.5.5)	All these lack industry specific scientific support and would benefit from further general investigation. Innovation in regards to pen design would benefit the industry (refer to appendix)
Provision of fodder within registered premises (LHC appendix 1.5.6)	This relates mostly to the fodder delivery within registered premises. Fodder quantity and quality are addressed elsewhere. This is discussed in more detail in the appendix.
Mortality investigation (LHC appendix 1.5.7)	Clearer guidelines in regards to appropriate action based on mortality investigation findings (within registered premises) are required. (Refer to appendix).
Management of rejects (LHC appendix 1.5.9)	This is an area of contention and clearer guidelines are required. (Refer to appendix)
Pre-loading inspection techniques and location (LHC appendix 1.5.11)	This is a contentious issue with clearly divided opinions about where the pre-loading inspection should be undertaken. Determination of a method to evaluate the effectiveness of different techniques would allow a determination of what is the best method. (Refer to appendix).
Loading personnel (LHC appendix 1.6.2)	See staff and training (1.5.2) above.
Accompaniment (LHC appendix 1.6.2)	There is a need to re-define the roles of both veterinarians and stockmen onboard long haul voyages. This is addressed in one of the suggested research projects (see 2.6.8 Onboard program (re-definition of onboard roles)).
Stocking density (LHC appendix 1.6.3)	This is an important issue and is currently under investigation by LIVE.233. The final report is pending. It is assumed that the report will include recommendations for further research.
Segregation (onboard) (LHC appendix 1.6.3)	The issues associated with segregation are discussed under the heading ‘Optimising segregation options” (see 2.6.13 Animal segregation (optimising segregation options)).
Voyage fodder quality and quantity (LHC appendix 1.6.5)	Greater use of assembly areas has increased fodder requirements. There are no guidelines relating to specifications for cattle pellets as there are for sheep pellets. This is an area that would benefit from further research. (Refer to appendix).
Bedding management (LHC appendix 1.6.5 and 1.7.3)	Additional research into bedding management in the long haul cattle trade would benefit the industry. Bedding management is a crucial part of the overall management of cattle on long haul voyages. There are a number of instances where reluctance to wash down has precipitated incidents on long haul cattle voyages. (Refer to appendix).
Ammonia (LHC appendix 1.7.2)	There has been considerable research undertaken that addresses the issue of ammonia. There are, however, limited industry guidelines and this issue still requires scrutiny (refer to appendix).

2.3 Long haul sheep (LHS)

The following tables show the key issues and possible actions applicable to the long haul sheep case. Only the major issues identified are included in the table. For a comprehensive list of all the issue that might warrant some investigation, the reader is referred to the appendices.

Table 2.3.1: Long Haul Sheep – High Priority Research Initiatives

Key Issue (LHS) – High Priority	Recommended Way Forward
Development of 'species specific' support for consignment risk management planning (CRMP) that includes planning of contingency response (LHS appendix 1.2.2)	Assist exporters to develop plans that reflect an in-depth knowledge of risk management in the long haul sheep trade (i.e., avoidance of incidents and minimisation of losses in the event of an incident). The principles here are the same as those for long haul cattle. (See 2.6.2 Development of CRMP tools).
Livestock identification (LHS appendix 1.3.5)	The development of the NLIS offers significant opportunities to the livestock export industry. Techniques are being utilised by LIVE.123, which is undertaking an epidemiological study into linkages between pre-delivery management and onboard performance. (See LIVE.123 and 2.6.9 Information Management Systems)
Pre-delivery management of goats prior to export (LHS appendix 1.3.3)	This is high priority research. The export of live goats has had mixed fortunes. Exports have been intermittent and this has precluded the development of established practices. Issues relating to 'domestication" and genetic upgrading blur some areas in regards to definitions and preparation. (See 2.6.11 Preparation of goats for live export).
Heat stress (management of open decks) (LHS appendix 1.7.2)	The management of open decks during periods of heat stress has been identified as needing further research. (See 2.6.18 Heat Stress - management of open decks).
Ventilation (LHS appendix 1.7.2)	Issues are similar to those of LHC, (see 2.6.17 Ventilation design).
Inanition (LHS appendix 1.7.4)	This has been identified as an important issue and is currently under investigation. (See 2.6.5 Inappetence in sheep – causes and preventative strategies)
Assembly period (LHS appendix 1.5.4)	Inconsistencies have been identified between industry research and the existing guidelines. These need to be reconciled. (See 2.6.12 Assembly periods – reconciling inconsistencies).
Animal segregation- horns and other factors (LHS appendix 1.4.2)	Move from prescriptive approach to that which optimises segregation options for land transport, registered premises and onboard. This is better explained in the appendix and applies to both cattle and sheep consignments. (See 2.6.13 Animal segregation (optimising options)).
Salmonellae – Early detection and management (LHS appendix 1.5.8)	Existing research focuses on prevention rather than early detection and management. There is a need to look more specifically at early detection and management. (See 2.6.6 Salmonellosis)
Water deprivation times and rest periods (LHS appendix 1.4.1)	Under investigation but need to check terms of reference and monitor project findings to ensure they properly consider issues relating to livestock exports. (Refer to appendix)
Linkages between performance and pre-delivery management (LHS appendix 1.3.5, 1.5.3, 1.5.4)	This involves issues relating to livestock identification and is the basis for the support for LIVE.123. It also relates to a requirement to address information management within the industry. (See 2.6.9 Information Management Systems).

Table 2.3.2: Long Haul Sheep – Medium Priority Research Initiatives

Key Issue (LHS) – Medium Priority	Recommended Way Forward
Review of importing country protocols (LHS appendix 1.2.1 and 1.3.1)	This issue is currently under investigation
Pinkeye in assembly centres	Pinkeye is an emerging problem in assembly areas due to the extension of assembly periods. (Refer to appendix)
Age (Saudi protocol) (LHS appendix 1.3.1)	Dispute over the age of sheep is a possible cause for the rejection of consignments. Sheep are usually aged on the basis of the number of permanent teeth. The age at which sheep 'cut their teeth' varies and is influenced by many factors yet to be determined. Identification of these factors and the possible age range would assist exporters to better identify eligible mobs of sheep. (Refer to appendix)
Sourcing restrictions – body weight, body condition, weight range, age, horn status and wool length (LHS appendix 1.3.1)	This investigation could be package with investigation into discretionary approval and/or investigations into other sourcing restrictions (see possible research projects – 2.6.10 Guidelines for discretional approval and 2.6.14 Sourcing restrictions).
Stocking density (also for trucking and registered premises) (LHS appendix 1.4.2, 1.5.5 and 1.6.3)	This issue is currently under investigation via a literature review. Final report is likely to make recommendations for further research. (See LIVE.233).
Staff training (registered premises and wharf-side) (LHS appendix 1.5.2, 1.6.2)	The requirement for training to competency assessment has been identified. (See 2.6.15 Industry training).
Management restrictions in regard to penning arrangements, isolation and stocking density within registered premises (LHS appendix 1.5.5, 1.5.6)	These restrictions seem arbitrary and would benefit from industry specific investigation. (Refer to appendix).
Pen and feedlot design of registered premises (LHS appendix 1.5.7)	As above.
Management of rejects at registered premises and/or wharf-side (LHS appendix 1.5.10 and 1.6.6)	There was some contention in regards to the management of rejects at both registered premises and wharf-side. (Refer to appendix).
Pre-loading inspection techniques and location (LHS appendix 1.5.12)	There was contention about where the pre-embarkation inspection should be undertaken. Practices vary considerably. (Refer to appendix).
Feed requirements (LH S appendix 1.6.5)	It was noted that 2% (of body weight) may be insufficient if sheep are already accustomed to eating pellets when loaded. (Refer to appendix).
Accompaniment and reporting (LHS appendix 1.6.2)	There were a number of issues in regards to voyage accompaniment. (See 2.6.8 Onboard program).
Pad moisture and bedding management (LHS appendix 1.6.5)	Pad moisture is an important issue on some vessels. Key variables may include use of sawdust for bedding and salt content of diet. (Refer to appendix).
Incident notification (LHS appendix 1.7.7)	Under investigation (see incident response arrangements under the Live Animal Incidence Response Plan. (APSEL)
OH&S (LHS appendix 1.8.3)	Refer to appendix.
Development of other welfare outcomes (appendix 1.8.2 - 1.8.4)	Refer to appendix and see 2.6.1 Outcome focused regulation.

2.4 Short haul cattle (SHC)

The following tables show the key issues and possible actions applicable to the short haul cattle case. Only the major issues identified are included in the table. For a comprehensive list of all the issue that might warrant some investigation the reader is encouraged to study the appendices.

Table 2.4.1: Short Haul Cattle – High Priority Research Initiatives

Key Issue (SHC) – High Priority	Recommended Way Forward
Consignment Risk Management Planning (CRMP) (SHC appendix 1.2.2)	In keeping with the principles discussed in other supply chains, a review of the risks associated with current CRMP process would be of benefit to both existing and new exporters. (See 2.6.2 Development of CRMP tools).
Lodgement of NOI & CRMP (SHC appendix 1.2.4)	Timelines associated with lodgement and approval needs to be reduced whilst not compromising integrity of process. (See appendix).
Weight range (SHC appendix 1.3.1)	Investigation is required to develop guidelines that enable export of heavier animals, particularly herd bulls from Northern Australia. (See possible research projects – 2.6.10 Guidelines for discretional approval and 2.6.14 Sourcing restrictions).
Water deprivation times and rest periods (SHC appendix 1.4.1)	Actively monitor and review conclusions of current study into water deprivation times (AHW 005) and investigate if further research is required specifically for short haul cattle trade. It may be necessary to address rest periods as a separate issue. (Refer to appendix)
Loading procedures (SHC appendix 1.4.2) (including segregation with regards to horn status) (SHC appendix 1.3.1)	Immediate need for R&D to determine need for segregation. Suggest see 2.6.13 Animal segregation (optimising segregation options).
Penning arrangements (including segregation) (SHC appendix 1.5.4)	As above.
Stocking density (SHC appendix 1.6.3)	R&D is required to assess bias against heavier framed animals when calculating loading density. (Refer to appendix)
Segregation (onboard) (SHC appendix 1.6.3)	Need to provide basis for on board segregation, industry disagrees with some aspects of current ASEL. Suggest see 2.6.13 Animal segregation (optimising segregation options).
Feed intake and weight gain (SHC appendix 1.8.2)	Value-adding approach should be investigated as an alternative to the existing approach of high intakes for large gut fill on discharge. (See possible research projects – 2.6.4. Linking pre-delivery factors to post delivery performance (SHC))
Voyage fodder (quality) (SHC appendix 1.6.5)	Should be reviewed with any value adding approach. “Better” feeding should add value to supply chain. (See possible research projects – 2.6.4. Linking pre-delivery factors to post delivery performance (SHC))
Occupational Health and Safety (SHC appendix 1.8.6)	Live Export Industry needs to address OHS issues in keeping with other industries. This could be a LiveCorp initiative. (Refer to appendix)

Table 2.4.2: Short Haul Cattle – Medium Priority Research Initiatives

Key Issue (SHC) – Medium Priority	Way Forward
Importing country requirements (SHC appendix 1.2.1) & conformance/import permit (SHC appendix 1.3.1)	Importing country protocols are under review by an industry sub committee. Industry should monitor outcomes of this review to determine if there is a need for possible R&D. (Refer to appendix).
Livestock identification (SHC appendix 1.3.4)	Investigate how NLIS may assist to add value to participants in the market. (Refer to appendix).
Livestock preparation (SHC appendix 1.4.1)	Linkages between preparation and subsequent performance are yet to be established. Investigation should determine if there are alternative means of preparation that will add value to supply chain. (See possible research projects – 2.6.4. Linking pre-delivery factors to post delivery performance (SHC)).
Feed and water curfews (SHC appendix 1.4.1)	ASEL has little industry scientific support at this stage. Industry preference not to curfew animals unnecessarily. LIVE.122A may shed further light on this issue. Monitor developments. (Final report pending).
Loading densities and penning arrangements (SHC appendix 1.4.2)	Restrictions under this heading apply to registered premises. Industry disagrees with guidelines and notes that industry specific R&D is lacking. Participants in other supply channels have expressed similar sentiments. The final report from LIVE.233 is pending and is likely to make recommendations for further research into stocking density issues.
Stocking density (SHC appendix 1.5.4)	Restrictions under this heading apply to onboard livestock vessels. The final report from LIVE.233 is pending and is likely to make recommendations for further research into stocking density issues.
Design of handling facilities (SHC appendix 1.5.5)	Industry feels that holding yard densities can be much higher than existing guidelines. Industry specific scientific support is lacking to back current densities. The final report from LIVE.233 is pending and is likely to make recommendations for further research into stocking density issues.
Isolation of livestock (SHC appendix 1.5.6)	In line with the segregation issue the concept of isolation versus separation should also be addressed and included in the current sub committee work on protocols. Suggest that this could be addressed along with segregation issues, see 2.6.13 Animal segregation (optimising segregation options).
Provision of fodder and water (1.5.9) & Pen design and provision of shelter (SHC appendix 1.5.11)	Industry feels that feed and water troughs can be much reduced with out compromising animal health and welfare. There has been no industry specific research undertaken in this area. (Refer to appendix)
Load plan (SHC appendix 1.6.3)	The importance of the load plan is acknowledged by industry. Specific issues relate to segregation of livestock. (Refer to appendix).
Voyage fodder (quantity) (SHC appendix 1.6.5)	Fodder requirements could be reviewed to ensure they are adequate for voyages of longer duration eg. Korea, or vessels with multi port loading and discharging. (Refer to appendix).

2.5 Special cases

Special cases apply to those livestock and / or journeys that are not covered by the other frameworks. For the most part the reference is to 'exotic' species such as alpacas, deer and camels. The live export of pigs is also a special case as it falls outside the established supply channels. Finally, there are other livestock categories that may at times be best considered under this heading such as the live export of pregnant dairy cattle and the export of live goats. In terms of method of transport, the export of livestock by air should be treated as a special case.

The distinguishing characteristic of 'special cases' tends to be their irregular and infrequent occurrence. This makes it difficult to tie any particular practice to the export process and encourages each consignment to be judged on its merits. The lack of continuity also makes it difficult to refine exporting procedures and because of this, they could be considered slightly higher risk. In practice, however, this risk can be offset by the fact that the consignments are generally small and high value and can be afforded high inputs of animal care and handling.

From the perspective of this project there are concerns that the 'one size fits all' approach of the ASEL (in regards to sea transport) is not appropriate when addressing the peculiarities of the species and circumstances associated with special cases. Thus our recurring concern with the robustness of ASEL applies to an even greater extent when it comes to the export of special case livestock. The need for each consignment to be recognised on its merit was emphasised by those consulted as was the need for regulators to use a strong working knowledge of the industry to make appropriate judgements.

As identified elsewhere in the project, the preparation of goats prior to export was found to be an important area that would benefit from further investigations. No other outstanding research priorities were identified although it was acknowledged there is no established 'best practice' when it comes to the export of these special case categories. Thus much of the experience and knowledge resides with a few highly experienced operators. A capacity to share this knowledge and experience would benefit new entrants to the industry – who are at greatest risk of suffering an adverse outcome.

It was generally thought that the IATA guidelines for the air transport of livestock were well considered and appropriate. Investigations into ventilation requirements have already been undertaken in response to a specific incident.

The transport of pregnant dairy heifers has been the focus of investigations. In particular, LIVE.208 (McCarthy, 2002) identified best practices in regards to the export of pregnant dairy cattle. This and a further study, aimed at managing premature lactation (LIVE.217) (Lean, 2003), have resolved many of the technical issues and performance since adoption of the recommendations has been very good. Remaining issues within the dairy trade are associated with the prevention and management of heat stress.

2.6 Possible research projects

2.6.1 Outcomes focused regulation (a potential shift in our approach)

Several 'unfortunate events' over recent years, leading to unacceptable welfare outcomes, have led to a relative high reliance on prescriptive regulation of the industry. The prescriptive approach has brought with it a sharp increase in the documentation required to demonstrate that certain actions have been undertaken. There is concern within the industry that a prescriptive 'dependence' does not protect it from the possibility of a major industry incident and along with this concern there is growing support for moving to greater reliance on an outcomes focused approach. The outcomes approach was explored in depth by LIVE.117 (Whan *et al* 2003) and this work should be used as a platform for any further development of the concept.

The key difference between the two approaches (prescriptive versus outcomes-focused) is that the outcome approach is not simply concerned about whether an action has been completed, but is also concerned about whether or not the action was (or will be) effective. It relies on a number of component parts that together contribute to the overall outcome(s). It does not completely displace the prescriptive requirements and clearly many "prescriptive pillars" would remain.

The outcomes approach triggers the introduction of discretionary approval. It also alerts regulators to situations where strict adherence to prescriptive requirements may actually contribute (in some circumstances) to sub optimal outcomes. Administration of an outcomes approach requires stakeholders to have a solid working knowledge of the industry. It also involves judgement calls that can prove (in hindsight) to be wrong.

A further benefit of the outcomes approach is that it nurtures innovation and allows for experimentation to bring about continuous improvement. Improvements will be evaluated by the business's own systems for evaluating the effectiveness of actions. It should be noted that ASEL does not have an accompanying rationale and as such the reasons behind some of the prescriptive requirements are not self-evident. The outcomes approach requires a clear understanding of the rationale behind any prescriptive requirements.

Adoption of an outcomes approach would pose a substantial challenge to industry participants and regulators alike. There is insufficient awareness of just how this approach might be practically implemented and more work to develop a possible framework.

Accordingly investigations should:

- Identify the strengths, weaknesses, opportunities and threats associated with an outcome based approach.
- Identify any comparative models (in other industries) where an outcome based approach has been successfully implemented.
- Review the existing standards and compliance requirements to better determine the rationale behind the prescriptive requirements and identify where systems to evaluate the effectiveness of prescribed actions could be practically applied.
- Identify any knowledge gaps and research requirements that would assist in the effective implementation of an outcome-focused management of regulatory and compliance requirements
- Identify any constraints to the effective implementation of outcome focused management of regulatory and compliance requirements.

- Identify ways in which exporters can demonstrate the effectiveness of their systems (to achieve outcomes) and reduce some of the paperwork inherent in the prescriptive type approach.

2.6.2 Development of CRMP tools (voyage specific)

The consignment risk management plan (CRMP) is a key feature of an approved export program. It should, however, genuinely address the risks of the consignment and be more than a paper entry to meet the requirements. Although the major risk headings are outlined in ASEL, there are a number of possible minor headings under each major heading. These would apply more specifically to each species and voyage destination.

There is scope for many of these to be addressed in a systematic way to provide a reference for exporters. This would address each of the headings in more detail than would be undertaken by an exporter under normal circumstances. Investigation would also detail the scientific support that addresses each of the headings and note any associated contention or differing views. It would also document any industry-derived experience and look at any recognised practices associated with the heading.

Each risk would be addressed in terms of prevention, but there would also be a strong emphasis on how to best manage an event should it occur. These could then be disseminated throughout the industry for comment and feedback with a view to continuous improvement on the basis of outcomes and experience.

The investigation would initially:
- List the possible risks under each of the major headings contained in ASEL
- Define and describe each of the risks
- Detail any science that may support the headings (in addition to those identified by this project)
- Detail any industry derived experience that may be relevant
- Detail any recognised industry practices associated with the relevant headings
- Note any contention or differing views (adding to the findings of the project)
- Detail ways in which the risk may be prevented
- Detail the ways in which a particular risk might be managed should it occur.

The tasks outlined above will identify the risks, as well as the best way to prevent and manage them. It is envisaged however, that this project takes a higher level view of the subject and evaluates how well equipped the industry is to prevent and/or deal with incidents if and/or when they should occur. There are many issues involved including a general assessment of the industry's (and or individual operator's) capability to respond in terms of experience and knowledge. It may also include a general assessment of the industry's (and or individual operator's) capability to respond in terms of available resources, jurisdiction and/or line management. It may also assess systems for identifying problems and/or early warning signs that problems may be developing. It could also assess the likely willingness to respond given certain commercial constraints. In summary, the industry must have a shared understanding of its limitations.

It is envisaged there would be two parts to the project. The first would be development of the tools while the second would validate that the tools can be effectively utilised. Note that these investigations would be separate to incident response arrangements developed as part of the Live Animal Export Incidence Response Plan (see Australian Position Statement on the Export of Livestock).

2.6.3 Perceptions of the industry (the reasons behind the trade)

The livestock export trade to the Middle East and South East Asia exists for reasons not readily apparent to the Australian public. Conveying these reasons clearly and succinctly would be a real challenge due to the complexity of the cultural and logistical background. We presume that people are more likely to accept the trade if they understand why it exists in the first place.

Although this challenge sits outside what would normally be considered research it is consistent with industry development and may generate spin-off benefits through developing a better understanding of customer requirements.

The preference for live animals in the Middle East derives from deep-seated cultural requirements linked to religious festivals that occur throughout the year. These festivals (particularly Ramadan and the Haj) are culturally significant and deeply institutionalised (being upheld by businesses and the government). Much of the significance revolves around the story of Abraham.

Agriculture throughout much of the Middle East is technologically advanced and has many achievements including the operation of very large dairies (in excess of 4,000 cows) and the cultivation of lucerne using desalinated water. The requirement to import live animals sits at the centre of this backdrop and is not likely to change in the foreseeable future. If Australia were to stop exporting livestock to the region, supplies would be sought from other countries, many of which have little or no formal welfare safeguards.

Live cattle exports to South East Asia are sustained less by religious reasons (although these play a part) and more by economic dynamics (see Whan *et al*, 2006). Virtually all growing cattle sold out of far northern Australia are targeted at remote finishing markets – whether in southern Australia or in SE Asia. Accordingly, the volume of live exports going to SE Asia fluctuates between years depending on seasonal conditions in southern Australia, the strength of beef export markets (principally in Japan, Korea and the US) and the exchange rate relative to analogous forces in the chief importing countries of Indonesia and the Philippines.

Lot feeding and processing costs in the SE Asian countries are relatively lower than in Australia and there is a more efficient utilisation of the "5th" quarter (by products and offal). Moreover, much of the beef processed in South East Asia goes directly to the wet markets, which reflects the householder's preference for fresh meat and the absence of refrigeration.

A study to present the historical, cultural and economic reasons for both trades would benefit both the industry and the general public. Such a study would not attempt to justify the trade, but simply explain accurately and objectively the reasons the trade developed in the first place and why it continues to flourish. To this end the study should:

- Collect accurate information from the destination countries to reveal the factors involved
- Present the facts succinctly and rationally through the industry's communication mediums.

2.6.4 Linking pre-delivery factors to post delivery performance (SHC)

The short haul cattle trade is an important sector of the livestock export industry. It is characterised by low mortality rates and as a consequence has attracted little R&D support. The issues facing this sector of the industry relate more to retention of market share and value adding than to aspects of welfare.

Consultations with industry members involved in the short haul cattle trade indicated there are virtually no problems requiring immediate R&D. Issues relating to sourcing restrictions and segregation have been addressed elsewhere. There are, however, concerns that the market might be supplied from other (lower cost) parts of the world, and efforts are required to secure Australia's market share by developing a better understanding of customer requirements and then delivering accordingly. This requires a better understanding of the profit drivers that apply to finishing, processing and distribution of the final product. To date, the major determinant of competitiveness has been price. It is becoming apparent to our customers, however, that factors such as dressing percentages and saleable meat yields have a major affect on profitability. In this event, different pre-delivery preparations may allow for better returns. Because northern producers have limited outlets, it is important that the live export market retain a capacity to absorb the full spectrum of turnoff from the North.

It is suggested that these issues be addressed as a staged project that underpins the trade's future. The first stage should be the development of a 'representative business model' that allows the industry to identify the major profit drivers and any distortions that may occur from trading type transactions.

This model could be used to identify knowledge gaps and / or any further areas that could benefit from research and development. The project should analyse the key profit drivers and look at any areas where management practices should be modified to better serve the overall process. Further industry consultations would be essential.

The final (and most crucial) stage would be development of a pilot system that allows the industry to evaluate existing management practices as well as any possible innovation. In essence, this would involve the development of a system to better define the linkages between pre-delivery factors and post delivery performance. The investigations would necessitate animal identification and tracking systems. The overall aim should be market retention and after sales service. It is envisaged that this would be a sizable project that would:

- Develop a representative business model for the short haul cattle trade
- Identify the key profit drivers within the model
- Identify knowledge gaps and/or constraints that limit the profit potential
- Develop a pilot system that enables the linkages between pre-delivery factors and post delivery performance to be determined
- Provide feedback to the industry in regard to the key factors involved.

2.6.5 Inappetence in sheep (causes and preventative strategies)

Persistent inappetence salmonellosis-inanition complex (PSI) was identified in the 1980s and early 1990s as the most important cause of mortality in the live sheep export trade. Approximately two-thirds of all sheep export deaths from Australia have been linked directly or indirectly to failure of the sheep to eat (Richards et al 1989). There appears to have been relatively little detailed research investigating inanition in live export sheep since the work or Norris, Richards and others through the late 1980s and early 1990s.

In the last few years there has been a reduction in mortalities compared to exports in the 1980s. Anecdotal evidence indicates a reduction in mortality due to inanition from improvements in sheep selection associated with a reduction in age and fatness of sheep destined for export. Uncertainty remains as to whether the findings of research conducted in the 1980s are still relevant today when so many other factors surrounding the live export trade have changed.

MLA recently convened meetings (October and November, 2006, Perth) at which industry stakeholders and technical experts discussed the knowledge gaps and research requirements associated with inanition in live export sheep. A number of issues were raised in these discussions including:

- Need for detailed understanding of physiologic and pathologic factors influencing appetite and anorexia in sheep, including effects of season, age and fatness as well as stress mediated pathways
- The role of animal temperament
- Importance of recording systems throughout the export process (land transport, feedlot, voyage) that allow tracing of animals back to farm of origin in order to collect data during routine voyages and analyse for possible risk factors associated with morbidity and mortality
- Potential role of shipboard veterinarians and stockmen in collecting data on an ongoing basis that could contribute to studies investigating inanition as well as other issues of value to the export industry
- A range of design options for further research, including experimental and observational studies.

A decision was made at the November 2006 meeting to commission a detailed literature review as the first stage to further investigating inanition in live export sheep. This would include the development of recommended terms of reference for a contingent project.

A team of researchers led by Dr Anne Barnes (Senior Lecturer, Veterinary Reproduction, School of Veterinary and Biomedical Sciences, Murdoch University) is understood to be working on this task currently.

The longer term aim is to have the literature review and research proposal completed in early 2007 with experimental and on-farm studies expected to commence in the second half of 2007. This would coincide with the high risk time period for live export sheep from Western Australia.

2.6.6 Salmonellosis (early detection and management)

LIVE.112 reported in considerable detail on Salmonellosis control and best practice in live sheep export feedlots (LIVE.112, 2002). This has been followed by LIVE.123 (literature review completed in July 2006 and research component in progress).

Two salmonella syndromes have been shown to occur during the live sheep export process, classical (or feedlot-related) salmonellosis and the persistent inappetence-inanition-salmonellosis (PSI) complex.

Clinically it is difficult to differentiate these since the post-mortem findings and salmonella serotype are often identical. The two syndromes may be distinguishable by identifying the risk factors that contribute to disease (LIVE.112, More 2002).

Classical salmonellosis is associated with clinical disease due to enteritis and is most likely to occur during the feedlot period and in the early days of the voyage. The development of classical salmonellosis is dependent on interaction between salmonella exposure and host resistance.

Most sheep are able to withstand salmonella challenge unless host resistance is decreased. Any event that produces stress, including transport, yard work, inappetence and inclement weather can decrease host resistance. Clinical salmonellosis does occur in healthy animals, and may be a consequence of massive challenge with salmonella organisms.

Salmonella exposure is a function of size of the salmonella challenge (i.e. number of organisms) and the virulence of the salmonella serovar. On arrival at the feedlot, prevalence of faecal salmonella shedding is close to zero (0% to 0.70%). As lot feeding progresses, prevalence of faecal salmonella shedding in the subject population has been shown to increase from close to zero to more than 15%, 83% and 93% on days 6, 14, and 22 of the feeding period respectively (Higgs, Norris et al. 1993; Kelly 1996). This indicates that over time there is a progressive increase in the excretion rate and exposure of sheep to salmonella organisms during the feedlot period. Only a small proportion of these will develop clinical salmonellosis as most sheep have sufficient host resistance to prevent clinical infection.

Control of salmonellosis in the live sheep trade is aimed at maximising host resistance to infection and minimising exposure to salmonella organisms. Host resistance can be maximised by maintaining adequate nutrition and minimising stress. Management guidelines for achieving these goals throughout the export process are given in the Australian Standards for the Export of Livestock, which are reviewed below. The key to minimising exposure to salmonella pathogens lies in reducing environmental salmonella contamination. Management procedures to reduce salmonella contamination include paddock rotations, isolation of sick animals, feed and water management to prevent faecal contamination and control of flies and rodents. Disease prevention and control strategies need to be tailored to each facility to account for differences in variables such as soil type, drainage and environmental conditions. It is also important to recognise the potential for positive and negative consequences to changes in management. For example the risk of salmonellosis is increased if sheep fail to eat. Therefore it is important that changes in feed presentation to reduce faecal contamination do not adversely impact feed intakes.

The persistent inappetence (PSI) complex has been identified as the most common and important cause of mortality during the on-ship phase. Persistent inappetence predisposes sheep to disease and mortality, with those that do not develop fatal salmonellosis ultimately perishing due to inanition. The condition has a complex causal web including farm, feedlot and

ship related factors as well as factors that produce stress and salmonella challenge. Development of salmonellosis within the PSI complex is considered to be an opportunistic infection and persistently inappentent sheep have been shown to have lower resistance to enteric colonisation with salmonella organisms and subsequent development of clinical salmonellosis. However, there appear to be difficulties in attempting to separate or establish relative importance to the role of inappetence as distinct from Salmonella infection in illness and death associated with PSI.

More (LIVE.112, 2002) identified knowledge gaps and opportunities for further research in relation to Salmonellosis, outlining four specific project areas worthy of attention:

1. Improved understanding of the reasons for increased sheep losses during voyages from Adelaide and Portland compared to Fremantle.
2. Improved understanding of the ecology of Salmonella spp. and the epidemiology of salmonella during lot feeding.
3. Improved understanding of rumen function during lot feeding.
4. Assessment of the efficacy and cost-effectiveness of existing and emerging feedlot products such as probiotics and rumen modifiers.

In 2005, a project was initiated by MLA aimed at investigating mortality in sheep and lambs exported through Adelaide and Portland (LIVE.123). LIVE.123 directly addressed the first two topic areas identified by More (2002) as well as planning for formulation of strategies for minimising risks associated with these conditions. The project was extended into 2007 and a final report is expected in early 2008. Progress in terms of improved understanding of salmonellosis has been hampered in part by a low level of morbidity and mortality in the sheep export trade during the period when the project gathered data.

The importance of Salmonellosis as a potential cause of morbidity and mortality in export sheep is clearly established. It is considered to be a high priority topic for additional R&D investment aimed at better understanding causal factors and identifying strategies to minimise risk. In the interim there is an urgent need to rehearse the early detection and subsequent management of a salmonellae outbreak, should it occur. High throughput (associated with Ramadan and the Haj festival) is anticipated to coincide with the late winter/early spring risk period over the next few years. Furthermore, the requirement to hold sheep in assembly facilities for longer periods prior to export suggests that a rehearsed response to a severe Salmonellae outbreak will be required. It is recommended that the findings of LIVE.123 be used in conjunction with additional background material, such as LIVE.112, to plan and prioritise additional R&D investment.

2.6.7 Project revisit (tailoring findings to the needs of the industry)

Most of the major industry issues identified during this project have been the subject of some form of industry specific research. This does not mean, however, that all the big questions have been answered, and/or that all of the research findings have been adopted. It was observed that small changes to scope and/or terms of reference can have a big impact on the nature of the research findings. A review of the industry specific research found that there have been few cases where research findings have been specifically tailored to the needs of the industry and even fewer situations where findings have been refined to the point of being an industry practice.

It was also found that the heightened scrutiny of R&D has succeeded in keeping a focus on scientific integrity. Unfortunately, this has led to a tendency to tailor the research to meet the expectations of the scientific community rather than the industry itself. This has led to the use of scientific jargon that tends to ‘distance’ stakeholders from otherwise useful research.

As the result of the above, several recommendations are made. Future research should be undertaken in two stages. The first stage should involve completing the work and forwarding a final report. After a specified period to allow industry feedback and absorption of the content, the project should be revisited by an implementation team consisting of the Live Export R&D Coordinator and / or Extension Officer, the lead researcher and an industry stakeholder. It is apparent that tailoring findings to the needs of the industry requires specific skills and industry experience.

In keeping with this sentiment, it is recommended that much of the completed industry specific research be revisited. The projects that would benefit from a revisit are identified in an overview of completed industry specific research (Section 2.7, Tables 2.7.1 – 2.7.10). These tables provide a brief summary of each research project and an assessment of the extent to which further implementation might be required.

It should be noted that some R&D findings can successfully address one aspect of the supply chain but turn out to be antagonistic for other aspects of the supply chain. The trade-off between assembly period acclimatisation and the potential for a salmonella outbreak is a classic example. Consequently, an implementation team will, when considering adoption of new practices, need to determine the effects on the overall export process. Again this requires a strong working knowledge of the industry since a new practice may need to be tested in a commercial setting before it is formally evaluated. Consequently, this project should:

- Review the “industry specific research” to determine those projects that would benefit from further development
- Prioritise those projects that have the potential to deliver the most benefit
- Work through these projects methodically with an appropriate allocation of resources
- Develop (and continuously improve) a methodology that successfully implements research findings (including a method that measures the impact of the innovation).

2.6.8 Onboard program (re-definition of onboard roles)

The requirement for veterinarians to accompany many long haul voyages has led to a number of issues including redundancy of responsibilities between veterinarians and stockmen with resulting potential for conflict and on occasions, under-utilisation of both positions. These issues are also identified as offering considerable opportunity for revision of the roles of the two positions with a view to clarifying responsibilities, removing conflict and where possible leveraging additional industry value from the positions.

There are many examples where experienced veterinarians and stockmen have adopted a team approach and been directly responsible for significant improvements in onboard management e.g., where veterinarians have collected data to contribute to R&D projects at no additional cost to the R&D program. To date, however, much of this has been *ad hoc* and/or casual and there is a pressing need for onboard roles to be re-defined and expectations revised accordingly. These reforms could be encompassed in the onboard program and merged with many of the functions and roles established as part of the stockman’s program.

It was noted when reviewing the industry specific research that there are references to the fact that the daily and end of voyage reports contain crucial information. However, these reports are not sufficiently robust to allow the information to be used in an analytical sense. There are also issues regarding who should read these reports and what is the most appropriate action to take on the basis of the report content. Since these reports could be critical to identifying emerging problems and issues within the industry, investigations are justified.

This project has considerable overlap with the development of systems for data collection concerning animal health and welfare and improvement of the usefulness of derived information for stakeholders, including regulators and industry, outlined in 2.6.6 (Information Management Systems). The on-board program described in this project will deliver clear-cut job responsibility statements for veterinarians and stockmen, thus ensuring efficient utilisation of resources and improved data collection and application.

In summary, there is a need to:

- Review onboard roles (general)
- Review current systems for onboard data collection and make recommendations concerning data collection to serve operational, compliance and strategic purposes including in particular:
  - scope for onboard data collection to contribute to R&D
  - scope for onboard monitoring to demonstrate animal welfare
  - scope for more detailed mortality investigation
  - scope for trace back to property of origin, treatment group, pre delivery treatment (in keeping with the principles of LIVE.123)
- Develop standardised definitions for data collection
- Develop systems and procedures to ensure data collection can be achieved whilst maintaining accuracy and validity
- Develop systems and methods for automated, semi-automated and *ad hoc* querying and analyses to generate reports of value to the industry segment and the broader industry
- Develop onboard training and competence assessment (see link to training).

2.6.9 Information Management Systems (IMS)

Each stage of the live export process currently has various requirements for collection of data concerning animals, individuals/organisations and events. In addition, a variety of information or reporting is required including regulatory reporting requirements as well as business management requirements. There is no standardised method for collecting and managing data and the only standardisation apparent in the system is associated with regulatory compliance requirements. At the same time there is growing external scrutiny of the entire industry as well as media criticism, much of which is based on exaggeration and misleading information. The industry remains relatively data-poor because of the lack of integration of various data recording systems. Furthermore, current recording systems are not well suited to collection of routine data capable of supporting industry claims of best practice, integrity and adherence to stipulated animal welfare outcomes.

Recent developments in animal traceability through NLIS offer a unique opportunity for the industry to leverage additional benefit by concurrently developing an integrated Information Management System (IMS) that has some or all of the following functions and applications:

- Capable of being accessed through the world wide web to facilitate data entry, retrieval, analysis and reporting
- Capable of being accessed through hand-held devices either as truck- or animal-side data-capture devices that are subsequently synchronised with the main IMS to upload data or through internet-capable hand-held devices that allow two-way information flow in direct linkage with a web-based IMS
- Capable of collecting data from all stages of the process including farm of origin, buyer, land transport, assembly feedlot and voyage

- Capable of automated, semi-automated and *ad hoc* querying and analyses to generate outputs ranging from data-export, pre-defined reports and flexible *ad hoc* analyses and reports for purposes ranging from:
    - automated generation of reports for compliance and regulatory purposes e.g., NVD, daily morbidity and mortality reports, etc
    - automated and semi-automated reporting for operational and business management purposes including invoicing, quality assurance, best practice, identification of problems
    - routine collection of data useful for ongoing monitoring and reporting to document compliance with best practice and with animal health and welfare standards, offering a powerful and auditable system for generating data to respond to exaggerated or misleading criticisms of the industry
    - early identification of animal health and welfare problems allowing rapid response and intervention
    - contribute to ongoing industry R&D and continuous improvement of practices.

LIVE.123 is currently in progress and has developed prototype software to facilitate collection of data from assembly feedlots and during the voyage. A key element in this approach is the importance of industry consultation to understand data and information needs for each segment of the industry. This information is used in designing an IMS to ensure that it can improve day-to-day operational management for each industry component as well as contribute on a more strategic level to broader industry benefits as outlined above. It is also noted that while a single, integrated IMS that operates across the entire live export chain does have significant operational benefits, there are likely to be major obstacles in obtaining consensual support from competing business houses (even though safeguards can be implemented to allow each business to only access details relevant to its own operations, for example). A more acceptable approach might be development of separate component systems that can be implemented (and possibly adapted) within each industry segment and within each business while ensuring that core data requirements are standardised and that industry benefit can still be achieved on a broad and strategic level while delivering operational efficiencies at the individual business level.

It is recommended that the findings and final report of LIVE.123 serve as a guide for development of additional R&D aimed at the following components:

- Understanding data and information needs for each segment of the industry
- Developing standardised data inputs for core data required for day-to-day operational management as well as for strategic, industry level outputs
- Understand the range of additional data inputs likely to be desired or required by each segment of the industry
- Development of prototype IMS on a web-platform that can be implemented as stand-alone software at the business level
- Development of a longer-term implementation process beginning with selected early adopters and allowing feedback and intermittent (annual or otherwise) modification to ensure that systems are modified to best suit industry needs
- A clear initial focus on a IMS product that improves business efficiency to ensure continued participation and support while also developing strategic industry applications.

Further action should follow with the completion of LIVE.123.

2.6.10 Guidelines for discretionary approval (principles and specifics)

There are more than 30 provisions for discretionary approval in the latest draft of ASEL and AQIS personnel have requested better guidelines regarding the granting of discretionary approval in a range of situations. This is an important facet of the regulation and should be carefully considered both in the sense of general principles as well as the specifics of each case.

Discretionary approval is important as it recognises there are many situations where strict adherence to prescriptive requirements contributes to a lesser outcome. To properly administer this provision requires a strong working knowledge of the industry, which might not always exist. Therefore it is in the interests of both the industry and the regulators to provide support to the situations where discretionary approval is stated as part of the standards.

It should be possible to address each of the provisions and support them with some general guidelines that make it clear to everyone the requirements that might be to allow discretional approval to be granted. Responsibility for identifying and justifying such situations rests in the first instance with the operators since they are most familiar with the issues and possibilities. The onus is also on the industry to ensure that the management options involved are sound and likely to lead to a satisfactory outcome.

Discretional approval can, in some cases, place additional pressure on regulators and on industry stakeholders should there subsequently be a sub optimal outcome. It is important to recognise this possibility and support decision makers accordingly. If this process can be implemented satisfactorily there might be other places in ASEL where discretionary approval would benefit the industry and regulators.

There is some overlap between this project and other suggested projects (namely outcome focused regulation, sourcing restrictions and segregation options).

The project should:

- Develop principles to address situations where discretionary approval may be required
- Develop principles to address circumstances and allow flexibility where it may be seen to improve welfare outcomes
- Develop a culture that supports decision-makers in this role
- Support decision makers with a raft of scenarios where discretionary approval exists and thereby bolster confidence in the approach
- Identify any further areas that would benefit from a discretionary approval approach.

2.6.11 Preparation of goats for live export (pre-delivery management)

The export of live goats has suffered fluctuating fortunes over several years and has become opportunistic in nature. Consequently it has not enjoyed the R&D it might have, had it operated more consistently. The ‘goat’ issue is complicated by domestication programs used to prepare feral goats are live export. Although the guidelines are reasonably clear, there are many grey areas that blur the lines between domestication and preparation for export.

Although there are consignments that perform very well, there have been difficulties with repeatability. Moreover, when adverse outcomes do occur it is difficult to pinpoint the reasons since many preparations lack consistent management practices.

The export of goats is of concern to the industry, particularly with respect to the development of a robust preparation regime. It will be necessary to have clear guidelines that define the status of the goats in question, especially if they are components of genetic upgrading and/or domestication programs. These guidelines require R&D support for development and to monitor performance.

The assembly of goats prior to export share many of the issues relating to salmonellosis in sheep, and many of the same principles apply. There are a number of exporters who specialise in the export in goats and have a successful track record. The experience and expertise of these exporters may be crucial to developing a successful preparation regime.

Issues and best practice procedures for live goat exports were identified in LIVE.215 (2003). Recommendation 12 from this report stated:

> *A critical and independent re-evaluation of the live goat export industry should be undertaken within three years of this report, to assess progress and the need for further change in a developing industry.*

This recommendation is strongly endorsed and it is suggested that research be initiated with the following objectives in mind:

- Review current practices and performance for live goat export over the past five years against the Standards and recommendations of LIVE.215 as well as other reports directly relevant to goat exports
- Focus specifically on the preparation of goats prior to export
- Identify knowledge gaps for prioritised research to address issues identified in the review
- Make recommendations concerning best practices where appropriate.

2.6.12 Assembly periods (reconciling inconsistencies)

The issues associated with assembly periods are highlighted in the industry framework documents (attached as appendices). The framework notes that ASEL states:

> *…..for preparation of sheep and goats in premises south of latitude 26 degrees south that are held:*
>
> *(a) in paddocks during any or all of May, June, July, August, September and October, premises must have procedures to ensure that:*
>
> *(i) sheep and goats to be exported by sea are held at the premises for five (5) clear days (excluding the days of arrival and departure) before export;*
> *(ii) livestock are fed ad libitum during that period; and*
> *(iii) during the last three (3) days of that period, livestock are fed ad libitum, but only on pelletised feed equivalent to that normally used during an export journey.*
>
> (b) in paddocks during any or all of November, December, January, February, March and April, premises must have procedures to ensure that:
>
> *(i) sheep and goats to be exported by sea are held at the premises for three (3) clear days (excluding the days of arrival and departure) before export; and*
> *(ii) livestock are fed ad libitum during that period and only on pelletised feed equivalent to that normally used during an export journey. (ASEL S3.8).*

The requirement for a clear five day holding period prior to export during the months of May to October (inclusive) is a recent amendment to ASEL. This requirement seems at odds with industry specific research (Norris et al, 1992) which concluded that extended assembly periods confer no additional benefit when it comes to addressing inanition. It is also evident from research undertaken by More (More, 2002) that extended assembly periods during the late winter/early spring period increase the risk of a serious salmonellae outbreak. It also follows that longer assembly periods seriously restrict management options within the assembly facility, many of which may affect welfare outcomes. Thus research is required to:

- Review industry specific research relating to assembly periods and the rationale for differing assembly period durations in different seasons
- Assess risks and benefits of existing assembly requirements, particularly in terms of welfare outcomes but also in relation to operational and logistical issues
- Determine suitable research to determine if existing assembly requirements are appropriate
- Examine throughput predictions for the next three years (based on normal seasons) to meet the demands of Ramadan and the Haj festival, as it moves forward in the calendar year, and compare this to existing feedlot capacities
- Integrate these activities with suggested research into Salmonellosis and inanition since these major potential causes of morbidity and mortality also are associated with assembly period management.

The work should be conducted with a representative from LESAC and involve experienced researchers where possible.

2.6.13 Animal segregation (optimising segregation options)

Segregation is a contentious issue within the industry, particularly with regards to the issue of horns. The requirement to segregate horned animals from non-horned animals is clear within the latest version of ASEL. Regulators have recently taken a more literal interpretation of this requirement and added a considerable complication to the assembly trucking and stowage of livestock onboard.

It is generally considered that the operational procedures resulting from this requirement are disproportional to any possible welfare benefit. Indeed exporters believe that for most categories of livestock there is very little welfare benefit. However the R&D that might support either case has not yet been performed.

Most operators routinely segregate animals on the basis of sex, type and weight. Further distinctions may be made in regards to property of origin and mob integrity. There is clearly a large number of possible segregations and good managers will utilise available segregation options to the best possible effect.

Segregation should be determined on the basis of expected effectiveness taking into account animal welfare needs and commercial realities. Further R&D will be needed to find an optimal solution and it is anticipated that a consultative approach may be needed to utilise industry experience. The effectiveness of “Qualitative Behavioural Assessment” (QBA) techniques might also be assessed.

This project should therefore:

- review advantages and disadvantages of segregations as stipulated in the Standards including scientific support for each;

- list the possible segregations for each part of the supply chain;
- develop a hierarchy of segregation options, together with a description of situations that make some segregation options more important;
- determine the practical and/or operational limitations to the extent that segregation options can be catered to, for each part of the supply chain;
- investigate how an optimisation approach may operate in practice and develop an ability to judge whether segregation has been genuinely addressed; and
- actions that should be taken should a blatant disregard for segregation be evident.

2.6.14 Sourcing restrictions (weight, body condition, age, wool etc)

Selecting only those animals that are fit to travel is a key part of the export process. The selection process must work within restrictions applying to parameters such as weight, fatness, age, wool length, pregnancy status, location of property of origin etc. While these restrictions are well considered and provide a platform by which animals can be confidently exported, there are many categories of livestock that can be transported with a satisfactory outcome provided they are managed appropriately.

It is not proposed that the regulation in regards to sourcing restrictions be relaxed. But careful scrutiny of the restrictions may allow development of management procedures that allow animals to be sourced from a broader resource base. A good example of this is the restriction on bulls from the north of Australia to less than 650 kg. With genetic upgrading, there are now significant numbers of herd bulls that exceed this critical weight, for which there is no alternative market. Clearly the establishment of special guidelines that would allow these animals to be exported would be of benefit to the industry, particularly if this represented little risk to an overall welfare outcome.

Similar examples exist throughout the sourcing process within each of the industry supply channels. A systematic evaluation of these restrictions would identify areas where the sourcing base can be broadened without threatening welfare outcomes.

R&D support is required to ensure that concessions are accompanied with conditions that adequately address the issues associated with the particular category of livestock.

It is suggested that this project should:

- Systematically address each framework document to identify restrictions that might lend themselves to specific management procedures and allow additional categories of livestock to be exported without significant welfare risks
- Systematically address each framework document to identify whether additional management procedures might be required to satisfactorily transport certain categories of livestock (for example heavy wethers during spring and early summer)
- Determine the risks, management options and various conditions (in association with an appropriate risk management plan) that might allow for the export of animals that currently fall outside the selection criteria
- Work co-operatively with projects addressing discretional approval and segregation options
- Consider how these concessions might be applied in practice to ensure that they maintain their integrity and are properly applied.

2.6.15 Industry training (assessing competencies and developing skills)

Currently, industry training is limited to a stockman's training and accreditation course. More recently a self learning accreditation course has been developed for onboard veterinarians. This has been developed by AQIS and addresses only those aspects required to fulfil the role from the point of view of AQIS personnel. There is scope to build on these training programs via a "continuing education type" approach. This could lead to a higher qualification and when combined with work-place experience, could elevate the status of stockman duties. Continuing education could also be packaged to ensure that veterinarians are fully aware of the contemporary research and industry practices. The self-paced learning package developed by AQIS could prove to be a suitable vehicle for a range of training products.

There is scope for many other members of the industry to contribute to industry aims and objectives. For example, wharf-side personnel might acquire some form of competency accreditation that allows them to assess the effectiveness of operational systems. There are numerous references to competency in ASEL but rarely is there an established way of demonstrating that competence exists.

2.6.16 HSRA model (explanation of assumptions and linkages)

The development of the industry "heat stress risk assessment" model is a significant industry achievement. It does not, however, enjoy widespread industry support because its implementation was somewhat hurried due to 'events' at the time. Under more favourable circumstances there may have been more time devoted to explaining the model and fine tuning to make it more user-friendly. Even so, the fundamentals of the model are sound as it effectively minimises the risk of heat stress. The model works by making appropriate linkages between anticipated weather, animal type (including acclimatisation) and ship ventilation characteristics. These linkages have been carefully considered and are based on extensive literature research and the findings of substantial onboard monitoring. A full explanation of the workings of the model is outlined in LIVE.116, "Development of a Heat Stress Risk Management Model" (Stacey, 2003).

It has not been easy to determine the specific details in regards to criticism of the model but industry consultation would suggest the following:

- A degree of distrust stems from the "black box" nature of the model whereby most of the model workings are obscured from view. This is unfortunate since most of the linkages are quite straightforward and logical. Also the heat stress report has been written to withstand scientific scrutiny and it may be difficult for many industry members to comprehend. A communication that better explains the workings of the model would remove some of the distrust and bring about greater industry ownership.
- There is also a lack of understanding of risk based terminology (e.g. "the % age risk of a % age mortality (due to heat stress)". It is also noted that the key measures of heat stress threshold and mortality limit relate to "invisible" definitions and much stronger links to visual assessments such as panting score and heat stress score are required.
- It was also expressed that the HSRA model operates independently of load plan software models and requires a "trial and error" approach to determine the most appropriate load plan. Ways to better integrate the model into existing industry practices would be appreciated by industry.
- There was some concern about the lack of clear guidelines as to how deck pen air turnovers should be measured and/or validated, as well as how any design shortcomings (such as re-ingestion) should be assessed and factored. It was also noted that "known"

temperatures are not being factored and that this could conceivably lead to certain categories of livestock being inappropriately stowed.

- It was also considered that, although the model is effective when addressing the risk of enclosed decks in enclosed decks, the way it addresses open decks depends too heavily on the skills and experience of the master to manage the vessel in the most appropriate way. This is addressed in a separate suggestion for research (see 2.6.7)
- It is also noted that the model does not factor duration of exposure. From a strict risk management point of view, this may not be important since each voyage will have approximately the same risk of prolonged exposure to heat. From a practical point of view, however, prolonged exposure is a real hazard and can lead to an outcome that is not anticipated by the model. Furthermore, management of heat stress is often more about "how long can an animal tolerate a particular temperature (Twb)" rather than "what temperature (Twb) can an animal tolerate".
- It is noted that whilst the HSRA model is an effective tool to minimise the risk of heat stress, it does not, in its current form assist in the management of heat stress should it occur (no matter how improbable).
- Finally, it is noted that the model considers only airflow and gives little consideration to "the way in which air is delivered" to pens although it is understood that this is under investigation.

2.6.17 Ventilation design (effectiveness vs capital and operating costs)

The existing industry guidelines relating to ventilation factor only airflow. Despite this there is considerable reference to the benefits of jetting and a general understanding that the way in which air is delivered is equally as important as airflow itself. Consequently there is conjecture as to what is "best" when it comes to ventilation design. It is noted that recommendations in regards to an open deck ventilation design contained in LIVE.211 "Practical Ventilation Measures" have not been adopted by industry.

Current ventilation systems struggle to cope with extreme weather conditions in the northern hemisphere summer. Whilst these situations fall within the risk criteria outlined by the industry heat stress model, this does not preclude the possibility of a major heat stress incident. Whilst an incident can be explained on the basis of the risk criteria it would be unexpected by many of those who scrutinise the industry. Research is therefore required to assist ship owners with future design, to ensure that they get the most benefit from their expenditure on ventilation. There are three aspects: the first is the capital cost of a system; the second is the operational cost of the system; and the third is the effectiveness of the system.

When simply considering airflow, it is important that losses are minimised without particular consideration to the materials that have to be used. When considering the way in which air is delivered, there are many more considerations. Firstly extra ducting may be required incurring additional capital cost. The system may also require additional power to achieve jetting or better distribution. Since this will affect operating costs, better delivery will need to be more effective. This will also need to be appropriately rewarded in the regulatory framework to encourage ship owners to utilise these types of systems if they are indeed better.

The benefits of jetting have already been discussed in the industry specific research. It is possible that additional power requirements make the benefits prohibitively expensive and that investment may be better directed into additional airflow. Some basic rules of thumb (based on a representative vessel) in regards to these factors would be of benefit to the industry.

Assessment of effectiveness may require a more detailed look at the way in which heat is removed from animals and a more in-depth look at both respiratory and cutaneous heat loss as well as a more detailed investigation at the relative effectiveness of evaporative versus convective heat loss.

There is scope, also to look at any inefficiency inherent in the existing systems. For example, most ventilation systems are run on full power from the beginning of a voyage, whereby (at least in regards to heat) there may be substantial savings by operating with reduced airflow for certain periods of the journey. Limitations in this case may then relate to pad emissions and/or pad moisture rather than heat.

It is recognised that many ship owners will have their own ideas about what is best since there are many factors that may influence the eventual design of a ventilation system. However, innovation that may improve the ability of mechanical ventilation to cope adequately with extreme weather challenges would avoid the industry having to contemplate air conditioning options which are likely to be prohibitively expensive. Such innovation may involve a combination jetting and wetting (in cattle) and possibly a “head in the box” type approach for sheep that maximises the capacity for heat loss via the respiratory tract.

The suggested project would address the various factors identified above.

2.6.18 Heat stress (management of open decks)

Although the HSRA model effectively minimises the risk of heat stress in enclosed decks, it relies heavily on the master’s ability to manage open decks to achieve the same level of confidence on open decks. While the relevant research provides reasonable guidelines on how to manage nil wind conditions and/or following breezes, it does not provide strong guidelines on how to take full advantage of the ship’s speed when encountering extreme conditions on open decks. The wet bulb rise (WBR) across open decks can sometimes be very high but the current response tends to be reactive rather than predictive. The associated lag can result in mortalities that might have been avoided with a more predictive approach.

Much of the discussion about open deck management refers to the “effective crosswind”. This can be calculated relatively easily as the wind speed multiplied by the sine of the wind angle. The wind speed required for thorough ventilation of the open deck is, however, far more complicated and must factor both the cross flow resistance caused by the infrastructure of the open deck as well as the deck width and length. The researchers that developed the HSRA model used computational fluid dynamics (CFD) to determine the crosswind required to provide adequate ventilation to a representative open deck.

Discussions with senior officers onboard livestock vessels would indicate that, whilst many of them understand the use of vectors to determine the results of any combination of the ship’s speed and outside wind speed and direction, they have little understanding of the “open deck operational guidelines” discussed in the LIVE.116 report, “Development of a Heat Stress Risk Management Model” (Stacey, 2003). Moreover, the way the CFD work is currently presented in the report does not allow it to be easily comprehended by exporters. Consequently, there is still some doubt as to the industry’s ability to manage heat stress incidents should they occur. There is a tendency to take a fatalistic view of extreme weather events and the approach undertaken onboard may not always optimise open deck conditions. This is not to underestimate the experience of many masters’ who have been negotiating hot seasonal conditions for many years. The combination of this experience and better technical information on how to best manage open decks may achieve satisfactory outcomes in difficult circumstances.

The first step would be the "calibration" of open decks so that the WBR across decks is measured for each combination of ship speed, wind speed and direction. This would allow a prediction of the worst case situations on the open decks and allow ship to be manoeuvred accordingly. This, combined with an understanding of heat tolerance that relates to both temperature (Twb) and duration, would allow a more strategic approach to managing heat stress incidents. Apart from a "lower end" threshold wind velocity, the anticipated WBR will be proportional to wind speed and many of the rises can be extrapolated from a relatively small number of measurements. Once this has been completed it should be possible to predict (or map) the temperatures (Twb) throughout the open decks based on a single temperature representing the ambient wet bulb challenge.

Other issues that could be considered may relate to the use of first port unloading to reduce the heat stress risk on the remaining open decks. It is not uncommon (under current practice) for whole decks to be unloaded at the first port. This does nothing to reduce the risk on the remaining decks. Removing smaller numbers over the full range of decks will reduce the potential WBR and the corresponding heat stress risk. These are simple exercises that require little explanation. It is suggested that this project address the issues outlined above.

2.6.19 Minimum airspeed (reconciling AMSA requirements)

AMSA part 43 (Appendix 4, 3.3) states that:

> *…on ships constructed (or converted) on or after 27th May 2004, the mechanical ventilation system should be capable of providing a minimum air velocity across any part of the pen from the source of supply of not less than 0.5 m/sec.*

This requirement is inconsistent with the industry heat stress model as the latter does not consider air speed in its risk assessment. The requirement is also inconsistent with the findings of LIVE.234 (Casey, 2005). The terms of reference of LIVE.234 did not specifically address minimum air speed but sample measurements from a number of pens indicated that the average airspeed was below the above stated minimum and that approximately 60-90% of the pen area fell below the stated minimum. The method of measuring air velocity used by owners of recently commissioned livestock vessels, and who claim to meet the above minimum requirements, remains unclear at this time.

There is confusion about how the critical figure (> 0.5 m/sec) relates to pen air turnover, also expressed in terms of distance and time (m/hr) and further confusion as to how it relates to other measures such as "drift velocities" and "velocity ratio".

It is noted that ventilation configuration has a major bearing on resultant drift velocities and that higher drift velocities are more easily achieved when air is delivered from the sides of vessels rather than directly into pens. In this way the requirement would seem to be at odds with what is generally considered as "superior" ventilation design.

There is no industry information that shows what sort of pen air turnover (PAT) may be required to achieve the minimum air speed and no information is available to industry to show how ventilation configuration might affect the specified minimum. Work in these areas is considered to be high priority and should:

- Standardise the methodology required to assess the minimum airspeed within the pen
- Provide the industry with clear definitions of the terms "drift velocities", velocity ratios, pen air turnover (as a measure of distance and time) and minimum air velocity

- Ascertain how ventilation configuration will affect both drift velocity and minimum air speed
- Rationalise the work undertaken on the benefits of jetting and how this relates to the minimum air speed requirement
- Explain the rationale behind the minimum air velocity requirement and how this may enable animals to better tolerate heat
- Determine how minimum air speed relates to the "preferred" measure of ventilation, pen air turnover (PAT)
- Investigate the rationale behind the minimum air speed requirement stated in the regulations of other countries.

It is suggested that this work be undertaken with representatives of both AMSA and ASEL (LESAC) and industry heat stress/ventilation researchers to deliver a more co-ordinated approach to ventilation requirements.

2.6.20 Other (further outstanding projects)

There are a number of medium priority research initiatives that have not been included in the suggested research above. These second tier type projects have been outlined in broad terms below:

Age (Saudi protocol): The age at which sheep "cut their teeth" varies within a mob and between mobs. Age (based on teeth) is grounds for consignment rejection. Investigations that better determine the factors that affect the age at which teeth are 'cut" as well as the likely range within mobs, would allow sheep to be purchased and consigned with greater confidence. This R&D would qualify as an 'Industry Initiated Project' (IIP).

Bedding management: Bedding management is a central part of the management of cattle on long haul voyages. There have been several cases where a reluctance to wash has been a contributing factor to incidents. Despite the attendant risks, little research has been undertaken to support industry practices. In addition, pad moisture on sheep vessels with marginal ventilation can be a welfare issue and any means by which this could be mitigated would be of enormous benefit to the industry. There has been a suggestion that the 'salt' content in pelleted fodder may have a bearing on urination and could therefore be manipulated toward a better outcome. Research into bedding management, either in isolation or jointly should therefore be considered.

Pinkeye in assembly process: Pinkeye has been identified as a bigger problem since assembly periods have been extended. A cheap, practical means of effectively controlling pinkeye is required. Industry experience with pinkeye is substantial and it is suggested this be drawn upon to develop practical control measures. This would qualify as 'Producer Initiated Research & Development' (PIRD).

Pre-embarkation inspection: The site at which the pre-embarkation inspection should be undertaken is a contentious issue within the industry. Practices vary considerably making an evaluation of current inspection practices useful for determining best practice.

Occupational Health and Safety: OH&S is an emerging issue in most industries. There is an onus on the live export industry to stay abreast with these developments.

Stocking density: Stocking density is currently under investigation (as a literature review) in LIVE.233. It is likely that the final report will have several recommendations for further research.

Stocking densities on trucks, in registered premises and onboard are all very important aspects of the trade and industry specific research to support industry practiced is essential.

Penning arrangements etc (registered premises): There are a host of issues associated with the restrictions placed on registered premises. This would appear to be an area that has had limited attention from R&D and would benefit from specific attention.

Fodder quality and quantity: There are a number of specific issues relating to fodder quality and quantity in all of the three nominated supply chains. These issues vary from specifications for cattle pellets in the long haul trade, to specialised fodder for integrated operators in the short haul cattle trade and to questions about the adequacy of the 2% allocation of fodder for sheep that have become accustomed to pellets prior to export. There is scope for a general project to address all of these issues.

Timeliness of approvals: This is an issue raised by operators in the short haul cattle trade who wish to shorten the turnarounds involved in lodging NOI's and receiving approvals.

Management of rejects: The management of rejects is a relatively contentious issue since mismanagement of rejects has the potential for major consequences. Current guidelines are somewhat vague.

Rest periods: It is anticipated that the industry will have to address the issue of rest periods independently of the work being conducted by CSIRO into water deprivation times.

2.7 Overview of completed industry specific research

2.7.1 Ventilation

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
SBMR.002 – "Investigation of the ventilation efficacy on livestock vessels" (Stacey, 2001)	This project included an initial literature review followed by onboard monitoring that established the linkages between environmental conditions and heat stress on livestock vessels. The findings formed the basis for development of the heat stress model.	Yes	Yes	Yes (findings adopted by LIVE.116)	Not required (reference document)
LIVE.212 – "Investigation of ventilation efficacy on live sheep vessels" (Stacey, 2004)	This project added to the knowledge base gained from the previous project with a special focus on sheep vessels. The findings were also incorporated into the subsequent industry heat stress model. The final report includes discussion about the management of open decks during hot and humid conditions.	Yes	Yes	Yes (findings adopted by LIVE.116)	Required (how to manage open decks)
LIVE.211 - "Practical ventilation measures for livestock vessels" (Stacey, 2003)	This project provides concise, practical guidelines for operators wishing to address issues relating to ventilation. Among other issues, the report addresses re-circulation, flow balancing and ventilation design. Additional discussion would benefit the industry, in particular the management of open decks and what is considered "best" in regard to ventilation design.	Yes	Yes (further refinement would be beneficial)	Partial	Required
LIVE.116 – "Development of a Heat Stress Risk Management Model" (Stacey, 2003)	The development of an industry "heat stress risk management" model is a significant achievement. Findings from a number of preceding projects were utilised to develop the model. It is a useful tool to minimise the risk of exposing animals to heat stress but does not provide any guidance on how to manage heat stress incidents if and when they occur.	Yes	Yes (further refinement would be beneficial)	Yes	Required (better explanation of the workings of the model)

2.7.2 Heat stress and thermoregulation

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.209 – "Physiology of heat stress in cattle and sheep" (Barnes et al, 2004)	This project utilised "heat rooms" that simulated onboard conditions for investigating the physiology of heat stress in both sheep and cattle. Findings from this project contributed to development of the industry heat stress model.	Yes	Yes	Yes (findings utilised by LIVE.116)	Not required
LIVE.223 - "Pilot monitoring of environmental conditions and animal performance" (McCarthy, 2005)	This project developed techniques to monitor environmental conditions and animal performance on livestock vessels. This included the use of data-loggers and the further development of observational techniques. Information collected in the course of this project was used to validate assumptions contained in the industry heat stress model. Techniques developed in the course of this study will be utilised by any subsequent onboard monitoring.	Yes	Yes	Yes (findings utilised by LIVE.116)	Not required (techniques will be utilised in any subsequent onboard monitoring)
LIVE.228 - "Updating the biological assumptions for the industry heat stress risk management model" (Stacey , 2005)	This project updated the model assumptions based on the findings of any subsequent "heat related" research.	Yes	Yes	Yes (findings utilised by LIVE.116)	Not required
LIVE.234 -"Potential benefits of jetting to the industry heat stress risk assessment model" (Casey, 2005)	This study determined whether jetting should be included into the "heat stress risk assessment" model.	Yes	No	Pending	Yes

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.219 - "Wetting cattle to alleviate heat stress on ships" (Gaughan, 2003)	This was an important project that demonstrated the effectiveness of wetting cattle to alleviate heat stress. It included a well prepared "Tips and Tools" circular describing the findings. Despite this, the use of wetting to mitigate heat stress has not become established practice within the industry. This emphasises the importance of further developing findings to the point of immediate adoption. The concept of an implementation program to achieve this has been discussed.	Yes	Yes	No	Required
LIVE.104B – "Use of electrolytes to alleviate heat stress" (Purdie, 2001)	This was a desktop study aimed at evaluating the benefits of using electrolytes to alleviate heat stress within the livestock export industry.	Questionable	No	Yes (findings utilised by LIVE.228)	Not required
LIVE.108 – "Desktop study of electrolyte products" (Rose, 2001)	This was a desktop study aimed at evaluating the efficacy of existing commercial electrolyte products.	Questionable	No	(Findings utilised by LIVE.228)	Not required
LIVE.228 – "Physiology of heat stress in cattle and sheep and electrolyte replacement therapy" (Barnes, 2006)	This project utilised "heat rooms" (that simulated onboard conditions) to investigate the benefits of using "electrolytes". It also investigated the physiology of heat stress in both sheep and cattle. Findings indicated that the administration of electrolytes did not increase animal's tolerance to heat but could accelerate an animal's recovery from a heat stress incident. Weight gains from the use of electrolytes were evident in cattle but the method of administration and bedding management due to increased urination remain unresolved.	Yes	Yes	Pending further results	Not required (except in the context of overall heat stress management)

2.7.3 Ammonia and other emissions

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.202 - "Decreasing shipboard ammonia levels by optimising the nutritional performance of cattle and the environment on ship during live export" (Acciolly, 2003)	This project examined ways to reduce ammonia production through the use of dietary manipulation and/or the use of dietary additives. The major recommendation was use of higher quality roughage to increase digestibility and animal performance while reducing dietary protein levels. Practical limitations precluded adoption of the major recommendation but other issues addressed by the study have been generally adopted.	Yes	No	Partial	Required
LIVE.218 – "Determining critical atmospheric ammonia levels for cattle, sheep and goats" (Costa, 2003)	This was a desktop study aimed at determining levels of ammonia that are harmful. Such critical levels have been identified and industry is aware of the implications of high levels. There are no industry guidelines that directly address ammonia levels for either livestock or personnel subject to occupational health and safety guidelines.	Yes	Yes	Partial	Required
LIVE.213 – Investigation into reducing odour emissions from partly loaded sheep vessels whilst in port" (McCarthy, 2003)	This project investigated how odour emission might be reduced from partly loaded sheep vessels whilst in port. A range of strategies were evaluated including dietary manipulation as well as dietary and bedding additives. The study recommended that odour management be subjected to the five factors of frequency, intensity, duration, offensiveness and location. Complaints have dropped dramatically since the Ports adopted these strategies.	Yes	Yes	Yes	Not required

2.7.4 Pre-delivery management

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.104A – "Influence of pre-delivery management on livestock exports" (Purdie, 2001)	This project attempted to arrive at conclusions when there was little documentation in regards to practices and even less industry-specific scientific support. Consequently the recommendations are rather superficial but the study provides a significant benchmark against which progress can be measured.	Questionable	No	No	Required
LIVE.115 –"Strategic annual sero-prevalence survey for bluetongue" (Melville, 2003)	This study assisted in determining sourcing restrictions relevant to bluetongue. The disease is an important consideration in many importing country protocols.	Yes	Yes	Yes	Not required (useful reference)
LIVE.118 – "Investigating blue tongue virus persistence in sheep" (Melville, 2004)	This study addressed issues to do with virus persistence in sheep.	Yes	Yes	Yes	Not required (useful reference)
LIVE.123 – " Investigating mortality in sheep and lambs exported from Adelaide and Portland" (House, 2006)	This was a large project aimed at establishing the linkages between pre-delivery management and subsequent performance. The project was preceded by a literature review. Research is still progressing in early 2007.	Pending	Pending	Pending	Pending
LIVE.301- "Management of pre-delivery stress in live export steers" (Fitzpatrick, 2004)	This project looked at the effects of land transport on cattle destined for live export. The study concluded that the supplementing with electrolytes mitigates pre-delivery stress more effectively than the provision of water alone.	Yes	Yes	Yes	Not required

2.7.5 Sheep and Goats (specific)

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.112 - "Salmonellosis control and best practice management in live export sheep feedlots" (More, 2002)	This project adopted a risk management approach to salmonellosis control. It generated many recommendations aimed at reducing the risk of a salmonellae outbreak. The report does not provide strong guidelines for early detection and management of a salmonellae outbreak.	Yes	Yes (further refinement required)	Partial	Required Further refinement required for implementation
LIVE. 110 - "Improving the Saudi Arabia sheep and goat protocol" (Brightling, 2002)	This project sought to give exporters confidence to ship livestock to the Saudi Arabian market and was integral to re-opening the Saudi trade. Industry events have overtaken the recommendations and there have been further revisions to the Saudi protocol.	Yes	Yes	Yes	Not required
LIVE.105 - "QA for live goat exports to Saudi Arabia" (Brightling, 2001)	This project identified several areas of management that required further investigation.	Yes (further investigation required)	Yes	No	Required
LIVE.106 – "Automatic counting of sheep" (Kassler, 2001)	This study provided a preliminary evaluation of technologies for automatic counting of sheep. The study was in response to costs associated with counting discrepancies. The work suggests that existing technology would require considerable development before it could be considered by a reliable alternative.	Yes	Yes	No	Not required (monitor developments)

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
"Causes of death in sheep exported live by sea" (Richards, 1989)	This study conducted a large number of post mortems on live export sheep (950 head from 6 voyages). Causes of death were grouped into 5 major categories. These were inanition, salmonellosis, trauma and acidosis and/or enterotoxaemia. The mortality profile on a number of voyages was also determined.	Yes	Yes	Yes	Not required (useful reference)
"Deaths in sheep exported by sea from Western Australia – analysis of ship Master's reports" (Norris et al, 1989)	This study examined the Masters's report from 181 shipments to assess death rates and patterns. Preliminary conclusions were drawn from the information obtained.	Yes	Yes	Yes	Not required
"An epidemiological study of sheep deaths before and during export by sea from Western Australia" (Norris et al, 1989)	This study suggested that the mortality rates on live sheep vessels are strongly correlated to common lines of sheep. It was proposed that overall mortality rates could be substantially reduced if these lines could be identified (at time of purchase) and selectively managed.	Yes	Yes	No	Required (further investigation required)
"Pre-embarkation risk factors for sheep deaths during export by sea from Western Australia" (Norris, 1989)	This study hypothesised 'property of origin' as a significant factor in export sheep deaths and attempted to link a number of different management events to subsequent performance. In fact no significant linkages were identified in this study thereby leaving unresolved the true importance of farm of origin.	Yes	Yes	No	Required (further investigation required)
"Mortality of sheep exported by sea: evidence of similarity by farm group and regional differences" (Higgs, 1999)	This study confirmed that animals from the same farm (and to some extent the same region) have a similar risk factor and that this is consistent between years. It also suggested that there was a linkage to the length of the pasture-growing season.	Yes	Yes	No	Required (further investigation required)

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
"Epidemiology of salmonellosis in the live sheep export industry" (Higgs, 1993)	The findings of this study suggested that initial outbreaks of salmonellosis were not related to 'challenge' but predisposed by inappetence and inanition.	Yes	Yes	Yes	Not required (valuable reference)
"Distribution of lesions in ovine salmonellosis" (Richards, 1993)	This study identified four forms of salmonellosis in sheep in feedlots and during transport by sea, each with characteristic lesions.	Yes	Yes	Yes	Not required
"Contagious ecthyma in the live sheep export industry" (Higgs, 1996)	This project assessed the efficacy of the scabby mouth vaccination and its ability to ensure that consignments could be delivered within accepted limits. It also recommended vaccination regimes that would achieve the efficacy required.	Yes	Yes	Yes	Not required
"Thiamin deficiency in sheep exported live by sea" (Thomas et al, 1990)	This study identified lower than normal thiamin levels in sheep during live export. It proposed that this may be a primary cause of innappetance, particularly from properties where the thiamin status is already low. It suggested that this would explain both the cause of inappetence and the linkage to property of origin. Thiamin supplementation trials were recommended.	Yes	Yes	No	Required
"Management of inappentent sheep during export by sea" (Norris et al, 1990)	This study examined a number of strategies to encourage non feeders to eat under simulated voyage conditions. The findings suggested sheep that die of inanition during shipment are not inhibited because of competition from other sheep or from social dominance. It did not support detecting non-feeders in the feedlot and withholding them from export. A better option is to address the factors that produce non-feeders.	Yes	Yes	No	Required (Findings may be inconsistent with industry guidelines)

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
"Season, age and adiposity influence death rates in sheep exported by sea" (Higgs, 1991)	This study established linkages between death rates and age, adiposity (fatness) and season.	Yes	Yes	Yes	Not required
"Seasonal metabolic factors may be responsible for deaths in sheep exported by sea" (Richards et al, 1991)	This study postulated that sheep experiencing a period of liveweight gain on green pastures are less able to mobilise fat and are more at risk than sheep undergoing liveweight loss whilst grazing dry feed.	Yes	Yes	Yes	Required (more research required)
"The duration of lot-feeding of sheep before sea transport" (Norris et al, 1992)	This study examined 3 different lot feeding periods prior to simulated shipping. There were no significant differences in the number of inappetent sheep between the treatment groups after 7 and 14 days. The relatively high proportion of non-feeders (32%) after the short feeding period and the practical difficulties of identifying animals that remain inappetent were noted. The greater exposure of animals to stress from inclement weather and/or salmonellae when lot fed for longer periods was also noted. This finding is inconsistent with current industry guidelines.	Yes	Yes	No	Required
"Feeds and feeding methods for assembly of sheep before export" (McDonald et al, 1994)	This study evaluated the use of both virginiamycin and/or higher lupin content in shipping pellets. The study concluded that either strategy helped to overcome problems associated with acidosis. Both strategies improved feed intake in the early stages of shipping.	Yes	Yes	Yes	Not required (useful reference)

2.7.6 Best practice management

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.204 – "Identifying current best practice in the export of young cattle to Israel" (Ainsworth, 2001)	This study identified the best practice management of young cattle based on current knowledge and extensive industry consultation. Most of the recommendations are current.	Yes	Yes	Yes	Not required
LIVE.215 – "Minimising mortality risks during export of live goats by sea from Australia" (Brightling, 2003)	This study outlined best practice in regards to the management of goats destined for live export. It took a risk management approach and addressed sourcing, as well as feedlot and onboard management. Issues relating to the preparation remain contentious and the history of poor outcomes continues. Incomplete adoption of the major recommendations seems a likely explanation.	Yes	No	Incomplete	Required (Further research required)
LIVE.207 – "Industry current best practice in export of beef cows by sea" (Ainsworth, 2002)	This study evaluated a number of possible strategies aimed at improving outcomes associated with the shipping of beef cows. The investigation was conducted under commercial conditions and conclusive results were difficult to obtain. Even so, several strategies were identified.	Questionable	Yes	Partial	Yes (further investigation would be beneficial)
LIVE.114 – "Best practice in the use of veterinary chemical and drugs in exporting livestock" (Brightling, 2003)	This project addressed the responsible use of veterinary chemicals and drugs used by the livestock export industry with particular reference to withholding periods and meat safety requirements.	Yes	Yes	Yes	Not required
LIVE.301 - "Management of pre-delivery stress in live export steers" (Fitzpatrick, 2004)	This project looked at the effects of land transport on cattle destined for live export. The study concluded that the provision of electrolytes to address pre-delivery stress would be of no greater benefit than the provision of water alone.	Yes	Yes	Yes	Not required

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.121 – "Investigating options to modify the aggressive behaviour of entire male livestock" (Entwistle, 2005)	This study evaluated the extent to which aggressive behaviour by entire males impacts on voyage outcomes. Investigations suggested that dairy breed bulls and entire male goats were the major categories of concern. Possible management strategies were identified.	Yes	No	No	Required
LIVE.102/103 – "Best practice standards in preparation and husbandry of export cattle" (Ainsworth, 2000)	This was a landmark study aimed at determining the consensus position with respect to 'best practice' management of beef cattle destined for export. It provided benchmarks against which the industry could gauge progress. At the time there was a paucity of relevant scientific support for many of the best practices identified. Despite this, few of the "best practices" identified have been subsequently refuted.	Yes	Yes	Yes	Not required (valuable reference and benchmark)
LIVE.111 – "Evaluation of the cost/benefit analysis of Rhinoguard vaccine in preventing BRD in export cattle" (More, 2003)	This study evaluated the benefits of utilising Rhinoguard vaccine to prevent pneumonia in live export cattle. The study found that rates are relatively lower when Rhinoguard is used routinely but its effectiveness depends on Bovine Herpes Virus (BHV) it being one of the causative agents.	Yes	Yes	Findings noted (usage would be confined to specific situations)	Required (further investigation to identify causative agents)
LIVE.233 – "Literature review of stocking densities on ships an din pre-export assembly depots" (Petherick, 2006)	This project conducted a literature review to determine support for the prescribed stocking densities utilised in the livestock export industry. An initial draft required a greater industry context and revisions have been requested.	Yes	No	Pending final report	Pending final report

2.7.7 Dairy Cattle

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.208 - “The best practice management of pregnant dairy cattle on long haul voyages” (McCarthy, 2002)	This project addressed issues relating to the transport of pregnant dairy cattle by sea, following resurgence in demand for replacement dairy cattle. Recommendations were widely circulated and improved voyage outcomes were acknowledged. Some further revisions have been made.	Yes	Yes	Yes	Not required
LIVE.113 - “Ringworm in live export dairy cattle” (Brightling, 2003)	This project identified the treatment of choice for ringworm in dairy cattle.	Yes	Yes	Yes	Not required
LIVE.217 – “Investigating premature lactation in pregnant dairy females” (Lean, 2003)	This project identified methods by which premature lactation may be managed in the live export chain. Nutritional management has proven successful in practice but refinement of these recommendations in the light of industry experience would be beneficial.	Yes	Yes	Partial	Required (further refinement beneficial)

2.7.8 Definitions and Measurement

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.122A - "Identifying curfews in the live export and processing industries" (Petherick, 2006)	This project identified uniform standards in regards to feed and water curfews. Curfew has particular relevance to determining stocking densities.	Yes	Yes	Partial	Required (further circulation of report)
LIVE.120 - "Identifying live animal condition scoring systems for the Australian Livestock Export industry" (Gaden, 2005)	There is considerable variation in the body scoring systems used between States and between industries and a standardised system is clearly required. This project made recommendations accordingly for the livestock export industry.	Yes	Yes	Yes	Required (further circulation of report)
LIVE.222 - "Developing alternative methods of measuring animal welfare on ships and in pre-export depots" (Phillips, 2005)	This project attempted to identify alternative methods of measuring animal welfare.	Yes	No	No	Required (further develop findings)
LIVE.221 – "Characteristics and volumes of effluent produced by livestock vessels" (Landline Consulting, 2003)	This project determined the quantities of solids, nitrogen, phosphorus and potassium produced on livestock vessels. This was in response to AMSA requirements and IMO's Marine Protection Policy.	Yes	Yes	Yes	Not required
LIVE.205 – "Water consumption on cattle ships" (Brightling, 2001)	This project reviewed water consumption on a large number of cattle voyages. Daily consumption requirements were determined on this basis. No attempt was made to correlate water consumption to environmental temperature and humidity for the purposes of identifying situations where higher allocations may be required.	Yes	Yes	Yes	Required (further investigation)

2.7.9 Industry Statistics

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.206 – "National Livestock Exports Mortality Summary 2001" (Norris, 2002)	This project collected and collated voyage information for the 2001 calendar year.	Yes	Yes	Yes	Not required (valuable reference)
LIVE.214 – "National Livestock Exports Mortality Summary 2002" (Norris, 2003)	This project collected and collated voyage information for the 2002 calendar year.	Yes	Yes	Yes	Not required (valuable reference)
LIVE.220 – "National Livestock Exports Mortality Summary 2003" (Norris, 2004)	This project collected and collated voyage information for the 2003 calendar year.	Yes	Yes	Yes	Not required (valuable reference)
LIVE.225 – "National Livestock Exports Mortality Summary 2004" (Norris, 2005)	This project collected and collated voyage information for the 2004 calendar year.	Yes	Yes	Yes	Not required (valuable reference)
LIVE.235 – "National Livestock Exports Mortality Summary 2005" (Norris, 2006)	This project collected and collated voyage information for the 2005 calendar year.	Yes	Yes	Yes	Not required (valuable reference)
LIVE.216 – "Mortality and morbidity risk factors for livestock during sea transport form Australia" (Norris, 2003)	This project analysed existing mortality reports to identify the risk factors for mortality and morbidity of livestock during export.	Yes	Yes	Yes	Not required

2.7.10 Industry projects

Industry Specific Research					
Research Project	Topic of investigation	Useful research findings	Tailored to needs of industry	Adoption	Revisit
LIVE.117 – "Review of the Australian Livestock Export Standards" (Whan, 2003)	This was a landmark study that sets out a blue print for future regulation of the industry. Unfortunately industry events coincided with completion of the study but many of its recommendations might yet be taken up by the industry.	Yes	Yes	No	Required
LIVE.316 – "Comparing world livestock export standards" (Whan, 2006)	This study reviewed and compared the export standards applied by a cross-section of different countries. Australia faired well in the comparison. It was found that few countries had standards specifically tailored to livestock exporting and Australia could glean little additional benefit from those that do exist. The complete absence of standards in many countries that compete in existing markets was noted with concern.	Yes	Yes	Yes	Not required
LIVE.314 - "Update of the value of the live export trade" (Hassall, 2003)	This project quantified the contribution of the livestock export industry to the Australian economy.	Yes	Yes	Yes	Not required (except for regular revisions)
LIVE.317 – "Development of a livestock export market outlook service" (Koch, 2006)	Final report pending.				

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4 Appendices

Appendix 1

Industry Framework

Long Haul Cattle

Knowledge gaps, inconsistencies and research priorities within the livestock export industry

Results of industry consultation and an overview of industry guidelines and completed “industry specific” research

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1 Long Haul Cattle

1.1 Overview - long haul cattle (LHC)

As outlined in the project overview, the industry has been divided into the following sectors and treated as case studies.

- Long Haul Cattle
- Long Haul Sheep
- Short Haul Cattle
- Special Cases

Voyages that exceed 10 days are generally considered to be long haul. This distinction applies to all cattle exported from Australia to the Middle East and to other remote destinations. Although voyages to Japan, Korea, Taiwan, Mexico and China can sometimes exceed 10 days they are considered as short haul voyages for the purposes of regulation. Some of the issues identified in this section (Long Haul Cattle) are common to both long and short voyages.

Each sector represents a specific supply channel that confronts essentially different issues. For the purposes of the study, each supply channel has been treated as a stand-alone case study and a separate framework developed accordingly. This has resulted in some repetition but the approach is justified on the grounds of 'client utility' (since most operators are interested in a particular supply channel).

Further divisions have been made that are consistent with the current Australian Standards for the Export of Livestock (ASEL) though these were broadened slightly to include other factors that may affect voyage outcomes. These divisions are described in the table of contents and are highlighted in the flow diagrams contained within the text.

The five standards that have been used to dissect the livestock exporting supply channel include:

1. Sourcing and on-farm preparation of livestock
2. Land transport of livestock
3. Management of livestock in registered premises
4. Vessel preparation and loading
5. On-board management of livestock.

It was also recognised that common to every supply channel is a Consignment Plan.

As outlined in the project over view, each case study has been furnished with summary tables that can be found at the end of the framework document (See Section 1.9). This represents a good starting point for those who do not wish to work through the detail of the appendix.

Mortality on long haul cattle voyages is low. The main causes of mortality are pneumonia and heat stress. Pneumonia is usually considered to be the result of pre-shipping and preparation factors. Heat stress is the major area of risk. Figure 1.1 provides an overview of the long haul cattle export process.

The existence of significant gaps was determined by systematic scrutiny of the supply process.

Gaps were identified and assessed against existing standards and guidelines according to the criteria and possible determinations detailed below:

Criteria	Possible determination
Relevant industry standards and guidelines	Exist / Do not exist
Issues associated with standards and guidelines supported by industry specific R&D	Exists / Lacking
Issues associated with framework headings acceptable from the exporter's and other stakeholder's perspective	Consensus / Some contention / Contentious
Impact of existing standards and guidelines (and/or framework headings) on operational procedures	Low / High
Affect of existing standards and guidelines (and/or framework headings) on animal welfare outcome	Low / High
Inferred R&D priority	Low / Medium / High / Very high

1.1.1 Guidelines for the long haul cattle trade

Following are details of documented guidelines used to the address the long haul cattle trade.

ASEL (Version 2) (Sept 2006)
The Australian Standards for the Export of Livestock (ASEL) is the central reference for regulation of the industry. ASEL is supported by the corresponding Welfare Acts and associated Orders at both the State and Federal level. A more recent version (Dec 2006) has been circulated but the amendments are minor. www.daff.gov.au/livestockexportstandards

Export Control (Animals) Orders 2004
These orders set out the arrangements under which the industry is regulated. The order is made under the Export Control Act 1982, and the Export Control (Animals) Regulations 1982. Other aspects are also made under the Australian Meat and Livestock Industry Act 1997. These orders provide the general framework by which the industry is regulated but it also contains quite specific guidelines relating to some areas of the industry. www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf

Marine Orders Part 43 (Issue 5)
The marine orders provide guidelines to the owners of vessels that transport livestock. They relate only to vessels that are Australian-registered or those that intend to participate in the export of livestock from Australia. Most of the guidelines relate specifically to the design and operation of the vessel. However, there are several key regulations that relate directly to livestock, particularly in regards to reporting mortality levels when they exceed reportable levels. Vessels operating from Australia require an Australian Certificate for the Carriage of Livestock (valid for the species of livestock to be carried). The marine orders have a particular interest in ensuring that "livestock services" are adequate and properly maintained. This relates to the penning arrangements, the delivery of fodder and water and the maintenance of the onboard environment. www.amsa.gov.au

Australian Position Statement on the Export of Livestock
The position statement provides a framework for the development of ASEL. It provides the guiding principles for the development of the Standards and ensures that the Australian

approach is consistent with that taken by international bodies (particularly the World Organization for Animal Health (OIE)). www.daff.gov.au/livestockexportstandards

Model Codes of Practice for the Welfare of Animals
Animal welfare codes have developed on a state by state basis and relate to different species and circumstances. In addition there is a set of national animal welfare codes giving rise to an initiative for the states to support a single national code. (various)

World Health Organization (OIE) Guidelines
OIE has a precise set of guidelines relating to the export of livestock. These guidelines are well considered and outcome based. The standards are consistent with OIE guidelines. https://www.oie.int/eng/bien_etre/AW_WG_december2004_eng.pdf

Industry Operating and Governance Manual
The industry operating and governance manual is designed to complement and support the industry standards. It enables exporters to detail their current practices and ensure that they meet the standards. They also draw together the regulatory requirements incorporated in the different industry guidelines.

Stockman's Handbook – Transport of Cattle by Sea (Short & Long Haul Voyages) - March 2006 (Ainsworth, 2006)
This is a very useful document designed to support stockman under the auspices of the 'stockman's program' operated by LiveCorp. It reflects the current thinking and experience of onboard stockmen and provides strong guidelines on how to manage key aspects of the export process (from the stockman's perspective). www.livecorp.com.au

1.1.2 Best practice recommendations (LHC)

Best practice recommendations that relate specifically to the long haul cattle trade include:

Best practice standards in the preparation and husbandry of export cattle (LIVE.102/103) (Ainsworth et al, 2000)
This study was an early attempt to document industry best practice and acted as a prelude to much of the industry regulation that exists today. The documentation drew heavily on industry experience with particular reliance on onboard stockmen. But the absence of industry specific research was soon evident and a scoring system was subsequently developed to assess the degree of scientific support for many of the recommendations. It is noteworthy that the vast majority of recommendations based on industry experience have been upheld by subsequent investigation (either through industry specific research and/or the identification of relevant research) with very few refuted or significantly changed. Furthermore, industry derived experience has generally supported those recommendations. Accordingly, this study remains an important benchmark against which industry progress can be measured.

Identifying current best practice in the export of young cattle to Israel (LIVE.204) (Ainsworth, 2001)
This study was commissioned after several incidents of high mortality rates in calves destined for Israel. The report identifies a number of practices likely to improve the outcome of transporting calves to Middle Eastern destinations.

Best practice use of veterinary drugs (LIVE.114) (Brightling, 2004)
This study focussed on the responsible use of veterinary drugs from the point of view of food safety. The project brief did not ask for any discussion of the appropriate use of veterinary drugs from a diagnostic perspective. Although stockman are usually supervised by a veterinarian in the

use of veterinary drugs during long haul cattle voyages, practices would be improved by development of a 'decision tree' approach to drug usage onboard. This approach would also assist inexperienced veterinarians.

1.1.3 Industry specific research (LHC)

Documented industry research that relates specifically to the long haul cattle trade includes:

Norris, RT, Richards, RB, Creeper, JH, Jubb, TF, Madin, B and Kerr JW (2003) 'Cattle deaths during sea transport from Australia' Aust Vet Jn 81: 156-161

LIVE.104A Influence of pre-delivery management on livestock exports (Purdie, 2001)

SBMR.002 Investigation of ventilation efficacy on livestock vessels (Stacey, 2001)

LIVE.209 Physiology of heat stress in cattle and sheep (Barnes et al, 2004)

LIVE.116 Development of a heat stress risk management model (Stacey, 2003)

LIVE.211 Practical ventilation measures for livestock vessels (Stacey, 2003)

LIVE.219 Wetting to alleviate heat stress on ships (Gaughan, 2003)

LIVE.233 Literature review of stocking densities on ship and in pre-export assembly depots (Petherick, 2006)

LIVE.218 Determining critical atmospheric ammonia levels for cattle, sheep and goats – a literature review (Costa, 2003)

LIVE.202 Decreasing shipboard ammonia levels by optimizing the nutritional performance of cattle and the environment on ship during live export (Acciolly, 2003)

LIVE.222 Developing alternative methods of measuring animal welfare on ships and in pre-export assembly depots (Phillips, 2005)

LIVE.223 Pilot monitoring of shipboard environmental conditions and animal performance (McCarthy, 2005)

LIVE.120 Identifying live animal condition score systems for the livestock export industry (Gaden, 2005)

LIVE.108 Desktop study of electrolyte products (Rose, 2001)

LIVE.224 Physiology of heat stress in cattle and sheep and electrolytes replacement therapy (Barnes et al, 2006)

LIVE.111 Evaluation and cost/benefit analysis of Rhinoguard vaccine in preventing Bovine Respiratory Disease in export cattle (More, 2003)

LIVE.121 Investigating options to modify the aggressive behaviour of entire male cattle (and other species) (Entwistle, 2005)

LIVE.122A Investigating curfew in the live export and processing industries (Petherick, 2005)

LIVE.228 Updating the biological assumptions in the industry heat stress risk assessment model (Stacey, 2005)

Figure 1. Industry framework

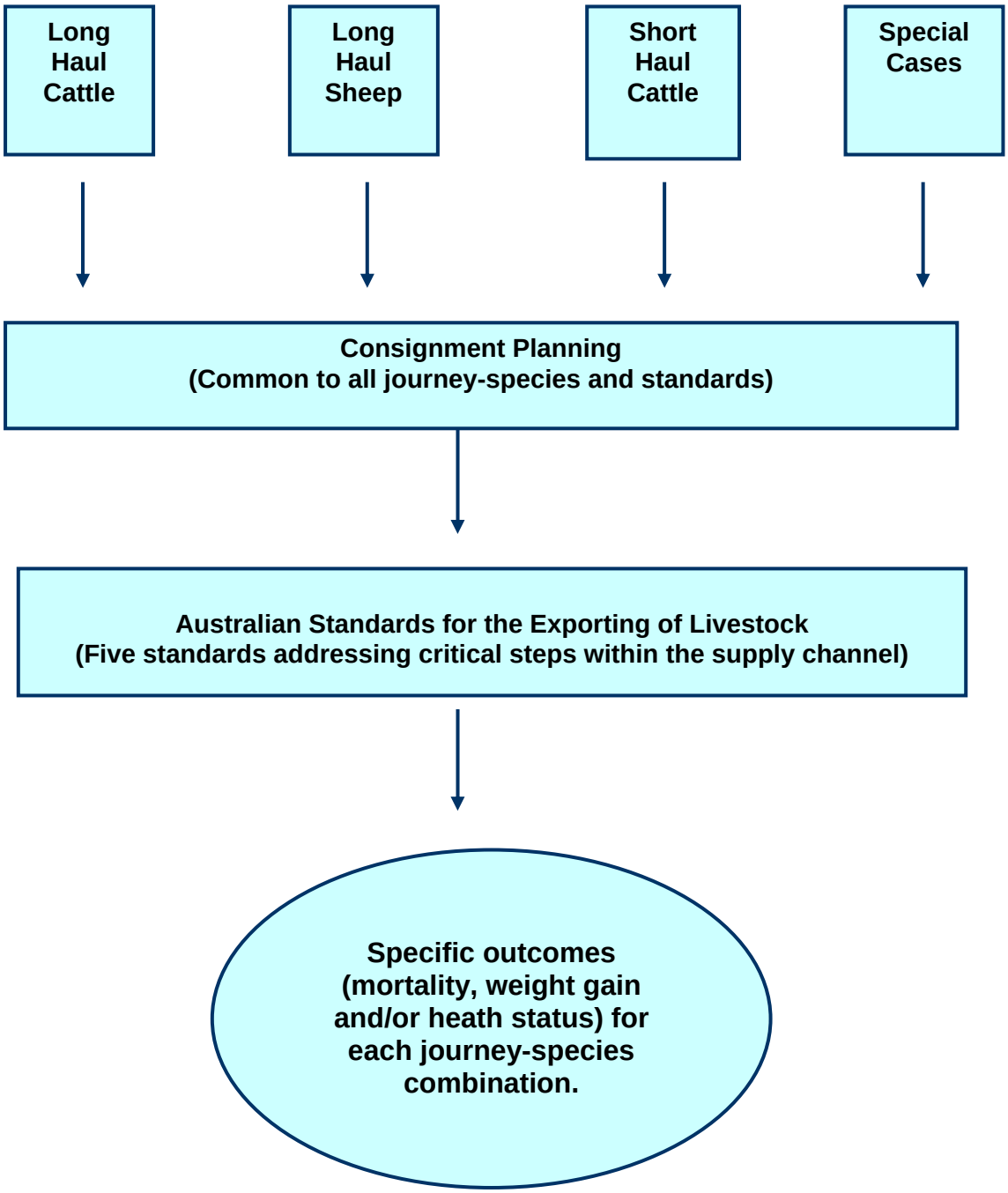
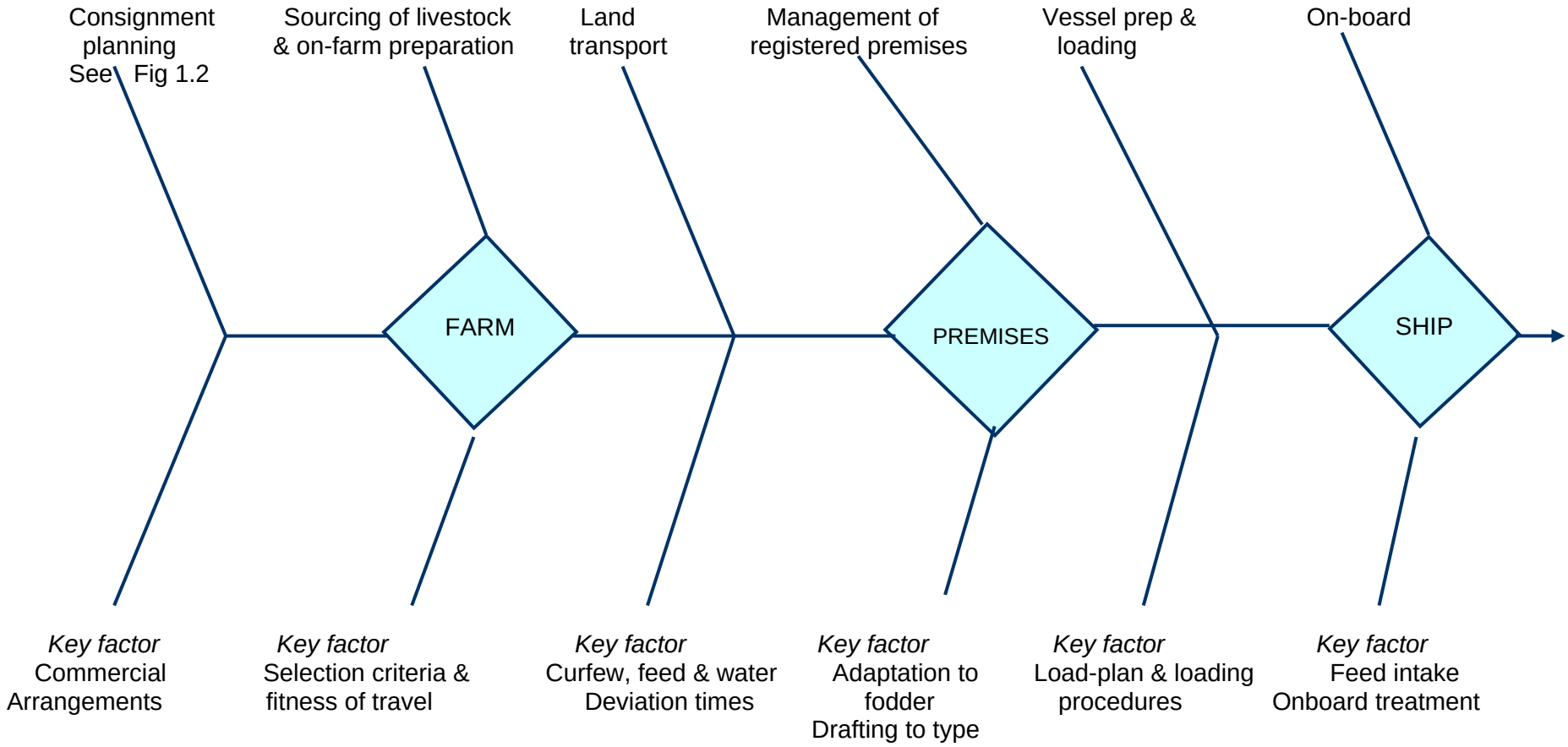


Figure 1.1: An Overview of the Long Haul Cattle Export Process



1.2 Consignment planning (LHC)

Consignment planning
Consignment planning is common to all livestock export projects – extending from farm of origin to port of disembarkation. The planning protocol takes in all phases of the project and is designed to bring about acceptable outcomes. Consignment planning (as outlined in the Industry Operating and Governance Manual) is described under the auspices of an approved export program. This activity is treated as an integral part of each export process, regardless of destination and/or the species involved.

Livestock exporting draws heavily upon the logistics and planning skills of the operator. It follows that 'good' planning is critical to achieving a good outcome.

Central to consignment planning is the requirement for a consignment to be conducted under the auspices of an approved export program. Details of this requirement can be found in the Export Control (Animals) Order 2004 (see 2.47 of the Order).

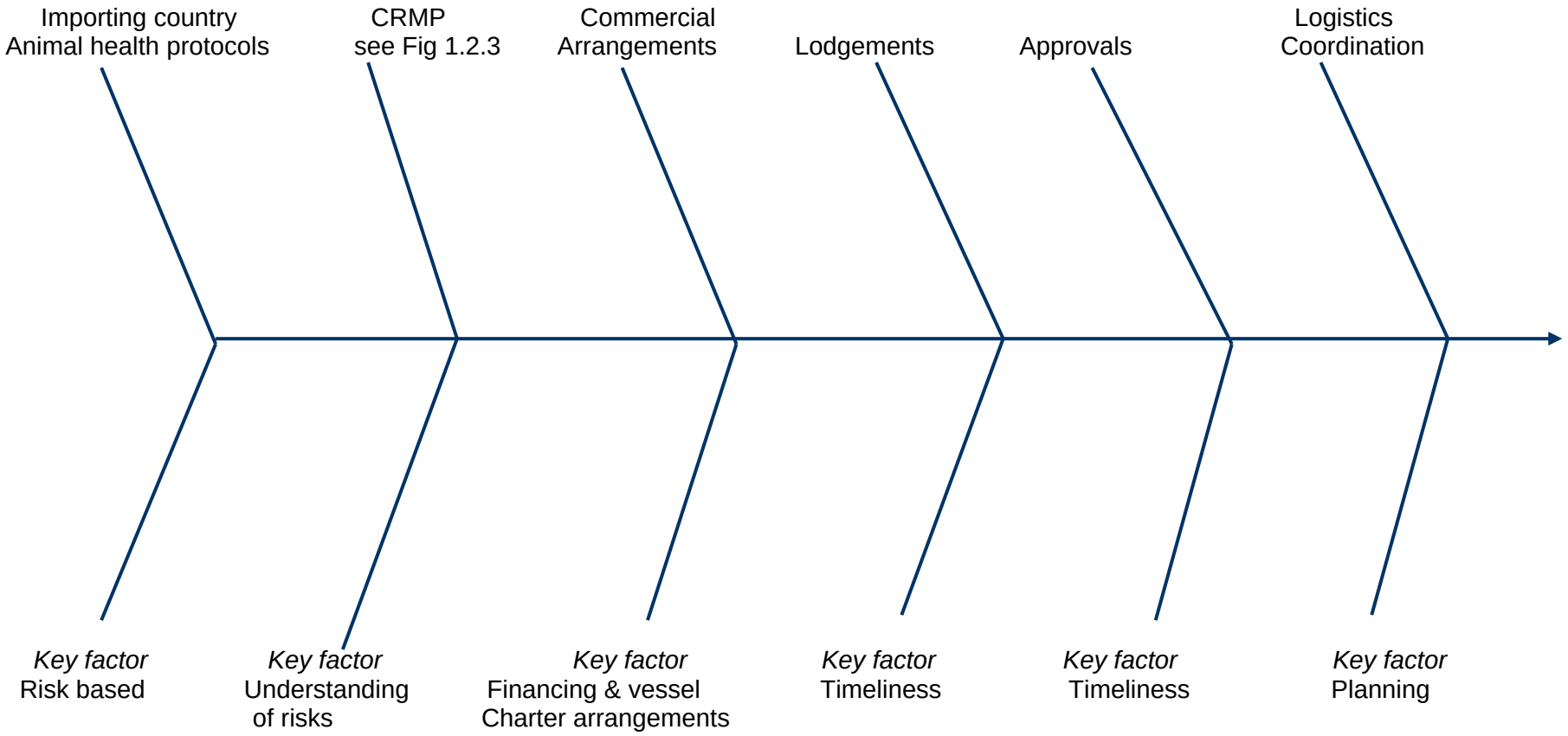
1.2.1 Determination of importing country's requirements

Importing country requirements
There is a large number of importing country animal health protocols with most being straightforward and consistent with current scientific knowledge. Several anomalies exist, however, where importing country requirements are not based on contemporary science and established principles of animal health. DAFF is currently responsible for any negotiations with host nations regarding protocols and there is an industry sub committee in place to address any anomalies. It is not intended that this project duplicate any of the work being undertaken by the sub-committee but there may be a place for MLA funded R&D to evaluate the risk implications of changes to protocols and/or to monitor or evaluate subsequent performance as a result of any changes.

Although industry practice is consistent with guidelines, there are instances where importing country protocols may adversely affect voyage outcomes. LIVE.204 noted that the importing protocols for calves destined for Israel (at the time the study was undertaken) appeared to more resemble "trade barriers than a logical attempt to protect the importing country from Australian bovine diseases" (Ainsworth, 2001). This study also noted that the "excessive" protocol requirements (particularly from the Eastern States of Australia) were "a contributing factor to poor onboard performance".

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (in some instances)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Sometimes adverse*
R&D priority:	*Medium*

Figure 1.2: Consignment planning (LHC)



1.2.2 Consignment Risk Management Plan (CRMP)

Consignment risk management plan
ASEL states in the planning phase, that:

> *…the exporter must specify the livestock to be sourced for export in the consignment risk management plan (CRMP). Only livestock sourced and prepared according to the approved CRMP should be presented for transport to registered premises (ASEL Overview Standard 1).*

A risk based approach is also consistent with the guiding principles provided by the Australian Position Statement on the Export of Livestock (see reference).

Reference to the CRMP is also made in the Export Control (Animals) Order 2004, which outlines specific guidelines for the detail required in the risk management plan (see 2.42 of the Order).

The major risks identified in the Order are:

- *Mechanical breakdown*
- *Food and water shortage*
- *Disease outbreak*
- *Extreme weather and*
- *Rejection of the consignment.*

These are very general headings that are neither species nor voyage specific. Much greater detail is required to demonstrate that the exporter has identified, defined and described the major risks associated with each of the major sectors of the industry. For example mechanical breakdown may involve the loss of power which may affect livestock services such as ventilation which has immediate and serious implications, or it may simply involve being stationary for period (which has implications for the budgeting of feed and water). Although disease is not usually a feature of the long haul cattle industry, there is an array of diseases that may feature in risk minimisation planning. ‘Extreme weather’ could refer to storm events but is more often it refers to extreme heat and humidity. Historically, few cattle consignments have been rejected but it remains a possibility, particularly with mixed consignments of sheep and cattle.

It is acknowledged that it is up to exporters to develop their own risk management plans. The onus is also on exporters to demonstrate that they have the capacity to manage events should they occur. But if the risk management approach is to be embraced by the industry, it requires pro-active support from the industry R&D program. It is suggested that this involve the following.

1. An active project that addresses existing research findings to ensure that they are presented in a way that meets industry needs and provides findings that are sufficiently developed to be applied as industry practice.
2. An active project that ensures that this information is readily accessible to exporters in a form that best meets the aims of a risk management approach.
3. A more general approach that ensures future research delivers findings consistent with risk minimisation and management of events should they occur.
4. A mechanism of continuous improvement that evaluates the appropriateness of recommended responses in the light of actual events if and when they occur.

N.B. These criteria may overlap with other research initiatives identified later in the document.
Much of the current focus of the CRMP is on risk minimisation. There is less detail in regards to the management of adverse events should they occur. Industry consultation found that exporters

differed in how they addressed this requirement. It is important that the CRMP be an effective working tool and not simply a “paper entry”.

Figure 1.2.2 identifies the major risks associated with the long haul export of cattle. There may be some overlap here with risks that are currently under investigation, and/or where completed research is revisited.

It would also be useful to have an incident response protocol that has the capacity to support onboard personnel should an incident occur. This is being addressed by LiveCorp and is discussed in more detail under the heading of contingency planning (1.7.6).

Industry guidelines:	*Exist*
Scientific support:	*Exists (more detail required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High (if properly utilised)*
R&D priority:	*High*

1.2.3 Commercial arrangements

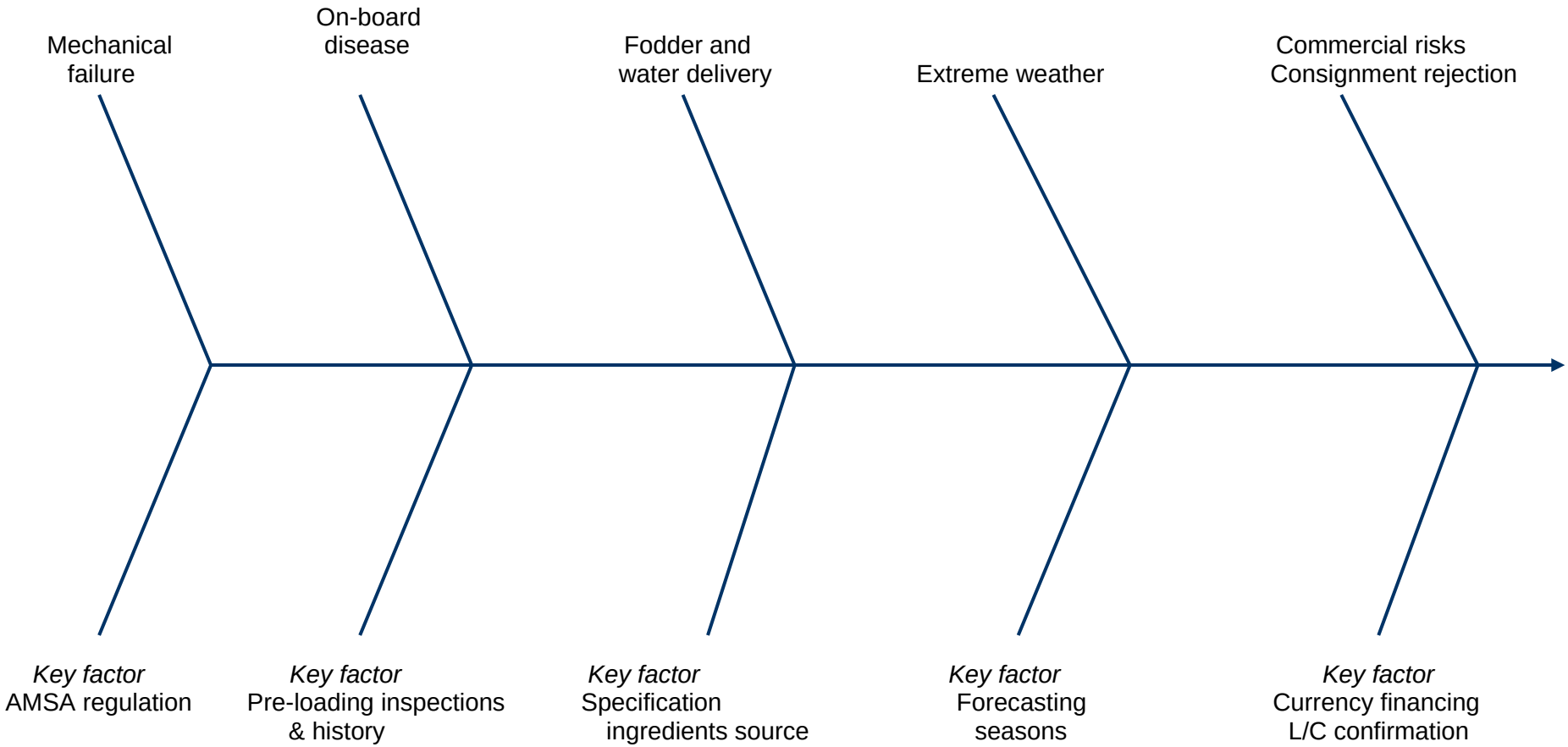
Commercial arrangements

The commercial arrangements and risk levels that will be tolerated by exporters vary considerably. While commercial arrangements are normally thought of as ‘off-limits’, the fact remains that poor outcomes are often linked to risky and poorly executed commercial arrangements that impose collateral stress on the whole export process. Last minute Letters of Credit, for example, will contribute to poor outcomes where they distract commitment from preparations that directly affect the welfare of the animals. Arrangements can be f.o.b., c.i.f. or f.a.s. etc, each of which affects jurisdiction and has implications with regards to risk. Thus an exporter who ‘delivers’ f.o.b. will have no commercial responsibilities once the livestock are loaded but from a regulatory perspective he or she will still be deemed responsible for their welfare to the point of disembarkation. It is important to note that some ASEL requirements apply to phases of the supply channel that are largely outside the control of exporters.

Commercial arrangements are not seen as an area that requires industry research and development. Industry guidelines in this area do not exist. If required, it is recommended that they be incorporated into the industry operating and governance manual.

Industry guidelines:	*Do not exist*
Scientific support:	*Not required*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.2.2: Consignment risk management plan (CRMP / LHC)



1.2.4 Lodgement of Notice of Intention (NOI) and CRMP

Lodgement of NOI and CRMP
There are several issues in regard to the timeliness of NOI and CRMP lodgement. In many cases, the NOI will not be lodged until many aspects of the commercial arrangements are already in place. This leaves the exporter at risk should the notice be denied. The timeliness of the lodgement and approval of the notice of intention is therefore critical. The requirement to lodge NOI and CRMP is outlined in the Export Control (Animals) Order 2004 (see 2.43 of the readers guide) but makes no reference to the issue of timeliness.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.2.5 Approval procedures

Approval procedures
As mentioned previously, the timeliness of the lodgement and approval of the notice of intention is important. The requirement to lodge NOI and CRMP and the receival of subsequent approval is outlined in the Export Control (Animals) Order 2004 (see 2.44 and 2.45 of the reader's guide).

Industry guidelines:	*Not required*
Scientific support:	*Not required*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.2.6 Test and treatment schedules

Planning of test and treatment schedules
Guiding principles that relate to test and treatment schedules undertaken within the industry are contained in the industry operating and governance manuals. However, ASEL also states that:

> *….a record of all vaccines, veterinary medicines and agricultural chemicals used to vaccinate or treat livestock sourced for export must be kept for at least two years after the date of export (ASEL S1.25).*

Industry practice is consistent with this requirement.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

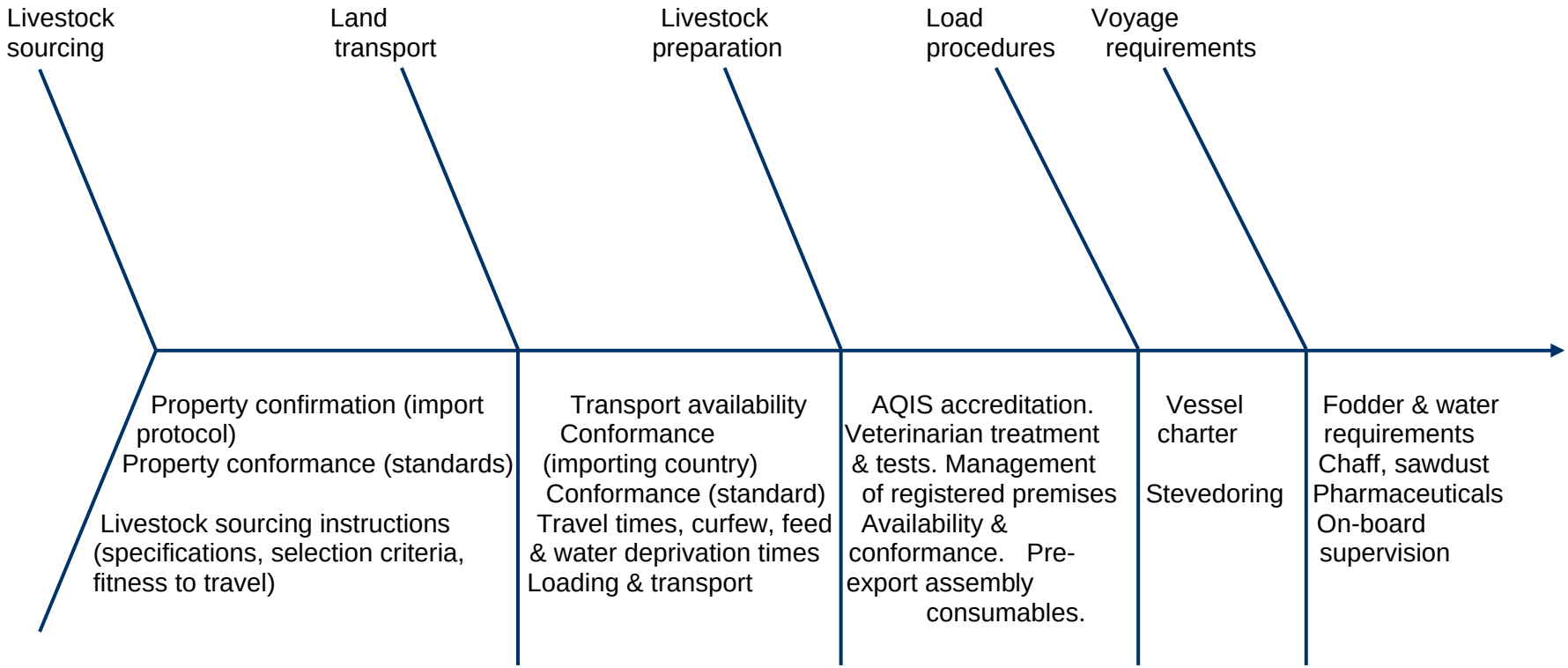
1.2.7 Logistics co-ordination

Logistics co-ordination

Guidelines relating to the industry logistics co-ordination are outlined in the industry operating and governance manual. This is performed under a number of subheadings including livestock sourcing, land transport, livestock preparation, loading and voyage. Most of the issues addressed in this section are operational in nature. A schematic of the operating procedures is provided in Figure 1.2.7.

Industry guidelines:	*Exist (Industry operating and governance manual)*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.2.7 Logistics Co-ordination – Pre- Export Planning (LHC)



1.3 Sourcing of livestock and on-farm preparation (LHC)

Overview
ASEL addresses the sourcing of livestock and on-farm preparation in Standard 1 and states that:

> *…this part of the export chain encompasses the sourcing of livestock for export by sea and their on-farm preparation, up to the point of loading and transport to registered premises.*

ASEL also states that:

> *…exporters must source suitable livestock that meet consignment specifications such as species, class, condition, animal health status and number of livestock. Animal health and production records may be required to confirm the eligibility of proposed consignments of livestock for export.*

Guiding principle (ASEL Standard 1)
ASEL states that:

> *…sourcing of appropriately prepared livestock that are fit to travel is critical to successful heath and welfare outcomes during export (ASEL Standard 1).*

Required outcomes (ASEL Standard 1)
ASEL states that:

> *…livestock sourced for export must meet any requirement under a law of a state or territory relating to the sourcing of livestock. State and territory governments are responsible for ensuring that these requirements are met.*
> - *Livestock sourced for export must meet ASEL Standards and importing country requirements.*
> - *Livestock sourced for export that become sick or injured during on-farm preparation must be excluded from export and arrangements must be made for their prompt and humane handling and care.*
> - *The Australian Quarantine and Inspection Service (AQIS) must be satisfied that these Standards and importing country requirements are met before issuing a health certificate and export permit.*

1.3.1 Selection criteria – buyer/selector

Conformance to Model Codes of Practice
ASEL states that:

> *…livestock sourced for export must meet any animal health and welfare requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL S1.1).*

The model codes of practice are being constantly reviewed and there are moves to amalgamate many state codes into one set on National codes under the National Welfare Strategy. It is assumed that the model codes of practice have been developed with due consideration for all available science and industry experience. This does not necessarily mean that all aspects have

been subjected to industry specific research. Like ASEL, the Model Codes do not cite specific scientific support, and they assume that the rationale behind each requirement is self-evident.

Industry guidelines:	*Model codes are under review*
Scientific support:	*Industry specific support lacking in many instances*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Can be high*
Affect on welfare outcome:	*Can be high*
R&D priority:	*Low (monitor developments)*

Conformance to import permit and protocol requirements
ASEL states that

> *…livestock sourced for export must meet importing country requirements (ASEL S1.2).*

In practice this relates to the conditions of the import permit and any protocol requirements. Issues relating to importing country protocol requirements have been addressed earlier (in section 1.2.1).

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (in some instances)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Sometimes adverse*
R&D priority:	*Medium*

Conformance to food safety requirements
ASEL states that:

> *…livestock sourced for export and intended for human consumption must comply with Australian food safety requirements, including standards for chemical residues and environmental contamination (ASEL S1.4).*

To assist in addressing this issue, the industry commissioned the publication “Best practice use of Veterinary Drugs” (LIVE.114) (Brightling, 2004) which is readily available to the industry. Issues relating to food safety and withholding periods have been well addressed by the industry with treated animals being kept isolated and/or identified and treatment histories forwarded to receivers on delivery.

Industry guidelines:	*Exist*
Scientific support:	*Exists (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Body condition (assessment)

The industry commissioned a study (Gaden, 2005) that identified a live animal condition scoring system for the livestock exports (LIVE.120). Previously there was some variation in scoring systems between states but LIVE.120 has addressed this problem and provided a valuable reference for the industry. There is no contention in regards to the way in which body condition is assessed.

Industry guidelines:	*Exist*
Scientific support:	*Exists (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Body condition
ASEL states that:

> *…fat bos taurus cattle must not be sourced for export from the ports of Darwin, Wyndham and Weipa from October 1st to December 31st (inclusive) (ASEL S1.5).*

and that:

> *…livestock must not be sourced for export if they are in an emaciated or overfat body condition. That is, cattle (and buffalo) must be from condition scores 2 to 6 (inclusive) (on a scale of 1 to 7). Pregnant cattle must be from condition score 3 to 6 (inclusive) (on a scale of 1 to 7).*

Consultation indicated that cattle with very high condition score (condition score 7) are unsuitable to travel on long haul voyages. There was some suggestion, however, that higher-level management techniques (***with further discretional approval***) may allow these animals to be exported under some circumstance.

Note that the restriction in regards to low condition score cattle is higher for pregnant cattle. This is consistent with industry practice where fodder rationing to maintain udder function is often undertaken and recognises the higher energy demands of pregnant cattle.

There is no industry specific research that supports the restrictions in regard to body condition, except for those established by the literature review investigating heat stress, SBMR002 (Stacey, 2001). Restrictions would appear to be based on industry derived experience.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific research lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Weight range
ASEL states that:

> *…cattle (and buffalo) sourced for export must have an individual weight of more than 200 kg and less than 650 kg, or if outside these weights, have written approval from the relevant government agency (ASEL S1.8 and S1.9)*

Maximum acceptable weight has been a contentious issue. Very large animals are less agile and need additional care. They are also difficult to pen to their exact allocation of area and they find it relatively difficult to mill within the pen. These animals also tend to have a higher body condition. The issue of weight is also important since it leaves open scope for the exercise of ***discretionary approval*** by the relevant government agency (in this case AQIS). Investigation is required into how animals (that fall outside the weight restrictions) might be managed to achieve a satisfactory outcome. This work would provide firm guidelines regarding the conditions needed to gain approval to allow exporters to export cattle that fall outside the specified weight range and would develop principles associated with discretional approval.

The industry also has completed a study entitled "Identifying current best practice in the export of young cattle to Israel" (LIVE.204) (Ainsworth, 2001). This study was commissioned in response to several high mortality incidents in calves destined for Israel. The report identified a number of practices likely to improve outcomes for calves transported to Middle Eastern destinations.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Weaning status
ASEL states that:

> *…cattle (and buffalo) must have been weaned at least 14 days before sourcing for export (ASEL S1.8 and S1.9).*

Industry consultation indicates that this requirement is well understood by industry and consistent with industry practice.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Pregnancy status
ASEL states that:

> *…cattle (and buffalo) sourced for export as slaughter and feeder animals must have been determined not to be pregnant (see ASEL S1.8 for criteria). ASEL also states that cattle sourced for export for breeding must be pregnancy tested and be no more than 190 days pregnant at the scheduled date of departure. Buffalo sourced for export for breeding must be pregnancy tested and be no more than 220 days pregnant at the scheduled date of departure (See ASEL S1.9 for criteria).*

Industry consultation indicated that the requirement for certain categories of livestock to be pregnancy tested is well understood and consistent with industry practice, despite there being no industry specific research being undertaken. Restrictions are based on industry derived experience and are consistent with recommendations from the best practice management of dairy cattle (McCarthy, 2002). The reference to days (rather than months) is more specific than earlier wording. Although the number of female cattle exported is not large, the record of accuracy and compliance has been good. There is some industry contention in regards to who is eligible to conduct pregnancy testing.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Low*

Heat tolerance
ASEL states that:

> *…..Bos taurus cattle, bred in an area of Australia south of latitude 26 degrees south must not be sourced for export to the Middle East from May until October unless an agreed livestock heat stress assessment indicates that the mortality risk is manageable (less than 2% risk of 5% mortality) (ASEL S1.5A).*

Issues relating to thermo-regulation and heat stress are addressed later in this document (see section 1.7.2). The use of the “industry heat stress risk assessment” model is an established practice within the industry.

Horn status (length)
ASEL states that:

> *….Horned cattle (and buffalo) must only be sourced for export as slaughter or feeder animals:*
> - *for cattle, if the horns are 12 cm or less in length and blunt*
> - *for buffalo, if the horns are no longer than the spread of the ears and blunt and*
> - *if dehorned, the wounds are healed.*
>
> *Otherwise, horned cattle and/or buffalo must only be sourced for export with the approval of the relevant Australian Government agency.*

This is further area where ***discretionary approval*** is available. However, most exporters agreed that it was not desirable to ship "untipped" cattle. The relevant Australian Government Agency is AQIS and again it would assist the industry if there were clear guidelines as to the conditions that would allow an exporter to gain approval.

There has been some contention about the way that horn length is measured. The provision of industry guidelines in regards to this matter would also be useful. The issue of horn length and segregation remains contentious and is addressed later in this document (section 1.4.2).

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Medium*

Other
Pre-shipping factors affecting the transport of cattle are discussed in the Stockman's Manual (see page 10). The selection criteria named above are important to achieving satisfactory outcomes.

1.3.2 Fitness to travel – buyer/selector

Fitness to travel criteria
ASEL provides a list of 'unfit' conditions to ensure that only fit cattle are selected for entry into the live export chain. Of particular concern are those conditions that may develop after animals have been selected. Condition such as ringworm and lice may be undetectable at the time of selection but develop subsequently and cause serious problems later in the export process. Pinkeye is another condition that may flare up after selection.

Most of the conditions named on the 'unfit' list are self-evident and industry consultation indicates that exporters readily accept the criteria since selection of only those animals that are fit to travel is important to a successful voyage. Ringworm (in dairy cattle) was addressed specifically in LIVE.113.

The fitness conditions are outlined in table 1.3.2.

Table 1.3.2 Fitness to Travel Criteria (LHC)

Fitness to travel – "unfit criteria" (Long Haul – Cattle)			
Unfit criteria (as per ASEL S1.7)	Scientific Support	Industry Consensus	R&D priority
General requirements (See ASEL S1.7)	Exists*	Consensus	Low
Lethargy, weakness, ill-thrift, dehydration.	Exists*	Consensus	Low
Anorexia (on farm)	Exists*	Consensus	Low
Lameness or abnormal gait	Exists*	Consensus	Low
Abnormal soft tissue or bony swellings	Exists*	Consensus	Low
Scouring, dysentery, profuse diarrhoea	Exists*	Consensus	Low
Bloat	Exists*	Consensus	Low
Nervous signs (eg head tilt, circling)	Exists*	Consensus	Low
Abnormal or aggressive behaviour	Exists*	Consensus	Low
Generalised papillomatosis	Exists*	Consensus	Low
Ringworm or dermatophilus	Exists* Yes (LIVE.113)	Consensus	Low
Generalized buffalo fly lesions	Exists*	Consensus	Low
Generalized skin disease	Exists*	Consensus	Low
Visible external parasites	Exists*	Consensus	Low
Significant lacerations	Exists*	Consensus	Low
Wounds or abscesses	Exists*	Consensus	Low
Pinkeye	Exists*	Consensus	Low
Cancer eye	Exists*	Consensus	Low
Blindness	Exists*	Consensus	Low
Abnormal nasal discharge	Exists*	Consensus	Low
Coughing or respiratory distress	Exists*	Consensus	Low
Bleeding horn stumps	Exists*	Consensus	Low
Excessive salivation	Exists*	Consensus	Low
Mobs with unusual mortality	Exists*	Consensus	Low
Mobs with large disparity in size and/or age	Exists*	Consensus	Low

* The justification for these criteria is self evident and supported by veterinary texts

Industry guidelines: *Exist*
Scientific support: *Exists (veterinary texts)*
Industry consensus: *Consensus*
Impact on operational procedures: *High*
Affect on welfare outcome: *High*
R&D priority: *Low*

1.3.3 Test and treatment schedules

Planning of test and treatment schedules
Guiding principles that relate to test and treatment schedules undertaken within the industry are contained in the industry operating and governance manuals. However, ASEL also states that:

> *….a record of all vaccines, veterinary medicines and agricultural chemicals used to vaccinate or treat livestock sourced for export must be kept for at least two years after the date of export (ASEL S1.25).*

Industry consultation indicated that this is an accepted practice underpinned by Livestock Production Assurance.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.3.4 Livestock identification

Livestock identification
ASEL states that:

> *….livestock sourced for export must be:*
> - *identified to the property of source*
> - *accompanied by a correctly completed and signed declaration as to the identification of the livestock and the property of source and*
> - *individually identified where testing is required during preparation (ASEL S1.3).*

The National Livestock Identification System (NLIS) allows tags to be read electronically. Whilst this can provide a comprehensive history for the animal, the system has yet to be fully utilised by participants in the long haul cattle industry. Large visual tags are preferred to allow for individual identification in assembly paddocks and in pens onboard the vessel. This is an area, however, where technological advances have been made and research would be valuable that identifies its direct application to the industry.

The industry should be aware of the aims and operation of NLIS as it is likely, over time, to engage in more detailed trace-back and monitoring activities. Livestock identification and associated history will provide important feedback about factors affecting voyage outcomes. Efforts to develop trace-back and identification procedures would be of benefit to the long haul cattle industry. Similar efforts are being undertaken in the long haul sheep trade. Livestock identification is a tool that can be used to enable epidemiological studies to be undertaken.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific research lacking (investigation required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.3.5 Pre-loading

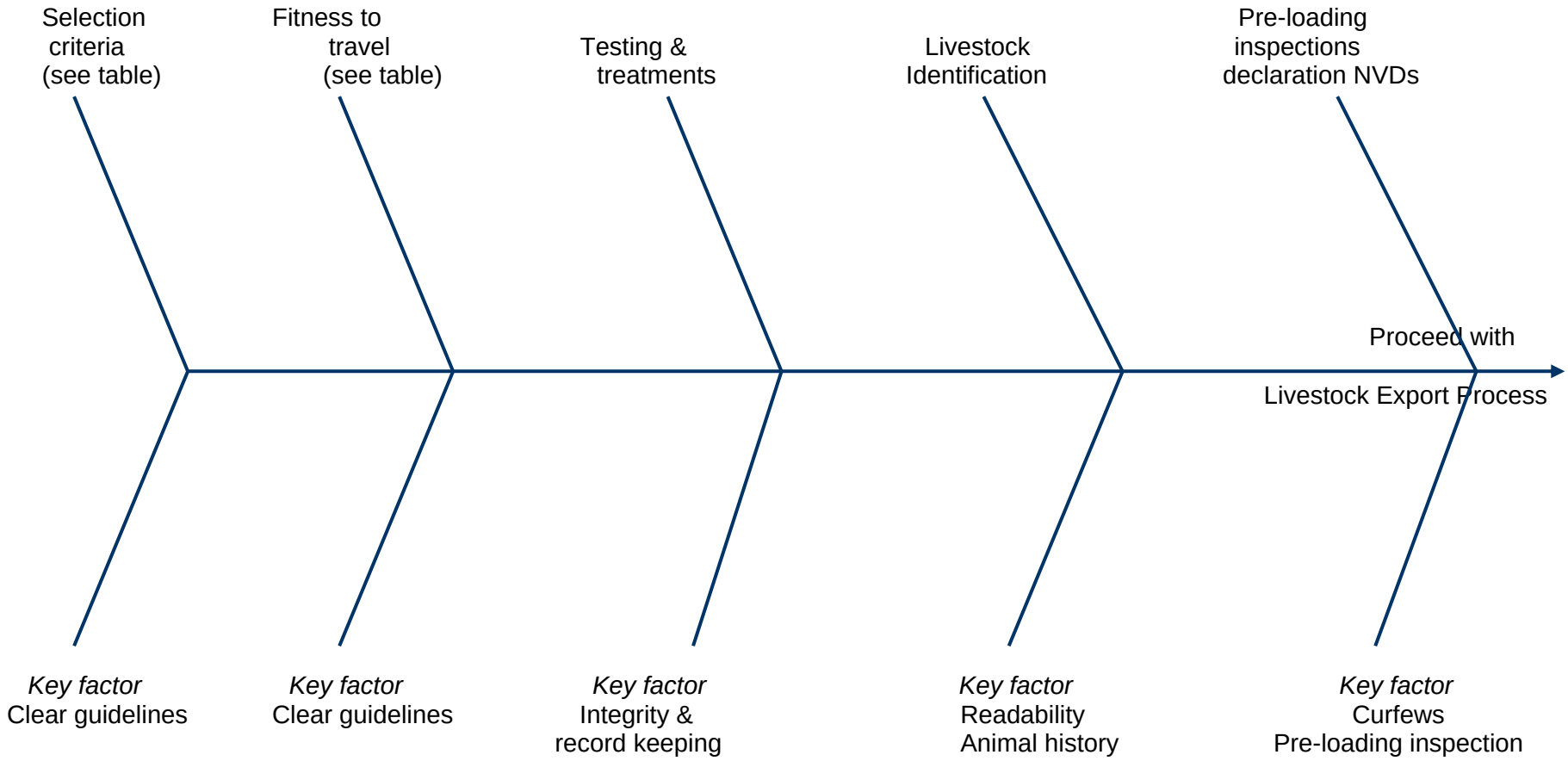
Pre-loading inspection and check
This is not always practical or feasible particularly where small numbers of livestock are drawn from a large number of properties.

Industry guidelines:	*Does not exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Vendor documentation
National vendor, buyers' declaration and the source property declaration are all utilised by the industry (see later section).

Industry guidelines:	*Exist (see later section)*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.3: Sourcing of Cattle and On-Farm Preparation (LHC)



1.4 Land transport of livestock intended for export (LHC)

Overview
ASEL states that:

> *…the land transport phase begins when the first animal is mustered and ends when the last animal is unloaded at the completion of the journey. Thus 'transport' includes:*
> - *pre-loading mustering and yarding*
> - *any stationary resting or holding periods*
> - *transport of livestock from the property of source to registered premises and*
> - *subsequent transport from registered premises to a point of embarkation.*

ASEL also states that:

> *…the health and welfare requirements of livestock must be addressed throughout the whole of the land transport phase in the export chain. Livestock presented for land transport must be fit to travel and accompanied by documentation that allows the livestock to be traced to their property of source.*

ASEL also describes the responsibilities for the health and welfare of livestock during the land transport phase as follows:

- *Exporters of livestock are responsible for the general health and welfare of the livestock until they are loaded. They are also responsible for the livestock's fitness for the intended land transport.*
- *Exporters of livestock must ensure that livestock selected are fit to travel. Agents of exporters have a joint responsibility at the start and at the end of the journey to ensure the availability of suitable facilities for the assembly, loading, transport, and unloading and holding of livestock. Agents are also jointly responsible for dealing with emergencies.*
- *Exporters must be able to demonstrate that the transport of the livestock complies with these Standards, importing country requirements, and any relevant risk mitigation measures documented or referred to in the approved consignment risk management plan.*

Guiding principle (ASEL Standard 2)
ASEL also states that:

> *…land transport is planned and undertaken on a competently operated and suitable vehicle, with the livestock being handled in a manner that prevents injury and minimises stress throughout the journey.*

Required outcomes (ASEL Standard 2)
ASEL states that:

> *….the required outcomes include that:*
> - *Only livestock fit to travel are presented for loading*
> - *Livestock are loaded in a manner that prevents injury and minimises stress*
> - *Transport of livestock is undertaken in a manner that meets the standards, any requirements of a state or territory relating to the transport of livestock and importing country requirements*
> - *Livestock are unloaded in a manner that prevents injury and minimises stress.*

ASEL also states that:

> *…the land transport of livestock for export must meet any relevant animal health and welfare and road transport requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL S2.1)….and that*
>
> *…the land transport must meet any importing country requirements for the land transport phase in the export chain (ASEL S2.2).*

1.4.1 Travel plans

Travel Plans
ASEL states that:

> *..the land transport must be undertaken in accordance with a travel plan. This travel plan must be completed for all interstate journeys greater than two hours and journeys of more than eight hours duration (ASEL S2.3).*
>
> *Each plan must address the following:*
> - *species, class, condition and number of livestock;*
> - *transport vehicles;*
> - *loading densities and penning requirements;*
> - *duration of the journey, including rest periods for driver and livestock;*
> - *the method of loading and unloading of the livestock;*
> - *inspection of livestock before loading;*
> - *the feed and water requirements and curfew times applicable to the livestock under this Standard, including to livestock sourced from saleyards;*
> - *the expected weather conditions before and during transport;*
> - *the route and the types of roads traversed;*
> - *completion of vendor declarations or waybill regarding the property of source and the time of departure; and*
> - *contingency plans for managing transport breakdown, accidents, escapes, deaths, downers and injuries.*

ASEL also states that:

> *Livestock must not be loaded until the travel plan is completed (ASEL S2.12). The following documentation must accompany each load of the consignment:*
> - *a signed declaration as to the identification of the livestock and the property of source and*
> - *a journey log that commences at loading, is maintained through the journey and finalised on completion of unloading, and is used to record the actual journey details.*
>
> *The livestock transport driver must be aware of the travel plan prior to commencement of the journey and the documentation relating to each consignment must be kept for at least two years after the date of export.*
>
> *Preparation for transport must also address the guidelines in regards to provision of feed and water, mustering rest times, vehicle requirements and handling facilities outlined in Appendix 2.3 of the ASEL (ASEL S2.4).*

ASEL states that:

> *…livestock must be inspected prior to loading and any animal showing signs consistent with the rejection criteria in Standard S1.7 of Standard 1 – Sourcing and on farm preparation of livestock, or any other condition that could cause the animal's health and welfare to decline during transport or export preparation, must not be transported (ASEL S2.11).*

Most of these requirements are operational and do not lend themselves to research and development. Some aspects may, however, have an affect on welfare outcome, particularly such things as contingencies for managing transport breakdowns, accidents, escapes, deaths, downers and injuries. For the most part they do not require any scientific support. Industry consultation did not identify any contentious issues in this area. Rejection criteria are addressed elsewhere in the document.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Livestock preparation for transportation

ASEL states that:

> *…livestock must be mustered and handled in preparation for loading in a way that maintains their health and welfare and fitness for travel. For example, where the journey will take more than 24 hours, provision of suitable feed and water and rest for at least 12 hours close to the loading facility must be provided. Before commencement of any curfews and where livestock are mustered by helicopter or light plane, provision of suitable feed and water and rest for at least 24 hours before commencement of any curfews is required. Holding areas for livestock before loading for land transport must securely contain the animals and maintain a safe environment (ASEL Appendix 2.1).*

Industry consultation did not identify any issues with this heading and statement. This requirement is based on industry derived experience. Scientific support would require the ability to link performance to pre-delivery management. This is under development in the live sheep export trade (see relevant appendix). The ability for the live cattle trade to accomplish the same ends would be of benefit to the industry.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Water deprivation times

Water deprivation times are outlined in Appendix 2.1 of ASEL. This has been a contentious issue since coming under scrutiny by animal welfare lobbyists. Steps have also been taken in both Europe and the US to address (and standardise) water deprivation times for most species of livestock.

The time limit (as defined by ASEL in Appendix 2.1) for any given journey by livestock and the requirement for rest periods are primarily determined by the maximum time that animals can be deprived of access to adequate water of a quality to maintain good health and welfare. This is termed the *water deprivation time*.

ASEL describes the water deprivation time as:

> *…. the total continuous period of water deprivation, starting when stock last had access to water, and must include:*
> - *time off water during mustering;*
> - *time off water when yarded after mustering;*
> - *curfew or 'empty out' time (see below);*
> - *all time on the vehicle, whether moving or stationary; and*
> - *any time without water after unloading, such as at a saleyard, spelling centre or registered premises.*
>
> *Curfew* or *empty out* time is the "*deliberate and variable period of water and/or 'green' fresh feed deprivation intended to minimise faecal and urine spoilage of the transport vehicle, subsequent problems with animals slipping, and contamination of the environment*".

The maximum water deprivation times and rest period requirements are described in Appendix 2.1 of ASEL. If animals of any species become dehydrated, precautions need to be taken to ensure that they do not gorge themselves when given access to water.

The Australian 'Model Code of Practice for the Land Transportation of Cattle' gives water deprivation times for different classes of cattle. Live export by sea involves "mature" stock weighing at least 200 kg.

ASEL states that:

> *…the maximum (normal) water deprivation time for cattle (mature stock) is 36 hours. The extended water deprivation time for cattle (mature stock) is 48 hours.*
>
> *Extended water deprivation times are permissible if and only if:*
> - *animals are travelling well and not showing signs of fatigue, thirst or distress;*
> - *adverse weather conditions are neither prevailing nor predicted;*
> - *the extension will allow the journey to be completed within a 48 hour period of water deprivation, and the animals are to be rested with water and feed for at least 18 hours immediately upon arrival at the registered premises; and*
> - *the journey's duration, excluding time off water before loading onto the transport vehicle, is less than 14 hours (ASEL Appendix 2.1).*

Science to support or otherwise the declared water deprivation times is not yet evident in the industry specific record. A study into the management of pre-delivery stress in live export steers (LIVE.301) (Fitzpatrick, 2004) did not address water deprivation times but did highlight the difficulty in determining a useful indicator of stress. LIVE.301 did, however, conclude that

provision of water at the point of destination was adequate for correcting dehydration incurred during transportation. In the absence of a measurable indicator, observable signs of distress such as fatigue or thirst are the only reliable indicators of the animal's welfare. Furthermore, the results of current research (MLA Project AHW.055 ~ Animal Welfare Outcomes of Livestock Road Transport Practices) will, in part, address this knowledge gap. A recent report commissioned by MLA (Cataloguing Land Transport Science and Practices in Australia, AHW.126) has indicated that further work is needed in this area.

Industry guidelines:	*Exists*
Scientific support:	*Lacking (under investigation AHW.005)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Unclear*
R&D priority:	*High (monitor project developments)*

Feed and water curfews
ASEL states that:

> *…livestock must be held off green feed (but may be given access to dry feed) for at least 12 hrs and may be held on water (but may be given access to dry feed) for up to 12 hrs before loading (ASEL S2.8).*

Curfews in the live export and processing industries are currently under investigation (LIVE.122A) (Petherick, 2006). This is an important issue as curfew can disrupt the passage of ingesta, which then leads to gastrointestinal disturbances. Quantifying the benefits of pre-transport curfews is recognised as a significant knowledge gap. The recommendations identified in the review (LIVE.122A) will be influential in any future research of the effects of pre-transport curfews in livestock. Additional research into the development of pre-transport curfew best practice needs to be considered. Curfews are an integral part of water deprivation periods and to this extent should be considered in conjunction with the issues identified in the previous section. The approach may be slightly different in that water deprivation times are likely to be viewed in terms of tolerance, whereas investigation into curfew periods would focus more on the effects on rumen function and other productivity and/or health related issues.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (under investigation LIVE.122A)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Rest periods
ASEL states that:

> *…cattle older than six months must be spelled for 12 to 24 hours after each 36 hours water deprivation time for a normal journey, or for 36 hours after journeys of 36 to 48 hours.*

Industry consultation did not identify any issues with this heading but there is no apparent scientific support in the industry specific research.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low (except in rare cases)*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.4.2 Loading procedures

Loading procedures
Guidelines on loading for transport are provided in ASEL S2.10.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low (except in rare cases)*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Segregation (trucking)
ASEL states that:

> *…when livestock are loaded for transport by land:*
> - *animals of different species must not be mixed in a single pen;*
> - *classes of animals of the same species must not be mixed if there is a likelihood of aggression or injury to other animals;*
> - *young animals must be separated from older animals;*
> - *animals of a dissimilar size must be separated; and*
> - *animals with horns must not be mixed with animals lacking horns.*

The guidelines stipulate five possible bases for segregation but there are rarely this many divisions within a stock crate and often fewer in holding facilities prior to trucking. There is also some dispute over when cattle actually enter the livestock export chain, since there may be drafts of animals that finish in different destinations. Clearly the guidelines need to be revised to take into account segregation limitations and to present operators with practical loading combinations that minimise 'mixing risks'. This is particularly the case with horned (and/or dehorned) animals since the reference to animals with horns refers to dehorned cattle (with horns less than 12cms and blunt). In this case, segregation on the basis of size and age is likely to be far more important than segregation on the basis of horns. Regulating authorities have chosen to take a literal interpretation of the standards in this instance, which is perhaps contrary to the spirit in which they were developed.

R&D to determine the relative impact of different types of segregation would be of great benefit to the industry. This would enable operators to optimise segregation options. Further suggestions as to how the R&D might be structured are made later in the report.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low (in many cases)*
R&D priority:	*High*

Handling

ASEL S2.14 makes specific reference to how animals should be handled to prevent injury and minimise stress. There are specific guidelines relating to the use of prodders, rattles and working dogs. There is little contention in regards to these aids and industry practice is consistent with the guidelines.

Industry guidelines:	*Exists*
Scientific support:	*Exist (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Penning arrangements

ASEL states:

> *…the land transport of livestock for export must meet any relevant animal health and welfare and road transport requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL Appendix 2.2).*

Loading density and penning arrangements for the land transport of livestock must conform to stocking densities and penning arrangement outlined in this appendix.

ASEL Appendix 2.2 states that:

> *…loading densities are determined according to the average liveweight, condition, size, shape and horn status of the livestock, as well as the prevailing conditions and the distance animals are to be transported. Numbers may be varied, provided the welfare of the livestock is not compromised and the following principles are applied:*
> - *loading rates must be assessed for each pen or division in the stock crate;*
> - *five per cent fewer livestock should be loaded if livestock are horned;*
> - *in hilly and more populated areas, where road vehicles change speed relatively frequently, sufficient internal partitions must be used and numbers varied accordingly; and*
> - *when fewer livestock per pen than in the tables below are transported, firmly fixed portable partitions must be used.*

The issue in regards to horns is again contentious since it actually refers to cattle that have been tipped and whose horns are blunt. It has not yet been established that the behaviour of tipped cattle causes unnecessary distress to their peers and/or polled animals. This is currently under investigation.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus (except for the issue of horns)*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Unclear*
R&D priority:	*Medium*

Loading densities
Truck loading densities for cattle are outlined in Table A2.2.1 of Appendix 2.2 in ASEL. It is assumed that liveweight refers to an industry standard curfew of 12 hours although this is not specified. Consultation with industry indicates that practices are consistent with these densities.

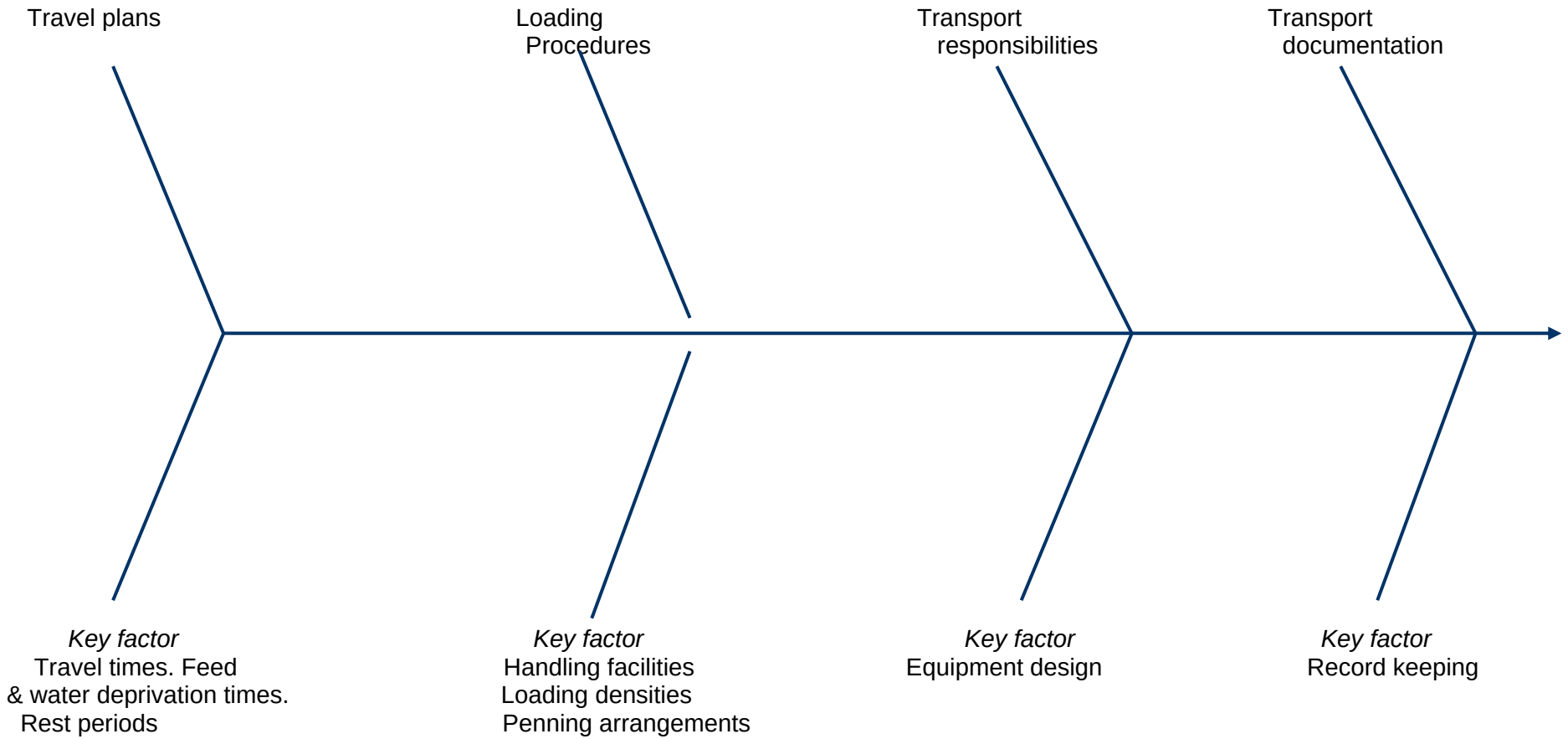
Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Unclear*
R&D priority:	*Medium*

1.4.3 Transport responsibilities

Transport responsibilities and documentation
The industry standards offer further guidelines relating to responsibilities, trucking procedures and facilities (ASEL S2.15-S2.24).

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.4: Land Transport of Cattle intended for Export (LHC)



1.5 Management within registered premises (LHC)

Overview
ASEL states that:

> *… the assembly of livestock for export commences with the unloading of the first animal into the premises and ends with the departure of the last animal from the premises, whether or not passed as fit for export. Livestock must be held in secure premises for a sufficient period of time to enable recovery from land transportation and to meet importing country requirements. Preparation of livestock must comply with this Standard. Livestock must also be inspected and deemed fit to travel before leaving the premises.*
>
> *Where premises are used for holding and assembling livestock for export, such premises must be registered in accordance with the legislation. Operators of registered premises are responsible for the design, maintenance, security and operation of the premises, including the provision of appropriate shelter, feed and water supply systems, animal husbandry and care by competent animal handlers. The exporter must be able to demonstrate to the Australian Government that the management of the livestock at the registered premises accords with the specifications set out in the risk management plan for the consignment, and the importing country requirements for registered premises.*
>
> *These Standards are relevant to each stage of the livestock export chain and should be reflected in relevant quality assurance programs. Livestock sourced for export must meet any requirement under a law of a state or territory. State and territory governments are responsible for ensuring that these jurisdictional requirements are met under respective state and territory legislation. The Australian Quarantine and Inspection Service must be satisfied that importing country requirements and the Standards have been met before issuing a health certificate and export permit.*

Guiding principle (ASEL Standard 3)
ASEL states that :

> *Livestock are assembled at registered premises, where the husbandry and management practices ensure that the livestock are adequately prepared for the export voyage.*

The Export Control (Animals) Order 2004 is quite specific about the conditions required to register an assembly premises (see Division 2.2). This Order also includes direction as to the use of an appropriate operations manual. The Order supports many of the items outlined in ASEL.

Required outcomes (ASEL Standard 3)
ASEL states that:

- *Facilities at registered premises are appropriate for the type and species of livestock to be held.*
- *The health and welfare needs of the livestock are appropriately catered for in a secure environment.*
- *Livestock leaving the premises are fit for the export voyage and meet importing country requirements.*
- *Livestock rejected for export are managed humanely (ASEL Standard 3).*

1.5.1 Location of premises

Location of premises
ASEL states that:

> *….the location of the registered premises, used for inspection for 'leave for loading', must not be more than eight hours journey time from the port of embarkation unless approved by a relevant Australian Government agency (ASEL S3.0).*

This represents another instance where powers for ***discretionary approval*** exist. The relevant Australian Government agency is again AQIS. The regulators want the industry to provide some guidelines as to what conditions might allow animals to journey for more than eight hours to the port of embarkation. Exporters have raised the possibility of temporary registration of premises in remote areas and/or in unusual circumstances.

Industry guidelines:	*Exist*
Scientific support:	*Not required (consider temporary registration)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.2 Staff and staff training

Staff and staff training
ASEL also states that:

> *…the operator of registered premises must employ sufficient appropriately trained staff for the effective day-to-day operation of the premises and management of the livestock (ASEL S3.1).*

There is no formal staff training available to the industry other than that used to accredit stockmen. It is suggested that more formal training/information dissemination should be provided to many participants within the industry (see later under training of onboard veterinarians).

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.5.3 Receival and unloading

Receival
ASEL requires that:

> *….when receiving and identifying livestock, the operator of the assembly centre must obtain a copy of the vendor declarations regarding the source property and the health and welfare status of the livestock before accepting the livestock for the purpose of preparation for export (ASEL S3.12).*

This is a tool to enable traceback linkages to be established. Industry consultation indicates that this practice is already adopted at cattle assembly centres.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational tool)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Unloading and inspection:
ASEL requires that:

- *Livestock must be unloaded as soon as possible after arrival at the registered premises and facilities must enable safe and efficient unloading of livestock.*
- *Livestock must be individually inspected at unloading to determine whether they are suitable for preparation for export, (see also rejection criteria).*
- *Livestock for export must be held and assembled at the registered premises in accordance with the relevant approved NOI and CRMP (ASEL S3.13).*

ASEL also requires that:

> *….. all livestock accepted into the registered premises must be offered water and feed as soon as possible and no more than 12 hours after arrival (ASEL S3.14).*

Industry consultation indicates that this practice is already adopted at cattle assembly centres and has a great bearing on subsequent voyage outcomes. Rejection criteria are addressed elsewhere in the document.

Industry guidelines:	*Exist*
Scientific support:	*Exists (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.4 Penning arrangements

Penning arrangements
ASEL requires that:

> *livestock must be penned in accordance with the following criteria:*
> - *livestock of similar species, classes, ages and weights are to be kept in groups; and*
> - *livestock with horns are to be separated from livestock lacking horns (ASEL S3.15).*

The segregation issues are currently under debate and the subject of observational studies being conducted by Murdoch University. Since the bases for segregation specified above are meant to be mutually exclusive, they impose a level of segregation that cannot be achieved in practice. Best practice management would make compromises that achieve the best overall result. The principle of optimising segregation options has been discussed elsewhere in the document.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low (in most cases)*
R&D priority:	*Medium*

Stocking density
ASEL states that:

> *….. the stocking density at registered premises must provide at least the following minimum space per head (cattle with horns must be provided with additional space), unless a variation is required and approved by the relevant Australian Government agency:*
> - *for cattle held for 30 days or more, a minimum of 9 m^2, based on an individual liveweight of 500 kg (this allowance can be varied by 0.09 m^2 for each 5 kg change in individual liveweight).*
> - *for cattle held for less than 30 days, a minimum of 4 m^2, based on an individual liveweight of 500 kilograms (this allowance can be varied by 0.04 m^2 for each 5 kg change in individual liveweight) (ASEL S3.11).*

Industry consultation found that these requirements are accepted even though the operators consulted were not able to cite the scientific basis. The key issue in the assembly of livestock prior to export is “preparation for the journey”. If the assembly period acts to extend stresses associated with the voyage then it may be counterproductive. Stocking density is an important factor in this consideration. It would be useful to the industry to address this as an industry specific research project, perhaps utilising some of the “observational techniques” developed whilst investigating other issues (eg horns) although this is not considered a first order priority at this stage. Space allocation would appear to be based on lot feeding experience that is slightly different to the requirement to prepare livestock for export. Note also the provision for ***discretionary approval*** in regards to cattle with horns. There is some lack of clarity in regards to when cattle actually enter the chain. For example, can cattle with “untipped” horns be allowed to enter the assembly facility and be processed?

The standards do not distinguish between covered or open facilities and/or sheds. Given the importance of shade and shelter, this would appear to be a deficiency and perhaps they should be addressed separately.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific research lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low*
R&D priority:	*Medium*

Isolation of livestock
ASEL also states that:

> *…. where a period of pre-export quarantine or isolation is required by the importing country, animals forming the consignment must at all times be physically isolated from all*

other animals (whether for an alternative export market or domestic use) to prevent contact (ASEL S3.3).

ASEL also states

…… that where handling facilities used for loading, holding, treating or inspecting livestock (including roadway and lanes) are to be used for both domestic and export livestock (including livestock of differing export status), the operator of the premises must have procedures in place to ensure that:

- *handling facilities are not used simultaneously by livestock of differing pre-export quarantine or isolation status;*
- *a minimum livestock traffic separation of two metres is maintained at all times, or livestock are separated by a physical barrier such as a fenced road or lane or a fully fenced empty paddock, unless specified otherwise by the importing country; and*
- *handling facilities and equipment used by different consignments of animals are managed in accordance with the pre-export quarantine or isolation requirements of each importing country (ASEL S3.3).*

Industry consultation indicates that this practice is accepted within cattle assembly centres. It is acknowledged that isolation requirements of importing countries must be respected. There is some contention, however, in regards to how these are interpreted.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low*
R&D priority:	*Medium*

1.5.5 Pen design

Pen design and the provision of shade and shelter

ASEL addresses pen design under sections S3.4-S3.6 and provides guidelines in regards to shade and shelter, fencing and drainage (ASEL S3.4-S3.6). These guidelines do not necessarily address issues related to disease and/or factors that affect voyage outcomes. Innovation in regards to design would be of benefit to the industry.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Design of handling facilities

ASEL states that:

…… livestock handling facilities and sheds at registered premises must comply with the following:

- *Sheds must be constructed with sufficient drainage and ventilation to ensure that the shed is free-draining.*
- *Livestock handling facilities must be constructed to handle the number of livestock (ie the number of stock at the premises, whatever that may be, depending on the consignment size) with a minimum of stress and injury.*
- *Floors of yards, sheds, pens and loading ramps must have non-slip surfaces (ASEL S3.2).*

The long haul cattle trade does, from time to time, experience quite high levels of pneumonia that can be attributable to the preparation of animals for export. Investigations have linked the problem to overcrowding and poor shed ventilation. The reference to ventilation in the above standard is very general and does not consider variations in weather conditions at different times of the year. Cattle sheds require regular cleaning to maintain bedding in a condition that does not affect the welfare of the animals. Research that determines the linkages between onboard clinical disease and prior handling activities would be of benefit to the industry.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Industry specific research lacking (required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.5.6 Provision of fodder and water

Provision of fodder and water
To ensure adequate supply of feed and water ASEL requires that:

- *where feeders, self-feeders and water troughs are used, they must be of a design that allows for complete cleaning of all surfaces, prevents spoilage of feed during inclement weather, and minimises faecal contamination and injuries.*
- *all livestock feed for use at the registered premises must be stored in a manner that maintains the integrity and nutritional value of the feed, and protects it from weather, pests and external contaminants (including chemical spray drift) and from direct access by animals.*
- *where feeders and self-feeders are used, the trough allowance for cattle/buffalo held in paddocks at the premises is to be calculated on a paddock-by-paddock basis and must be no less than fifteen (15) cm of feed trough per head.*
- *the quantity of feed available should meet at least minimum feed requirements, which are (for cattle/buffalo), two point five (2.5) per cent of their bodyweight, of a quality feed able to meet daily maintenance requirements;*
- *all livestock in the registered premises must have access to drinking water at all times (unless under curfew).*
- *water troughs must be positioned apart from hay and feed sources to prevent fouling and kept clean.*
- *the water quality must be suitable for the livestock and there must be sufficient backup storage or a contingency plan to ensure continuity of supply at peak demand for two days (ASEL S3.7).*

Industry consultation indicates that these requirements are an accepted practice in cattle assembly centres, although the trough space requirement attracts a degree of contention. There is no obvious industry specific scientific support for these requirements. Minimum feed

requirements in terms of quantity and quality are generally accepted. Water quality and delivery requirements were also generally accepted.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.5.7 Animal care and handling

Supervision/observation of livestock
ASEL requires daily monitoring of health, welfare and mortality and states that all livestock must be inspected daily by a competent stock person (ASEL S3.16). This is an accepted practice.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High*
R&D priority:	*Low*

Mortality investigation
ASEL states that:

> *….all sick or injured livestock must be given immediate treatment, and veterinary advice must be sought if the cause of a sickness or injury is not obvious, or if action taken to prevent or treat the problem is ineffective. Investigation by a registered veterinarian must be conducted if mortalities in any one paddock or shed exceed zero point one (0.1) per cent or 3 deaths, whichever is the greater, on any one day for cattle and buffalo. Dead livestock must be collected and disposed of on a daily basis. Animals must not be able to access the area for disposal of carcasses (ASEL S3.16). Records of each consignment must be kept for at least two years after the date of export (ASEL S3.16).*

Whilst ASEL states that an investigation must be conducted as to the cause of significant mortalities, it does not provide any further guidance as to what action should be taken on the basis of the findings. Clearly the diagnosis of an infectious disease with potential to adversely affect the outcome of a voyage should ultimately prevent the loading of the affected animals.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*High*
R&D priority:	*Medium*

1.5.8 Treatment records and required documentation

Treatment records
Records of each consignment must be kept for at least two years after the date of export (ASEL S3.16).

This is acknowledged by industry.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.9 Rejections

Identification of rejected animals
ASEL also states that:

> *….. any livestock identified at unloading as being distressed, injured or otherwise unsuitable for export must be marked by a permanent method and isolated from the rest of the consignment. A record must be kept that details identity, the method of treatment or euthanasia and disposal of all rejected animals (ASEL S3.17).*

This is acknowledged by industry.

Industry guidelines:	*Exist*
Scientific support:	*R&D not required*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Rejection criteria
ASEL Appendix 3.1 outlines the criteria for rejecting cattle (and buffalo) for fitness to travel. These criteria are the same as those described in the section relating to sourcing (see table 1.3.2).

Management of rejects
Industry consultation has revealed that there is considerable debate regarding how rejects should be managed. Much of this debate is based around commercial arrangements between vendors or suppliers. It also involves transport insurance, residual (or salvage values) and treatment possibilities. Rejected animals will, from time to time, find their way back into the live export chain. If the animals are fully recovered there seems no basis for opposing this action. The aim is clearly to minimise losses associated with these rejects. In any event, there are no guidelines in regards to how rejects are managed apart from the requirement for them to be isolated.

Industry guidelines:	*Do not exist*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*High*
R&D priority:	*Medium*

1.5.10 Authorised entry

Authorised entry
ASEL requires that:

> *….. the operator of the registered premises must have arrangements in place at the premises to prevent unauthorised entry and access to the feed when livestock are being prepared for export. Access to the premises must be controlled at all times, with:*
> - *all entry points to premises being clearly signed;*
> - *only those persons necessary for the day-to-day operation of the premises and state*
> - *and territory government officials having direct access to the area of the premises; and*
> - *all non-employees reporting to reception for appropriate biosecurity checks relevant to the requirements of the facility (ASEL S3.10).*

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.11 Pre-loading inspection (3rd Party Veterinarian)

Fitness to travel criteria
This criterion is well addressed by ASEL. In addition WADA and MLA have a relevant publication.

Pre-loading inspection location
There are differences between states as to where pre-loading inspection takes place. When animals have been sourced from many properties and not assembled, it is sometimes more practical to inspect them at the wharf. However, most operators agreed that on farm inspection and/or inspection at the assembly point is more thorough. This is a contentious issue that has a great bearing on outcomes. The industry would benefit from investigation into the best ways to conduct pre-loading inspections.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (assessment of effectiveness required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

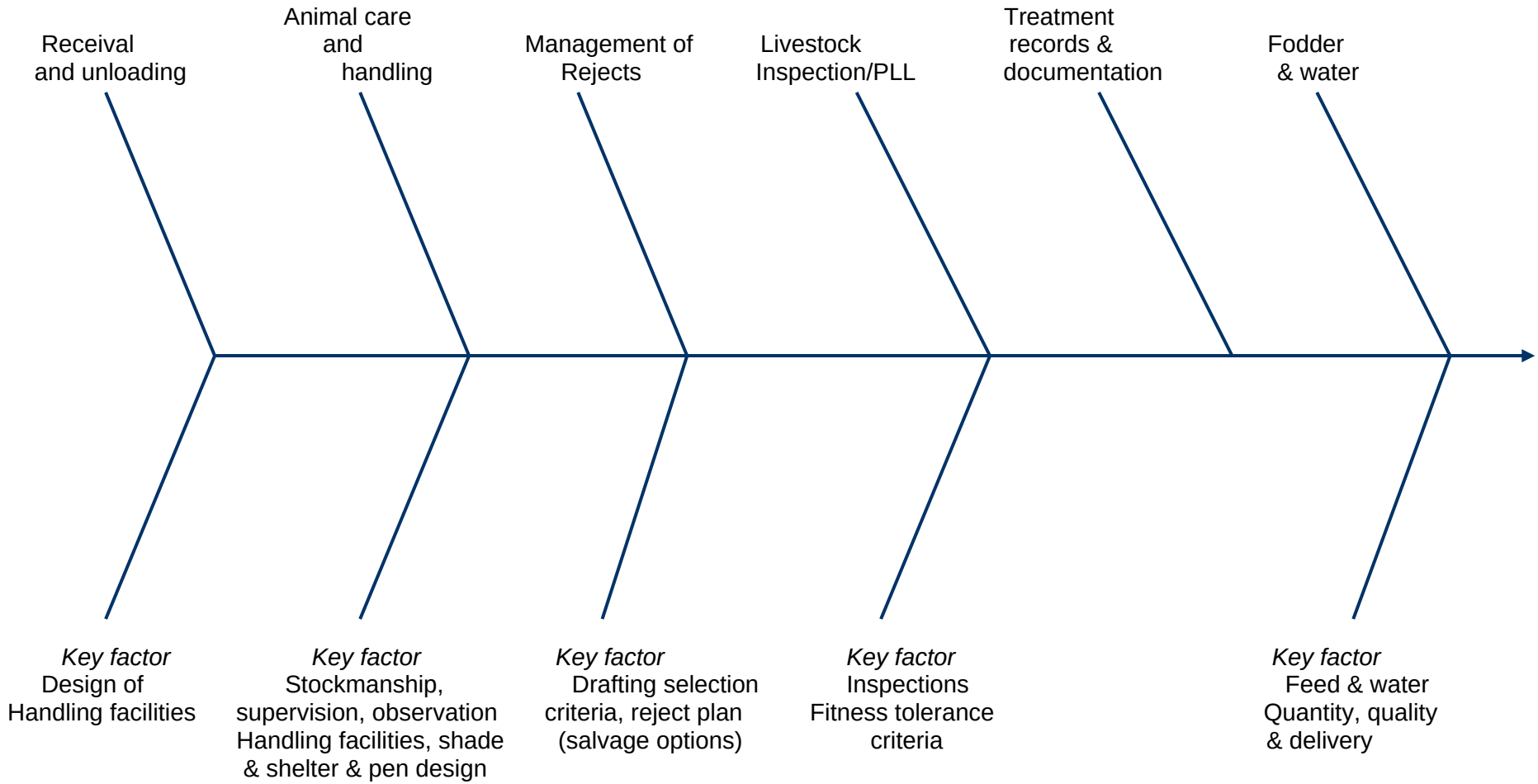
1.5.12 Permission to leave for loading (PLL/AQIS Veterinarian)

Permission to leave for loading
Permission to leave for loading is found in the Export Control (Animals) Order 2004 (see page 5 of the readers guide).

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*

Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

Figure 1.5: Management of Registered Premises (LHC)



1.6 Vessel preparation and loading (LHC)

Overview
ASEL describes the vessel preparation and loading phase as:

> *beginning with the arrival of livestock at the port of loading and ending when all of the animals have been loaded onto the vessel. Once loading has been completed in accordance with the loading plan, an export permit and health certificate is issued.*

ASEL states that:

> *……. the Australian Maritime Safety Authority (AMSA) is responsible for the inspection of selected foreign flag ships to monitor their compliance with safety and environment protection standards, including safe carriage of livestock as cargo. AMSA administers the regulation of vessels through the auspices of Marine Orders No.43.*

(Many of these orders relate to aspects of vessels and vessel management that are removed from aspects relating to the export of livestock. However, there are a number of key regulations that have a direct bearing on livestock exporting activities. These are noted in the appropriate sections).

ASEL also states that:

> *….. the master of the vessel is responsible for the vessel's loading configuration and for ensuring the safety of the vessel, crew and cargo during loading. Livestock vessels carry crew in sufficient numbers with experience in the care of animals to satisfactorily provide for their tending, feeding and watering, as well as assisting the accredited stock person(s) and/or veterinarian onboard in their responsibilities during the voyage.*

ASEL describes the relevant responsibilities as follows:

> *…the exporter is responsible for providing competent animal handlers to ensure that livestock are loaded in a manner that prevents injury and minimises stress, and for ensuring that suitable loading facilities are provided. The vessel owner is responsible for ensuring that the vessel is appropriately designed, constructed, equipped, maintained and certified to carry the cargo of livestock.*

ASEL further states that:

> *…. the exporter must ensure that stocking densities meet all legislative requirements; that there is adequate provisioning of the vessel before departure, including feed, water and veterinary supplies; and that accredited stock persons and, when required, an accredited veterinarian have been engaged. The exporter must be able to demonstrate that the loading of the livestock at the port of loading has been conducted in accordance with the approved loading plan and with any importing country requirements relating to the consignment, and relevant requirements of the Australian Government and the state or territory for loading of livestock.*

Guiding Principles (ASEL Standard 4)
ASEL states that:

> *…. the sea voyage is planned and is undertaken on an appropriately provisioned vessel certified for the carriage of livestock, and the livestock are loaded in a manner that prevents injury and minimises stress.*

Required outcomes (ASEL Standard 4)
ASEL identifies the following outcomes:

- *Livestock are healthy, fit to travel and comply with importing country requirements.*
- *The vessel meets Australian requirements for the safe carriage of livestock.*
- *Sufficient personnel must be available both at loading and during the voyage to ensure that livestock husbandry and welfare needs are addressed.*
- *Livestock are handled and loaded in a manner that prevents injury and minimises stress.*
- *The travel and loading plans adequately address the health and welfare of the livestock.*
- *A health certificate and an export permit are issued by the Australian Quarantine and Inspection Service (AQIS).*

1.6.1 Loading instructions

Loading instructions
ASEL has no specific guidelines in regards to loading instructions but does state that loading arrangements must be made and take into consideration:

- *port facilities, including the available water supply rate;*
- *port and ship security;*
- *environmental management;*
- *labour availability and competency; and*
- *occupational health and safety.*

Timeliness of loading instructions can be a contentious issue. Loading instructions should be forwarded to the vessel at the earliest possible time to allow the appropriate set up and planning.

These are implicit, however, in achieving the stated outcomes and guidelines in regards to loading. Moreover they are included in the industry operating and governance manual whose charter it is to demonstrate how outcomes can be achieved.

The industry will be required to address occupational health and safety issues.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.6.2 Loading personnel

Loading personnel
ASEL states that:

> *…. sufficient personnel must be available both at loading and during the voyage to ensure that livestock husbandry and welfare needs are addressed (ASEL S4.6).*

ASEL also states that:

> *… upon arrival at the port of embarkation, responsibility for the livestock must be transferred to a competent person nominated by the exporter and that that person must be notified of any aspect of transport to the port of embarkation that might affect the future health and welfare of the livestock (ASEL S4.7).*

Appendix 4.1 of ASEL also states that:

> *… a suitably competent person must be appointed by the exporter to be responsible for the handling, husbandry and welfare of the livestock for export and to ensure that loading facilities and livestock handling standards at the port are satisfactory during unloading from the land transport, inspection and loading onto the vessel.*

ASEL also states that:

> *…. livestock for export must be loaded onto the vessel by competent stock handlers in a manner that prevents injury and minimises stress (Appendix 4.1).*

Industry consultation suggests that there has been a marked improvement in the competence of those involved in the loading of vessels over the past few years. There are, however, no formal training or competency assessment programs in place for people assisting in the loading of livestock vessels. Suitable training (and/or assessment) programs would be of benefit to the industry. There may be additional roles that could be developed for wharfside personnel. These may relate to observing for any transgressions in transport requirements.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (training and competency assessment)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Accompaniment
ASEL states that:

> *…. an accredited stock person who is employed by the exporter and who is not ordinarily a member of the ship's crew must be appointed to accompany each consignment of livestock for export to its destination. If required by the relevant Australian Government agency, an accredited veterinarian must also be appointed to accompany a consignment (ASEL S4.5).*

The consultations revealed a degree of contention about voyage accompaniment. Since introduction of the requirement for a veterinarian to accompany long haul voyages, there has been some erosion of the stockman's program and new roles are now emerging. Whist there are many veterinarians that contribute strongly to onboard vessels carrying live cattle, it was reported that some veterinarians arrive at the vessel unprepared and in some cases do little to contribute to the running of the vessel once onboard. It is important that the new roles are clearly defined so that the stockman's program and the veterinarian's role complement each other and that any new roles in regard to onboard monitoring and data are well thought out and described. It was suggested that key instructions as to the expected role of the veterinarian be issued well before the voyage (rather than on departure) and that veterinarians familiarise themselves with details of the protocols, the cargo and the vessel itself. It is suggested that the roles for those travelling onboard be re-defined.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (roles in regards to R&D need to be defined)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.6.3 Load plan

Load plan
In recognition of the importance of the load plan, ASEL devotes an appendix (ASEL S4 Appendix 4.1) to provide guidelines on how to prepare a loading plan.

It states that:

> *…. before loading of livestock for export begins, a loading plan must be prepared in accordance with the specifications in Appendix 4.1, including details of the net available pen area on the ship (excluding the area of the hospital pens) according to the vessel's record of equipment for the carriage of livestock, and the number of livestock that may be loaded on the vessel, based on the minimum pen area per head for the relevant livestock species and class as specified in the Appendix (ASEL Appendix 4.1 and Tables A4.1.1–A4.1.6)*

The marine orders have specific requirements with regard to the provision and use of "hospital pens" (36.1-36.7).

The load plan is central to the successful loading of the vessel. It is, in essence, an operational tool, and does not require R&D support. However, R&D products such as the HSRA model need to work with (and complement) the way in which load planning is undertaken.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (R&D needs to work with procedures)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Stocking density
The key tables involved (for cattle) are:

Table 4.1.1 - Minimum pen area per head for cattle exported by sea — default table.
Table A4.1.2 - Minimum pen area per head for cattle exported by sea from a port south of latitude 26 degrees south, from 1 May to 31 October.
Table A4.1.3 - Minimum pen area per head for cattle exported by sea from a port south of latitude 26 degrees south, from 1 November to 30 April and
Table A4.1.4 - Minimum pen area per head for buffalo exported by sea.

Pregnant cattle require special consideration and ASEL states that:

> *….. pregnant cattle must be kept in pens that have an average floor area for each head of cattle as follows:*
> - *For pregnant heifers* of a Bos taurus breed — the minimum area required for cattle under Table A4.1.2; and*
> - *For pregnant heifers of a Bos indicus breed — the minimum area required for cattle under Table A4.1.1; and*
> - *For pregnant cows** of a Bos taurus breed — an area five (5) per cent larger than the minimum area required for cattle under ASEL Table A4.1.2; and*
> - *For pregnant cows of a Bos indicus breed — an area five (5) per cent larger than the minimum area required for cattle under ASEL Table A4.1.1*
>
> .

* Heifer means a female bovine animal less than three (3) years of age that has not produced a calf
** Cow means a female bovine animal that has produced a calf or is over three (3) years of age

Stocking density is a contentious issue. LIVE.233 is conducting a literature review that addresses stocking density and recommendations are pending. Preliminary findings, however, suggest that stocking density restrictions have been derived from trial and error and industry experience and that industry specific scientific support does not yet exist. There is no accompanying explanation of how and why the prevailing restrictions have been set. Thus it is a high priority for the industry to develop scientific support for the guidelines on stocking density.

Industry consultation noted that curfew times are not stipulated within the tables provided by ASEL and there is some industry inconsistency regarding how to manage full or partial curfew weights when it comes to allocating appropriate stocking densities.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*High*

Other
ASEL states that:

> *….. a loading plan for the vessel on which the livestock for export are to be transported must be prepared and be compliant with relevant ship safety standards and must give due consideration to:*
> - *Differences in handling, holding and husbandry needs of each livestock species, number of animals, sex, class, reproductive status, weight, breed, origin, preparation and transport history;*
> - *Pen layout, available pen area for the particular consignment, ventilation, vessel characteristics, port rotation, discharge sequence and stability; and*
> - *Provision of livestock accommodation that enables the following requirements to be satisfied:*
>   – *segregation of livestock according to species;*
>   – *segregation of classes of livestock of the same species;*
>   – *separation of younger animals from older animals;*
>   – *separation of livestock of a dissimilar size;*
>   – *segregation of livestock with horns from livestock without horns;*
>   – *separation of cattle or buffalo from other species by a passageway, an empty pen or an effective impermeable barrier, to the satisfaction of an accredited stock person or accredited veterinarian;*
>   – *location of livestock in relation to hatchways (there must be no location of livestock over a hatchway, unless the hatchway is protected against consequent damage and the hatchway covers are secured against movement); and*
>   – *location of livestock in relation to health and welfare (there must be no penning or location of livestock on or in any part of a vessel where the livestock, livestock fittings, livestock equipment or carrying arrangements could substantially compromise livestock health and/or welfare);*
> - *Provision of clearly identified hospital pens (or stalls), constructed to the standard required for the species of livestock for which they are intended as specified in Marine Orders 43 (27), on each deck or otherwise in a manner readily accessible to livestock; and*
> - *Stocking densities and pen-group weight-range tolerances for the species in accordance with the specifications in the tables below, unless a variation is approved by the relevant Australian Government agency based on an agreed heat stress risk assessment (ASEL Appendix 4.1).*

Other general guidelines for load planning also exist, (see Stockman's Manual, March 2006, page 8). There is a general industry consensus on the importance of load planning. In particular, it was noted that the loading sequence is a major factor in the execution of a load plan, and that most loadings require some contingency plan to cater for out of sequence loading. ASEL states that a contingency plan for emergencies and interruption to loading must be prepared, including procedures for contacting the exporter in the event of an animal health or welfare emergency. However this does not specifically address the issue of 'out of sequence delivery' which is really an operational issue.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Segregation
Furthermore ASEL states that:

> *….. livestock for export must be presented for loading, and penned on the vessel in lines segregated by species, class, age, weight, presence/absence of horns or antlers, and any other relevant characteristic (and, where relevant, port of destination), in accordance with the approved loading plan (ASEL S4.11).*

The direction to segregate livestock with horns from livestock without horns has become a contentious issue. There is a need to optimise the segregation options onboard. Discussion of the use of hospital pens is included in the section relating to treatment of sick animals (see Marine Orders). This is discussed elsewhere in the document (see section 1.4.2).

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Industry specific scientific support lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Unclear*
R&D priority:	*High*

Heat stress
ASEL states that:

> *….. stocking densities and pen-group weight-range tolerances for species of livestock must be in accordance with specifications in Appendix 4.1 and heat stress assessment using an agreed heat stress risk assessment unless a variation is required and approved by the relevant Australian Government agency.*

Heat stress is addressed under the heading thermoregulation/heat stress in the section on onboard management (Physical environment 1.7.2). Note the provision for ***discretional approval***.

1.6.4 Loading procedures

Loading procedures
To ensure only fit and healthy livestock are transported and loaded on board ASEL states that:

- *the exporter must arrange for the livestock to be inspected for health and welfare and fitness to travel immediately before they are loaded onto the vessel;*
- *only livestock that are healthy and fit to travel can be loaded;*
- *any livestock rejected for export must be distinctively identified and humane and effective arrangements made for their removal from the port;*
- *if euthanasia is necessary it must be carried out humanely and promptly; and*
- *dead livestock must be removed from the port and carcasses must be disposed of in compliance with all relevant health and environmental legislation (ASEL S4.8).*

As already mentioned there is some dispute about whether the pre-embarkation inspection conducted under the supervision of the 3rd party veterinarian should be done at the assembly area and/or at the wharf. Some better explanation of ‘permission to leave for loading’ (PLL) would also be useful.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Communication during (and after) loading
ASEL recognises the importance of communication during and after loading and states:

> *…a communication plan involving all responsible parties must be established before the loading of livestock for export begins. This plan must cover:*
> - *roles and responsibilities of the exporter or nominated representative/s, the accredited stock person, the accredited veterinarian (if required), the master of the vessel, nominated officers and crew members, and government and port authorities;*
> - *arrangements for regular meetings of key people before, during and after loading; and*
> - *reporting procedures during and on completion of the voyage (ASEL Appendix 4.1).*

Operationally, exporters find that there are a number of key practices that facilitate a smooth loading. In many cases these are documented in the individual operating and governance manuals and include the strategic positioning of key personnel, the use of communication devices, agreed hand signals and clear delegation of tasks and responsibilities. These are operational issues (at this stage) and it is considered that they do not require R&D support.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Ventilation during loading
ASEL states that:

> *…. when livestock for export are loaded on vessels with enclosed decks, the ventilation system must be run continuously from the commencement of loading (ASEL S4.9).*

This is an established and accepted practice.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

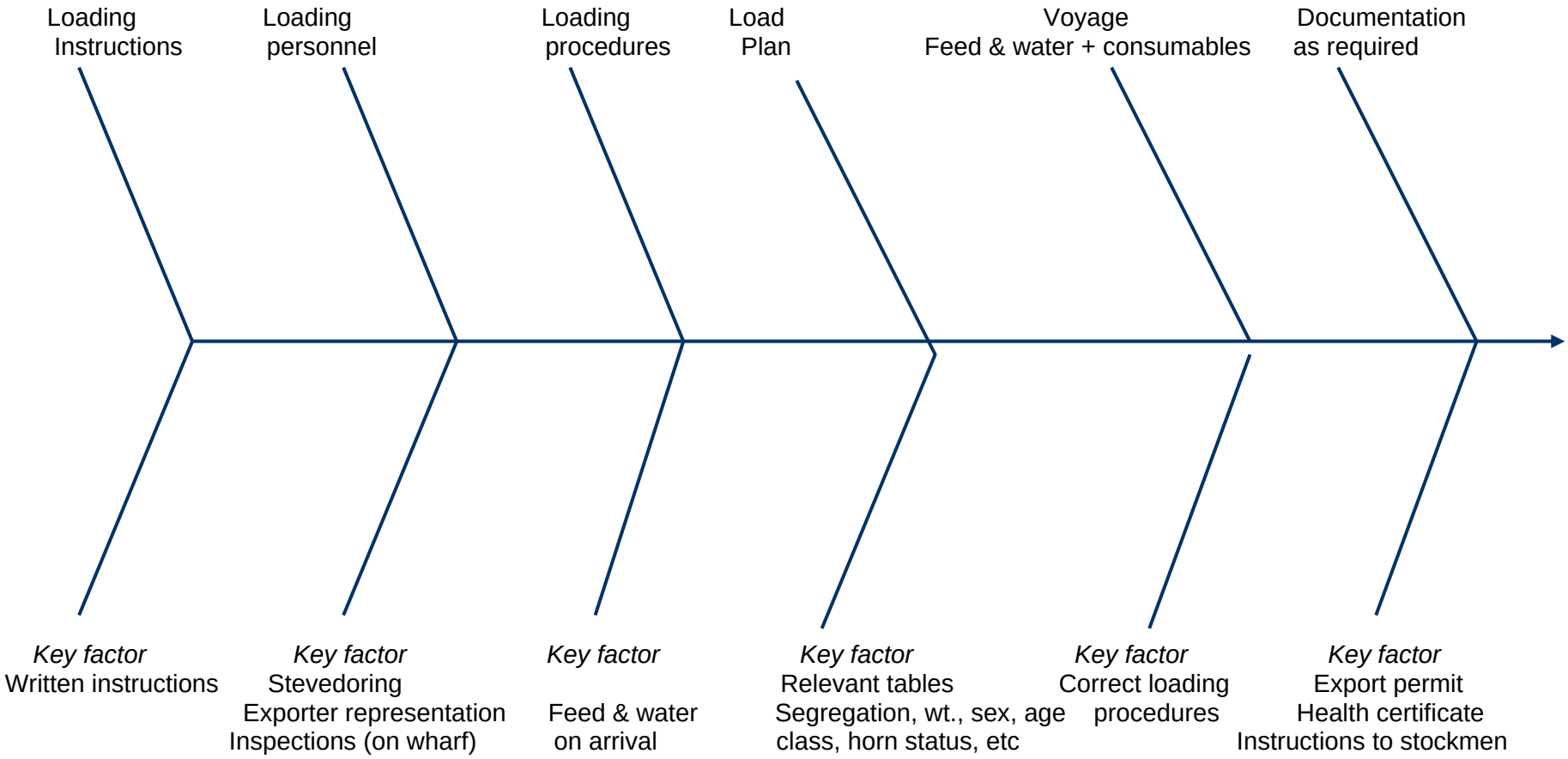
Feed and water on arrival
ASEL states that:

> *…. all livestock for export must be offered feed and water as soon as possible after being loaded on the vessel, but no later than 12 hours after loading (ASEL S4.13) (see also ASEL S5.4).*

Water is usually made available as animals are loaded. Most exporters will wait until animals have been penned up before fodder is made available. It is considered best practice to wait until the cattle have settled down before madding fodder available.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Unclear*
R&D priority:	*Low*

Figure 1.6: Vessel Preparation and Loading (LHC)



1.6.5 Voyage feed and water and other consumables

Voyage water
ASEL states that:

> *…. the supplies of feed and water must maintain good health and satisfy energy requirements of the livestock for the duration of the voyage. There must also be feed and water reserves as specified in Appendix 4.2. The feed and water provisions must take into consideration the livestock species, class, age and expected weather conditions (ASEL S4.14).*

ASEL also states that:

> *…. for cattle and buffalo there must be sufficient water on the ship to meet the anticipated needs of the cattle and buffalo during the voyage plus an additional three days water (ASEL Appendix 4.2).*

ASEL states that when calculating water requirements:

> *… provision must be made for livestock to receive at least 12% of liveweight of water per head per day. (This water allowance may be reduced to 10% of liveweight per head per day if water consumption on the ship for each of the previous three voyages averaged less than 10% of liveweight per head per day. Allowance may be made for fresh water produced on the ship while at sea (ASEL Appendix 4.2).*

Note that LIVE.209 found that animals consumed water equivalent to up to 15% of their bodyweight (Barnes et al, 2004) while LIVE.205 investigated water consumption on 87 shipments involving cattle and found that 13% was sufficient in all but one voyage (Brightling, 2001). There was no attempt, however, to correlate water consumption to a wet (or dry) bulb temperature.

Experience by onboard personnel indicates that both cattle and sheep will drink up to 15% of bodyweight (60 litres and 7 litres per head respectively) under extremely hot conditions. Water requirements should take into consideration the anticipated weather throughout the voyage, the type of cattle (bos indicus drink less) and the preparation history (acclimatisation).

Industry guidelines:	*Exist*
Scientific support:	*Exist (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Voyage fodder (quantity)
In regards to feed, ASEL states that:

> *….there must be sufficient feed on the ship to meet the anticipated needs of the cattle and buffalo during the voyage, plus an additional 20% or three days feed, whichever is less (ASEL Appendix 4.2).*

ASEL states that when calculating feed requirements:

> *….cattle and buffalo less than 250 kg to be provided with at least 2.5% of their bodyweight per head per day. Breeding heifers (with six or fewer permanent incisor teeth)*

must be provided with a minimum feed allowance of 2.5% of their bodyweight (regardless of pregnancy status). Pregnant cows must be provided with a minimum feed allowance of 2.5% of their bodyweight. All other categories cows must be provided with a minimum feed allowance of 2% of their bodyweight (ASEL Appendix 4.2).

Onboard personnel have reported an increase in total fodder consumption since exporters have made greater use of the assembly feedlot, particularly where cattle have been exposed to the pellet diet. Previously, animals not familiar with the pellet diet usually took 5-6 days to "come onto the feed" and this provided a substantial 'reserve' of fodder that was utilised later in the voyage. Higher onboard fodder consumption should translate into superior animal performance and welfare.

It should be noted that a minimum feed allowance of 2% represents a restricted feeding situation and will invoke a number of potential issues relating to trough space and more exaggerated social hierarchical behaviour. These issues are not well documented in the guidelines and further work in this area would be of benefit to the industry.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Industry specific research lacking (more required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Voyage fodder (quality)
ASEL also states that:

….. fodder for cattle exported from an Australian port south of latitude 26 degrees south must include at least 1% of the required feed as chaff and/or hay (ASEL Appendix 4.2).

ASEL makes general statements regarding shipboard specifications and provisioning.

ASEL states that:

….. the shipboard ration must not contain more than 30% by weight of wheat, barley or corn, unless the livestock have been adapted to the ration over a period of at least two weeks before export. All pelleted feed must be accompanied by a manufacturer's declaration that it is manufactured in accordance with national pellet standards. All feed from a previous voyage that is suitable for livestock consumption may remain in a feed storage tank provided that:

- *each tank is completely emptied at least once in every 90 days;*
- *all feed that is no longer suitable for livestock consumption is emptied in its entirety before further feed is loaded and*
- *records are maintained of the emptying of feed storage tanks and are made available for inspection (ASEL Appendix 4.2).*

ASEL provides no specific guidelines for fodder provided to cattle (and buffalo) apart from those specified above. Bloat is experienced on some voyages and is directly attributable to fodder quality. The ability to provide chaff is an important onboard management tool.

Industry guidelines:	*Exist (further scrutiny required)*
Scientific support:	*Industry specific support lacking (required)*

Industry consensus: *Consensus*
Impact on operational procedures: *Potentially high*
Affect on welfare outcome: *Potentially high*
R&D priority: *Medium*

Veterinary supplies and equipment
A suggested pre-shipment checklist in regards to veterinary supplies and equipment is provided by ASEL and outlined in the industry Stockman's Manual (Appendix 6 & 7).

ASEL also states that restraint facilities and veterinary equipment, including medicines, instruments and stores sufficient for the species and number of livestock carried, must be provided on the vessel.

- *The minimum restraint equipment to be carried on ships exporting feeder and slaughter cattle and/or buffalo from Australia to facilitate treatment and minimise the potential for livestock injury and stress is outlined in ASEL Table A4.1.8.*
- *The minimum requirements for veterinary equipment to be carried on ships exporting feeder and slaughter cattle, and/or buffalo from Australia, based on the injuries and diseases likely to occur during a normal voyage, are shown in ASEL Table A4.1.8.*
- *Appropriate equipment for the humane killing of livestock of the species to be carried must be provided.*

The requirement to carry suitable veterinary equipment and medicine is also supported by the Marine Orders (18.1). This is an established and accepted practice within the industry.

Industry guidelines: *Exist*
Scientific support: *Exists (adequate)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

Bedding requirements
ASEL states that:

…. cattle and buffalo exported on voyages of 10 days or more must be provided with sawdust, rice hulls or similar material to be used exclusively for bedding at a rate of at least seven tonnes or 25 cubic metres for every 1000 square metres of cattle pen space. (This does not apply to cattle and buffalo loaded from Brisbane or a port north of latitude 26 degrees south and exported to Southeast Asia or Japan (ASEL S4.15)).

Study to establish the linkages between animal welfare, bedding volumes and types, flooring type and deck washing frequency would be of benefit to the industry. The management of the cattle bedding is one of the most important factors affecting the welfare of cattle onboard livestock vessels. There are only limited guidelines for this important area, although industry has established practices (mostly involving washing frequency) and the provision of bedding.

Industry guidelines: *Exist (for bedding requirements)*
Scientific support: *Lacking (in regards to bedding management)*
Industry consensus: *Consensus*
Impact on operational procedures: *Potentially high*
Affect on welfare outcome: *Potentially high*

R&D priority: *Medium*

1.6.6 Required documentation

Written instructions
ASEL states that:

> *…… written instructions and/or standard operating procedures for the care and handling of the livestock being exported must be prepared before departure of the vessel from an Australian port. The procedures must address:*
> - *the quantity and type of feed to be provided and frequency of feeding required for each class of livestock during the voyage;*
> - *if water is not supplied ad libitum, the quantity of water to be provided and frequency of watering required during the voyage;*
> - *pen cleaning requirements;*
> - *treatment of livestock during the voyage; and*
> - *authority to humanely destroy any animal that is seriously ill or injured.*

The Marine orders also require that vessels carry a means of humanely killing livestock (appropriate for use with species carried) (18.1). Onboard practice has changed in keeping with welfare concerns and there is greater use of the 'captive bolt' when required. There is also greater scrutiny during unloading to ensure that moribund livestock are humanely killed at the earliest possible opportunity. It is an established and accepted practice to provide onboard personnel with written instructions.

Industry guidelines: *Exist*
Scientific support: *Not required (operational issue)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

1.7 Onboard management of livestock (LHC)

Overview
ASEL provides the following overview in regards to the onboard management of livestock.

> *Onboard management covers the period from the time the first animal is loaded onto the vessel until the last animal is unloaded at the port of disembarkation. Provisions should exist to ensure that animal health and welfare interventions are undertaken where necessary to treat or euthanise sick or injured animals.*
>
> *Once loading begins at the point of embarkation the master of the vessel assumes overall responsibility for the management and care of the livestock during transport on the vessel. This responsibility continues until the point of disembarkation. It includes the provision of satisfactory livestock services such as ventilation, food, water, drainage and lighting.*
>
> *After the livestock have been loaded on board the vessel and all requirements have been met, the Australian Quarantine and Inspection Service (AQIS) will issue the health certificate and export permit.*
>
> *Where an accredited veterinarian is required to accompany the consignment, that person is responsible for monitoring and regular reporting (to AQIS) of consignment conditions on board during and after the voyage.*
>
> (Reporting requirements are an important issue and discussed later in this section).
>
> *Accredited stock persons accompanying the consignment are responsible for providing appropriate care and management of the livestock on board during the voyage. Livestock vessels carry crew in sufficient numbers with experience in the care of animals to satisfactorily provide for their tending, feeding and watering, as well as assisting the accredited stock person(s) and/or veterinarian onboard in their responsibilities during the voyage.*

Guiding principle (ASEL Standard 5)
ASEL states that:

> *…. the onboard facilities, management and husbandry must be adequate to maintain the health and welfare of livestock throughout the sea voyage.*

Required outcomes (ASEL Standard 5)
ASEL also requires that:

> *… the voyage is completed safely, adequate livestock services are maintained throughout the voyage, onboard care and management of the livestock is adequate to maintain their health and welfare and statutory reporting requirements are met, both during and after the voyage.*

1.7.1 After loading

On completion of loading
ASEL states that:

…. all livestock for export must be offered feed and water as soon as possible after being loaded on the vessel, and within 12 hours (ASEL S5.4).

It is usual practice for water to be available as animals are loaded but fodder is generally withheld until the animals have been penned off. Provision of fodder at the time of loading tends to disrupt the flow of livestock and is not recommended. However, there can be benefits in feeding immediately after the cattle have been loaded, particularly if fodder is being loaded concurrently and storage space is an issue. Apart from the issue of reserves, the timeliness of providing feed and water is not thought to have a great bearing on the outcomes of long haul cattle voyages since it is observed that fodder and water consumption is low in the period immediately after loading. However, longer assembly periods (where animals are more accustomed to the pelleted diet) do correspond to greater consumption immediately after loading. This has been addressed in the previous section.

ASEL also states that:

> *… the consignment must be checked before departure to ensure that the livestock have been loaded according to the loading plan (ASEL S5.3).*

The attending AQIS veterinarian will usually conduct a validation of the loading plan but some consignments may not be loaded exactly as per the plan. Provision for "out of sequence" loading is also good practice. It is not considered that variations to the loading plan have a major affect on a voyage outcome unless it is an indication of poor planning (eg, incompatible with expected unloading pattern) or where certain categories of livestock are inappropriately stowed. It is important that any load plan revisions are addressed to ensure appropriate management is applied.

ASEL states also that:

> *…. the onboard management of livestock for export by sea must ensure that the health, welfare and physical needs of livestock are met during the voyage as follows:*
> - *An accredited stock person must accompany each consignment of livestock and must remain with the consignment until the vessel has completed discharging at the final port of discharge.*
> - *An accredited veterinarian must accompany each consignment of livestock where required by the relevant Australian Government agency and must remain with the consignment until the vessel has completed discharging at the final port of discharge.*
> - *Accredited stock persons and/or veterinarians must work with the vessel's master and crew to maintain the health and welfare of the livestock on board.*
> - *All personnel handling and caring for livestock or who are otherwise responsible for animals during the voyage must be able to demonstrate an adequate level of experience and skill to allow them to undertake their duties (ASEL S5.1).*

Aspects to do with accompaniment have been discussed in the previous section. Although not stipulated in ASEL, most exporters conduct a pre-shipment meeting where all key persons attend. This usually includes the master, the 3rd party veterinarian, the livestock exporter (or his representative), the onboard veterinarian and stockman and the attending AQIS veterinarian. It is usual at these meeting for the master, the onboard stockman and the veterinarian to be issued with detailed written instructions concerning the voyage.

Issues relating to the competency (experience and skill) of onboard personnel should be considered in a similar manner to competency issues addressed in other parts of the document.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.7.2 Physical environment

Ventilation

Ventilation is a major factor in the ability of a vessel to manage heat stress in cattle and this has been identified as the major risk factors within the long haul cattle trade. Whereas most voyages will encounter predictable weather, extreme weather events do occur and these have the capacity to invoke major incidents. Accordingly, research into ventilation efficacy has been a research priority over the past five years. Industry members acknowledge that current industry practices do not safeguard against the possibility of further heat-related incidents, and for this reason ventilation is discussed in some detail.

This research was initiated by a ventilation study SBMR002 (Stacey, 2001) focussed mainly on cattle voyages. The ventilation efficacy on six vessels was evaluated and linkages made to livestock performance. Minimum ventilation requirements for different categories of livestock were determined on the basis of these investigations and an extensive literature search. These have formed the basis of the industry "heat stress risk assessment" model (see next heading under thermo-regulation/heat stress).

This study also provided the basis for a further project that was commissioned to give ship owners some practical guidelines in regards to onboard ventilation systems. A report associated with LIVE.211, "Practical ventilation measures for livestock vessels" (Stacey, 2002), outlines the major issues associated with the ventilation of livestock vessels and provides clear and practical guidelines to the industry. The work was aimed primarily at ship owners with existing vessels.

Ventilation is categorised as a "livestock service" and as such falls under the jurisdiction of AMSA Part 43. There is, however, evidence that the findings of the ventilation research have not been well embraced by AMSA and there are major inconsistencies between the AMSA requirements and ASEL requirements in terms of meeting certain heat stress risk criteria. This suggests a lack of consultation and communication between the relevant parties. (During our consultations, many industry members alluded to this being the case).

AMSA part 43 (Appendix 4, 3.1.1) states that:

> *….an enclosed space for the carriage of livestock should be provided with a mechanical ventilation system of sufficient capacity to change the air of that space in it's entire volume not less than once every three minutes (if the minimum clear height of the space is 2.30 m or more) and not less than once every two minutes (if the minimum clear height of space is 1.80 m and a rate proportional to those specified above (if the minimum clear height of the space is between 2.30 m and 1.80 m).*

These rates represent an air exchange of 20 units per hour at the higher deck height, and 30 exchanges per hour at the lower deck height. Again there is a lack of consistency between the research (which states quite clearly that pen air turnover (PAT) is the preferred measure of airflow) and these guidelines. The minimum air exchanges referred to in the Marine Orders are extremely low and correspond to pen air turnovers of 46 m/hr and 54 m/hr respectively (based on

holds with pen space that occupies 70-80% of the floor space). This is well below the minimum pen air turnover required to transport most categories of cattle to most long haul destinations, and well below the PAT provided on most vessels involved in the trade.

Stacey (SMBR.002A, 2001) states: "*If AMSA MO43 ventilation requirements are to be updated, the figures in air changes per hour should be replaced with requirements expressed as minimum pen air turnover (airflow per pen area in m^3/hr/m^2 (or m/hr).)'*

He also states that: *"on a 'per deck area' basis, current industry ventilation practice generally exceeds the minimum AMSA MO43 air change rates for 2.3m deck heights by a significant margin (a factor of 2.2 to 6.9 for the ships studied)".*

AMSA Part 43 also addresses open decks by stating:

> *….a space for the carriage of livestock that is not enclosed should be provided with a mechanical ventilation system if the space, being a structure having an arrangement of pens on more than one deck level, has a breadth greater than 20 metres; or because of a partial enclosure of the space, the natural ventilation is restricted (AMSA Part 43 Appendix 4, 3.2.1).*

AMSA Part 43 further states that:

> *…on ships constructed or converted on or after 27th May 2004, any mechanical ventilation system referred to in 3.2.1 should be capable of providing 100% of the relevant capacity in 3.1.1. On all other ships, any mechanical system referred to in 3.2.1 should be capable of providing 75% of the relevant capacity in 3.1.1.*

As previously mentioned, the ventilation rate referred to in "3.1.1." is extremely low and unlikely to meet the risk criteria required by ASEL for most categories of cattle. AMSA Part 43 makes no reference to the industry heat stress risk criteria required by ASEL.

Both the Marine Orders and the industry HSRA model factor airflow only and give little consideration to the way in which air is delivered or the ventilation configuration. Vessels that deliver air from the walls of the hold are considered in the same way as vessels that deliver air directly to every pen. Direct jetting has been ignored despite the benefits being identified by the research that has been undertaken.

Neither the Marine Orders nor the HSRA model give any weighting to design faults such as the discharge of exhaust air onto main decks, the siting of supply intakes above exhaust gratings, short circuiting within decks and the close proximity of exhaust outlets to supply intakes. These factors are, however, addressed in the research that has already been undertaken. The short comings identified above add greatly to the risk of a heat stress related incident

AMSA Part 43 does however state that:

> *….appropriate measures must be taken by the operator to ensure that air supplied to livestock spaces is as clean as practicable and that adequate separation measures are taken to ensure minimal recirculation of intake and exhaust air.*

This is vague in itself and there is no indication as to how it might be assessed, who it should be assessed by and/or what action might be taken when the "separation" is assessed as inadequate. Discussions with ship owners have indicated that many of them are oblivious to the

ventilation shortcomings of their vessels. Furthermore there is little consensus about what is the "best" method of delivering air to livestock holds. There are several companies contemplating construction of new vessels and discussions have revealed that they are either "unsure" about the best way to build the vessel or convinced that their way is best (without any precise evidence as to why). It should also be noted that there have been several vessels built since the circulation of the report outlining "practical ventilation measures" and none of these have embraced the open deck system suggested in the document. Furthermore vessels that have provided generous ventilation have in some instances found that the excessive power requirements have rendered them less competitive in the market place.

It would seem paramount that what is "best" considers both capital and operating costs and that the "better" vessels receive appropriate commercial advantages within the regulatory framework. Without this, industry has to work to the lowest common denominator. The current HSRA model does this to some extent since it precludes the transport of some categories of cattle at specific times of the year. However, the model considers only pen air turnover. It does not factor in other considerations such as the way in which the air is delivered or the ventilation configuration.

Central to these discussions is the extent to which vessels should utilise passive (as opposed to active) exhaust possibilities. All of the above suggests that there is scope for the development of more detailed guidelines in regards to the design of ventilation systems on future vessels.

It should be noted that much of the debate about ventilation design is "state of the old art" with many current designs not able cope with the weather challenge likely at some destinations. Innovation is required to increase cargo cooling ability and increase the scope to transport a greater range of livestock categories throughout the year. For example, it may be possible for a design that delivers large wetting droplets in combination with direct jetting which may have sufficient cooling power to allow transporting of dairy cattle to the Middle East for a greater period of the year. This same innovation would provide a greater buffer to deal with extreme weather events that might occur (no matter how improbable). Livestock transport by sea is a niche industry with a finite number of vessels owned by even fewer business houses. It is unlikely that these businesses will invest heavily in research, particularly if the benefits are likely to flow on to other parties. It is reasonable, therefore, that investigations into ventilation design is assisted by the industry.

As mentioned earlier industry members believe there should be greater application of existing R&D results. There is considerable evidence that many research recommendations have been largely ignored and/or poorly adopted. Only recently, for example, did a vessel remove the "hoods" from ventilation supply intakes despite this being recommended four years ago in LIVE.211. The removal of these hoods has generated a measured increase in airflow of up to 20%.

Ventilation, temperature and humidity are addressed in the Stockman's manual for the transport of cattle by sea (page 15-21). Minimum air speed, however, remains an outstanding issue in relation to ventilation.

AMSA part 43 (Appendix 4, 3.3) states that:

> *…on ships constructed (or converted) on or after 27th May 2004, the mechanical ventilation system should be capable of providing a minimum air velocity across any part of the pen from the source of supply of not less than 0.5 m/sec.*

Implicitly, this requirement is inconsistent with the industry heat stress model, which does not consider air speed in its risk assessment. There is no industry information that shows what sort of PAT may be required to achieve this air speed and no information as to how the ventilation configuration might affect the specified minimum. There is confusion about how this figure relates to pen air turnover, also expressed in terms of distance and time (m/hr), and further confusion as to how it relates to other measures such as “drift velocities” and “velocity ratio”.

MLA commissioned LIVE.234 (Casey 2005) to determine whether jetting would complement the industry’s heat stress model. The terms of reference of this project did not address minimum air speed but sample measurements from a number of pens indicated that the average airspeed was below the above stated minimum and that approximately 60-90% of the pen area fell below the stated minimum. Confusion surrounding the minimum air speed figure is further indication of a lack of communication and confidence between industry and the ventilation research findings. Work to clarify the issue of air speed is considered a high research priority.

With the exception of air speed, it is apparent that many of the key issues relating to ventilation have been subjected to effective R&D. However there is a pressing need to develop key findings so that they can be better adopted by industry.

Industry guidelines:	*Exist (further scrutiny required)*
Scientific support:	*Exists (but still lacking)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Very high*

Thermo-regulation/heat stress

Heat stress has also been extensively researched by the industry. The end-point of much of this research is the “heat stress risk assessment” model. Background research to support the development of the industry heat stress risk assessment (HSRA) model for cattle included projects SBMR.002, LIVE.209 and 224, LIVE.223 and LIVE.219. Development of the model itself was performed by LIVE.116.

ASEL endorses this model by stating that:

> *…animals must be loaded at a density that infers an acceptable risk of not succumbing to heat stress (eg, 2% risk of 5% mortality) (see ASEL S1.5A).*

In this way, minimum ventilation rates (to transport different categories of cattle at different times of year) are essentially dictated by heat stress risk assessment.

The heat stress model is a significant achievement for the industry and assists the industry to assess the large number of factors involved. Industry consultation, however, suggests a general lack of ownership of the model. This is regrettable since the model is technically sound and based on supportable assumptions. The lack of ownership apparent among exporters seems to be linked to hasty implementation of the model that caused many critical refinements to be overlooked. Despite this, the model is an effective risk assessment tool.

Specific concerns included the following:

1. The model sits aside from normal load planning procedures and therefore requires a duplication of effort in determining a load plan.
2. The large number of “drop down” boxes indicates a much greater complexity than actually exists within the model.
3. It would be useful for the model to generate some rough tables that would aid planners to get “closer to the mark” when initially entering load plans, avoiding the trial and error approach that currently exists.
4. The model does not adequately address open decks.
5. Although the biological assumptions within the model have been updated (see LIVE.228), a lack of guidelines on how to assess deck pen air turnovers may mean that there is inconsistency in how ship owners calculate their stated pen air turnovers.
6. There is no differentiation between vessels that deliver directly into pens versus those that deliver air from the walls of the vessels.
7. Design faults lead to such things as the re-ingestion of exhaust air, short circuiting within decks and/or the discharge of exhaust onto main decks and are not considered by the model.
8. Known temperature variation within decks will sometimes not correlate with the PAT information (which is often entered as a deck average). This could lead to some categories of animals being improperly stowed.
9. Vessels that have invested heavily in systems to deliver air to all parts of pens (including some jetting benefits) are not considered differently to systems that do not direct air into all parts of the pen. (Indeed the model makes no consideration of the way in which the air is delivered and considers only airflow).
10. The model is not able to factor duration of exposure.
11. There is some confusion about the risk assessment terminology used.

A number of these shortcomings are acknowledged by the creators of the model, who rightly point out that the model’s ability to assess risk is not materially affected. For example, the risk due to prolonged exposure is approximately the same for all voyages. However, there is some industry concern that the risk stress calculation may lead to a false sense of security since other factors (such as a lengthy duration of exposure) will lead to incidents that are not entirely predictable.

This is also compounded by the fact that the model is aimed at risk minimisation and will not completely avoid a heat stress incident (given extreme weather) no matter how improbable. It should be noted that the model is designed purely to minimise risk and does not assist in dealing with a heat stress incident should it occur.

The development of the heat stress model was supported by a number of research projects. Initial studies included SBMR.002A, which conducted an extensive literature review and investigated of ventilation efficacy on six livestock vessels. The findings from this study formed the basis of the model while LIVE.212 looked specifically at sheep vessels and contributed important information.

The physiology of heat stress in cattle and sheep (in the context of livestock exports) was investigated in LIVE.209 (Barnes et al, 2004). The study monitored cattle under simulated onboard conditions in specifically designed climate rooms at Murdoch University. This enabled researchers to study many aspects of heat stress whilst evaluating changes to acid-base and electrolyte balance. Core body temperature, feed and water intake, respiratory and heart rates were also monitored under conditions similar to those encountered in the Middle East during their summer. This work applied directly to the industry and contributed to the assumptions of the heat stress model.

The heat stress model also assisted in defining heat stress thresholds (HST) for bos indicus and bos taurus cattle. There has been some contention over the use (and definition) of HST, which is defined in terms of an increase in core body temperature. Onboard stockmen would prefer that the definition be better linked to panting score (or at least respiratory rates to allow them to recognise when the animal's heat stress threshold has been reached). HST is only loosely related to any critical temperature above which the animal should not be exposed. It would also be useful to determine guidelines that determine heat tolerance in terms of duration of exposure rather than an absolute temperature. This would have more meaning to those onboard. It would be in the industry's interest for these linkages to be better described and introduced into the industry reporting procedures.

A further study undertaken by the Murdoch University team (LIVE.224) evaluated the use of electrolyte replacements to correct the effects of heat stress. This research was again conducted in heat rooms that simulated onboard conditions. It was concluded that the provision of electrolytes enables animals to recover their initial acid-base and electrolyte balance more quickly than those animals that did not receive supplementation. This did not however, change the animals' heat tolerance. A significant difference in weight was also identified. These differences were almost certainly due to hydration, although it is possible that this weight advantage was independent of heat stress.

In addition to the research undertaken to develop the HSRA model, research has been undertaken to evaluate the benefits of wetting cattle to alleviate heat stress. LIVE.219 investigated wetting cattle under simulated shipboard conditions to alleviate heat stress on ships (Gaughan 2004). It found that wetting of cattle is effective in alleviating heat stress and led to publication of a "fact sheet" that was circulated widely within the industry. This was a significant piece of research that challenged the industry practice of not deck washing during periods of hot weather due to concerns that higher levels of relative humidity might be detrimental. Wetting was also identified as an effective practice to combat heat stress. It is interesting to note that despite the industry now being prepared to undertake deck washing during hot periods, the wetting of cattle during heat stress incidents is still not practiced. This suggests that the communication of information is not always sufficient to effect changes to industry practice and highlights further the extent to which findings need to be packaged for delivery.

It is interesting to note also that despite the "fact sheet" recommending the use of both panting scores and/or heat stress scores as the preferred observed measure of heat stress, these indicators do not feature in onboard reporting requirements (and/or utilise a different scale). Heat stress remains the most important issue facing the long haul cattle industry. Most of the other risk factors (with the exception of mechanical failure) are reasonably well understood within the industry with limited scope to impact adversely on outcomes. Therefore heat stress is seen as an issue with remaining technical problems and a major potential to impact on voyage outcomes.

Industry guidelines:	*Exist (further scrutiny required)*
Scientific support:	*Exists (but still lacking)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Very high*

Ammonia

The industry has recognised that ammonia is generated in the bedding and can at times affect the onboard health of cattle. There has been considerable research undertaken to address these concerns. A study that looked at decreasing shipboard ammonia levels and optimising the

nutritional performance of cattle (LIVE.202) (Acciolly, 2003) evaluated dietary manipulation and the use of feed additives as methods of reducing ammonia production from manure. Dietary manipulation (particularly the use of more digestible roughage) proved to be effective in reducing ammonia production with the added benefit of better nutritional performance. Feed additives (particularly gypsum) have also proved effective. Neither of these recommendations has been widely adopted due to commercial limitations but protein levels have been reduced in pelleted fodder by adjusting ingredient ratios. It was also noted that the use of canola meal (rather than lupins) as a protein source led to lower ammonia production (Acciolly, 2004). Gypsum as a bedding additive was also effective as a means of reducing ammonia production (by reducing the pH of the bedding).

Phillips (Phillips, 2005) cited ammonia as a measure of welfare in LIVE.222 ("Developing alternative methods of measuring animal welfare on ships and in pre-export assembly depots"). This is discussed in more detail in the section on "Outcomes" (Section 4.8).

Industry guidelines:	*Do not exist*
Scientific support:	*Exists*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium (revisit existing research)*

Flooring
Flooring varies considerably between vessels servicing the long haul transport of cattle. Industry consultation indicates that there is a general consensus between ship owners about the best flooring but some older vessels still have sub-optimal flooring. New flooring can be quite abrasive until it "settles down". Additional sawdust is often required on vessels where sub optimal flooring is an issue.

Industry guidelines:	*Do not exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Pen design
Pen design requirements are outlined in AMSA Part 43.

Industry guidelines:	*Exist (Marine Orders)*
Scientific support:	*Lacking (further innovation would be of benefit)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.7.3 Bedding management

Bedding management
ASEL states that:

> *… when bedding is used, it must be maintained in adequate condition to ensure the health and welfare of the livestock (ASEL S5.9).*

Bedding management is an important issue on long haul cattle voyages. Heat stress related incidents have occurred where onboard personnel have been reluctant to wash decks. There has been a trend towards more frequent deck washing, particularly since research findings have encouraged the wetting of cattle during periods of hot weather. Bedding management is addressed in the industry Stockman's manual (pages 21-24). See also the recommendation of Tips and Tools "wetting to alleviate heat stress" (Gaughan, 2003).

The characteristics and volume of effluent produced by livestock vessels have been studied by LIVE.221 (Landline Consulting, 2003). This work quantified the effluent production from cattle in terms of organic matter, nitrogen, phosphorus and potassium and the implications in terms of changes to AMSA regulations that will require livestock vessels to hold effluent in tanks prior to it being discharged into the ocean. The study recommends that the environmental impact of this discharge on the mixing zones behind the vessels be evaluated.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Exists (revisit existing research)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.7.4 Feed and water

Provision of feed and water
ASEL states that:

> *… all during the voyage, livestock must have access to adequate water of a quality to maintain good health and suitable feed to satisfy their energy requirements, taking into consideration needs according to the livestock species, class and age:*
> - *There must be a contingency plan to provide satisfactory tending, feeding and watering of the livestock in the event of a malfunction of the automatic feeding or watering systems, but without compromising the safe navigation of the vessel.*
> - *Adequate feed and water must be supplied to livestock waiting to be discharged, and during the discharge period (ASEL S5.5).*

Onboard personnel have observed an increase in total fodder consumption since exporters have made greater use of assembly feedlots, particularly where cattle have been exposed to the pellet diet. Animals that are not familiar with the pellet diet usually take 5-6 days to "come onto the feed". Where cattle are slow to 'come onto feed' it is possible to budget for lower reserves of fodder. Water and water delivery is addressed by the industry Stockman's manual (pages 27-28). Fodder and fodder delivery is addressed by the industry Stockman's manual (pages 24-27).

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.7.5 Treatment of sick and/or injured animals

Animal care and observation
ASEL states that:

> *…… livestock and livestock services on the vessel must be regularly inspected (day and night) to ensure that the health and welfare of the livestock are maintained while the livestock are on the vessel:*
> - *A meeting must be held daily to discuss all issues relating to the health and welfare of the livestock. This must include the master and/or the master's representative, accredited stock person and veterinarian.*
> - *Livestock must be systematically inspected to assess their health and welfare.*
> - *Feed and water supply systems must be monitored day and night and maintained in good order.*
> - *The pen stocking density must be checked regularly throughout the voyage and adjustments made as required.*
> - *Ventilation must be monitored regularly each day to ensure adequate thermoregulation of the livestock.*
> - *Washing down of decks and disposal of faeces and litter must be carried out with regard to the health and welfare of livestock (see bedding management) (ASEL S5.6).*

These are an established and accepted industry practice.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Treatment of sick and injured animals
ASEL states that:

> *…any livestock for export identified after loading as being sick or injured must be given immediate treatment. Where euthanasia is necessary, this must be done humanely and without delay (ASEL S5.2).*

ASEL also states that:

> *…. any livestock identified as being sick or injured must:*
> - *be given prompt treatment;*
> - *be transferred to a hospital pen if required and*

Careful observation of livestock to determine their well-being is a key competency and skill. In many cases the observation may not involve any specific treatment but could mean small changes to feeding regimes or other management procedures. Aspects of onboard observation are described in the Stockman's manual (pages 11-15).

There has been some questioning regarding the capability of stockmen to properly administer veterinary drugs. The study entitled 'best practice usage of veterinary drugs' focussed specifically on the responsible use of veterinary drugs from the point of view of food health and safety. The project brief did not ask for any discussion of the appropriate use of veterinary drugs from a

diagnostic perspective. Most long haul voyages involving cattle will require veterinary accompaniment, and suitable supervision and guidance will be provided accordingly. Additional training of stockman travelling on long haul voyages without a veterinarian has been suggested, as has the development of an industry specific "decision tree" to assist with treatment choices. This would also assist inexperienced veterinarians. Specific treatments for the common ailments are discussed in the Stockman's manual (pages 28-36).

ASEL states that:

> *…. veterinary drugs must be stored and used according to veterinary directions and manufacturers' recommendations, and treatment records must be maintained (ASEL S5.8).*

Considerable work has been undertaken on electrolytes to reduce heat stress in cattle. This includes LIVE.104B, LIVE.108, LIVE.209 and LIVE.224. Recommendations from this research have eliminated industry practices that were inappropriate (mainly through improper delivery methods). The result has been a considerable saving to the industry. At this stage it would appear that electrolytes do not alter an animal's ability to tolerate heat but allows them to recover faster from a heat stress episode. Justification for the usage of electrolytes depends therefore on a transitory increase in body weight that occurs in most situations.

Bovine Respiratory Disease has been addressed to some extent in a MLA project entitled "Evaluation and cost/benefit analysis of Rhinoguard vaccine". The justification for the use of a vaccine depends on the anticipated prevalence of the disease and must ensure that the vaccine is active against the most common etiological agents (More, 2003). Prevalence on most voyages is low and the industry would be better served by addressing predisposing factors during the assembly process. High risk groups could be candidates for vaccination or preventative treatment.

Ringworm has been addressed by LIVE.113 (Brightling, 2003). Although this project was specifically aimed at dairy cattle, the findings apply equally to other categories of livestock.

LIVE.121 looked into aggressive behaviour but did not specifically address lameness due to "riding" behaviour. Now that 'other' conditions have been successfully addressed, lameness has evolved as one of the major clinical conditions requiring attention (Entwistle, 2005).

The use of sick pens is a crucial part of rehabilitating sick animals but there are few guidelines on this important tool. Sick pen space should reflect the numbers of cattle likely to require assistance. The results of sick pen monitoring could provide valuable information for researchers wishing to establish cause and effect, particularly where mortality figures are low. A superior technique for monitoring sick pen activity is discussed in more detail in a later section.

Most of the clinical conditions found in cattle onboard are well understood and do not require further research and development. Pneumonia is the most common cause of mortality and the predisposing factors are well known. There would, however, be merit in establishing linkages to pre-delivery factors by developing better trace-back and onboard monitoring systems. A facet of this is the provision of better diagnostic support to onboard veterinarians and stockmen. Guidelines on the disposal of dead stock exist in the Marine Orders (Section 39).

ASEL also states that:

- *if necessary sick animals be euthanised humanely and without delay (the carcasses of any dead stock must be disposed accordance with the requirements of Annex V of MARPOL 73/78[1]) (ASEL S5.7).*

The techniques for euthanasia and disposal are well understood by industry.

Industry guidelines: *Exist*
Scientific support: *Exist (mostly adequate)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

Table 1.7.5: Treatment of Onboard Conditions (LHC)

Treatment of Onboard Conditions (Long Haul – Cattle)				
Condition	Industry Guidelines	Scientific Support	Industry Consensus	R&D priority
Lameness	Adequate*	**	Consensus	Low
Downers	Adequate*	**	Consensus	Low
Diarrhea	Adequate*	**	Consensus	Low
Bloat	Adequate*	**	Consensus	Low
Wounds and injuries	Adequate*	**	Consensus	Low
Pink Eye	Adequate*	**	Consensus	Low
Enterotoxaemia	Adequate*	**	Consensus	Low
Blackleg	Adequate*	**	Consensus	Low
Shy Feeders	Adequate*	**	Consensus	Low
Ringworm	Adequate*	Yes (LIVE.113)****	Consensus	Low
IBR/BRD	Adequate*	Yes (LIVE.111)*****	Consensus	Low
Pneumonia	Adequate*	**	Consensus	Low
Misadventure	Adequate*	**	Consensus	Low
Heat Stress	Adequate*	Yes (numerous)******	Consensus	Low
Diagnostic Support	Required	Required	Some Contention	Medium
Disposal	Adequate		Consensus	Low

* Guidelines contained in the industry Stockman's manual.
** Recommended treatments are regularly reviewed to ensure they are consistent with contemporary veterinary knowledge.
*** LIVE.121 addressed industry options for modifying aggressive behaviour and subsequent lameness due to "riding".
****LIVE.113 addressed Ringworm in Dairy cattle. Findings are consistent to other cattle.
***** LIVE.111 addressed the possible use of IBR/BRD vaccine.
****** The research undertaken to address heat stress is outline under the section heading.

1.7.6 Daily reporting and end of voyage reporting

Daily meetings
Most vessels conduct daily meetings where management issues are discussed. The Captain, the chief officer and the bosun usually attend these meetings, with the stockman and veterinarian attending on behalf of the exporter. This is a good practice and is already adhered to on most vessels.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Daily report

ASEL states that:

> *….. for journeys greater than 10 days, an accredited stock person must provide daily reports on the health and welfare of the livestock to the relevant Australian Government agency, commencing on day one of the voyage. The report must include the information outlined in ASEL Appendix 5.1. However, where an accredited veterinarian is on board, he or she must provide the daily report rather than the stock person (ASEL S5.12).*

There has been some contention over the format used for daily reports. First, the reports (at times) appear to ignore industry recommendations (e.g. the industry has promoted the use of panting scores to monitor heat stress yet the report scores respiratory rate and character). Secondly, there is rarely any attempt to collate the information contained in the reports and retrospective attempts to do so are generally frustrated by a lack of specifics. Consequently, there is scope to revisit the reporting format, particularly if it is part of an overall program to monitor and document onboard information to establish useful linkages to performance. Aspects of this are discussed in other parts of this report.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (as a tool to support R&D)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

End of voyage report

ASEL states that:

> *….. regardless of the journey duration, within five days of completion of discharge at the final port of discharge, an accredited stock person must provide an end-of-voyage report on the health and welfare of the livestock to the relevant Australian Government agency. The report must include the information outlined in ASEL Appendix 5.2. Where there is an accredited veterinarian on board, he or she must provide the end-of-voyage report (ASEL S5.13).*

The nature and quality of information supplied via 'end of voyage' reports varies considerably. Contention surrounds the information that should be contained in these reports and the actions that should be precipitated by the report contents. Also there are questions as to whether AQIS is the appropriate agency to be investigating issues raised in the end of voyage report and whether AQIS has the appropriate resources. Furthermore there are confidentiality issues that preclude information which may be useful to the industry from being added to the knowledge bank. Possible solutions to some of these dilemmas are presented in the final report.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (as a tool to support R&D)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.7.7 Contingency planning and response

Contingency planning
ASEL states that:

> *….. a contingency plan for the following emergencies must be prepared for each consignment as part of the consignment risk management plan:*
> - *mechanical breakdown;*
> - *a feed or water shortage during the voyage;*
> - *an outbreak of a disease during the voyage;*
> - *extreme weather conditions during the voyage; and*
> - *rejection of the consignment by the overseas market (ASEL S5.10).*

There is a danger that contingency planning for each consignment may lead to this being a routine book entry. It is incumbent on the industry to have real and specific responses to the important contingencies. Thus research and development in these areas should be a high priority. Contingency events are the industry's major identified risks and as such require maximum detail – given the vast array of possible responses. This is an area that requires considerable attention and complements the risk management approach discussed earlier in this document.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking (more detail required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.7.8 Incident notification

Incident notification
ASEL states that:

> *….. if a notifiable incident occurs at any time, the relevant Australian Government agency must be advised as soon as possible and within 12 hours. In relation to a notifiable incident involving a mortality, equal to or greater than the reportable level, a report must be provided that includes the following:*

- *details of the mortalities (eg number, species, suspected cause);*
- *factors that may have contributed to the deaths; and*
- *the current location of the vessel and, if appropriate, its destination and estimated time of arrival (ASEL S5.11) (see also Marine Orders Part 43 40.1).*

Reportable levels are designated in both the AMSA Part 43 (40) and ASEL.

They are:

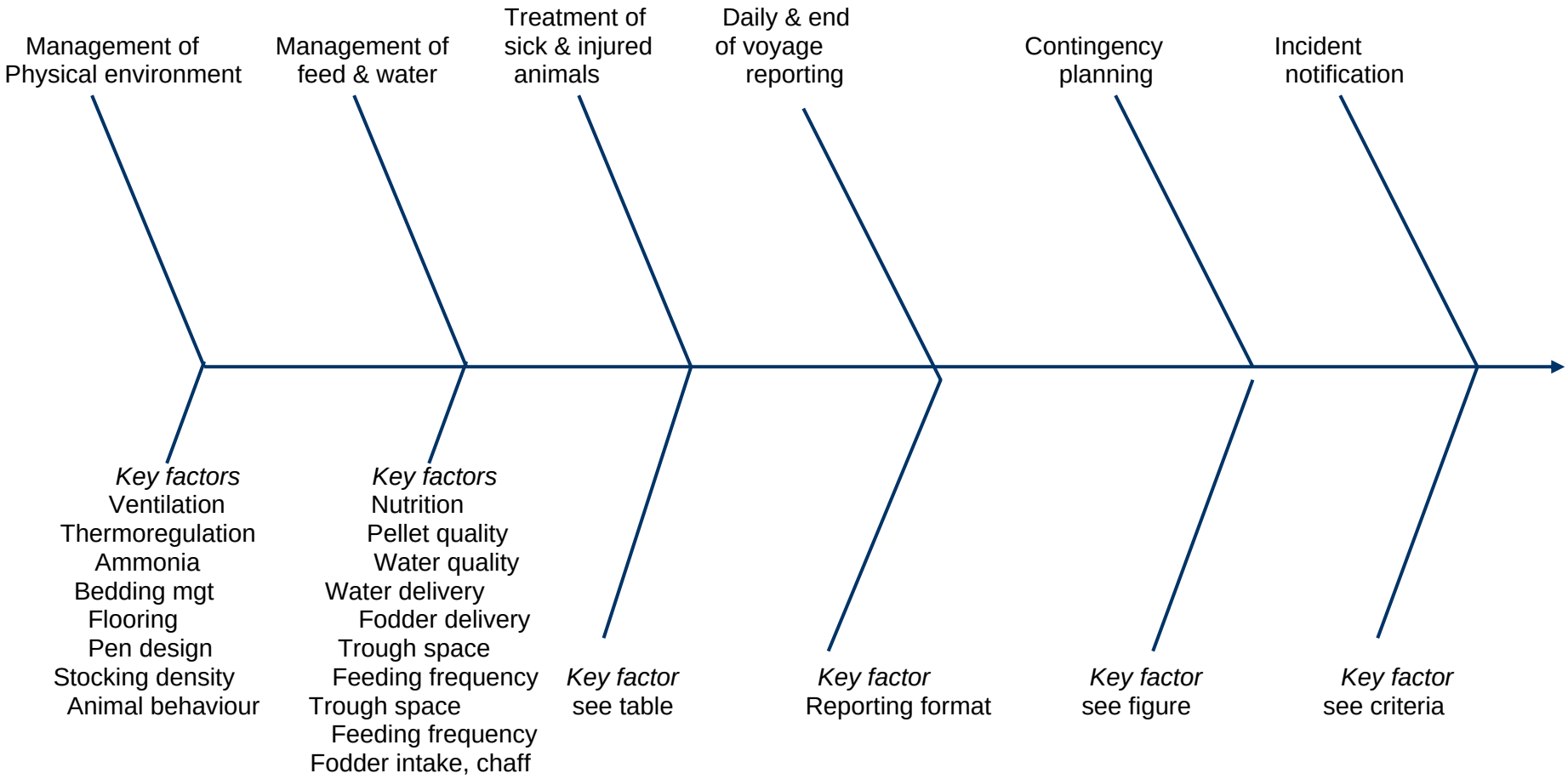
Cattle for voyages (greater or equal to 10 days)	*1%*
Cattle for voyages (less than 10 days)	*0.5%*

(The AMSA definition dictates that the mortality relates to each species within the voyage).

It is not within the scope of this project to comment on mortality levels. The requirement for reporting appears reasonable except that the relevant Australian Government Agency in this case is the Chief Marine Surveyor at AMSA and AQIS. Under the current framework (and with a view to respecting confidentiality) details are not extensively circulated. From a research perspective, it is important to determine and document how, when and why the incident occurred and then add the results to the industry's body of knowledge. An "incident response" has been suggested that may require a co-operative approach between LiveCorp and a suitably skilled industry person. Currently there is some blurring of responsibilities regarding how incidents are investigated. This is an issue for the industry research body to resolve.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low (under investigation)*

Figure 1.7: Onboard Management of Livestock (LHC)



1.8 Voyage outcomes (LHC)

Because livestock exporting is perceived to threaten animal welfare, the industry and other stakeholders place considerable emphasis on the concept of acceptable outcomes. While there is broad agreement on the need to achieve 'acceptable' outcomes, there are differing points of view regarding the definition of 'acceptable' and on how the outcomes, however defined, should be achieved in practice. This is a challenging subject but has been researched on several occasions over recent years. LIVE.117 (Whan et al, 2002) undertook a comprehensive review of the Australian Livestock Export Standards (ALES) and made a key recommendation with respect to achievement of outcomes. The study advocated a risk based approach with primary responsibility for understanding and managing the risks resting with the operator. There are however, many misconceptions associated with the outcome approach. Many people think it is concerned only with the ultimate outcome (currently voyage mortality). In fact there are many "mini" outcomes associated with the approach. For example, whilst a prescriptive approach may require that a pre-embarkation inspection is undertaken, an outcome approach would evaluate the actual effectiveness of the inspection. The same principle can be applied to most of the prescriptive requirements. Notwithstanding the thrust of LIVE.117, the prevailing approach to outcomes management is prescriptive in the sense that exporters are required to act in accordance with orders, regulations and standards. It seems likely, however, that the industry will eventually take direct responsibility for achieving outcomes and it will do this through comprehensive risk management. The following discussion initiates steps in this direction.

Welfare outcomes have traditionally been considered in terms of mortality rates as stated in an earlier section. There have been several attempts to develop alternative indicators of animal welfare with the latest using a computer-based questionnaire to rank possible measures (Phillips, 2005). The measures considered included mortality, clinical disease incidence, respiration rate, space allowance, ammonia, weight change, wet bulb temperature, time in assembly depots, proportion of animals hospitalised, fodder intake, stress related metabolites, proportion of feed troughs utilised, injuries, proportion of animals able to access feeding troughs at any one time, cortisol, noise and photoperiod.

Studies of this nature are likely to suffer from multicollinearity[1] making it is very difficult to interpret the findings. Moreover, there will be spurious interactions between the dependent and independent variables. Thus wet bulb temperature is meaningless without knowing the category and prior history of an animal. The proportion of animals able to access feeding troughs at any one time is of little consequence when feeding is *ad lib* but becomes highly important when feeding is restricted.

Currently the industry has a heavy reliance on mortality as a proxy for acceptable welfare. This can be misleading as a measure of welfare impact. Thus a 1% incidence of mortality due to specific condition (say enterotoxaemia) will only impact those animals that die, leaving the remainder unaffected. Conversely a major heat stress incident may affect large numbers of cattle but kill very few.

Interestingly, much of the existing reporting (in a rough and ready way) already demonstrates an absence of distress as might be defined by many welfare concerns. It is suggested that a more formal approach to monitoring and reporting (with a view to addressing a wider array of welfare concerns) would cast the industry in a better light. A proactive stance by the industry on this matter may increase its standing in the eyes of key welfare bodies. The following headings are

[1] Multicollinearity occurs when several of the independent variables are highly correlated and convey the same information. This is a particular problem when we want to understand how the independent variables impact on the dependent variable – in this case animal welfare.

suggested indicators that develop this concept further. The definition of outcomes should be broadened to consider assessment of many of the systems used to achieve mini outcomes within the live export process.

1.8.1 Mortality

Mortality
Both ASEL and AMSA Part 43 require the recording of mortality data by species, category and deck. There have been several attempts on sheep voyages to further develop trace-back mortality to property and treatment history and scope exists to develop similar systems for long haul cattle voyages. Mortality rates on cattle voyages are low and animals that do die are subjected to post mortem, which assists in determining the cause of death. This information could be collated so as to demonstrate the absence (or at least very low incidence) of disease that adversely affects welfare.

Industry guidelines:	*Exist*
Scientific support:	*Exist (mostly adequate)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.8.2 Weight gain

Feed Intake and weight gain
Actual daily feed intake is rarely measured during a voyage despite the fact that intake is a reliable indicator of health. However total consumption is known by the end of the voyage and is reported on a daily basis, allowing a post-voyage indicator of consignment welfare to be demonstrated.

Similarly overall weight gain (or the absence of weight loss) is an indicator of welfare. This information is not routinely reported (and not always known) depending on commercial arrangements. Where weight gain is known it could be used to demonstrate satisfactory welfare.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.8.3 Health status

Absence/Incidence of clinical disease
As mentioned previously, some of the existing reporting refers to the incidence of disease. The existing reporting, however, is not sufficiently robust to give any more than a rough indication of the commonly occurring conditions. Better systems exist and have been utilised albeit only for short periods. A table that tracks hospital entrants and recoveries as well as the animals under treatment has the capacity to provide relatively good quality data on clinical disease incidence as well as gauge of the effectiveness of treatment. This is a simple modification that would deliver superior information. It would, however, require analytical and reporting resources and would need to overcome any issues to do with confidentiality. It would seem to be an inappropriate role for AQIS personnel.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

Absence of distress due to ammonia

Several projects have been undertaken to investigate aspects relating to ammonia. Strong linkages to pad moisture and pH levels have been demonstrated as well as the episodic nature of emissions. A study was also undertaken to determine critical atmospheric ammonia levels for cattle, sheep and goats" (Costa (2003). This study set the standard for ammonia levels at 25ppm (assumed to be a quoted as a time weighted average (TWA)). This can be logged by appropriate equipment and the capacity exists to demonstrate that ammonia levels are maintained below the identified critical level (NB: the issue of ammonia levels is also likely to be addressed as an Occupational Health and Safety issue for onboard personnel).

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.8.4 Behavioural/Environmental stress

Absence of distress due to heat

Thermo-regulation and heat stress has been discussed in an earlier section. Again, existing reporting procedures demonstrate the effectiveness of risk minimisation procedures aimed at avoiding distress due to heat stress. Appropriate linkages exist so that either deck wet bulb temperatures or behavioural responses such as respiration rate/panting score/heat stress score can all be used to determine the occurrence of a heat stress incident. In addition, factors such as measurement of the ambient challenge (and/or prevailing wind conditions on open decks) can also validate (or otherwise) the assumptions behind heat stress risk assessment procedures. Duration of exposure can also be evaluated as a factor. Onboard monitoring procedures have been developed in pilot studies and more routine onboard monitoring is well within the reach of available resources.

Industry guidelines:	*Exist (in part)*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

Absence of distress due to crowding

Distress due to crowding is, of course, linked directly to stocking density. But it also involves other factors such as whether feeding is *ad lib* or restricted. Pen size and/or the size of the cattle in a pen are also relevant factors. These issues have been addressed in LIVE.233 (Petherick, 2006). There is some debate over the ability of people to observe anxiety and/or distress among animals. Observational studies have shown that both trained and untrained people can identify distress in animals and that this is repeatable. Current stocking density on long haul cattle

voyages are such that in many cases it is possible for all the animals in the pen to lie down if they choose, and this situation is often observed. This in itself is an indicator of the welfare of the animals. Stocking density remains a contentious subject within the industry.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

Absence of distress due to poor bedding
This is an important indicator on long haul cattle voyages due to the need to undertake deck washing to maintain suitable bedding. Again, existing reporting procedures demonstrate the maintenance of suitable bedding using an appropriate bedding score. There has been a trend toward more frequent washings onboard and most vessels wash “before” it is required, rather than once the bedding has deteriorated. Technical and economic aspects of bedding management could be refined by further study.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.8.5 Client satisfaction / Commercial outcome

It is noted that many of the overseas destinations do not exhibit the welfare concerns found and applied in Australia. Moreover, client satisfaction in regards to the state of animals at discharge is generally high. It should also be remembered that improving welfare usually adds to costs and at some point the addition of another measure will threaten the entire business model. Finally, we would note that research in many other industries is often directed at innovations that improve productivity and profitability. The long haul cattle industry has not yet had the luxury to engage in research of this type.

Industry guidelines:	*Not relevant*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Variable*
R&D priority:	*Low*

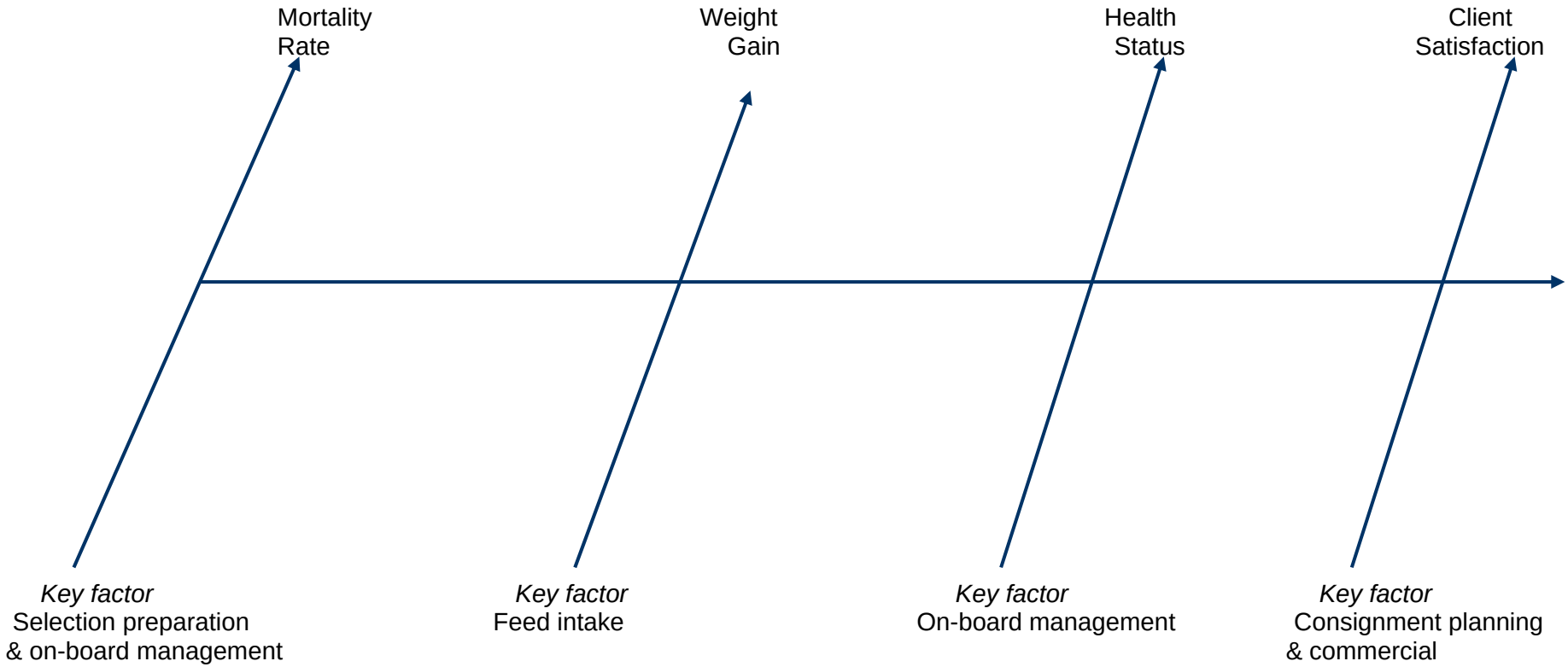
1.8.6 Occupational Health and Safety

Occupational Health and Safety
It is suggested that the industry be prepared to address occupational health and safety issues, in keeping with trends in other industries. It is of interest to note that tolerance levels for ammonia are the same for humans as stated for livestock. Absolute levels and exposure times are both important. Costa, (2003) noted that the Australian National Occupational Health and Safety Commission sets ammonia for occupational health and safety at 25 ppm as a time weighted

average (TWA), 35 ppm as a short term exposure limit (STEL) and 50 ppm as the maximum permissible exposure limit (PEL). This can be logged by appropriate equipment and it is likely that at some time in the future both human and animal health issues relating to ammonia will be addressed concurrently. Other aspects of OH&S may also overlap with animal health issues. Occupational Health and Safety is not likely attract R&D funding unless it overlaps with animal health issues.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Figure 1.8 Outcomes (LHC)



1.9 Summary Tables (LHC)

1.9.1 Consignment planning (LHC)

The following headings apply to the planning phase of the live cattle export process (long haul).

Table 1.9.1: Consignment Planning (LHC)

Consignment Planning (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D Priority
Determination of importing country requirements (1.2.1)	Exist (scrutiny required)	Lacking (required)	Some contention	Sometimes high	Sometimes adverse	Medium
Consignment Risk Management Planning (CRMP) (1.2.2)	Exist	Exists (more detail required)	Some contention	Low	High (if properly utilised)	High
Commercial arrangements (1.2.3)	Do not exist	Not required	Some contention	Low	Low	Low
Lodgement of Notice of Intention & CRMP (1.2.4)	Exist	Not required	Some contention	Low	Low	Low
Approval Procedures (1.2.5)	Exist	Not required	Some contention	Low	Low	Low
Test and treatment schedules (1.2.6)	Exist	Not required	Consensus	Low	Low	Low
Logistics Co-ordination (1.2.7)	Exist industry operating and governance manual)	Not required	Consensus	Low	Low	Low

1.9.2 Sourcing and selection (LHC)

The following headings apply to the sourcing phase of the live cattle export process (long haul).

Table 1.9.2: Sourcing and Selection Criteria (LHC)

Sourcing and Selection Criteria (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Conformance/model codes (1.3.1)	Model codes are under review	Lacking in many instances	Some contention	Can be high	Can be high	Low (monitor developments)
Conformance/import permit (1.3.1)	Exist (scrutiny required)	See earlier section	Some contention	Sometimes high	Sometimes adverse	Medium
Conformance/food safety (1.3.1)	Exist	Exists (LIVE.114)	Consensus	Low	Low	Low
Body condition (assessment) (1.3.1)	Exist	Exist (LIVE.120)	Consensus	Low	Potentially high	Low
Body condition (1.3.1)	Exist	Lacking	Some contention	Low	Potentially high	Low
Weight range (1.3.1)	Exist	Lacking (required)	Some contention	Sometimes high	Potentially high	Medium
Weaning status (1.3.1)	Exist	Lacking	Consensus	Low	High	Low
Pregnancy status (1.3.1)	Exist	Lacking	Consensus	High	High	Low
Horn status (length) (1.3.1)	Exist	Lacking	Contentious	High	High	Medium
Fitness to travel (1.3.2)	Exist (see Table 1.3.2)	Exists (veterinary texts)	Consensus	High	High	Low

The following headings apply to the sourcing phase of the live cattle export process (long haul) - continued.

Table 1.9.2: Sourcing and Selection Criteria (LHC)

Sourcing and Selection Criteria –cont. (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
On farm testing (1.3.3)	Exist	Not required	Consensus	Low	Low	Low
Livestock identification (1.3.4)	Exist	Lacking (investigation required)	Consensus	Low	Potentially high	Medium
Pre-loading inspection (1.3.5)	Do not exist	Not required	Consensus	Low	Low	Low
Vendor documentation (1.3.5)	Exist	Not required	Consensus	Low	Low	Low

1.9.3 Land transport (LHC)

The following headings apply to the land transport phase of the live cattle export process (long haul).

Table 1.9.3: Land Transport of Cattle intended for Export (LHC)

Land transport of livestock intended for export (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Travel plans (1.4.1)	Exist	Not required	Consensus	Low	Low	Low
Preparation (1.4.1)	Exist	Lacking	Consensus	Low	Potentially high	Low
Water deprivation times (1.4.1)	Exist	Lacking (under investigation AHW.005)	Contentious	Potentially high	Unclear	High (monitor project developments)
Feed and water curfews (1.4.1)	Exist	Lacking (under investigation LIVE.122A)	Consensus	Low	Potentially high	Medium
Rest periods (1.4.1)	Exist	Lacking	Consensus	Low (except in rare case)	Potentially high	Low
Loading procedures (1.4.2)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Segregation (trucks) (1.4.2)	Exist	Lacking (required)	Contentious	High	Low	High
Handling (1.4.2)	Exist	Exists (adequate)	Consensus	Low	Potentially high	Low
Penning arrangements (1.4.2)	Exist	Lacking	Consensus (except for the issue of horns)	Sometimes high	Unclear	Medium
Loading densities (1.4.2)	Exist	Lacking	Consensus (except for the issue of horns)	Sometimes high	Unclear	Medium
Transport responsibilities and documentation (1.4.3)	Exist	Not required	Consensus	Low	Low	Low

1.9.4 Management within registered premises (LHC)

The following headings apply to the management within registered premises phase of the live cattle export process (long haul).

Table 1.9.4: Management within Registered Premises (LHC)

Management within Registered Premises (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Location of premises (1.5.1)	Exist	Not required (consider temporary registration)	Consensus	Potentially high	Low	Low
Staff and staff training (1.5.2)	Exist	Lacking (required)	Consensus	Low	Potentially high	Medium
Receival (1.5.3)	Exist	Not required (operation tool)	Consensus	Low	Potentially high	Low
Unloading and inspection (1.5.3)	Exist	Exists (adequate)	Consensus	Low	Low	Low
Penning arrangements (including segregation) (1.5.4)	Exist (scrutiny required)	Lacking (required)	Contentious	High	Low	Medium
Stocking density (1.5.4)	Exist (scrutiny required)	Lacking (required)	Some contention	High	Low	Medium
Isolation of livestock (1.5.4)	Exist (scrutiny required)	Lacking (required)	Some contention	High	Low	Medium
Pen design (1.5.5)	Exist (scrutiny required)	Lacking (required)	Some contention	Potentially high	Potentially high	Medium
Design of handling facilities (1.5.5)	Exist (scrutiny required)	Lacking	Consensus	Potentially high	Potentially high	Medium

The following headings apply to the management within registered premises phase of the live cattle export process (long haul) - (cont).

Table 1.9.4: Management within Registered Premises (LHC) …(continued)

Management within Registered Premises (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Provision of fodder and water (1.5.6)	Exist (scrutiny required)	Lacking	Some contention	Potentially high	Potentially high	Medium
Supervision/observation of livestock (1.5.7)	Adequate	Not required	Consensus	Low	High	Low
Mortality investigation (1.5.7)	Exist (scrutiny required)	Lacking (required)	Some contention	Potentially high	High	Medium
Treatment records (1.5.8)	Exist	Not required	Consensus	Low	Low	Low
Identification of rejects (1.5.9)	Exist	Not required	Some contention	Low	Potentially high	Low
Management of rejects (1.5.9)	Do not exist	Lacking (required)	Some contention	Potentially high	Potentially high	Medium
Authorized entry (1.5.10)	Exist	Not required	Consensus	Potentially high	Low	Low
Pre-loading inspection techniques and location (1.5.11)	Exist (scrutiny required)	Lacking (required)	Contentious	Potentially high	Potentially high	Medium
Permission to leave for loading (PLL) (1.5.12)	Exist	Not required	Consensus	Low	Low	Low

1.9.5 Vessel preparation and loading (LHC)

The following headings apply to the vessel preparation and loading phase of the live cattle export process (long haul).

Table 1.9.5: Vessel Preparation and Loading (LHC)

Vessel Preparation and Loading (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Loading instructions (1.6.1)	Exist	Not required (operational issue)	Some contention	Potentially high	Potentially high	Low
Loading personnel (1.6.2)	Exist	Lacking (training and competency assessment)	Consensus	Low	Potentially high	Medium
Accompaniment (1.6.2)	Exist	Lacking (roles in regards to R&D need to be defined)	Consensus	Low	Potentially high	High
Load plan (1.6.3)	Exist	Lacking (R&D need to work with procedures)	Consensus	Potentially high	Potentially high	Medium
Stocking density (1.6.3)	Exist (scrutiny required)	Lacking (required) (see LIVE.233)	Contentious	High	High	High
Other (1.6.3)	Exist	Not required (operational issues)	Consensus	Low	Low	Low
Segregation (onboard) (1.6.3)	Exist (scrutiny required)	Lacking (see 1.4.2)	Contentious	High	Unclear	High
Loading procedures (1.6.4)	Exist	Not required (operational issues)	Consensus	Low	Low	Low
Communication (1.6.4)	Exist	Not required (operational issues)	Consensus	Low	Low	Low

Table 1.9.5: Vessel Preparation and Loading (LHC) …(continued)

Vessel Preparation and Loading (Long Haul Cattle))						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Ventilation during loading (1.6.4)	Exist	Not required (operational issue)	Consensus	Low	Low	Low
Feed and water on arrival (1.6.4)	Exist	Lacking	Consensus	Low	Low	Low
Voyage water (1.6.5)	Exist	Exist (adequate see LIVE.205)	Consensus	Low	Low	Low
Voyage fodder (quantity) (1.6.5)	Exist (scrutiny required)	Lacking (more required)	Consensus	Potentially high	Potentially high	Medium
Voyage fodder (quality) (1.6.5)	Exist (scrutiny required)	Lacking (required)	Consensus	Potentially high	Potentially high	Medium
Veterinary supplies (1.6.5)	Exist	Exists (adequate)	Consensus	Low	Potentially high	Low
Bedding requirements (1.6.5)	Exist	Lacking (in regards to bedding management)	Consensus	Potentially high	Potentially high	Medium
Written instructions (1.6.6)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low

1.9.6 Onboard management (LHC)

The following headings apply to the onboard management phase of the live cattle export process (long haul).

Table 1.9.6: Onboard Management of Livestock (LHC)

Onboard Management of Livestock (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
On completion of loading (1.7.1)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Physical environment – ventilation (1.7.2)	Exist (scrutiny required)	Exists (more required)	Contentious	High	Potentially high	Very high
Physical environment – thermoregulation (1.7.2)	Exist (further scrutiny required)	Exists (more required)	Contentious	High	Potentially high	Very high
Physical environment – ammonia (1.7.2)	Do not exist	Exist	Consensus	Low	Potentially high	Medium (revisit existing research)
Physical environment – flooring (1.7.2)	Do not exist	Lacking	Consensus	Low	Potentially high	Low
Physical environment – pen design (1.7.2)	Scrutiny ongoing	Further innovation would be of benefit	Consensus	Low	Potentially high	Low
Bedding management (1.7.3)	Exist (scrutiny required)	Exists (more required)	Some contention	Low	Potentially high	Medium
Provision of feed and water (1.7.4)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Animal care and observation (1.7.5)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Treatment of sick and/or injured animals (1.7.5)	Exist	Exist (mostly adequate, see Table 1.7.5)	Consensus	Low	Potentially high	Low

Table 1.9.6: Onboard Management of Livestock (LHC) (continued)

Onboard Management of Livestock (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Daily meetings (1.7.6)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Daily reporting (1.7.6)	Exist	Lacking (as a support tool for R&D)	Consensus	Low	Potentially high	High
End of voyage reporting (1.7.6)	Exist	Lacking (as a support tool for R&D)	Some contention	Low	Potentially high	High
Contingency planning (1.7.7)	Exist	Lacking (much more detail required)	Consensus	Low	Potentially high	High
Incident notification (1.7.8)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low (already under investigation)

1.9.7 Outcomes (LHC)

The following headings apply to outcomes of the live cattle export process (long haul).

Table 1.9.7: Outcomes (LHC)

Outcomes (Long Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Voyage mortality (1.8.1)	Exist	Exists	Some contention	Low	Potentially high	Low
Feed intake and weight gain (1.8.2)	Do not exist	Lacking (as an outcome measure)	Consensus	Low	Potentially high	High
Incidence of clinical disease (1.8.3)	Do not exist	Lacking (as an outcome measure)	Consensus	Low	Potentially high	High
Ammonia (1.8.3)	Do not exist	Lacking (as an outcome measure)	Consensus	Low	Potentially high	High
Heat (1.8.4)	Do not exist (as an outcome measure)	Lacking (as an outcome measure)	Consensus	Low	Potentially high	High
Crowding (1.8.4)	Do not exist (as an outcome measure)	Lacking (as an outcome measure)	Consensus	Low	Potentially high	High
Bedding (1.8.4)	Do not exist (as an outcome measure)	Lacking (as an outcome measure)	Consensus	Low	Potentially high	High
Occupational Health and Safety (1.8.6)	Do not exist	Lacking (operational issue)	Consensus	Low	Potentially high	Low

Appendix 2

Industry Framework

Long Haul Sheep

Knowledge gaps, inconsistencies and research priorities within the livestock export industry

Results of consultations and an overview of guidelines and completed research

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1 Long Haul Sheep

1.1 Overview - long haul sheep (LHS)

As outlined in the project overview, the industry has been divided into the following sectors and treated as case studies.

- Long Haul Cattle
- Long Haul Sheep
- Short Haul Cattle
- Special Cases

The long haul sheep trade encompasses the export of sheep from southern parts of Australia to the Middle East. Voyage duration tends to be between 12 and 30 days.

It should be noted that many of the issues confronting the long haul sheep are common to all livestock supply chains. This situation gives rise to considerable repetition. Figure 1.1 provides an overview of the long haul sheep export process.

Each sector represents a specific supply channel that confronts essentially different issues. For the purposes of the study, each supply channel has been treated as a stand-alone case study and a separate framework developed accordingly. This has resulted in some repetition but the approach is justified on the grounds of 'client utility' (since most operators are interested in a particular supply channel).

Further divisions have been made that are consistent with the current Australian Standards for the Export of Livestock (ASEL) though these were broadened slightly to include other factors that may affect voyage outcomes. These divisions are described in the table of contents and are highlighted in the flow diagrams contained within the text.

The five standards that have been used to dissect the livestock exporting supply channel include:

1. Sourcing and on-farm preparation of livestock
2. Land transport of livestock
3. Management of livestock in registered premises
4. Vessel preparation and loading
5. On-board management of livestock.

It was also recognised that common to every supply channel is a Consignment Plan.

As outlined in the project over view, each case study has been furnished with summary tables that can be found at the end of the framework document (See Section 1.9). This represents a good starting point for those who do not wish to work through the detail of the appendix.

The trade is characterised by a focus on sheep survival with mortalities usually confined to a range of 0.5% -1.5%. Sheep are sold on a per head basis so there is little emphasis on delivered weight, although significant weight losses during the voyage are usually noted for investigation. Once loading is completed, treatment of individual animals is difficult so there is major emphasis on selection of healthy animals and careful preparation prior to shipment. Key areas of risk are salmonellae, heat stress and inanition.

The existence of significant gaps was determined by systematic scrutiny of the supply process.

Gaps were identified and assessed against existing standards and guidelines according to the criteria and possible determinations detailed below:

Criteria	Possible determination
Relevant industry standards and guidelines	Exist / Do not exist
Issues associated with standards and guidelines supported by industry specific R&D	Exists / Lacking
Issues associated with framework headings acceptable from the exporter's and other stakeholder's perspective	Consensus / Some contention / Contentious
Impact of existing standards and guidelines (and/or framework headings) on operational procedures	Low / High
Affect of existing standards and guidelines (and/or framework headings) on animal welfare outcome	Low / High
Inferred R&D priority	Low / Medium / High / Very high

1.1.1 Guidelines for the long haul sheep trade

Guidelines that relate to the long haul sheep trade include:

ASEL (Version 2)
The Australian Standards for the Export of Livestock (ASEL) represent the central reference point for the regulation of the industry. ASEL is supported by the corresponding Welfare Acts and associated Orders at both a State and Federal level. www.daff.gov.au/livestockexportstandards

Export Control (Animals) Orders 2004
These orders set out the arrangements under which the industry is regulated. The order is made under the Export Control Act 1982 and the Export Control (Animals) Regulations 1982. Complementary requirements are also found under the Australian Meat and Livestock Industry Act 1997. These orders provide both a general framework for regulation of the industry and some quite specific guidelines. www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf

Marine Orders Part 43
The marine orders provide guideline to the owners of vessels used for transporting livestock. They relate only to vessels that are Australian-registered or those that intend to participate in the export of livestock from Australia. Most of the guidelines relate specifically to the design and operation of the vessel but there are several key regulations that relate directly to livestock, particularly in regards to reporting mortality levels when they exceed critical levels. Vessels operating from Australia require an Australian Certificate for the Carriage of Livestock (valid for the species of livestock to be carried). The marine orders have a particular interest in ensuring that “livestock services” are adequate and properly maintained. This relates to the penning arrangements, the delivery of fodder and water and the maintenance of the onboard environment. www.amsa.gov.au

Figure 1. Industry framework

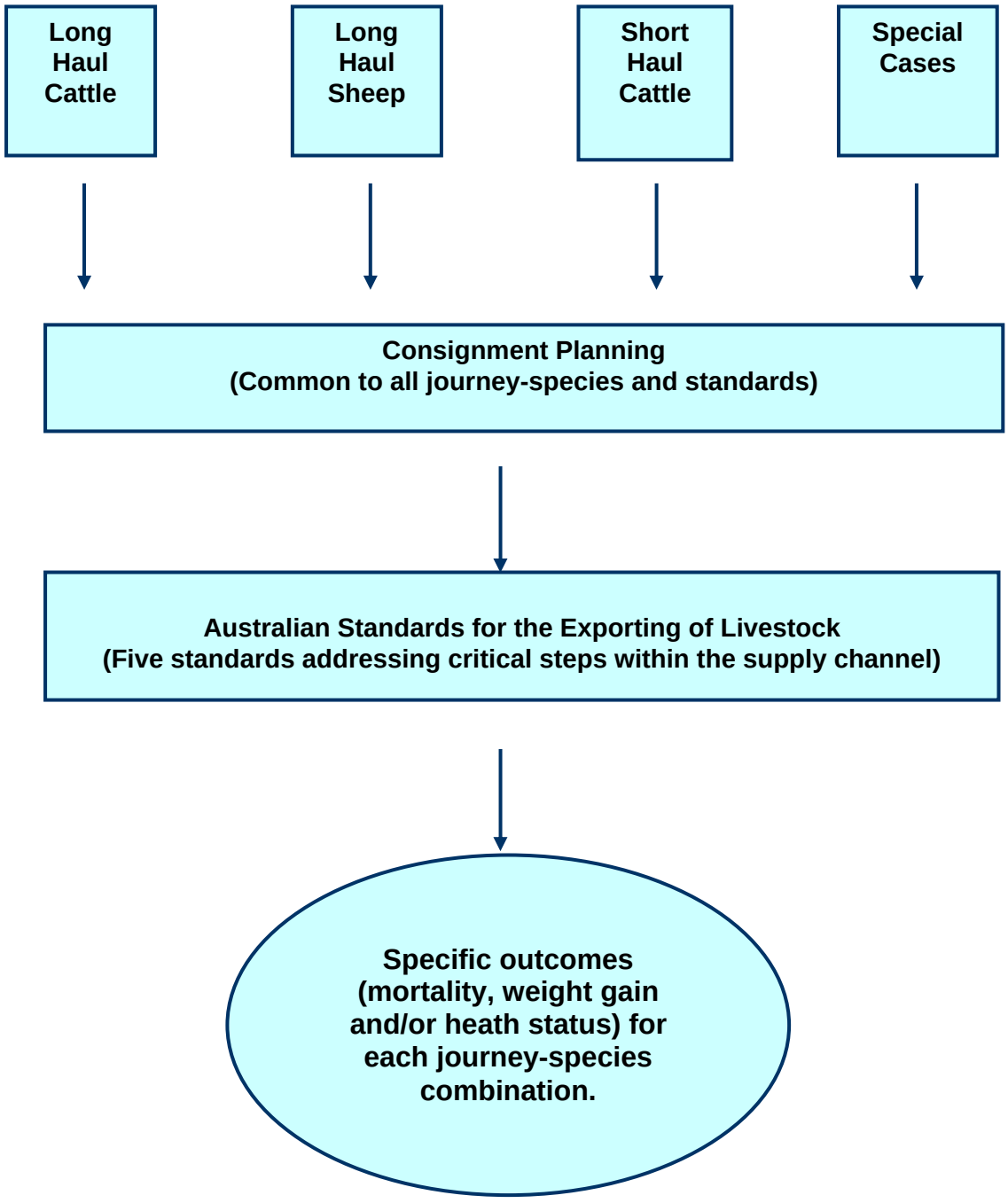
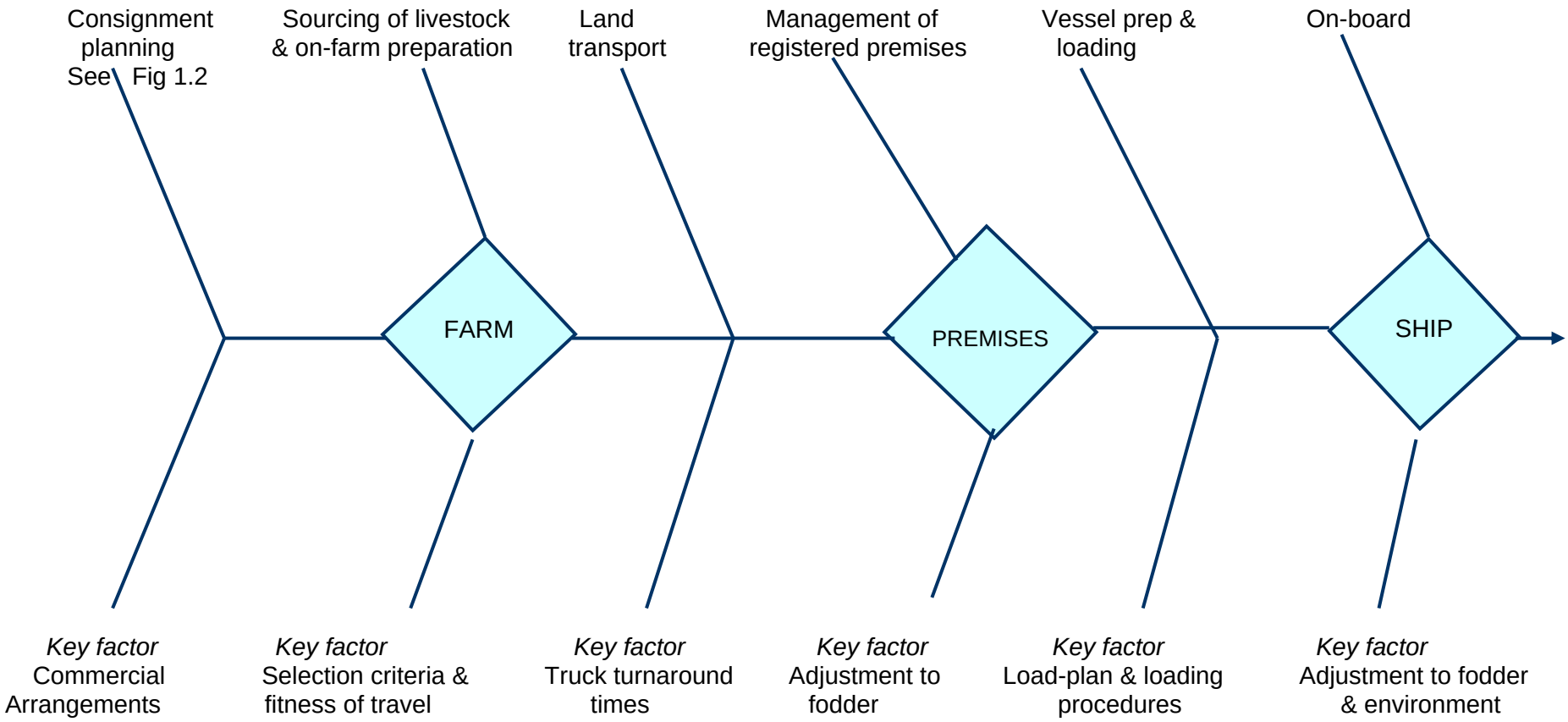


Figure 1.1: An Overview of the Long Haul Sheep Export Process



Australian Position Statement on the Export of Livestock
The position statement provides a framework for the development of ASEL. It provides the guiding principles for the development of the Standards and ensures that the Australian approach is consistent with that taken by international bodies (particularly the World Organization for Animal Health (OIE)).

Model Codes of Practice for the Welfare of Animals
Currently there are different State codes as well as a National Code relating to different species and circumstances. Logically, there is an initiative in place for the different State codes to be amalgamated into a common set of national codes. (various)

World Health Organization (OIE) Guidelines
The OIE has a precise set of guidelines relating to the export of livestock. These guidelines are well considered with an outcome based focus. ASEL is consistent with OIE guidelines. https://www.oie.int/eng/bien_etre/AW_WG_december2004_eng.pdf

Industry Operating and Governance Manual
The industry operating and governance manual is designed to complement and support the industry standards. It enables exporters to detail their current practices and ensure that they meet the requirements of the standards. They also draw together the regulation held within the different industry guidelines.

Stockman's Handbook – Transport of Sheep and Goats by Sea - December 2005 (Brightling, 2005)
The stockman's manual is a pivotal document aimed at supporting stockman under the auspices of the "stockman's program" operated by LiveCorp. The manual reflects the current thinking and experience of onboard stockmen and provides strong guidelines on how to manage the most important aspects of the export process from the stockman's perspective. www.livecorp.com.au

1.1.2 Best practice recommendations (LHS)

The only specific best practice recommendations undertaken that relate to the long haul sheep trade are listed below:

1.1.3 Industry specific research (LHS)

Industry research that relates specifically to the long haul sheep trade includes:

LIVE.123 Investigating mortality in sheep and lambs exported from Adelaide and Portland (under investigation, House, 2007)

LIVE.212 Investigation of ventilation efficacy on live sheep vessels (Stacey et al, 2004)

LIVE.105 Quality assurance for live goats to Saudi Arabia (Brightling, 2001)

LIVE.110 Improving the Saudi Arabia sheep and goat protocol (Brightling, 2002)

LIVE.213 Investigation into reducing odor emissions from partly loaded sheep vessels whilst in port (McCarthy, 2003)

Norris, R., R. Richards, et al. (1989a). "Pre-embarkation risk factors for sheep deaths during export by sea from Western Australia" *Australian Veterinary Journal* 66(10): 309-314.*

Norris, R., R. Richards, et al. (1989b). "An epidemiological study of sheep deaths before and during export by sea from Western Australia" *Australian Veterinary Journal* 66(9): 276-279.*
Norris, R., R. Richards, et al. (1992). "The duration of lot-feeding sheep before sea transport" *Australian Veterinary Journal* 69(1): 8-10.*

Richards, R., M. W. Hyder, et al. (1991). "Seasonal and metabolic factors may be responsible for deaths in sheep exported by sea" *Australian Journal of Agricultural Research* 42: 215-226.*

Richards, R., R. Norris, et al. (1989). "Causes of death in sheep exported live by sea" *Australian Veterinary Journal* 66(2): 33-38.*

Richards, R. B., R. T. Norris, et al. (1993). "Distribution of lesions in ovine salmonellosis" *Australian Veterinary Journal* 70: 326-330.*

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Wray, C. and K. A. Linklater (2000) Salmonella infections in sheep. Salmonella in Domestic Animals C. Wray and A. Wray, CABI Publishing, Wallingford, Oxon: 209-218.

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Higgs, ARB, Norris, RT and Richards, RB (1993) Epidemiology of salmonellosis in the live sheep export industry *Aust Vet Jn* 70: 330-335

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Higgs, ARB, Norris, RT, Love, RA and Norman, GJ (1999) Mortality of sheep exported by sea: evidence of similarity by farm group and of regions *Aust Vet Jn* 77: 729-733

Norris, R., C. L. McDonald, et al. (1990). "Management of inappetant sheep during export by sea" *Australian Veterinary Journal* 67(6): 244-247.*

LIVE.118 Investigating blue tongue virus persistence in sheep (Melville, 2003)

LIVE.106 Automatic counting of sheep (Kassler, 2001)

Projects of a more general nature that relate partially to the long haul sheep trade include:

LIVE.116 Development of a heat stress risk management model (Stacey, 2003)

LIVE.120 Identifying live animal condition score systems for the livestock export industry (Gaden, 2005)

LIVE.122A Investigating curfew in the live export and processing industries (under investigation Petherick, 2007)

LIVE.222 Developing alternative methods of measuring animal welfare on ships and in pre-export assembly depots (Phillips, 2005)

LIVE.211 Practical ventilation measures for livestock vessels (Stacey, 2003)

SBMR.002 Investigation of ventilation efficacy on livestock vessels (Stacey, 2001)

LIVE.228 Updating the biological assumptions in the industry heat stress risk assessment model (Stacey, 2005)

LIVE.218 Determining critical atmospheric ammonia levels for cattle, sheep and goats – a literature review (Costa, 2003)

LIVE.221 Characteristics and volumes of effluent produced by livestock vessels (Landline, 2003)

LIVE.223 Pilot monitoring of shipboard environmental conditions and animal performance (McCarthy, 2005)

LIVE.209 & LIVE.224 Physiology of heat stress in cattle and sheep and electrolytes replacement therapy (Barnes, 2004 & 2006)

LIVE.233 Literature review of stocking densities on ship and in pre-export assembly depots (Under investigation Petherick, 2007)

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Norris, R. and G. Norman (2004) National Livestock Export Mortality Summary 2003 LIVE.220.
Sydney, Meat & Livestock Australia and Livecorp

1.2 Consignment planning (LHS)

Consignment planning is common to all livestock export projects and there are no special circumstances associated with the long haul sheep trade. The planning protocol takes in all phases of the project, extending from farm of origin to port of disembarkation, and is designed to bring about acceptable outcomes. Consignment planning (as outlined in the Industry Operating and Governance Manual) is described under the auspices of an approved export program. This activity is treated as an integral part of each export process, regardless of destination and/or the species involved.

Central to consignment planning is the requirement for a consignment to be conducted under the auspices of an approved export program. Details of this requirement can be found in the Export Control (Animals) Order 2004 (see 2.47 of the Order). There are no special cases when it comes to the long haul sheep trade.

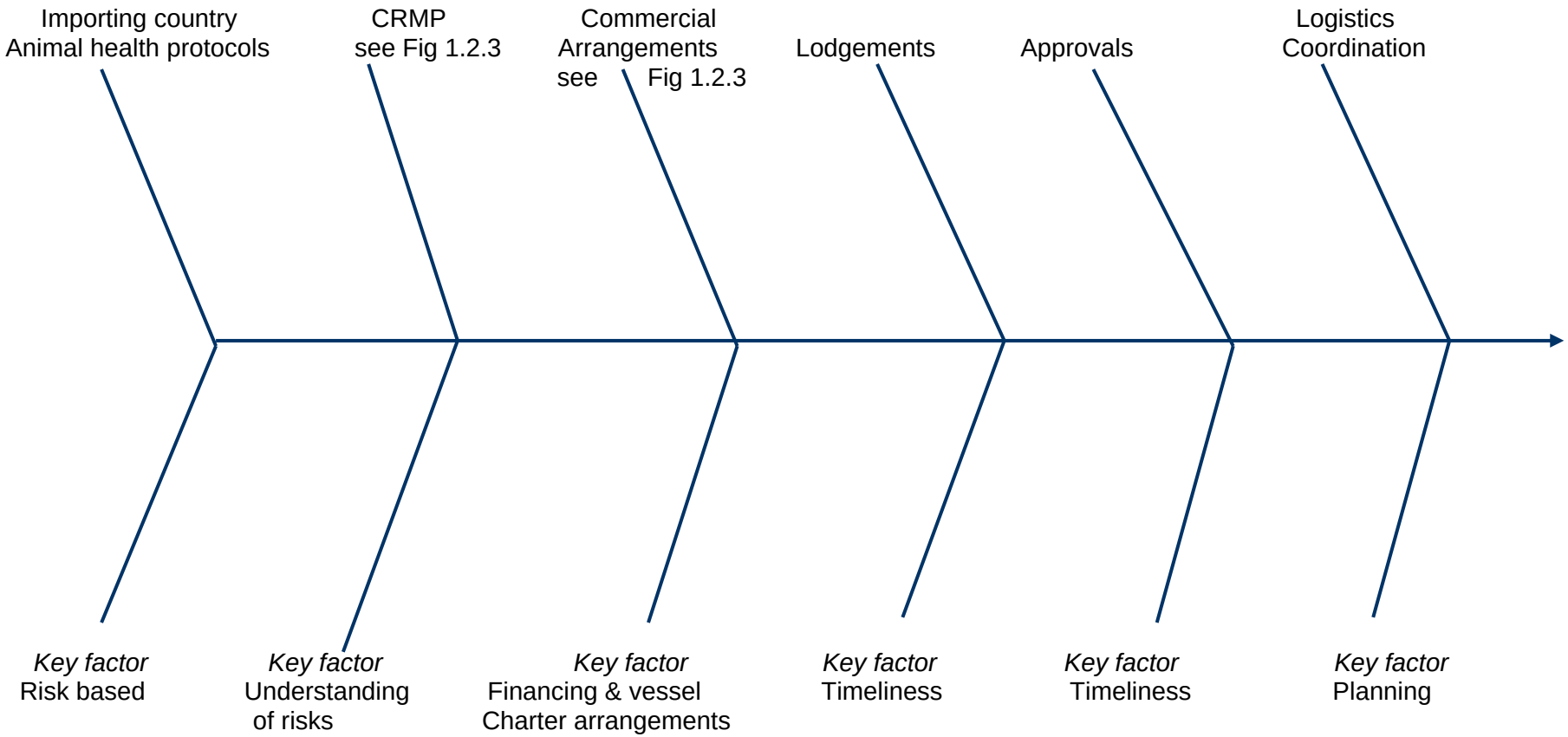
1.2.1 Determination of importing country's requirements

Importing country requirements
As mentioned in the other supply chain reports, there are many importing country animal health protocols with most being straightforward and consistent with current scientific knowledge. Several anomalies exist, however, where importing country requirements are not based on contemporary science and established principles of animal health. Indeed the existing protocols are under review by a sub committee. Accordingly, this study will not duplicate any of the work being undertaken. There may be a place, however, for MLA funded R&D to assist in affecting constructive changes in some of these areas. In particular, it will in the industry's interests to circulate the reasoning behind each protocol. Importing country protocols are available from AQIS and on the LiveCorp website.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (in many instances)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Sometimes adverse*
R&D priority:	*Medium*

:

Figure 1.2: Consignment planning (LHS)



1.2.2 Consignment Risk Management Plan (CRMP)

Consignment risk management plan
ASEL states in the planning phase, that:

> *…the exporter must specify the livestock to be sourced for export in the consignment risk management plan (CRMP). Only livestock sourced and prepared according to the approved CRMP should be presented for transport to registered premises (ASEL Overview Standard 1).*

A risk based approach is also consistent with the guiding principles provided by the Australian Position Statement on the Export of Livestock (see reference).

Reference to CRMP is also made in the Export Control (Animals) Order 2004, which outlines specific guidelines for the detail required in the risk management plan (see 2.42 of the Order). The major risks identified in the Order are:

- Mechanical breakdown
- Food and water shortage
- Disease outbreak
- Extreme weather and
- Rejection of the consignment.

There are specific risks associated with the long haul sheep trade. Much greater detail is required for exporters to demonstrate that they have identified, defined and described the major risks associated with each phase of the process. Most people consulted identified salmonellae, inanition and heat stress as the major risks in the live sheep trade.

Much of the current emphasis is on 'passive risk management' where the cost of a bad outcome is avoided through application of the precautionary principle. It is also important that exporters have a sound understanding of 'active risk management' to ensure optimal decision-making should an incident be experienced. While good decision making during an incident is the key to avoiding losses, it requires a high level of technical understanding.

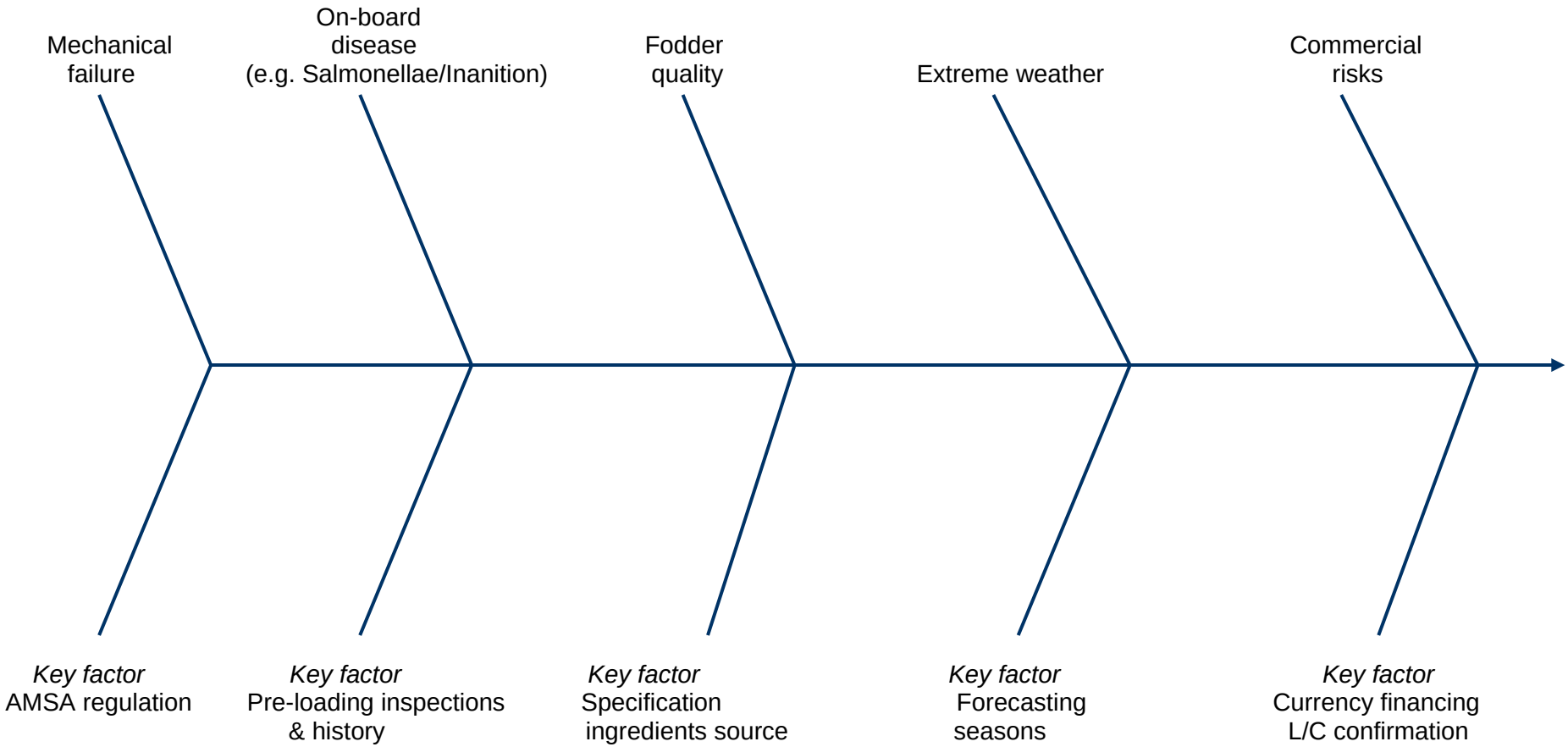
It is important that CRMP be an effective working tool and not become a simple "paper entry". A greater understanding of the major identified risks would be of benefit to the industry. Research and development aimed specifically at identifying, defining and describing, understanding and managing the major identified risks would be of benefit to the sheep export industry. This would enable exporters to tailor their risk management plans and better describe the way in which a risk management approach is put into practice. Figure 1.2.2 identified the major risks associated with the long haul export of sheep.

Industry guidelines:	*Exist*
Scientific support:	*Exists (more detail required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High (if properly utilised)*
R&D priority:	*High*

1.2.3 Commercial arrangements

Commercial arrangements
There are no issues identified that would benefit from industry R&D.

Figure 1.2.2: Consignment risk management plan (CRMP/LHS)



1.2.4 Lodgement of Notice of Intention and CRMP

Lodgement of NOI and CRMP
The requirement to lodge NOI and CRMP documentation is outlined in the Export Control (Animals) Order 2004 (see 2.43 of the Order). This is not an issue that requires industry guidelines other than a reference in the industry operations and governance manual. No additional scientific support is required and industry consultation did not suggest any contention in regards to this heading. Problems associated with poor timeliness are serious when they occur but in practice, nearly all lodgements are made on time. It is suggested therefore that this heading does not have a great bearing on voyage outcomes.

Industry guidelines: *Exist*
Scientific support: *Not required*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

1.2.5 Approval procedures

Approval procedures
As inferred above, the timeliness of the lodgement and approval of the notice of intention is important. The requirement to lodge NOI and CRMP and the receival of subsequent approval is outlined in the Export Control (Animals) Order 2004 (see 2.44 and 2.45 of the readers guide). It is not considered that this is an issue that requires industry guidelines other than a reference in the industry operations and governance manual.

Industry guidelines: *Not required*
Scientific support: *Not required*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

1.2.6 Test and treatment schedules

Planning of test and treatment schedules
Guiding principles that relate to test and treatment schedules undertaken within the industry are contained in the industry operating and governance manuals. However, ASEL also states that:

> *….a record of all vaccines, veterinary medicines and agricultural chemicals used to vaccinate or treat livestock sourced for export must be kept for at least two years after the date of export (ASEL S1.25).*

Industry practice is consistent with this requirement.

Industry guidelines: *Exist*
Scientific support: *Not required*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

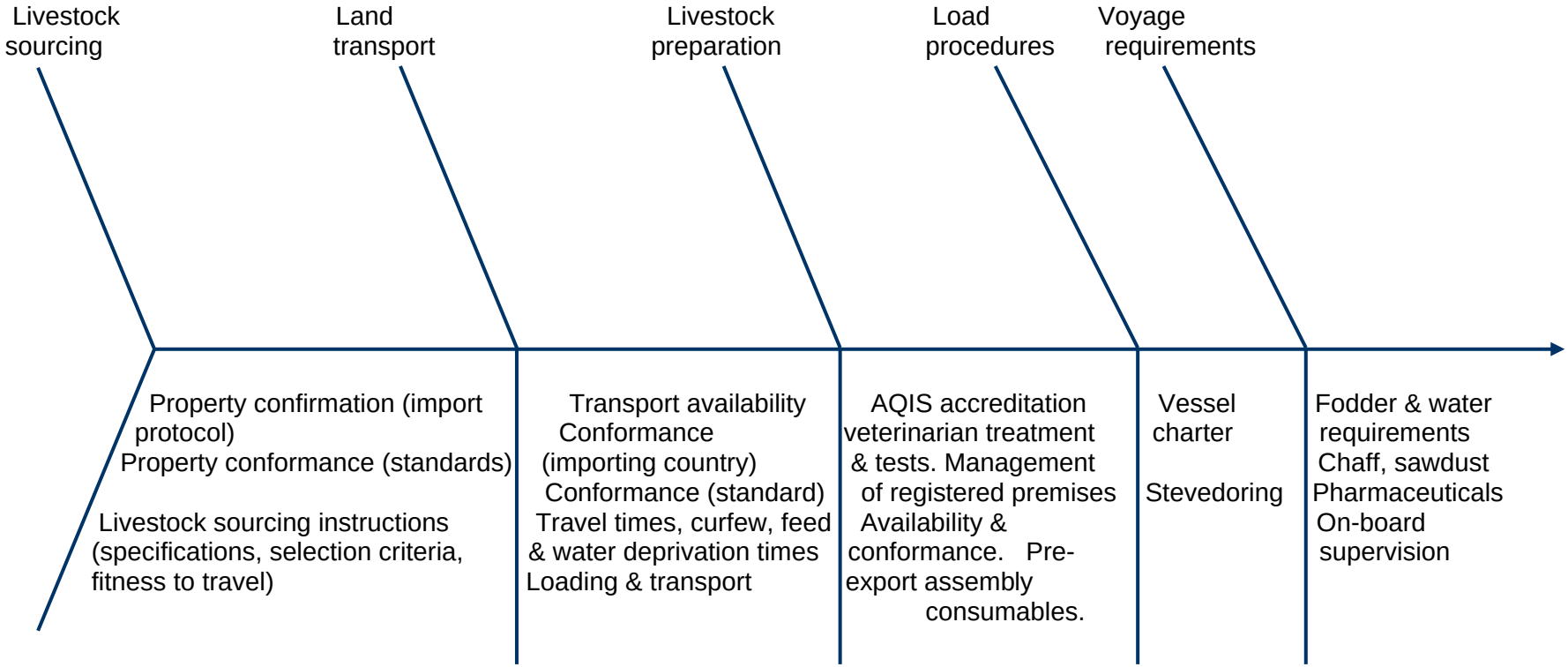
1.2.7 Logistics co-ordination

Logistics co-ordination

Guidelines relating to the industry logistics co-ordination are outlined in the industry operating and governance manual. This is performed under a number of subheadings including livestock sourcing, land transport, livestock preparation, loading and voyage. Most of the issues addressed in this section are operational in nature. A schematic of the operating procedures is provided in Figure 1.2.7. No outstanding R&D requirements have been identified at this stage.

Industry guidelines:	*Exist (Industry operating and governance manual)*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.2.7 Logistics Co-ordination – Pre- Export Planning (LHS)



1.3 Sourcing of livestock and on-farm preparation (LHS)

Overview
ASEL addresses the sourcing of livestock and on-farm preparation in Standard 1 and states that:

> *…this part of the export chain encompasses the sourcing of livestock for export by sea and their on-farm preparation, up to the point of loading and transport to registered premises.*

ASEL also states that:

> *…exporters must source suitable livestock that meet consignment specifications such as species, class, condition, animal health status and number of livestock. Animal health and production records may be required to confirm the eligibility of proposed consignments of livestock for export.*

Guiding principle (ASEL Standard 1)
ASEL states that:

> *…sourcing of appropriately prepared livestock that are fit to travel is critical to successful heath and welfare outcomes during export (ASEL Standard 1).*

Required outcomes (ASEL Standard 1)
ASEL states that:

> *…livestock sourced for export must meet any requirement under a law of a state or territory relating to the sourcing of livestock. State and territory governments are responsible for ensuring that these requirements are met.*
> - *Livestock sourced for export must meet ASEL Standards and importing country requirements.*
> - *Livestock sourced for export that become sick or injured during on-farm preparation must be excluded from export and arrangements must be made for their prompt and humane handling and care.*
> - *The Australian Quarantine and Inspection Service (AQIS) must be satisfied that these Standards and importing country requirements are met before issuing a health certificate and export permit.*

1.3.1 Selection criteria – buyer/selector

Conformance to Model Codes of Practice
ASEL states that:

> *…livestock sourced for export must meet any animal health and welfare requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL S1.1).*

The model codes of practice are being constantly reviewed and there are moves to amalgamate many state codes into one set of National codes under the National Welfare Strategy.

(http://dpie.gov.au/content/output.cfm?ObjectID=CD8D7632-6CAD-43B8-8B72313529E79039&contType=outputs).

Many of these codes are in a similar situation to ASEL as they have been developed through industry derived experience. Specific industry research may not exist for many of the areas in question.

Industry guidelines:	*Model codes are under review*
Scientific support:	*Lacking (in many cases)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Can be high*
Affect on welfare outcome:	*Variable*
R&D priority:	*Low (monitor developments)*

Conformance to import permit and protocol requirements
ASEL states that:

> *…livestock sourced for export must meet importing country requirements (ASEL S1.2).*

In practice this relates to the conditions of the import permit and any protocol requirements. Issues relating to importing country protocol requirements have been addressed earlier (in section 1.2.1).

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (in many cases)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Can be adverse*
R&D priority:	*Medium*

Conformance to food safety requirements
ASEL states that:

> *…livestock sourced for export and intended for human consumption must comply with Australian food safety requirements, including standards for chemical residues and environmental contamination (ASEL S1.4).*

To assist in addressing this issue the industry commissioned the publication “Best practice use of Veterinary Drugs” (LIVE.114) (Brightling, 2004). This report is readily available to the industry. Issues relating to food safety and withholding periods have been addressed by the industry with treated animals being isolated and/or identified and treatment histories forwarded to receivers on delivery. The industry has embraced the findings of this work.

Industry guidelines:	*Exist*
Scientific support:	*Exists (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Body condition
ASEL S1.8 states that:

> *….sheep must not be sourced for export from the ports of Darwin, Weipa or Wyndham from 1 November to 31 May in the following year (inclusive).*

and that:

> *…. sheep and goats must not be sourced for export if they are in an emaciated or overfat body condition, (i.e. sheep must be from condition scores 2 to 4 (inclusive) on a scale of 1 to 5).*

The industry has completed a study (Gaden, 2005) that identifies live animal condition scoring for the livestock export industry (LIVE.120). This study addressed both sheep and cattle and has standardised the way in which an animal's body condition is assessed. No contention was identified in regards to the assessment of body condition.

The requirement to not source "overfat" sheep can represent a severe restriction when purchasing for certain markets. Additional management conditions might allow ***discretionary approval*** to adequately address the issue of sheep with high body condition. Similarly, sheep in very poor condition (condition score 1) are normally unsuitable to transport but it may be possible to develop a protocol that allows them to be transported with acceptable welfare outcomes. Conditions that would allow the transport of animals that fall outside the stated range of body condition have not been determined.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (in regards to restrictions)* *(NB assessment of body condition has been addressed)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*High*
R&D priority:	*Medium*

Weight range
ASEL states that:

> *….unless approved by the relevant Australian Government agency, lambs and goat kids must only be sourced for export if:*
> *(b) lambs have a liveweight of more than 28 kg; and*
> *(c) goat kids have a liveweight of more than 22 kg. (ASEL S.1.12)*

Clearly minimum weights are somewhat arbitrary and can, under some circumstances, restrict operation procedures. There were only limited concerns over the setting of the arbitrary weight limit. It was noted, however, that there has been no specific scientific work undertaken to support (or refute) these limits. The discretionary powers relate to AQIS personnel who would be required to determine the conditions under which lighter animals could be exported. Assessments of this nature should consider all the circumstances applying at the time and a decision made based on a working knowledge of the industry and an understanding of all the factors involved. Increased centralisation of regulatory functions has heightened concerns about who might be held accountable should discretionary powers ultimately lead to a poor outcome.

Consultation identified repeated expressions of concerns about the "lack of working knowledge" among AQIS staff based in Canberra while those with most experience are generally situated regionally. It was noted that to utilise discretionary powers requires a sound working knowledge of the industry. Several exporters suggested that the head office regulators should undertake more in-field training for the purposes of gaining a better working knowledge of the industry. Training of this nature would assist them to utilise the above mentioned discretionary powers. In

the absence of this it will be necessary to determine the conditions by which the ***discretionary approval*** might be given.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Unclear*
R&D priority:	*Medium*

Age

Age restrictions are generally stated in the importing country's protocol. Age remains a contentious issue for sheep going to Saudi Arabia due to the tolerance level applying to older sheep and the variations between sheep in regards to when their teeth may appear. Saudi veterinarians have recently insisted that the sheep within the tolerance level be stowed separately. This has meant that aging of the main consignment (i.e., falling outside the tolerance zone) must be more precise. Current practice is for the tolerance to be applied across the whole consignment. R&D is needed to identify the factors that affect the cutting of teeth at different physiological ages. It should also identify the variations within a similar group of sheep. All of this is important since the teeth issue is grounds for rejection of a consignment.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low*
R&D priority:	*Medium*

Wool status

ASEL states that:

> *….sheep must only be sourced for export if they:*
> *(a) have wool not more than 25 mm in length, unless approved by the relevant Australian Government agency based on an agreed heat stress risk assessment model; and*
> *(b) are ten (10) days or more off shears; or*
> *(c) are to be shorn during the ten (10)-day period before export, in which case they must be accommodated in sheds on the registered premises. (ASEL S1.19)*

Two problems have been identified with "woolly" sheep through discussions with the industry. Firstly they are bulkier (and therefore compromise stocking density) and secondly they have a greater predisposition for heat stress. It is noted, however, that "industry specific" research that supports (or refutes) the wool length specified by ASEL has not been undertaken. Climate room work has not established heat stress thresholds for "woolly" sheep. Industry consultation did not reveal any contention in regards to the maximum wool length stipulations but it was noted that the impact on operational procedures can be high. Additional management conditions might allow ***discretionary approval*** to adequately address the issue of sheep with longer wool length.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*High in some circumstances (heat)*

R&D priority: *Medium*

Horn status
ASEL states that:

> *….horned sheep, rams or goats must only be sourced for export as slaughter and feeder animals if the horns:*
> *(a) are not turned in so as to cause damage to the head or eyes;*
> *(b) would not endanger other animals during transport;*
> *(c) would not restrict access to feed or water during transport; and*
> *(d) are one full curl or less, or are tipped back to one full curl or less.*
>
> *Otherwise, horned sheep or goats must only be sourced for export with the approval of the relevant Australian Government agency. (ASEL S.1.16)*

Industry consultation did not determine any issues with regards to the above requirements and adherence to these requirements is an established practice within the industry. There is some contention about what constitutes a "full curl" but the reasons behind the restriction are noted. The use of ***discretionary approval*** should be considered in the same manner as previously discussion (see weight range). Issues relevant to segregation of horned and polled sheep are addressed later.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*High (if trough access is restricted)*
R&D priority:	*Medium*

Pregnancy status
ASEL states that:

> *…ewes with a weight of 40 kg or more and does (goats) with a weight of 35 kg or more must only be sourced for export as slaughter and feeder animals if they have been pregnancy tested by ultrasound within thirty (30) days of export and certified not to be pregnant, by written declaration, by a person able to demonstrate a suitable level of experience and skill.*

and that:

> *…. all female Damara sheep breeds sourced as feeder or slaughter must be pregnancy tested within thirty (30) days of export by ultrasound and certified not to be pregnant, by written declaration, by a person able to demonstrate a suitable level of experience and skill. (ASEL S.1.11)*

and that:

> *…sheep and goats sourced for breeding must only be sourced for export if they have been pregnancy tested using ultrasound foetal measurement within thirty (30) days of export and certified, by written declaration, by a person able to demonstrate a suitable level of experience and skill, to be not more than a maximum of one-hundred (100) days pregnant at the scheduled date of departure. (ASEL S1.13)*

The critical weight at which sheep are required to be pregnancy tested appears to be arbitrary and was identified as a possible point of contention. There has been no industry specific research to support (or refute) the arbitrary weight at which ewes must be pregnancy tested, and/or the maximum number of days pregnant at the scheduled date of departure. Both these have an impact on operational procedures and affect the ability to source suitable livestock.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Potentially High*
R&D priority:	*Medium*

Weaning status
ASEL states that:

> *…unless approved by the relevant Australian Government agency, lambs and goat kids must only be sourced for export if hey have been weaned at least fourteen (14) days before sourcing for export. (ASEL S1.7)*

There is no industry contention in regards to this requirement, but note the reference to ***discretionary approval.***

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially High*
R&D priority:	*Low*

1.3.2 Fitness to travel – buyer/selector

Fitness to travel
Both pinkeye and scabby mouth have been singled out from the list of “fit to travel criteria”.

Pinkeye results in economic loss and can be problematic in the event of an onboard outbreak. It is an infectious disease and one of the most common causes of rejection at feedlots. Research into the prevention and control of pinkeye would benefit the industry.

Scabby mouth is contentious due to the possibility of rejection, particularly when destined for Saudi Arabia. The Saudi protocol also requires that a vaccination regime is properly completed. Research into scabby mouth has already been undertaken (Higgs, 1996). The other “unfit criteria are straight forward and generally accepted by industry.

Anorexia is a cause of concern to the industry and is addressed in a later section. In this instance it is identified as a criterion (not an animal health issue). The criteria used to determine an animal’s fitness to travel is outlined in Table 1.3.2.

Table 1.3.2: Fitness to Travel Criteria (LHS)

Fitness to travel – "unfit criteria" (Long Haul Sheep)			
Current Practice	Scientific Support	Industry Consensus	R&D priority
Lethargy, weakness, ill-thrift, dehydration.	Exists*	Consensus	Low
Anorexia	Exists*	Consensus	Low
Lameness or abnormal gait	Exists*	Consensus	Low
Abnormal soft tissue or bony swellings	Exists*	Consensus	Low
Scouring, dysentery, profuse diarrhoea	Exists*	Consensus	Low
Bloat	Exists*	Consensus	Low
Nervous signs (eg head tilt, circling)	Exists*	Consensus	Low
Abnormal or aggressive behaviour	Exists*	Consensus	Low
External parasites	Exists*	Consensus	Low
Significant lacerations	Exists*	Consensus	Low
Wounds or abscesses	Exists*	Consensus	Low
Generalized papillomatosis	Exists*	Consensus	Low
Ringworm or dermatophilus	Exists*	Consensus	Low
Scabby Mouth	Exists*	Consensus	Medium
Pinkeye	Exists*	Consensus	Medium
Cancer eye	Exists*	Consensus	Low
Blindness	Exists*	Consensus	Low
Abnormal nasal discharge	Exists*	Consensus	Low
Coughing or respiratory distress	Exists*	Consensus	Low
Ballanitis (pizzle rot in sheep)	Exists*	Consensus	Low
Long horns greater than one curl	Exists*	Consensus	Low
Excessive salivation	Exists*	Consensus	Low

* The justification for most of these criteria is self evident and supported by veterinary texts.

Industry guidelines: *Exist*
Scientific support: *Exists (veterinary texts)*
Industry consensus: *Consensus*
Impact on operational procedures: *Sometimes high*
Affect on welfare outcome: *Potentially High*
R&D priority: *Low*

1.3.3 Handling and preparation (goats)

Handling and preparation (goats)
ASEL states that:

> *…goats must not be sourced for export unless they have become conditioned to being handled and to eating and drinking from troughs for a minimum of twenty-one (21) days before transfer to registered premises. (ASEL S1.20)*

The shipping of goats generally (but particularly feral goats) is a difficult undertaking and evidence that prolonged assembly and preparation brings about superior outcomes has not been conclusively demonstrated. There has been industry specific research undertaken on goats but with a focus on Saudi Arabia as a destination (see LIVE.105 Quality assurance for live goats to Saudi Arabia and LIVE.110 Improving the Saudi Arabia sheep and goat protocol). This is a high risk area with a history of poor outcomes and best practice in regards to the preparation of goats for live export remains unresolved.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (more required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Very high*

1.3.4 On farm testing and treatments

On farm testing and treatments

As mentioned previously ASEL states:

> *….a record of all vaccines, veterinary medicines and agricultural chemicals used to vaccinate or treat livestock sourced for export must be kept for at least 2 years after the date of export (ASEL S1.25).*

Industry consultation indicated that this is an accepted practice.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.3.5 Livestock identification

Livestock identification
ASEL states that:

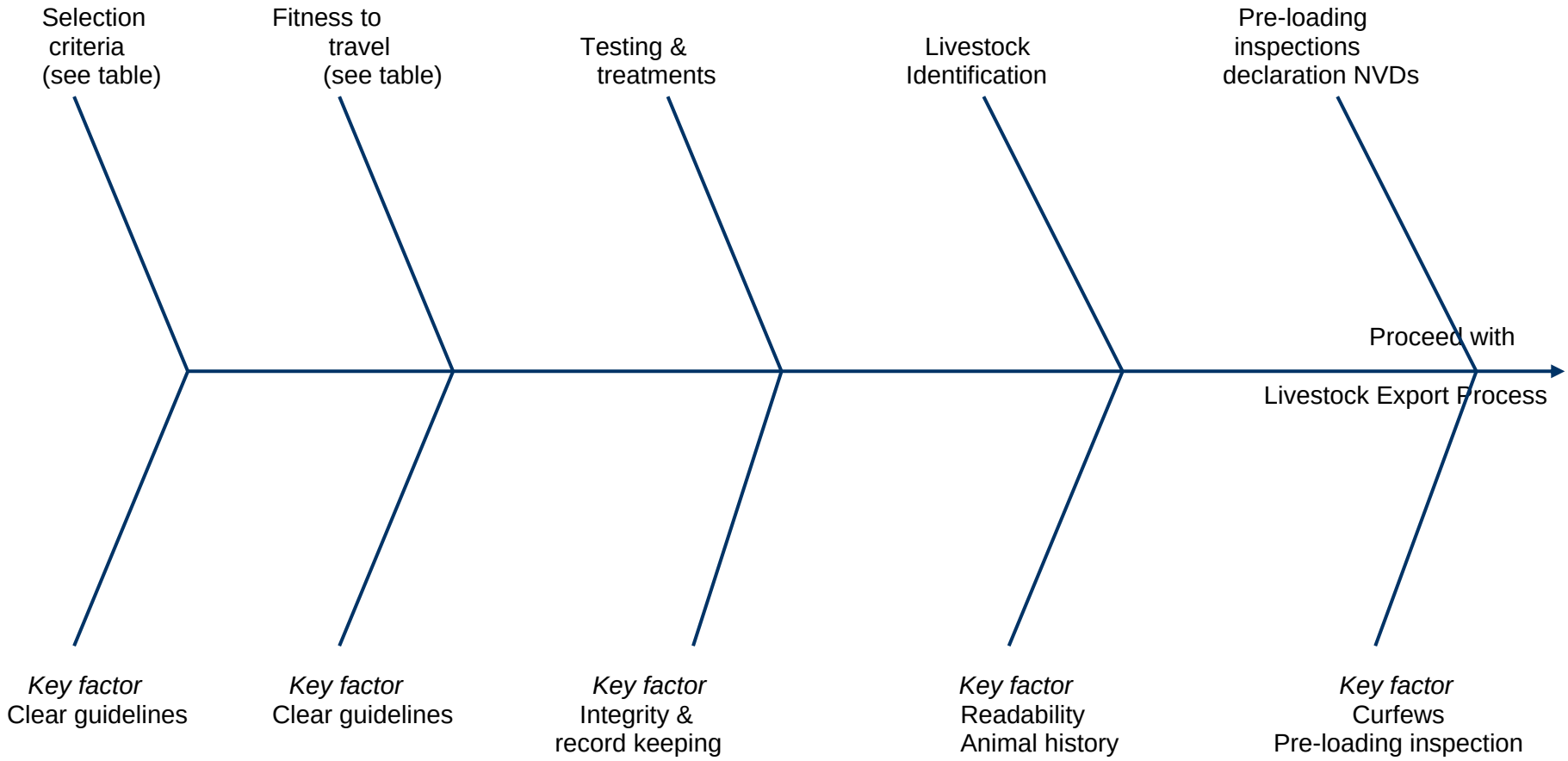
> *….livestock sourced for export must be:*
> - *identified to the property of source*

- *accompanied by a correctly completed and signed declaration as to the identification of the livestock and the property of source and*
- *individually identified where testing is required during preparation (ASEL S1.3).*

A pilot project is currently underway that uses ear tag information to trace animals back to property of origin (LIVE.123) (House, 2006). The project has engaged significant resources and will compare different pre-delivery treatments and management practices. Implementation of systems allowing tracing of animals back to the mob or farm level are capable of delivering a range of industry benefits associated with monitoring performance and assisting in investigations of relationships between management practices and outcomes of interest to the industry. Such an outcome would benefit the industry but the requirement to collect tag information onboard will require modification to onboard practices for it to be totally effective. The industry should be aware of the aims and capacity of NLIS for the purposes of gaining complementary advantages. Livestock identification is a tool to enable epidemiological studies to be undertaken.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (support for the above project is required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Potentially High*
R&D priority:	*High*

Figure 1.3: Sourcing of Sheep and On-Farm Preparation (LHS)



1.3.6 Pre-loading

Pre-loading inspection and check
This is not always practical or feasible particularly where small numbers of livestock are drawn from a large number of properties.

Industry guidelines:	*Do not exist (relies on farmer)*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Vendor documentation
National vendor, buyers' declaration and the source property declaration are all utilised by the industry (see later section).

Industry guidelines:	*Exist (see later section)*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.4 Land transport of sheep intended for export (LHS)

Overview
ASEL states that:

> *…the land transport phase begins when the first animal is mustered and ends when the last animal is unloaded at the completion of the journey. Thus 'transport' includes:*
> - *pre-loading mustering and yarding*
> - *any stationary resting or holding periods*
> - *transport of livestock from the property of source to registered premises and*
> - *subsequent transport from registered premises to a point of embarkation.*

ASEL also states that:

> *…the health and welfare requirements of livestock must be addressed throughout the whole of the land transport phase in the export chain. Livestock presented for land transport must be fit to travel and accompanied by documentation that allows the livestock to be traced to their property of source.*

ASEL also describes the responsibilities for the health and welfare of livestock during the land transport phase as follows:

- *Exporters of livestock are responsible for the general health and welfare of the livestock until they are loaded. They are also responsible for the livestock's fitness for the intended land transport.*
- *Exporters of livestock must ensure that livestock selected are fit to travel. Agents of exporters have a joint responsibility at the start and at the end of the journey to ensure the availability of suitable facilities for the assembly, loading, transport, and unloading and holding of livestock. Agents are also jointly responsible for dealing with emergencies.*
- *Exporters must be able to demonstrate that the transport of the livestock complies with these Standards, importing country requirements, and any relevant risk mitigation measures documented or referred to in the approved consignment risk management plan.*

Guiding principle (ASEL Standard 2)
ASEL also states that:

> *…land transport is planned and undertaken on a competently operated and suitable vehicle, with the livestock being handled in a manner that prevents injury and minimises stress throughout the journey.*

Required outcomes (ASEL Standard 2)
ASEL states that:

> *….the required outcomes include that:*
> - *Only livestock fit to travel are presented for loading*
> - *Livestock are loaded in a manner that prevents injury and minimises stress*
> - *Transport of livestock is undertaken in a manner that meets the standards, any requirements of a state or territory relating to the transport of livestock and importing country requirements*
> - *Livestock are unloaded in a manner that prevents injury and minimises stress.*

ASEL also states that:

> *…the land transport of livestock for export must meet any relevant animal health and welfare and road transport requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL S2.1)….and that*
>
> *…the land transport must meet any importing country requirements for the land transport phase in the export chain (ASEL S2.2).*

1.4.1 Preparation history

Travel Plans
ASEL states that:

> *..the land transport must be undertaken in accordance with a travel plan. This travel plan must be completed for all interstate journeys greater than two hours and journeys of more than eight hours duration (ASEL S2.3).*
>
> *Each plan must address the following:*
> - *species, class, condition and number of livestock;*
> - *transport vehicles;*
> - *loading densities and penning requirements;*
> - *duration of the journey, including rest periods for driver and livestock;*
> - *the method of loading and unloading of the livestock;*
> - *inspection of livestock before loading;*
> - *the feed and water requirements and curfew times applicable to the livestock under this Standard, including to livestock sourced from saleyards;*
> - *the expected weather conditions before and during transport;*
> - *the route and the types of roads traversed;*
> - *completion of vendor declarations or waybill regarding the property of source and the time of departure; and*
> - *contingency plans for managing transport breakdown, accidents, escapes, deaths, downers and injuries.*

ASEL also states that:

> *Livestock must not be loaded until the travel plan is completed (ASEL S2.12). The following documentation must accompany each load of the consignment:*
> - *a signed declaration as to the identification of the livestock and the property of source and*
> - *a journey log that commences at loading, is maintained through the journey and finalised on completion of unloading, and is used to record the actual journey details.*

The livestock transport driver must be aware of the travel plan prior to commencement of the journey and documentation relating to each consignment must be kept for at least two years following the date of export. The details contained in travel plans are important to maintain a complete history of the preparation of animals for export and are components of any epidemiological study. Travel plans are an operational issue and do not require any specific research and development.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Preparation for transport must also address the guidelines in regards to provision of feed and water, mustering rest times, vehicle requirements and handling facilities outlined in Appendix 2.3 of the ASEL (ASEL S2.4).

ASEL states that:

> *…livestock must be inspected prior to loading and any animal showing signs consistent with the rejection criteria in Standard S1.7 of Standard 1 – Sourcing and on farm preparation of livestock, or any other condition that could cause the animal's health and welfare to decline during transport or export preparation, must not be transported (ASEL S2.11). This is covered in an earlier section*

Livestock preparation for transportation
ASEL states that:

> *…livestock must be mustered and handled in preparation for loading in a way that maintains their health and welfare and fitness for travel. For example, where the journey will take more than 24 hours, provision of suitable feed and water and rest for at least 12 hours close to the loading facility must be provided. Before commencement of any curfews and where livestock are mustered by helicopter or light plane, provision of suitable feed and water and rest for at least 24 hours before commencement of any curfews is required. Holding areas for livestock before loading for land transport must securely contain the animals and maintain a safe environment (ASEL Appendix 2.1).*

Industry consultation did not identify any issues with this heading and statement. Despite there being evidence that property of origin has a great bearing on outcomes, the precise preparation histories that adversely affect consignment outcomes is not yet known.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (more investigation required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Water deprivation times
Water deprivation times are outlined in Appendix 2.1 of ASEL. This has been a contentious issue and one that has been under strong scrutiny from the animal welfare lobbyists. It has also coincided with action in both Europe and the US to address and standardise water deprivation times for most species of livestock.

The time limit (as defined by ASEL in Appendix 2.1) for any given journey by livestock and the requirement for rest periods are primarily determined by the maximum time that animals can be deprived of access to adequate water of a quality sufficient to maintain good health and welfare. This is termed the *water deprivation time*.

ASEL describes the water deprivation time as:

> *…. the total continuous period of water deprivation, starting when stock last had access to water, and must include:*
> - *time off water during mustering;*
> - *time off water when yarded after mustering;*
> - *curfew or 'empty out' time (see below);*
> - *all time on the vehicle, whether moving or stationary; and*
> - *any time without water after unloading, such as at a saleyard, spelling centre or registered premises.*
>
> *Curfew* or *empty out* time is the "*deliberate and variable period of water and/or 'green' fresh feed deprivation intended to minimise faecal and urine spoilage of the transport vehicle, subsequent problems with animals slipping, and contamination of the environment*".

The maximum water deprivation times and rest period requirements are described in Appendix 2.1 of ASEL. If animals of any species become dehydrated, precautions need to be taken to ensure that they do not gorge themselves when given access to water.

ASEL states that:

> *…the maximum (normal) water deprivation time for sheep (mature stock) is 36 hours. The extended water deprivation time for sheep (mature stock) is 48 hours.*

ASEL also states that:

> *…the maximum (normal) water deprivation time for goats (mature stock) is 32 hours. The extended water deprivation time for sheep (mature stock) is 38 hours.*

Furthermore:

> *…the maximum (normal) water deprivation time for young goats (less than 12 mths old) is 20 hours. The extended water deprivation time for young goats (less than 12mths old) is 28 hours*
>
> *Extended water deprivation times are permissible if and only if:*
> - *animals are travelling well and not showing signs of fatigue, thirst or distress;*
> - *adverse weather conditions are neither prevailing nor predicted;*
> - *the extension will allow the journey to be completed within a 48 hour period of water deprivation, and the animals are to be rested with water and feed for at least 18 hours immediately upon arrival at the registered premises; and*
> - *the journey's duration, excluding time off water before loading onto the transport vehicle, is less than 14 hours (ASEL Appendix 2.1.2).*

There is limited scientific support for these water deprivation times but the issue is under scrutiny by CSIRO (AHW.005). It would be prudent for the industry to monitor the progress of this research as developments in this area have the potential to impact heavily on operational procedures. Industry consultation indicated that this was a contentious area.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (under investigation, AHW.005)*
Industry consensus:	*Contentious*

Impact on operational procedures: *Potentially high*
Affect on welfare outcome: *Unclear*
R&D priority: *High*

Mustering and loading
ASEL states that:

> *….feed and adequate water of a quality to maintain good health must be provided between mustering and loading if:*
> *• sheep are to remain in the yards for more than twenty-four (24) hours;*
> *• sheep are to travel for twenty-four (24) hours or more; or*
> *• the combined yarding and travel time is to be more than the time nominated in Table A2.1.2.*

Industry consultation indicated that this is an accepted requirement.

Industry guidelines: *Exist*
Scientific support: *Lacking*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

Rest periods
ASEL states that:

> *…after each thirty-two (32) hours of combined curfew and travel, adult sheep must have a rest period of at least twelve (12) hours and that animals between weaning and twelve (12) months of age must have a rest period of at least twelve (12) hours after every twenty (20) hours of transport, unless the entire journey can be completed within a total of twenty-eight (28) hours.*

and that:

> *……during every specified rest period, sheep of all ages must:*
> *a) be unloaded;*
> *b) have access to food and adequate water of a quality to maintain good health, which may be withdrawn during the curfew period of up to a maximum of eight (8) hours before reloading; and*
> *c) have enough space for exercise and rest.*

ASEL states that in regards to goats:

> *……after each thirty-two (32) hours of combined curfew and travel, adult goats must have a rest period of at least twelve (12) hours and that goats between weaning and twelve (12) months of age must have a rest period of at least twelve (12) hours after every twenty (20) hours of transport, unless the entire journey can be completed within a total of twenty-eight (28) hours.*

ASEL also states that:

> *….during every specified rest period, goats of all ages must:*

a) be unloaded;
b) have access to food and adequate water of a quality to maintain good health, which may be withdrawn during the curfew period of up to a maximum of eight (8) hours before reloading; and
c) have enough space for exercise and rest.

There is no industry specific scientific support to determine how beneficial rest periods are to animals in transit. This is a contentious area.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Unclear*
R&D priority:	*High*

1.4.2 Loading procedures

Loading procedures
Guidelines on loading for transport are provided in ASEL S2.10. They are general and are not considered contentious. At this time they are based on industry derived experience.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Segregation
ASEL states that:

…when livestock are loaded for transport by land:
- *animals of different species must not be mixed in a single pen;*
- *classes of animals of the same species must not be mixed if there is a likelihood of aggression or injury to other animals;*
- *young animals must be separated from older animals;*
- *animals of a dissimilar size must be separated; and*
- *animals with horns must not be mixed with animals lacking horns.*

Segregation has become a contentious issue within the industry particularly with respect to transportation and management of cattle during the export chain. While most of the issues have applied to cattle it would be useful to address issues of segregation in sheep at the same time since literal interpretation of the standards can lead to sub optimal welfare outcomes. Focus should be on optimising segregation options. Note that there is no provision for ***discretionary approval*** under this heading.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (required under current interpretation)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*

Affect on welfare outcome: *Unclear (but likely to be low)*
R&D priority: *High*

Handling
ASEL S2.14 makes specific reference to how animals should be handled to prevent injury and minimise stress. There are specific guidelines relating to the use of prodders, rattles and working dogs. There is little contention in regards to these tools and industry practice is consistent with the guidelines. Animal handling has been well documented within the livestock industry.

Industry guidelines: *Exist*
Scientific support: *Not required*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

Loading densities and penning arrangements
ASEL states:

> *…the land transport of livestock for export must meet any relevant animal health and welfare and road transport requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL Appendix 2.2).*

Loading density and penning arrangements for the land transport of livestock must conform to stocking densities and the penning arrangements outlined in this appendix.

ASEL Appendix 2.2 states that:

> *…loading densities are determined according to the average liveweight, condition, size, shape and horn status of the livestock, as well as the prevailing conditions and the distance animals are to be transported. Numbers may be varied, provided the welfare of the livestock is not compromised and the following principles are applied:*
> - *loading rates must be assessed for each pen or division in the stock crate;*
> - *five per cent fewer livestock should be loaded if livestock are horned;*
> - *in hilly and more populated areas, where road vehicles change speed relatively frequently, sufficient internal partitions must be used and numbers varied accordingly; and*
> - *when fewer livestock per pen than in the tables below are transported, firmly fixed portable partitions must be used.*

Truck loading densities for sheep are outlined in Table A2.2.1 of Appendix 2.2 in ASEL. Consultation with industry indicates that practice is consistent with these densities. The requirement to load horned rams at 5% lesser density is contentious and could be examined at the same time as the issue of segregation.

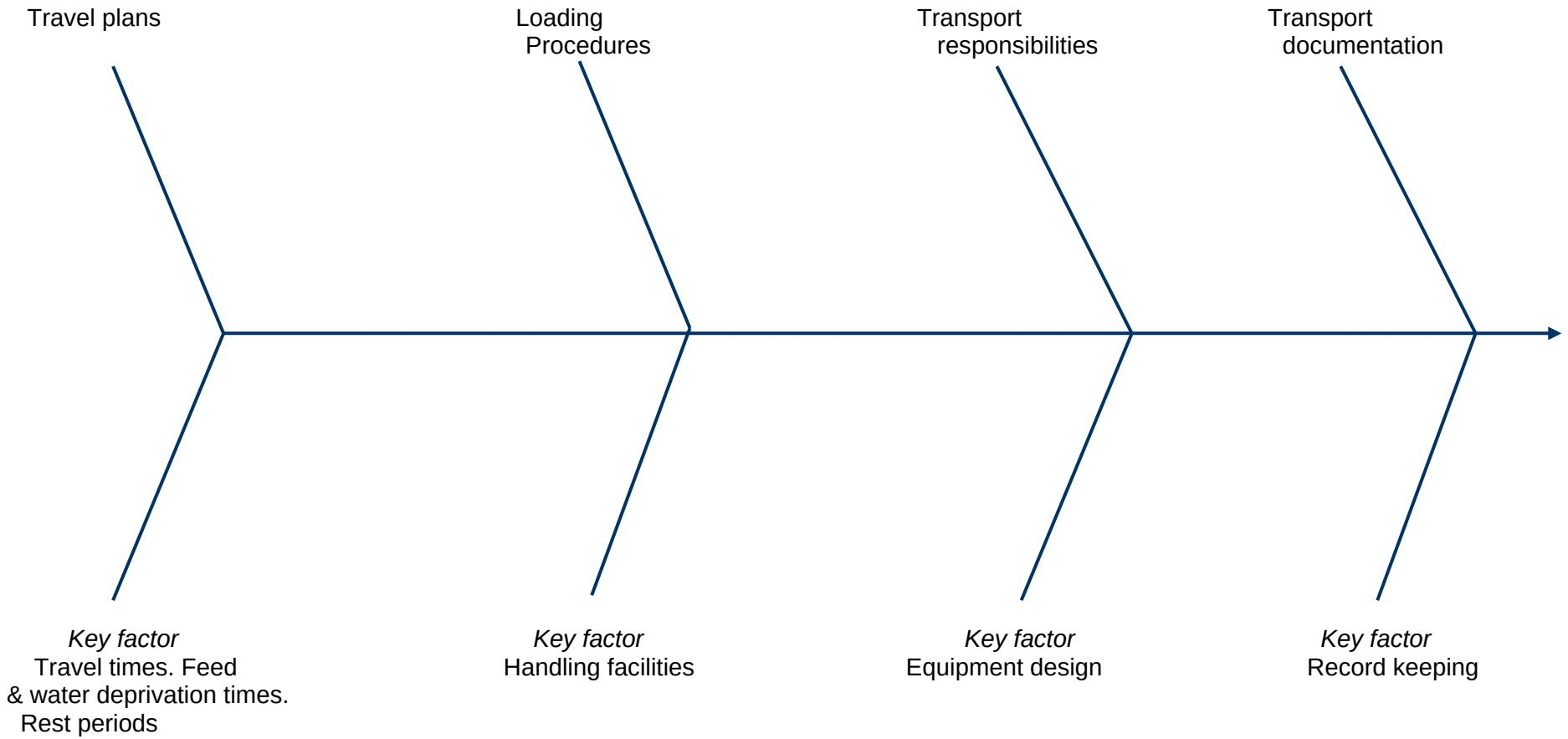
Industry guidelines: *Exist*
Scientific support: *Lacking (required)*
Industry consensus: *Consensus*
Impact on operational procedures: *Sometimes high*
Affect on welfare outcome: *Unclear*
R&D priority: *Medium*

1.4.3 Transport responsibilities

Transport responsibilities and documentation
The industry standards offer further guidelines relating to responsibilities, trucking procedures and facilities and documentation (ASEL S2.15-S2.24).

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.4: Land Transport of Sheep intended for Export (LHS)



1.5 Management within registered premises (LHS)

Overview
ASEL states that:

> *… the assembly of livestock for export commences with the unloading of the first animal into the premises and ends with the departure of the last animal from the premises, whether or not passed as fit for export. Livestock must be held in secure premises for a sufficient period of time to enable recovery from land transportation and to meet importing country requirements. Preparation of livestock must comply with this Standard. Livestock must also be inspected and deemed fit to travel before leaving the premises.*
>
> *Where premises are used for holding and assembling livestock for export, such premises must be registered in accordance with the legislation. Operators of registered premises are responsible for the design, maintenance, security and operation of the premises, including the provision of appropriate shelter, feed and water supply systems, animal husbandry and care by competent animal handlers. The exporter must be able to demonstrate to the Australian Government that the management of the livestock at the registered premises accords with the specifications set out in the risk management plan for the consignment, and the importing country requirements for registered premises.*
>
> *These Standards are relevant to each stage of the livestock export chain and should be reflected in relevant quality assurance programs. Livestock sourced for export must meet any requirement under a law of a state or territory. State and territory governments are responsible for ensuring that these jurisdictional requirements are met under respective state and territory legislation. The Australian Quarantine and Inspection Service must be satisfied that importing country requirements and the Standards have been met before issuing a health certificate and export permit.*

Guiding principle (ASEL Standard 3)
ASEL states that:

> *Livestock are assembled at registered premises where the husbandry and management practices ensure that the livestock are adequately prepared for the export voyage.*

The Export Control (Animals) Order 2004 has quite specific direction about the required conditions to register assembly premises (see Division 2.2). This includes directions as to the use of an appropriate operations manual. The Order supports many of the items outlined in ASEL.

Required outcomes (ASEL Standard 3)
ASEL states that:

- *Facilities at registered premises are appropriate for the type and species of livestock to be held.*
- *The health and welfare needs of the livestock are appropriately catered for in a secure environment.*
- *Livestock leaving the premises are fit for the export voyage and meet importing country requirements.*
- *Livestock rejected for export are managed humanely (ASEL Standard 3).*

1.5.1 Location of premises

Location of premises
ASEL also states that:

> *….the location of the registered premises, used for inspection for 'leave for loading', must not be more than eight hours journey time from the port of embarkation unless approved by a relevant Australian Government agency (ASEL S3.0).*

There would seem to be no issue with the location of premises with the possible exception of the clause for discretionary approval. Several exporters raised the possibility of temporary registration for facilities during peak throughput and/or in remote areas.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.2 Staff and staff training

Staff and staff training
ASEL also states that:

> *…the operator of registered premises must employ sufficient appropriately trained staff for the effective day-to-day operation of the premises and management of the livestock (ASEL S3.1).*

There are no formal competencies or training programs for staff working in premises. Several exporters made reference to the training of staff, particularly to perform checking functions on receival. This could be addressed by a broader industry based training program.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.5.3 Receival and unloading

Receival
ASEL requires that:

> *….when receiving and identifying livestock, the operator of the assembly centre must obtain a copy of the vendor declarations regarding the source property and the health and welfare status of the livestock before accepting the livestock for the purpose of preparation for export (ASEL S3.12).*

This is an integral part of efforts to link performance to property of origin and is being actively utilised by project LIVE.123. This project is strongly supported. The vendor declarations are a tool to enable epidemiological studies to be undertaken.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational tool to support research)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

Unloading and inspection
ASEL requires that:

- *Livestock must be unloaded as soon as possible after arrival at the registered premises and facilities must enable safe and efficient unloading of livestock.*
- *Livestock must be individually inspected at unloading to determine whether they are suitable for preparation for export, (see also rejection criteria).*
- *Livestock for export must be held and assembled at the registered premises in accordance with the relevant approved NOI and CRMP (ASEL S3.13).*

These requirements are practiced by industry.

ASEL also requires that:

> *….. all livestock accepted into the registered premises must be offered water and feed as soon as possible and no more than 12 hours after arrival (ASEL S3.14).*

This requirement is also accepted by industry. Rejection criteria are addressed elsewhere in the document.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High*
R&D priority:	*Low*

1.5.4 Assembly period

Assembly period
ASEL states that:

> *…..for preparation of sheep and goats in premises south of latitude 26 degrees south that are held:*
>
> *(a) in paddocks during any or all of May, June, July, August, September and October, premises must have procedures to ensure that:*
> *(i) sheep and goats to be exported by sea are held at the premises for five (5) clear days (excluding the days of arrival and departure) before export;*
> *(ii) livestock are fed ad libitum during that period; and*
> *(iii) during the last three (3) days of that period, livestock are fed ad libitum, but only*

on pelletised feed equivalent to that normally used during an export journey.

(b) in paddocks during any or all of November, December, January, February, March and April, premises must have procedures to ensure that:
(i) sheep and goats to be exported by sea are held at the premises for three (3) clear days (excluding the days of arrival and departure) before export; and
(ii) livestock are fed ad libitum during that period and only on pelletised feed equivalent to that normally used during an export journey. (ASEL S3.8)

There has been no recent industry specific research that supports these requirements. Earlier work by Norris et al, (1992) suggests that there is no benefit from an extended assembly period. There is actually some evidence (per comm. sheep exporters) that extended assembly periods are actually detrimental to good outcomes since prolonged periods in assembly can lead to problems with lameness, pinkeye and other animal health issues. As stated elsewhere, assembly should prepare animals for the voyage rather than lead to an "extension of the voyage".

Assembly is often considered purely in terms of adaptation to the pellet diet and the implications for inappetent sheep. Work by Norris (1992) examined the duration of lot feeding prior to sea transport and found little correlation between the incidence of inappetent sheep and the lot feeding period. This suggests an inconsistency between the scientific findings and application of the standards. More (2002) stated that "paddock-based feedlots provide conditions that are often well-suited to the development of feedlot-related salmonellosis, including animals with low host resistance and an environment of high Salmonella challenge. Therefore, a useful strategy to limit outbreaks of salmonellosis would be to hold sheep in paddock-based feedlotting systems for as short a time as possible". There are, however, many considerations involved and the consensus is that more work in this area would be of benefit to the industry.

It is also noted that Ramadan (Middle Eastern religious festival) will fall during the peak turnoff period (September to December) during the next few years. This will test the capacity of the existing assembly facilities, particularly as the festival moves forward (approximately one month per year). High throughput (with extended assembly periods) will increase the risk of Salmonellae issues in the feedlots prior to export.

Industry guidelines:	*Exist*
Scientific support:	*Inconsistent with requirements*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Very High*

Other restrictions
ASEL also states that for sheep exports to the Middle East:

(a) The operator of the registered premises must not prepare the following classes of sheep for export to the Middle East by sea during the period from May to October, unless the sheep are part of an agreed trial:
(i) For livestock held in paddocks:
– pastoral and station sheep;
– lambs (less than 34 kg and no permanent incisors); and
– sheep and goats that have been held on trucks for more than fourteen (14) hours.
(ii) For livestock held in paddocks or sheds:
– full-mouth wethers with a body condition score greater than 4;

– broken-mouth sheep; and
– pregnant ewes.
(b) All sheep for export to the Middle East by ship during the period from May to October held in paddocks in the registered premises must have wool not more than 25 mm in length, unless approved by the relevant Australian Government agency based on an agreed heat stress risk assessment model and must be at least ten (10) days off shears on arrival at the premises. (ASEL S3.9)

The restriction on pastoral sheep from May to October appears to have been based on information such as that summarised in LIVE.112 (More, 2002):

- Outbreaks of salmonellosis have occurred sporadically since early 2000 at each of the large paddock-based feedlots in Victoria, South Australia and Western Australia. Similar outbreaks have not been reported in the shed-based feedlots, nor have there been losses attributable to salmonellosis in animals held in paddocks surrounding these facilities.
- All have occurred at a time of high feedlot throughput. Outbreaks are sporadic and unpredictable, but may be more common between the autumn break and early summer.
- The outbreaks are confined to one or a small number of non-contiguous paddocks/pens in affected consignments, and can result in the deaths of up to 50% of animals in these paddocks. These paddocks are not more likely to be affected in subsequent consignments.
- When outbreaks occur in a particular paddock, a number of operators have suggested that deaths are more common in specific lines of sheep. Although not consistently affected, high-risk lines include young animals, animals in poor condition and long-haul and pastoral animals. Risk of disease is substantially higher if animals arrive when the weather is cold, windy and wet.
- Based on industry experience, salmonellosis is a significant problem during the live export of goats. Goats are highly susceptible to salmonellosis.

In addition, original research published by Norris et al (1989) reported no association between shipboard mortality or assembly feedlot feeding behaviour, and distance that sheep were transported to arrive at the assembly feedlot. However, Norris et al were only able to incorporate distances to a maximum of 850 km. As a result, it seems that subsequent interpretation of the findings of this paper may have moved slightly to indicate that distances of less than 800 km were not associated with shipboard mortality and that in the absence of further knowledge, distances greater than 800 km could potentially be associated with shipboard mortality. The restriction on distance transported outlined in version 1 of ASEL was removed in version 2.

In addition there is information to indicate that pastoral sheep may not be associated with elevated risk of morbidity or mortality based on preliminary results of research currently in progress (LIVE.123) and anecdotal feedback from industry.

In summary, the level of scientific support for the restrictions outlined above is variable at best. There is also a research project underway looking at the linkage between pre-delivery factors and performance (LIVE.123). This is an important project and will address some aspects of the restrictions outlined above. The restriction that prevents the sourcing of “pastoral” sheep and “lambs” has a potential impact on operational procedures depending on sheep availability versus demand.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*

Affect on welfare outcome: *Unclear*
R&D priority: *High*

1.5.5 Penning arrangements

Penning arrangements
ASEL requires that:

> *livestock must be penned in accordance with the following criteria:*
> - *livestock of similar species, classes, ages and weights are to be kept in groups; and*
> - *livestock with horns are to be separated from livestock lacking horns (ASEL S3.15).*

These restrictions relate to segregation and have been addressed in other sections. Industry consultation identified this as an area of contention. Literal interpretation of these requirements fails to acknowledge that segregation should be optimised to achieve the best possible welfare outcome. Strict adherence to any one factor may be either immaterial or detrimental to an overall outcome.

Industry guidelines: *Exist (scrutiny required)*
Scientific support: *Lacking (required)*
Industry consensus: *Contentious*
Impact on operational procedures: *High*
Affect on welfare outcome: *Low*
R&D priority: *Medium*

Stocking density
ASEL states that minimum space per head:

> *…for sheep and goats held in sheds for ten (10) days or more, based on an individual liveweight of 54 kg:*
> *(i) penned in groups of less than eight (8) animals, a minimum of 0.9 m^2*
> *(ii) penned in groups of 9–15 animals, a minimum of 0.8 m^2*
> *(iii) penned in groups of 16–30 animals, a minimum of 0.6 m^2*
> *(iv) penned in groups of thirty-one (31) or more animals, a minimum of 0.5 m^2*
> *……and for sheep and goats held in sheds for less than ten (10) days, based on an individual liveweight of 54 kg:*
> *(i) penned in groups of less than eight (8) animals, a minimum of 0.6 m^2*
> *(ii) penned in groups of 9–15 animals, a minimum of 0.53 m^2*
> *(iii) penned in groups of 16–30 animals, a minimum of 0.4 m^2*
> *(iv) penned in groups of thirty-one (31) or more animals, a minimum of 0.33 m^2.*

Industry consultation suggested that penning densities within assembly areas are an important issue. The restrictions appear to be based on recommendations from experts in animal welfare and are identical to those published in the Code of Practice for Sheep in Western Australia (2003[1]) and those contained in the Model Code of Practice for the Welfare of Sheep[2]. Consultation would indicate that they are not, however, straightforward and best practice management will incorporate many factors to achieve the best possible outcome. For example, mob integrity during periods when there is a high chance of a salmonellae outbreak may outweigh the maintenance of a minimum pen area per head.

[1] http://www.dlgrd.wa.gov.au/Legislation/Docs/imageT.sheep.pdf
[2] http://downloads.publish.csiro.au/books/download.cfm?ID=5389

Biological processes are dynamic and unpredictable. Weather, turnover, sourcing patterns and livestock type are all factors that may affect the way in which welfare is optimised within an assembly area. There remains an inability within the regulatory framework to accommodate these principles. Some of this stems from inexperience and some from concerns of accountability in the event of a poor outcome.

Nevertheless, there is a big difference between an operator that shows blatant disregard for the factors involved to achieve a good outcome and one who is guilty of minor transgressions that achieve a better outcome overall. Judgement in regards to the above requires a sound working knowledge of the industry. Our consultations suggested that acknowledgement of this is lacking, particularly where the regulation has been centralised. The skills involved in managing an assembly area are underestimated by the current industry regulation.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Medium*

Isolation of livestock
ASEL also states that:

> *…. where a period of pre-export quarantine or isolation is required by the importing country, animals forming the consignment must at all times be physically isolated from all other animals (whether for an alternative export market or domestic use) to prevent contact (ASEL S3.3).*

ASEL also states

> *…… that where handling facilities used for loading, holding, treating or inspecting livestock (including roadway and lanes) are to be used for both domestic and export livestock (including livestock of differing export status), the operator of the premises must have procedures in place to ensure that:*
> - *handling facilities are not used simultaneously by livestock of differing pre-export quarantine or isolation status;*
> - *a minimum livestock traffic separation of two metres is maintained at all times, or livestock are separated by a physical barrier such as a fenced road or lane or a fully fenced empty paddock, unless specified otherwise by the importing country; and*
> - *handling facilities and equipment used by different consignments of animals are managed in accordance with the pre-export quarantine or isolation requirements of each importing country (ASEL S3.3).*

Industry consultation did not identify any issues with regards to isolation of stock, although the same issues that were identified under segregation apply to these headings.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Low*
R&D priority:	*Medium*

1.5.6 Pen design

Pen design and the provision of shade and shelter
The ASEL addresses pen design under sections S3.4-S3.6 and provides guidelines in regards to shade and shelter, fencing and drainage (ASEL S3.4-S3.6).

Industry consultation has identified that research that to address design issues would be of benefit to the industry.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Design of handling facilities
ASEL states that:

> *…… livestock handling facilities and sheds at registered premises must comply with the following:*
> - *Sheds must be constructed with sufficient drainage and ventilation to ensure that the shed is free-draining.*
> - *Livestock handling facilities must be constructed to handle the number of livestock (ie the number of stock at the premises, whatever that may be, depending on the consignment size) with a minimum of stress and injury.*
> - *Floors of yards, sheds, pens and loading ramps must have non-slip surfaces (ASEL S3.2).*

Industry consultation suggests that there is scope for identifying better design principles for both sheds and open assembly areas.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.5.7 Provision of fodder and water

Feed and water
To ensure adequate supply of feed and water ASEL requires that:

- *where feeders, self-feeders and water troughs are used, they must be of a design that allows for complete cleaning of all surfaces, prevents spoilage of feed during inclement weather, and minimizes fecal contamination and injuries.*
- *all livestock feed for use at the registered premises must be stored in a manner that maintains the integrity and nutritional value of the feed, and protects it from weather, pests and external contaminants (including chemical spray drift) and from direct access by animals.*

- *where feeders and self-feeders are used, the feed trough allowance for sheep and goats held in paddocks at the registered premises is to be calculated on a paddock-by-paddock basis and must be:*
  (i) for ration feeding, no less than five (5) cm of feed trough per head;
  (ii) for ad libitum feeding, no less than three (3) cm of feed trough per head;
  (iii) during any or all of May, June, July, August, September and October feeding must occur from fully sheltered feed troughs.

ASEL also states that:

- *…..for sheep and goats, must be fed three (3) per cent of their bodyweight per day for sheep younger than four (4) tooth and two (2) per cent of their bodyweight per day for four (4) tooth or older, of a quality feed able to meet daily maintenance requirements;*

and that:

- *all livestock in the registered premises must have access to drinking water at all times (unless under curfew).*
- *water troughs must be positioned apart from hay and feed sources to prevent fouling and kept clean.*
- *the water quality must be suitable for the livestock and there must be sufficient backup storage or a contingency plan to ensure continuity of supply at peak demand for two days (ASEL S3.7).*

These are acknowledged by industry. The requirement to cover troughs stems from the work done on preventing Salmonellae (see LIVE.112). There has been no specific work undertaken on the provision of trough space in assembly areas. This heading addresses important issues but there is general agreement that the requirements are reasonable.

There is anecdotal evidence indicating that the requirement for covered feed troughs in winter may, on occasions, result in an adverse impact on health. Feedlots with fixed, covered troughs are forced to house sheep in the same paddocks for several months and this may lead to inadvertent increased risk of environmental salmonella exposure and increased risk of salmonellosis. One option currently being utilised by a feedlot is to use movable covered feed troughs that can be moved from paddock to paddock and as a result retain the ability to rotate and spell paddocks through the winter. The Standard could be modified to ensure that the requirement stipulates movable, covered feed troughs. Another alternative would be to allow the use of paddocks with uncovered feed troughs in the winter as long as the weather is fine. In times of inclement weather animals would need to be moved to paddocks with covered feed troughs. This would need to be explored in light of information on the number of rain-days in the affected period based on local climate records.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.5.8 Animal care and handling

Supervision/observation of livestock
ASEL requires daily monitoring of health, welfare and mortality and states that all livestock must be inspected daily by a competent stock person (ASEL S3.16). This is an accepted practice and issues related to competence and training have been discussed in other parts of the document.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High*
R&D priority:	*Low*

Treatment of sick or injured stock
ASEL also states that:

> *….all sick or injured livestock must be given immediate treatment, and veterinary advice must be sought if the cause of a sickness or injury is not obvious, or if action taken to prevent or treat the problem is ineffective. Investigation by a registered veterinarian must be conducted if mortalities in any one paddock or shed exceed zero point one (0.25) per cent or 3 deaths, whichever is the greater, on any one day for sheep and/or goats. Dead livestock must be collected and disposed of on a daily basis. Animals must not be able to access the area for disposal of carcasses (ASEL S3.16). Records of each consignment must be kept for at least two (2) years after the date of export (ASEL S3.16).*

and that:

> *….. any livestock identified at unloading as being distressed, injured or otherwise unsuitable for export must be marked by a permanent method and isolated from the rest of the consignment. A record must be kept that details identity, the method of treatment or euthanasia and disposal of all rejected animals (ASEL S3.17).*

The cause of deaths in assembly areas has not been a focus with the exception of salmonellosis, which was the subject of investigation in LIVE.112 (More, 2002) and earlier work by Higgs et al, (1993) and Richards et al, (1993). LIVE.123 is currently investigating causes of death in assembly feedlots with the results yet to be finalised. Salmonellosis is one of the major disease risks within the industry. LIVE.112 is quality work that provides a clear definition of the problem and description of the disease. The work is presented in a way that enables readers to gain a good understanding of the disease and provides recommendations on how it can be managed. There are also some suggestions as to how the standards could be modified to better minimise the risk of a salmonellae outbreak. Some of the recommendations have been adopted (e.g. the covering of troughs in the Portland feedlots) although others would appear to have been ignored.

The study suggests:
- Modification of curfews prior to long haul transport (during risk periods)
- Practices to maintain consistent feed intake
- Holding sheep (in paddock based feedlots) for the shortest time possible (during risk periods)
- Maintenance of sheep quality (during risk periods)
- Developing practices to get sheep quickly onto feed
- Practices to minimise contamination of pellets
- Specific practices to minimise paddock contamination

- Appropriate management of newly-introduced animals
- Development of an “all in/all out” approach to feedlot management
- Other management related suggestions.

Industry consultation would indicate that only some of these suggestions have been embraced and converted into regular practice in feedlots. Some of the suggestions actually conflict with the current ASEL requirements and this illustrates how literal interpretation of the standards can, in some cases, generate inferior welfare outcomes.

The same study (More, 2002) also notes that “….the current relationship between industry and relevant government does not appear to be based on a co-operative partnership”, and notes the constraints that this places on achieving continuous improvement, despite the efforts of many individuals.

A further symptom of the same problem is to be found in ASEL 3.16 which requires a mortality investigation by a registered veterinarian when “….*mortalities in any one paddock or shed exceed zero point one two five (0.25) per cent or 3 deaths, whichever is the greater, on any one day for sheep and/or goats”*. Whilst this requirement is acknowledged by industry as necessary, there is no reference to what action should be taken on the basis of the findings. There may be a paddock or mob level prevalence at which the shipment of diseased animals (and their cohorts that may be carriers) is irresponsible and invites serious consequences onboard. The commercial implications of this risk are large and remain one of the key threats that could bring about the downfall of the industry. It is in the best interests of the livestock export industry to develop strategies that address this contingency and provide options that protect against the possible commercial repercussions. As stated by More (More, 2001), an open relationship between government and industry will help to ensure that problems are quickly and effectively addressed.

Pinkeye is another animal health problem in assembly areas. This disease is endemic in many flocks of sheep throughout Australia and it is unreasonable to believe that it could be prevented from entering assembly areas prior to a voyage. The disease is relatively easy to treat as small doses of antibiotic appear to be effective. The practical implications are more complex since the way in which affected animals are identified, removed, treated and isolated has a major bearing on the overall effectiveness of prevention and treatment. Severe outbreaks of pinkeye onboard can contribute to mortality and welfare issues. A study (similar to that conducted by More in LIVE.112) could assist assembly managers to deal with pinkeye. Such work might also identify more innovative methods of treatment.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Exists (more required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Very High*

1.5.9 Treatment records and required documentation

Treatment records
Records of each consignment must be kept for at least two years after the date of export (ASEL S3.16).

This is acknowledged by industry.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.10 Rejections

Rejection criteria

ASEL Appendix 3.1 outlines the criteria for rejecting sheep and goats for fitness to travel. These criteria are the same as those described in the section relating to sourcing (see table 4.3.2). The ability to detect inappetant sheep at the feedlot before loading is an outstanding issue within the industry. Inanition is currently under investigation and addressed in section addressing treatment of animals in the onboard management section (1.7.4).

These are acknowledged by industry.

Industry guidelines:	*Exist*
Scientific support:	*Exists (veterinary texts)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High*
R&D priority:	*Low*

Management of rejects

ASEL states that:

> *….. any livestock identified at unloading as being distressed, injured or otherwise unsuitable for export must be marked by a permanent method and isolated from the rest of the consignment. A record must be kept that details identity, the method of treatment or euthanasia and disposal of all rejected animals (ASEL S3.17).*

Industry consultation has revealed debate as to how rejects should be managed. Much of this is based around commercial arrangements between vendors or suppliers. It also involves transport insurance, residual (or salvage values) and treatment possibilities. Rejected animals will, from time to time, find their way back into the live export chain. At times this is based purely as a commercial decision to minimise losses associated with these rejects. Currently little or no identifying information (tag, PIC, NLIS number, shipment identity) is collected on rejects and variable information is collected on animals that die during the assembly feedlot period. This has interfered with attempts to reconcile numbers of animals and trace animals from farm through to ship. Improved standards for managing and tracking animals during the feedlot period would assist with information collection and application.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Sometimes high*
R&D priority:	*Medium*

1.5.11 Authorised entry

Authorised entry
ASEL requires that:

> *….. the operator of the registered premises must have arrangements in place at the premises to prevent unauthorised entry and access to the feed when livestock are being prepared for export. Access to the premises must be controlled at all times, with:*
> - *all entry points to premises being clearly signed;*
> - *only those persons necessary for the day-to-day operation of the premises and state*
> - *and territory government officials having direct access to the area of the premises; and*
> - *all non-employees reporting to reception for appropriate biosecurity checks relevant to the requirements of the facility (ASEL S3.10).*

Untoward industry events have made this a requirement.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.12 Pre-loading inspection (3rd Party Veterinarian)

Fitness to travel criteria
This criterion is thoroughly addressed by ASEL. In addition WADA and MLA have a relevant publication.

Industry guidelines:	*Exist*
Scientific support:	*Exist (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High*
R&D priority:	*Low*

Pre-loading inspection techniques and location
There is some debate over whether pre-loading inspection should be undertaken at the wharf or at the assembly area. Proximity to the wharf is a consideration but the determining factor should be ‘where the inspection is likely to be most effective’. Inspection races have been used effectively in the Eastern States. Research that identifies the most effective method of conducting pre-embarkation inspections would be of benefit to the industry. The development of practices that check on the effectiveness of the systems would be in keeping with an outcome based approach.

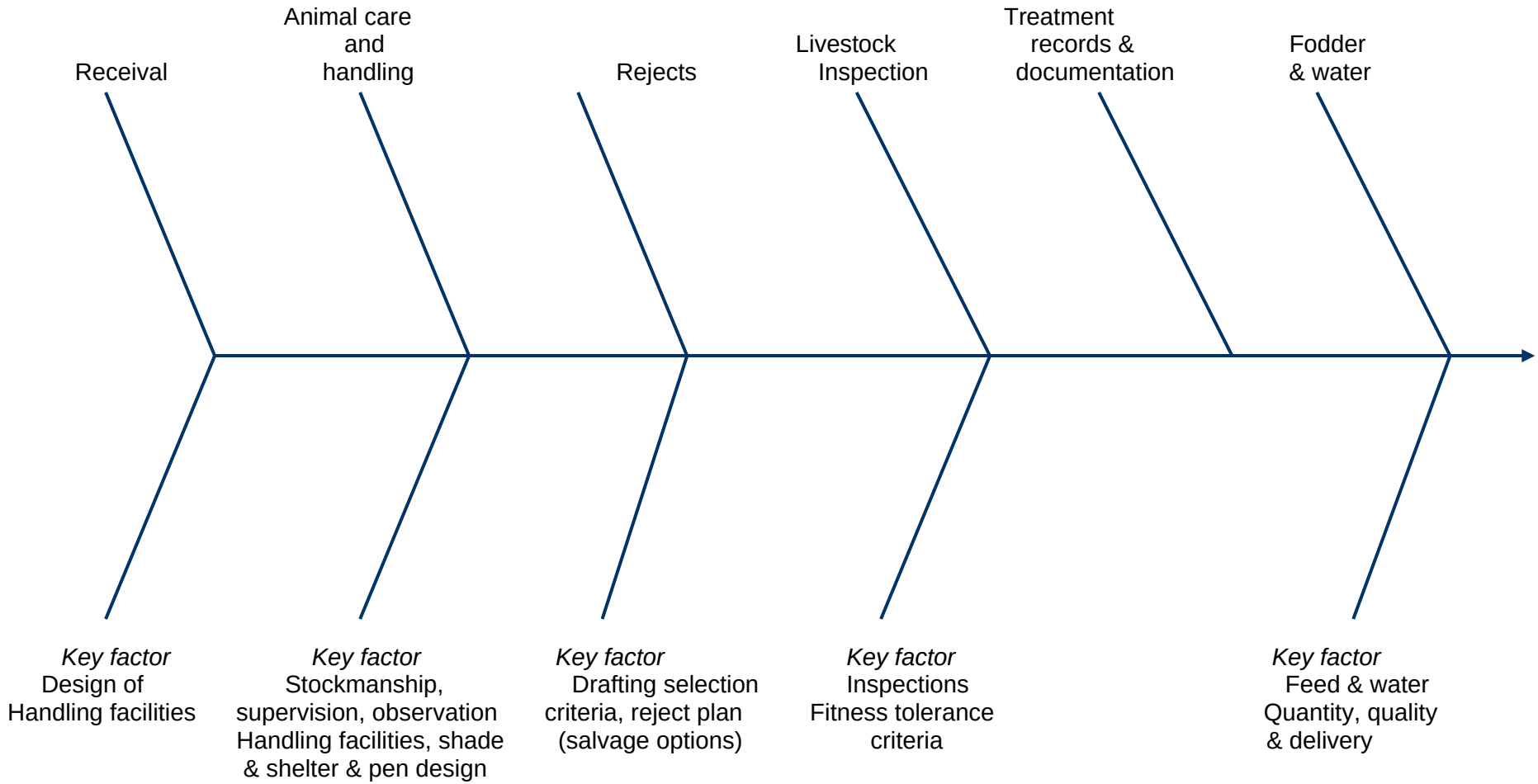
Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.5.13 Permission to leave for loading (PLL / AQIS Veterinarian)

Permission to leave for loading
The instruction for ‘permission to leave for loading’ is found in the Export Control (Animals).

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.5: Management of Registered Premises (LHS)



1.6 Vessel preparation and loading (LHS)

Overview
ASEL describes the vessel preparation and loading phase as:

> *…beginning with the arrival of livestock at the port of loading and ending when all of the animals have been loaded onto the vessel. Once loading has been completed in accordance with the loading plan, an export permit and health certificate is issued.*

ASEL states that:

> *……. the Australian Maritime Safety Authority (AMSA) is responsible for the inspection of selected foreign flag ships to monitor their compliance with safety and environment protection standards, including safe carriage of livestock as cargo. AMSA administers the regulation of vessels through the auspices of Marine Orders No.43.*

(Many of these orders relate to aspects of vessels and vessel management that are removed from aspects relating to the export of livestock. However, there are a number of key regulations that have a direct bearing on livestock exporting activities. These are noted in the appropriate sections).

ASEL also states that:

> *….. ..the master of the vessel is responsible for the vessel's loading configuration and for ensuring the safety of the vessel, crew and cargo during loading. Livestock vessels carry crew in sufficient numbers with experience in the care of animals to satisfactorily provide for their tending, feeding and watering, as well as assisting the accredited stock person(s) and/or veterinarian onboard in their responsibilities during the voyage.*

ASEL describes the relevant responsibilities as follows:

> *…the exporter is responsible for providing competent animal handlers to ensure that livestock are loaded in a manner that prevents injury and minimises stress, and for ensuring that suitable loading facilities are provided. The vessel owner is responsible for ensuring that the vessel is appropriately designed, constructed, equipped, maintained and certified to carry the cargo of livestock.*

ASEL further states that:

> *…. the exporter must ensure that stocking densities meet all legislative requirements; that there is adequate provisioning of the vessel before departure, including feed, water and veterinary supplies; and that accredited stock persons and, when required, an accredited veterinarian have been engaged. The exporter must be able to demonstrate that the loading of the livestock at the port of loading has been conducted in accordance with the approved loading plan and with any importing country requirements relating to the consignment, and relevant requirements of the Australian Government and the state or territory for loading of livestock.*

Guiding Principles (ASEL Standard 4)
ASEL states that:

…. the sea voyage is planned and is undertaken on an appropriately provisioned vessel certified for the carriage of livestock, and the livestock are loaded in a manner that prevents injury and minimizes stress.

Required outcomes (ASEL Standard 4)
ASEL identifies the following outcomes:

- *Livestock are healthy, fit to travel and comply with importing country requirements.*
- *The vessel meets Australian requirements for the safe carriage of livestock.*
- *Sufficient personnel must be available both at loading and during the voyage to ensure that livestock husbandry and welfare needs are addressed.*
- *Livestock are handled and loaded in a manner that prevents injury and minimizes stress.*
- *The travel and loading plans adequately address the health and welfare of the livestock.*
- *A health certificate and an export permit are issued by the Australian Quarantine and Inspection Service (AQIS).*

1.6.1 Loading instructions

Loading instructions
ASEL has no direct guidelines in regards to loading instructions but does state that loading arrangements must be made and take into consideration:

- *port facilities, including the available water supply rate;*
- *port and ship security;*
- *environmental management;*
- *labour availability and competency; and*
- *occupational health and safety.*

Timeliness of provision of loading instructions has been identified as a contentious issue. Loading instructions should be forwarded to the vessel at the earliest possible time to allow the appropriate set up and planning.

Timely provision of instruction is implicit, however, in achieving stated outcomes and guidelines in regards to loading. Moreover, this imperative is referenced in the industry operating and governance manual whose charter it is to demonstrate how outcomes can be achieved. The issue is not regarded as a priority for research.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.6.2 Loading personnel

Loading personnel
ASEL states that:

…. sufficient personnel must be available both at loading and during the voyage to ensure that livestock husbandry and welfare needs are addressed (ASEL S4.6).

ASEL also states that:

> *… upon arrival at the port of embarkation, responsibility for the livestock must be transferred to a competent person nominated by the exporter and that that person must be notified of any aspect of transport to the port of embarkation that might affect the future health and welfare of the livestock (ASEL S4.7).*

Appendix 4.1 of ASEL also states that:

> *… a suitably competent person must be appointed by the exporter to be responsible for the handling, husbandry and welfare of the livestock for export and to ensure that loading facilities and livestock handling standards at the port are satisfactory during unloading from the land transport, inspection and loading onto the vessel.*

ASEL also states that:

> *…. livestock for export must be loaded onto the vessel by competent stock handlers in a manner that prevents injury and minimises stress (Appendix 4.1).*

ASEL makes reference to both sufficient and competent personnel to load the vessel. It would be in the industry's interests to have key competencies identified and develop a short course that allowed these competencies to be assessed. This is in keeping with trends in other industries and would promote an appropriate image in regards to the care and handling of livestock. It might also allow selected staff to act as "watch dogs" to identify and report transgressions from the standards. This could be preferable to the enforced (and paid) supervision that may arise through other welfare imperatives.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (training and competency assessment)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Sometimes high*
R&D priority:	*Medium*

Accompaniment

ASEL states that:

> *…. an accredited stock person who is employed by the exporter and who is not ordinarily a member of the ship's crew must be appointed to accompany each consignment of livestock for export to its destination. If required by the relevant Australian Government agency, an accredited veterinarian must also be appointed to accompany a consignment (ASEL S4.5).*

There is some contention in regards to accompaniment, particularly the role of onboard veterinarians. The onboard veterinarian is currently viewed as an underutilised resource with a poorly defined role. There are many inexperienced veterinarians travelling onboard and it is recognised that veterinarians that are prepared to travel on livestock vessels are not easy to find.

Consultation with veterinarians that have travelled indicates that the majority are quite prepared to take on added responsibilities during a voyage and in fact many indicated that this would serve as an added inducement.

Mortality investigation by the veterinarian is already required but could be extended to data collection and onboard monitoring to assist selected research projects. It is also possible that veterinarians could be given a charter to disseminate research findings and/or undertake lead work to convert research findings into operational practice. A team approach with close links to the Stockman's program and activities is envisaged.

There is an opportunity for review of the job descriptions for both stockperson and veterinarians and to develop an integrated set of tasks that are feasible and contribute to improved animal health and welfare as well as better monitoring and recording of data about stock management and health issues and events.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (roles in regards to R&D need to be defined)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.6.3 Load plan

Load plan
In recognition of the importance of the load plan, ASEL devotes an appendix (ASEL S4 Appendix 4.1) to guidelines on how to prepare a loading plan.

It also states that:

> *…. before loading of livestock for export begins, a loading plan must be prepared in accordance with the specifications in Appendix 4.1, including details of the net available pen area on the ship (excluding the area of the hospital pens) according to the vessel's record of equipment for the carriage of livestock, and the number of livestock that may be loaded on the vessel, based on the minimum pen area per head for the relevant livestock species and class as specified in the Appendix (ASEL Appendix 4.1 and Tables A4.1.1–A4.1.6).*

There has been no industry research that relates specifically to the preparation and execution of a load plan. Some exporters utilise quite sophisticated programs to put together their load plans. As mentioned in other parts of this report, better linkages to the heat stress risk assessment model would be useful at an operational level.

The marine orders have specific requirements with regard to the provision and use of "hospital pens" (36.1-36.7).

The influence of the load plan on the overall outcome of the voyage is recognised. However, there has been no specific research identified that might assist or improve aspects of the load plan.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (R&D needs to work with procedures)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

Stocking density
The key tables involved for sheep and goats are: ASEL appendix 4.1 -Table 4.1.5.

Stocking density is a contentious issue. LIVE.233 addressed stocking density but its findings are still pending. Better scientific support for existing stocking density levels is considered a high priority area.

Other general guidelines for load planning exist (see Stockman's Manual, March 2006, page 8). There has been general industry consensus on the importance of load planning. Loading sequence is a major factor in the execution of a load plan and that most loadings require some contingency plan to cater for out of sequence loading (per comm. loading personnel). ASEL states that a contingency plan for emergencies and interruption to loading must be prepared, including procedures for contacting the exporter in the event of an animal health or welfare emergency. However this does not specifically address the issue of 'out of sequence delivery'.

Curfew times are not stipulated within the tables provided by ASEL and there is some industry confusion in regards to how to manage full or partial curfew weights when it comes to allocating appropriate stocking densities.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*High*

Other
ASEL states that:

> *….. a loading plan for the vessel on which the livestock for export are to be transported must be prepared and be compliant with relevant ship safety standards and must give due consideration to:*
> - *Differences in handling, holding and husbandry needs of each livestock species, number of animals, sex, class, reproductive status, weight, breed, origin, preparation and transport history;*
> - *Pen layout, available pen area for the particular consignment, ventilation, vessel characteristics, port rotation, discharge sequence and stability; and*
> - *Provision of livestock accommodation that enables the following requirements to be satisfied:*
>   – *segregation of livestock according to species;*
>   – *segregation of classes of livestock of the same species;*
>   – *separation of younger animals from older animals;*
>   – *separation of livestock of a dissimilar size;*
>   – *segregation of livestock with horns from livestock without horns;*
>   – *separation of cattle or buffalo from other species by a passageway, an empty pen or an effective impermeable barrier, to the satisfaction of an accredited stock person or accredited veterinarian;*
>   – *location of livestock in relation to hatchways (there must be no location of livestock over a hatchway, unless the hatchway is protected against consequent damage and the hatchway covers are secured against movement); and*
>   – *location of livestock in relation to health and welfare (there must be no penning or location of livestock on or in any part of a vessel where the livestock, livestock*

fittings, livestock equipment or carrying arrangements could substantially compromise livestock health and/or welfare);

- *Provision of clearly identified hospital pens (or stalls), constructed to the standard required for the species of livestock for which they are intended as specified in Marine Orders 43 (27), on each deck or otherwise in a manner readily accessible to livestock; and*
- *Stocking densities and pen-group weight-range tolerances for the species in accordance with the specifications in the tables below, unless a variation is approved by the relevant Australian Government agency based on an agreed heat stress risk assessment (ASEL Appendix 4.1).*

Furthermore ASEL states that:

> *….. livestock for export must be presented for loading, and penned on the vessel in lines segregated by species, class, age, weight, presence/absence of horns or antlers, and any other relevant characteristic (and, where relevant, port of destination), in accordance with the approved loading plan (ASEL S4.11).*

The load plan, including the issue of segregation, is a key instrument with a strong bearing on voyage outcome. Segregation is addressed elsewhere in the document.

Discussion of the use of hospital pens is included in the section relating to treatment of sick animals (see Marine Orders).

ASEL states that:

> *….. stocking densities and pen-group weight-range tolerances for species of livestock must be in accordance with specifications in Appendix 4.1 and heat stress assessment using an agreed heat stress risk assessment unless a variation is required and approved by the relevant Australian Government agency.*

Heat stress is addressed under the heading thermoregulation/heat stress in the section on physical environment (1.7.2).

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.6.4 Loading procedures

Loading procedures
To ensure only fit and healthy livestock are transported and loaded on board ASEL states that:

- *the exporter must arrange for the livestock to be inspected for health and welfare and fitness to travel immediately before they are loaded onto the vessel;*
- *only livestock that are healthy and fit to travel can be loaded;*
- *any livestock rejected for export must be distinctively identified and humane and effective arrangements made for their removal from the port;*

- *if euthanasia is necessary it must be carried out humanely and promptly; and*
- *dead livestock must be removed from the port and carcasses must be disposed of in compliance with all relevant health and environmental legislation (ASEL S4.8).*

As already mentioned there is some dispute about whether the pre-embarkation inspection conducted under the supervision of the 3rd party veterinarian should be done at the assembly area and/or at the wharf. Some better explanation of PLL would also be useful (per comm. onboard personnel). A final wharfside overview is practiced where pre-embarkation inspection takes place at the feedlot.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Communication during (and after) loading
ASEL recognises the importance of communication during and after loading and states:

> *…a communication plan involving all responsible parties must be established before the loading of livestock for export begins. This plan must cover:*
> - *roles and responsibilities of the exporter or nominated representative/s, the accredited stock person, the accredited veterinarian (if required), the master of the vessel, nominated officers and crew members, and government and port authorities;*
> - *arrangements for regular meetings of key people before, during and after loading; and*
> - *reporting procedures during and on completion of the voyage (ASEL Appendix 4.1).*

Exporters find there are a number of key practices that facilitate a smooth loading. In many cases these are documented in the individual operating and governance manuals and include the strategic positioning of key personnel, the use of communication devices, agreed hand signals and clear delegation of tasks and responsibilities.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Ventilation during loading
ASEL states that:

> *…. when livestock for export are loaded on vessels with enclosed decks, the ventilation system must be run continuously from the commencement of loading (ASEL S4.9).*

This is an established and accepted practice.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*

Affect on welfare outcome: *Low (except in the event of ventilation failure)*
R&D priority: *Low*

Feed and water on arrival
ASEL states that:

> *…. all livestock for export must be offered feed and water as soon as possible after being loaded on the vessel, but no later than 12 hours after loading (ASEL S4.13) (see also ASEL S5.4).*

This is an established and accepted industry practice. Fodder consumption in the first 12 hours is usually low, so the implications of this ASEL requirement are unclear.

Industry guidelines: *Exist*
Scientific support: *Lacking*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Unclear*
R&D priority: *Low*

1.6.5 Voyage feed and water and other consumables

Voyage feed (quality and specifications)
ASEL states that:

> *…. the supplies of feed and water must maintain good health and satisfy energy requirements of the livestock for the duration of the voyage. There must also be feed and water reserves as specified in Appendix 4.2. The feed and water provisions must take into consideration the livestock species, class, age and expected weather conditions (ASEL S4.14).*

ASEL has clear nutritional specifications for the shipboard ration of sheep and states:

> *….pellets used as the shipboard ration must conform to the nutritional specifications outlined in Table A4.2.1.*

Whilst pellet manufacturers have an excellent reputation for producing a consistent, trouble free foodstuff, there is always scope for technology to make improvements. It should be noted that the long haul sheep trade involves large number of sheep that are totally dependent on the volume of fodder loaded. There is little scope for experimentation under these circumstances.

ASEL makes general statements regarding shipboard specifications and provisioning and states that:

> *….. the shipboard ration must not contain more than 30% by weight of wheat, barley or corn, unless the livestock have been adapted to the ration over a period of at least two weeks before export. All pelleted feed must be accompanied by a manufacturer's declaration that it is manufactured in accordance with national pellet standards.*

Industry guidelines: *Exist*
Scientific support: *Lacking (further research would be of benefit)*
Industry consensus: *Consensus*

Impact on operational procedures: *Low*
Affect on welfare outcome: *High*
R&D priority: *Medium*

Voyage feed (storage)
ASEL also states that:

> *…..All feed from a previous voyage that is suitable for livestock consumption may remain in a feed storage tank provided that:*
> - *each tank is completely emptied at least once in every 90 days;*
> - *all feed that is no longer suitable for livestock consumption is emptied in its entirety before further feed is loaded and*
> - *records are maintained of the emptying of feed storage tanks and are made available for inspection (ASEL Appendix 4.2).*

These are an established and accepted industry practice.

Industry guidelines: *Exist*
Scientific support: *Not required (operational issue)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

Voyage feed (quantity)
ASEL also states that:

> *…… at the time of departure, there must be sufficient feed and water on the ship to meet the anticipated needs of the sheep and goats during the voyage, plus an additional twenty-five (25) per cent or three (3) days feed and water, whichever is less.*

Feed allowances must be as follows:

> *…… for young sheep and goats (up to and including four (4) permanent incisor teeth), at least three (3) per cent of liveweight of feed per head per day, but for sheep and goats with more than four (4) permanent incisor teeth, at least two (2) per cent of liveweight of feed per head per day.*

Sheep normally take some time to reach their full intake. But onboard personnel have noted that extension of the assembly period has led to a greater overall fodder intake during the first five days of the voyage. This extra consumption has meant that greater attention needs to be placed on feed budgeting since *ad lib* feeding will lead to fodder shortages if feed is budgeted at just 2% of live weight. There is also the issue as to when, during the voyage, should the feed reserve be "sacrificed". Unrestricted feeding can mean that the "3-day" reserve is consumed very early in the voyage and defeats the purpose of having the reserve. It would be in the interests of the industry to better quantify the feed requirements of adult sheep and address fodder management onboard. Whilst actual consequences of "running out of fodder" are not as serious as many perceive, it is difficult to defend reduced rations from an animal welfare perspective.

Industry guidelines: *Exist*
Scientific support: *Lacking*
Industry consensus: *Consensus*

Impact on operational procedures: *Low*
Affect on welfare outcome: *Unclear*
R&D priority: *Low*

Voyage water (quantity)
Water allowances must be as follows:

> *….for sheep and goats, at least four (4) litres of water per head per day, except for days when the ambient temperature is expected to exceed 35°C, when allowance must be made for at least six (6) litres of water per head per day. Allowance may be made for fresh water produced on the ship while at sea.*

ASEL states that when calculating water requirements:

> *… provision must be made for livestock to receive at least 12% of liveweight of water per head per day. (This water allowance may be reduced to 10% of liveweight per head per day if water consumption on the ship for each of the previous three voyages averaged less than 10% of liveweight per head per day). Allowance may be made for fresh water produced on the ship while at sea (ASEL Appendix 4.2).*

LIVE.209 found that animals consumed water equivalent to 15% of their bodyweight (Barnes et al, 2004) while LIVE.205 investigated water consumption on 87 shipments involving cattle and found that 13% of bodyweight was sufficient in all but one voyage (Brightling, 2001). The provision for a lower water allowance based on the previous three voyages appears to be illogical. Water requirements should be based on stock parameters and on climate/weather patterns and not on historical information from the most recent voyages. There was no attempt, to correlate water consumption to a wet (or dry) bulb temperature. The experience of onboard personnel indicates that both cattle and sheep will drink up to 15% bodyweight (60 litres and 7 litres per head respectively) under hot conditions.

Industry guidelines: *Exist*
Scientific support: *Exists (adequate)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

Water production and delivery
Additional onboard water production can be expensive in terms of power and can overload already extended power resources. The associated power demands are an identified risk on some vessels. There is also an array of water delivery systems onboard livestock vessels but industry best systems should be identified and used on new vessels.

Industry guidelines: *Do not exist*
Scientific support: *Lacking (required)*
Industry consensus: *Consensus*
Impact on operational procedures: *Potentially high*
Affect on welfare outcome: *Potentially high*
R&D priority: *Medium*

Veterinary supplies and equipment
A suggested pre-shipment checklist in regards to veterinary supplies and equipment is provided by ASEL (Table 4.1.9) and outlined in the industry Stockman's Manual (Appendix 6 & 7).

The requirement to carry suitable veterinary equipment and medicine is also supported by the Marine Orders (18.1). There is some contention about the use of Oxytetracycline as a blanket medication technique. This is currently a low priority issue for the industry.

Industry guidelines:	*Exist*
Scientific support:	*Exists (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Bedding
There is no requirement for sheep to be provided with bedding, although research to address situations where the sheep pad deteriorates would be of benefit to the industry. This is discussed in more detail in the next section.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.6.6 Management of rejected livestock

Management of rejects at the wharf
There are various welfare issues in regards to the fate of sheep rejected at the wharf (see loading procedures.

Industry guidelines:	*Exist*
Scientific support:	*Lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.6.7 Required documentation

Written instructions
ASEL states that:

> *…… written instructions and/or standard operating procedures for the care and handling of the livestock being exported must be prepared before departure of the vessel from an Australian port. The procedures must address:*
> - *the quantity and type of feed to be provided and frequency of feeding required for each class of livestock during the voyage;*

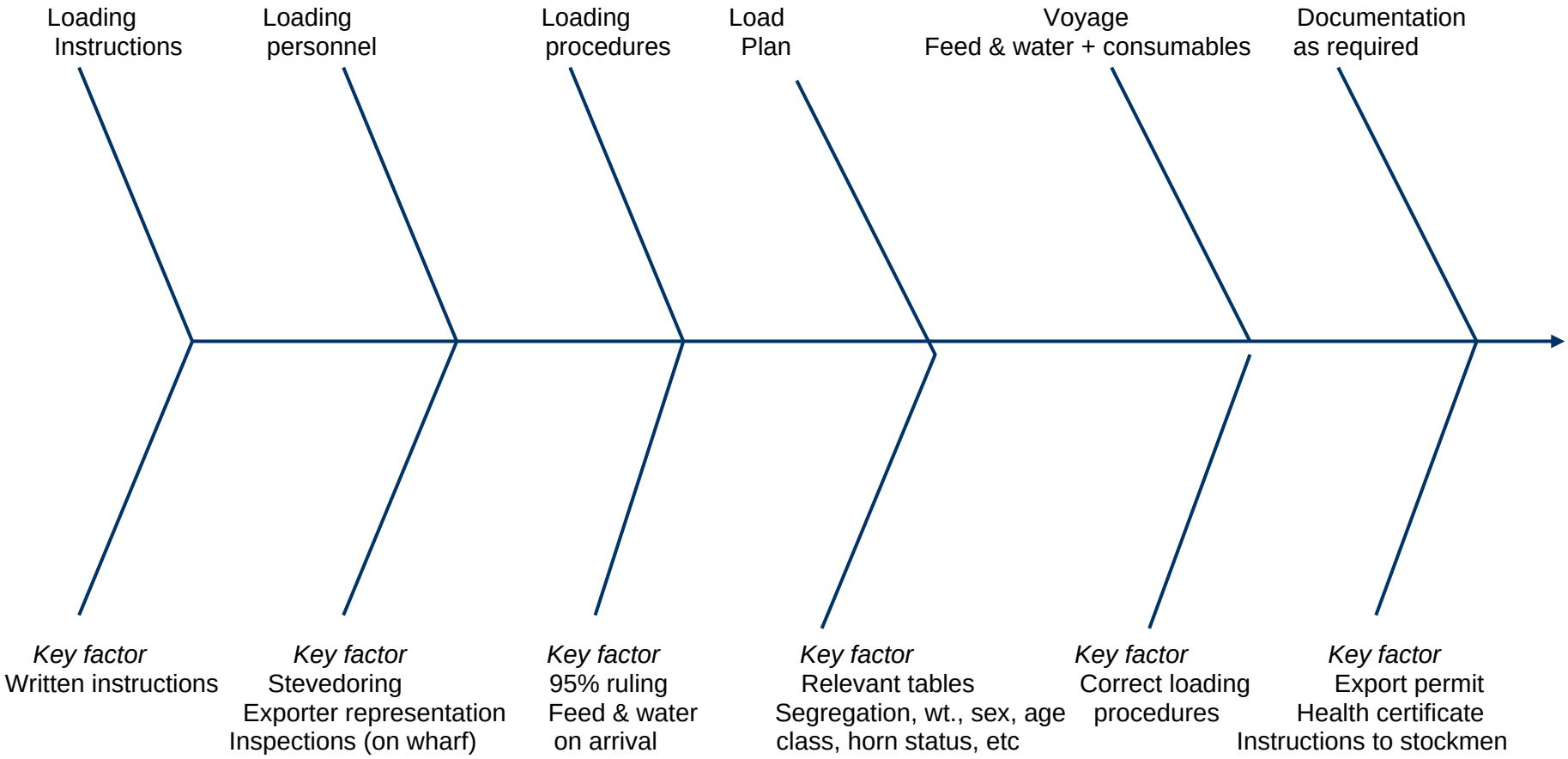
- *if water is not supplied ad libitum, the quantity of water to be provided and frequency of watering required during the voyage;*
- *pen cleaning requirements;*
- *treatment of livestock during the voyage; and*
- *authority to humanely destroy any animal that is seriously ill or injured.*

The Marine orders also require that vessels carry a means of humanely killing livestock (appropriate for use with species carried) (18.1). Onboard practice has changed in keeping with welfare concerns and there is now greater use of the “captive bolt”. There is also greater scrutiny during unloading to ensure that moribund livestock are humanely killed at the earliest possible opportunity.

The provision of written instructions is important and generally practiced within the industry. Instructions should possibly be issued some days prior to departure to allow onboard personnel to better prepare for the voyage.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Figure 1.6: Vessel Preparation and Loading (LHS)



1.7 Onboard management of livestock (LHS)

Overview
ASEL provides the following overview in regards to the onboard management of livestock.

> *Onboard management covers the period from the time the first animal is loaded onto the vessel until the last animal is unloaded at the port of disembarkation. Provisions should exist to ensure that animal health and welfare interventions are undertaken where necessary to treat or euthanise sick or injured animals.*
>
> *Once loading begins at the point of embarkation the master of the vessel assumes overall responsibility for the management and care of the livestock during transport on the vessel. This responsibility continues until the point of disembarkation. It includes the provision of satisfactory livestock services such as ventilation, food, water, drainage and lighting.*
>
> *After the livestock have been loaded on board the vessel and all requirements have been met, the Australian Quarantine and Inspection Service (AQIS) will issue the health certificate and export permit.*
>
> *(ASEL states that the consignment must be checked before departure to ensure that the livestock have been loaded according to the loading plan (ASEL S5.3)). This will usually be conducted by the attending AQIS veterinarian.*
>
> *Where an accredited veterinarian is required to accompany the consignment, that person is responsible for monitoring and regular reporting (to AQIS) of consignment conditions on board during and after the voyage.*
>
> *Accredited stock persons accompanying the consignment are responsible for providing appropriate care and management of the livestock on board during the voyage. Livestock vessels carry crew in sufficient numbers with experience in the care of animals to satisfactorily provide for their tending, feeding and watering, as well as assisting the accredited stock person(s) and/or veterinarian onboard in their responsibilities during the voyage.*

Guiding principle (ASEL Standard 5)
ASEL states that:

> *…. the onboard facilities, management and husbandry must be adequate to maintain the health and welfare of livestock throughout the sea voyage.*

Required outcomes (ASEL Standard 5)
ASEL also requires that:

> *… the voyage is completed safely, adequate livestock services are maintained throughout the voyage, onboard care and management of the livestock is adequate to maintain their health and welfare and statutory reporting requirements are met, both during and after the voyage.*

1.7.1 After loading

On completion of loading
ASEL states that:

…. all livestock for export must be offered feed and water as soon as possible after being loaded on the vessel, and within 12 hours (ASEL S5.4).

ASEL also states that:

> *… the consignment must be checked before departure to ensure that the livestock have been loaded according to the loading plan (ASEL S5.3).*

This will usually be conducted by the attending AQIS veterinarian.

ASEL states also that:

> *…. the onboard management of livestock for export by sea must ensure that the health, welfare and physical needs of livestock are met during the voyage as follows:*
> - *An accredited stock person must accompany each consignment of livestock and must remain with the consignment until the vessel has completed discharging at the final port of discharge.*
> - *An accredited veterinarian must accompany each consignment of livestock where required by the relevant Australian Government agency and must remain with the consignment until the vessel has completed discharging at the final port of discharge.*
> - *Accredited stock persons and/or veterinarians must work with the vessel's master and crew to maintain the health and welfare of the livestock on board.*
> - *All personnel handling and caring for livestock or who are otherwise responsible for animals during the voyage must be able to demonstrate an adequate level of experience and skill to allow them to undertake their duties (ASEL S5.1).*

Although not stipulated in ASEL, most exporters conduct a pre-shipment meeting that all key persons attend. This usually includes the master, the 3rd party veterinarian, the livestock exporter (or his representative) the onboard veterinarian and stockman and the attending AQIS veterinarian. It is usual at these meeting for the master, the onboard stockman and the veterinarian to be issued with detailed written instructions concerning the voyage (per comm. onboard personnel). There have been several pilot projects where onboard personnel have collected specific data to contribute to R&D. There is plenty of scope to further develop this concept.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.7.2 Physical environment

Ventilation temperature and humidity
Ventilation, temperature and humidity are addressed in the industry Stockman's manual (page 15-21). Many issues relating to ventilation have been identified and discussed in the long haul cattle industry framework.

Key research includes LIVE.211, which identified practical ventilation measures for livestock vessels (Stacey, 2002). This was aimed primarily at ship owners with existing vessels. There is scope for the development of more detailed guidelines in regards to the design of ventilation systems on future vessels. SBMR.002 was the original ventilation study that established many of the early linkages between ventilation and heat stress in both sheep and cattle. This was later supported by LIVE.212, which examined further sheep voyages.

Several issues are yet to be addressed including:

1. Calibration of open decks to determine anticipated wet bulb rise under a range of wind direction and speed.
2. Better guidelines on how to utilise ship speed when encountering hot conditions.
3. Identification of the best type of ventilation for sheep vessels in regards to capital expenditure/operating cost and effectiveness.
4. Identification of individual vessel shortcomings in regards to ventilation efficiency.

Industry guidelines:	*Exist (further scrutiny required)*
Scientific support:	*Exists (further investigation required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Very high*

Thermoregulation/heat stress
ASEL requires that:

> *….animals are loaded at a density that infers an acceptable risk of not succumbing to heat stress (eg, 2% risk of 5% mortality) (see ASEL).*

Substantial research has been undertaken to support the development of the industry heat stress risk assessment (HSRA) model for both sheep and cattle (LIVE.116, LIVE. and LIVE.223). Apart from the studies mentioned above, LIVE.209 investigated the physiology of heat stress in cattle and sheep (Barnes et al, 2004). The study monitored sheep under simulated onboard conditions in specifically designed climate rooms at Murdoch University. This enabled researchers to study many aspects of heat stress whilst evaluating changes to acid-base and electrolyte balance. Core body temperature, feed and water intake, respiratory and heart rates were also monitored under conditions similar to those encountered in the Middle East during their Northern Summer. This work also assisted in defining heat stress thresholds (HST) for sheep and Awassi.

The heat stress model has not been fully embraced by industry. Efforts to "demystify" the model would be appreciated by industry.

Remaining points of contention include:
1. Enabling model to complement existing load planning software
2. Better definition of heat stress threshold (and or linkage to an observable panting score)

3. Practical guidelines in regards heat tolerance and time of exposure to assist in decision making whilst in port.
4. Further development of methods to address heat stress when it occurs on livestock vessels

Industry guidelines:	*Exist (further scrutiny required)*
Scientific support:	*Exists (further investigation required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Very high*

Ammonia

The industry has recognised that ammonia is generated in the bedding and can at times affect the onboard health of animals. There has been research undertaken to address these concerns. For example, Phillips (2003) looked at alternative methods of measuring animal welfare and cites ammonia as a measure of welfare although we would contend it would be more correct to cite the actual symptoms caused by ammonia as the welfare 'measure'. Further work by Costa (2004) determined critical atmospheric levels for cattle sheep and goats (LIVE.218). Other work aimed at identifying methods to control ammonia production from the cattle manure pad has been undertaken by Acciolly et al, (2003) in LIVE.213.

Maintaining ammonia concentrations below critical levels is an important voyage outcome. Currently, there are no industry guidelines that directly address the issue of ammonia.

Industry guidelines:	*Do not exist (further scrutiny required)*
Scientific support:	*Exists (further investigation required)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High*
R&D priority:	*High (revisit existing work)*

Pen design

Pen design lends itself to innovation and any improves would be appreciated by industry.

Industry guidelines:	*Exist (Marine Orders)*
Scientific support:	*Lacking (further innovation would be of benefit)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Bedding and pad moisture

ASEL states that:

> *… when bedding is used, it must be maintained in adequate condition to ensure the health and welfare of the livestock (ASEL S5.9).*

For the most part, the sheep pad makes ideal bedding due to the low moisture content of sheep manure. Under normal conditions this allows the pad to remain firm and relatively dry. However, in hot and humid conditions, particularly when sheep drink and urinate more, the moisture content of the pad can rise and the pad can deteriorate. This is an important issue where ventilation is marginal.

The salt and/or electrolyte content in the fodder will also affect urine qualities. Research to establish minimum “salt” levels (that will maintain palatability) would be beneficial to the industry. This would be of benefit to existing vessels whose ventilation is sub optimal.

Adequate ventilation can mitigate air quality problems with no adverse consequences for animal welfare. On vessels with inadequate ventilation pad moisture levels can at times climb to the point where the bedding is unsuitable to house the animals. There can also be an intermittent increase in gas emissions from the pad (particularly ammonia) at different stages of this process. In the case of newer vessels joining the fleet, ammonia is a minor problem due to superior ventilation.

It is noted, however, that the prevailing daily report format uses the same bedding scoring system for cattle and sheep. This is completely inappropriate given the different nature of both the management and composition of the pads and could be considered a gap or inconsistency. We believe it should be reviewed along with other suggestions relating to onboard reporting.

Unlike cattle bedding, which is regularly removed by the deck washing procedures, the sheep pad is only removed on the return journey. This is a big undertaking and can occupy a major part of the voyage. The characteristics and volume of effluent produced by livestock vessels (Landline Consulting, 2003) quantifies the effluent production from cattle in terms of organic matter, nitrogen, phosphorus and potassium. This has implications in regards to forecast changes to AMSA regulations that will require livestock vessels to hold effluent in tanks prior to it being discharged into the ocean. The study recommends that the environmental impact of this discharge on the mixing zones behind the vessels be evaluated (Landline Consulting, 2003).

Industry guidelines:	*Do not exist*
Scientific support:	*Exists (further investigation required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.7.3 Feed and water

Provision of feed and water
ASEL states that:

> *… all during the voyage, livestock must have access to adequate water of a quality to maintain good health and suitable feed to satisfy their energy requirements, taking into consideration needs according to the livestock species, class and age:*
> - *There must be a contingency plan to provide satisfactory tending, feeding and watering of the livestock in the event of a malfunction of the automatic feeding or watering systems, but without compromising the safe navigation of the vessel.*
> - *Adequate feed and water must be supplied to livestock waiting to be discharged, and during the discharge period (ASEL S5.5).*

This is an established and accepted industry practice.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*

Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

1.7.4 Treatment of sick and/or injured animals

Animal care and observation
ASEL states that:

> *…… livestock and livestock services on the vessel must be regularly inspected (day and night) to ensure that the health and welfare of the livestock are maintained while the livestock are on the vessel:*
> - *A meeting must be held daily to discuss all issues relating to the health and welfare of the livestock. This must include the master and/or the master's representative, accredited stock person and veterinarian.*
> - *Livestock must be systematically inspected to assess their health and welfare.*
> - *Feed and water supply systems must be monitored day and night and maintained in good order.*
> - *The pen stocking density must be checked regularly throughout the voyage and adjustments made as required.*
> - *Ventilation must be monitored regularly each day to ensure adequate thermoregulation of the livestock.*
> - *Washing down of decks and disposal of faeces and litter must be carried out with regard to the health and welfare of livestock (see bedding management) (ASEL S5.6).*

These are an established and accepted industry practice.

Industry guidelines: *Exist*
Scientific support: *Not required (operational issues)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

Treatment of sick and injured animals
ASEL states that:

> *…any livestock for export identified after loading as being sick or injured must be given immediate treatment. Where euthanasia is necessary, this must be done humanely and without delay (ASEL S5.2).*

ASEL also states that:

> *…. any livestock identified as being sick or injured must:*
> - *be given prompt treatment;*
> - *be transferred to a hospital pen if required and*
> - *if necessary be euthanised humanely and without delay (the carcasses of any dead livestock must be disposed accordance with the requirements of Annex V of MARPOL 73/78[1]) (ASEL S5.7).*

Careful observation of livestock to determine their well-being is a key competency and skill. In many cases this may not involve any specific treatment but could mean small changes to feeding regimes or other management procedures. Aspects of onboard observation are described in the Stockman's manual.

There has been some question over the ability of stockmen to properly administer veterinary drugs. Most long haul voyages will require veterinary accompaniment, and suitable supervision and guidance will be provided accordingly. Additional training of stockman travelling on long haul voyages without a veterinarian has been suggested, as has the development of an industry specific "decision tree". Treatments for the common ailments are discussed in the Stockman's manuals but onboard conditions rarely lend themselves to individual animal treatment and have not been well developed in any event. The treatment of pinkeye is an exception and several methods of treatment exist. The development of better treatment methods for pinkeye within assembly areas has been identified as a research need.

The cause of mortality onboard has been comprehensively studied. LIVE.220, for example, examined mortality and morbidity factors for livestock during sea transport from Australia (Norris et al, 2003). Also regular mortality summaries for 2002 onwards have been published that provide an analysis of mortality for all species and all ports. Finally, the 1989 study by Norris and Richards (1989) and Richards (1989) looked at pre-embarkation factors and the epidemiology of sheep deaths before and during export by sea. LIVE.123 is an ongoing study investigating causes of morbidity and mortality in the assembly and shipboard phases of export.

Industry guidelines:	*Exist*
Scientific support:	*Exists (more work required…inanition)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

ASEL states that:

> *…. veterinary drugs must be stored and used according to veterinary directions and manufacturers' recommendations, and treatment records must be maintained (ASEL S5.8).*

Inanition

Inanition is identified as a major cause of mortality and the incidence has been well documented. There is seemingly more than one cause of inanition as it has been linked to property of origin, salmonellae (persistent inanition/salmonellae complex) and to behavioural issues. Inanition has been examined (both directly and indirectly) in much of the work undertaken in the early 1990's. It is currently under investigation by a team headed by Murdoch University. Earlier work included work by Richards (1991) that looked into seasonal and metabolic factors that may be responsible for deaths in sheep exported by sea. Work by McDonald *et al* looked at feeding behaviour of Merino wethers under conditions similar to lot feeding before live export (McDonald et al, 1990). Work by Higgs *et al* examined the effect of age, season and adiposity (fatness) on death rates in sheep (Higgs et al, 1999). Further work by McDonald examined feeds and feeding methods for assembly before export (McDonald et al, 1994). Inanition has a considerable bearing on the voyage outcome and should be considered a high research priority.

Industry guidelines:	*Do not exist (general requirements only)*
Scientific support:	*Exist (under further investigation)*

Industry consensus: *Some contention*
Impact on operational procedures: *Potentially high*
Affect on welfare outcome: *High*
R&D priority: *High*

Disposal of dead livestock
Guidelines exist in the Marine Orders (Section 39).

The ability/inability to remove dead animals from vessels is often overlooked. Fast and efficient removal of dead animals ensures that daily livestock services are not disrupted. This is an issue for vessel design.

Industry guidelines: *Exist (Marine Orders)*
Scientific support: *Not required (operational issue)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

1.7.5 Daily reporting and end of voyage reporting

Daily meetings

Note that ASEL states:

> *…..a meeting must be held daily to discuss all issues relating to the health and welfare of the livestock. This must include the master and/or the master's representative, accredited stock person and veterinarian.*

Daily meetings are conducted as matter of course onboard livestock vessels.

Industry guidelines: *Exist*
Scientific support: *Not required (operational issue)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

Daily report
ASEL states that:

> *….. for journeys greater than 10 days, an accredited stock person must provide daily reports on the health and welfare of the livestock to the relevant Australian Government agency, commencing on day one of the voyage. The report must include the information outlined in ASEL Appendix 5.1. However, where an accredited veterinarian is on board, he or she must provide the daily report rather than the stock person (ASEL S5.12).*

The reporting function is described elsewhere in the documents. Amendments to the reporting format have been suggested along with a fresh view of what information should be collected and how it should be handled.

Industry guidelines: *Exist (scrutiny required)*

Scientific support:	*Lacking (as part of overall data collection & monitoring)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

End of voyage report
ASEL states that:

> *….. regardless of the journey duration, within five days of completion of discharge at the final port of discharge, an accredited stock person must provide an end-of-voyage report on the health and welfare of the livestock to the relevant Australian Government agency. The report must include the information outlined in ASEL Appendix 5.2. Where there is an accredited veterinarian on board, he or she must provide the end-of-voyage report (ASEL S5.13).*

An end of voyage report is forwarded after every voyage. Content of end of voyage report should be considered in the same way as discussed under the daily reporting.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (as part of overall data collection & monitoring)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.7.6 Contingency planning and response

Contingency planning and response
ASEL states that:

> *….. a contingency plan for the following emergencies must be prepared for each consignment as part of the consignment risk management plan:*
> - *mechanical breakdown;*
> - *a feed or water shortage during the voyage;*
> - *an outbreak of a disease during the voyage;*
> - *extreme weather conditions during the voyage; and*
> - *rejection of the consignment by the overseas market (ASEL S5.10).*

These events can be taken as the industry's major identified risks and clearly require more detail given the vast array of possibilities and responses. This is an area that requires considerable attention and is described more fully in an earlier section.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (better detail required for risk management)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.7.7 Incident notification

Incident notification
ASEL states that:

> *….. if a notifiable incident occurs at any time, the relevant Australian Government agency must be advised as soon as possible and within 12 hours. In relation to a notifiable incident involving a mortality rate equal to or greater than the reportable level, a report must be provided that includes the following:*
> - *details of the mortalities (eg number, species, suspected cause);*
> - *factors that may have contributed to the deaths; and*
> - *the current location of the vessel and, if appropriate, its destination and estimated time of arrival (ASEL S5.11).*

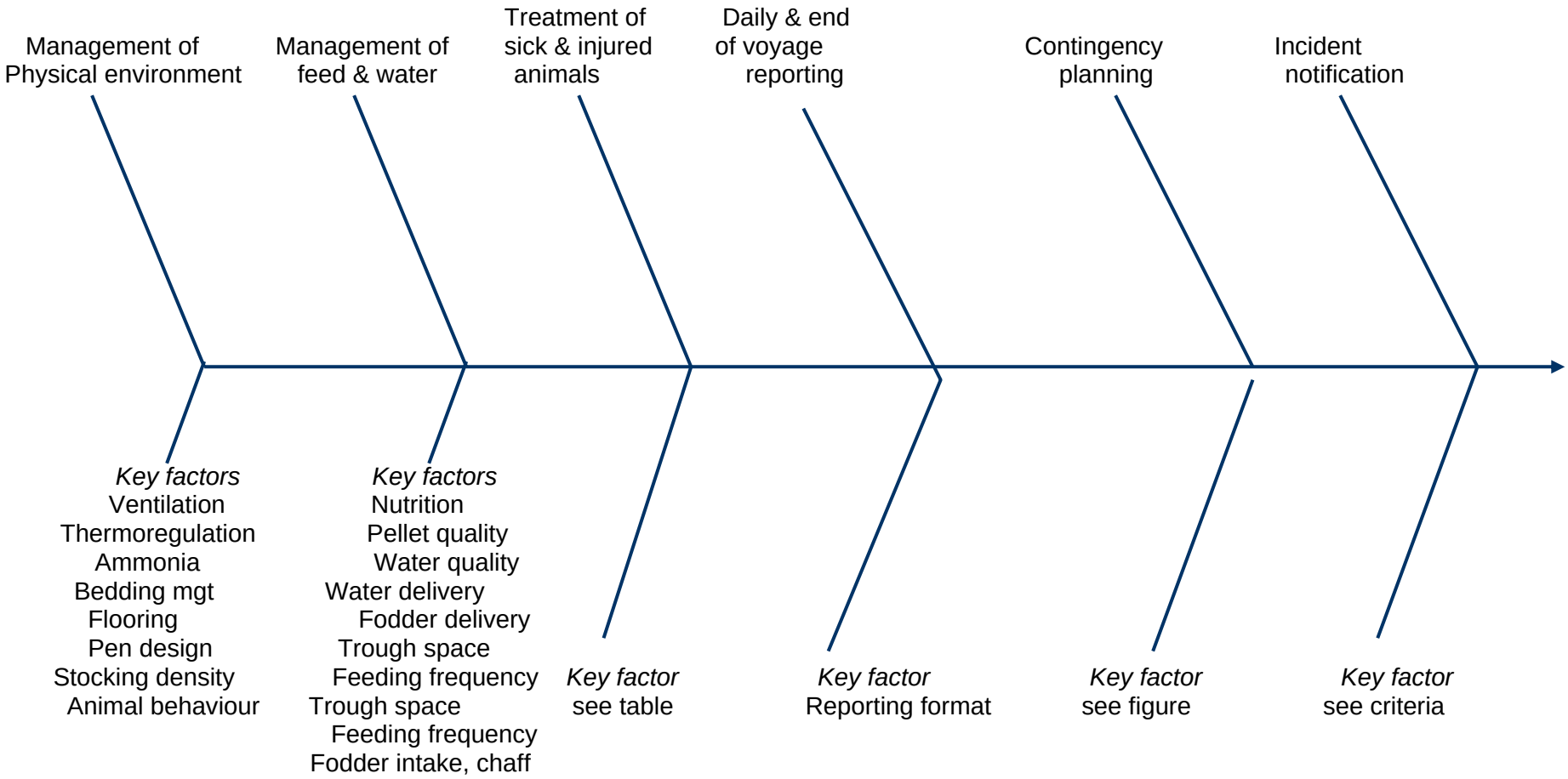
The reportable level is also stated in the AMSA Part 43 Issue 5 (40 Table 9)

> *Reportable level Sheep and goats 2%*

Note that the mortality is defined in terms of the species onboard. Incident reporting and response is currently under investigation by a MLA funded project. This is aimed at assisting onboard personnel with incidents as well as dealing with the political and public aspects of an incident should it occur.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low (under investigation)*

Figure 1.7: Onboard Management of Livestock (LHS)



1.8 Outcome (LHS)

Mortality is the primary measure of welfare and outcome acceptability for the long haul sheep trade. A study that investigated alternative indicators of welfare (LIVE.222) (Phillips, 2005) suggested a number of alternative indicators but these have not yet had any practical application.

1.8.1 Voyage mortality

Mortality
To this point in time, mortality remains the primary indicator of acceptable welfare within the long haul sheep trade. Mortality trigger points are identified under incident notification. There is no suggestion that these trigger points should be modified. Efforts to reduce mortality are ongoing.

Industry guidelines:	*Exist*
Scientific support:	*Exists (as a fundamental outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.8.2 Health and welfare status

Health and welfare status
While the industry is still struggling to embrace other measures of animal welfare, the ability to demonstrate key aspects of satisfactory welfare is an important initiative and should be explored further. Useful measures might include the absence of clinical disease and absence of distress due to heat, crowding and poor bedding. These could be developed along with the other information systems that have been identified elsewhere in this document.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.8.3 Occupational Health and Safety

Occupational health and safety
OH&S is growing in importance across all industries but is unlikely to attract industry R&D funding. Other agencies are likely to have direct responsibility for any R&D required leaving the livestock exporting industry more concerned with OH&S adoption issues.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.8.4 Evaluation of systems

Evaluation of system effectiveness
This is fundamental to the outcome focus approach that is highlighted in LIVE.117 (Review of ALES). Exporters should develop methods to assess the effectiveness of their actions (rather than rely on a statement of their actions). A greater focus on assessing the effectiveness of the actions is seen as fundamental to taking the industry forward.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (better explanation required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.9 Summary tables – (LHS)

1.9.1 Consignment planning (LHS)

The following headings apply to the planning phase of the live sheep export process.

Table 1.9.1: Consignment Planning (LHS)

Consignment Planning (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D Priority
Determination of importing country requirements (1.2.1)	Exist (scrutiny required)	Lacking (in many instances)	Some contention	Sometimes high	Sometimes adverse	Medium
Consignment Risk Management Planning (CRMP) (1.2.2)	Exist	Exists (more detail required)	Some contention	Low	High (if properly utilised)	High
Lodgement of Notice of Intention & CRMP (1.2.4)	Exist	Not required	Consensus	Low	Low	Low
Approval Procedures (1.2.5)	Not required	Not required	Consensus	Low	Low	Low
Planning of testing and treatment schedules (1.2.6)	Exist	Not required	Consensus	Low	Low	Low
Logistics Co-ordination (1.2.7)	Exist	Not required	Consensus	Low	Low	Low

1.9.2 Sourcing and selection (LHS)

The following headings apply to the sourcing phase of the live sheep export process (long haul).

Table 1.9.2: Sourcing and Selection Criteria (LHS)

Sourcing and Selection Criteria (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Conformance/model codes (1.3.1)	Model codes are under review	Lacking (in many cases)	Some contention	Can be high	Variable	Low (monitor developments)
Conformance/import permit (1.3.1)	Exist (scrutiny required)	See 1.2.1	Some contention	Sometimes high	Can be adverse	Medium
Conformance/food safety (1.3.1)	Exist	Exist (adequate see LIVE.114)	Consensus	Low	Low	Low
Body condition (1.3.1)	Exist	Lacking (in regards to restriction) (see LIVE.120)	Some contention	Sometimes high	High	Medium
Weight range (1.3.1)	Exist	Lacking	Some contention	Sometimes high	Unclear	Medium
Age (1.3.1)	Exist (scrutiny required)	Lacking (required)	Contentious	High	Low	Medium
Wool status (1.3.1)	Exist (scrutiny required)	Lacking (required)	Some contention	Sometimes high	High (in some circumstance)	Medium
Horn status (1.3.1)	Exist	Lacking	Some contention	Sometimes high	High (if trough access restricted)	Medium

Table 1.9.2: Sourcing and Selection Criteria (LHS) …(continued)

Sourcing and Selection Criteria (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Pregnancy status (1.3.1)	Exist (scrutiny required)	Lacking	Some contention	High	Potentially high	Medium
Weaning status (1.3.1)	Exist	Lacking	Consensus	Low	Potentially high	Low
Fitness to travel (1.3.2)	Exist (see table 1.3.2)	Exists (veterinary texts)	Consensus	Sometimes high	High	Low
Fitness to travel – Scabby Mouth (1.3.2)	Exist (see table 1.3.2)	Exists (veterinary texts)	Consensus	Sometimes high	High	Medium
Fitness to travel – Pinkeye (1.3.2)	Exist (see table 1.3.2)	Exists (veterinary texts)	Consensus	Sometimes high	High	Medium
Handling and preparation (goats) (1.3.3)	Exist (scrutiny required)	Lacking (more required) (see LIVE.105 & LIVE.110)	Contentious	High	High	Very High
On farm testing (1.3.4)	Exist	Not required	Consensus	Low	Low	Low
Livestock identification (1.3.5)	Exist	(Note project LIVE.123)	Consensus	Sometimes high	Potentially high	High
Pre-loading inspection (1.3.5)	Do not exist	Not required	Consensus	Low	Low	Low
Vendor documentation (1.3.5)	Exist	Not required	Consensus	Low	Low	Low

1.9.3 Land transport (LHS)

The following headings apply to the land transport phase of the live sheep export process (long haul).

Table 1.9.3: Land Transport of Sheep intended for Export (LHS)

Land transport of livestock intended for export (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Travel plans (1.4.1)	Exist	Not required (operational issue)	Consensus	Low	Low	Low
Preparation for transport (1.4.1)	Exist	Lacking	Consensus	Low	Potentially high	Low
Water deprivation times (1.4.1)	Exist	Lacking (under investigation see AHW.005)	Contentious	Potentially high	Unclear	High
Mustering and loading (1.4.1)	Exist	Lacking	Consensus	Low	Low	Low
Rest periods (1.4.1)	Exist	Lacking	Some contention	High	Unclear	High
Loading procedures (1.4.2)	Exist	Lacking	Consensus	Low	Low	Low
Segregation (1.4.2)	Exist (scrutiny required)	Lacking (required under current interpretation)	Contentious	High	Low	High
Handling (1.4.2)	Exist	Not required	Consensus	Low	Low	Low
Loading densities (1.4.2)	Exist	Lacking (required)	Consensus	Sometimes high	Unclear	Medium
Transport responsibilities (1.4.3)	Exist	Not required	Consensus	Low	Low	Low

1.9.4 Management within registered premises (LHS)

The following headings apply to the management within registered premises phase of the live sheep export process (long haul).

Table 1.9.4: Management within Registered Premises (LHS)

Management within Registered Premises (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Location of premises (1.5.1)	Exist	Not required	Consensus	Potentially high	Low	Low
Staff and staff training (1.5.2)	Exist	Lacking (required)	Consensus	Low	Potentially high	Medium
Receival (1.5.3)	Exist	Not required (operational tool support research) (see LIVE.123)	Consensus	High	Potentially high	High
Unloading and inspection (1.5.3)	Exist	Not required (operational issue)	Consensus	Low	High	Low
Assembly period (1.5.4)	Exist	Inconsistent with requirements	Contentious	High	High	Very High
Other restrictions (1.5.4)	Exist (scrutiny required)	Lacking (required) (See LIVE.123)	Contentious	High	Unclear	High
Penning arrangements (1.5.5)	Exist (scrutiny required)	Lacking (required)	Contentious	High	Low	Medium
Stocking density (1.5.5)	Exist (scrutiny required)	Lacking	Contentious	High	High	Medium
Isolation of livestock (1.5.5)	Exist	Lacking	Some contention	Potentially high	Low	Medium

Table 1.9.4: Management within Registered Premises (LHS) ….(continued)

Management within Registered Premises (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Pen design (1.5.6)	Exist	Lacking (required)	Some contention	Potentially high	Potentially high	Medium
Design of handling facilities (1.5.6)	Exist	Lacking	Some contention	Potentially high	Potentially high	Medium
Feed and water (1.5.7)	Exist	Lacking	Consensus	Potentially high	Potentially high	Medium
Supervision/observation of livestock (1.5.8)	Exist	Not required	Consensus	Low	High	Low
Treatment of sick or injured livestock (1.5.8)	Exist (scrutiny required)	Exists (more required)	Contentious	High	High	Very High
Treatment records (1.5.9)	Exist	Not required	Consensus	Low	Low	Low
Rejection criteria (1.5.10)	Exist	Exist (veterinary texts)	Consensus	Low	High	Low
Management of rejects (1.5.10)	Exist	Lacking (required)	Some contention	Sometimes high	Sometimes high	Medium
Authorized entry (1.5.11)	Exist	Not required	Consensus	Low	Low	Low
Fitness to travel criteria (1.5.12)	Exist	Exist (adequate)	Consensus	Low	High	Low
Pre-loading inspection techniques and location (1.5.12)	Do not exist	Lacking (required)	Contentious	Potentially high	Potentially high	Medium
Permission to leave for loading (1.5.13)	Exist	Not required (operational issue)	Consensus	Low	Low	Low

1.9.5 Vessel preparation and loading (LHS)

The following headings apply to the vessel preparation and loading phase of the live sheep export process (long haul).

Table 1.9.5: Vessel Preparation and Loading (LHS)

Vessel Preparation and Loading (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Loading instructions (1.6.1)	Exist	Not required (operational issue)	Some contention	Potentially high	Potentially high	Low
Loading personnel (1.6.2)	Exist	Lacking (training and competency assessment)	Consensus	Low	Sometimes high	Medium
Accompaniment (1.6.2)	Exist	Lacking (roles in regards to R&D need to be defined)	Consensus	Low	Potentially high	High
Load plan (1.6.3)	Exist	Lacking (R&D needs to work with load plan procedures)	Consensus	Sometimes high	Potentially high	High
Stocking density (1.6.3)	Exist	Lacking (more required see LIVE.233)	Contentious	High	High	Medium
Loading procedures (1.6.4)	Exist	Not required (operational issue)	Consensus	Low	Low	Low
Communication (1.6.4)	Exist	Not required (operational issue)	Consensus	Low	Low	Low
Ventilation during loading (1.6.4)	Exist	Not required (operational issue)	Consensus	Low	Low	Low

Table 1.9.5: Vessel Preparation and Loading (LHS) …(continued)

Vessel Preparation and Loading (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Feed and water on arrival (1.6.4)	Exist	Lacking	Consensus	Low	Unclear	Low
Voyage feed (quality & specifications) (1.6.5)	Exist	Lacking (further research required)	Consensus	Low	High	Medium
Voyage feed (storage) (1.6.5)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Voyage feed (quantity) (1.6.5)	Exist	Lacking	Consensus	Low	Potentially high	Low
Voyage water (quantity) (1.6.5)	Exist	Exists (adequate) (see LIVE.205)	Consensus	Low	Potentially high	Low
Water production and delivery (1.6.5)	Do not exist	Lacking (investigation into delivery systems required)	Consensus	Potentially high	Potentially high	Medium
Veterinary supplies (1.6.5)	Exist	Exists (adequate)	Consensus	Low	Potentially high	Low
Bedding (1.6.5)	Do not exist	Lacking	Consensus	Low	Potentially high	Medium
Management of rejected livestock at wharf (1.6.6)	Exist	Lacking	Some contention	Potentially high	Potentially high	Medium
Written instructions (1.6.7)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low

1.9.6 Onboard management (LHS)

The following headings apply to the onboard management phase of the live sheep export process (long haul).

Table 1.9.6: Onboard Management of Livestock (LHS)

Onboard Management of Livestock (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
On completion of loading (1.7.1)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Physical environment (ventilation) (1.7.2)	Exist (further scrutiny required)	Exist (further investigation required)	Contentious	High	High	Very high
Physical environment (thermoregulation) (1.7.2)	Exist (further scrutiny required)	Exists (further investigation required)	Contentious	High	High	Very high
Physical environment (ammonia) (1.7.2)	Do not exist	Exist (further investigation required)	Contentious	Low	High	High (revisit)
Physical environment (pen design) (1.7.2)	Exist (Marine Orders)	Lacking	Consensus	Low	Potentially high	Low
Physical environment (bedding/pad moisture) (1.7.2)	Do not exist	Exists (further investigation required)	Some contention	Low	Potentially high	High
Provision of feed and water (1.7.3)	Exist	Not required	Consensus	Low	Low	Low
Animal care and observation (1.7.4)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Treatment of sick and/or injured animals (1.7.4)	Exist	Exists (more work required)	Consensus	Low	Potentially high	High

Table 1.9.6: Onboard Management of Livestock (LHS) (continued)

Onboard Management of Livestock (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Inanition (1.7.4)	Do not exist	Exists (under further investigation)	Some contention	Potentially high	High	High
Disposal of dead livestock (1.7.4)	Exist (Marine Orders)	Not required (operational issue)	Consensus	Low	Potentially high	Low
Daily meetings (1.7.5)	Exist	Not required (operational issue)	Consensus	Low	Can be important	Low
Daily report (1.7.5)	Exist (scrutiny required)	Lacking (as part of overall data collection & monitoring)	Contentious	Potentially high	Potentially high	High
End of voyage report (1.7.5)	Exist (scrutiny required)	Lacking (as part of overall data collection & monitoring)	Contentious	Potentially high	Potentially high	High
Contingency planning (1.7.6)	Exist	Lacking (better detail required for risk management)	Some contention	Potentially high	Potentially high	High
Incident notification (1.7.7)	Exist	Not required (operational issue under investigation)	Some contention	Potentially high	Potentially high	Low (under investigation)

1.9.7 Outcomes (LHS)

The following headings apply to outcomes of the live sheep export process (long haul).

Table 1.9.7: Outcomes (LHS)

Outcomes (Long Haul Sheep)						
Current Practice	Industry Guidelines	Scientific Support	Industry Consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Voyage mortality (1.8.1)	Exist	Exists (as a fundamental outcome measure)	Consensus	Low	Potentially high	Low
Health and welfare (1.8.2)	Do not exist	Lacking (as an alternative welfare measure)	Consensus	Low	Potentially high	High
Occupational Health and Safety (1.8.3)	Do not exist	Lacking (operational issue)	Consensus	Low	Potentially high	Low
Evaluation of system effectiveness (1.8.4)	Do not exist	Lacking (better explanation required)	Contentious	Low	Potentially high	High

Appendix 3

Industry Framework

Short Haul Cattle

Knowledge gaps, inconsistencies and research priorities in the livestock export industry

Results of industry consultation and an overview of guidelines and completed “industry specific” research

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1 Short Haul Cattle

1.1 Overview - short haul cattle (SHC)

As outlined in the project overview, the industry has been divided into the following sectors and treated as case studies.

- Long Haul Cattle
- Long Haul Sheep
- Short Haul Cattle
- Special Cases

The short haul cattle trade refers to the export of cattle from the North and South of Australia to markets in Malaysia, Indonesia, Thailand, Vietnam, Philippines, Taiwan, Korea and Japan. In most cases the voyages are completed in less than a 10-day period. Shipments to Mexico are regulated in the same way as short haul voyages although many of the issues are common to long voyages. The shipment of dairy cattle to China has also been classified as short haul but can be considered as a special case due to the circumstances surrounding the shipment of pregnant breeding cattle.

Each sector represents a specific supply channel that confronts essentially different issues. For the purposes of the study, each supply channel has been treated as a stand-alone case study and a separate framework developed accordingly. This has resulted in some repetition but the approach is justified on the grounds of 'client utility' (since most operators are interested in a particular supply channel).

Further divisions have been made that are consistent with the current Australian Standards for the Export of Livestock (ASEL) though these were broadened slightly to include other factors that may affect voyage outcomes. These divisions are described in the table of contents and are highlighted in the flow diagrams contained within the text.

The five standards that have been used to dissect the livestock exporting supply channel include:

1. Sourcing and on-farm preparation of livestock
2. Land transport of livestock
3. Management of livestock in registered premises
4. Vessel preparation and loading
5. On-board management of livestock.

It was also recognised that common to every supply channel is a Consignment Plan.

As outlined in the project over view, each case study has been furnished with summary tables that can be found at the end of the framework document (See Section 1.9). This represents a good starting point for those who do not wish to work through the detail of the appendix.

Activity levels within the short haul cattle trade are highly sensitive to price. Factors that influence price include foreign exchange movements, the supply and demand relationship applying to suitable cattle, charter costs, industry regulation (both in Australian and importing country) and the exporter's risk profile and cost structure. Negotiations are almost always based on 'delivered price' with little reference to the cattle's property of origin. Consequently, a trading culture has developed in this market and the most successful exporters are those who are either vertically

integrated or positioned to offer the importer shipments of cattle at the lowest price. While exporters and importers both understand that property of origin is important to feedlot performance, payment of premiums for cattle that might be predicted to perform better (than average) does not yet happen. The return or cost per head is normally based on the weight at discharge and this by itself gives rise to distortions. Thus the exporter attempts by all means to increase weight gain via feed and water intake during the voyage while the importer would prefer that the cattle are discharged from the vessel empty of feed.

Therefore, the profitability of the overall trade is not simply linked to reducing costs. It may be possible to reduce costs and make the overall trade more profitable. For example, moving to a value-added approach from producer to exporter/importer and wet market operator would not only increase the profitability of the export chain but might also increase the scale and longevity of the industry. This would, however, entail a major change in attitudes by the participants. It is unlikely, at this stage, that the benefits of a value-added approach would be embraced by the prevailing industry since its trading culture is deeply entrenched.

A recent development has been the introduction of larger vessels that perform multiple port loading and discharges. The transit times between ports are usually short but some livestock may be onboard for considerable periods (up to 20 days). From this perspective, these voyages can have issues common to long haul voyages.

The trade has several distinguishing features. First, the short haul sea voyage can be considered as an extension of the trucking operation. Secondly, the basis for determining payment makes weight gain/loss the primary focus of the trade and the primary measure of performance. Accordingly, industry practices are largely focused on minimising weight loss (or achieving maximum weight gain). Thirdly, the short haul trade is characterised by negligible mortality rates.

Because live export cattle are drawn from a large area inferring long trucking times, on farm selection for suitability is of paramount importance. Furthermore, the assembly facility plays a central role in the short haul export process while onboard issues are of minor consequence relative to long hauls. Figure 1.1 provides an overview of the short haul export process.

The existence of significant gaps was determined by systematic scrutiny of the supply process. Gaps were identified and assessed against existing standards and guidelines according to the criteria and possible determinations detailed below:

Criteria	**Possible determination**
Relevant industry standards and guidelines	Exist / Do not exist
Issues associated with standards and guidelines supported by industry specific R&D	Exists / Lacking
Issues associated with framework headings acceptable from the exporter's and other stakeholder's perspective	Consensus / Some contention / Contentious
Impact of existing standards and guidelines (and/or framework headings) on operational procedures	Low / High
Affect of existing standards and guidelines (and/or framework headings) on animal welfare outcome	Low / High
Inferred R&D priority	Low / Medium / High / Very high

1.1.1 Guidelines for the short haul cattle trade

Guidelines that have been used to address the short haul cattle trade include:

ASEL (Version 2 & 2.1)
The Australian Standards for the Export of Livestock (ASEL) represent the central reference point for the regulation of the industry. They are supported by the corresponding Welfare Acts and associated Orders at both the State and Federal level. www.daff.gov.au/livestockexportstandards

Export Control (Animals) Orders 2004
These orders set out the arrangements under which the industry is regulated. The order is made under the Export Control Act 1982, and the Export Control (Animals) Regulations 1982. Other aspects are also made under the Australian Meat and Livestock Industry Act 1997. These orders provide the general framework for regulating the industry along with quite specific guidelines. www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf

Marine Orders Part 43
The marine orders provide guideline to the owners of vessels that transport livestock. They relate only to vessels that are Australian-registered or those that intend to participate in the export of livestock from Australia. Most of the guidelines relate specifically to the design and operation of the vessel, however, there are several key regulations that relate directly to livestock, particularly in regards to reporting mortality levels when they exceed critical (specified) levels. Vessels operating from Australia require an Australian Certificate for the Carriage of Livestock (valid for the species of livestock to be carried). The marine orders have a particular role in ensuring that 'livestock services' are adequate and properly maintained. This relates to the penning arrangements, the delivery of fodder and water and the maintenance of the onboard environment. www.amsa.gov.au

Australian Position Statement on the Export of Livestock
The position statement provides a framework for the development of ASEL. It provides the guiding principles for the development of the Standards and ensures that the Australian approach is consistent with that taken by international bodies (particularly the World Organization for Animal Health (OIE)). www.daff.gov.au/livestockexportstandards

Model Codes of Practice for the Welfare of Animals
Currently there are different State codes relating to different species and circumstances as well as a set of National Codes. There is an initiative in place for the State codes to be amalgamated into one set of national codes. . (various)

World Health Organization (OIE) Guidelines
The OIE has a precise set of guidelines relating to the export of livestock. They are well considered and provide general guidelines with and outcome based focus. The ASEL are consistent with OIE guidelines. https://www.oie.int/eng/bien_etre/AW_WG_december2004_eng.pdf

Industry Operating and Governance Manual
The industry operating and governance manual is designed to complement and support the industry standards. This manual enables exporters to detail their current practices and ensure that they meet the requirements of the standards. It also draws together the regulations expanded within the different industry guidelines.

Stockman's Manual – Transport of Cattle by Sea (Short & Long Haul Voyages) March 2006
The stockman's manual is a pivotal document aimed at supporting stockman under the auspices of the "stockman's program" operated by LiveCorp. It reflects the current thinking and experience of onboard stockmen and provides useful information on how to manage the most important aspects of the export process (from the stockman's point of view). www.livecorp.com.au

1.1.2 Best practice recommendations (SHC)

Best practice recommendations that relate specifically to the short haul cattle trade include:

Best practice standards in the preparation and husbandry of export cattle (LIVE.102/103) (Ainsworth et al, 2000).
This study was the first attempt to document industry best practice and formed a prelude to much of the industry regulation. They were based largely on industry experience. The absence of industry specific research was recognised and a scoring system was developed to assess the degree of scientific support for many of the recommendations. It is of interest to note that the vast majority of recommendations based on industry experience have been upheld by subsequent scientific investigation and very few (if any) have been refuted. The study represents an important benchmark against which industry progress can be measured.

Best practice use of veterinary drugs (LIVE.114) (Brightling, 2004).
This study focussed specifically on the responsible use of veterinary drugs from the point of view of food health and safety. The project brief did not ask for any discussion of the appropriate use of veterinary drugs from a diagnostic point of view. Drug usage is not extensive in the short haul trade. The best practice handbook provides a useful reference.

Investigating current best practice in the export of beef cows by sea (LIVE.207) (Ainsworth, 2002).
This study focussed specifically on the factors that affect the performance of beef cows when being shipped by sea . Best practice recommendations were determined on the basis of these investigations.

1.1.3 Industry specific research (SHC)

There has been very little research undertaken that relates specifically to the short haul cattle trade. Projects that have relevance include:

LIVE.301 Management of pre-delivery stress in live export steers (Fitzpatrick, 2004)

LIVE.120 Identifying live animal condition score systems (Gaden, 2005)

LIVE.104A Influence of pre-delivery management on livestock exports (Purdie, 2001)

LIVE.121 Investigating options to modify the aggressive behaviour of entire male cattle (and other species) (Entwistle, 2005)

LIVE.122A Investigating curfew in the live export and processing industries (Final report pending - Petherick, 2007)

LIVE.205 Water consumption on cattle ships (Brightling, 2001)

LIVE.233 Literature review of stocking densities on ship and in pre-export assembly depot (Final report pending …Petherick, 2007)

Figure 1. Industry framework

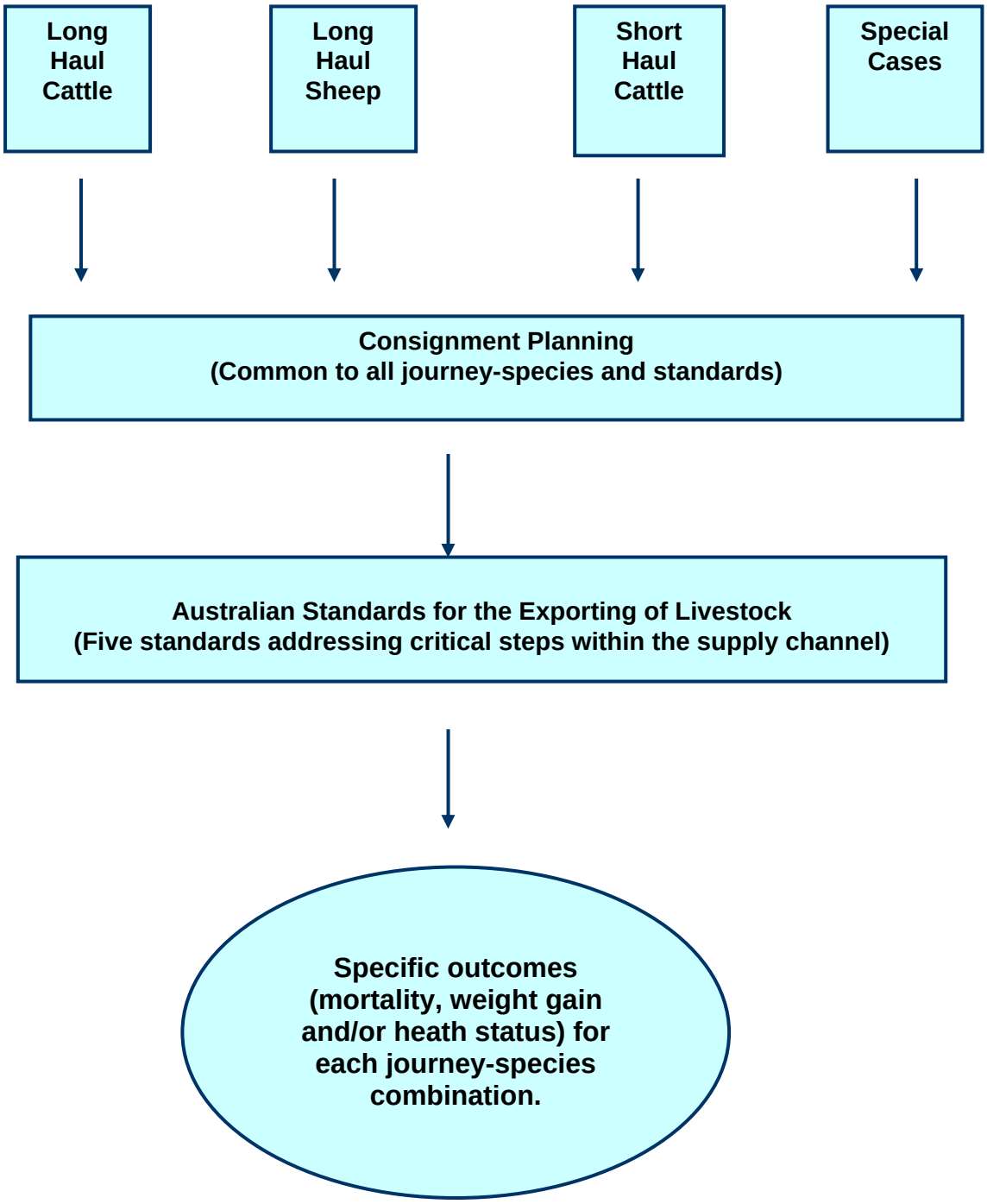
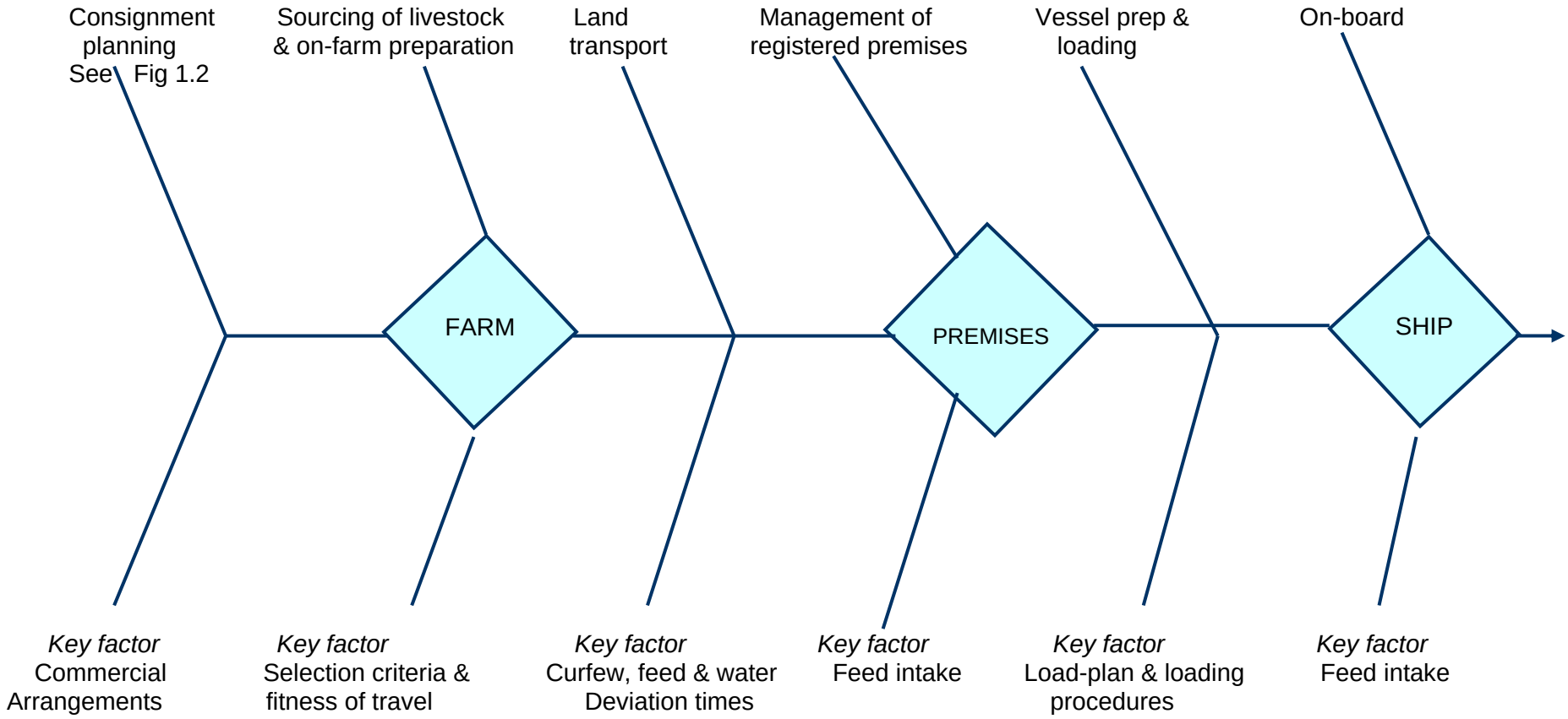


Figure 1.1: An Overview of the Short Haul Cattle Export Process

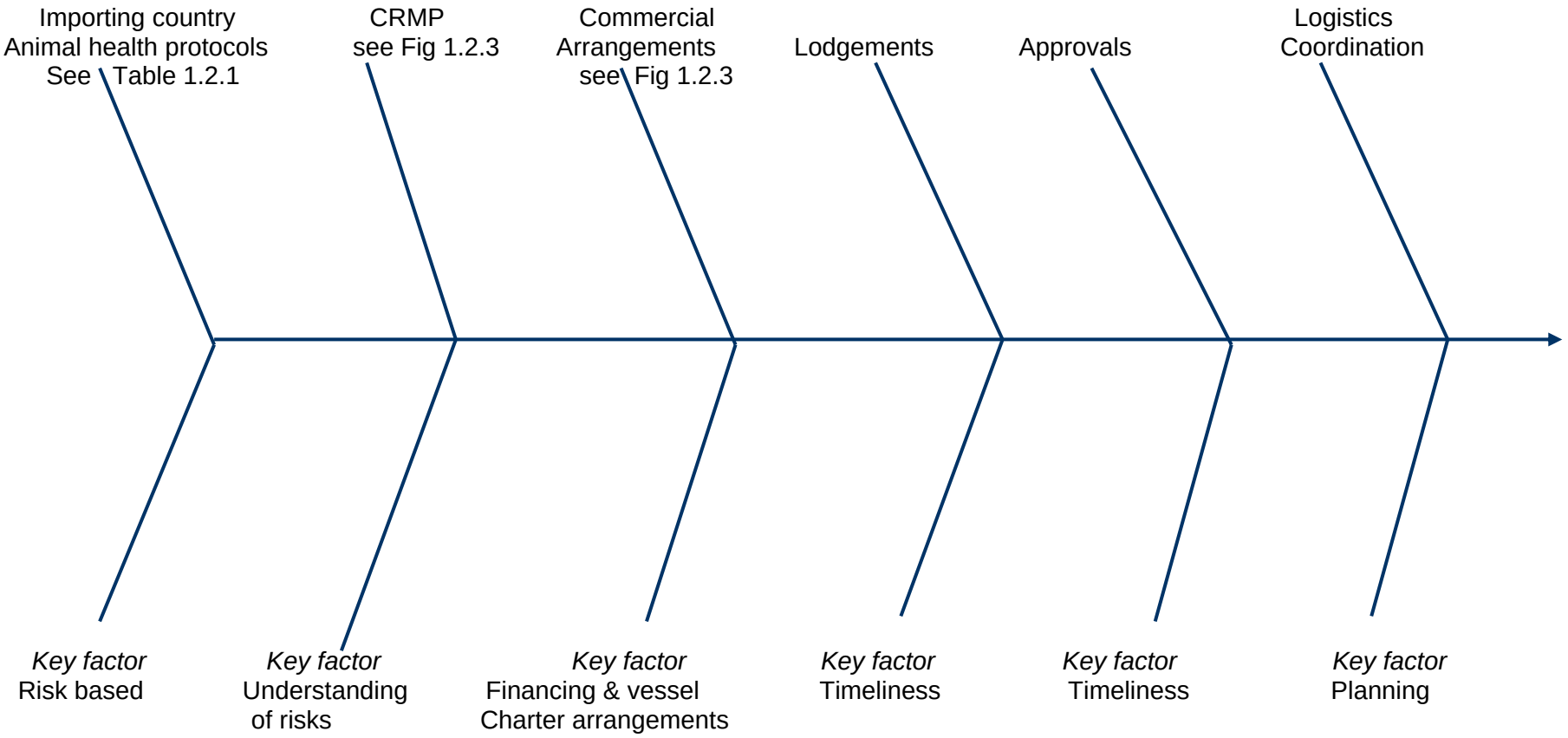


1.2 Consignment planning (SHC)

Consignment planning is common to all livestock export projects – extending from farm of origin to port of disembarkation. The planning protocol takes in all phases of the project and is designed to bring about acceptable outcomes. Consignment planning (as outlined in the Industry Operating and Governance Manual) is described under the auspices of an approved export program. This activity is treated as an integral part of each export process, regardless of destination and/or the species involved.

Central to consignment planning is the requirement for a consignment to be conducted under the auspices of an approved export program. Details of this requirement can be found in the Export Control (Animals) Order 2004 (see 2.47 of the readers guide).

Figure 1.2: Consignment planning (SHC)



1.2.1 Determination of importing country's requirements

Importing country requirements
There is a large number of importing country animal health protocols with most being straightforward and consistent with current scientific knowledge. Several anomalies exist, however, where importing country requirements do not appear to be based on contemporary science and established principles of animal health.

These protocols are currently being scrutinised by an industry subcommittee, and it is not intended that this project duplicate this work. However, if the subcommittee identifies issues that would benefit from industry research and development then these will be noted.

The industry feels that the protocols are generally understood and accepted. Moreover, the protocols are not arduous with the exception of the Indonesian feeder protocol, which had its origins in the initial breeder protocol.

There is scope for research and development to address two key aspects:

(1) Botulism and 7-in-1 vaccination of cattle for the Indonesian Feeder Cattle Protocol. The need for these vaccinations is questionable since exposure to botulism is highly unlikely due to the advances in Indonesian lot feeding infrastructure and practices. Similar arguments can be mounted with respect to the 7-in-1 vaccination. The cost of the current protocol is about $1 per head inferring a cost on the industry of about $780,000 per annum.
(2) Cost and animal welfare implications associated with meeting the isolation requirements in the various protocols. The isolation requirements should be researched with a view to understanding the risks, costs and rational. The implied cost saving is difficult to estimate but it would be substantial.

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*Lacking (in some instances)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Low*
R&D priority:	*Medium*

1.2.2 Consignment Risk Management Plan (CRMP)

Consignment risk management plan
ASEL states in the planning phase, that:

> *…the exporter must specify the livestock to be sourced for export in the consignment risk management plan (CRMP). Only livestock sourced and prepared according to the approved CRMP should be presented for transport to registered premises (ASEL Overview Standard 1).*

A risk based approach is also consistent with the guiding principles provided by the Australian Position Statement on the Export of Livestock (see reference).

Reference to the CRMP is also made in the Export Control (Animals) Order 2004, which outlines specific guidelines for the detail required in the risk management plan (see 2.42 of the readers' guide). The major risks identified in the Order are:

- Mechanical breakdown
- Food and water shortage
- Disease outbreak
- Extreme weather and
- Rejection of the consignment.

Clearly these are very general headings that are neither species nor voyage specific. Much greater detail is required for exporters to demonstrate that they have identified, defined and described the major risks associated with each of the major sectors of the industry, and have the capacity to manage the event should it occur.

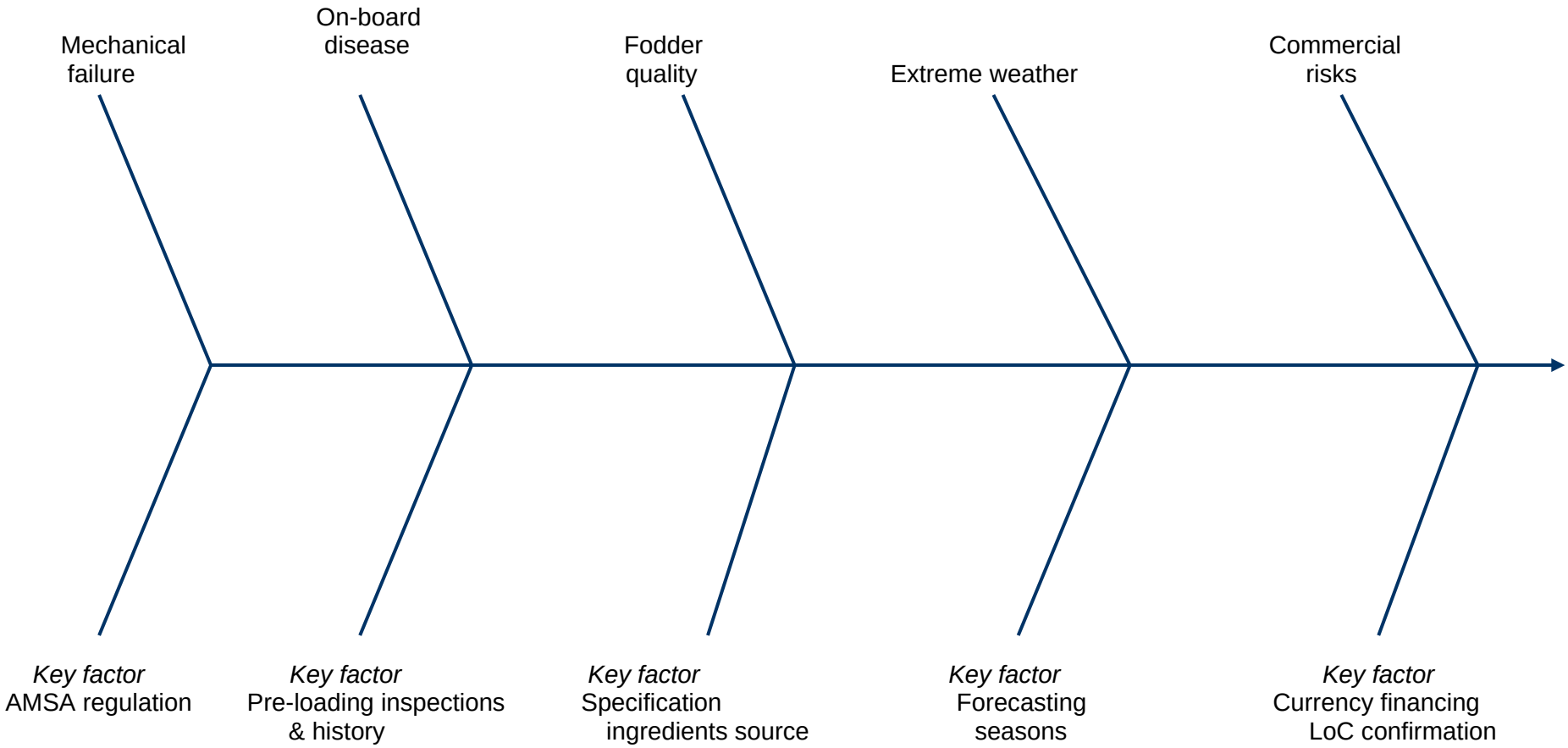
The short haul trade has seen relatively few new entrants in recent times. Most of the exporting companies and their employees are long term participants in this industry. These operators are mindful that situations can arise from time to time and develop their contingency plans accordingly. For the more experienced exporter the CRMP is a written version of what they practice.

The development of a voyage specific CRMP has been accepted as a normal part of operating within the short haul trade. Concern was expressed as to the suitability of the existing CRMP for a recently established operator. Without suitable experience in the industry a new operator may be able to develop a CRMP acceptable for a consignment without a real understanding of the risks involved. In this event, it becomes more of a "paper entry" than an indication of competency. Ensuring that risk management capabilities are real and adequate is an important issue in the use and application of CRMP.

If an identified risk or incident does occur the experienced operator is in a far better position to carry out the steps required to address that risk. Perhaps having faced similar situations or seeing a competitor face a similar problem they are able to quickly remedy the situation via implementation of their CRMP. The CRMP proposed by a new entrant might be found lacking if an incident arises or they might not have the necessary contacts or ability to implement their CRMP. While not wanting to create barriers to new industry participants, it might be desirable to have inexperienced exporters develop a more detailed CRMP. There is an onus on the industry research and development program to provide support that is practical and directly applicable.

Figure 1.2.2 outlines the major identified risks in the short haul cattle export process.

Figure 1.2.2: Consignment risk management plan (CRMP / SHC)



Industry guidelines:	*Exist*
Scientific support:	*Exists (more detail required)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*High (if properly utilised)*
R&D priority:	*High*

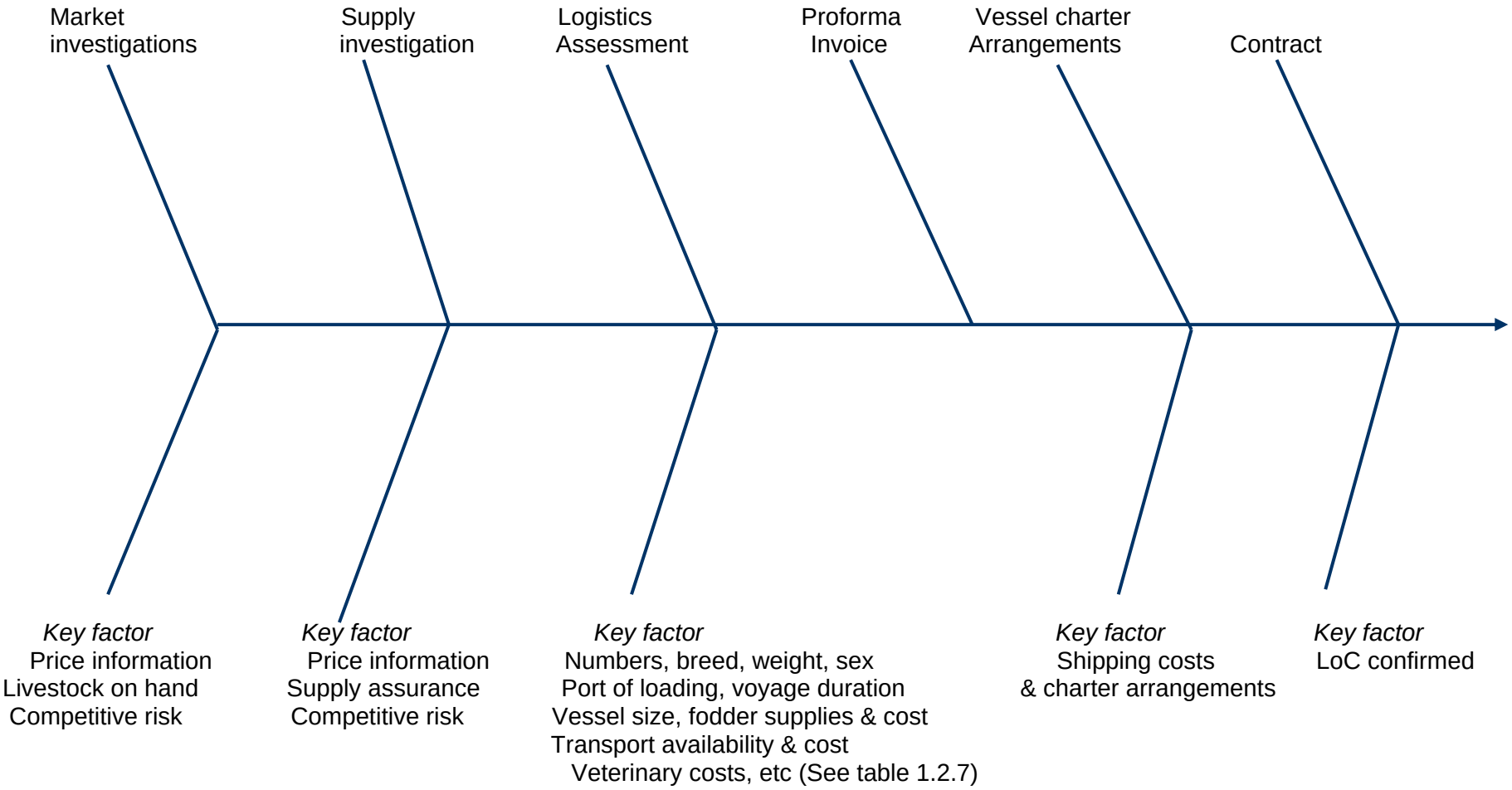
1.2.3 Commercial arrangements

Commercial arrangements
The commercial arrangements and risk levels that will be tolerated by exporters vary considerably. Most commercial arrangements commence with a proforma invoice and move through a series of steps to the point of delivery. Arrangements can be f.o.b., c.i.f., f.a.s. etc, each of which has different implications with regards to risk. They also have implications when it comes to jurisdiction and control over outcomes.

Poorly designed commercial arrangements can impact adversely on the whole industry. However, commercial arrangements were generally considered to be off limits for 'whole-of-industry' discussion. Due to the trading nature of the industry, commercial arrangements are often the competitive advantage that one exporter has over another exporter. Educating the industry about this risk may well take away from the competitiveness of particular exporters.

Industry guidelines:	*Do not exist*
Scientific support:	*Not required*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.2.3: Commercial arrangements (SHC)



1.2.4 Lodgement of Notice of Intention & CRMP

Lodgment of NOI and CRMP
There have been issues in regards to the timeliness of lodging the NOI and CRMP. In most cases, the notice of intention will not be lodged until many aspects of the commercial arrangements are already in place. This leaves the exporter very much at risk should the notice be denied. The timeliness of the lodgment and approval of the notice of intention is therefore important. The requirement to lodge NOI and CRMP is outlined in the Export Control (Animals) Order 2004 (see 2.43 of the Order).

The lodgement and approval procedures (below at 1.2.5) need to be reviewed to allow Australia to exercise its major competitive advantage. This competitiveness exists by maintaining a minimal lag between the importer having to pay for the livestock and taking delivery. Part of this competitive advantage stems from physical proximity to market. This proximity and the relatively quick delivery eases the difficulties importers might have in raising finances. So while South American countries may speculate about exporting to Asian markets, the likelihood of importers being able to raise the funds for a much longer-lasting shipment, with acceptable commercial risk, is unlikely. The likelihood of successful shipments from non-Australian ports would increase, however, if our own export systems were to increase the timeframe needed for an export to take place. Clearly, therefore, the Australian industry should be striving to reduce the timeframe to implement pre-export procedures and perform the actual export activity.

It is not suggested that this area requires any specific research and development activity. However, the discussion is consistent with an approach that seeks to maintain the viability and international competitiveness of the short haul cattle export industry.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Some Contention*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low*
R&D priority:	*High*

1.2.5 Approval procedures

Approval procedures
As mentioned previously, the timeliness of the lodgment and approval of the notice of intention is important. The requirement to lodge NOI and CRMP and the receival of subsequent approval is outlined in the Export Control (Animals) Order 2004 (see 2.44 and 2.45 of the Order). Similar issues (to lodgment procedures) apply to approval procedures.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Some Contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*High*

1.2.6 Test and treatment schedules

Planning of test and treatment schedules
Guiding principles that relate to test and treatment schedules undertaken within the industry are contained in the industry operating and governance manuals. However, ASEL also states that:

> *…..a record of all vaccines, veterinary medicines and agricultural chemicals used to vaccinate or treat livestock sourced for export must be kept for at least 2 years after the date of export (ASEL S1.25).*

Industry practice is consistent with this requirement.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

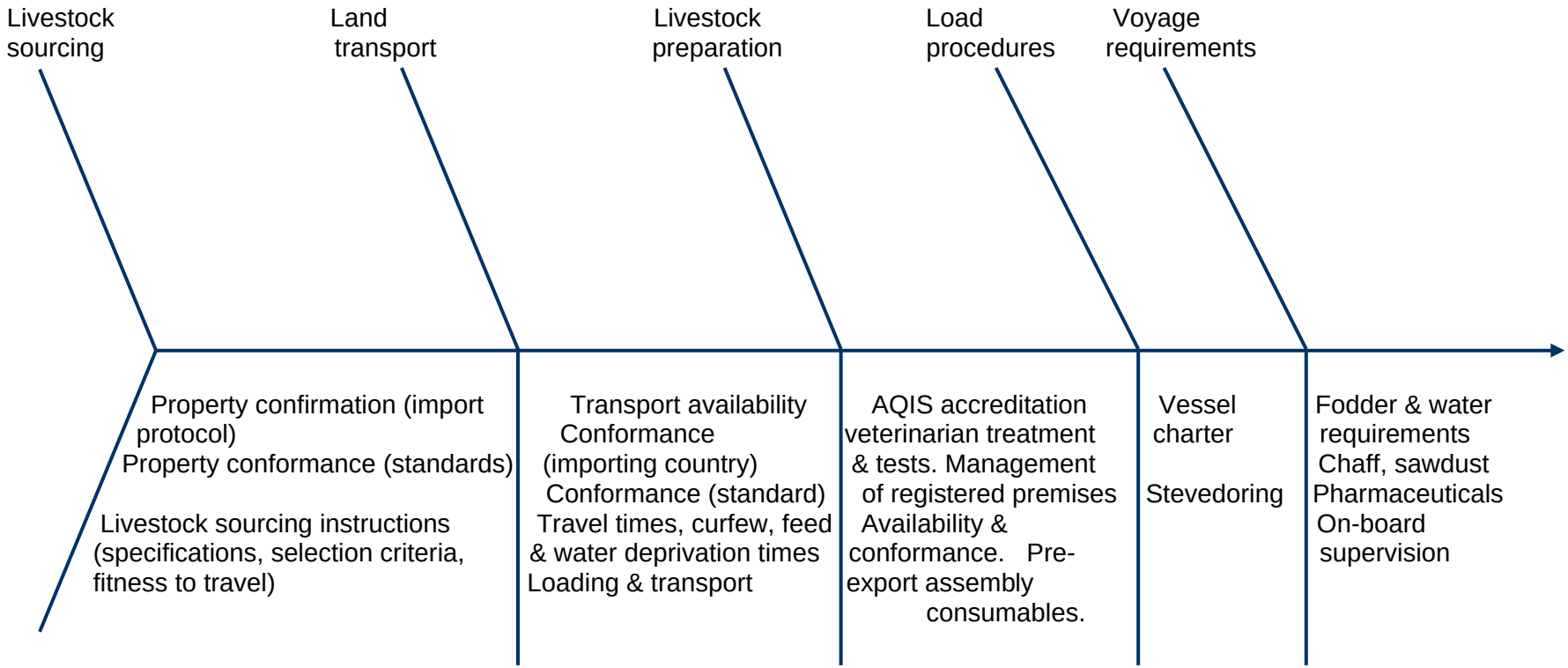
1.2.7 Logistics co-ordination

Logistics co-ordination
Guidelines relating to the industry logistics co-ordination are outlined in the industry operating and governance manual. This is performed under a number of subheadings including livestock sourcing, land transport, livestock preparation, loading and voyage. Most of the issues addressed in this section are operational in nature. A schematic of the operating procedures is provided in Figure 4.2.7. No outstanding R&D requirements have been identified at this stage.

Consistent with earlier comments on new entrants to the market, it is essential that the exporter representative responsible for livestock co-ordination is fully versed in CRMP and the procedures for mitigation of risky events.

Industry guidelines:	*Exist (in industry operating and governance manual)*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.2.7 Logistics Co-ordination – Pre- Export Planning (SHC)



1.3 Sourcing of livestock and on-farm preparation (SHC)

Overview
ASEL addresses the sourcing of livestock and on-farm preparation in Standard 1 and states that:

> *…this part of the export chain encompasses the sourcing of livestock for export by sea and their on-farm preparation, up to the point of loading and transport to registered premises.*

ASEL also states that:

> *…exporters must source suitable livestock that meet consignment specifications such as species, class, condition, animal health status and number of livestock. Animal health and production records may be required to confirm the eligibility of proposed consignments of livestock for export.*

Guiding principle (ASEL Standard 1)
ASEL states that:

> *…sourcing of appropriately prepared livestock that are fit to travel is critical to successful heath and welfare outcomes during export (ASEL Standard 1).*

Required outcomes (ASEL Standard 1)
ASEL states that:

…livestock sourced for export must meet any requirement under a law of a state or territory relating to the sourcing of livestock. State and territory governments are responsible for ensuring that these requirements are met.

- *Livestock sourced for export must meet ASEL Standards and importing country requirements.*
- *Livestock sourced for export that become sick or injured during on-farm preparation must be excluded from export and arrangements must be made for their prompt and humane handling and care.*
- *The Australian Quarantine and Inspection Service (AQIS) must be satisfied that these Standards and importing country requirements are met before issuing a health certificate and export permit.*

1.3.1 Selection criteria – Buyer/Selector

Conformance to Model Codes of Practice
ASEL states that:

> *…livestock sourced for export must meet any animal health and welfare requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL S1.1).*

It is assumed that the model codes of practice have been developed with due consideration of all available science and industry experience. This does not necessarily mean that all aspects have been subjected to industry specific research. Like ASEL, the Model Codes do not cite specific scientific support, and assumes that the rationale behind the each requirement is self-evident.

Industry guidelines:	*Model codes are under review*
Scientific support:	*Industry specific support lacking in many instances*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low (monitor developments)*

Conformance to import permit and protocol requirements
ASEL states that

> *…livestock sourced for export must meet importing country requirements (ASEL S1.2).*

In practice, this relates to the conditions of the import permit and any protocol requirements. Issues relating to importing country protocol requirements (particularly the Indonesian feeder protocol) have been addressed earlier (in section 1.2.1).

Industry guidelines:	*Exist (scrutiny required)*
Scientific support:	*See earlier section*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Sometimes adverse*
R&D priority:	*Medium*

Conformance to food safety requirements
ASEL states that:

> *…livestock sourced for export and intended for human consumption must comply with Australian food safety requirements, including standards for chemical residues and environmental contamination (ASEL S1.4).*

To assist in addressing this issue the industry commissioned the publication “Best practice use of Veterinary Drugs” (LIVE.114) (Brightling, 2004). This is readily available to the industry. Issues relating to food safety and withholding periods have been well addressed by the industry with treated animals being kept isolated and/or identified and treatment histories forwarded to receivers on delivery. There are contradictions in regards to withholding periods and the Indonesian protocol requirements. These are under investigation by the subcommittee mentioned previously. Overseas practices are largely outside the jurisdiction, but there is evidence of improvements in many aspects of handling and management practices.

Industry guidelines:	*Exist*
Scientific support:	*Exists (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Body condition
ASEL states that:

> *…fat bos taurus cattle must not be sourced for export from the ports of Darwin, Wyndham and Weipa from October 1st to December 31st (inclusive) (ASEL S1.5).*

and that:

> *…livestock must not be sourced for export if they are in an emaciated or overfat body condition. That is, cattle (and buffalo) must be from condition scores 2 to 6 (inclusive) (on a scale of 1 to 7). Pregnant cattle must be from condition score 3 to 6 (inclusive) (on a scale of 1 to 7).*

The industry has completed a study (Gaden, 2005) that identifying live animal condition scoring system for the livestock export industry (LIVE.120). There was some variation in scoring systems between states but this project has addressed this problem and provided a valuable reference for the industry. There is no contention in regards to the way in which body condition is assessed.

The use of these guidelines is generally accepted by the industry with many exporters drafting mobs on the basis of condition scores.

Industry guidelines:	*Exist*
Scientific support:	*Exists (Live.120)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Weight range
ASEL states that:

> *…cattle (and buffalo) sourced for export must have an individual weight of more than 200 kg and less than 650 kg, or if outside these weights, have written approval from the relevant government agency (ASEL S1.8 and S1.9)*

Maximum weight has been a contentious issue. Very large animals are less agile and need additional care. They are also difficult to pen to their exact allocation of area and find it relatively difficult to mill within the pen. These animals also tend to have a higher body temperature.

Investigations into how animals falling outside the current weight restrictions might be managed to achieve satisfactory outcomes could form the basis of a research project. This work would provide firm guidelines regarding the conditions needed to gain approval to export cattle that fall outside the specified weight range and would develop principles associated with discretionary approval.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

Weaning status
ASEL states that:

> *…cattle (and buffalo) must have been weaned at least 14 days before sourcing for export (ASEL S1.8 and S1.9).*

Cattle destined for the short haul trade are usually weaned at weights below 200kgs. However, the 14 days withholding period needs to be substantiated as it could prove restrictive when drought forces producers to wean and move younger cattle. The priority to undertake R&D into this issue is low as generally producers typically hold onto weaned cattle for at least another season prior to sale.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Pregnancy status
ASEL states that:

> *…cattle (and buffalo) sourced for export as slaughter and feeder animals must have been determined not to be pregnant (see ASEL S1.8 for criteria). ASEL also states that cattle sourced for export for breeding must be pregnancy tested and be no more than 190 days pregnant at the scheduled date of departure. Buffalo sourced for export for breeding must be pregnancy tested and be no more than 220 days pregnant at the scheduled date of departure (See ASEL S1.9 for criteria).*

The industry generally accepts that this is a minimum requirement.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Heat Tolerance
ASEL states that:

> *…..Bos taurus cattle, bred in an area of Australia south of latitude 26 degrees south must not be sourced for export to the Middle East from May until October unless an agreed livestock heat stress assessment indicates that the mortality risk is manageable (less than 2% risk of 5% mortality).*

Heat can be an issue on some short haul voyages but occurrence of heat stress is quite low with very few Bos Taurus cattle being exported out of the north. This is dealt with in more detail in a later section.

Horn status (length)
ASEL states that:

> *….Horned cattle (and buffalo) must only be sourced for export as slaughter or feeder animals:*
> - *for cattle, if the horns are 12 cm or less in length and blunt*
> - *for buffalo, if the horns are no longer than the spread of the ears and blunt and*
> - *if dehorned, the wounds are healed.*

Otherwise, horned cattle and/or buffalo must only be sourced for export with the approval of the relevant Australian Government agency.

There has been some contention about the way in which horn length is measured. The provision of industry guidelines in regards to this matter would be useful.

The interpretation and enforcement of this standard is of great concern to exporters as one consignment could have upward of five different drafts due to horn size. This issue is discussed more fully relative to segregation in (section 1.4.2).

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low*
R&D priority:	*High – to be discussed with segregation*

Other

Pre-shipping factors affecting the transport of cattle are discussed in the industry Stockman's Manual (see page 10).

Consistency regarding the point at which an animal enters the export chain should be determined. It can be argued that an animal does not enter the export chain until the protocol is completed and it is placed on a truck for the export. Until that time it is not clear if an animal is being exported or is being procured for other reasons.

Industry guidelines:	*Do not exist*
Scientific support:	*Primarily an operational issue*
Industry consensus:	*Some contention*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.3.2 Fitness to travel – Buyer/Selector

Fitness to travel criteria
ASEL provides a list of 'unfit' conditions to ensure that only fit cattle are selected for entry into the live export supply chain. Of particular concern are those conditions that may develop after animals have been selected. Condition such as ringworm and lice may be undetectable at the time of selection but develop subsequently and cause serious problems in the export process. Pinkeye is another condition that may flare up after selection.

Most of the conditions named on the 'unfit' list are self-evident and industry consultation indicates that exporters readily accept the criteria since selection of only those animals that are fit to travel is important to a successful voyage.

Industry guidelines:	*Exist – see table below*
Scientific support:	*Exists (veterinary texts)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*High*
R&D priority:	*Low*

Table 1.3.2: Fitness to Travel Criteria (SHC)

Fitness to travel – "unfit criteria" (Short Haul Cattle)			
Unfit criteria (ASEL S1.7)	Scientific Support	Industry Consensus	R&D priority
Lethargy, weakness, ill-thrift, dehydration.	Exists*	Consensus	Low
Anorexia	Exists*	Consensus	Low
Lameness or abnormal gait	Exists*	Consensus	Low
Abnormal soft tissue or bony swellings	Exists*	Consensus	Low
Scouring, dysentery, profuse diarrhea	Exists*	Consensus	Low
Bloat	Exists*	Consensus	Low
Nervous signs (eg head tilt, circling)	Exists*	Consensus	Low
Abnormal or aggressive behaviour	Exists*	Consensus	Low
External parasites	Exists*	Consensus	Low
Significant lacerations	Exists*	Consensus	Low
Wounds or abscesses	Exists* Yes (LIVE.113)	Consensus	Low
Generalized papillomatosis	Exists*	Consensus	Low
Ringworm or dermatophilus	Exists*	Consensus	Low
Generalized buffalo fly lesions	Exists*	Consensus	Low
Pinkeye	Exists*	Consensus	Low
Cancer eye	Exists*	Consensus	Low
Blindness	Exists*	Consensus	Low
Abnormal nasal discharge	Exists*	Consensus	Low
Coughing or respiratory distress	Exists*	Consensus	Low
Bleeding horn stumps	Exists*	Consensus	Low
Excessive salivation	Exists*	Consensus	Low
Mobs with unusual mortality	Exists*	Consensus	Low
Mobs with large disparity in size and/or age	Exists*	Consensus	Low

1.3.3 On farm testing and treatments

On farm testing and treatments
As mentioned, a record of all vaccines, veterinary medicines and agricultural chemicals used to vaccinate or treat livestock sourced for export must be kept for at least two years after the date of export (ASEL S1.25).

This 'retention period' is generally satisfactory, as information is often kept for longer than two years for other statutory purposes.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.3.4 Livestock identification

Livestock identification
ASEL states that:

> *….livestock sourced for export must be:*
> - *identified to the property of source*
> - *accompanied by a correctly completed and signed declaration as to the identification of the livestock and the property of source and*
> - *individually identified where testing is required during preparation (ASEL S1.3).*

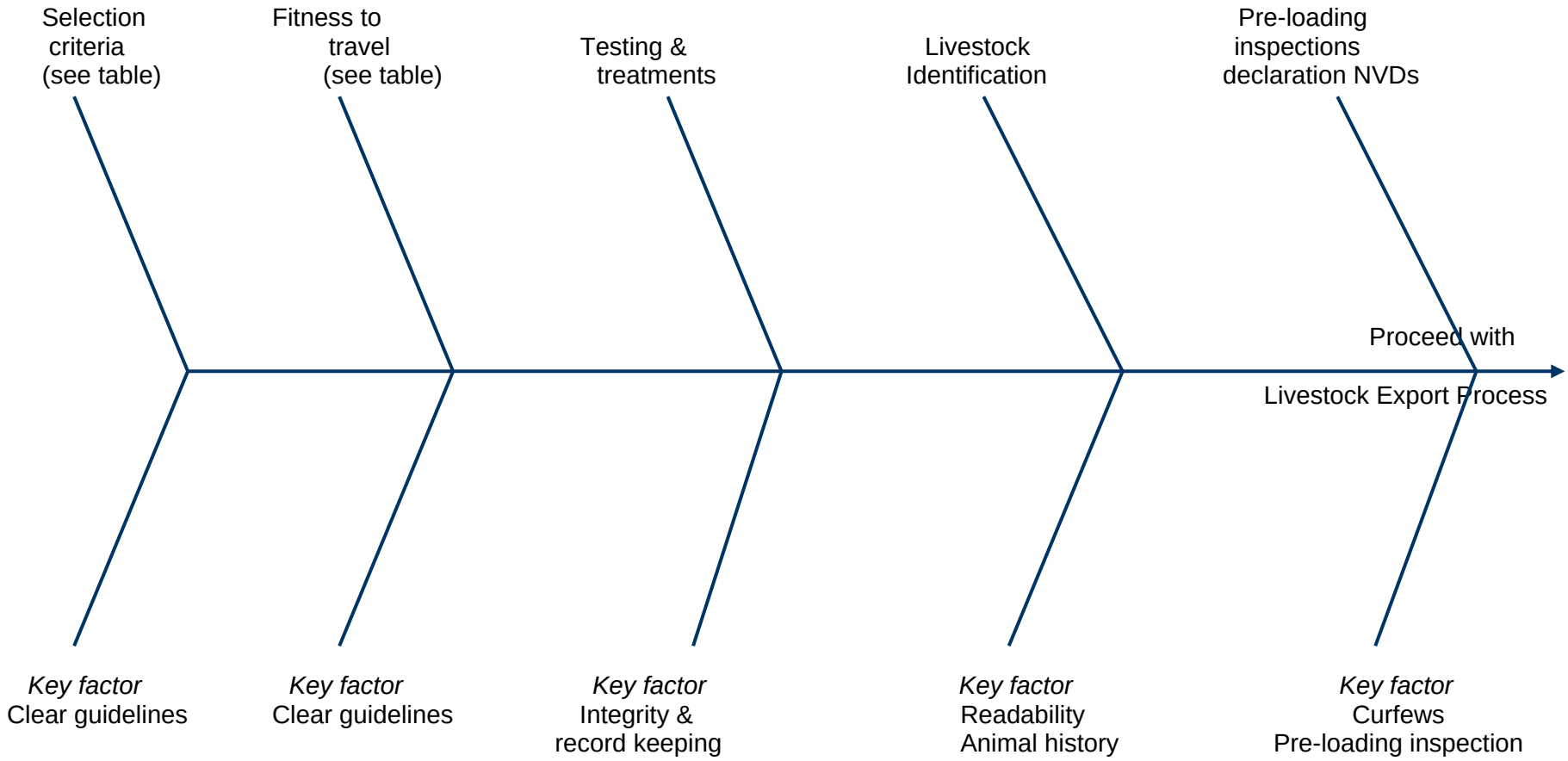
The National Livestock Identification System (NLIS) allows tags to be read electronically. Whilst this can provide a comprehensive history for the animal, the system has yet to be fully utilised by most participants in the short haul cattle industry. Large visual tags are preferred to allow for individual identification in assembly paddocks and in pens onboard the vessel. This is an area, however, where technological advances have been made and research to identify innovation with direct application to the industry would be valuable. There are some vertically integrated businesses that operate within the short haul trade and embrace "paddock to plate" principles. For these operations, NLIS would appear to offer substantial opportunities.

NLIS information flows should also assist other short haul destinations as it will allow both the exporter and importer to track pricing and feedlot performance. Ultimately, benefits derive from an ability to predict performance. While NLIS may not initially be required for cattle bound for live export, producers may be encouraged to embrace the NLIS technology if they can see such benefits.

Useful projects would provide examples of how NLIS can assist producers, exporters and importers when data are exchanged between all three. The industry should be aware of the aims and aspirations of NLIS and see where it can complement its objectives.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific research lacking (investigation required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Figure 1.3: Sourcing of Cattle and On-Farm Preparation (SHC)



1.3.5 Pre-loading

Pre-loading inspection and check
This is not always practical or feasible particularly where small numbers of livestock are drawn from large distances and dispersed regions. Provision for non-conforming or unfit livestock is difficult especially at remote ports. Non-conforming stock needs to be identified before the point of embarkation to ensure that these cattle are not hauled over a long distance only to be returned.

Industry guidelines:	*Do not exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Vendor documentation
National vendor, buyers' declaration and the source property declaration are all utilised by the industry (see later section).

Industry guidelines:	*Exist (see later section)*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.4 Land transport of livestock intended for export (SHC)

Overview
ASEL states that:

> *…the land transport phase begins when the first animal is mustered and ends when the last animal is unloaded at the completion of the journey. Thus 'transport' includes:*
> - *pre-loading mustering and yarding*
> - *any stationary resting or holding periods*
> - *transport of livestock from the property of source to registered premises and*
> - *subsequent transport from registered premises to a point of embarkation.*

ASEL also states that:

> *…the health and welfare requirements of livestock must be addressed throughout the whole of the land transport phase in the export chain. Livestock presented for land transport must be fit to travel and accompanied by documentation that allows the livestock to be traced to their property of source.*

ASEL also describes the responsibilities for the health and welfare of livestock during the land transport phase as follows:

- *Exporters of livestock are responsible for the general health and welfare of the livestock until they are loaded. They are also responsible for the livestock's fitness for the intended land transport.*
- *Exporters of livestock must ensure that livestock selected are fit to travel. Agents of exporters have a joint responsibility at the start and at the end of the journey to ensure the availability of suitable facilities for the assembly, loading, transport, and unloading and holding of livestock. Agents are also jointly responsible for dealing with emergencies.*
- *Exporters must be able to demonstrate that the transport of the livestock complies with these Standards, importing country requirements, and any relevant risk mitigation measures documented or referred to in the approved consignment risk management plan.*

Guiding principle (ASEL Standard 2)
ASEL also states that:

> *…land transport is planned and undertaken on a competently operated and suitable vehicle, with the livestock being handled in a manner that prevents injury and minimises stress throughout the journey.*

Required outcomes (ASEL Standard 2)
ASEL states that:

> *….the required outcomes include that:*
> - *Only livestock fit to travel are presented for loading*
> - *Livestock are loaded in a manner that prevents injury and minimises stress*
> - *Transport of livestock is undertaken in a manner that meets the standards, any requirements of a state or territory relating to the transport of livestock and importing country requirements*
> - *Livestock are unloaded in a manner that prevents injury and minimises stress.*

ASEL also states that:

> *…the land transport of livestock for export must meet any relevant animal health and welfare and road transport requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL S2.1)….and that*
>
> *…the land transport must meet any importing country requirements for the land transport phase in the export chain (ASEL S2.2).*

Transportation R&D commencing in 2007 will aim to bring some uniformity and consistency to the industry.

1.4.1 Travel plans

Travel Plans
ASEL states that:

> *....the land transport must be undertaken in accordance with a travel plan. This travel plan must be completed for all interstate journeys greater than two hours and journeys of more than eight hours duration (ASEL S2.3).*
>
> *Each plan must address the following:*
> - *species, class, condition and number of livestock;*
> - *transport vehicles;*
> - *loading densities and penning requirements;*
> - *duration of the journey, including rest periods for driver and livestock;*
> - *the method of loading and unloading of the livestock;*
> - *inspection of livestock before loading;*
> - *the feed and water requirements and curfew times applicable to the livestock under this Standard, including to livestock sourced from saleyards;*
> - *the expected weather conditions before and during transport;*
> - *the route and the types of roads traversed;*
> - *completion of vendor declarations or waybill regarding the property of source and the time of departure; and*
> - *contingency plans for managing transport breakdown, accidents, escapes, deaths, downers and injuries.*

ASEL also states that:

> *Livestock must not be loaded until the travel plan is completed (ASEL S2.12). The following documentation must accompany each load of the consignment:*
> - *a signed declaration as to the identification of the livestock and the property of source and*
> - *a journey log that commences at loading, is maintained through the journey and finalised on completion of unloading, and is used to record the actual journey details.*

The livestock transport driver must be aware of the travel plan prior to commencement of the journey and the documentation relating to each consignment must be kept for at least two years after the date of export.

Preparation for transport must also address the guidelines in regards to provision of feed and water, mustering rest times, vehicle requirements and handling facilities outlined in Appendix 2.3 of the ASEL (ASEL S2.4).

ASEL states that:

> *…livestock must be inspected prior to loading and any animal showing signs consistent with the rejection criteria in Standard S1.7 of Standard 1 – Sourcing and on farm preparation of livestock, or any other condition that could cause the animal's health and welfare to decline during transport or export preparation, must not be transported (ASEL S2.11).*

Most of these requirements are operational and do not lend themselves to research and development. Contingencies for managing transport breakdown, accidents, escapes, deaths, downers and injuries may, however, have an affect on welfare outcome. For the most part they do not require any scientific support. Industry consultation did not identify any contentious issues in this area. Rejection criteria are addressed elsewhere in the document.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Livestock preparation for transportation

ASEL states that:

> *…livestock must be mustered and handled in preparation for loading in a way that maintains their health and welfare and fitness for travel. For example, where the journey will take more than 24 hours, provision of suitable feed and water and rest for at least 12 hours close to the loading facility must be provided. Before commencement of any curfews and where livestock are mustered by helicopter or light plane, provision of suitable feed and water and rest for at least 24 hours before commencement of any curfews is required. Holding areas for livestock before loading for land transport must securely contain the animals and maintain a safe environment (ASEL Appendix 2.1).*

Linkages between preparation and subsequent performance are yet to be established.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Unclear*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Water deprivation times

Water deprivation times are outlined in Appendix 2.1 of ASEL. This has been a contentious issue and one that has been under strong scrutiny from the animal welfare lobbyists. It has also coincided with action in both Europe and the US to address (and standardise) water deprivation times for most species of livestock.

The time limit (as defined by ASEL in Appendix 2.1) for any given journey by livestock and the requirement for rest periods are primarily determined by the maximum time that animals can be deprived of access to water sufficient to maintain good health and welfare. This is termed the *water deprivation time*.

ASEL describes the water deprivation time as:

> *…. the total continuous period of water deprivation, starting when stock last had access to water, and must include:*
> - *time off water during mustering;*
> - *time off water when yarded after mustering;*
> - *curfew or 'empty out' time (see below);*
> - *all time on the vehicle, whether moving or stationary; and*
> - *any time without water after unloading, such as at a saleyard, spelling centre or registered premises.*

Curfew or *empty out* time is the deliberate and variable period of water and/or 'green' fresh feed deprivation intended to minimise faecal and urine spoilage of the transport vehicle and subsequent problems with animals slipping, and contamination of the environment.

The maximum water deprivation times and rest period requirements are described in Appendix 2.1 of ASEL. If animals of any species become dehydrated, precautions need to be taken to ensure that they do not gorge themselves when given access to water.

The Australian 'Model Code of Practice for the Land Transportation of Cattle' gives water deprivation times for different classes of cattle. Live export by sea involves mature stock weighing at least 200 kg.

ASEL states that:

> *…the maximum (normal) water deprivation time for cattle (mature stock) is 36 hours. The extended water deprivation time for cattle (mature stock) is 48 hours.*
>
> *Extended water deprivation times are permissible if and only if:*
> - *animals are travelling well and not showing signs of fatigue, thirst or distress;*
> - *adverse weather conditions are neither prevailing nor predicted;*
> - *the extension will allow the journey to be completed within a 48 hour period of water deprivation, and the animals are to be rested with water and feed for at least 18 hours immediately upon arrival at the registered premises; and*
> - *the journey's duration, excluding time off water before loading onto the transport vehicle, is less than 14 hours (ASEL Appendix 2.1).*

There is little science to support or otherwise the declared water deprivation times. A study into the management of pre-delivery stress in live export steers (LIVE.301) (Fitzpatrick, 2004) did not address water deprivation time but highlighted the difficulty in determining a useful indicator of stress. The study concludes that provision of water at the point of destination was adequate in correcting dehydration incurred during transport. In the absence of a measurable indicator, observable signs of distress such as fatigue or thirst are the only reliable indicators of the animal's welfare. There is, however, work being undertaken by CSIRO (AHW.055) that is addressing this issue. It would be useful for the industry to actively monitor the results of this project.

Industry guidelines:	*Exist*
Scientific support:	*Under investigation (AHW.005)*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Unclear*
R&D priority:	*High*

Feed and water curfews
ASEL states that:

> *…livestock must be held off green feed (but may be given access to dry feed) for at least 12 hrs and l may be held on water (but may be given access to dry feed) for up to 12 hrs before loading (ASEL S2.8).*

Curfews in the live export and processing industries are currently under investigation (LIVE.122A) (Petherick, 2006). Curfew can disrupt the passage of ingesta, which can lead to gastrointestinal disturbances. Quantifying the benefits or effects of pre-transport curfews is recognised as a significant knowledge gap. The recommendations identified in the review (by LIVE.122A) will be influential in any future research of the effects of pre-transport curfews in livestock. Additional research into the development of pre-transport curfew best practice needs to be considered. Curfews are an integral part of water deprivation periods and to this extent they should be considered in conjunction with the issues identified in the previous section. The accent may be slightly different, however, in that water deprivation times are likely to be viewed in terms of tolerance, whereas investigation into curfew periods would focus more on the affects on rumen function and other productivity and/or health related issues.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Rest periods
ASEL states that:

> *…cattle older than six months must be spelled for 12 to 24 hours after each 36 hours water deprivation time for a normal journey, or for 36 hours after journeys of 36 to 48 hours.*

It is presumed that rest periods improve the welfare of cattle in transit. There is some suggestion, however, that the unloading and reloading of animals in new and unfamiliar surroundings is equally stressful and in some cases counterproductive. Rest periods increase timeframes associated with completing the export process. These timeframes can adversely affect profitability by extending the period of pre-delivery “ownership” which has implications for risk and financing. Whilst it not suggested that welfare should be compromised, there is an onus on regulators not to impose unnecessary restrictions that may have little welfare benefit. Restrictions that increase the timeframe of the export chain and increase the risk of allowing a competitor country access to our market, and/or decrease the markets profitability should be avoided where possible. It is important, therefore, that welfare gains surrounding delays are clearly identified.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.4.2 Loading procedures

Loading procedures
Guidelines on loading for transport are provided in ASEL S2.10.

ASEL states that:

> *…when livestock are loaded for transport by land:*
> - *animals of different species must not be mixed in a single pen;*
> - *classes of animals of the same species must not be mixed if there is a likelihood of aggression or injury to other animals;*
> - *young animals must be separated from older animals;*
> - *animals of a dissimilar size must be separated; and*
> - *animals with horns must not be mixed with animals lacking horns.*

There are practical and commercial limitations on the extent to which animals can be segregated. As there are only so many divisions within a stock crate, it is usual for compromises to be made. Given this, it would be desirable to prioritise the guidelines to ensure that the most important segregations are recognised and adhered to. This is particularly the case with horned (and/or dehorned animals). If a there is more than one consignment on a vessel, the implied segregation is often not practical and can be detrimental to animal health and welfare. Cattle may have to be transported in less than optimal pen sizes and then re-establish pecking orders. Exporters do not see this imposition as rational and demand that priority be given to a satisfactory resolution. Clearly this is an area in need of immediate R&D to determine consequence and solutions.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

ASEL S2.14 makes specific reference to how animals should be handled to prevent injury and minimise stress. There are specific guidelines relating to the use of prodders, rattle and working dogs. There is little contention in regards to cattle handling and industry practice is consistent with the guidelines.

Loading densities and penning arrangements
ASEL states:

> *…the land transport of livestock for export must meet any relevant animal health and welfare and road transport requirements under state and territory legislation and relevant requirements under national Model Codes of Practice for the Welfare of Animals (ASEL Appendix 2.2).*

Loading density and penning arrangements for the land transport of livestock must conform to stocking densities and penning arrangement outlined in this appendix.

ASEL Appendix 2.2 states that:

> …*loading densities are determined according to the average liveweight, condition, size, shape and horn status of the livestock, as well as the prevailing conditions and the distance animals are to be transported. Numbers may be varied, provided the welfare of the livestock is not compromised and the following principles are applied:*
> - *loading rates must be assessed for each pen or division in the stock crate;*
> - *five per cent fewer livestock should be loaded if livestock are horned;*
> - *in hilly and more populated areas, where road vehicles change speed relatively frequently, sufficient internal partitions must be used and numbers varied accordingly; and*
> - *when fewer livestock per pen than in the tables below are transported, firmly fixed portable partitions must be used.*

Truck loading densities for cattle are outlined in Table A2.2.1 of Appendix 2.2 in ASEL. Consultation with industry indicates that practice is consistent with these densities. It is assumed that liveweight refers to the weight after an industry standard curfew of 12 hours although this is not specified. Consultation with industry indicated that practice is consistent with these densities.

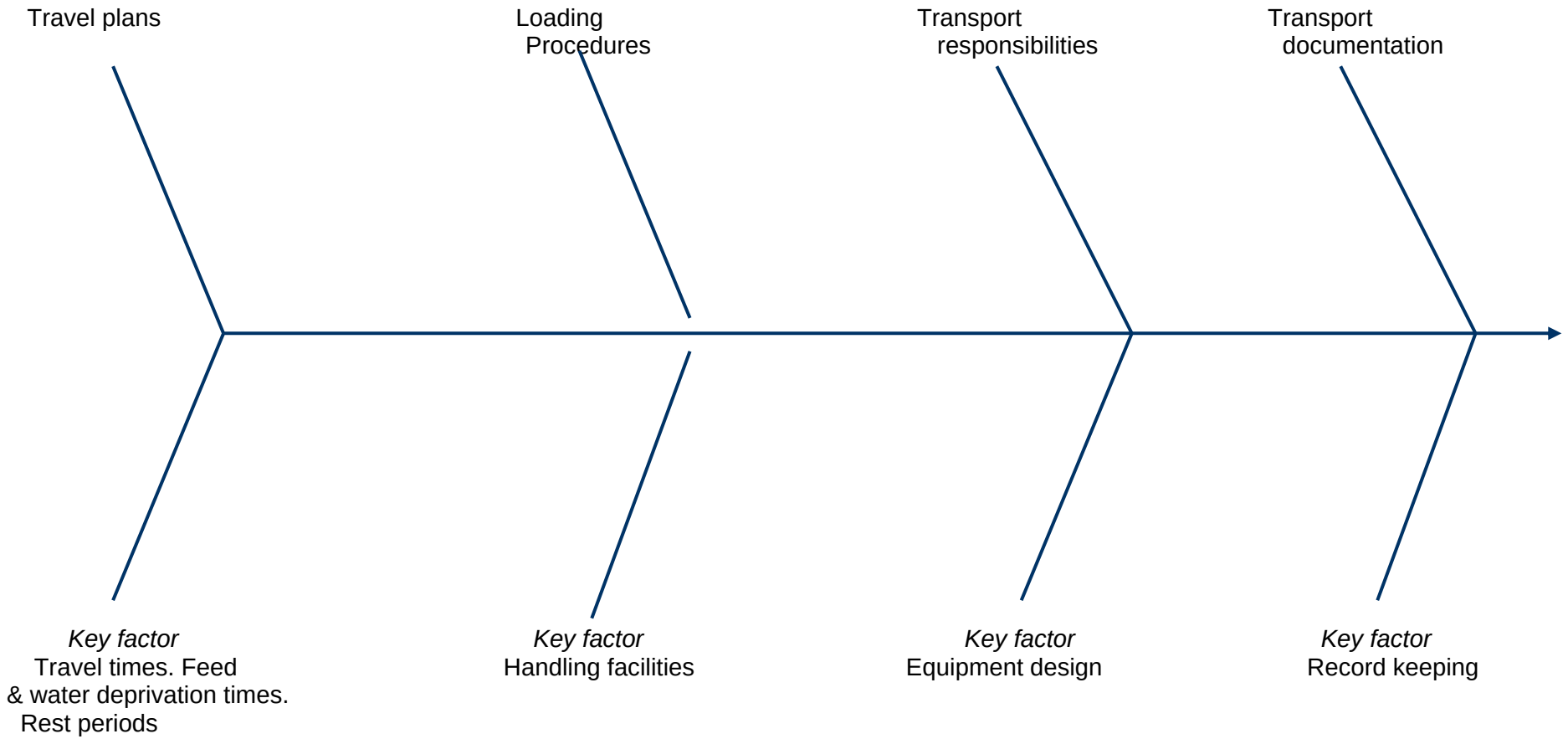
Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus (except for issue of horns)*
Impact on operational procedures:	*Sometimes high*
Affect on welfare outcome:	*Unclear*
R&D priority:	*Medium*

1.4.3 Transport responsibilities and documentation

Transport responsibilities and documentation
The industry standards offer further guidelines relating to responsibilities, trucking procedures and facilities (ASEL S2.15-S2.24).

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.4: Land Transport of Cattle intended for Export (SHC)



1.5 Management within registered premises (SHC)

Overview
ASEL states that:

> *… the assembly of livestock for export commences with the unloading of the first animal into the premises and ends with the departure of the last animal from the premises, whether or not passed as fit for export. Livestock must be held in secure premises for a sufficient period of time to enable recovery from land transportation and to meet importing country requirements. Preparation of livestock must comply with this Standard. Livestock must also be inspected and deemed fit to travel before leaving the premises.*
>
> *Where premises are used for holding and assembling livestock for export, such premises must be registered in accordance with the legislation. Operators of registered premises are responsible for the design, maintenance, security and operation of the premises, including the provision of appropriate shelter, feed and water supply systems, animal husbandry and care by competent animal handlers. The exporter must be able to demonstrate to the Australian Government that the management of the livestock at the registered premises accords with the specifications set out in the risk management plan for the consignment, and the importing country requirements for registered premises.*
>
> *These Standards are relevant to each stage of the livestock export chain and should be reflected in relevant quality assurance programs. Livestock sourced for export must meet any requirement under a law of a state or territory. State and territory governments are responsible for ensuring that these jurisdictional requirements are met under respective state and territory legislation. The Australian Quarantine and Inspection Service must be satisfied that importing country requirements and the Standards have been met before issuing a health certificate and export permit.*

Guiding principle (ASEL Standard 3)
Livestock are assembled at registered premises where the husbandry and management practices ensure that the livestock are adequately prepared for the export voyage.

The Export Control (Animals) Order 2004 has quite specific directions about the required conditions to register assembly premises (see Division 2.2). This also includes direction as to the use of an appropriate operations manual. They support many of the items outlined in ASEL.

ASEL does not require that cattle be assembled prior to export.

Required outcomes (ASEL Standard 3)
ASEL states that:

- *Facilities at registered premises are appropriate for the type and species of livestock to be held.*
- *The health and welfare needs of the livestock are appropriately catered for in a secure environment.*
- *Livestock leaving the premises are fit for the export voyage and meet importing country requirements.*
- *Livestock rejected for export are managed humanely (ASEL Standard 3).*

1.5.1 Location of premises

Location of premises
ASEL also states that:

> *….the location of the registered premises, used for inspection for 'leave for loading', must not be more than eight hours journey time from the port of embarkation unless approved by a relevant Australian Government agency (ASEL S3.0).*

Exporters concur that this is not restrictive and assists risk mitigation as it ensures that cattle will not be overly stressed prior to export. It is also risk minimising as the closer the cattle are assembled to the wharf the less scope for problems and for the cattle to lose weight.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.2 Staff and staff training

Staff and staff training
ASEL also states that:

> *…the operator of registered premises must employ sufficient appropriately trained staff for the effective day-to-day operation of the premises and management of the livestock (ASEL S3.1).*

Generally staff are experienced in cattle handling.

Industry guidelines:	*Exist*
Scientific support:	*Considered adequate in short haul trade*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially low*
R&D priority:	*Low*

1.5.3 Receival and unloading

Receival
ASEL requires that:

> *….when receiving and identifying livestock, the operator of the assembly centre must obtain a copy of the vendor declarations regarding the source property and the health and welfare status of the livestock before accepting the livestock for the purpose of preparation for export (ASEL S3.12).*

This is not always practical prior to cattle entering a yard for export. Situations arise where cattle are booked and received prior to the paperwork arriving. In the interest of animal welfare the

depot manager should be able to accept delivery. This is not strictly R&D, but remains an operational issue requiring resolution.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Unloading and inspection:
ASEL requires that:

- *Livestock must be unloaded as soon as possible after arrival at the registered premises and facilities must enable safe and efficient unloading of livestock.*
- *Livestock must be individually inspected at unloading to determine whether they are suitable for preparation for export, (see also rejection criteria).*
- *Livestock for export must be held and assembled at the registered premises in accordance with the relevant approved NOI and CRMP (ASEL S3.13).*

ASEL also requires that:

> *….. all livestock accepted into the registered premises must be offered water and feed as soon as possible and no more than 12 hours after arrival (ASEL S3.14).*

This is not always practical, especially where cattle have to be individually inspected to determine whether they are suitable for preparation for export. In some cases it is better practice to accept delivery of the cattle and draft out those unsuitable prior to export. It would help if the wording should be altered from ‘must’ to ‘should’.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.4 Penning arrangements

Penning arrangements
ASEL requires that:

> *livestock must be penned in accordance with the following criteria:*
> - *livestock of similar species, classes, ages and weights are to be kept in groups; and*
> - *livestock with horns are to be separated from livestock lacking horns (ASEL S3.15).*

This should be addressed along the lines of optimising segregation options as discussed in other parts of the document.

Industry guidelines:	*Exists*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Contentious*

Impact on operational procedures: *High*
Affect on welfare outcome: *Potentially high*
R&D priority: *High*

Stocking density
ASEL states that:

> *….. the stocking density at registered premises must provide at least the following minimum space per head (cattle with horns must be provided with additional space), unless a variation is required and approved by the relevant Australian Government agency:*
> - *for cattle held for 30 days or more, a minimum of 9 m^2, based on an individual liveweight of 500 kg (this allowance can be varied by 0.09 m^2 for each 5 kg change in individual liveweight).*
> - *for cattle held for less than 30 days, a minimum of 4 m^2, based on an individual liveweight of 500 kilograms (this allowance can be varied by 0.04 m^2 for each 5 kg change in individual liveweight) (ASEL S3.11).*

These stocking densities are drawn from a feedlot requirement where cattle are held for much longer periods. The industry contends that cattle being held for live export do not require the same space as those held in a feedlot for production.

While decreasing densities may not have an impact on profitability, the scope to maintain a consignment in one location has advantages when preparing the cattle for export.

Industry guidelines: *Exist*
Scientific support: *Industry specific support lacking*
Industry consensus: *Some contention*
Impact on operational procedures: *Potentially high*
Affect on welfare outcome: *Unclear*
R&D priority: *Medium*

1.5.5 Design of handling facilities

Design of handling facilities
ASEL states that:

> *…… livestock handling facilities and sheds at registered premises must comply with the following:*
>
> - *Sheds must be constructed with sufficient drainage and ventilation to ensure that the shed is free-draining.*
> - *Livestock handling facilities must be constructed to handle the number of livestock (ie the number of stock at the premises, whatever that may be, depending on the consignment size) with a minimum of stress and injury.*
> - *Floors of yards, sheds, pens and loading ramps must have non-slip surfaces (ASEL S3.2).*

Requiring the holding yards to have feed and water troughs space that emulates a feedlot is a matter for concern since holding yards can provide sufficient feed and water with relatively less

trough space. If holding facilities are intended to prepare livestock for export, higher densities in holding yards may be more suitable.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Unclear*
R&D priority:	*Medium*

1.5.6 Isolation of livestock

Isolation of livestock
ASEL also states that:

> *…. where a period of pre-export quarantine or isolation is required by the importing country, animals forming the consignment must at all times be physically isolated from all other animals (whether for an alternative export market or domestic use) to prevent contact (ASEL S3.3).*

ASEL also states

> *…… that where handling facilities used for loading, holding, treating or inspecting livestock (including roadway and lanes) are to be used for both domestic and export livestock (including livestock of differing export status), the operator of the premises must have procedures in place to ensure that:*
> - *handling facilities are not used simultaneously by livestock of differing pre-export quarantine or isolation status;*
> - *a minimum livestock traffic separation of two metres is maintained at all times, or livestock are separated by a physical barrier such as a fenced road or lane or a fully fenced empty paddock, unless specified otherwise by the importing country; and*
> - *handling facilities and equipment used by different consignments of animals are managed in accordance with the pre-export quarantine or isolation requirements of each importing country (ASEL S3.3).*

Whilst importing country protocols in regards to isolation need to be respected, there is some contention in regards to the way that this particular protocol is interpreted. There are serious operational implications if unnecessary isolation is imposed. Requirements to further segregate animals on the basis of type/horns etc can be almost impossible if imposed over isolation requirements.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Low*
R&D priority:	*Medium*

1.5.7 Animal Care and Handling

Supervision/observation of livestock

ASEL requires daily monitoring of health, welfare and mortality and states that all livestock must be inspected daily by a competent stock person (ASEL S3.16).

Industry guidelines: *Exist*
Scientific support: *Not required (operational issue)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low (routine procedure)*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

Treatment of sick or injured stock
ASEL also states that:

> *….all sick or injured livestock must be given immediate treatment, and veterinary advice must be sought if the cause of a sickness or injury is not obvious, or if action taken to prevent or treat the problem is ineffective. Investigation by a registered veterinarian must be conducted if mortalities in any one paddock or shed exceed zero point one (0.1) per cent or 3 deaths, whichever is the greater, on any one day for cattle and buffalo. Dead livestock must be collected and disposed of on a daily basis. Animals must not be able to access the area for disposal of carcasses (ASEL S3.16). Records of each consignment must be kept for at least two years after the date of export (ASEL S3.16).*

and that:

> *….. any livestock identified at unloading as being distressed, injured or otherwise unsuitable for export must be marked by a permanent method and isolated from the rest of the consignment. A record must be kept that details identity, the method of treatment or euthanasia and disposal of all rejected animals (ASEL S3.17).*

This is normal practice and minimum requirement in many cases within industry.

Industry guidelines: *Exist*
Scientific support: *Exists (adequate)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *High*
R&D priority: *Low*

1.5.8 Treatment records and required documentation

Treatment records
Records of each consignment must be kept for at least two years after the date of export (ASEL S3.16).

This is normal practice and minimum requirement in many cases within industry.

Industry guidelines: *Exist*
Scientific support: *Not required*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

1.5.9 Provision of fodder and water

Provision of fodder and water
To ensure adequate supply of feed and water ASEL requires that:

- *where feeders, self-feeders and water troughs are used, they must be of a design that allows for complete cleaning of all surfaces, prevents spoilage of feed during inclement weather, and minimises faecal contamination and injuries.*
- *all livestock feed for use at the registered premises must be stored in a manner that maintains the integrity and nutritional value of the feed, and protects it from weather, pests and external contaminants (including chemical spray drift) and from direct access by animals.*
- *where feeders and self-feeders are used, the trough allowance for cattle/buffalo held in paddocks at the premises is to be calculated on a paddock-by-paddock basis and must be no less than fifteen (15) cm of feed trough per head.*
- *the quantity of feed available should meet at least minimum feed requirements, which*
- *are (for cattle/buffalo), two point five (2.5) per cent of their bodyweight, of a quality feed*
- *able to meet daily maintenance requirements;*
- *all livestock in the registered premises must have access to drinking water at all times (unless under curfew).*
- *water troughs must be positioned apart from hay and feed sources to prevent fouling and kept clean.*
- *the water quality must be suitable for the livestock and there must be sufficient backup storage or a contingency plan to ensure continuity of supply at peak demand for two days (ASEL S3.7).*

These feed and water stipulations are based on feedlot and backgrounding situations where more space is needed than for holding yards and holding depots. The added space requirements mean exporters having to prepare cattle across more sites than they otherwise. Thus the industry feels that pen densities and access to feed can be decreased without compromising the health and welfare of the animals.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.5.10 Authorised entry

Authorised entry
ASEL requires that:

> *….. the operator of the registered premises must have arrangements in place at the premises to prevent unauthorised entry and access to the feed when livestock are being prepared for export. Access to the premises must be controlled at all times, with:*
> - *all entry points to premises being clearly signed;*
> - *only those persons necessary for the day-to-day operation of the premises and state*
> - *and territory government officials having direct access to the area of the premises; and*
> - *all non-employees reporting to reception for appropriate biosecurity checks relevant to the requirements of the facility (ASEL S3.10).*

Industry generally concurs with these requirements. Given the assorted risks associated with exporting cattle, some means of preventing unwanted visitors from disturbing them is desirable.

Industry guidelines:	*Exist*
Scientific support:	*Not required*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.5.11 Pen design and the provision of shade and shelter

Pen design and the provision of shade and shelter
ASEL addresses pen design under sections S3.4-S3.6 and provides guidelines in regards to shade and shelter, fencing and drainage (ASEL S3.4-S3.6).

As noted above, this is area that needs to be addressed as it does not follow generally accepted industry practices.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Unclear*
Affect on welfare outcome:	*Unclear*
R&D priority:	*Medium*

1.5.12 Rejections

Rejection criteria
ASEL Appendix 3.1 outlines the criteria for rejecting cattle (and buffalo) for fitness to travel. These criteria are the same as those described in the section relating to sourcing (see table 4.3.2).

These rejection criteria are accepted by industry.

Industry guidelines:	*Exist*

Scientific support: *Exists (adequate)*
Industry consensus: *Consensus*
Impact on operational procedures: *High*
Affect on welfare outcome: *High*
R&D priority: *Low*

Management of rejects
Industry consultation has revealed that there is considerable debate regarding how rejects should be managed. Much of this is based around commercial arrangements between vendors or suppliers. It also involves transport insurance, residual (or salvage values) and treatment possibilities. Rejected animals will, from time to time, find their way back into the live export chain provided they are able to recover from the condition they made them ineligible the first time.

Industry guidelines: *Do not exist*
Scientific support: *Not required (operational issue)*
Industry consensus: *Some contention*
Impact on operational procedures: *Potentially high*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

1.5.13 Pre-loading inspection (3rd Party Veterinarian)

Fitness to travel criteria
This criterion is well addressed by ASEL and is accepted by industry.

Industry guidelines: *Exist*
Scientific support: *Not required (operational issue)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

Pre-loading inspection techniques
The short haul cattle industry considers that R&D is not required in this area. Operators should be able to adequately experienced or new entrants found to have an understanding of this process. Documenting best practice may be of some help. Current the inspection techniques depend on the individual's preference. There is some conjecture as to the best location for inspection to occur whether: on farm; at a holding depot or shipside. Documenting best practice by operators at each location may provide adequate guidance.

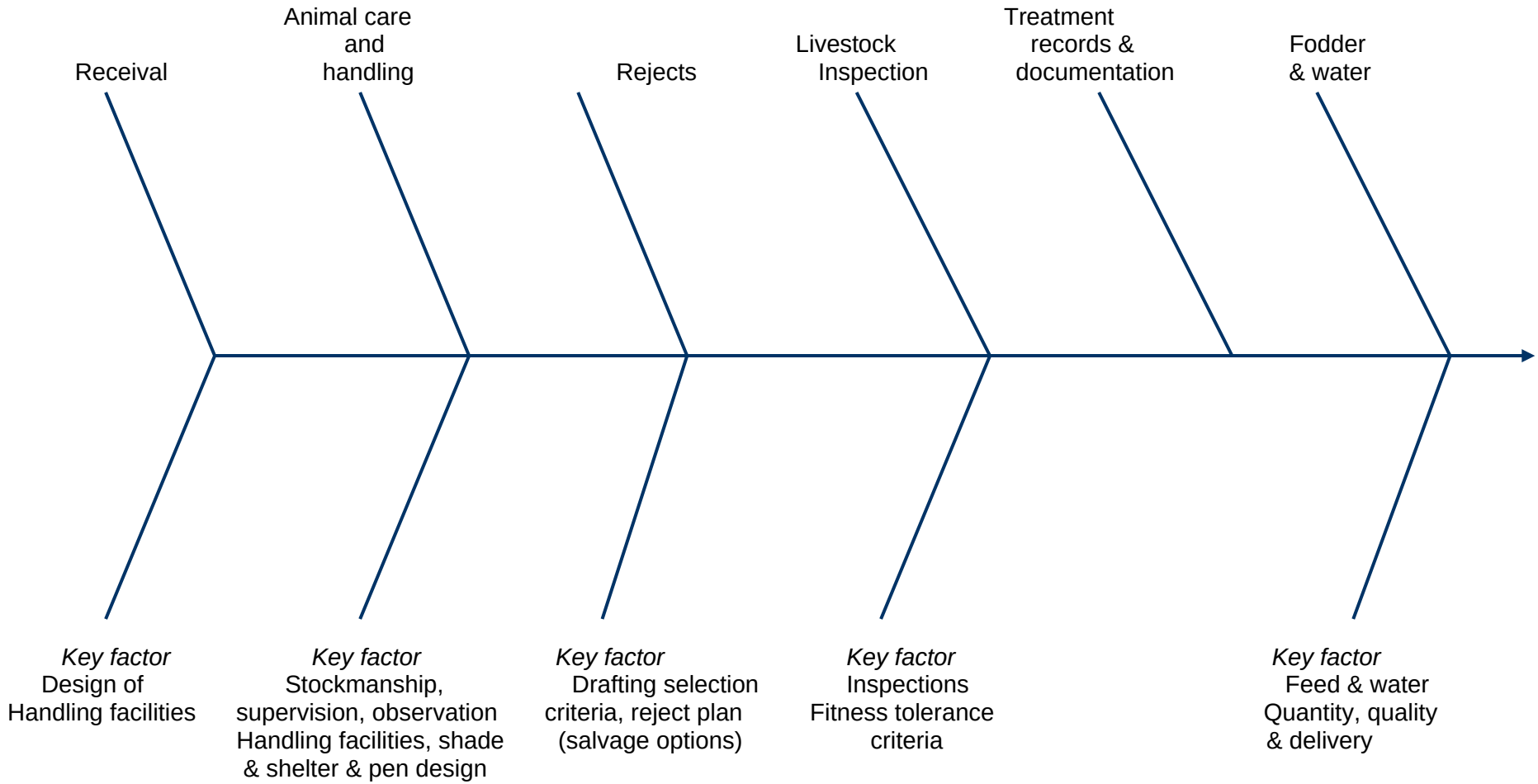
Industry guidelines: *Exist*
Scientific support: *Not required (operational issue)*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Low*
R&D priority: *Low*

1.5.14 Permission to leave for loading (PLL/AQIS Veterinarian)

Permission to leave for loading
The instruction for a permission to leave for loading is found in the Export Control (Animals) Order 2004 (see page 5 of the Order).

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Figure 1.5: Management of Registered Premises (SHC)



1.6 Vessel preparation and loading (SHC)

Overview
ASEL describes the vessel preparation and loading phase as:

> *beginning with the arrival of livestock at the port of loading and ending when all of the animals have been loaded onto the vessel. Once loading has been completed in accordance with the loading plan, an export permit and health certificate is issued.*

ASEL states that:

> *……. the Australian Maritime Safety Authority (AMSA) is responsible for the inspection of selected foreign flag ships to monitor their compliance with safety and environment protection standards, including safe carriage of livestock as cargo. AMSA administers the regulation of vessels through the auspices of Marine Orders No.43.*

Many of these orders relate to aspects of vessels and vessel management that are removed from aspects relating to the export of livestock. However, there are a number of key regulations that have a direct bearing on livestock exporting activities. These are noted in the appropriate sections.

ASEL also states that:

> *….. the master of the vessel is responsible for the vessel's loading configuration and for ensuring the safety of the vessel, crew and cargo during loading. Livestock vessels carry crew in sufficient numbers with experience in the care of animals to satisfactorily provide for their tending, feeding and watering, as well as assisting the accredited stock person(s) and/or veterinarian onboard in their responsibilities during the voyage.*

ASEL describes the relevant responsibilities as follows:

> *…the exporter is responsible for providing competent animal handlers to ensure that livestock are loaded in a manner that prevents injury and minimises stress, and for ensuring that suitable loading facilities are provided. The vessel owner is responsible for ensuring that the vessel is appropriately designed, constructed, equipped, maintained and certified to carry the cargo of livestock.*

ASEL further states that:

> *…. the exporter must ensure that stocking densities meet all legislative requirements; that there is adequate provisioning of the vessel before departure, including feed, water and veterinary supplies; and that accredited stock persons and, when required, an accredited veterinarian have been engaged. The exporter must be able to demonstrate that the loading of the livestock at the port of loading has been conducted in accordance with the approved loading plan and with any importing country requirements relating to the consignment, and relevant requirements of the Australian Government and the state or territory for loading of livestock.*

Guiding Principles (ASEL Standard 4)
ASEL states that:

…. the sea voyage is planned and is undertaken on an appropriately provisioned vessel certified for the carriage of livestock, and the livestock are loaded in a manner that prevents injury and minimises stress.

Required outcomes (ASEL Standard 4)
ASEL identifies the following outcomes:

- *Livestock are healthy, fit to travel and comply with importing country requirements.*
- *The vessel meets Australian requirements for the safe carriage of livestock.*
- *Sufficient personnel must be available both at loading and during the voyage to ensure that livestock husbandry and welfare needs are addressed.*
- *Livestock are handled and loaded in a manner that prevents injury and minimises stress.*
- *The travel and loading plans adequately address the health and welfare of the livestock.*
- *A health certificate and an export permit are issued by the Australian Quarantine and Inspection Service (AQIS).*

1.6.1 Loading instructions

Loading instructions
ASEL has no direct guidelines in regards to loading instructions but states that loading arrangements must be made and take into consideration:

- *port facilities, including the available water supply rate;*
- *port and ship security;*
- *environmental management;*
- *labour availability and competency; and*
- *occupational health and safety.*

Timeliness of provision of loading instructions can be a contentious issue. Loading instructions should be forwarded to the vessel at the earliest possible time to allow the appropriate set up and planning. The more experienced operators feel that this practice is routine and straightforward.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.6.2 Loading personnel

Loading personnel
ASEL states that:

> *…. sufficient personnel must be available both at loading and during the voyage to ensure that livestock husbandry and welfare needs are addressed (ASEL S4.6).*

ASEL also states that:

> *… upon arrival at the port of embarkation, responsibility for the livestock must be transferred to a competent person nominated by the exporter and that that person must be notified of any aspect of transport to the port of embarkation that might affect the future health and welfare of the livestock (ASEL S4.7).*

Appendix 4.1 of ASEL also states that:

> *… a suitably competent person must be appointed by the exporter to be responsible for the handling, husbandry and welfare of the livestock for export and to ensure that loading facilities and livestock handling standards at the port are satisfactory during unloading from the land transport, inspection and loading onto the vessel.*

ASEL also states that:

> *…. livestock for export must be loaded onto the vessel by competent stock handlers in a manner that prevents injury and minimises stress (Appendix 4.1).*

It is in the best interests of the exporter to ensure that this process is managed in the most professional manner possible. It is considered that the general competency of those involved is good but formal recognition may help to meet industry requirements.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (competency assessment)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Accompaniment
ASEL states that:

> *…. an accredited stock person who is employed by the exporter and who is not ordinarily a member of the ship's crew must be appointed to accompany each consignment of livestock for export to its destination. If required by the relevant Australian Government agency, an accredited veterinarian must also be appointed to accompany a consignment (ASEL S4.5).*

The short haul trade has a requirement for an accredited stockman to accompany each voyage. This is endorsed by the industry and seen as a long-term industry practice. The stockman's onboard role is quite clear and well defined. From time to time it has been difficult to find suitably accredited stock people or sufficient numbers to deliver training courses.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.6.3 Load plan

Load plan
In recognition of the importance of the load plan, ASEL devotes an appendix (ASEL S4 Appendix 4.1) to provide guidelines on how to prepare a loading plan.

It also states that:

> *…. before loading of livestock for export begins, a loading plan must be prepared in accordance with the specifications in Appendix 4.1, including details of the net available pen area on the ship (excluding the area of the hospital pens) according to the vessel's record of equipment for the carriage of livestock, and the number of livestock that may be loaded on the vessel, based on the minimum pen area per head for the relevant livestock species and class as specified in the Appendix (ASEL Appendix 4.1 and Tables A4.1.1–A4.1.6).*

There has been no industry research conducted that relates specifically to the preparation and execution of a load plan.

The marine orders have specific requirements with regard to the provision and use of "hospital pens" (36.1-36.7).

The issue of horned animals is again raised here as an extremely contentious issue. Drafting by horn status causes inadequate loading densities, mixing of cattle from different mobs and is perceived by the industry as being detrimental to animal welfare.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (R&D needs to work with procedures)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Stocking density
The key tables involved (for cattle) are:

Table 4.1.1 - Minimum pen area per head for cattle exported by sea — default table
Table A4.1.2 - Minimum pen area per head for cattle exported by sea from a port south of latitude 26 degrees south, from 1 May to 31 October
Table A4.1.3 - Minimum pen area per head for cattle exported by sea from a port south of latitude 26 degrees south, from 1 November to 30 April and
Table A4.1.4 - Minimum pen area per head for buffalo exported by sea

Pregnant cattle require special consideration and ASEL states that:

> *….. pregnant cattle must be kept in pens that have an average floor area for each head of cattle as follows:*
> - *For pregnant heifers* of a Bos taurus breed — the minimum area required for cattle under Table A4.1.2; and*
> - *For pregnant heifers of a Bos indicus breed — the minimum area required for cattle under Table A4.1.1; and*
> - *For pregnant cows** of a Bos taurus breed — an area five (5) per cent larger than the minimum area required for cattle under ASEL Table A4.1.2; and*
> - *For pregnant cows of a Bos indicus breed — an area five (5) per cent larger than the minimum area required for cattle under ASEL Table A4.1.1.*

* Heifer means a female bovine animal less than three (3) years of age that has not produced a calf
** Cow means a female bovine animal that has produced a calf or is over three (3) years of age

ASEL states that:

> *….. a loading plan for the vessel on which the livestock for export are to be transported must be prepared and be compliant with relevant ship safety standards and must give due consideration to:*
> - *Differences in handling, holding and husbandry needs of each livestock species, number of animals, sex, class, reproductive status, weight, breed, origin, preparation and transport history;*
> - *Pen layout, available pen area for the particular consignment, ventilation, vessel characteristics, port rotation, discharge sequence and stability; and*
> - *Provision of livestock accommodation that enables the following requirements to be satisfied:*
>   – *segregation of livestock according to species;*
>   – *segregation of classes of livestock of the same species;*
>   – *separation of younger animals from older animals;*
>   – *separation of livestock of a dissimilar size;*
>   – *segregation of livestock with horns from livestock without horns;*
>   – *separation of cattle or buffalo from other species by a passageway, an empty pen or an effective impermeable barrier, to the satisfaction of an accredited stock person or accredited veterinarian;*
>   – *location of livestock in relation to hatchways (there must be no location of livestock over a hatchway, unless the hatchway is protected against consequent damage and the hatchway covers are secured against movement); and*
>   – *location of livestock in relation to health and welfare (there must be no penning or location of livestock on or in any part of a vessel where the livestock, livestock fittings, livestock equipment or carrying arrangements could substantially compromise livestock health and/or welfare);*

- *Provision of clearly identified hospital pens (or stalls), constructed to the standard required for the species of livestock for which they are intended as specified in Marine Orders 43 (27), on each deck or otherwise in a manner readily accessible to livestock; and*
- *Stocking densities and pen-group weight-range tolerances for the species in accordance with the specifications in the tables below, unless a variation is approved by the relevant Australian Government agency based on an agreed heat stress risk assessment (ASEL Appendix 4.1).*

Stocking density remains a contentious issue within the industry. Calculation on a weight basis for feeder cattle is acceptable but for heavier framed cattle the weight basis is a disadvantage. Research is required for the purposes of distinguishing weight and frame (differences) in calculating load densities. The final report from LIVE.233 is pending (Petherick, 2007).

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Unclear*
R&D priority:	*High*

Segregation
Furthermore ASEL states that:

> *….. livestock for export must be presented for loading, and penned on the vessel in lines segregated by species, class, age, weight, presence/absence of horns or antlers, and any other relevant characteristic (and, where relevant, port of destination), in accordance with the approved loading plan (ASEL S4.11).*

The direction to segregate livestock with horns from livestock without horns has become a contentious issue. There is a need to optimise the segregation options onboard. Discussion of the use of hospital pens is included in the section relating to treatment of sick animals (see Marine Orders). This is discussed elsewhere in the document (see section 1.4.2). Contentious issues generally relate to horn status and frame versus weight.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific scientific support lacking*
Industry consensus:	*Contentious*
Impact on operational procedures:	*High*
Affect on welfare outcome:	*Unclear*
R&D priority:	*High*

1.6.4 Loading procedures

Loading procedures
To ensure only fit and healthy livestock are transported and loaded on board ASEL states that:

- *the exporter must arrange for the livestock to be inspected for health and welfare and fitness to travel immediately before they are loaded onto the vessel;*
- *only livestock that are healthy and fit to travel can be loaded;*

- *any livestock rejected for export must be distinctively identified and humane and effective arrangements made for their removal from the port;*
- *if euthanasia is necessary it must be carried out humanely and promptly; and*
- *dead livestock must be removed from the port and carcasses must be disposed of in compliance with all relevant health and environmental legislation (ASEL S4.8).*

As already mentioned there is some dispute about whether the pr-embarkation inspection conducted under the supervision of the 3rd party veterinarian should be done at the assembly area and/or at the wharf. Better explanation of permission to leave for loading (PLL) would also be useful.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Communication during (and after) loading
ASEL recognises the importance of communication during and after loading and states:

> *…a communication plan involving all responsible parties must be established before the loading of livestock for export begins. This plan must cover:*
> - *roles and responsibilities of the exporter or nominated representative/s, the accredited stock person, the accredited veterinarian (if required), the master of the vessel, nominated officers and crew members, and government and port authorities;*
> - *arrangements for regular meetings of key people before, during and after loading; and*
> - *reporting procedures during and on completion of the voyage (ASEL Appendix 4.1).*

Operationally, exporters find that there are a number of key practices that facilitate a smooth loading. In many cases these are documented in the individual operating and governance manuals and include the strategic positioning of key personnel, the use of communication devices, agreed hand signals and clear delegation of tasks and responsibilities.

Informal debriefings immediately after the vessel loads are common practise in the industry. The debriefings cover issues relating to the proforma and problems encountered on the day the vessel is loaded. They also refer to technical difficulties that other exporters may have recently encountered and practical remedies for overcoming these difficulties.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Ventilation during loading
ASEL states that:

> *…. when livestock for export are loaded on vessels with enclosed decks, the ventilation system must be run continuously from the commencement of loading (ASEL S4.9).*

This is standard industry practice.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Feed and water on arrival
ASEL states that:

> *…. all livestock for export must be offered feed and water as soon as possible after being loaded on the vessel, but no later than 12 hours after loading (ASEL S4.13) (see also ASEL S5.4).*

Quarantine issues should be investigated for feed either not of Australian origin or held on the vessel from a previous voyage. While not directly related to the consignment, identification of possible disease risks and/or exotic pests should be investigated to ensure that feed fed while cattle are along side is free of contamination. Trucks discharging cattle and returning to holding yards run the risk of initiating a disease outbreak.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Unclear*
R&D priority:	*Low*

1.6.5 Voyage feed and water and other consumables

Voyage water
ASEL states that:

> *…. the supplies of feed and water must maintain good health and satisfy energy requirements of the livestock for the duration of the voyage. There must also be feed and water reserves as specified in Appendix 4.2. The feed and water provisions must take into consideration the livestock species, class, age and expected weather conditions (ASEL S4.14).*

ASEL also states that:

> *…. for cattle and buffalo there must be sufficient water on the ship to meet the anticipated needs of the cattle and buffalo during the voyage plus an additional three days water (ASEL Appendix 4.2).*

ASEL states that when calculating water requirements:

> *… provision must be made for livestock to receive at least 12% of liveweight of water per head per day. (This water allowance may be reduced to 10% of liveweight per head per day if water consumption on the ship for each of the previous three voyages averaged less than 10% of liveweight per head per day. (This is illogical and needs to be based on*

destinations/time of year and type of cattle). Allowance may be made for fresh water produced on the ship while at sea (ASEL Appendix 4.2).

LIVE.209 found that animals can consume water equivalent to 15% of their bodyweight (Barnes et al, 2004) while LIVE.205 investigated water consumption on 87 shipments involving cattle and found that 13% was sufficient in all but one voyage (Brightling, 2001). There was no attempt, however, to correlate water consumption to a wet (or dry) bulb temperature. Experience by onboard personnel indicates that both cattle and sheep will drink up to 15% bodyweight (60 litres and 7 litres per head respectively) under extremely hot conditions. Water requirements should take into consideration the anticipated weather throughout the voyage, the type of cattle (bos indicus drink less) and the preparation history. Additional water production requirements can be expensive in terms of power and can overload already extended power resources onboard. This can be an identified risk on some vessels.

Industry guidelines:	*Exist*
Scientific support:	*Exist (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

Voyage feed (quantity)
In regards to feed, ASEL states that:

….there must be sufficient feed on the ship to meet the anticipated needs of the cattle and buffalo during the voyage, plus an additional 20% or three days feed, whichever is less (ASEL Appendix 4.2).

ASEL states that when calculating feed and water requirements:

….cattle and buffalo less than 250 kg to be provided with at least 2.5% of their bodyweight per head per day. Breeding heifers (with six or fewer permanent incisor teeth) must be provided with a minimum feed allowance of 2.5% of their bodyweight (regardless of pregnancy status). Pregnant cows must be provided with a minimum feed allowance of 2.5% of their bodyweight. All other categories cows must be provided with a minimum feed allowance of 2% of their bodyweight (ASEL Appendix 4.2).

It should be noted that a minimum feed allowance of 2% represents a restricted feeding situation and will invoke a number of potential issues relating to trough space and exaggerated hierarchical behaviour. These issues are not well documented in the industry guidelines and further work would be of benefit to the industry.

The volume and formulation of feed are both contentious issues. The basic specification will keep animals alive and might be sufficient on short haul voyages but for higher value animals or markets where the protocol may require feed to be provided after discharge (eg Korea) providing high quality feed is critical. Adopting minimum specifications for individual markets may circumvent feed-related difficulties.

Further, consideration should be given to weight losses and adaptation of cattle to new rations following discharge and introduction to the importer's feedlot. R&D is this area would seek to reconcile the exporter's preoccupation with gut-fill (to achieve maximum weight at discharge) and

the importer's need for rapid feedlot adaptation and subsequent performance. This is possibly an example of 'value-adding' R&D.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

Voyage feed (quality)
ASEL also states that:

> *….. fodder for cattle exported from an Australian port south of latitude 26 degrees south must include at least 1% of the required feed as chaff and/or hay (ASEL Appendix 4.2).*

ASEL makes general statements regarding shipboard fodder specifications and provisioning and states that:

> *….. the shipboard ration must not contain more than 30% by weight of wheat, barley or corn, unless the livestock have been adapted to the ration over a period of at least two weeks before export. All pelleted feed must be accompanied by a manufacturer's declaration that it is manufactured in accordance with national pellet standards. All feed from a previous voyage that is suitable for livestock consumption may remain in a feed storage tank provided that:*
> - *each tank is completely emptied at least once in every 90 days;*
> - *all feed that is no longer suitable for livestock consumption is emptied in its entirety before further feed is loaded and*
> - *records are maintained of the emptying of feed storage tanks and are made available for inspection (ASEL Appendix 4.2).*

The provision of hay applies only to cattle exports sourced from below the 26th parallel. Further, consideration should be given to weight losses and adaptation of cattle to new rations following discharge and introduction to the importer's feedlot. R&D is this area would seek to reconcile the exporter's preoccupation with gut-fill (to achieve maximum weight at discharge) and the importer's need for rapid feedlot adaptation and subsequent performance. This is possibly an example of 'value-adding' R&D.

Industry guidelines:	*Exist*
Scientific support:	*Industry specific support lacking (required)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

Veterinary supplies and equipment
A suggested pre-shipment checklist in regards to veterinary supplies and equipment is provided by ASEL and outlined in the industry Stockman's Manual (Appendices 6 and 7).

ASEL also states that restraint facilities and veterinary equipment, including medicines, instruments and stores sufficient for the species and number of livestock carried, must be provided on the vessel.

- *The minimum restraint equipment to be carried on ships exporting feeder and slaughter cattle and/or buffalo from Australia to facilitate treatment and minimise the potential for livestock injury and stress is outlined in ASEL Table A4.1.8.*
- *The minimum requirements for veterinary equipment to be carried on ships exporting feeder and slaughter cattle, and/or buffalo from Australia, based on the injuries and diseases likely to occur during a normal voyage, are shown in ASEL Table A4.1.8.*
- *Appropriate equipment for the humane killing of livestock of the species to be carried must be provided.*

The requirement to carry suitable veterinary equipment and medicine is also supported by the Marine Orders (18.1).

No contentious issues have been found here.

Industry guidelines:	*Exist*
Scientific support:	*Exists (adequate)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Bedding
ASEL states that:

…. cattle and buffalo exported on voyages of 10 days or more must be provided with sawdust, rice hulls or similar material to be used exclusively for bedding at a rate of at least seven tonnes or 25 cubic metres for every 1000 square metres of cattle pen space. (This does not apply to cattle and buffalo loaded from Brisbane or a port north of latitude 26 degrees south and exported to Southeast Asia or Japan (ASEL S4.15)).

No contentious issues exist here since bedding management is more applicable to long haul voyages. However, issues relating to bedding management can occur when utilising larger vessels and/or when conducting short haul voyages from south of the 26th parallel.

Industry guidelines:	*Exist (for bedding requirements)*
Scientific support:	*Not required on short haul*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Potentially high*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.6.6 Required documentation

Written instructions
ASEL states that:

> *…… written instructions and/or standard operating procedures for the care and handling of the livestock being exported must be prepared before departure of the vessel from an Australian port. The procedures must address:*
> - *the quantity and type of feed to be provided and frequency of feeding required for each class of livestock during the voyage;*

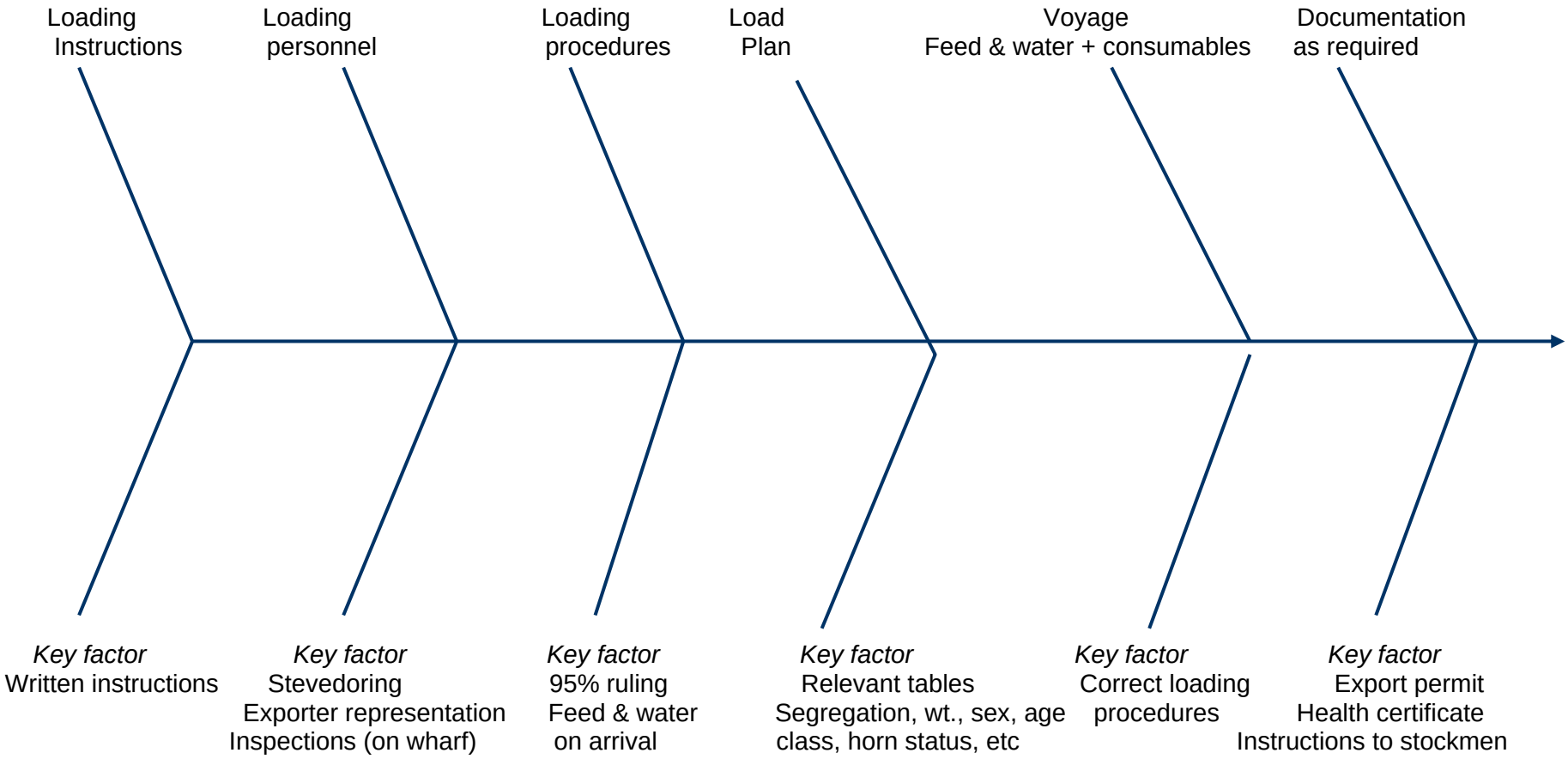
- *if water is not supplied ad libitum, the quantity of water to be provided and frequency of watering required during the voyage;*
- *pen cleaning requirements;*
- *treatment of livestock during the voyage; and*
- *authority to humanely destroy any animal that is seriously ill or injured.*

The Marine orders also require that vessels carry a means of humanely killing livestock (appropriate for use with species carried) (18.1). Onboard practices have changed in keeping with welfare concerns and there is now greater use of the "captive bolt" where required. There is also greater scrutiny during unloading to ensure that moribund livestock are humanely killed at the earliest possible opportunity.

During the project investigations a brochure published by one of the more professional shippers was discovered. The brochure gave examples of best practice methods of loading vessels from the shipper's perspective. While the brochure was based on European experience, adoption something similar would be worthwhile for all livestock vessels operating out of Australian ports.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Figure 1.6: Vessel Preparation and Loading (SHC)



1.7 Onboard management of livestock (SHC)

ASEL provides the following overview in regards to the onboard management of livestock.

> *Onboard management covers the period from the time the first animal is loaded onto the vessel until the last animal is unloaded at the port of disembarkation. Provisions should exist to ensure that animal health and welfare interventions are undertaken where necessary to treat or euthanise sick or injured animals.*
>
> *Once loading begins at the point of embarkation the master of the vessel assumes overall responsibility for the management and care of the livestock during transport on the vessel. This responsibility continues until the point of disembarkation. It includes the provision of satisfactory livestock services such as ventilation, food, water, drainage and lighting.*
>
> *After the livestock have been loaded on board the vessel and all requirements have been met, the Australian Quarantine and Inspection Service (AQIS) will issue the health certificate and export permit.*

ASEL states that:

> *the consignment must be checked before departure to ensure that the livestock have been loaded according to the loading plan (ASEL S5.3)). This will usually be conducted by the attending AQIS veterinarian.*
>
> *Where an accredited veterinarian is required to accompany the consignment, that person is responsible for monitoring and regular reporting (to AQIS) of consignment conditions on board during and after the voyage.*
>
> *Accredited stock persons accompanying the consignment are responsible for providing appropriate care and management of the livestock on board during the voyage. Livestock vessels carry crew in sufficient numbers with experience in the care of animals to satisfactorily provide for their tending, feeding and watering, as well as assisting the accredited stock person(s) and/or veterinarian onboard in their responsibilities during the voyage.*

Guiding principle (ASEL Standard 5)
ASEL states that:

> *…. the onboard facilities, management and husbandry must be adequate to maintain the health and welfare of livestock throughout the sea voyage.*

Required outcomes (ASEL Standard 5)
ASEL also requires that:

> *… the voyage is completed safely, adequate livestock services are maintained throughout the voyage, onboard care and management of the livestock is adequate to maintain their health and welfare and statutory reporting requirements are met, both during and after the voyage.*

1.7.1 After loading

On completion of loading
ASEL states that:

…. all livestock for export must be offered feed and water as soon as possible after being loaded on the vessel, and within 12 hours (ASEL S5.4).

This is normal practice in the short haul trade.

ASEL also states that:

> *… the consignment must be checked before departure to ensure that the livestock have been loaded according to the loading plan (ASEL S5.3).*

This will usually be conducted by the attending AQIS veterinarian.

ASEL states also that:

> *…. the onboard management of livestock for export by sea must ensure that the health, welfare and physical needs of livestock are met during the voyage as follows:*
> - *An accredited stock person must accompany each consignment of livestock and must remain with the consignment until the vessel has completed discharging at the final port of discharge.*
> - *An accredited veterinarian must accompany each consignment of livestock where required by the relevant Australian Government agency and must remain with the consignment until the vessel has completed discharging at the final port of discharge.*
> - *Accredited stock persons and/or veterinarians must work with the vessel's master and crew to maintain the health and welfare of the livestock on board.*
> - *All personnel handling and caring for livestock or who are otherwise responsible for animals during the voyage must be able to demonstrate an adequate level of experience and skill to allow them to undertake their duties (ASEL S5.1).*

The need for training and competency evaluation is acknowledged by the industry.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.7.2 Physical environment

Ventilation temperature and humidity
Ventilation, temperature and humidity are addressed in the industry Stockman's manual (page 15-21). This also includes guidelines for the use of wetting to alleviate heat stress and a discussion of thermoregulation and heat stress. These guidelines are accepted by industry.

Industry guidelines:	*Exist*
Scientific support:	*See long haul cattle document*

Industry consensus: *Consensus*
Impact on operational procedures: *Low in short haul trade*
Affect on welfare outcome: *Potentially high in some categories of cattle*
R&D priority: *Low*

Thermoregulation/heat stress

ASEL requires that:

> *…..animals are loaded at a density that infers an acceptable risk of not succumbing to heat stress (eg, 2% risk of 5% mortality) (see ASEL S1.5A).*

This requirement appears to have taken the place of minimum ventilation rates prescribed by AMSA.

Heat stress is not usually a feature of short haul voyages. However, some short haul voyages require an equator crossing and this can cause concerns for some categories of cattle, most particularly Bos Taurus breeds. Substantial research has been undertaken to support the development of the industry "heat stress risk assessment" (HSRA) model for cattle (see document describing the long haul cattle framework).

Industry guidelines: *Exist*
Scientific support: *See long haul cattle document*
Industry consensus: *Consensus*
Impact on operational procedures: *Low in short haul trade*
Affect on welfare outcome: *Potentially high in some categories of cattle*
R&D priority: *Low*

Ammonia

The industry has recognised that ammonia levels can at times be a cause of concern onboard cattle vessels. Unlike the sheep pad, cattle bedding requires regular cleaning. Ammonia levels are not considered to be excessive by short haul operators but there has not yet been any work to determine acceptable levels.

Industry guidelines: *Do not exist*
Scientific support: *Exist*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Medium (revisit existing research)*

1.7.3 Feed and water

Provision of feed and water
ASEL states that:

> *… all during the voyage, livestock must have access to adequate water of a quality to maintain good health and suitable feed to satisfy their energy requirements, taking into consideration needs according to the livestock species, class and age:*
> - *There must be a contingency plan to provide satisfactory tending, feeding and watering of the livestock in the event of a malfunction of the automatic feeding or watering systems, but without compromising the safe navigation of the vessel.*
> - *Adequate feed and water must be supplied to livestock waiting to be discharged, and during the discharge period (ASEL S5.5).*

Water and water delivery is addressed by the industry Stockman's manual (pages 27-28).

Fodder and fodder delivery is addressed by the industry Stockman's manual (pages 24-27).

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.7.4 Bedding management

Bedding management
ASEL states that:

> *… when bedding is used, it must be maintained in adequate condition to ensure the health and welfare of the livestock (ASEL S5.9).*

Bedding management is an important issue on long haul cattle voyages and is an emerging issue associated with the larger vessels that have recently been operating in the short haul trade.

Bedding management is addressed in the industry Stockman's manual (pages 21-24).

Industry guidelines:	*Exist*
Scientific support:	*See long haul cattle for issues*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low (except possibly for voyages of longer duration)*

1.7.5 Treatment of sick and/or injured animals

Animal care and observation
ASEL states that:

> *…… livestock and livestock services on the vessel must be regularly inspected (day and night) to ensure that the health and welfare of the livestock are maintained while the livestock are on the vessel:*
> - *A meeting must be held daily to discuss all issues relating to the health and welfare of the livestock. This must include the master and/or the master's representative, accredited stock person and veterinarian.*
> - *Livestock must be systematically inspected to assess their health and welfare.*
> - *Feed and water supply systems must be monitored day and night and maintained in good order.*
> - *The pen stocking density must be checked regularly throughout the voyage and adjustments made as required.*
> - *Ventilation must be monitored regularly each day to ensure adequate thermoregulation of the livestock.*
> - *Washing down of decks and disposal of faeces and litter must be carried out with regard to the health and welfare of livestock (see bedding management) (ASEL S5.6).*

Health issues on short haul voyages are rarely a major concern. A more detailed discussion of the types of issues concerned is contained in the long haul cattle framework document.

Industry guidelines:	*Exist*
Scientific support:	*Exists*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Treatment of sick and injured animals
ASEL states that:

> *…any livestock for export identified after loading as being sick or injured must be given immediate treatment. Where euthanasia is necessary, this must be done humanely and without delay (ASEL S5.2).*

ASEL also states that:

> *…. any livestock identified as being sick or injured must:*
> - *be given prompt treatment;*
> - *be transferred to a hospital pen if required and*
> - *if necessary be euthanised humanely and without delay (the carcasses of any dead livestock must be disposed accordance with the requirements of Annex V of MARPOL 73/78[1]) (ASEL S5.7).*

Careful observation of livestock to determine their well-being is a key competency and skill. In many cases this may not involve any specific treatment but can mean small changes to feeding regimes or other management procedures. Aspects of onboard observation are described in the Stockman's manual (pages 11-15).

Specific treatments for the common ailments are discussed in the Stockman's manual (pages 28-36)

ASEL states that:

> *…. veterinary drugs must be stored and used according to veterinary directions and manufacturers' recommendations, and treatment records must be maintained (ASEL S5.8).*

Table 2.7.3: Treatment of Onboard Conditions (SHC)

Treatment of Onboard Conditions (Short Haul Cattle)*			
Condition	Scientific Support	Industry Consensus	R&D priority
Lameness	Adequate	Consensus	Low
Downers	Adequate	Consensus	Low
Diarrhea	Adequate	Consensus	Low
Bloat	Adequate	Consensus	Low
Wounds and injuries	Adequate	Consensus	Low
Pink Eye	Adequate	Consensus	Low
Enterotoxaemia	Adequate	Consensus	Low
Blackleg	Adequate	Consensus	Low
Shy Feeders	Adequate	Consensus	Low
Ringworm	Adequate	Consensus	Low
IBR/BRD	Adequate	Consensus	Low
Pneumonia	Adequate	Consensus	Low
Misadventure	Adequate	Consensus	Low
Heat Stress	Adequate	Consensus	Low
Diagnostic Support	Adequate	Consensus	Low
Shy Feeders	Adequate	Consensus	Low

*More detail on the treatment of common animal health conditions is contained in the long haul framework document.

Industry guidelines: *Exists*
Scientific support: *Exists*
Industry consensus: *Consensus*
Impact on operational procedures: *Low*
Affect on welfare outcome: *Potentially high*
R&D priority: *Low*

1.7.6 Daily reporting and end of voyage reporting

Daily meetings
Most vessels conduct daily meetings of personnel where management issues are discussed. The captain, the chief officer and the bosun usually attend these meetings, with the stockman and

veterinarian attending on behalf of the exporter. These meetings are good practice and are still conducted on most vessels.

Industry guidelines:	*Not required (operational issue)*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Daily report

ASEL states that:

> *….. for journeys greater than 10 days, an accredited stock person must provide daily reports on the health and welfare of the livestock to the relevant Australian Government agency, commencing on day one of the voyage. The report must include the information outlined in ASEL Appendix 5.1. However, where an accredited veterinarian is on board, he or she must provide the daily report rather than the stock person (ASEL S5.12).*

Industry guidelines:	*Exist*
Scientific support:	*Lacking (reporting as a tool to support R&D)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

End of voyage report
ASEL states that:

> *….. regardless of the journey duration, within five days of completion of discharge at the final port of discharge, an accredited stock person must provide an end-of-voyage report on the health and welfare of the livestock to the relevant Australian Government agency. The report must include the information outlined in ASEL Appendix 5.2. Where there is an accredited veterinarian on board, he or she must provide the end-of-voyage report (ASEL S5.13).*

The nature and quality of information supplied through ‘end of voyage’ reports varies considerably. Contention surrounds the information that should be contained in these reports and the actions that should be precipitated by the report contents. This requirement to make the reports is generally accepted by industry.

Industry guidelines:	*Exist*
Scientific support:	*Lacking (reporting as a tool to support R&D)*
Industry consensus:	*Some contention*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Low*
R&D priority:	*Low*

1.7.7 Contingency planning and response

ASEL states that:

> *….. a contingency plan for the following emergencies must be prepared for each consignment as part of the consignment risk management plan:*
> - *mechanical breakdown;*
> - *a feed or water shortage during the voyage;*
> - *an outbreak of a disease during the voyage;*
> - *extreme weather conditions during the voyage; and*
> - *rejection of the consignment by the overseas market (ASEL S5.10).*

Reportable incidents occur relatively infrequently in the short haul trade. However the same principles should be applied as for the long haul trade and contingency planning should be undertaken as a serious endeavour.

Industry guidelines:	*Exist*
Scientific support:	*Support for contingency plans a priority*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Medium*

1.7.8 Incident Notification

Incident notification
ASEL states that:

> *….. if a notifiable incident occurs at any time, the relevant Australian Government agency must be advised as soon as possible and within 12 hours. In relation to a notifiable incident involving a mortality, equal to or greater than the reportable level, a report must be provided that includes the following:*
> - *details of the mortalities (eg number, species, suspected cause);*
> - *factors that may have contributed to the deaths; and*
> - *the current location of the vessel and, if appropriate, its destination and estimated time of arrival (ASEL S5.11).*

Reportable levels are designated in both the AMSA Part 43 (40) and ASEL.

They are:

Cattle for voyages (greater or equal to 10 days)	*1%*
Cattle for voyages (less than 10 days)	*0.5%*

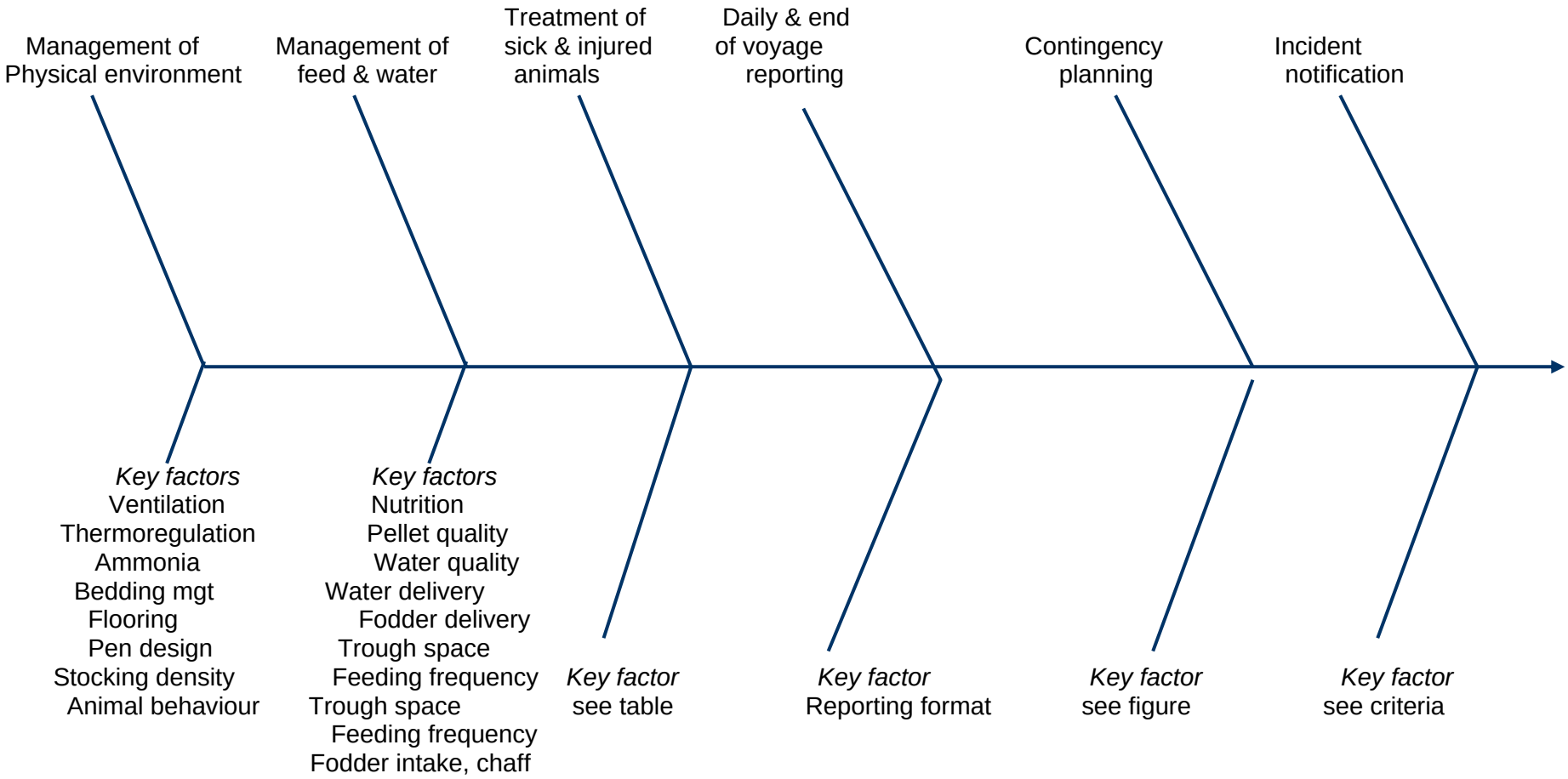
> *(The AMSA definition dictates that the mortality relates to each species within the voyage).*

Following the emergence of larger boats, with multiple consignees, this directive needs to be revised to consider whether the 'notification' should on a consignment basis or a shipment basis. This is a contentious issue as it may eventually increase regulation of the industry without offsetting benefits. AMSA regulation states that the notifiable (mortality) incident applies if it

exceeds the notifiable level by species by voyage. To date, AQIS investigations have been inconsistent with this requirement. Industry is developing protocols to deal with major incidents if and when they occur.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issues)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low (under investigation)*

Figure 1.7: Onboard Management of Livestock (SHC)



1.8 Voyage outcome (SHC)

Weight gain is the most important performance measure in the short haul industry.

1.8.1 Mortality

Mortality
Both ASEL and AMSA Part 43 require the recording of mortality data by species, category and deck. Mortality rates on cattle voyages are typically low.

Industry guidelines:	*Exist*
Scientific support:	*Not required (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Primary measure of outcome*
R&D priority:	*Low*

1.8.2 Weight Gain

Feed Intake and weight gain
Overall weight gain (or the absence of weight loss) is also an indicator of welfare, even though this may simply reflect gut fill. Feeding strategies that address the end to end process are being developed by the industry. This may see a reduction in weight gains during voyages but lead to productivity improvements overall. Where weight gain is known it could be used to demonstrate satisfactory welfare.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*High*

1.8.3 Health Status

Absence/Incidence of clinical disease
The absence or presence of clinical disease is a possible measure of animal welfare.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (as an alternative outcome measure)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

1.8.4 Client Satisfaction

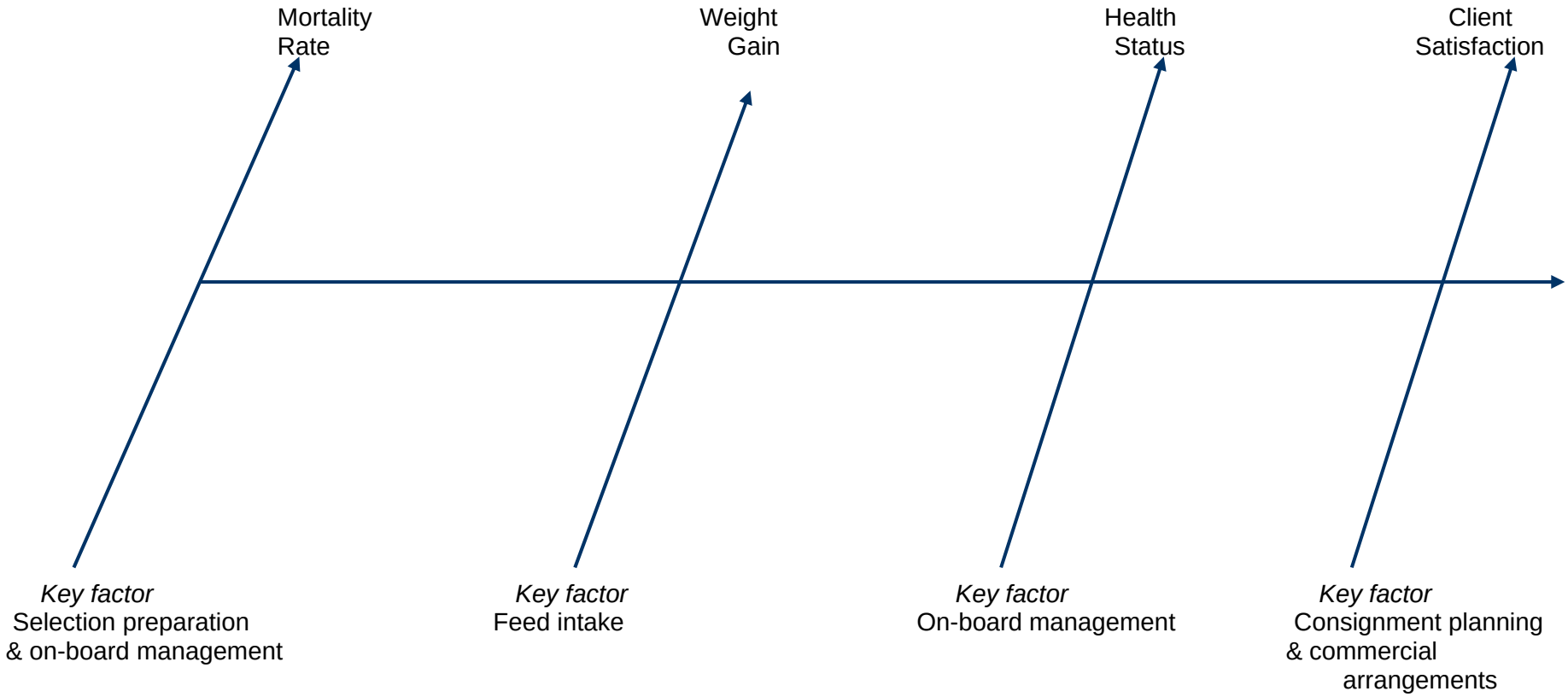
Market research for the purpose of determining overall client satisfaction would be a useful undertaking. While exporters generally work closely with their client base, a third party (confidential) survey may flush out issues that an importer would be reluctant to raise directly due to cultural sensitivities.

1.8.5 Occupational Health and Safety

Occupational Health and Safety
It is suggested that the industry be prepared to address occupational health and safety issues, in keeping with trends in other industries. The actual research associated with OH&S might not, however, be seen as the industry's responsibility.

Industry guidelines:	*Do not exist*
Scientific support:	*Lacking (operational issue)*
Industry consensus:	*Consensus*
Impact on operational procedures:	*Low*
Affect on welfare outcome:	*Potentially high*
R&D priority:	*Low*

Figure 1.8 Outcomes (SHC)



1.9 Summary Tables (SHC)

1.9.1 Consignment planning (SHC)

The following headings apply to the planning phase of the live cattle export process (short haul).

Table 1.9.1: Consignment Planning (SHC)

Consignment Planning (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Importing country requirements (1.2.1)	Exist (scrutiny required)	Lacking (in some instances)	Some contention	Sometimes high	Low	Medium
Consignment Risk Management Planning (CRMP) (1.2.2)	Exist	Exists (more detail required)	Some contention	Low	High (if properly utilised)	High
Commercial arrangements (1.2.3)	Do not exist	Not required	Some contention	Low	Low	Low
Lodgement of Notice of Intention & CRMP (1.2.4)	Exist	Not required (operational issue)	Some contention	Low	Low	High
Approval Procedures (1.2.5)	Exist	Not required (operational issue)	Some contention	Low	Low	High
Test and treatment schedules (1.2.6)	Exist	Not required	Consensus	Low	Low	Low
Logistics Co-ordination (1.2.7)	Exist (in industry operating and governance manual)	Not required	Consensus	Low	Low	Low

1.9.2 Sourcing and selection (SHC)

Table 1.9.2: Sourcing and Selection Criteria (SHC)

Sourcing and Selection Criteria (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Conformance/model codes (1.3.1)	Model codes are under review	Lacking in many instances	Some contention	Potentially high	Potentially high	Low (monitor developments)
Conformance/import permit (1.3.1)	Exist (scrutiny required)	See earlier section	Some contention	Potentially high	Sometimes adverse	Medium
Conformance/food safety (1.3.1)	Exist	Exist (LIVE.114)	Consensus	Low	Low	Low
Body condition (1.3.1)	Exist	Exist (LIVE.120)	Consensus	Low	Potentially high	Low
Weight range (1.3.1)	Exist	Lacking (required)	Contentious	Sometimes high	Potentially high	High
Weaning status (1.3.1)	Exist	Lacking	Consensus	Low	Potentially high	Low
Pregnancy status (1.3.1)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Horn status (length) (1.3.1)	Exist	Lacking	Contentious	High	Low	High (address under heading of segregation)
Other (definition of export chain) (1.3.1)	Do not exist	Primarily an operational issue	Some contention	Potentially high	Low	Low
Fitness to travel (1.3.2)	Exist (see Table 1.3.2)	Exists (veterinary texts)	Consensus	High	High	Low

The following headings apply to the sourcing phase of the live cattle export process (short haul) - continued.

Table 1.9.2: Sourcing and Selection Criteria (SHC)

Sourcing and Selection Criteria –cont. (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
On farm testing (1.3.3)	Exist	Not required	Consensus	Low	Low	Low
Livestock identification (1.3.4)	Exist	Lacking (investigate benefits)	Consensus	Low	Potentially high	Medium
Pre-loading inspection (1.3.5)	Do not exist	Not required	Consensus	Low	Low	Low
Vendor documentation (1.3.5)	Exist	Not required	Consensus	Low	Low	Low

1.9.3 Land transport (SHC)

The following headings apply to the land transport phase of the live cattle export process (short haul).

Table 1.9.3: Land Transport of Cattle intended for Export (SHC)

Land transport of livestock intended for export (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Travel plans (1.4.1)	Exist	Not required	Consensus	Low	Low	Low
Preparation (1.4.1)	Exist	Lacking	Consensus	Unclear	Potentially high	Medium
Water deprivation times (1.4.1)	Exist	Lacking (under investigation AHW.005)	Contentious	Potentially high	Unclear	High (monitor project developments)
Feed and water curfews (1.4.1)	Exist	Lacking (under investigation LIVE.122A)	Consensus	Low	Potentially high	Medium
Rest periods (1.4.1)	Exist	Lacking	Some contention	Potentially high	Potentially high	Medium
Loading procedures (1.4.2) (including segregation)	Exist	Lacking (required)	Contentious	High	Potentially high	High (address under heading of segregation)
Loading densities and penning arrangements (1.4.2)	Exist	Lacking	Consensus (except for the issue of horns)	Sometimes high	Unclear	Medium
Transport responsibilities and documentation (1.4.3)	Exist	Not required	Consensus	Low	Low	Low

1.9.4 Management within registered premises (SHC)

The following headings apply to the management within registered premises phase of the live cattle export process (short haul).

Table 1.9.4: Management within Registered Premises (SHC)

Management within Registered Premises (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Location of premises (1.5.1)	Exist	Not required	Consensus	Potentially high	Low	Low
Staff and staff training (1.5.2)	Exist	Considered adequate	Consensus	Low	Potentially high	Low
Receival (1.5.3)	Exist	Not required	Consensus	Low	Potentially high	Low
Unloading and inspection (1.5.3)	Exist	Not required	Consensus	Low	Low	Low
Penning arrangements (including segregation) (1.5.4)	Exist	Lacking	Contentious	High	Potentially high	Medium (address under heading of segregation)
Stocking density (1.5.4)	Exist	Lacking (Note final report LIVE.233 pending)	Some contention	Potentially high	Unclear	Medium
Design of handling facilities (1.5.5)	Exist	Lacking	Some contention	Potentially high	Unclear	Medium
Isolation of livestock (1.5.6)	Exist	Lacking	Some contention	High	Low	Medium (address under heading of segregation)

Table 1.9.4: Management within Registered Premises (SHC) (continued)

Management within Registered Premises (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Supervision/observation of livestock (1.5.7)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Treatment of sick or injured livestock (1.5.7)	Exist	Exists (adequate)	Consensus	Low	High	Low
Treatment records (1.5.8)	Exist	Not required	Consensus	Low	Low	Low
Provision of fodder and water (1.5.9)	Exist	Lacking	Some contention	Potentially high	Potentially high	Medium
Authorized entry (1.5.10)	Exist	Not required	Consensus	Potentially high	Low	Low
Pen design and provision of shelter (1.5.11)	Exist	Lacking	Some contention	Unclear	Unclear	Medium
Rejection criteria(1.5.12)	Exist	Exists (adequate)	Consensus	Low	Potentially high	Low
Management of rejects (1.5.12)	Do not exist	Not required (operational issue)	Some contention	Potentially high	Potentially high	Medium
Pre-loading inspection techniques and location (1.5.13)	Exist	Not required (operational issue)	Consensus	Low	Low	Low
Permission to leave for loading (PLL) (1.5.12)	Exist	Not required	Consensus	Low	Low	Low

1.9.5 Vessel preparation and loading (SHC)

The following headings apply to the vessel preparation and loading phase of the live cattle export process (short haul).

Table 1.9.5: Vessel Preparation and Loading (SHC)

Vessel Preparation and Loading (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Loading instructions (1.6.1)	Exist	Not required (operational issue)	Some contention	Potentially high	Potentially high	Low
Loading personnel (1.6.2)	Exist	Lacking (competency assessment)	Consensus	Low	Potentially high	Low
Accompaniment (1.6.2)	Exist	Adequate (stockman roles are well defined)	Consensus	Low	Potentially high	Low
Load plan (1.6.3)	Exist	Lacking (R&D needs to work with procedures)	Consensus	Potentially high	Potentially high	Medium
Stocking density (1.6.3)	Exist	Lacking (required) (see LIVE.233)	Contentious	High	Unclear	High
Segregation (onboard) (1.6.3)	Exist	Lacking (see 1.4.2)	Contentious	High	Unclear	High
Loading procedures (1.6.4)	Exist	Not required (operational issues)	Consensus	Low	Low	Low
Communication (1.6.4)	Exist	Not required (operational issues)	Consensus	Low	Low	Low

Table 1.9.5: Vessel Preparation and Loading (SHC) (continued)

Vessel Preparation and Loading (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Ventilation during loading (1.6.4)	Exist	Not required (operational issue)	Consensus	Low	Low	Low
Feed and water on arrival (1.6.4)	Exist	Lacking	Consensus	Low	Unclear	Low
Voyage water (1.6.5)	Exist	Exist (adequate see LIVE.205)	Consensus	Low	Low	Low
Voyage fodder (quantity) (1.6.5)	Exist	Lacking (more required)	Consensus	Potentially high	Potentially high	Medium
Voyage fodder (quality) (1.6.5)	Exist	Lacking (required)	Consensus	Potentially high	Potentially high	High
Veterinary supplies (1.6.5)	Exist	Exists (adequate)	Consensus	Low	Potentially high	Low
Bedding requirements (1.6.5)	Exist	Lacking (in regards to bedding management)	Consensus	Potentially high	Potentially high	Low
Written instructions (1.6.6)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low

1.9.6 Onboard management (SHC)

The following headings apply to the onboard management phase of the live cattle export process (short haul).

Table 1.9.6: Onboard Management of Livestock (SHC)

Onboard Management of Livestock (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
On completion of loading (1.7.1)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Physical environment – ventilation (1.7.2)	Exist	Exists (more required, see long haul document)	Consensus	Low in short haul trade	Potentially high in some cases	Low
Physical environment – thermoregulation (1.7.2)	Exist	Exists (more required, see long haul document)	Consensus	Low in short haul trade	Potentially high in some categories of cattle	Low
Physical environment – ammonia (1.7.2)	Do not exist	Exist	Consensus	Low	Potentially high	Medium (revisit existing research)
Provision of feed and water (1.7.3)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low

The following headings apply to the onboard management phase of the live cattle export process (short haul) (continued)

Table 1.9.6: Onboard Management of Livestock (SHC)

Onboard Management of Livestock (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Bedding management (1.7.4)	Exist (scrutiny required)	Exists (more required, see long haul cattle for issues)	Some contention	Low	Potentially high	Low (except for those voyages of longer duration)
Animal care and observation (1.7.5)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Treatment of sick and/or injured animals	Exist	Exist (mostly adequate. See table)	Consensus	Low	Potentially high	Low
Daily meetings (1.7.6)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low
Daily reporting (1.7.6)	Exist	Lacking (as a support tool for R&D)	Consensus	Low	Potentially high	Low
End of voyage reporting (1.7.6)	Exist	Lacking (as a support tool for R&D)	Some contention	Low	Potentially high	Low
Contingency planning (1.7.7)	Exist	Lacking (much more detail required)	Consensus	Low	Potentially high	Medium
Incident notification (1.7.8)	Exist	Not required (operational issue)	Consensus	Low	Potentially high	Low (already under investigation)

1.9.7 Outcomes (SHC)

The following headings apply to outcomes of the live cattle export process (short haul).

Table 1.9.7: Outcomes (SHC)

Outcomes (Short Haul Cattle)						
Current Practice	Industry guidelines	Industry specific scientific support	Industry consensus	Impact on operational procedures	Affect on welfare outcome	R&D priority
Voyage mortality (1.8.1)	Exist	Exists	Some contention	Low	Potentially high	Low
Feed intake and weight gain (1.8.2)	Do not exist	Lacking (as an outcome measure)	Consensus	Low	Potentially high	High
Incidence of clinical disease (1.8.3)	Do not exist	Lacking (as an outcome measure)	Consensus	Low	Potentially high	Low
Occupational Health and Safety (1.8.6)	Do not exist	Lacking (operational issue)	Consensus	Low	Potentially high	Low