

Quarantine Pathways — Barrier Selection Report

1. Introduction

This document provides additional information in support of Chapter 12 of the EIS/ERMP, Quarantine – Risks and Management. It provides details of the barriers that are proposed to meet the standards for acceptable risk on three priority pathways. The priority pathways were nominated by the Quarantine Expert Panel as presenting the greatest management challenge for meeting standards for acceptable risk, based on the results of risk assessment, expert opinion and community consultation. The three priority pathways are:

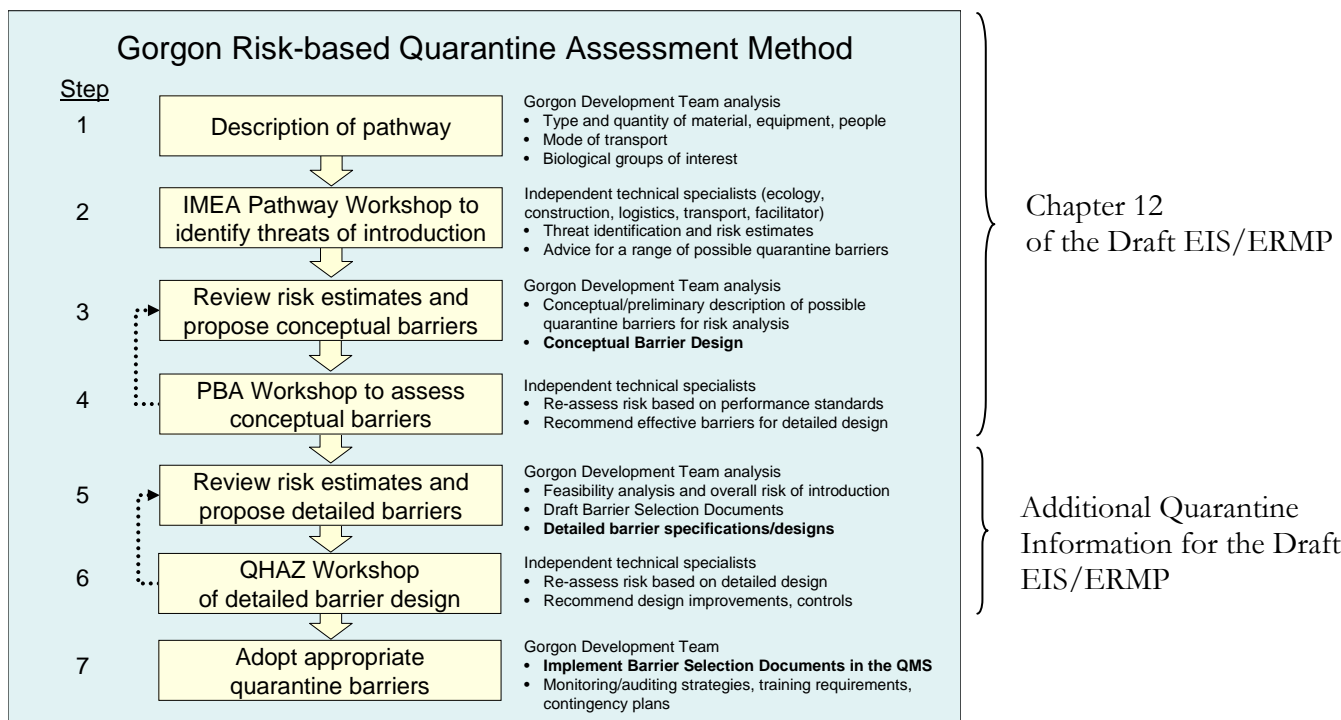
1. Food and perishables;
2. Personnel and accompanying luggage; and
3. Sand and aggregate.

The development of quarantine barriers on other pathways is proceeding, using exactly the same assessment process to develop barriers which will meet the standards for acceptable risk.

The barrier details presented here and assessed by independent technical specialists in Quarantine Hazard Analysis (QHAZ) workshops demonstrates how quarantine will be managed on three priority pathways. The same risk-based assessment method will be used to develop quarantine barriers to meet the standards for acceptable risk on all other pathways for equipment and materials to be transported to Barrow Island.

Chapter 12 of the Draft EIS/ERMP is incorporated herein by reference. The information developed for the three priority pathways had progressed through Step 4 of the seven step risk assessment method at the time of preparation of the Draft EIS/ERMP, as shown in Figure 1. Since the publication of the Draft EIS/ERMP, barriers that were under consideration at a conceptual level have been subject to a barrier selection process (Step 5) and a proposed set of barriers for each of the priority pathways have undergone a quarantine hazard (QHAZ) analysis (Step 6) with independent technical specialists (Box 1). The risk assessment relies on the expert judgement of recognised specialists recommended to the Joint Venturers by the Quarantine Expert Panel.

Figure 1: Step-by-step Flowchart of the Quarantine Risk Assessment Method (reproduced from Figure 12-3 of the Draft EIS/ERMP).



Box 1: Independent technical specialists who have participated in QHAZ workshops, and scored the likelihood of introduction for the three priority pathways.

Food and perishables pathway QHAZ workshop (29-30 June 2005)

Andrew Burbidge, Conservation Biologist
Peter Davis, WA Department of Agriculture
Mike Grimm, WA Department of Agriculture
Darryl Hardie, WA Department of Agriculture
John Scott, CSIRO Entomology

Personnel and accompanying luggage pathway QHAZ workshop (19-20 July 2005)

Andrew Burbidge, Conservation Biologist
Paul Doughty, WA Museum
Darryl Hardie, WA Department of Agriculture
Vicki Long, Astron Environmental Plant Ecologist
John Scott, CSIRO Entomology

Sand and aggregate pathway QHAZ workshop (22-23 September 2005)

Peter Davis, WA Department of Agriculture
Paul Doughty, WA Museum
Sandy Lloyd, WA Department of Agriculture
Vicki Long, Astron Environmental Plant Ecologist
Jonathan Majer, Curtin University, Environmental Biology

Personnel and accompanying luggage QHAZ workshop (29 September 2005)

Darryl Hardie, WA Department of Agriculture
Vicki Long, Astron Environmental Plant Ecologist
John Scott, CSIRO Entomology

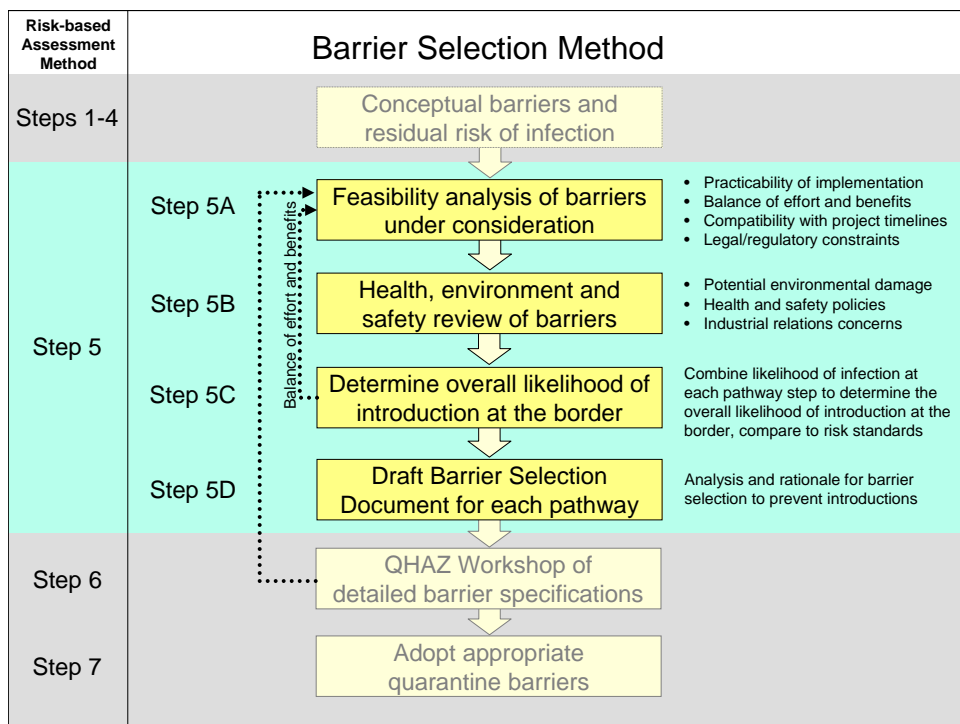
The barrier selection process has been used to analyse the feasibility of implementing conceptual barriers that have been suggested by specialists or otherwise identified by the Joint Venturers in discussion with a range of subject experts. Benchmarking of quarantine practices used elsewhere, and conceptual barriers evaluated in the barrier selection process are presented in Technical Appendices D5 and D10, respectively, of the Draft EIS/ERMP. Details of the barrier selection method are shown in Figure 2.

The quarantine risk assessment method is used to identify threats of introduction, develop appropriate quarantine barriers, and ‘test’ the expected effectiveness of the proposed barriers on each pathway using expert judgement. The term ‘introduction’ means the arrival of non-indigenous species into the native environment of Barrow Island. Introduction into the native environment is an outcome of ‘infection’ at steps along a pathway. The term ‘infection’ refers to the contamination of cargoes, vessels or personnel at any step in a pathway by non-indigenous species.

A qualitative scoring approach is used by independent specialists to evaluate the effectiveness of quarantine barriers, expressed as a likelihood that the personnel or goods being sourced and transported to Barrow Island are infected with living organisms. Expertise is used to make these judgements about vertebrates, invertebrates and plants. The threat of micro-organism introductions is treated separately under the advice of the Quarantine Expert Panel (refer to Technical Appendices D8 and D9 of the Draft EIS/ERMP).

The quarantine risk assessment and barrier selection methods are iterative processes, shown by the dotted lines in Figures 1 and 2. These iterations in the methods have already been exercised by the Joint Venturers in developing proposed quarantine barriers to meet the standards for acceptable risk. As experience and knowledge is gained during the planning and implementation of quarantine barriers, the Joint Venturers will be able to use this information to reconsider the specifications and risk reduction benefits of the barriers that are selected to manage quarantine on each pathway. Quarantine barriers will be refined accordingly under the Quarantine Management System (QMS) commitment for continuous improvement.

Figure 2: Quarantine Barrier Selection Method
(reproduced from Figure 12-5 of the Draft EIS/ERMP).



The description of each pathway includes information on the nature and composition of cargoes to be transported to Barrow Island. An overview of each pathway is presented at the start of each quarantine risk assessment workshop, to outline the quantity and frequency of personnel and cargo movements which are proposed.

Quarantine barriers proposed for consideration in the QHAZ workshops are presented in two groups: systematic barriers and pathway-specific barriers. The systematic barriers reflect elements of the QMS which are proposed independently of any specific pathway step, and often apply more generally to a number of pathways. The systematic barriers inform QHAZ workshops of the elements of the QMS that are relevant to the pathway being assessed. Examples of systematic barriers following the required elements of an ISO 14001-based QMS are:

- Inclusion of quarantine requirements in pre-qualification of suppliers and contractors;
- Inclusion of quarantine requirements in contracts for all contractors and suppliers providing goods and services for Barrow Island;
- Induction of all personnel (staff, contractors and suppliers) in quarantine management requirements;
- Provision of specific quarantine training to personnel in the procurement and logistics supply chain;
- Inclusion of quarantine responsibilities in the position description for key personnel;
- Development and support of a strong culture of quarantine awareness in the workforce;
- Quarantine compliance for all personnel and goods going to Barrow Island will be recorded and tracked; and
- Conduct regular quarantine compliance audits and checks throughout the supply chain.

Pathway-specific barriers are identified for detailed consideration in QHAZ workshops. These are numbered in the barrier description documents and are assessed by workshop participants. The following sections of this document describe the assessment of proposed barriers for the three priority pathways, and residual risk of introduction on each pathway.

This additional information document is a report of progress through Steps 5 and 6 of the risk assessment method presented in Figure 1. For each of the priority pathways, the risk of introduction has been reduced to a score of '1' to '3', addressing the community expectations for acceptable risk (Technical Appendix D3 of the Draft EIS/ERMP).

The Joint Venturers' standards for acceptable risk take the community expectations into account. Where an introduction score of '1' cannot be achieved, these standards require that advice is to be sought from technical experts to see if there are other feasible barriers which could reduce the risk of introduction any further. This has been demonstrated on all three of the priority pathways.

2. Food and perishables

The supply of food and perishables to Barrow Island involves the following pathway steps:

1. Supplier preparation and packaging;
2. Transport to a Mainland Consolidation Depot;
3. Mainland Consolidation Depot where food and perishables are processed and packed for shipment in sealed, refrigerated containers;
4. Truck transport of sealed containers to a mainland marine loading facility;
5. Mainland marine loading facility, where sealed containers are loaded onto marine vessels;
6. Marine vessel transport of sealed containers to Barrow Island;
7. Arrival at the Barrow Island Materials Offloading Facility (MOF);
8. Truck transport of sealed containers to the Barrow Island Kitchen Facility; and
9. Kitchen Facility, functioning as a containment facility for food and perishables, including
 - Unloading of sealed containers and food storage;
 - Serving of food in the Kitchen Facility dining room;
 - Preparation of 'crib' lunches;
 - Solid waste and packaging removal to mainland for disposal; and
 - Liquid waste management.

Based upon advice from technical specialists in previous infection modes and effects analysis (IMEA) and pathway barrier analysis (PBA) workshops, two pathway steps were singled out where appropriate quarantine barriers could be applied to reduce the likelihood of introduction on the overall pathway:

- Mainland Consolidation Depot (pathway step 3), where food and perishables will be processed and packed for shipment in sealed, refrigerated containers; and
- Kitchen Facility at the Barrow Island Camp (pathway step 9), where sealed containers will be unpacked, and where food will be prepared and served to personnel in a containment facility.

These two pathway steps were the subject of a detailed QHAZ assessment. Proposed barriers at these two steps were expected to reduce significantly the likelihood of introduction, per advice from technical specialists in six previous IMEA and PBA workshops for this pathway. Notwithstanding the importance of the barriers proposed at these two pathway steps, additional systematic quarantine barriers which will further reduce the risk of introduction will be applied at all other steps in the pathway. Both the pathway-specific barriers and the systematic barriers are described in Technical Appendix 1 for reference.

2.1 Proposed quarantine barriers

The proposed quarantine barriers on the food and perishables pathway which were subject to QHAZ assessment are summarised in Table 1. These pathway-specific barriers are focused on the two pathway steps where significant reduction in the likelihood of infection could occur. Detailed descriptions of the barriers are presented in Technical Appendix 1.

Table 1. Pathway-specific quarantine barriers assessed for food and perishables.

Pathway step	Design element of the pathway step where quarantine barriers are applied	Barriers subject to QHAZ
Mainland Consolidation Depot	Air flow in and out of the building	Air curtains Air filtration Receiving bay for chilled containers Sealed depot (building)
	Entry/exit of personnel	Induction and training Air curtains on entry/exit points Overalls and covered footwear
	Re-packaging of dry goods	Unpacking Trained visual inspection Re-packaging Chilled storage
	Pre-processing of fresh produce	Unpacking Trained visual inspection Dry brushing, washing, peeling, topping/ tailing/coring vegetables Blanching vegetables Vacuum sealing vegetables Re-packaging Chilled storage
	Re-packaging of frozen and chilled produce	Unpacking Trained visual inspection Re-packaging Chilled storage
	Consolidation in chiller containers	Chilled containers Sealed containers
	Waste management	Separation of waste Sealed containers
Kitchen Facility	Air flow in and out of the building	Air curtains Air filtration Receiving bay for chilled containers Sealed depot (building)
	Entry/exit of personnel	Induction and training Air curtains on entry/exit points Overalls and covered footwear (kitchen personnel)
	Food handling	Delivery of containers Food processing Food delivery to dining areas
	Waste management	Separation of waste water Food waste processing Packaging disposal Recyclable processing Kitchen laundry processing

The proposed Kitchen Facility design will incorporate the features that can be scaled up to a facility that accommodates the full workforce.

2.2 Risk assessment of barriers on individual pathway steps

Food and perishable cargoes are sealed in freezer/chiller containers at the Mainland Consolidation Depot for transport to Barrow Island by road and barge. It was the view of workshop participants that these sealed containers would prevent the escape of organisms remaining in food and perishables that had not been removed during processing in the consolidation depot (or at the supplier's facilities). It was also recommended to use rodenticide inside packed, sealed containers to poison any rodents which might be accidentally encapsulated in shipments, subject to human food safety requirements.

Containers shipped to Barrow Island remain sealed until they are unpacked into a containment room in the proposed Kitchen Facility at Barrow Island. The Kitchen Facility functions as a containment facility, where organisms are trapped and prevented from exiting the building.

The efficacy of quarantine barriers was considered with respect to subgroups of invertebrates, which represent a vast number of species (comprising perhaps 90 percent of potential organisms which might infect food and perishable cargoes). A suggestion by technical specialists from the Department of Agriculture to consider an array of invertebrate subgroups classified as airborne, crawling, or sedentary, which may be either active or passive, was adopted by the workshop participants. These subgroups (e.g. active airborne, passive airborne) are noted in the risk scores contained in the QHAZ workshop record. Such consideration for invertebrate subgroups was necessary to ensure that barriers proposed at each pathway step are effective for a full range of invertebrate species.

Based on the results of the QHAZ assessment, and considering the recommendations proposed by workshop participants to make the proposed barriers meet their design intention, a likelihood of infection (or 'risk' using likelihood as a proxy for risk) was estimated for each of these two pathway steps. It is important to note that in this QHAZ, each pathway step was assessed and scored independently.

A graphical representation of the two pathway steps, showing the likelihood of infection for the barriers at each step, is presented in Figure 3. The risk posed by sealed containers from the Mainland Consolidation Depot is further reduced by the risk posed by food and perishables processed and contained in the Kitchen Facility.

By way of explanation, referring to Figure 3, the likelihood of infection following the implementation of barriers at the Mainland Consolidation Depot is scored '2' for vertebrates. However, if a vertebrate organism did survive the barrier treatments in the Mainland Consolidation Depot (even though the likelihood is low), some of the potential routes of escape relevant to the Kitchen Facility (eg escape through air handling systems) would not be so secure. On the other hand, while the barriers at the Mainland Consolidation Depot are not greatly effective at eliminating plants and propagules, the barriers at the Kitchen Facility are very effective, reducing the likelihood of infection (or escape from the facility) to a score of '1' to '3'.

Liquid waste treatment from the Kitchen Facility has not yet been designed, and is the subject of future QHAZ analysis. However, the likelihood of infection through liquid waste, which is treated in a waste water treatment plant, is expected to be very low.

The likelihood of infection at each pathway step (Figure 3) is summarised in Table 2 for each broad biological group, estimated by the QHAZ workshop participants for the barriers at that step. In the case of the Kitchen Facility, the possible escape routes of organisms from the facility have been identified. The likelihoods of infection shown in Table 2 have been estimated by workshop participants subject to consideration of the recommended risk treatment measures noted in the QHAZ workshop record (Appendix 1). Table 2 shows that the risk of infection is reduced to scores of '1' to '3' on at least one of the two independent pathway steps.

Table 2. Likelihood of infection at the two pathway steps assessed in the QHAZ of food and perishables.

Pathway step	Escape route	Risk of infection (from QHAZ)		
		Invertebrates	Vertebrates	Plants
Mainland Consolidation Depot	Packed, sealed containers	2	2	6
Kitchen Facility	Air handling systems	1-2	4-5	2-3
	Personnel entry/exit	2-3	4-5	2-3
	Processed food to crib rooms	1-2	1	1-2
	Leakage from sealed building	2	4-5	1
	Solid waste to mainland	1-2	1-2	1-2

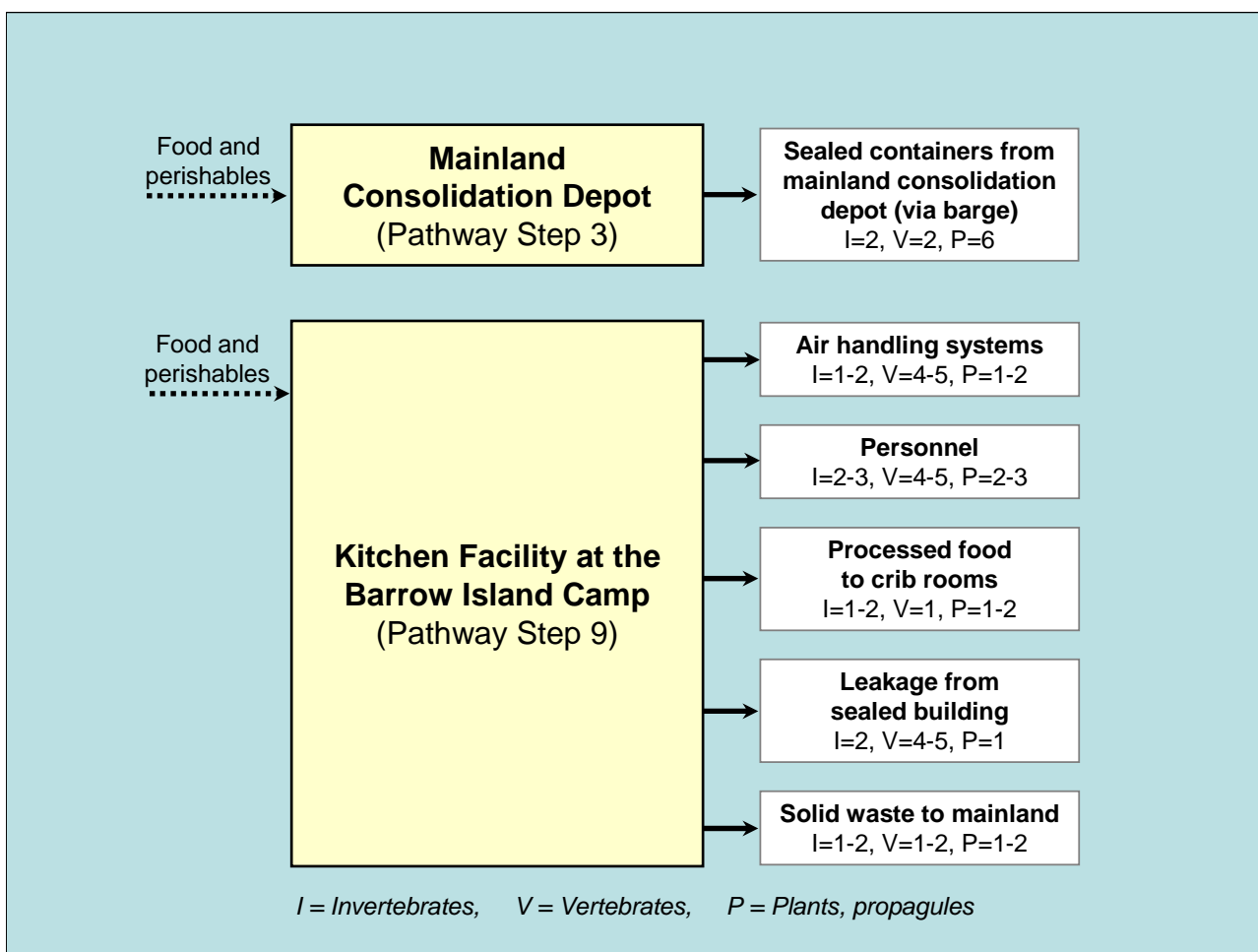


Figure 3. Likelihood of infection on pathway steps assessed in the QHAZ.

2.3 Residual risk of introduction on the overall pathway

The overall likelihood of introduction (or ‘risk of introduction’) for the pathway is derived from the scores shown in Figure 3 (and Table 2). The packing of food into sealed containers between these two steps means that whatever likelihood of infection exists in the container when it is packed cannot be any higher than the likelihood of infection on subsequent steps. For the Mainland Consolidation Depot (pathway step 3), the likelihood of infection for invertebrates and vertebrates is very low. However, the workshop participants advised that it is not possible to reduce the likelihood of infection for plants below a score of 6. Therefore, the residual risk of introduction on the overall pathway cannot be higher than ‘2’ for invertebrates, ‘2’ for vertebrates, and ‘6’ for plants, based on the scores for food which is protected from further infection in sealed containers.

The sealed containers transported to Barrow Island are opened and unpacked into a Kitchen Facility, which functions as a containment facility and incorporates the barriers assessed in pathway step 9. The likelihood of infection beyond the Kitchen Facility has been assessed independently of the Mainland Consolidation Depot. The potential ways in which organisms can escape the containment features of the Kitchen Facility have been identified and scored by QHAZ workshop participants. In the case of plants and plant propagules (e.g. seeds) arriving inside the sealed containers, it was found that the Kitchen Facility reduced the likelihood of infection (through escape) to scores not exceeding 2-3.

Therefore, the residual likelihood of introduction for the overall pathway is constrained by the low likelihood of invertebrates and vertebrates in sealed containers (pathway step 3), and the low likelihood of the escape of plants and propagules from the containment barriers in the Kitchen Facility (pathway step 9). The residual risk scores are presented in Table 4, showing that the overall risk of introduction score is '2' to '3'.

Table 4. Residual likelihood of introduction for the overall food and perishables pathway.

	Residual risk of introduction		
	Invertebrates	Vertebrates	Plants
Overall pathway (constrained by infection scores at each step)	2	2	2-3

Workshop participants advised that the likelihood of infection at the two pathway steps considered in the QHAZ could not be further reduced for this pathway. Therefore, the residual risk of introduction appears to be limited to the scores for invertebrates, vertebrates and plants shown in Table 4.

3. Personnel and accompanying luggage

The personnel and accompanying luggage pathway involves the following pathway steps:

1. Recruitment and training of personnel prior to travel;
2. Preparation for travel to Barrow Island, prior to arrival at airport;
3. Airport arrival and check-in;
4. Transfer to Barrow Island in fixed-wing aircraft;
5. Barrow Island Airport arrival and transfer to Construction Village; and
6. Construction Village facilities.

These pathway steps were the subject of a detailed QHAZ assessment. The barriers proposed for this pathway were expected to reduce significantly the likelihood of introduction, per advice from technical specialists in three previous IMEA and PBA workshops for this pathway. Both the pathway-specific barriers and the systematic barriers are described in Technical Appendix 2 for reference. The term ‘Accommodation Camp’ in Technical Appendix 2 refers to the Construction Village at steps 5 and 6 of the pathway.

3.1 Proposed quarantine barriers

The proposed quarantine barriers on the personnel and luggage pathway which were subject to QHAZ assessment are summarised in Table 5. Detailed descriptions of the barriers are presented in Technical Appendix 2.

Table 5. Pathway-specific quarantine barriers assessed for personnel and luggage.

Pathway step	Type of system or activity associated with the pathway step	Barriers subject to QHAZ
1. Recruitment and training of personnel	Pre-start requirements	Employment agreement Quarantine induction and refresher training Feedback to improve training programs Reinforcement of quarantine culture
2. Personal preparation for travel to Barrow Island	Verification of training	Project Induction Card
	Work clothing and luggage	Cleaning and inspection (zero tolerance) Guidelines for luggage, clothing and footwear Cleaning facilities at airport
	Air crew and airport personnel training	Quarantine induction and refresher training Feedback to improve training programs
3. Airport processing	Verification of compliance	Cleaning facilities (prior to check-in) X-ray and visual inspection Quarantine compliance seal Training of x-ray operators Quarantine trained sniffer dogs Signed declaration of compliance Personnel required to carry identification
	Check-in of personnel and luggage	Inspection of quarantine seals, Project Induction Card, personal identification, and signed declaration of compliance Personnel and carry-on luggage held in a project transit lounge

Table 5. Pathway-specific quarantine barriers assessed for personnel and luggage (concluded).

Pathway step	Type of system or activity associated with the pathway step	Barriers subject to QHAZ
4. Transfer of personnel and luggage to Barrow Island (fixed wing aircraft)	Verification of compliance	Barrow Island boarding pass Inspection of carry-on luggage Prohibited list of items and amnesty bins
	Aircraft	Visual inspection checklist Cleaning of aircraft prior to acceptance Daily cleaning of cabin Scheduled treatment and cleaning of aircraft, monitoring for organisms Amnesty bins at aircraft exits Waste double-bagged and returned to mainland
5. Barrow Island Airport and transfer of personnel and luggage to Construction Village	Verification of compliance	Random visual inspections Checking of luggage seals Sealed quarantine inspection room
	Personnel and luggage	Transfer directly to Camp in transit vehicles, enclosed trailers for luggage Transit passengers and air crews remain contained within Barrow Island Airport for connecting flights
6. Construction Village	Camp facilities	Camp to be free of vegetation Baiting and trapping program, including closets of accommodation units where personal belongings are stored Personnel contained within the Camp and Development Site
	Field personnel preparation to work in undisturbed areas (e.g. surveys, pipelines)	Field clothing and footwear to meet quarantine specifications Vigorous inspection and cleaning prior to field work and upon return to Camp Job Hazard Analysis (JHA) to include quarantine hazards, mitigation procedures Equipment subject to strict quarantine specifications Flora surveys required at locations where field work to be performed (with attention to any existing introduced plants to prevent translocation)

Barriers will be applied to all components of the development proposal.

3.2 Risk assessment of barriers on individual pathway steps

Personnel travelling to Barrow Island are subject to a number of barriers which instil and reinforce a very high level of quarantine awareness. This will begin with the recruitment and selection of all personnel that will work on the Island, and continue through a very thorough quarantine induction and refresher training program. A strong motivation for quarantine compliance will be a ‘zero tolerance’ policy at the airport when personnel are presenting themselves and their luggage for visual and x-ray inspections. Personnel who do not meet quarantine requirements will not be issued with a boarding pass for the flight to Barrow Island until they comply. Further compliance checking after airport check-in will result in corrective action being taken.

A departure lounge for Barrow Island passengers will be established, to segregate Barrow Island personnel from travellers to other destinations not under quarantine control. This will prevent the threat of cross-contamination or accidental exposure to small organisms (e.g. seeds, invertebrates) which may be present in public areas of the airport, which were identified as potential sources of infection.

Upon arrival of passenger flights at Barrow Island Airport, quarantine safeguards on the personnel and luggage pathway extend to the Airport, Construction Village and project development site. These are areas which will be cleared of all vegetation and will be subject to chemical treatment and baiting/trapping of organisms. QHAZ workshop participants noted that the likelihood of infection due to small organisms would be largely contained or reduced in the Camp facilities.

Based on the results of the QHAZ assessment, and considering all of the recommendations proposed by workshop participants to make the proposed barriers meet their design intention, a likelihood of infection (or 'risk of infection' using likelihood as a proxy for risk) was estimated at each step in the pathway. The QHAZ participants expressed the view that it would be convenient in this case to score the likelihood of infection at each pathway step, taking into account all of the barriers proposed at the subject pathway step and previous pathway steps.

A graphical representation of the pathway steps, showing the likelihood of infection, is presented in Figure 4. The figure shows that the likelihood of infection following airport check-in and processing of people (score following step 3) is carried through the subsequent steps of transfer to Barrow Island (step 4) and transfer to the Camp (step 5). The barriers at the Construction Village (step 6) were judged to further reduce the likelihood of infection for invertebrates and plants.

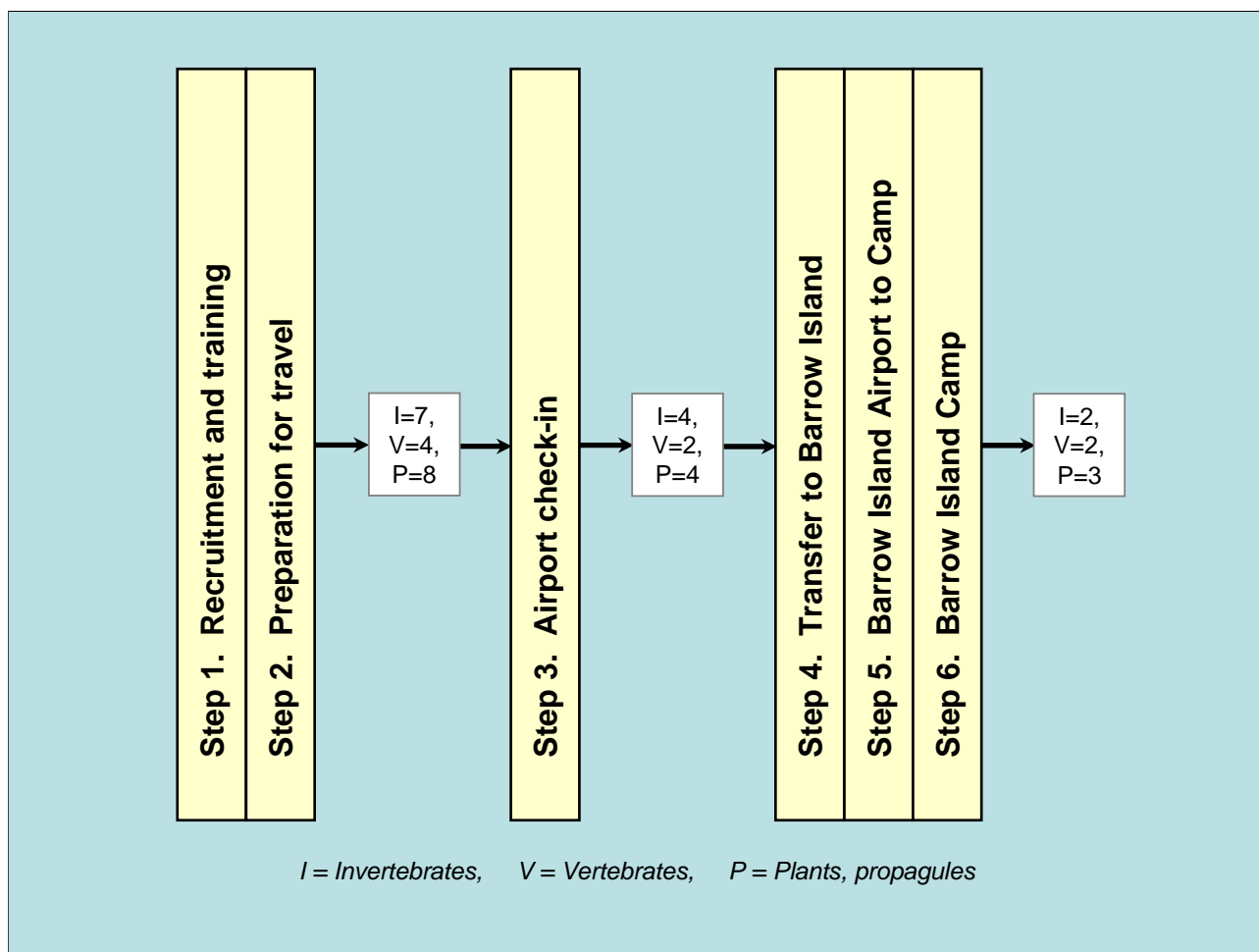


Figure 4. Likelihood of infection on pathway steps considered in the QHAZ.

3.3 Residual risk of introduction on the overall pathway

The likelihood of infection at each pathway step (Figure 4) is summarised in Table 6 for each broad biological group, estimated by the QHAZ workshop participants for the barriers at that step. The scores for each pathway step take into account all of the barriers on previous pathway steps. The likelihoods of infection shown in Table 6 have been estimated by workshop participants subject to consideration of the recommended risk treatment measures noted in the QHAZ workshop record (Appendix 2). Table 6 shows that the likelihood of infection score is '2' to '3' at the end of the pathway (step 6).

Table 6. Likelihood of infection at each step assessed in the QHAZ of personnel and luggage.

Pathway step	Risk of infection (from QHAZ)		
	Invertebrates	Vertebrates	Plants
1. Recruitment and training prior to travel	<i>(infection scores not relevant at this step)</i>		
2. Preparation for travel	7	4	8
3. Airport arrival, check-in and processing	4	2	4
4. Transfer to Barrow Island (by aircraft)	4	2	4
5. Barrow Island Airport and transfer to Construction Village	4	2	4
6. Barrow Island Construction Village	2	2	3

The overall likelihood of introduction (or 'risk of introduction') for the pathway, when the scores at each step take into account all of the barriers of previous steps, is therefore the likelihood of infection at the last pathway step. The infection scores show that the likelihood of infection due to invertebrates and plants upon arrival of personnel and luggage at the Barrow Island Airport (pathway step 5) is further reduced with the barriers considered at the Construction Village (pathway step 6). The overall likelihood of introduction for the pathway is shown in Table 7. The risk of introduction on this pathway is reduced to scores of '2' to '3'.

Table 7. Residual likelihood of introduction for the overall personnel and luggage pathway.

	Residual risk of introduction		
	Invertebrates	Vertebrates	Plants
Overall pathway (considering infection scores at the last pathway step)	2	2	3

The residual risk of introduction has been reduced to very low levels for the proposed set of barriers analysed in the QHAZ. Small invertebrates and seeds are difficult to eliminate from the personnel and luggage pathway, even with recommendations for a wide range of quarantine barriers that have been proposed for consideration. These small organisms will be difficult to eliminate entirely from luggage, and to some extent from people themselves (particularly the commensal organisms). The control of quarantine at the proposed Construction Village will enable the Joint Venturers to largely contain and eliminate the small organisms that arrive in luggage, based on QHAZ recommendations to install pest strips and other forms of traps in the accommodation units where personal items and luggage will be stored (refer to Barrier 29 in Table 1, at the end of Technical Appendix 2). Seeds which may be dislodged from personal items and luggage will also be contained and eliminated in the housekeeping of the accommodation units. As a result, the likelihood of introduction for invertebrates and plants is reduced to scores of 2 and 3, respectively.

In the case of vertebrates, workshop participants judged the likelihood of infection to be very low. In the unlikely event of the infection of luggage with invertebrates, the control of quarantine at the Camp is expected to further reduce the likelihood of introduction.

Workshop participants advised that the likelihood of introduction as a result of the barriers considered in the QHAZ could not be further reduced for this pathway. Therefore, the residual risk of introduction appears to be limited to the scores for invertebrates, vertebrates and plants shown in Table 7.

The workshop participants summarised the findings of the QHAZ for personnel and luggage:

Noting:

- *the barriers proposed for the personnel and luggage pathway;*
- *the comprehensive training and awareness programs;*
- *rigorous inspection and detection processes at the mainland airport; and*
- *control and containment of personnel and luggage within defined areas on Barrow Island, which are monitored and devoid of vegetation;*

the likelihood of the movement of personnel and luggage leading to an incursion of vertebrates, invertebrates or plants to Barrow Island is low.

4. Sand and aggregate

The sand and aggregate pathway involves the following pathway steps:

1. Quarry, stockpile and surrounds;
2. Loading and truck transport to the mainland wharf;
3. Mainland wharf and barge loading;
4. Barge transport to Barrow Island;
5. Arrival and unloading at the Barrow Island Materials Offloading Facility (MOF);
6. Concrete batch plant on the Gorgon Project development site; and
7. Utilisation in construction as concrete.

These pathway steps were the subject of a detailed QHAZ assessment. The barriers proposed for this pathway were expected to reduce significantly the likelihood of introduction, per advice from technical specialists in three previous IMEA and PBA workshops for this pathway. Both the pathway-specific barriers and the systematic barriers are described in Technical Appendix 3 for reference.

4.1 Proposed quarantine barriers

The proposed quarantine barriers on the sand and aggregate pathway which were subject to QHAZ assessment are summarised in Table 8. Detailed descriptions of the barriers are presented in Technical Appendix 3.

An important aspect of the sand and aggregate pathway is that the sand and aggregate to be imported to Barrow Island will be used only for making concrete. Other materials (e.g. road base, backfill) will be sourced from Barrow Island, such as the rock generated from cut and fill operations on the proposed gas plant construction site. Barges proposed for transporting sand and aggregate are ‘dumb barges’, which do not have accommodation spaces or propulsion equipment on board the vessels. Marine vessels, including barges, are the subject of separate pathway assessments to prevent the introduction of terrestrial and marine organisms. Notwithstanding the barriers that will be developed for marine vessels, the inherent simplicity of dumb barges does not present a significant threat of cross-contamination of the sand and aggregate cargoes, since there are few places for vertebrates or invertebrates to hide, and no food on the vessels that would attract organisms.

Table 8. Pathway-specific quarantine barriers assessed for sand and aggregate.

Pathway step	Type of system or activity associated with the pathway step	Barriers subject to QHAZ
1. Quarry, stockpile and surrounds	Quarry operators	Prequalification of suppliers and quarries Site selection criteria incorporating quarantine requirements Sampling of soil and rock to meet specifications
	Workforce training and awareness	Quarantine induction and refresher training for all personnel
	Quarry management	Perimeter fence and gate, shade cloth Removal of all vegetation in the development area Stockpiles to be sized in barge-load batches (approx 3,000 tonnes each), encapsulated in a secure storage system Application of insecticides, baits and traps for vertebrates and invertebrates Cleaning of quarry equipment, subject to verification prior to use Diversion of storm water runoff

Table 8. Pathway-specific quarantine barriers assessed for sand and aggregate (continued).

Pathway step	Type of system or activity associated with the pathway step	Barriers subject to QHAZ
2. Loading and truck transport to the mainland wharf	Trucking suppliers	Prequalification of transport suppliers Quarantine awareness training and refresher training Truck fleet dedicated to each trucking campaign Cleaning of transport vehicles, inspection checklist Loading during daylight hours End tipper trucks with integrated tarpaulins (treated) Establish designated transport route (develop contingency plans for breakdowns)
3. Mainland wharf and barge loading	Wharf facilities	Designated wharf, fenced perimeter Equipment dedicated to Barrow Island supply chain Equipment cleaned and verified prior entry to wharf facility, daily wash down, checklist
	Truck unloading at wharf laydown area	Stockpiles to be sized in barge-load batches (approx 3,000 tonnes each), encapsulated in a secure storage system Application of insecticides, baits and traps for vertebrates and invertebrates Security lighting to be of low attraction to invertebrates
	Barge loading	Destruction/scarring of invertebrates and plant seeds in a high energy vibrating hopper during barge loading Treatment with insecticide at loading point onto barge Personnel to be trained to recognise non-compliance situations and will be empowered to stop operation if necessary
4. Barge transport to Barrow Island	Barge vessels	Compliance with quarantine barriers for marine vessels to prevent cross-contamination of cargoes to Barrow Island
5. Arrival and unloading at the Barrow Island MOF	Barge vessels	Verification of compliance prior to obtaining clearance to berth at the MOF
	Truck transport	End tipper trucks with integrated tarpaulins (treated)
6. Concrete batch plant on the Gorgon Project development site	Batch plant laydown area	Stockpiles to be sized in barge-load batches (approx 3,000 tonnes each), encapsulated in a secure storage system Buffer distance between stockpiles and the perimeter of the cleared development site Application of insecticides, baits and traps for vertebrates and invertebrates Contingency plans for extreme weather

Table 8. Pathway-specific quarantine barriers assessed for sand and aggregate (concluded).

7. Utilisation in construction as concrete	Batch plant operations	<p>Inspection of sand and aggregate at point of use, and immediate chemical treatment if necessary</p> <p>Mixing with cement and encapsulated in concrete</p> <p>Personnel to be trained to recognise non-compliance situations and will be empowered to stop operation if necessary</p>
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4.2 Risk assessment of barriers on individual pathway steps

Sand and aggregate will be sourced from a quarry which has been pre-qualified and tested to produce material virtually free of organic material when it is quarried, using a regime of quarantine barriers to prevent the contamination of the quarried material with invertebrates and windblown seeds.

Once the material is quarried, it will be graded and encapsulated in secure storage systems, which are designed to keep out moisture and will be treated with insecticide to prevent the infiltration of crawling invertebrates. Similarly, covered trucks and secure storage systems are used at the wharf laydown area, along with other barriers to prevent the infection of the cargo with vertebrates and invertebrates. Based on advice from QHAZ participants, the relatively small number of seeds which may be encapsulated in the storage system would be soft skin, light weight windblown seeds from the areas surrounding the quarry.

At the wharf, the stockpiles will be loaded into barges via a high energy vibrating hopper (at about 400 tonnes per hour, or about one tonne every ten seconds). The mechanical friction of sand and aggregate grains being tumbled and crushed through the hopper is almost certainly expected to destroy vertebrates and invertebrates. There may be some seeds which pass through the hopper without losing their viability. However, even if viable, any taxonomic features which assist in the wind blown mobility of seeds are likely to be destroyed. Any seeds remaining in the cargo are mixed into the material, and even those remaining near the surface are not as likely to be re-suspended by wind. As a precaution, it is proposed to treat the cargo with insecticide at the point of loading, and cover the entire barge load with treated tarpaulins.

Covered trucks and a secure storage system will be used to store sand and aggregate within a cleared laydown area at the concrete batch plant, with a buffer zone between the covered stockpiles and the perimeter of the development site. Any remaining organisms contained within the storage system are ultimately encapsulated in concrete.

Based on the results of the QHAZ assessment, and considering the recommendations proposed by workshop participants to make the proposed barriers meet their design intention, a likelihood of infection (or ‘risk of infection’ using likelihood as a proxy for risk) was estimated at each step in the pathway. The QHAZ participants expressed the view that it would be convenient in this case to score the likelihood of infection at each pathway step, taking into account all of the barriers proposed at the subject pathway step and previous pathway steps.

A graphical representation of the pathway steps, showing the likelihood of infection, is presented in Figure 5. The figure shows that the likelihood of infection starts out very low at a quarry which has undergone a rigorous pre-qualification and selection process, and which is subject to a range of barriers which prevent the infection of quarried rock and sand. The primary objective of the barriers at subsequent steps is to preserve the low incidence of organisms in the quarried sand and aggregate by preventing infection of the material as it is transported along the pathway. The likelihood of infection due to vertebrates reduced to a score of ‘1’ in pathway step 3, following the loading of sand and aggregate onto vessels through a high energy vibrating hopper which is expected to destroy any vertebrates that may be present in the material.

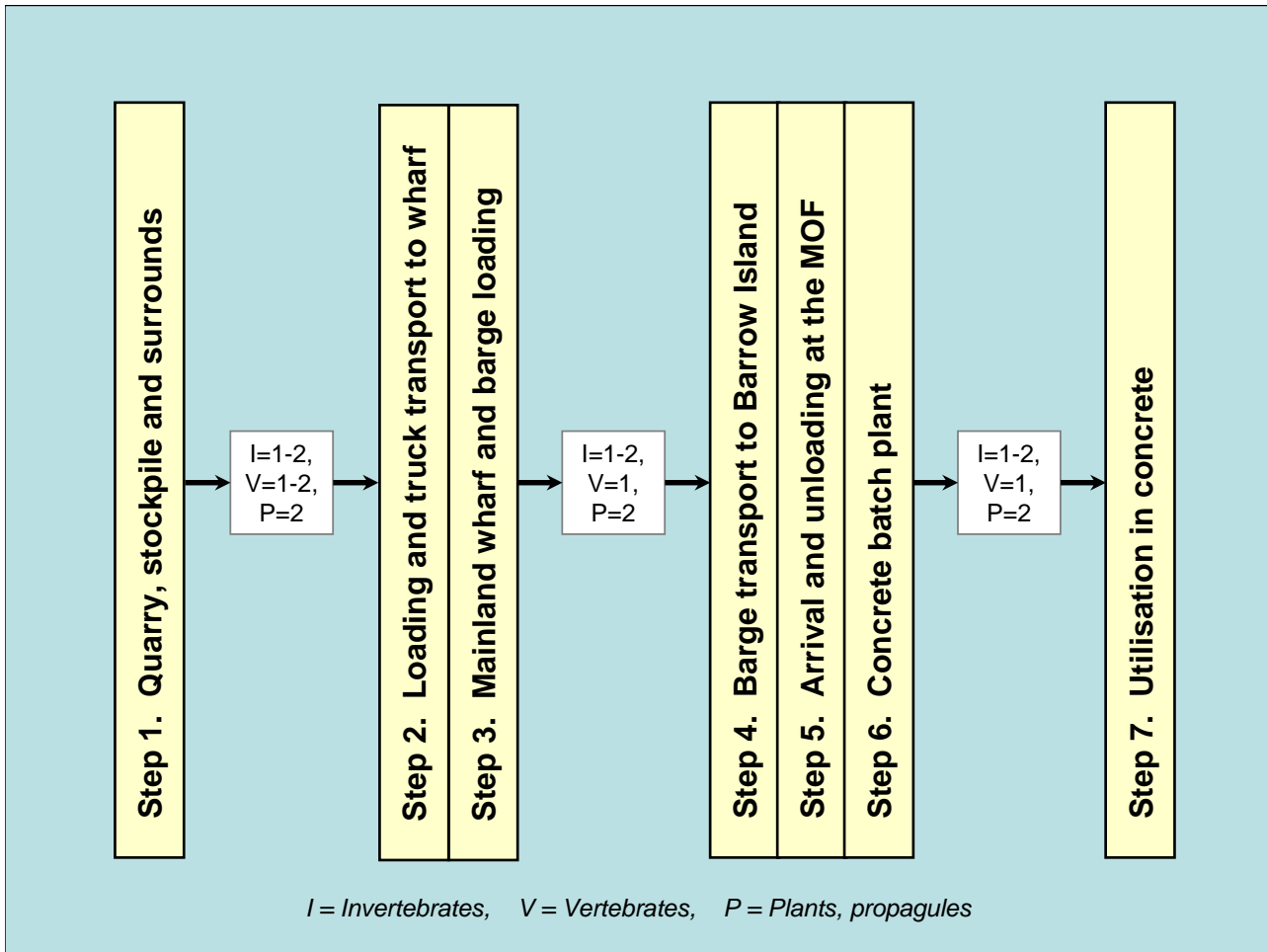


Figure 5. Likelihood of infection on pathway steps considered in the QHAZ.

4.3 Residual risk of introduction on the overall pathway

The likelihood of infection at each pathway step (Figure 5) is summarised in Table 9 for each broad biological group, estimated by the QHAZ workshop participants for the barriers at that step. The scores for each pathway step take into account all of the barriers on previous pathway steps. The likelihoods of infection shown in Table 9 have been estimated by workshop participants subject to consideration of the recommended risk treatment measures noted in the QHAZ workshop record (Appendix 3). Table 9 shows that the likelihood of infection score is '1' to '2' at the end of the pathway (step 6), prior to utilisation of the material in construction.

Table 9. Likelihood of infection at each step assessed in the QHAZ of sand and aggregate.

Pathway step	Risk of infection (from QHAZ)		
	Invertebrates	Vertebrates	Plants
1. Quarry, stockpile and surrounds	1-2	1-2	2
2. Loading and truck transport to the mainland wharf	1-2	1-2	2
3. Mainland wharf and barge loading	1-2	1	2
4. Barge transport to Barrow Island	1-2	1	2
5. Arrival and unloading at the Barrow Island MOF	1-2	1	2
6. Concrete batch plant on the Gorgon Project development site	1-2	1	2
7. Utilisation in construction	<i>(residual organisms largely encapsulated in concrete)</i>		

The residual number of organisms contained in sand and aggregate are ultimately encapsulated in concrete. The overall likelihood of introduction (or ‘risk of introduction’) for the pathway, when the scores at each step take into account all of the barriers of previous steps, is therefore the likelihood of infection at the last pathway step. The infection scores show that once sand and aggregate is sourced from a quarry which is qualified and managed to produce relatively ‘clean’ material (step 1), the barriers proposed on the subsequent steps were judged to be effective at keeping the material free of organisms. The overall likelihood of introduction for the pathway is shown in Table 10. The risk of introduction on this pathway is reduced to scores of ‘1’ to ‘2’.

Table 10. Residual likelihood of introduction for the overall sand and aggregate pathway.

	Residual risk of introduction		
	Invertebrates	Vertebrates	Plants
Overall pathway (considering infection scores at the last pathway step)	1-2	1	2

The residual risk of introduction has been reduced to very low levels for the proposed set of barriers analysed in the QHAZ. Workshop participants advised that the likelihood of introduction as a result of the barriers considered in the QHAZ could not be further reduced for this pathway. Therefore, the residual risk of introduction appears to be limited to the scores for invertebrates, vertebrates and plants shown in Table 10.

The workshop participants summarised the findings of the QHAZ for sand and aggregate:

Noting:

- *the pathway for sand and aggregate;*
- *the final location of the material on Barrow Island, in concrete; and*
- *the barriers to be introduced along the pathway, including monitoring and treatment;*

the likelihood of the movement of sand and aggregate leading to an incursion of vertebrates, invertebrates or plants to Barrow Island is low.

5 Reference to the standards for acceptable risk

The adopted standards for acceptable risk are set out in Chapter 12 of the Draft EIS/ERMP. The residual risk of introduction for invertebrates, vertebrates and plants on the three priority pathways presented in this document (Tables 4, 7 and 10) is low. The risk of introduction is reduced as far as practicable, and approaches community expectations for acceptable risk to prevent establishment (likelihood of introduction score of '1'). Box 2 repeats the Joint Venturers' standards for acceptable quarantine risk to the terrestrial flora and fauna conservation values of Barrow Island.

Box 2: Standards for acceptable quarantine risk to the terrestrial flora and fauna conservation values of Barrow Island (from Box 12-9 in Chapter 12 of the Draft EIS/ERMP).

The Joint Venturers will use the risk assessment process to identify and eliminate significant threats of introduction wherever possible, substitute particular cargoes with alternative goods and materials to reduce the severity of threats, and minimise the volumes of cargoes to reduce the likelihood of introduction.

For threats which cannot be entirely eliminated or reduced, the objective of the Joint Venturers is to meet the community expectations for acceptable risk by implementing quarantine barriers to prevent establishment. The focus of these barriers is on the pre-border prevention of introductions from infected cargoes, personnel and vessels, such that the likelihood of introduction is considered extremely remote and highly unlikely (an overall introduction score of '1'). Quarantine barriers will also include border protection measures on Barrow Island, and post-border monitoring and eradication strategies to prevent establishment.

Where the community expectations for acceptable risk scores cannot be achieved, the Joint Venturers will demonstrate in a transparent manner that:

- Advice has been sought from specialists (ecological and construction) as to whether there are additional quarantine barriers to be considered which would further reduce the likelihood of introduction.
- Barriers adopted to prevent introductions are of a standard which has considered current quarantine practices found elsewhere; and establishes new benchmarks in relation to the pathways under consideration.
- Plans are developed for implementing a surveillance, monitoring and assessment regime to evaluate the performance of the quarantine barriers.

Involvement of technical specialists has enabled the Joint Venturers to consider a range of quarantine practices found elsewhere. There are no practical barriers beyond those proposed which would further reduce the overall likelihood of introduction. Surveillance, monitoring and contingency response plans will be developed under the Terms of Reference of an independent Quarantine Advisory Committee, established in September 2005. The Advisory Committee provides advice to the Joint Venturers on continued development of a world class Quarantine Management System. Quarantine barriers will be subject to performance assessment and continuous improvement.

The proposed quarantine barriers for the three priority pathways described here represent world class performance in quarantine management, and meet the standards for acceptable quarantine risk. All other pathways for the proposed Gorgon Project will be subject to the same high level of assessment and standards for acceptable risk.

Quarantine Pathways — Barrier Selection Report

Technical Appendix 1

**Quarantine Barrier Selection Document
Food and Perishables Pathway**

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1.0 INTRODUCTION

This document presents the quarantine barriers for the food and perishables material pathway and describes the associated management measures. This document was originally prepared to assist with the Quarantine Hazard Analysis (QHAZ) workshop of proposed quarantine barriers on the Food and Perishables pathway. The QHAZ method is used to assess the effectiveness of barriers which are proposed to manage quarantine on a pathway of exposure.

An overview of the food and perishables pathway steps is presented in Figure 1. Three pathway steps were singled out where the quarantine barriers applied reduce the likelihood of introduction of organisms to Barrow Island :

1. Pre processing of food and perishables by the suppliers prior to shipment to Barrow Island including cleaning and where required repackaging into quarantine compliant packaging.
2. The consolidation of the food and perishables consignments into chiller and freezer containers at the mainland consolidation depot, and
3. Border kitchen diner facility located at the Barrow Island Accommodation Camp, where the sealed containers are unpacked, and food is prepared and served to personnel.

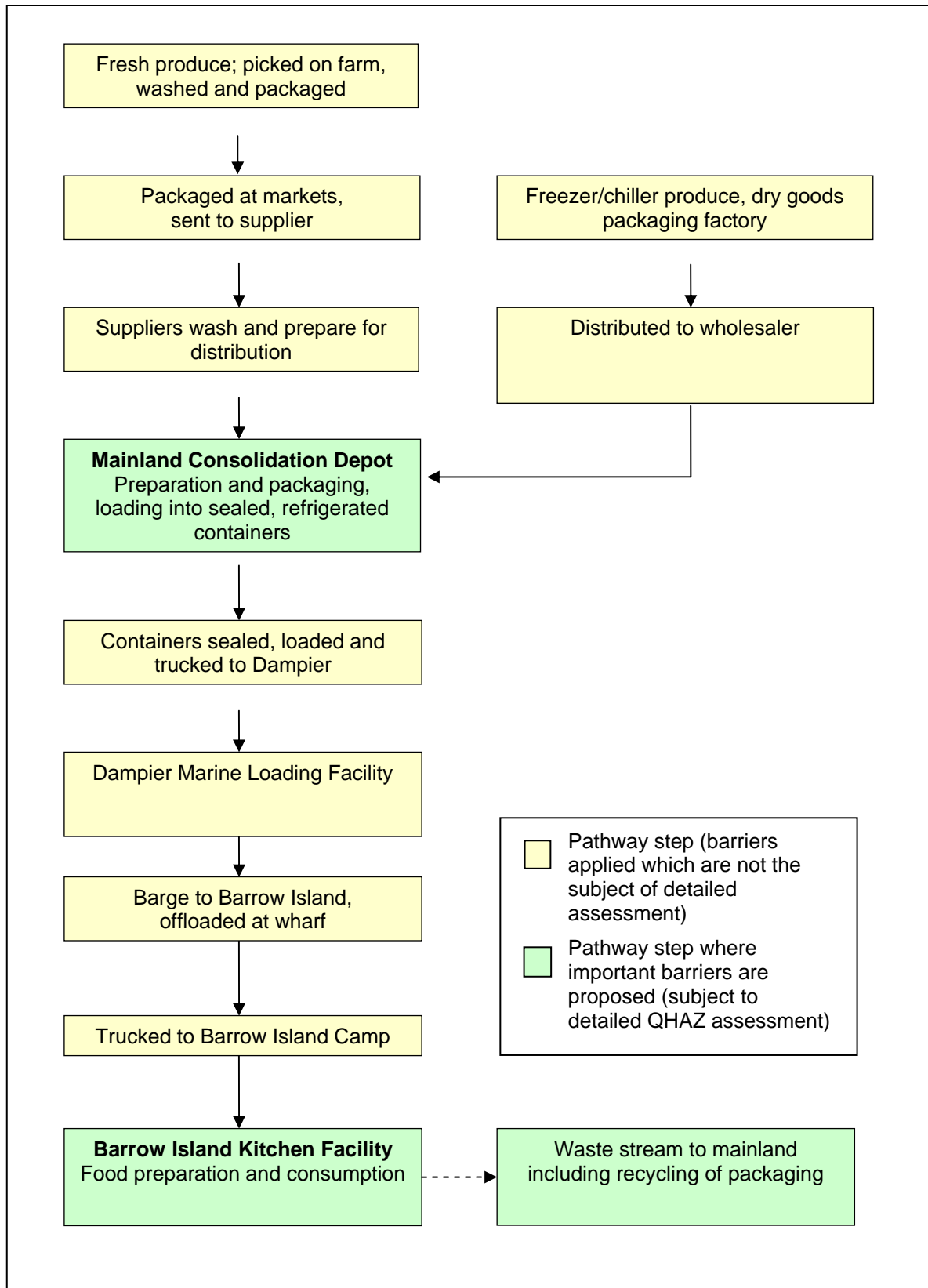
The other steps in the pathway focus on maintaining the external of the containers as clean and quarantine compliant as the food and perishables are sealed and quarantine compliant.

Chapter 2.0 of this report describes the systematic barriers which are applicable to all material pathways, Chapter 3.0 details the barriers which are specific only to the food and perishables material pathway, and Chapter 4.0 presents an assessment of the quarantine barriers.

Thirteen steps were identified in the foods and perishables pathway.

- | | |
|-----------|---|
| Step 1: | Supplier preparation and packaging including pre processing of fresh produce, and supply of food and perishable in compliant packaging. |
| Step 2: | Transport of foods and perishables to supply consolidation depot |
| Step 3: | Supply consolidation depot |
| Step 4: | Transport of foods and perishables to Mainland marine loading facility (Dampier) |
| Step 5: | Mainland marine loading facility |
| Step 6: | Transport to Barrow Island |
| Step 7: | Arrival at Barrow Island materials offloading facility (MOF) |
| Step 8: | Transport to the Barrow Island Accommodation Camp Kitchen Diner Facility |
| Step 9: | Containers unloaded and stored in Kitchen Diner Facility |
| Step 10 : | Food served in Kitchen Diner Facility |
| Step 11: | Preparation of Cribs |
| Step 12: | Kitchen Diner Waste Management |
| Step 13 : | Barrow Island Development Site |

Figure 1: Material Pathway Description for Food and Perishables



2.0 SYSTEMATIC BARRIER DESCRIPTION

Two groups of barriers have been developed. The first, termed the 'systematic barriers', applies to all material pathways and are discussed in this section. These barriers will be implemented through the Quarantine Management System being developed for the Project. The second group of barriers is specific to food and perishables and is discussed in reference to each step in the food and perishables pathway (Section 3.0). The barriers are essentially a series of quarantine controls implemented at various steps of the material pathway/supply chain.

2.1 Supplier Prequalification

Inclusion of quarantine requirements in pre-qualification of suppliers and contractors.

Suppliers and contractors specific to food and perishables pathway are identified in the table below, with some examples of prequalification requirements. Requirements may include:

- Barrow Island Quarantine Policy;
- List of prohibited food and perishable products;
- Barrow Island quarantine management practices specific to the food and perishables pathway; and
- Packaging requirements documentation.

Subcontractor/Supplier	Quarantine Compliance documentation to be included in Tender response	Documentation examples provided by Chevron
Food and Perishable Suppliers	<p>Must provide documentation to support prequalification requirements as part of tender.</p> <p>Site visit by EPCM contractor and Caterer to verify compliance with quarantine standards as well as health standards</p>	<p>Quarantine Policy</p> <p>Checklists for equipment cleaning and maintenance</p> <p>Prohibited food and perishable products list</p> <p>Guidelines for preparation of food and perishables for consolidation at mainland supply depot</p> <p>Project packaging specifications</p> <p>Victorian Health Guidelines, HACCP guidelines</p> <p>WAQIS documentation including quarantine risk materials and import requirements manual.</p> <p>http://agspsrv95.agric.wa.gov.au/quarantine/default.asp</p>
Caterer	<p>Must provide documentation to support prequalification requirements as part of tender.</p> <p>Site visit by EPCM contractor to verify compliance with quarantine standards as well as health standards</p>	<p>Quarantine Policy</p> <p>Checklists for equipment cleaning and maintenance</p> <p>Prohibited food and perishable products list</p> <p>Guidelines for preparation of food and perishables for consolidation at mainland supply depot</p>

		Project packaging specifications Guidelines for the consolidation of consignments in preparation for transport Victorian Health Guidelines, HACCP guidelines WAQIS documentation including quarantine risk materials and import requirements manual. http://agspsrv95.agric.wa.gov.au/quarantine/default.asp
Road Transport	Must provide documentation to support prequalification requirements as part of tender. Journey management plan compliant with ISO 14001 and Chevron quarantine requirements. Verification of fleet maintenance schedule. Licensed Operators and vehicles/trailers	Quarantine Policy Checklists for equipment cleaning and maintenance Journey management Australian Road Regulations compliant. Load management practices (tarps, loading regime etc).
Barge / Sea Transport	Must provide documentation to support prequalification requirements as part of tender. Operators are certified. Vessel specifications and supporting photos. Journey management plan	Quarantine Policy Checklists for vessel hygiene, cleaning and maintenance AQIS compliant IMO standards Waste management.

2.2 Contracts

Inclusion of quarantine requirements in contracts for all contractors and suppliers providing goods and services for Barrow Island.

This documentation includes the detailed quarantine procedures relevant to the food and perishables pathway, for example:

- Equipment checklists, audit protocols, and reporting of compliance for , Marine Loading Facility, Barges and Vessels.
- Food and perishable inspection and packaging procedures at the mainland supply base (consolidation depot) to verify HACCP and project quarantine compliance
- Environmental management audit procedure, frequency for the Suppliers, Caterer, Kitchen Diner and the Consolidation Depot.
- Containers checklist, road transport checklists, vessel checklists, journey management compliance register.

- Health, Safety, Environment and Quarantine training for all personnel involved in the Supply Chain, with specific site quarantine training for personnel working at each pathway step.

2.2.1 Inductions

Induction of all personnel (including staff, contractors, and suppliers) in quarantine awareness and quarantine management requirements.

Inductions will be quarantine-specific, targeted to particular workgroups highlighting the risks associated with their responsibilities.

These inductions will include, suppliers, contractors, sub contractors, service providers and managers involved at each pathway step. All data related to quarantine inductions and training for personnel will be maintained in a central database specific to their work areas and will designate the access personnel have.

The outline of the proposed Generic quarantine induction is provided as an example below.

Generic Quarantine Induction Outline

1. Introduction – scope and learning objectives:

Learning objective:

- Participants should be able to articulate why quarantine is important, identify the key rules and identify where to obtain further information or guidance at the end of the session.

Scope:

- The unique ecology and conservation values of Barrow Island;
- The quarantine risks - potential impacts of the introduction of non-indigenous species (NIS);
- The Gorgon Project quarantine commitments;
- Pathways, Borders and Barriers - steps needed to manage the quarantine risks;
- Quarantine rules and the QMS;
- Response strategies – what actions to take in case of a quarantine breach; and
- Where to get further advice and information.

2. Barrow Island Conservation - provide information on:

- The importance of the conservation values of Barrow Island;
- 'Class A' nature reserve status;
- Unique ecosystem and species that have evolved in isolation from the mainland for over 8000 years;
- Species identified on the island that are not known elsewhere in Australia.

3. Gorgon Project Quarantine Commitments – cover the following:

- Barrow Island Quarantine Policy Statement;
- Regulatory commitments;
- Operating licence commitments

4. Quarantine Risk - Potential impacts of introductions and establishment of NIS:

- Introduction of NIS and potential irreversible and detrimental impacts to the ecological composition and function of the island's ecosystem through competition, predation, or habitat modification.

5. Pathways, Borders and Barriers – define the concepts and provide examples of:

- Pathways – routes of exposure that may enable NIS to be introduced to Barrow Island;
- Borders – the entry points of cargoes, vessels or people to Barrow Island;
- Barriers – physical, chemical, biological, procedural or administrative process that prevents NIS being introduced to Barrow Island. Including emphasis on prevention being better than cure and personal responsibilities to the quarantine management commitments of the project.

6. Quarantine Rules and the Quarantine Management System (QMS) –

- Gorgon project quarantine rules applicable to work activities and personnel;
- Risk Register;
- Structure of QMS (road map);
- Relevance to your work.

7. Response Strategies – actions to take in case of a quarantine breach:

- Incident response – contact details and procedures;
- Incident reporting – responsibilities and procedures.

8. Further Information – Directions to locations of additional resources and help:

- QMS Website;
- Quarantine Advisor.

As assessment of participants success in meeting the learning objectives will be made following the training session.

The project will reinforce the quarantine culture, the inductions and the training provided to all personnel through posters (identifying common weeds, seeds, invertebrates and vertebrates), videos (Barrow Island Conservation Values). Regular lectures (given by ecologists whom may be visiting Barrow Island for routine monitoring work), in flight announcements reminding personnel that Barrow Island is a Class A nature reserve and of the Project commitments to Quarantine.

2.2.2 Quarantine Inspection Training

Provision of specific quarantine training to personnel in the procurement and logistics supply chain. This recognises that the supply chain is critical in achieving effective quarantine management. Training will be provided by accredited quarantine trainers and will include scheduled refresher courses. All training will have a competency standard that will need to be attained in order to perform the work tasks.

Examples of specific training associated with work areas and personnel are provided below.

Work Area and Personnel	Quarantine Training
Food and Perishable Suppliers	Identification of organisms and recognition of quarantine risk Knowledge of packaging specifications for Barrow Island Pre processing required to the “fresh produce” to meet the Barrow Island quarantine requirements Personal hygiene and inspection of clothing/footwear to meet Health standards and project quarantine requirements. Interactive online quarantine awareness including expectations for how goods are delivered to the Mainland Supply Base / Caterer
Supply Base and Logistics (Caterer)	Identification of organisms and non compliant goods received at the Mainland Supply base Knowledge of packaging specifications for Barrow Island Pre processing required to the “fresh produce” to meet the Barrow Island quarantine requirements Personal hygiene and inspection of clothing/footwear to meet Health standards and project quarantine requirements.

Work Area and Personnel	Quarantine Training
Caterer on Barrow Island	Identification of organisms Knowledge of packaging specifications for Barrow Island Processing required to the “fresh produce” to meet the Barrow Island quarantine requirements Personal hygiene and inspection of clothing/footwear to meet Health standards and project quarantine requirements. Knowledge of how the Kitchen Diner Facility works and the three functional areas (High, moderate, low quarantine risk) Emergency response plan and execution if quarantine non compliance detected in any of the three areas.

2.2.3 Accountability

Inclusion of quarantine responsibilities in the position description and key performance indicators for personnel. Quarantine responsibilities may include:

- Maintain housekeeping and equipment cleanliness to quarantine compliant checklist.
- Undertake regular quarantine training and awareness
- Undertake regular identification training to identify signs of contaminants such as invertebrates, rodents.
- Report all incidents potentially resulting in quarantine non compliance.
- Reflect quarantine culture in daily work practices.
- Undertake personal audits of equipment and supply base daily, maintain records.
- Decision making empowerment to STOP work when there is potential for non compliance with quarantine.
- Development of procedures and Job Hazard Analyses (JHAs) to support quarantine compliance.

2.2.4 Culture

Develop, encourage and support a strong culture of quarantine awareness in the workforce. Reference to how the safety culture in Chevron and other resource companies has been successfully developed and implemented. The culture is reinforced through Toolbox meetings, position descriptions, management style and value of personnel contributions.

The Project will provide regular feedback via Quarantine noticeboards and the regular toolbox meetings to ALL personnel regarding:

- Barrow Island environmental surveys and conservations status
- Quarantine Management non compliances
- Iterative changes to the quarantine procedures to always ensure that quarantine adapts best available knowledge from ongoing benchmarking

2.2.5 Monitoring and Measurement

Quarantine compliance (including quarantine training, inductions and inspections) for all personnel and goods going to Barrow Island will be recorded and tracked. Chevron and its contractors will implement this through the Material Management System for tracking materials and the Quarantine Management System for personnel, and includes, signed and completed quarantine compliance checklists, manifests, quarantine handover forms, verification of quarantine activities.

2.2.6 Auditing

Conduct regular quarantine compliance audits and checks throughout the supply chain. These audits and checks will be in compliance with ISO 14001. A reporting protocol for the audit outcomes will be established, including non-compliance register. The auditing will be undertaken at three levels;

- regular internal auditing through the Construction Contractors,
 - Chevron audits, and
 - external party auditors (including Regulatory authorities).
-
- The Project will seek guidance from the ecologists, CALM, and Regulators on the frequency and the intensity of the audits.

3.0 BARRIERS IN THE FOOD AND PERISHABLES MATERIAL PATHWAY

The QHAZ assessment for the food and perishable pathways focussed on the barriers implemented at three different steps in the material pathway. It was considered that once the food and perishables had been consolidated into sealed, chiller containers for transport from Perth to Dampier and onto Barrow Island (Steps 4 to 8) that the containers will be managed through the quarantine barriers implemented for the containerised goods pathway and the Barrow Island Materials Offloading Facility. The goods would remain clean and contained until unpacked within the contained environment of the Kitchen/Diner facility on Barrow Island. The three steps are described as below, and more detailed barrier descriptions follow.

- **Step 1** - Pre processing of food and perishables by the suppliers prior to shipment to Barrow Island including cleaning etc and where required repackaging into quarantine compliant packaging.
- **Steps 2 and 3** - The consolidation of the food and perishables consignments into chiller and freezer containers at the mainland consolidation depot, and
- **Steps 9 - 13** - Border Kitchen Diner facility located at the Barrow Island Accommodation Camp, where the sealed containers are unpacked, and food is prepared and served to personnel.

3.1 Pre-processing of fresh produce and Supply of Dry/ Frozen and Chilled Food and Perishables through Pre qualified Suppliers

The objective of quarantine controls implemented for the suppliers of the food and perishables is to ensure that the food and perishables provided to the caterer at the Supply / Consolidation Depot are compliant with the Project's quarantine requirements and non quarantine compliant food and perishables are not supplied. The suppliers will also assist with the provision of food and perishable products in quarantine compliant packaging to assist with preventing introductions of organisms to Barrow Island, and to deter the movement of these through the Supply Chain.

The fresh produce consignments may include vegetables (heavy vegetables, brassicas, salad vegetables, leafy vegetables / bunch lines, mushrooms) and fruit. The suppliers will adhere to the guidelines established by WAIS and AQIS for the importing of fresh produce from overseas and interstate. Additional information on these can be found at <http://agspsrv95.agric.wa.gov.au/quarantine/default.asp>.

The fresh produce will be provided by pre qualified suppliers who will be responsible for the “pre processing” of the fresh produce to ensure that it is free from discernable evidence of soils, organisms, invertebrates etc.

The project will develop a list of fresh produce “pre processing” requirements for the suppliers, in conjunction with experts and the Department of Agriculture to meet the quarantine requirements for Barrow Island. Processes undertaken by the Supplier at their premises or through their subcontractors to reduce quarantine risk may include :

- Unpacking
- Trained Visual Inspection
- Pre processing
- Repacking
- Storage for load out

The barriers associated with each of these are described in detail below, along with the quarantine requirements for the Supplier Premises themselves.

3.1.1 Supplier Premises

As part of the pre-qualification process the Supplier will have to demonstrate that the premises where food and perishables are pre processed are :

- maintained free from vermin and pests (regular pest control programmes implemented and monitored),
- storage off the floors and walls,
- good housekeeping practices and facility that is easily cleaned and
- that the premises meet the Victorian Health standards or equivalent and HACCP guidelines.

3.1.2 Unpacking

Destuffing of consignments and repackaging where required so that packaging meets the project packaging specifications for quarantine compliance

3.1.3 Trained Visual Inspection

Visual inspection of goods as repackaged, all goods will be inspected by personnel. Personnel will have focussed training to assist with this process. All non compliant goods will be returned to suppliers or subcontractors or disposed of and recorded. Recording of these non compliances will assist with the ongoing optimisation of the quarantine management practices, and also with understanding the effectiveness of the training and awareness inductions for Suppliers.

3.1.4 Pre Processing

The processing will be specific to fresh produce and may include:

- Dry brushing vegetables
- Washing vegetables, in saline water then potable water eg leafy vegetables, broccoli
- Peeling of root vegetables such a potatoes, carrots
- Topping and tailing, coring
- Blanching (par boil) eg beans, broccoli
- Vacuum sealing fresh produce as per health regulations to ensure that food maintains its freshness and quality

3.1.5 Repacking

Repacking into the quarantine compliant packaging, ie recyclable plastic trays, sealable plastic containers, new cardboard boxes which are compliant (new supply direct from factory, and where applicable insecticide treated to meet Health guidelines).

Shrink wrapped with clear plastic to assist visual inspection onto new pallets (heavy duty plastic, chemically washed) which are inspected pre use.

3.1.6 Storage

Stored for despatch to consolidation depot to minimise storage time, maintain quarantine compliance and ensure freshness maintained.

3.2 Consolidation of Food and Perishables at Mainland Catering / Supply Consolidation Depot Transport to Barrow Island

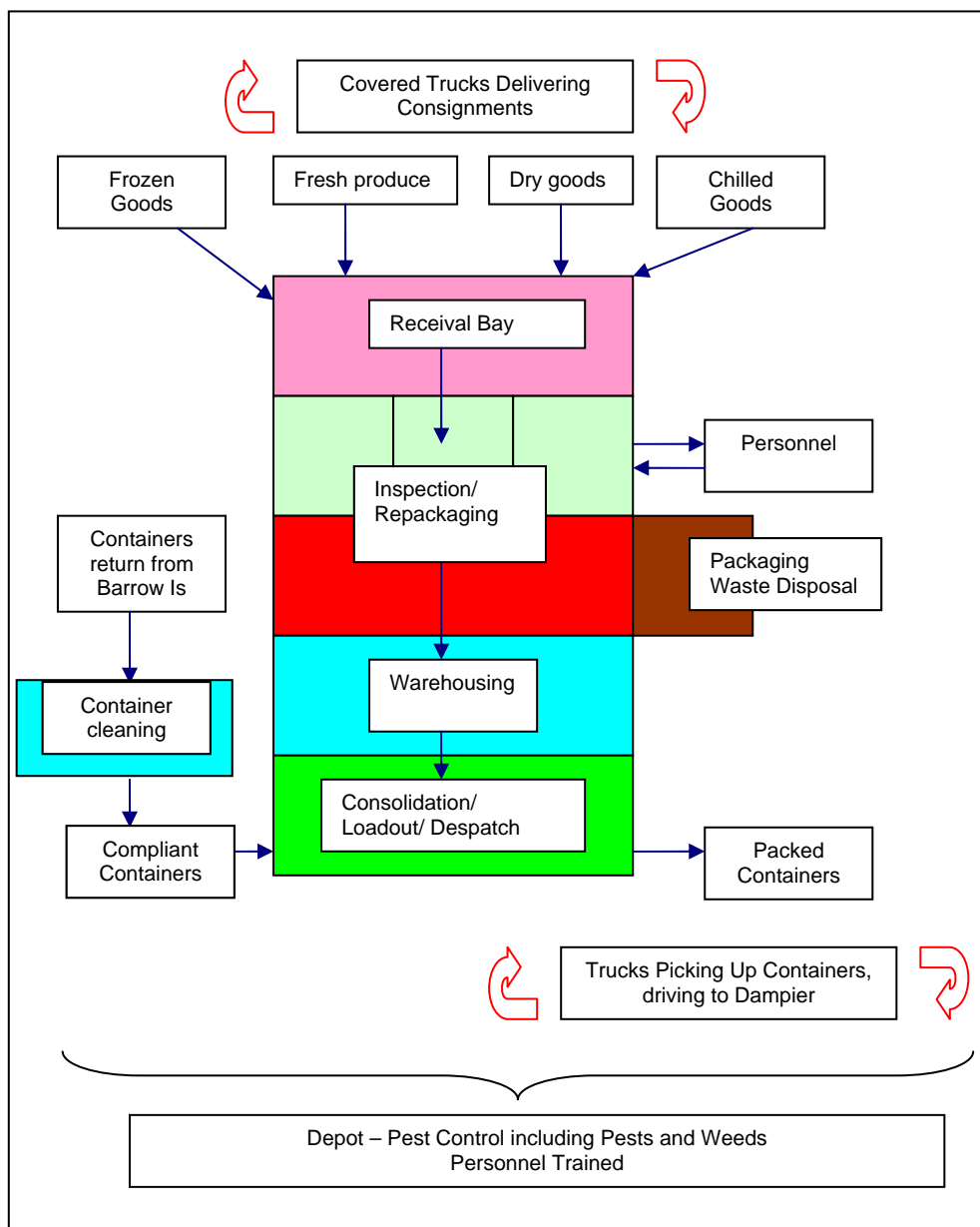
The objective of quarantine control at the Catering/Supply Consolidation Depot is to remove non quarantine compliant food and perishables, and remove non quarantine compliant packaging materials to assist with preventing introductions of organisms to Barrow Island, and to deter the movement of these through the Supply Chain.

It is proposed to receive all the food and perishables in a central location in the Perth area to enable repackaging, consolidation of food and perishables into consignments for transport via containers to Barrow Island. The Depot will manage the receipt and despatch of all food and perishables for Barrow Island. The conceptual flow of food and perishables through the Depot is illustrated in Figure 2.

The Depot will be managed by the Caterer in accordance with the Victorian Health Standards or equivalent and HACCP (Hazard Analysis and Critical Control Point) guidelines. HACCP guidelines are food safety guidelines and programmes designed and implemented to manage health and safety around the supply, transport and processing of food to people. These guidelines include pest control, hygiene and sanitation controls. The barriers proposed for the Consolidation Depot pathway step are described below.

The depot layout proposed in Figure 2 will assist with the process flow of the consignments through destuffing, inspection, repackaging and despatch. These functions will be separated to minimise the risk of cross contamination.

Figure 2: Conceptual Supply/Consolidation Facility for Food and Perishables



3.2.1 Building Design

Air curtains on entry/exits: All entry and exits to the depot will have air curtains installed. These will be designed to have a minimum air velocity to prevent the ingress of flying insects, wind blown insects and seeds/dust, and insects travelling on, with or adjacent to personnel. The Project will seek advice from abbatoirs and experts on optimum air velocity. These will be tested when the kitchen is built and operated to ensure quarantine compliance is maintained.

All entry/exits to have plastic curtain strips installed.

Sealed Depot: The Depot will be purpose fit.

3.2.2 Personnel

Induction and training: Induction of all personnel (staff, contractors) in quarantine requirements, identification of organisms, emergency response procedures in case of non compliance, non compliance reporting and Health guidelines/ regulations. Inductions will be quarantine and health focussed.

All access to the depot is via air curtain entry-exits only. Only authorised personnel to access the depot.

Protective equipment: all personnel to wear the provided protective overalls and covered footwear at all times when in the Depot.

3.2.3 Repackaging / Inspection of Food and Perishables

The dry good consignments may include canned products, products in plastic containers, drinks, cereals, flour, dry mixes, herbs and spices, flavourings, sauces and condiments, jarred goods, confectionery, snack foods, dried fruit, pasta and rice.

Chiller produce includes dairy products such as milk, cheese, yoghurt, fresh fruit juices, eggs, cold meats, delicatessen produce.

Frozen produce includes frozen vegetables, meat (beef, lamb, poultry, fish, pork), ice cream, and frozen pre processed foods, ie pasta, pies, pizza, pastry sheets, desserts.

The fresh produce consignments may include vegetables (heavy vegetables, brassicas, salad vegetables, leafy vegetables / bunch lines, mushrooms) and fruit.

These consignments will be received at the Depot, and repackaged where necessary into compliant packaging as described below for delivery to Barrow Island Kitchen facility in chiller containers.

Unpacking

Destuffing refers to the unpacking of the consignments, for example removal of cans from cardboard trays to repack into plastic trays/boxes, cereals will be removed from external cardboard packaging and the sealed bags repacked into plastic packaging. Dried and ground herbs and spices are stored in large plastic jars. The food and perishables will be supplied in commercial and catering supply quantities and packaging.

Destuffing of consignments, all waste packaging removed through controlled waste stream to minimise re-infestation of consignment as it travels through the Depot.

The destuffing process also serves to reduce the volume of waste requiring removal from Barrow Island.

Trained Visual Inspection

Visual inspection of all goods as repackaged, all goods will be inspected by personnel. Personnel will have training to assist with this process. All non compliant goods will be rejected and either disposed of through waste stream or returned to the supplier. Non compliances will be recorded.

Repackaging

Repacking into the quarantine compliant packaging, ie recyclable plastic trays, sealable plastic containers, new cardboard boxes which are compliant.

Shrink wrapped with clear plastic to assist visual inspection onto new pallets (heavy duty plastic, chemically washed) which are inspected pre use.

The project will implement recyclable packaging containers where possible to facilitate quarantine inspection, facilitate transportation, reduce risk of re infestation with organisms, reduce waste stream from Barrow Island and maintain the freshness of the produce.

Storage

Food and perishables will be stored to maintain quarantine compliance and freshness until despatched to Barrow Island. The consignments will be manifested and loaded into pre chilled, quarantine compliant, chiller containers (maintained at 12°C or less). The containers will be monitored via temperature gauges whilst in transit to ensure

temperatures are maintained. If temperature is not maintained, the container will be reinspected for compliance before transported to Barrow Island.

3.2.4 Consolidation of consignments for transport

- Containers are cleaned and disinfected prior to coming to the facility for loading.
 - Container interiors are cleaned using high pressure steam cleaners (water heated to 90°C)
 - External surfaces cleaned
 - All external surfaces will be sprayed with residual insecticide
 - Containers will be verified as pest free and quarantine complaint through visual inspection and monitoring/detection methods (including baiting, trapping etc overnight).
- The food and perishables will be loaded directly into the chiller containers at catering/supply loading facility.
- Packed containers to be closed immediately upon completion of loading (100% inspection of container loading process).
- Containers to be sealed with quarantine seal immediately after loading. The quarantine seal needs to remain intact, and certification to remain with container, throughout subsequent processes of storage, loading, transport and unloading on Barrow Island.
- All containers to be accompanied with Manifest and Quarantine Handover Form which verifies that the consignment in the container has met all the quarantine requirements, and visual inspection has been undertaken to verify the quarantine integrity of the consignment.

3.2.5 Waste management and disposal

To reduce the risk of re-contamination of the food and perishables products in the depot the waste from destuffing and unpacking is separated from the process flows, and consolidated in an area dedicated for waste, where it is stored and is regularly removed from the facility.

3.2.6 Pest Control

The facility will implement pest controls including insect controls such as :

1. Space sprays (for flying insects) which contain pyrethrin
2. Residual surface sprays - These sprays remain active after they come into contact with a surface.
3. Cockroach powders.

The facility will implement rodent controls such as :

1. Trapping
2. Rodenticides
3. Storage off the ground

Ongoing pest controls, with baiting trapping and monitoring will provide feedback to the quarantine management system allowing quarantine

Once the chiller container is sealed with the quarantine seal and loaded onto trucks for transport to Barrow Island through the Supply chain (Steps 4 to 8), there are a number of barriers described in the containerised goods pathway which ensure that the external of the container remains quarantine compliant, and that the internal consignment maintains its integrity. Some quarantine barriers in these pathway steps specific to food and perishables include :

- monitoring of the internal temperature of the chiller containers,
- transport of the containers on next available barges from Dampier to Barrow Island

- inspection of the quarantine seal at Dampier, and prior to offloading at Barrow Island
- offloading at Barrow Island and direct transfer to the Kitchen/Diner facility.

3.3 Kitchen / Diner Facility, Barrow Island Accommodation Camp

The key quarantine objective of the Kitchen / Diner Facility is containment of any organisms that do enter the facility, through the food and perishables, and prevention of them entering the Barrow Island Environment. The Kitchen Facility is also designed to contain all organisms and allow for the successful eradication.

The primary function of the kitchen facility will be the preparation, processing and serving/delivering of food to the workforce. The kitchen facility will manage the receipt and processing of all food and perishables within the Barrow Island accommodation camp. The conceptual layout of the kitchen facility is shown in Figure 3. The barriers for the Kitchen Diner facility are discussed below.

The facility can be divided into three areas of quarantine risk.

High risk area includes the receipt bay (consignment receipt and unpacking), storage areas, waste management area and the initial fresh produce preparation area.

Moderate risk area including day storage areas and food preparation/cooking

Low risk area including the servery, dining room and crib preparation area.

3.3.1 Air

- **Air curtains on entry/exits:** All entry and exits to the facility and between the functional areas of the kitchen will have air curtains installed. These will be designed to minimise the movement of organisms, particularly flying insects. The Project will seek advice from abattoirs, experts on optimum air velocity. These will be tested when the kitchen is built and operated to ensure quarantine compliance is maintained.

All entry/exits to have plastic curtain strips installed.

From a quarantine perspective the air curtains are designed to restrict movement of the invertebrates from the facility and within the three areas of the facility.

- **Air filtration:** Filtration of all inlet and exhaust air and controlled ventilation and air movement system. All exhausts will be fitted with a G4 rated filter as per the Australian Standard AS1324.2.

The filters will prevent organisms from entering the Barrow Island environment.

All air systems will have filters at both ends ie external to the Barrow Island environment and internal to the kitchen diner. The filters will be placed so that air flow is maintained, whilst maximising the containment of organisms. Invertebrate traps will be placed in the ducts near the filters to capture any potential organisms. These will be replaced when the filters are cleaned.

Filter cleaning and general maintenance will be undertaken through a "lockout" maintenance procedure which will ensure the air system integrity is maintained.

- **Sealed Kitchen Facility:** Kitchen Facility will be designed and built as a Class 1 Building in accordance with the Building Code of Australia 2005 Vol 2. Australian Standard AS2047 applies for the sealing of the windows. A Class 1 building will contain organisms.

3.3.2 Personnel

- **Induction and training:** Induction of all personnel (staff, contractors) in quarantine requirements. Inductions will be quarantine specific. Training of all staff in quarantine specific procedures including Emergency Response for quarantine non compliances, or in the event of cyclones etc, preparation of fresh produce, waste management, and visual inspection and detection of organisms in the facility.
- **Air curtains on entry/exits:** velocity of air curtains will ensure that insects on personnel will not travel into, or out of the kitchen facility. All access to the facility is via air curtain entry exits only. Only authorised personnel ie kitchen staff are allowed access to the food preparation areas.

- **Protective equipment:** kitchen personnel will wear protective overalls and covered footwear at all times. All clothes will be laundered daily and when disposed of will be disposed through the waste stream. All footwear worn by facility personnel to remain in the facility change rooms. This will reduce the movement of potential contaminants to the Barrow Island environment.

3.3.3 Food and Perishable Consignments

- **Chiller Container Delivery:** Delivery vehicles (with containers) will reverse and engage a seal on the exterior of the receiving bay. The seal will be manually operated and designed to accommodate the freezer/chiller containers. Upon positioning of container and verification of the seal integrity, the door to the receiving bay will be opened. A vertical air curtain over the receiving bay will operate during container loading and unloading. Only containers with an intact quarantine seal will be opened.
- **Fresh food processing**
 - All fresh fruits and vegetables are subject to inspection, and washing if required (saline water followed by potable water). Foods will receive additional processing including, as relevant, washing in potable water, peeling, topping/tailing and coring. This processing will be undertaken in a designated pre processing area adjacent to the receival bay. This area will enable further containment of any organisms which have been transported in the fresh produce. Fruits and vegetables to be chopped, sliced, diced, etc, then placed on trays and sealed with plastic wrap and stored in the Day Storage area. Dry goods, as appropriate, to be mixed or otherwise combined, and placed on trays and sealed with plastic wrap and stored in the Day Storage area.
 - Frozen or chilled goods are to be moved directly from the chilled bulk storage to the Day Storage area.
 - All prepared food will be covered.
 - Wastes, including all packaging, will be transferred directly to the waste processing centre.
 - All food is pre processed and / or cooked before serving in dining room or crib preparation areas. The Project will seek advice from experts and Department of Agriculture in developing a list of high risk foods, and appropriate methods of processing this food to reduce risk.
- **Food Delivery to Dining Areas**
 - All food is pre processed and / or cooked before going to the crib preparation area.
 - Personnel to prepare cribs in crib preparation area, and take cribs to site in insulated bags.
 - All prepared foods and fresh fruit to be consumed within dining areas.
 - All waste to be deposited within the bins provided in these areas. Individually wrapped and processed snack foods delivered with meals, or obtained from machines within dining facility, can be taken from the facility and consumed on-site. Cold and hot drinks obtained from the dining facility, can also be taken from the facility and consumed on-site.

3.3.4 Waste management and disposal

Water – the waste water streams will be managed to ensure there is limited exposure to the Barrow Island environment through containment (piped, with u-shaped traps and grates fitted with 100 µm mesh) and effective treatment to ensure seeds are not exposed to the Barrow Island environment.

- Water split into two systems – grey water and black water
- Water to the Waste Water treatment plant located on Barrow Island.

- Covered sewage tanks
- Grey water treated to minimise nutrient levels.

Food waste

- Food waste pulpers which dewater waste will be located in the Waste Processing Centre. Food waste along with packaging received at the waste processing centre is placed into the pulper machine. The resultant dewatered waste to be placed in double bags, tied and then placed in the returning, used chiller containers awaiting transport to the mainland for cleaning and re use.
- Food waste will be double bagged and / or sluiced to the Waste processing facility.
- Fats and oils will be transferred from the kitchen to the waste processing centre. They will be decanted into sealed drums and mechanically lifted into the waste disposal vehicle and taken to the mainland for recycling.

Packaging Waste

- Cartons and cardboard waste will be broken down and stored in covered skip bins for collection transfer to the mainland for recycling.
- Empty plastic containers to be stored in the waste processing centre and transported to the mainland for cleaning and recycling through the Catering Depot.

Recyclables

- Empty plastic containers and plastic wrapping to be stored in the waste processing centre and transported to the mainland for recycling.
- Newspapers, stationary, cloths, rags and general waste collected in rooms to be placed in sealed double bags then sent to the waste processing centre for transport to the mainland.
- Aerosol cans to be collected and placed in sealed double bags, stored in skip bins and then transferred to the mainland for disposal.
- Skip bins storing bagged or wrapped cartons, plastics, glass and cans to be covered whilst located in the waste processing centre.

Clothing

- Cleaned overalls, or new disposal overalls and footwear covers, to be worn at the start of each shift. Overalls to be discarded at the close of each shift in the laundry or disposal bins provided. Footwear to be clean at the start of each shift or upon re entry to the depot. Clothing processed daily through camp laundry.

4.0 ASSESSMENT OF QUARANTINE BARRIERS

Quarantine barriers to prevent the introduction of organisms were assessed in the QHAZ with respect to two pathway steps: pre processing and consolidation at the mainland consolidation depot; and the border kitchen facility. The proposed recommendations to improve the barriers presented at the QHAZ workshops, by the experts at the workshop are presented in Table 1.

Table 1: Assessment of quarantine barriers, food and perishables material pathway

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
Mainland consolidation depot and Kitchen Diner Facility on Barrow Island					
Air handling systems	Air curtains	Design issue; inadequate airflow (velocity) for exposure (e.g. blow flies)	Review design against appropriate research and design standards for anticipated exposures. Control of temperature and light;	Y	Research air curtains used abattoirs and test the design. Operational temperature observed. Insect repelling lighting to be used. Seek advice from CSIRO on effective testing methodology
			Test effectiveness of air curtains as barrier; use of exhaust grating in floors to create stronger air curtains;	Y	
			Consider the use of insect repellents or masking odours integrated with air curtain design;	TBR	
			Curtain strips Reduce temperature.	Y N	
		Emergency exits	Contingency plan for disinfecting building after operation and servicing of emergency exits; Temporary physical barrier which does not impede emergency exits.	Y N	Servicing of emergency exits Project will develop Emergency response plans, and contingency procedures for use in cyclones, and all emergencies.
		Attraction to lights in the building	Other treatments above plus shielding of turning off lights decoy zappers; switch to non-UV lighting when loading areas open; sodium yellow lamps to reduce attraction to insects	Y	Adopt sodium yellow lamps in high risk areas. Loading and unloading during daylight hours only.
	Air filtrations	Does not exclude organisms less than 20 micron	Mesh aperture size needs to be less than 20 micron (post-QHAZ advice from WA Department of Agriculture)	TBR	Will require a substantial increase in energy requirements (air conditioner) Implementation of a maintenance procedure, and

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
					inclusion of invertebrate traps in the ducting mitigates the need for this sized filter
		Blocked filters, mechanical damage, inappropriate fitting or removal	Servicing strategy implemented to compliment the quarantine pathway control process. Provide appropriate training to service technicians.	Y	To be adopted
		Location of inlets, filters etc. Exhaust ducting from toilets, kitchens etc. Windows	Filters on inlet and exhaust; insects occupying ductwork, contingency for maintenance of filters to avoid releasing pathogens; baffle arrangement (before/after) around filters to shut down ductwork and facilitate maintenance; pre-filter; windows should be sealed (non-openable)	Y	Maintenance strategy for changing filters and baiting/trapping developed. All windows will be sealed (non-openable).
	Sealed depot (building)	Water traps on drains and vents	Floor drains to be trapped and flooded so rodents cannot enter; Baiting inside and around the building (cockroaches and mice) to comply with HACCP standards; Mesh of floor drains; Ensure that food is stored off the ground, and design storage racks so that rodents cannot climb up supports.	Y	To be adopted
		Ambient temperature at warehouse and loadout	Cool warehouse to reduce cross contamination and activity of organisms	Y	Operational temperature observed
Entry / exit of personnel	Induction and training	No instruction on bringing food (etc) into building	Instructions on bringing food (etc) into the building provided during induction; Signage erected at entry to building.	Y	Included in induction programme
	Air curtains on entry/ exit points	Air curtain fails to remove insects/ invertebrates	Review design against appropriate research and design standards for anticipated exposures. Control of temperature and light; Test effectiveness of air curtains as barrier; use of exhaust grating in floors to create stronger air	Y Y	Research air curtains used abattoirs and test the design. Operational temperature observed. Insect repelling lighting to be used. Seek advice from CSIRO on effective testing methodology

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
			curtains; Consider the use of insect repellents or masking odours integrated with air curtain design; Curtain strips; Reduce temperature.	TBR Y N	Industrial relations implications require further investigation Effective design feature No additional value to quarantine barrier
	Overalls and covered footwear	Possible cross contamination at point where footwear is changed	Clothing will either be disposable or changed at consolidation depot, laundered and returned. Disposable covers to be work on footwear at all times.	Y	To be adopted
Pre-processing of fresh produce	Unpacking	Liquids and debris falling out of packaging	Establish area which can be regularly cleaned and decontaminated; Contingency to re-apply surface insecticides in this area	Y Y	To be adopted Pest control program will implemented with guidance from Department of Ag
		Fruit with organisms moving into inspections area	Consider pre-processing at supplier or pre-processing area prior to consolidation depot	Y	Although fruit is pre-processed, shelf life will be maintained. Pre-processing will be reviewed if not successful
	Trained visual inspection	Organisms concealed in fruit/ unable to examine interior of all fresh produce	Strict control over peel from citrus fruit and fruits themselves; Strict control over all organic materials on Barrow Island; Consider other treatment options for citrus fruit; Pre-delivery washing and removal of organic material.	N Y N Y	Fruit will be pre-processed and will not contain peel To be adopted Not required, existing treatment options have been thoroughly investigated and adopted Fresh wash and saline wash
		Introduction of new organisms for which there are not procedures for	Quarantine procedures constantly updated. Ongoing training of staff in inspecting for organisms.	Y	Is an iterative process.

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
		inspection and/ or treatment			
		Accepting off spec deliveries under time pressures	Ensure that there are no exceptions to procedures – zero tolerance; Responsibility for food quality and packaging will rest with the supplier. If quality is inadequate, goods will be returned	Y	To be adopted.
	Dry brushing, washing, peeling, topping/ tailing/ coring vegetables	Inability to process certain types of produce	Compliant processing facility located at Barrow Island	Y	Enable the processing of food at Barrow Island
Re-packaging of dry goods	Trained visual inspection	Insects not identified during unpacking	Light coloured surfaces and walls for the easy detection of organisms	Y	To be adopted
		Not seeing organisms during visual inspection process, or failure to detect rodent droppings	Pre-selection process to ensure that inspectors will be as effective as possible; Light coloured floor, walls, ceiling, fluorescent overhead lights; Inspection area to be maintained clear of potential hiding places for organisms; Unloading to separate room to reduce extent of potential contamination.	Y	To be adopted
		Not knowing the effectiveness of inspectors	Monitor competence and performance of inspection team with appropriate feedback mechanisms; Implement fatigue management plan (rotation of staff).	Y	Required for effective organism inspection
		Accidental encapsulation of rodents	Use rodenticide inside dry goods containers when repacked for transit to Barrow Island	TBR	Further advice required from health and pest control experts
	Sealed containers	No deviation causes identified	Use rodenticide inside dry goods containers when repacked for transit to Barrow Island	TBR	Further advice required from health and pest control experts.
Border kitchen facility					
Air handling systems	Air curtains	Rodents can escape	Training and procedures to deal with rodents; sealed doors on unloading bay, rat guards on	Y	Ability to contain loading facility as required

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
			doors; Traps inside containers	TBR	Further advice required from industrial relations and pest control experts
		Salad and vegetable preparation (high risk) in low risk zone	Rearrangement of salad preparation and toilets; alternatively, add a pre-preparation area to eliminate high risk contamination risks from food (e.g. seeds, salad/ vegetable preparation)	Y	Kitchen facility separated into high, medium and low risk zones to enable non-conformance containment
	Air filtration	Air filters not operational; mechanical failure, blowers fail, transformer failure etc.	Temporary operating procedure in case of equipment failure. Backup generators, facility will be cyclone proof	Y	Backup filters for immediate change out. Kitchen facility separated into high, medium and low risk zones to enable containment of non-conformance
		Oils trapped in filters	Filters regularly changed	Y	Part of maintenance procedure
		Leakage of seal between container and dock skirt	Training and procedures for opening doors on container and loading/ unloading	Y	To be adopted
	Sealed depot (building)	Leakage through building fabric, e.g. light fixtures, building/ cable penetrations, etc.	Contingency plan to deal with the failure	Y	Kitchen facility separated into high, medium and low risk zones to enable containment of non-conformance
		Mechanical failure or damage to doors from pallet jacks, wear and tear	Contingency plan to deal with the failure	Y	Kitchen facility separated into high, medium and low risk zones to enable containment of non-conformance
Entry/ exit of personnel	Air curtains on entry/ exit points	Not dark enough at entry	Darkened entry, floor lighting, strip curtains, rails to keep people away from insecticide coated walls	TBR	Testing the effectiveness of air curtains and strip curtains. Consult OHS and industrial relations experts re insecticide coated walls
		Non-segregation of cleaning activities between zones	Separate cleaning activities to avoid confusion due to cross contamination (e.g. colour coding of brooms etc for use only in specific zones)	Y	Part of cleaning procedure

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
Food handling	Food processing	Translocation of species from within the Island facilities	All food that leaves the Barrow Island facility is treated	TBR	Part of food handling procedure but may have food safe implications
	Food delivery to dining areas	Waste material removed from dining areas being put back into waste management system	Design a means of getting waste into waste processing area or have a separate bin outside building to contain waste from dining areas	Y	All waste to be double bagged, sealed and stored in chilled container
Waste management	Separation of waste water	Grease trap outside kitchen facility	All grease traps outside of facility to be enclosed. Maintenance procedure in place.	Y	Part waste management procedure
	Recyclable processing	No deviation causes identified	Chlorination of waste water	TBR	Being reviewed separately

Quarantine Pathways — Barrier Selection Report

Technical Appendix 2

**Quarantine Barrier Selection Document
Personnel and Luggage Pathway**

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1.0 INTRODUCTION

This document has been prepared to describe quarantine barriers and controls to manage the quarantine risk associated with the Personnel and Luggage Pathway. These barriers are focussed at various steps of the pathway.

Step 1: Recruitment and training of personnel

Step 2 : Preparation of personnel and luggage for travel to Barrow Island.

Step 3: Airport check-in and processing of personnel and luggage.

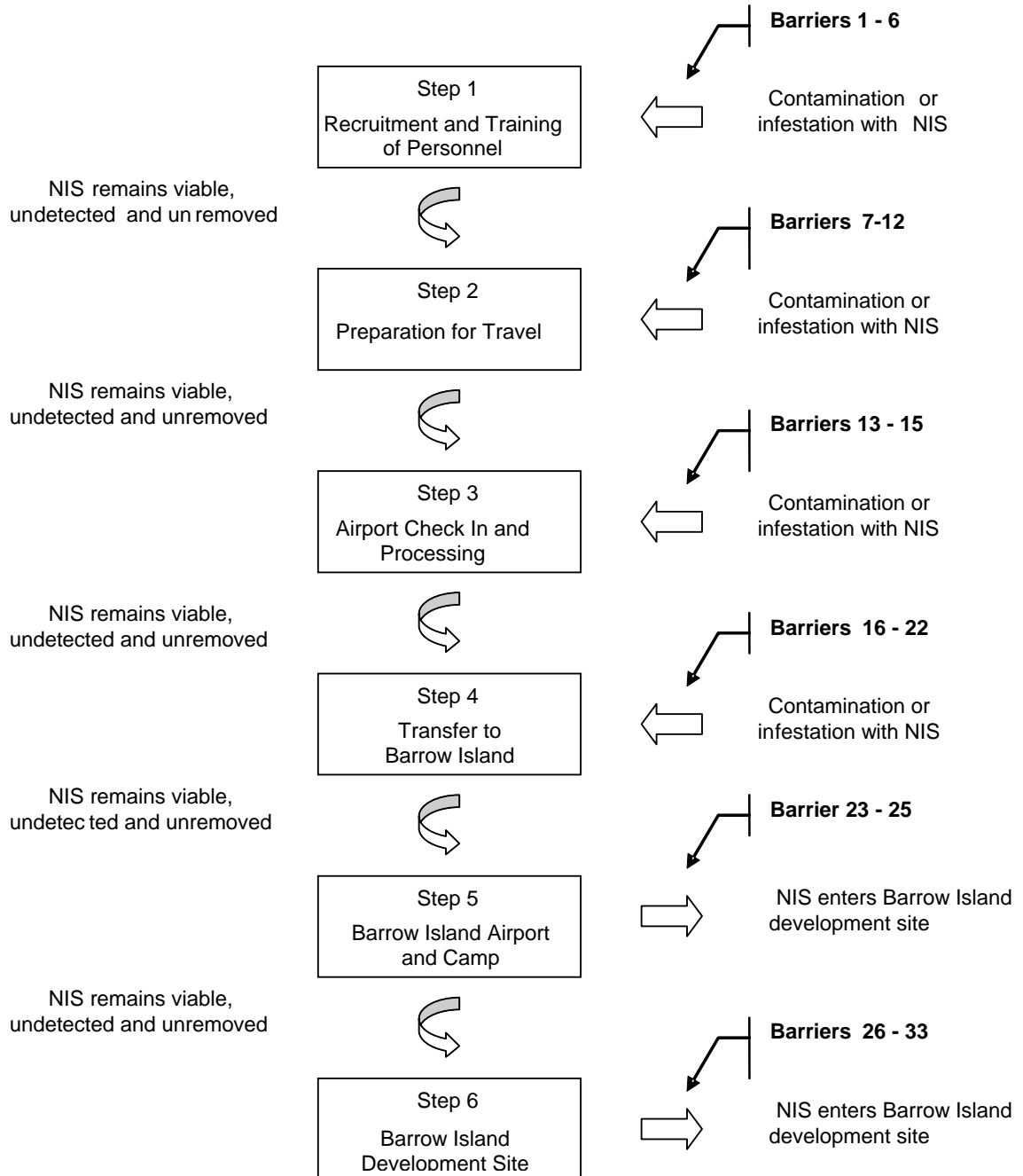
Step 4: Transfer of personnel and luggage to Barrow Island

Step 5: Offloading and transfer of personnel and luggage at Barrow Island airport facility to Accommodation Camp.

Step 6: Accommodation Camp and LNG Development Site

The Project has implemented barriers (systematic and prescriptive) for each of the steps described above. Barriers implemented for the LNG Development Site (Airport Facility, Accommodation Camp, LNG Plant site and proposed pipeline and utility corridors) are considered as border barriers recognising that the personnel and luggage will be contained (the Project will have well defined boundaries for movement of project personnel) within a designated footprint on Barrow Island.

Figure 1 : Pathway Description for Personnel and Luggage



2.0 BARRIER DESCRIPTION

Two groups of barriers have been developed. The first, termed the ‘systematic barriers’, applies to all material pathways. These barriers are discussed in the text below (Section 2). The second group of barriers is specific to personnel and luggage and is discussed in reference to each step (Section 3). The barriers are essentially a series of quarantine controls implemented at various steps of the material pathway/ supply chain.

2.1 Systematic barrier

2.1.1 Supplier Prequalification

Inclusion of quarantine requirements in pre-qualification of suppliers and contractors. Suppliers and contractors specific to personnel and luggage pathway are identified in the table below, with some examples of prequalification requirements. Requirements will include:

- Barrow Island Quarantine Policy ;and
- Barrow Island quarantine management practices specific to the personnel and luggage pathway.

Subcontractor/Supplier	Quarantine Compliance documentation to be included in Tender response	Documentation examples provided by Chevron
Air Alliance	<p>Must provide documentation to support prequalification requirements as part of tender.</p> <p>Site visit by EPCM Contractor to verify training, housekeeping and management practices</p> <p>Proposed Manning Profiles</p> <p>Proposed Facility and layout to meet quarantine procedures to be implemented.</p> <p>Maintenance schedule and checklists</p>	<p>Quarantine Policy</p> <p>Training requirements</p> <p>Manning Profiles</p> <p>Quarantine Procedures to be implemented</p> <p>Checklists for equipment cleaning and maintenance</p>
Catering Contractor	<p>Must provide documentation to support prequalification requirements as part of tender.</p> <p>Site visit by EPCM Contractor to verify training, housekeeping and management practices</p> <p>Must provide menus to EPCM for in flight catering, detailing what is served and preparation.</p>	<p>Quarantine Policy</p> <p>Checklists for equipment cleaning and maintenance</p> <p>In flight catering requirements to meet Projects quarantine guidelines for food and perishable products.</p>

2.1.2 Contracts

Inclusion of quarantine requirements in contracts for all contractors and suppliers providing goods and services for Barrow Island.

This documentation includes the detailed quarantine procedures relevant to the personnel and luggage pathway for example:

- Equipment checklists, audit protocols, and reporting of compliance.
- Health, Safety, Environment and Quarantine training for all personnel involved in the Supply Chain, with specific site quarantine training for personnel working at each pathway step.

2.1.3 Inductions

Induction of all personnel (including staff, contractors, and suppliers) in quarantine awareness and quarantine management requirements.

Inductions will be quarantine-specific, targeted to particular workgroups highlighting the risks associated with their responsibilities.

These inductions will include, suppliers, contractors, sub contractors, service providers and managers involved at each pathway step. All data related to quarantine inductions and training for personnel will be maintained in a central database specific to their work areas and will designate the access personnel have.

The Inductions will include :

- Environmental management practices for Barrow Island
- Visual monitoring regime.
- Targeted inspection procedures for identifying seeds and invertebrates in personal luggage
- Rejection culture and incident reporting.
- Barrow Island Conservation Values and the need for the Quarantine Management System
- Project commitments for Quarantine Management.
- How to undertake personal inspection of clothing and boots to ensure no seeds etc brought to Barrow Island and that luggage is clean (all discernable evidence of seeds, soil, invertebrates, vertebrates and plants are removed)
- Housekeeping and waste management practices for the Barrow Island Development Site.
- Training personnel to clean and inspect footwear, clothing and jackets to remove discernable evidence of seeds, soil, invertebrates, vertebrates when presented for travel to Barrow Island.
- Luggage (luggage to be vacuumed and cleaned) and clothing (laundered and free from seeds and soil, no cuffs on pants) guidelines for travel to Barrow Island.
- Completion of Declaration card for check in at Barrow Island flight.
- Provision of list detailing goods that are prohibited to be carried to Barrow Island in personal luggage and freight.

2.1.4 Quarantine Inspection Training

Provision of specific quarantine training to personnel required to undertake visual inspections. This recognises that the inspections need to be focussed, targeted and undertaken with rigour and thoroughness to achieve effective

quarantine management. Training will be provided by accredited quarantine trainers and will include scheduled refresher courses. All training will have a competency standard that will need to be attained in order to perform the work tasks.

Examples of specific training associated with work areas and personnel are provided below.

X-ray and Visual Inspectors, Pre check-in

- Inter personal skills for managing passengers and the pre check in process
- Visual and X-ray identification of organisms and signs of organisms, also including soil, seeds etc
- Personal cleanliness to ensure no re-contamination
- Undertaken focussed quarantine inspections of luggage and contents using checklists

Air and Maintenance Crew, Pre Flight Departure

- Cleaning protocols for aircraft and various sections i.e. cargo hold, cabin, flight deck, undercarriage etc
- Identification of organisms and signs of organisms, also including soil, seeds etc
- Personal cleanliness to ensure no transfer of seeds etc
- Undertaken focussed quarantine inspections using checklists whilst loading etc

2.1.5 Accountability

Inclusion of quarantine responsibilities in the position description for personnel. Quarantine responsibilities may include :

- Maintain housekeeping and equipment cleanliness to quarantine compliant checklist.
- Undertake regular quarantine training and awareness
- Undertake regular identification training to identify signs of contaminants such as invertebrates, rodents.
- Report all incidents potentially resulting in quarantine non compliance.
- Reflect quarantine culture in daily work practices.
- Undertake personal audits of monitoring equipment and airport facilities daily, maintain records.
- Decision making empowerment to STOP work when there is potential for non compliance with quarantine culture.
- Development of procedures and JHAs to support quarantine compliance.

2.1.6 Culture

Develop, encourage and support a strong culture of quarantine awareness in the workforce. Reference to how the safety culture in Chevron has been successfully developed and implemented. The culture is reinforced through toolbox meetings, position descriptions, management style and value of personnel contributions.

2.1.7 Monitoring and Measurement

Quarantine compliance (including quarantine training, inductions, inspections) for all personnel and goods going to Barrow Island will be recorded and tracked. Chevron and its contractors will implement this through the Quarantine Management System for personnel, and includes, signed and completed quarantine compliance checklists, manifests, quarantine handover forms, verification of quarantine activities.

2.1.8 Auditing

Conduct regular quarantine compliance audits and checks throughout the supply chain. These audits and checks will be in compliance with ISO 14001. A reporting protocol for the audit outcomes will be established, including non-compliance register. The auditing will be undertaken at three levels, regular internal auditing through the Construction Contractors, Chevron, and external third party auditors (including Regulatory authorities). The Project will seek guidance from experts and comply with accepted environmental auditing procedures.

3.0 BARRIERS IN THE PERSONNEL AND LUGGAGE PATHWAY

The quarantine management system has been developed such that it is an iterative process. Ongoing monitoring, detection and surveillance, as well as the reporting of all non compliances will provide feedback to the management system, along with continued best practice benchmarking, will result in procedures being updated to ensure the non compliances do not reoccur, and the best possible quarantine practices are being implemented.

3.1.1 Step 1: Recruitment and training of personnel

The barriers in this step are implemented to develop the quarantine culture of the personnel working on the Gorgon project (Barrow Island, Mainland and Internationally). Personnel will be self controlled and self disciplined and held accountable to quarantine through the development of the culture and disciplinary protocols developed for the Code of Conduct.

Barrier 1: Personnel applying to work with the Gorgon Project are introduced to the Quarantine Management System, its objective, rationale, expectations (performance and non compliances) and shared responsibility for the Project. This will form the basis of developing the quarantine culture for the Project and is part of the recruitment process to be implemented. Personnel will then sign a recruitment agreement agreeing to adopt the quarantine philosophy for the Project, or they may withdraw from the recruitment process

Barrier 2 : Recruited and all existing personnel for the Project will sign an Employee agreement that will include :

- Barrow Island Quarantine Policy
- Project Commitments for Quarantine Management
- Barrow Island Quarantine Procedures for Personnel and Luggage
- List of goods prohibited to carry to Barrow Island (including but not limited to fresh produce, plants, pets) developed in consultation with experts and from benchmarked practices such as those implemented for Australian Antarctic Division.
- Code of Conduct which includes the disciplinary protocol in event of a quarantine breach (all quarantine non compliances will result in an incident investigation, subsequent disciplinary action for individuals involved and also revision if required of the procedures).
- Declaration Card (checklist) that has to be completed every time personnel travel to Barrow Island.

Barrier 3 : ALL Project personnel will complete a quarantine induction. This will be the first step in a scheduled program of quarantine refresher courses which will include :

- Environmental management practices for Barrow Island
- Visual monitoring regime.
- Targeted inspection procedures for identifying seeds and invertebrates in personal luggage
- Rejection culture and incident reporting.
- Barrow Island Conservation Values and the need for the Quarantine Management System
- Project commitments for Quarantine Management.
- How to undertake personal inspection of clothing and boots to ensure no seeds etc brought to Barrow Island and that luggage is clean (all discernable evidence of seeds, soil, invertebrates, vertebrates and plants are removed)

- Housekeeping and waste management practices for the Barrow Island Development Site.
- Training personnel to clean and inspect footwear, clothing and jackets to remove discernable evidence of seeds, soil, invertebrates, vertebrates when presented for travel to Barrow Island.
- Luggage (luggage to be vacuumed and cleaned) and clothing (laundered and free from seeds and soil, no cuffs on pants) guidelines for travel to Barrow Island.
- Completion of Declaration card for check in at Barrow Island flight.
- Provision of list detailing goods that are prohibited to be carried to Barrow Island in personal luggage and freight.

The refresher course will be scheduled every 3-6 months, and will reinforce the quarantine culture, the key aspects of the quarantine procedures implemented and retraining in the observation of NIS.

Personnel will be issued with an induction card (including photograph), this will enable them to be booked on flights to Barrow Island and will identify what and when refresher training is required.

Personnel will also undertake training specific to their work areas and quarantine procedures specific to their work tasks. These are identified in the other material pathway quarantine procedures.

Barrier 4 : Employment contracts will inform personnel that there will be requirements for quarantine compliance.

Barrier 5 : The Project will provide regular feedback via Quarantine noticeboards and the regular toolbox meetings to ALL personnel regarding:

- Barrow Island environmental surveys and conservation status
- Quarantine Management non compliances
- Iterative changes to the quarantine procedures to always ensure that quarantine adapts best available knowledge from ongoing benchmarking.

Barrier 6 : The project will reinforce the quarantine culture, the inductions and the training provided to all personnel through posters (identifying common weeds, seeds invertebrates and vertebrates), videos (Barrow Island Conservation Values), regular lectures (given by ecologists whom may be visiting Barrow Island for routine monitoring work), in flight announcements reminding personnel that Barrow Island is a Class A nature reserve and of the Project commitments to Quarantine.

3.1.2 Step 2 : Preparation for Travel

The barriers in this step are implemented to ensure that the personnel and luggage travelling to Barrow Island is compliant with the quarantine procedures. Personnel includes:

Air Alliance - air crew and cabin staff that travel to Barrow Island

Rostered Workforce – workforce personnel on rotational roster including Construction, Chevron, Operators and Contractors, will have lockers provided on Barrow Island.

Transient workforce – workforce personnel that work periodically on Barrow Island, and all clothing, footwear etc will travel with the person.

Visitors – workforce personnel that “visit” the island to work for a short length of time and all clothing, footwear etc will travel with the person.

Barrier 7 : Project personnel will not be allowed to travel to Barrow Island without an active Project Induction Card. This will verify that the person has completed the necessary training and inductions / refresher courses to travel to Barrow Island and work.

Barrier 8 : ALL clothing, footwear and jackets must be cleaned and inspected to remove discernable evidence of seeds, soil, invertebrates, vertebrates when presented in luggage for travel to Barrow Island (Quarantine Compliant). Non compliant clothing, footwear and jackets will not pass the visual inspection process at pre check in and will not be allowed to travel until compliant. The Project will have adopted a Zero Tolerance standard, and if clothing, footwear etc is not compliant it will NOT travel.

All inspections at the pre check-in process will be undertaken by trained inspectors and security personnel (Barrier 11).

Air Alliance will be provided with work uniform and footwear for which they will be responsible for ensuring it is compliant with the Project guidelines. This will be visually inspected in the pre check-in process.

Rostered Workforce will be provided with task specific, clean fieldwork clothing and footwear for use on the work site at Barrow Island. All footwear and clothing can be remain on the Island, stored in lockers when personnel are on rostered breaks. All clothing, footwear etc that is taken in luggage to Barrow Island will have to be compliant with the project guidelines and quarantine compliant to pass the visual inspection.

Transient workforce and Visitors – will be responsible for ensuring clothing, footwear etc is compliant with the Project guidelines and quarantine compliant when presented at pre check-in. This will be visually inspected in the pre check-in process.

Barrier 9 : The project will implement guidelines for both hold and cabin luggage. Advice for luggage will include:

- Readily inspectable
- Sealable, ie an adhesive seal can be placed over zips and clasps
- Limited external pockets to assist with inspections
- Limited Velcro fastenings, and if present need to be cleaned and inspected.
- Free from dust, soil, plant material, invertebrates and vertebrates (achieved by vacuuming before packing)
- Free from prohibited to carry items.
- Compliant with weight limits and baggage size restrictions

Non conforming luggage will not be allowed to travel. There will be limited facilities available at pre check in including vacuum cleaner to assist with rectifying non complaint luggage.

Barrier 10 : The project will implement guidelines for clothing and footwear taken to Barrow Island. The objective of this is to assist with visual inspections at the airport and to reduce the risk of personnel “carrying” seeds, dust and small organisms to Barrow Island on and in their clothing and footwear / luggage.

- Pants/shorts with no cuffs, and all pockets cleaned (ie no seeds or dust in pockets, turn them inside out)
- Shirt pockets to be turned inside out and cleaned.
- Footwear to be cleaned (inside and out), free from discernable evidence of seeds / soil in the grooves of the sole, the tongue, and under the insoles – particularly in the toe area. All footwear will be inspected and have to be cleaned if it is non compliant before travel is allowed, or luggage accepted at the check in.
- Socks must be free from seeds, new socks are preferable.
- Velcro on clothing will be visually inspected to ensure it is clean.
- Velcro on footwear will not be allowed.

3.1.3 Step 3: Airport check-in and processing of personnel and luggage.

Personnel will also be checked for adherence to both the luggage and dress guidelines adopted for the project. Facilities will be provided at the pre check-in area for the scrubbing, cleaning and vacuuming of footwear that is presented non-compliant. This will have to be done by the personnel if there is sufficient time prior to the flight boarding, or the footwear will NOT travel.

Barrier 11 : All luggage and its contents will be x-rayed and visually inspected by trained inspectors and X-ray (security) operators prior to check in for the Barrow Island flight. The inspectors will be trained in the detection of and signs of seeds, plant material, food, vertebrate and invertebrate species. Refresher training will be provided on a 3 monthly basis.

The X-ray (security) operators will be trained in targeting and identifying signs of organics, seeds, plant material, food, vertebrate and invertebrate species. Personnel in the pre check-in area will be rotated between X-ray and visual inspections to ensure rigorous inspections by minimising “fatigue”.

Luggage and personnel will be randomly examined by AQIS trained sniffer dogs during the pre check-in procedure. Following inspection all luggage will be sealed with an adhesive quarantine seal. The Declaration Card will be stamped and signed by the Inspector.

Barrier 12 : ALL personnel will be required to complete and sign a Declaration that includes and states :

- A stamped and signed verification from trained inspectors that person and luggage has been through the pre check in inspection process
- A declaration that states no prohibited items are in the “sealed” luggage
- A person has undertaken personal check of clothing and footwear to verify quarantine compliance

Barrier 13 : All personnel associated with the operation of the air alliance including airport security, check in, airport facility, ground crew, flight maintenance and engineers, air crew (pilots, flight attendants), aircraft cleaning, catering alliance management and supervisors will receive ongoing training and inductions (3-6 monthly) in the quarantine management practices implemented for Barrow Island and the project.

The induction will include :

- Environmental management practices for Barrow Island
- Visual monitoring regime.
- Targeted inspection procedures for identifying seeds and invertebrates in personal luggage
- Rejection culture and incident reporting.
- Barrow Island Conservation Values and the need for the Quarantine Management System
- Project commitments for Quarantine Management.
- How to undertake personal inspection of clothing and boots to ensure no seeds etc brought to Barrow Island and that luggage is clean (all discernable evidence of seeds, soil, invertebrates, vertebrates and plants are removed)
- Housekeeping and waste management practices for the Barrow Island Development Site.
- Training personnel to clean and inspect footwear, clothing and jackets to remove discernable evidence of seeds, soil, invertebrates, vertebrates when presented for travel to Barrow Island.
- Luggage (luggage to be vacuumed and cleaned) and clothing (laundered and free from seeds and soil, no cuffs on pants) guidelines for travel to Barrow Island.
- Completion of Declaration card for check in at Barrow Island flight.
- Provision of list detailing goods that are prohibited to be carried to Barrow Island in personal luggage and freight.
- Inter personal skills to assist interaction with the project workforce and personnel travelling to Barrow Island.

The Project will provide regular feedback via Quarantine noticeboards and the regular toolbox meetings to ALL personnel regarding:

- Barrow Island environmental surveys and conservation status
- Quarantine Management non compliances
- Iterative changes to the quarantine procedures to always ensure that quarantine adapts best available knowledge from ongoing benchmarking.

Barrier 14 : The project will provide specific training to the pre check-in inspectors / security and the check-in personnel. The training will be focussed on the identification of organisms or signs of organisms (vertebrates, invertebrates, specifically but not limited to the commensal species and all seeds), as well as food and prohibited items.

The inspection process described in Barriers 9 – 11 will be undertaken by this group of personnel. ALL luggage will be inspected prior to the placement of an adhesive quarantine seal across the zip and/or lock of the luggage. These seals will remain in place until the point of clearance at Barrow Island. Personnel will be required to carry ID on person. If the seals are broken then the luggage will have to be re-inspected and re sealed.

Following pre check in inspection, personnel will check in for the Barrow Island flight. Luggage which is not sealed with a quarantine adhesive seal, and not compliant with the

luggage code will not be accepted. All project personnel will present Project Induction Card, ID and stamped Declaration for issue of Barrow Island boarding pass. The boarding pass acts as a verification that personnel have complied with all pre check in inspections, and received inductions and training and refresher courses as required, allowing them to travel to Barrow Island.

Barrier 15 : Following the issue of Barrow Island boarding pass at the check in, personnel and hand luggage will proceed to the project transit lounge. Personnel are not to open hand luggage prior to boarding the flight (and therefore breaking the adhesive quarantine seal).

3.1.4 Step 4: Transfer of personnel and luggage to Barrow Island

The barriers described here encompass the aircraft and its preparation for flight, loading of cargo, servicing the flight and the boarding of passengers. The barriers are designed for the detection and eradication of organisms, and to ensure quarantine compliance is maintained within parameters of acceptable risk.

Barrier 16 : All personnel boarding the flight will be in possession of Barrow Island boarding pass.

Barrier 17 : All hand luggage will be inspected to ensure that the adhesive quarantine seal is intact across the zips/locks. If the seal is tampered or broken then the hand luggage will be rejected, and will have to be re inspected and re sealed before being allowed on the flight.

Barrier 18 : All personnel travelling to Barrow Island (passengers and air crew), as well as all personnel associated with the servicing/loading of the aircraft, will be prohibited from taking items on the “prohibited items” list on board the plane. The food served on the plane will be provided by the in flight catering service. There will be amnesty bins provided for personnel to dispose of food and drink items at the point of boarding the aircraft. The amnesty bins will be monitored to assist with compliance monitoring.

The inflight catering service will be given guidelines for the provision of the in flight catering service, including a list of prohibited items, the preparation of the food to meeting the Project quarantine requirements and the management of the waste. These guidelines would be adopted from those implemented for the processing of food and perishables.

Barrier 19 : Air, ground and maintenance crew will undertake focussed visual inspections of the aircraft (including flight deck, cabin, cargo hold, and undercarriage of the aircraft) during routine maintenance and prior to, during and following loading to ensure that quarantine compliance is met and maintained. The focussed visual inspections will be based on a checklist (developed by the Project in conjunction with experts to ensure that key areas where organisms may be housed are targeted). This visual inspection will be audited as part of the systematic barriers implemented through the Quarantine Management System. The checklists will need to be signed off and verified prior to the flight departing for Barrow Island by the quarantine supervisor and the pilot.

If a non compliance is detected during the inspection process the area will have to be re-cleaned to meet the quarantine requirements before the aircraft can depart.

Barrier 20 : The aircraft travelling to Barrow Island will undergo a daily cleaning and maintenance schedule to meet the Project quarantine requirements (that is removal of discernable soil, seeds, plants, invertebrates and vertebrates and signs of these).

The aircraft will undergo a visual inspection (using a checklist) to ensure quarantine compliance prior to commencing the Barrow Island service, that is prior to being taxied to terminal for loading of cargo, supplies and passengers.

The aircraft cabin will undergo cleaning (vacuum, wipe down of surface, empty of seat pockets and removal of visible signs of soil, seeds etc) prior to each scheduled Barrow Island service.

Barrier 21 : The aircraft will be treated and cleaned on a scheduled basis in accordance with AQIS “Schedule of Aircraft Disinsection Procedures”. Regular monitoring and detection via daily completion of visual inspection checklists, and also baiting/trapping will be undertaken to determine the appropriate frequency of the recommended treatments and the efficacy of these treatments in reducing risk.

Barrier 22 : All unconsumed food and drink items from the in flight catering service will remain on the aircraft, amnesty bins will be provided at the aircraft exits to ensure that this is complied with. All the waste will be double bagged, sealed and returned to the mainland in the cargo hold for disposal.

3.1.5 Step 5: Barrow Island airport facility and transfer to Barrow Island Accommodation Camp

The project recognises that there must be a number of controls implemented at the border which ensure that quarantine compliance is maintained and that NIS do not enter the Barrow Island environment. The Barrow Island Airport Facility is designed to handle transit passengers, and associated air freight and cargo, for transfer to other islands and rigs in the NW Shelf, as well as the passengers, air freight and cargo for Barrow Island. The airport Facility is designed to contain personnel and luggage for movement to Barrow Island Camp, and other NW Shelf Projects.

Barrier 23 : Passengers will disembark from aircraft to airport terminal, passengers and hand luggage will be subject to random visual inspections.

On-arrival verification that all personnel have completed quarantine-related training and certification requirements, and that themselves and luggage have passed all required pre-entry quarantine barriers at the mainland airport facility.

Personnel clothing and luggage to be subject to an on-arrival verification and if required inspection by trained inspectors (as described in Barrier 11), that there are no quarantine non compliances, and that all the adhesive quarantine seals placed on the checked luggage, and the air freight/cargo are still intact, and that the cargo, air freight and checked luggage is tagged for Barrow Island and or NW Shelf Projects.

Barrier 24 : Personnel and hand luggage will be transferred directly from the aircraft to the Barrow Island Accommodation Camp in transit vehicles only. Only personnel with completed certification, tagged luggage and Project Induction Card to be given permission to exit the Barrow Island air terminal and board transit vehicles to the camp facility. Personnel will not be allowed to freely travel on the island or be picked up by other personnel at the airport, all personnel will travel directly to the Camp.

Luggage, cargo and air freight without an intact quarantine seal to be moved directly to a sealed quarantine inspection room for thorough visual inspection by trained inspectors as described in barriers above. If inspection confirms that luggage is non-compliant it will be bagged and sealed for return to the mainland on the return flight. If the baggage is compliant it will be transferred to the Camp. Checked luggage to be contained and moved directly from the airport facility to the camp in enclosed trailers. Cargo and air freight to be contained and moved directly from the airport facility to the Development site warehouse in enclosed trailers, for pick up and distribution.

Barrier 25 : Passengers, luggage, air freight and cargo in transit to other islands, rigs and NW Shelf projects will remain contained within the confines of the Barrow Island airport facility for transfer.

Air crew will also remain contained in the Barrow Island airport facility following routine inspections etc of the aircraft, and preparation of the aircraft for return flight to the mainland.

Containment will be enforced through messages, announcements and provision of tea/coffee facilities etc.

3.1.6 Step 6: Accommodation camp and LNG development site

The Project will adopt a number of quarantine barriers across the Project Development site encompassing the Airport Facility, Accommodation Camp, LNG Plant site and proposed pipeline and utility corridors to reduce the risk of introduction of organisms to the Barrow Island Environment, and also to monitor, detect and eradicate these.

Barrier 26 : All luggage received in the camp from the airport facility, and picked up by personnel on receipt of room key. All luggage transferred to rooms by personnel.

Barrier 27 : Camp will be denuded of vegetation, and architecturally designed to be aesthetically acceptable through the use of sails, screens, sculptures.

Barrier 28 : Camp Manager will implement baiting and trapping programme, including regular pest control, weed control and maintenance. The project will seek advice on these programmes from CALM, and department of Agriculture.

Barrier 29 : Personnel and luggage will be contained within the Development site. Personnel will be allowed within the Accommodation Camp, LNG Plant site and associated Development areas only.

The Project recognises that there may be a requirement for some personnel to enter the Barrow Island environment. These personnel will have to adhere to additional quarantine barriers as proposed below.

Barrier 30 : Personnel will have specific field clothing and footwear which will be issued and dedicated to use for this purpose only. The clothing and footwear will undergo a vigorous inspection prior to field mobilisation to ensure quarantine compliance is met. Following the completion of the fieldwork the clothing and footwear will be inspected and cleaned to remove all discernable evidence of soil, seeds etc.

Barrier 31 : Work crews will have to obtain a work permit detailing the activities and the locations of work within the Barrow Island environment. Personnel will have to complete a Job Hazard Analysis (JHA) for the work activities which will include quarantine risks and mitigation procedures.

Barrier 32 : All equipment used in these surveys will also have to adhere to the strict quarantine guidelines to ensure potential transfer of organisms does not happen.

Barrier 33 : All activities in the Barrow Island environment will be preceded by flora surveys undertaken in the work areas to identify any concerns. These will feedback into the JHA.

4.0 ASSESSMENT OF QUARANTINE BARRIERS

Quarantine barriers to prevent the introduction of organisms were assessed in the QHAZ with respect to 6 pathway steps: recruitment and training of personnel; preparation for travel; airport check-in and processing of personnel and luggage; transfer of personnel and luggage to Barrow Island; Barrow Island airport facility and transfer to Barrow Island accommodation camp; and accommodation camp and LNG development site. The proposed recommendations from the QHAZ workshops are summarised in Table 1, with actions required or undertaken by the Project.

Table 1: Assessment of quarantine barriers, personnel and accompanying luggage material pathway

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
Recruitment and training of personnel					
B1. Education and training	Surrogates	Inadequate knowledge of training effectiveness	Develop methods for monitoring the effectiveness of the training programs. Not direct assessment, but monitoring of expected outcomes of the training; needs to be managed with a database to analyse the results and identify problems with the quarantine process.	Y	
B2. Employee agreement	Employment agreement	Lack of appreciation of legal document	Glossy brochures, interesting communication materials to get message across; hotline to report quarantine issues	Y	
		Long list of prohibited items	Also emphasise what items are permitted (be positive)	Y	
		Lack of understanding why quarantine requirements are important	Ensure the process is enforced and communicated back to the workforce	Y	
		People who work for other companies using Barrow Island as a transit point	Consortium agreement has to be renegotiated to provide greater level of control on quarantine issues	Y	
		Gap between signing agreement and going to Barrow Island	Refresher training	Y	
		Employees who do not go to Barrow Island are exempt	No exceptions to persons employed on the project, whether they travel to Barrow Island or not.	Y	
B3. Quarantine induction and training	Quarantine training		Biogeography; consider the impact on the conservation values and the cost of rectification of invasions on Barrow Island; recurring expenditure over many years; Barrow Island is unique on a world scale and this should be reinforced in the training program	Y	It is recognised that there is an ongoing training requirement throughout the project life. It is recognised that the training program will be

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
			<p>Consider clean viewing areas of the quarantine process for the purposes of training</p> <p>Perth supply base will be the primary quarantine centre for the project. The training base will likely be incorporated into this facility</p> <p>Consider tours of the island for personnel to understand the environment and to satisfy curiosity</p>	TBR TBR	iterative and will involve continuous improvement for implementation and improvement
	Quarantine induction	Inadequate training of persons delivering induction training	Train the Trainer; persons need passion and knowledge in biological processes	Y	
		Insufficient emphasis on quarantine message	<p>High impact posters, persuasive language, method of communicating quarantine message; look at inducting smaller groups; appreciated biodiversity of Barrow Island and provide examples of extinctions on other islands; use toolbox meetings as a forum for discussing environmental issues with invited specialists; included feedback and verification of effectiveness of induction process; clear specifications for persons leading inductions.</p> <p>Demonstration of packing bags and what will happen at the airport with quarantine inspection</p>	Y	
		Information overload	Manage the induction process for effectiveness; keep the training current, interesting etc.	Y	
		Departures from other ports			
		SAS visits	Government agreement has to be negotiated to provide greater level of control on	TBR	

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
			quarantine issues; note in supplement to EIS or letter of transmission Reinforce communication to tour operators, yachts-people re: mooring restrictions	TBR	
		People who work for other companies using Barrow Island as a transit point	Consortium agreement has to be renegotiated to provide greater level of control on quarantine issues	TBR	
Preparation for travel					
B8. Clothing and footwear inspection	Inspection	Velcro	Ban Velcro on footwear; Advise personnel of potential difficulties in cleaning Velcro to comply with quarantine requirements; Discourage the use of Velcro generally; Provide information in inductions so personnel understand that decontamination at the airport is a last resort; Encourage people to leave boots on the island. Induction to include examination of footwear and discussion of cleaning issues for footwear.	Y	
		Workboots for online pipeline personnel	Additional inspection of workboots for personnel leaving compound on the island to work along the onshore pipeline route to prevent contamination.	Y	
B9. Hold and cabin luggage guidelines	Cleaned of visible soil, plants, invertebrates	Newcomers to the quarantine processes		Y	Packing method needs to be included in the induction Packing needs to be in an orderly arrangement to facilitate inspection
		Luggage with concealed	Specify type of bag which is acceptable;	Y	

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
		pockets or other containment for organisms	discourage velcro; advise that velcro has potential problems associated with it and may inhibit ability to pass quarantine requirements.		
		Late changes in passenger lists; emergency mobilisation of personnel	Treat bags with appropriate pesticides	N	Safety hazard and human resources issue.
		Early flight resulting in rushing the packing process	Adequate staff to passenger ratio for available check-in time; additional time for check-in (1.5 hrs); change flight time?	Y	
B10. Clothing and footwear guidelines	Issued work clothing (or equivalent footwear)	Workboots transported to and from the island with personal gear; unable to inspect thoroughly (unlike other items of clothing)	No treatment for disinfecting boots; leave boots on the island	Y	
		Non work clothing worn outside of compound	Non work clothing restricted to compound; No recreation outside compound	Y	
B11. Inspection procedures	Inspection procedures	Uncertainty with respect to performance in detection of organisms	Spiking of luggage to test detection performance; uses a feedback mechanism for non-compliance	Y	
		Lack of x-ray sensitivity or training to detect small organisms	The sensitivity of detection needs to be tested to understand the training requirements and performance of detection systems; refer to New Zealand x-ray operator performance	TBR	
Airport check-in and processing of personnel and luggage					
Personnel check-in	Completion of checklist	Lack of suitable location to do personal inspections and repacking	Alternative areas to do personal inspections and repacking will be designated	Y	
		NIS accumulate in cuffs of trousers	Cuffs will be prohibited on trousers	Y	
		Unknown accuracy of checklist	Any inaccuracies with a checklist will deny a person boarding a flight	Y	
Cabin luggage check-in	Visual and x-ray inspection	Fatigue or complacency of x-ray inspection staff	Refresher training and spiking of luggage to test effectiveness of detection	Y	
		Focus on contraband	Consider interaction of residual pesticides with	TBR	

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
		during x-ray rather than quarantine	sniffer dogs if both methods used.		
		Footwear	All footwear to be removed for visual inspection of shoes and socks	Y	
		Small organisms and propagules hard to detect	Baiting for rats and mice with bags above the ground and in transit	Y	
	Visual and x-ray inspection, sniffer dogs	Inspection occurs prior to personnel waling through public airport		Y	
	Quarantine seal			Y	Air Alliance requires compliance with quarantine requirements by other users (not yet a signed agreement)
Air crew clothing and cabin luggage	Visual and x-ray inspection	Cuffs on trousers	Contingency for dealing with cuffs if the need arises (turn inside out and vacuum Implement checklist as for Gorgon personnel	Y	
Personnel clothing and cabin luggage	Visual and x-ray inspection	Public use of inspection trays at airport security	Airport security advises that we have no control over their equipment; include awareness and instructions in the inductions on how to avoid contamination at security	Y	
		Personnel wearing overcoats and headwear during visual inspection	Quarantine does not allow bulky clothing to be worn without separate inspections; overcoats to go through x-ray inspection to facilitate visual inspection of personnel Opportunity to clean out pockets for seeds etc.	Y	
B15. Departure lounge	Boarding aircraft	Windblown seeds on airport tarmac at Perth, particularly in late spring	Airport aprons (Perth) to be inspected and kept clean to avoid contamination from windblown seeds on the ground; Consider spraying airport tarmac to destroy seeds and plants which may present a quarantine issue.	Y	
Transfer of personnel and luggage to Barrow Island					

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
B18. Elimination of prohibited food items	Amnesty bins and quarantine posters	Uninteresting reinforcement		Y	
B19. Visual inspection of aircraft	Visual checkpoint inspection			Y	Airline inspection staff need to have awareness training for the specific quarantine requirements for Barrow Island; AQIS protocol to be adopted – Schedule of Aircraft Disinfection Procedures Non-compliance triggers cleaning of aircraft
B20. Cleaning and maintenance of aircraft	Cleaning of aircraft cabin	Incomplete cleaning	Include in inductions; encourage travellers to report shortfalls in cleaning	Y	Nightly comprehensive cleaning of aircraft, cleaning between flights; existing protocols for aircraft cleaning
	Treatment of cargo hold			Y	Strong recommendation for using insecticide bomb on aircraft for treatment en route Section 8.1.1 of AQIS Protocol Consider more frequent cleaning of cargo holds
B22. Food and drink items to remain on aircraft	Amnesty bins and quarantine barriers			Y	Inspection of Amnesty bin contents provides feedback loop for effectiveness of quarantine process List of allowable goods (foods) to be emphasised at inductions
Barrow Island airport facility and transfer to Barrow Island accommodation camp					

Exposure route	Barrier	Barrier failure cause	Recommended treatment	Adopted (y/n)	Explanation
B23. Personnel clothing and cabin luggage	Verification of compliance		Remark Contingency needed for persons accidentally arriving at Barrow Island without quarantine	Y	
	Personnel certified and luggage re-tagged	No deviation causes identified		Y	
B25. Stopover passengers and luggage	Remain within confined air terminal	Inadvertent leaving of airport terminal (non-Gorgon personnel) Medical emergency of aircrew	RFDS has priority for medical emergencies Contingency needed for medivacs and other non-routine operations	TBR	
Accommodation camp and LNG development site					
B29. Luggage containment	Containment of people and luggage	Residual infection of luggage	Install pest strips or other forms of traps in closets to reduce infestation potential	Y	
B30. Field clothing and footwear	Field clothing and footwear		Clothing and footwear to be used in the field will meet particular specifications for these applications; eg work areas around the airport, terminal tanks, onshore pipeline	Y	
B33. Flora survey	Weeds survey	Seed loading in soils; weeds which may not be apparent (due to seasonal die off)	Review most up-to-date weed eradication reports to identify species which may be present or potential for seed loading in soils; Weed management plan should also include a buffer zone.	Y	

Quarantine Pathways — Barrier Selection Report

Technical Appendix 3

**Quarantine Barrier Selection Document
Sand and Aggregate Pathway**

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1.0 INTRODUCTION

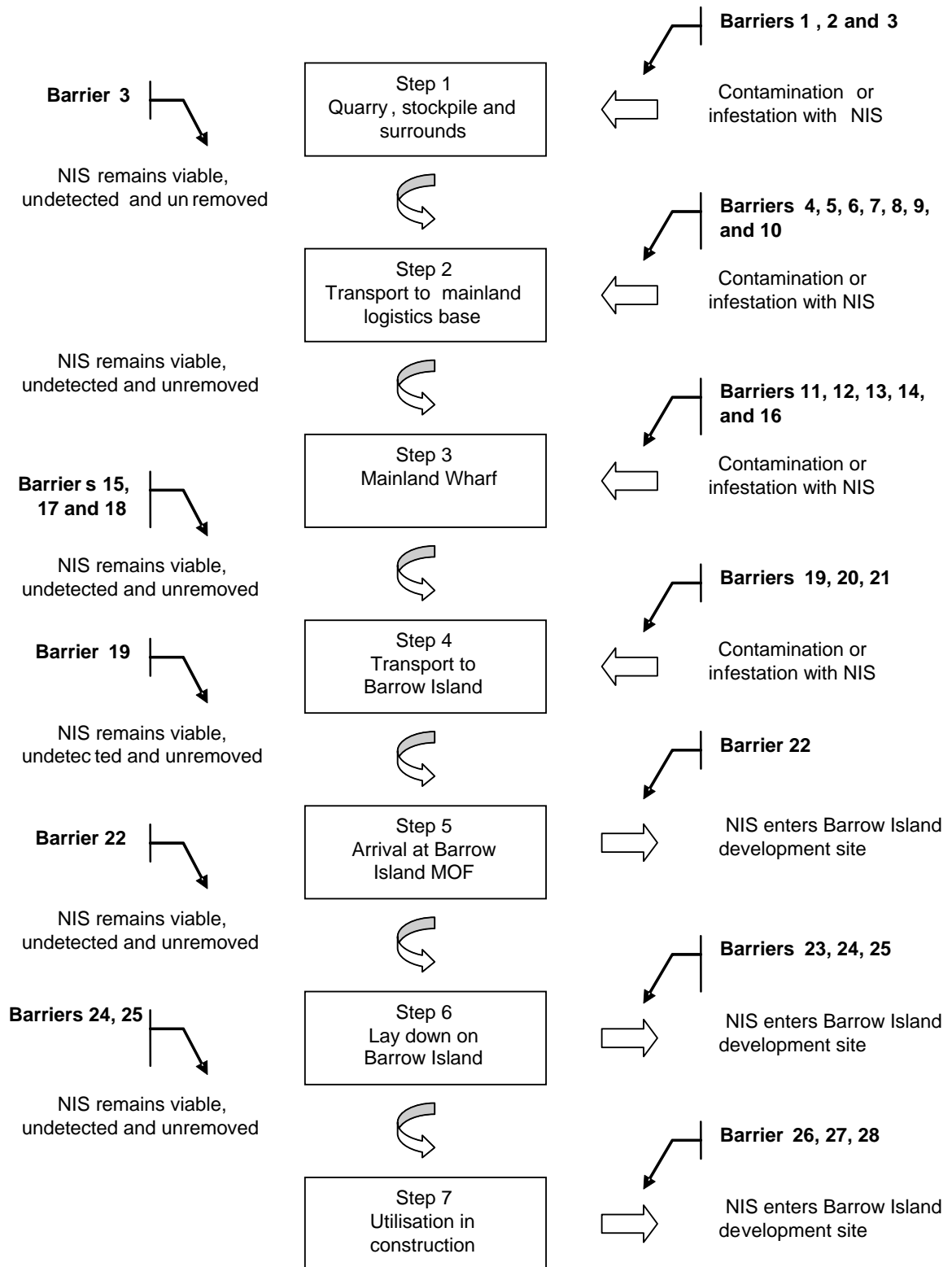
This document represents the quarantine barriers for the sand and aggregate pathway and describes the associated quarantine management measures. This document was originally prepared for risk assessment in the Quarantine Hazard Analysis (QHAZ) workshop of proposed quarantine barriers for the sand and aggregate pathway. The QHAZ method is used to assess the effectiveness of barriers proposed to manage quarantine on a pathway of exposure. Following the QHAZ, recommendations suggested to improve barrier effectiveness were evaluated.

Seven steps were identified in the sand and aggregate pathway and these are illustrated in Figure 1 and listed below:

- Step 1: Sourcing of sand and aggregate from mainland quarries;
- Step 2: Transport by road to mainland marine loading facility;
- Step 3: Lay down at marine loading facility, and transfer to barge;
- Step 4: Transport by barge to Barrow Island;
- Step 5: Arrival and unloading at Barrow Island MOF;
- Step 6: Lay down on Barrow Island Gorgon development site; and
- Step 7: Construction works on Barrow Island Gorgon development site.

Chapter 2.0 of this report describes the systematic barriers which are applicable to all material pathways, Chapter 3.0 details the barriers which are specific only to the sand and aggregate material pathway, and Chapter 4.0 presents an assessment of the quarantine barriers, from the QHAZ workshops.

Figure 1: Steps in the Sand and Aggregate Pathway and Barriers



2.0 BARRIER DESCRIPTION

Two groups of barriers have been developed. The first, termed the ‘systematic barriers’, applies to all material pathways and are discussed in this section. These barriers are implemented through the Quarantine Management system being developed, and incorporated into the specific procedures developed for each material pathway. The second groups of barriers is specific to sand and aggregate and is discussed in reference to each step in the sand and aggregate pathway (Section 3.0). The barriers are essentially a series of quarantine controls implemented at various steps of the material pathway/supply chain.

2.1 Systematic Barriers

2.1.1 Supplier prequalification

Inclusion of quarantine requirements in pre-qualification of suppliers and contractors. Suppliers and contractors specific to sand and aggregate pathway are identified in the table below, with some examples of prequalification requirements. Requirements will include:

- Barrow Island Quarantine Policy ;
- Barrow Island quarantine management practices specific to the sand and aggregate pathway; and
- Packaging requirements documentation.

Subcontractor/Supplier	Quarantine Compliance documentation to be included in Tender response	Documentation examples provided by Chevron
Quarry Suppliers	<p>Must provide documentation to support prequalification requirements as part of tender.</p> <p>Site visit by EPCM Contractor to verify Environmental management practices</p> <p>Provision of sand and aggregate samples from stockpiles, quarry face, processing plant for independent verification of “organics” content</p>	<p>Quarantine Policy</p> <p>Environmental management Plan,</p> <p>Guidelines for managing topsoil, stockpiles etc,</p> <p>Checklists for equipment cleaning and maintenance</p> <p>Site Selection Criteria</p>
Road Transport	<p>Must provide documentation to support prequalification requirements as part of tender.</p> <p>Journey management plan compliant to ISO 14001 and Chevron quarantine requirements.</p> <p>Verification of fleet maintenance schedule.</p> <p>Licensed Operators</p>	<p>Quarantine Policy</p> <p>Checklists for equipment cleaning and maintenance</p> <p>Journey management</p> <p>Australian Road Regulations compliant.</p> <p>Load management practices (tarps, loading regime etc).</p>

Subcontractor/Supplier	Quarantine Compliance documentation to be included in Tender response	Documentation examples provided by Chevron
Barge / Sea Transport	<p>Must provide documentation to support prequalification requirements as part of tender.</p> <p>Operators are certified.</p> <p>Vessel specifications and supporting photos.</p> <p>Journey management plan</p>	<p>Quarantine Policy</p> <p>Checklists for vessel hygiene, cleaning and maintenance</p> <p>AQIS compliant</p> <p>IMO standards</p> <p>Waste management.</p>

2.1.2 Contracts

Inclusion of quarantine requirements in contracts for all contractors and suppliers providing goods and services for Barrow Island.

This documentation includes the detailed quarantine procedures relevant to the sand and aggregate pathway for example:

- Equipment checklists, audit protocols, and reporting of compliance for Quarry, Marine Loading Facility, Barges and vessels.
- Sand and Aggregate sampling procedures at the quarry to verify civil and environmental compliance
- Environmental management audit procedure, frequency for the quarry and the Marine Loading Facility
- Road transport and Vessel checklists, journey management compliance register.
- Health, Safety, Environment and Quarantine training for all personnel involved in the Supply Chain, with specific site quarantine training for personnel working at each pathway step.

2.1.3 Inductions

Induction of all personnel (including staff, contractors, and suppliers) in quarantine awareness and quarantine management requirements.

Inductions will be quarantine-specific, targeted to particular workgroups highlighting the risks associated with their responsibilities. Examples provided below.

These inductions will include, suppliers, contractors, sub contractors, service providers and managers involved at each pathway step. All data related to quarantine inductions and training for personnel will be maintained in a central database specific to their work areas and will designate the access personnel have.

Generic Quarantine Induction Outline

1. Introduction – scope and learning objectives:

Learning objective:

- Participants should be able to articulate why quarantine is important, identify the key rules and identify where to obtain further information or guidance at the end of the session.

Scope:

- The unique ecology and conservation values of Barrow Island;
- The quarantine risks - potential impacts of the introduction of organisms;
- The Gorgon Project quarantine commitments;
- Pathways, Borders and Barriers - steps needed to manage the quarantine risks;
- Quarantine rules and the QMS;
- Response strategies – what actions to take in case of a quarantine breach; and
- Where to get further advice and information.

2. Barrow Island Conservation (why Quarantine?) - provide information on:

- The importance of the conservation values of Barrow Island;
- 'Class A' nature reserve status;
- Unique ecosystem and species that have evolved in isolation from the mainland for over 8000 years;
- Species identified on the island that are not known elsewhere in Australia.

3. Gorgon Project Quarantine Commitments – cover the following:

- Barrow Island Quarantine Policy Statement;
- Regulatory commitments;
- Operating licence commitments

4. Quarantine Risk - Potential impacts of introductions and establishment of organisms:

- Introduction of organisms and potential irreversible and detrimental impacts to the ecological composition and function of the island's ecosystem through competition, predation, or habitat modification.

5. Pathways, Borders and Barriers – define the concepts and provide examples of:

- Pathways – routes of exposure that may enable organisms to be introduced to Barrow Island;
- Borders – the entry points of cargoes, vessels or people to Barrow Island;
- Barriers – physical, chemical, biological, procedural or administrative process that prevents organisms being introduced to Barrow Island. Including emphasis on prevention being better than cure and personal responsibilities to the quarantine management commitments of the project.

6. **Quarantine Rules and the Quarantine Management System (QMS) –**
 - Gorgon project quarantine rules applicable to work activities and personnel;
 - Risk Register;
 - Structure of QMS (road map);
 - Relevance to your work.
7. **Response Strategies – actions to take in case of a quarantine breach:**
 - Incident response – contact details and procedures;
 - Incident reporting – responsibilities and procedures.
8. **Further Information – Directions to locations of additional resources and help:**
 - QMS Website;
 - Quarantine Advisor.

As assessment of participants success in meeting the learning objectives will be made following the training session.

Personnel

Quarantine Induction

Quarry Managers and Operators

Environmental management practices for the quarry.
Sampling procedure and rejection culture.

Visual monitoring regime.

Targeted inspection procedures for identifying seeds and invertebrates and rejection culture.

Incident reporting.

Barrow Island Conservation

Project commitments for Quarantine Management.

Personal inspection of clothing and boots to ensure no seeds etc brought into the facility.

Housekeeping, eg food eaten in Crib rooms, not in operational areas, waste management

Logistics Providers (road transport, and loading at Wharf)

Journey and fatigue management training

Visual monitoring regime and rejection culture

Targeted inspection procedures for identifying seeds and invertebrates at the start of each shift, and during operations.

Incident reporting.

Personal inspection of clothing and boots to ensure no seeds etc brought into the facility.

Barrow Island Conservation

Project commitments for Quarantine Management.

Housekeeping, eg food eaten in Crib rooms, not in operational areas, waste management

Personnel

Quarantine Induction

Wharf Operations (Wharf crew)

Visual monitoring regime and rejection culture
Targeted inspection procedures for identifying seeds and invertebrates in the stockpiles, around the facility, and during daily operations.

Incident reporting.

Facility Housekeeping and environmental management practices.

Personal inspection of clothing and boots to ensure no seeds etc brought into the facility.

Barrow Island Conservation

Project commitments for Quarantine Management.

Housekeeping, eg food eaten in Crib rooms, not in operational areas, waste management

Marine Vessels and crew

Visual monitoring regime and rejection culture

Targeted inspection procedures for identifying seeds invertebrates and vertebrates (rodents) or signs of these, in the stockpiles loaded onto the barge, around the vessel and accommodation, and during sailing operations / loading/ unloading.

Incident reporting.

Vessel housekeeping and waste management practices, includes food consumed in designated areas only.

Personal inspection of clothing and boots to ensure no seeds etc brought onto the vessel.

Barrow Island Conservation

Project commitments for Quarantine Management.

Visitors to any Facility on the Mainland

Barrow Island Conservation

Visual monitoring regime and rejection culture.

Project commitments for Quarantine Management.

Movement Restrictions.

Personal inspection of clothing and boots to ensure no seeds etc brought into the facility.

Barrow Island Construction Crew

Visual monitoring regime and rejection culture when receiving and unloading the barges.

Targeted inspection procedures for identifying seeds, invertebrates (ants) and vertebrates (geckoes, lizards) in the stockpiles being unloaded from the barge, around the laydown area, and during daily construction operations.

Incident reporting.

Barrow Island Wharf and Barrow Island

Personnel

Quarantine Induction

Development site housekeeping and environmental management practices.

Personal inspection of clothing and boots to ensure no seeds etc brought onto the Island and/or transported between the Camp, the construction site and the Wharf.

Barrow Island Conservation

Project commitments for Quarantine Management.

Housekeeping, eg food eaten in Crib rooms only.

The project will reinforce the quarantine culture, the inductions and the training provided to all personnel through posters (identifying common weeds, seeds, invertebrates and vertebrates), videos (Barrow Island Conservation Values). Regular lectures (given by ecologists whom may be visiting Barrow Island for routine monitoring work), in flight announcements reminding personnel that Barrow Island is a Class A nature reserve and of the Project commitments to Quarantine.

2.1.4 Quarantine inspection training

Provision of specific quarantine training to personnel in the procurement and logistics supply chain. This recognises that the supply chain is critical in achieving effective quarantine management. Training will be provided by accredited quarantine trainers and will include scheduled refresher courses. All training will have a competency standard that will need to be attained in order to perform the work tasks.

Examples of specific training associated with work areas and personnel are provided below.

Work Area and Personnel	Quarantine Training / Key Competency
Quarry	Suppliers training to include interactive on line quarantine awareness module, including goods delivery, packaging specifications. Competency: online questionnaire to assess understanding of quarantine requirements.
Supervisors	Quarantine training and accreditation for quarry management and supervisors. Refresher training every 6 months. Competency: questionnaire to assess understanding of requirements, on site assessment of inspection practices, completion of quarry JHA highlighting quarantine risks.
Equipment Operators	Quarantine training and accreditation for all quarry operators. Refresher training every 6 months. Competency: questionnaire to assess understanding of requirements and equipment

Work Area and Personnel	Quarantine Training / Key Competency
	movement within the Quarry, on site assessment of inspection practices, assessment of flora/fauna identification, completion of procedural JHA highlighting quarantine risks.
<i>Road Transport</i>	Suppliers and mechanics training to include interactive on line quarantine awareness module, including goods delivery, packaging specifications.
Transport Company Managers	Training to include interactive on line quarantine awareness module, including goods delivery, packaging specifications. Managers need to support the training and competencies developed for quarantine.
Truck Drivers	Quarantine training and accreditation for all truck operators. Refresher training every 6 months. Competency: questionnaire to assess understanding of requirements, on site assessment of inspection practices, completion of procedural JHA highlighting quarantine risks.
<i>Wharf Operations</i>	Suppliers and service providers training to include interactive on line quarantine awareness module, including goods delivery, packaging specifications.
Facility Supervisor	Quarantine training and accreditation for Facility management and supervisors. Refresher training every 6 months. Competency: questionnaire to assess understanding of requirements, on site assessment of inspection practices, completion of procedural JHA highlighting quarantine risks within the facility and operational procedures.
Security	Quarantine training and accreditation for all security operators. Refresher training every 6 months. Competency: questionnaire to assess understanding of requirements, on site assessment of inspection practices.
Equipment Operators	Quarantine training and accreditation for all equipment operators. Refresher training every 6 months. Competency: questionnaire to assess understanding of requirements and equipment movement within the Wharf Facility, on site assessment of inspection practices assessment of flora/fauna identification, completion of procedural JHA highlighting quarantine risks.
Wharf Crew	Quarantine training and accreditation for the Wharf crew. Refresher training every month, through

Work Area and Personnel	Quarantine Training / Key Competency
	<p>toolbox meetings.</p> <p>Competency: questionnaire to assess understanding of quarantine requirements and loading of the barges, on site assessment of inspection practices assessment of flora/fauna identification, completion of procedural JHA highlighting quarantine risks.</p>
<i>Marine Vessels</i>	<p>Suppliers and service providers training to include interactive on line quarantine awareness module, including goods delivery, packaging specifications, vessel housekeeping/monitoring and relevant AQIS marine (wetsides) quarantine procedures.</p>
Vessel Masters	<p>Quarantine training and accreditation for Vessel Masters. Refresher training every month.</p> <p>Competency: questionnaire to assess understanding of quarantine requirements, loading of the barges, ship pest monitoring, load monitoring, on site assessment of inspection practices and assessment of flora/fauna identification including rodent sign, completion of procedural JHA highlighting quarantine risks.</p>
Vessel crew	<p>Quarantine training and accreditation for the vessel crew. Refresher training every month, through toolbox meetings.</p> <p>Competency: questionnaire to assess understanding of quarantine requirements, loading of the barges, ship pest monitoring, load monitoring, on site assessment of inspection practices and assessment of flora/fauna identification including rodent sign.</p>
<i>Barrow Island MOF / Development Site</i> Harbour Master	<p>Quarantine training and accreditation for Harbour Masters. Refresher training every month, running the toolbox meetings. Training needs to include understanding of the Marine vessel requirements and training.</p> <p>Competency: questionnaire to assess understanding of quarantine and AQIS marine requirements, ship pest monitoring, load inspection prior to unloading, quarantine compliance verification and unloading of the barges, on site assessment of inspection practices and assessment of flora/fauna identification including rodent sign, completion of procedural JHA highlighting quarantine risks.</p>
Site Supervisors	<p>Quarantine training and accreditation for construction site supervisors. Refresher training every 6 months.</p>

Work Area and Personnel	Quarantine Training / Key Competency
	<p>Competency: questionnaire to assess understanding of requirements, on site assessment of inspection practices, completion of procedural JHA highlighting quarantine risks within the construction site and operational procedures.</p>
Unloading and Transport Crew	<p>Quarantine training and accreditation for the unloading and transport crew. Refresher training every month, through toolbox meetings.</p> <p>Competency: questionnaire to assess understanding of quarantine requirements, unloading of the barges, load verification and quarantine compliance inspection, on site assessment of inspection practices and assessment of flora/fauna identification including rodent sign.</p>
Construction Equipment Operators	<p>Quarantine training and accreditation for all construction equipment operators. Refresher training every 3 - 6 months.</p> <p>Competency: questionnaire to assess understanding of requirements and equipment movement within the plant construction site, on site assessment of inspection practices assessment of flora/fauna identification, completion of procedural JHA highlighting quarantine risks.</p>

2.1.5 Accountability

Inclusion of quarantine responsibilities in the position description for personnel. Quarantine responsibilities may include :

- Maintain housekeeping and equipment cleanliness to quarantine compliant checklist.
- Undertake regular quarantine training and awareness
- Undertake regular identification training to identify signs of contaminants such as invertebrates, rodents.
- Report all incidents potentially resulting in quarantine non compliance.
- Reflect quarantine culture in daily work practices.
- Undertake personal audits of equipment and quarry daily, maintain records.
- Decision making empowerment to STOP work when there is potential for non compliance with quarantine culture.
- Development of procedures and JHAs to support quarantine compliance.

2.1.6 Culture

Develop, encourage and support a strong culture of quarantine awareness in the workforce. Reference to how the safety culture in Chevron has been successfully developed and implemented as well as in other resource companies. The culture

is reinforced through Toolbox meetings, position descriptions, management style and value of personnel contributions.

The Project will provide regular feedback via Quarantine noticeboards and the regular toolbox meetings to ALL personnel regarding:

- Barrow Island environmental surveys and conservations status
- Quarantine Management non compliances
- Iterative changes to the quarantine procedures to always ensure that quarantine adapts best available knowledge from ongoing benchmarking

2.1.7 Monitoring and measurement

Quarantine compliance (including quarantine training, inductions, inspections) for all personnel and goods going to Barrow Island will be recorded and tracked. Chevron and its contractors will implement this through the Material Management System for tracking materials and the Quarantine Management System for personnel, and includes, signed and completed quarantine compliance checklists, manifests, quarantine handover forms, verification of quarantine activities.

2.1.8 Auditing

Conduct regular quarantine compliance audits and checks throughout the supply chain. These audits and checks will be in compliance with ISO 14001. A reporting protocol for the audit outcomes will be established, including non-compliance register. The auditing will be undertaken at three levels, regular internal auditing through the Construction Contractors, Chevron and external party auditors (including Regulatory authorities). The Project will seek guidance from the ecologists, CALM, and Regulators on the frequency and the intensity of the audits.

3.0 BARRIERS IN THE SAND AND AGGREGATE PATHWAY

Road Base - sourced from the island, cut and fill from the proposed plant site.

Backfill for the cable trenches - sourced from the island, cut and fill from the proposed plant site.

Sand – 35,000 cubic metres (61,000 tonnes), approximately 21 barge loads. Used in concrete and foundations.

Aggregate – 62,400 cubic metres predominantly 20mm (100,000 tonnes), approximately 34 barge loads. Used in concrete and foundations.

This equates to seven barge loads per month (four day barge cycle) being transported to Barrow Island, approximately 16 months of quarrying and nine months of continued supply chain activity of transport and barging, so there will be a necessity for stockpiling at the wharf and on the island. These volumes do not take into consideration modularisation and pre casting. These both have the potential to reduce the volumes of “raw” sand and aggregate that will be imported to Barrow Island.

3.1.1 Step 1 – Quarry, stockpile and surrounds

This group of barriers is designed to minimise the likelihood that organisms would contaminate sand or aggregate at the quarry face, or whilst awaiting transport to the mainland marine loading facility, or to maximise the likelihood that any existing organisms would be detected or destroyed. All supporting documents including examples of checklist or references to standards are included in Appendix A.

Barrier 1: Pre-qualification of Suppliers and their quarries.

Pre-qualification to be supported with site selection, to ensure that quarries selected will be able to implement all site-specific quarantine barriers.

Site Selection criteria to include:

- effective Environmental Management plan in place,
- fencing,
- fauna and flora monitoring,
- quarry operations,
- baiting and trapping regime,
- Gorgon allocated equipment and production areas,
- stockpiles and maintenance,
- equipment cleaning and inspection
- site access and security
- QA/QC system
- Stormwater management
- Material sampling

- Proximity to Wharf Facility
- Site access and delineated vehicle movement
- Topsoil removal and storage practices
- Ability to provide sand / aggregate for the Project to engineering specifications required

Suppliers to undertake sampling of soils and rocks to demonstrate that the materials proposed meet the required engineering specifications, as part of the tender prequalification, in accordance with the relevant Australian Standards (see below table). Information in the sampling standards made available for review.

Australian standards	Reference
Methods of Sampling and Testing Concrete	AS 1012
Methods for Sampling and Testing Aggregates	AS 1141
Specification and Supply of Concrete	AS 1379
Chemical Admixtures for Concrete	AS 1478
Methods of Testing Portland and Blended Cements	AS 2350
Aggregates and rock for engineering purposes. Part 1: Concrete aggregates	AS 2758
Concrete Structures	AS 3600
Portland and Blended Cements	AS 3972

Supplier to provide a quarrying plan identifying the sources of the sand and aggregate to provide the quantities required for the Project.

Ability to verify extraction location through survey and visual inspection.

Barrier 2: Quarry workforce training and awareness, focussing on the Project quarantine values, as well as on practical considerations relevant to the quarrying of sand or aggregate. Inductions to include:

- Environmental management practices for the quarry.
- Sampling procedure and rejection culture.
- Visual monitoring regime.
- Targeted inspection procedures for identifying seeds and invertebrates and rejection culture.
- Incident reporting.
- Barrow Island Conservation Values
- Project commitments for Quarantine Management.
- Personal inspection of clothing and boots to ensure no seeds etc brought into the facility.
- Housekeeping, eg food eaten in Crib rooms, not in operational areas, waste management

Reinforcement of quarantine through adequate and appropriate signage, and discussion at toolbox meetings.

Quarantine training and accreditation with refresher training every 6 months. Examples of competency may include:

- questionnaire to assess understanding of requirements,
- on site assessment of inspection practices,
- completion of procedural Job Hazard Analyses (JHAs) highlighting quarantine risks.

Barrier 3: The following suite of barriers is considered a baseline for the management of the **quarry, stockpile area and surrounds** (within the quarry perimeter fence).

Quarry, stockpile and surrounds to be delineated by a perimeter fence and gate. The project will seek advice as to whether a fence with shade cloth attached to a height of 1.8m (wind break, reduce ground tumbling windblown seeds/soils entering the quarry) is effective in reducing windblown seeds.

Stockpiles to be sized at approximately 45m*20m*5m. Sand and aggregate to be stored in temporary storage system (similar to food grain industry) consisting of skirts to approximately 1m high, tarped (see Plate 1). The tarps will be impregnated with residual insecticide. Broad-spectrum residual insecticide (Coopex - Permethrin) and post emergent herbicide (Roundup - glyphosate) to be applied weekly and after rainfall events to stockpiles of sand and aggregate. Dosage requirements will be based on advice sought from CALM, and WA Agriculture.

Plate 1: Sand and aggregate temporary storage system



Sand will be screened and sorted to remove organics and fines to meet the engineering specifications for acceptable materials. Washing and drying may be required at some quarry sites to meet the engineering specification.

Aggregate is crushed, and sorted to size which eliminates fine materials and to meet the engineering specification.

Post-emergent broad-spectrum herbicide (Roundup - glyphosate) and insecticide (Coopex - Permethrin) to be applied bi-weekly and after rainfall events, to the quarry area inside the perimeter fence. The treatments will be applied by spraying. No plants of any form to be tolerated within project operating area. The project will seek advice from CALM, WA Agriculture, and ecologists on the dosage and application rates of the herbicides and pesticides to meet the intent of zero tolerance within the operating areas.

Baits or traps for vertebrates and invertebrates to be placed within the quarry, stockpile and fenced areas. This will include the interior of any buildings on the site. Baits or traps to be designed to catch and kill, as well as to hold trapped vertebrates or invertebrates for inspection and identification. Effectiveness of baiting/ trapping to be monitored to optimise pathway management.

Crusher, screens and related equipment to be cleaned immediately prior to production runs (batch). Compressed air and/or high pressure water is used for cleaning. The cleaning will be undertaken to ensure that the equipment is free from soils, seeds and invertebrates to minimise cross contamination with the sand and aggregate loads. The contents of the washings will be monitored for presence of contaminants. The wash down area will be monitored for signs of germination. Provide feedback to quarantine manager on what seeds and/ or invertebrates are present to enable procedures to be updated, and inspections more focussed.

The cleaning by the quarry operator is subject to verification and approval by the Project Management prior to commencement of operation. A production run will be 3000 tonnes of sand/ aggregate. This is equivalent to one barge load.

Stormwater runoff to be diverted away from the quarry, stockpile and inside perimeter fences.

3.1.2 Step 2 – Loading and transport to wharf

This group of barriers is designed to minimise the likelihood that organisms would contaminate sand and aggregate at the point of loading or during transport to the wharf, or to maximise the likelihood that any existing contaminants would be detected or destroyed.

Barrier 4: Pre-qualification and contracting scope of work for transport companies, and drivers to meet project quarantine requirements and specifications will be conducted. This will include from the trucking companies a commitment that their personnel and equipment will comply with the quarantine steps and processes mandated.

Criteria for prequalification will include:

- Method Statement for carrying out the quarantine steps
- Truck, trailer, cover, tyre, ropes, cabin housekeeping
- Driver selection and monitoring

- Ability to follow loading and unloading instructions
- Vehicle maintenance and cabin hygiene condition
- Ability to allocate equipment to Gorgon
- equipment cleaning and inspection facilities
- existing driver checking and security protocols
- QA/QC system
- Training programmes in place?
- Incident reporting – system in place?
- Journey management and fatigue, monitoring / tracking programme
- Fleet size and back-up contingencies
- Government regulations for license and registration
- Conflicting work and business references
- Previous experience with supply work to Barrow Island
- Trucks to be end tippers with covers in good condition and checked for function and seal.
- Undertake project awareness sessions to understand commitments for Quarantine Management.

Pre-qualification will also ensure adequate staff in place to carry out the planning, training, cleaning, inspection and authorisation steps needed.

Barrier 5: Transport company and driver training and awareness, focussing on the Project quarantine values, as well as on practical considerations relevant to transport of sand and aggregate.

- Journey and fatigue management training
- Visual monitoring regime and rejection culture
- Targeted inspection procedures for identifying seeds and invertebrates at the start of each shift, and during operations
- Quarantine Incident and non compliance reporting
- Truck and vehicle hygiene and cleanliness
- Personal inspection of clothing and boots to ensure no seeds etc brought into the facility.
- Barrow Island Conservation Values
- Project commitments for Quarantine Management.
- Housekeeping, eg where food can / can't be eaten and associated waste management

Quarantine training and accreditation with focussed refresher training, every three months, with ongoing training through toolbox meetings (including incident reporting and feedback).

Examples of competency may include :

- questionnaire to assess understanding of requirements,
- on site assessment of inspection practices,
- completion of procedural JHAs highlighting quarantine risks.

Barrier 6: An allocated fleet (fleet of trucks specifically procured for the campaign of loading sand and aggregate to the Wharf) of road transport vehicles and truck drivers to be established for the purpose of moving sand and aggregate from the quarry to the wharf. The fleet will be dedicated (not used for other work during the trucking campaign) for each loading/ road campaign from the quarry to the wharf and will remain in the yard at the quarry site overnight. A checklist will be developed for the parking of trucks overnight to ensure the procedure is accurately followed.

Barrier 7: Transport vehicles to be cleaned (chassis and trays) and an insecticide treatment to the trays of trucks applied at the point of entry to the quarry. Cleaning to be undertaken at a washdown bay (high water pressure, high air pressure or vacuum cleaning all discernible evidence of soil, plant materials and seeds, invertebrates and vertebrates). This would be verified with an inspection checklist at the quarry security gate. The cleaning process would result in the removal of soils and organics from the vehicle chassis, and trays, minimising cross contamination of the load.

Barrier 8: Loading to road transport vehicles to take place during daylight hours. Wheels of loading equipment to be kept separate from trucks, separation via physical barrier for example 1m high concrete kerbing (safety barrier), minimising potential for cross contamination. Physical barrier to be periodically treated with insecticide.

Barrier 9: The trucks will be end tippers. All vehicles trays carrying sand or aggregate to be covered. Tarpaulins used will be free from soil, plant material and seeds, invertebrates and vertebrates and will have been treated with a residual insecticide. Vehicle trays to remain covered for the duration of transport to the wharf. Contingency plans established for the range of road transport events (e.g. breakdown during transport).

Barrier 10: Loaded vehicles to stop during transport only for mechanical or regulatory reasons. Loaded vehicles to follow a designated transport route from the quarry to the wharf. Road maintained to ensure vehicles are always able to follow designated transport route. Truck drivers to maintain daily vehicle logs, recording tonnages, distance travelled and stops made. Non compliant stops also to be recorded.

3.1.3 Step 3 – Wharf

This group of barriers is designed to minimise the likelihood that organisms would contaminate sand and aggregate at the mainland marine loading facility, or to maximise the likelihood that any existing contaminants would be detected or destroyed.

Barrier 11: All sand and aggregate to be handled through a designated wharf. Wharf facility will have restricted access via the gate only and will have a stormwater management system in place. The project will seek advice as to whether the facility is to be fenced and with shade cloth (attached to height of 1.8m to keep out ground tumbling, windblown seeds/ plants).

Barrier 12: All equipment used to handle sand or aggregate to be dedicated to the Barrow Island supply chain. Cleaned equipment to be inspected and verified clean before entering the wharf facility.

Equipment for handling of sand and aggregate to be wash down daily as part of pre start, and inspected with checklist. The equipment will be free from soil matter, seeds, invertebrates and nests, webs etc.

Barrier 13: The end tippers trucks will unload sand and aggregate over a cantilevered ramp. Individual stockpiles of sand and aggregate to be sized so as to be a single barge load of 3000 tonnes, (45m * 20m * 5m high). Sand and aggregate to be immediately stored in temporary storage system consisting of skirts to approximately 1m high and tarped until used in the quarry. There will be up to 4 stockpiles on the wharf for barge loading.

The tarpaulins will be impregnated with residual insecticide. Advice will be sought on the affect the salt water environment has on the insecticide and how to best evaluate the condition of the insecticide barrier.

Barrier 14: Sand and aggregate will be stockpiled on hardstand which will be treated with insecticide (Coopex - 2% Permethrin) and post emergent herbicide (Roundup - glyphosate) between barge loadings to ensure no cross contamination with the sand and aggregate stockpiled on top. The project will seek advice on the dosage, chemical application and effective application of herbicides and insecticides from CALM and WA Agriculture.

A stormwater management system will be put in place to prevent flooding of the stockpile.

Barrier 15: Broad-spectrum residual insecticide (Coopex - 2% Permethrin) to be applied weekly to stockpiles of sand and aggregate. The stockpiles of sand and aggregate will be covered until time of loading.

Barrier 16: Lighting required for security purposes on the wharf facility perimeter fence to be designed to be minimally attractive to invertebrates.

Barrier 17: Loading of the barge with sand and aggregate at approximately 400 tonnes per hour via front end loaders into a hopper. Sand and aggregate to be treated at the point of loading with a broad-spectrum residual insecticide (Coopex - 2% Permethrin) applied through spraying.

The hopper will be regularly cleaned and chemically and/ or physically isolated from infecting organisms. The effectiveness of the hopper to destroy seeds due to mechanical agitation (windblown and crushing of seeds) will be tested prior to commissioning. The Project will seek advice from CALM,

Department of Agriculture and ecologists on the application rate for insecticides.

Barrier 18: Sand and aggregate to be visually inspected for signs of seed, plant and invertebrate contamination, at the point of loading by inspectors trained in the recognition of key organisms and signs of organisms. Sand and aggregate will be sampled for organic matter and germination trials conducted to ensure any contamination is known.

3.1.4 Step 4 – Transport to Barrow Island

This group of barriers is designed to minimise the likelihood that organisms would re contaminate sand and aggregate during transport to Barrow Island, or to maximise the likelihood that any existing contaminants would be detected or destroyed.

The sand and aggregate will be transported on 3000T dumb barges (no crew on board during transport), towed by tugs.

Barrier 19: Vessels used to transport sand or aggregate to comply with all of the quarantine management controls detailed for domestic vessel topsides. The key barriers implemented include:

- the cleaning and inspection of the dumb barge deck prior to loading sand and aggregate. The barge will be free of soils, sand and aggregate, seeds, and signs of invertebrates and vertebrates (nests, webs, bird droppings etc)
- baiting and trapping regime implemented
- mooring the barge adjacent to the loading facility

Sand and aggregate will be covered with tarpaulins (impregnated with residual insecticides) for the period of transport.

Barrier 20: Vessels used to transport sand and aggregate to comply with all of the quarantine requirements detailed for domestic vessel wet sides.

Barrier 21: Vessels used to transport sand or aggregate to comply with all of the quarantine requirements detailed for domestic vessel ballast water management.

3.1.5 Step 5 – Arrival and unloading at Barrow Island MOF

This group of barriers is designed to maximise the likelihood that any existing contaminants would be detected on arrival at Barrow Island, or to minimise the likelihood that organisms will leave sand and aggregate and enter the environment of the development site.

Barrier 22: Vessels used to transport sand or aggregate to comply with all of the on-arrival quarantine requirements detailed for the Barrow Island MOF including :

- Visual inspection of the sand/ aggregate load to ensure quarantine compliance has been maintained (i.e. no tarpaulins have blown off or moved during sea transport) before obtaining clearance from the Harbour Master to berth at the Barrow Island MOF (Materials Offloading Facility).

- Tarpaulins to be cleaned at the mainland only, prior to the next loading (refer to Barrier 19)

Unloading of sand and aggregate via front end loaders from barge into trucks. If lighting is required at night on the MOF, the use of light sources that don't attract flying insects will be used. The trucks loads will be covered with tarpaulins for transport to concrete batch plant.

Pesticides in a readily useable state (e.g. pressurised can) to be made available on the MOF for emergency response if required.

3.1.6 Step 6 – Concrete batch plant on Barrow Island development site

This group of barriers is designed to maximise the likelihood that any existing contaminants would be detected or destroyed within the Barrow Island development site.

Barrier 23: Sand and aggregate to be stockpiled at the concrete batch plant. Sand and aggregate to be stored in temporary storage system consisting of skirts to approximately 1m high, tarped (see Plate 1). The tarps will be impregnated with residual insecticide. Routine inspection of the stockpile and perimeter will be conducted, and glyphosate used to treat any plants detected.

Barrier 24: Sand and aggregate will be stockpiled and treated with insecticide bi-weekly. The project will seek advice on the dosage, chemical application and effective application of herbicides and insecticides from CALM and WA Agriculture.

Barrier 25: Stockpiles of sand or aggregate to be inspected weekly as part of a monitoring and surveillance program to complement the quarantine pathway control process. Any evidence of plants, invertebrates or vertebrates to result in immediate treatment of the stockpile and surrounds with (as relevant) broad-spectrum post-emergent herbicide, broad-spectrum insecticide or vertebrate baits and traps.

3.1.7 Step 7 – Utilisation in construction

This group of barriers is designed to maximise the likelihood that any existing contaminants would be detected or destroyed at the point of utilisation in construction.

Barrier 26: Sand and aggregate to be inspected at the point of use as part of a monitoring and surveillance program to complement the quarantine pathway control process. Any evidence of plants, invertebrates or vertebrates to result in immediate treatment of the stockpile and surrounds with (as relevant) broad-spectrum post-emergent herbicide, broad-spectrum insecticide or vertebrate baits and traps.

Appropriate training in the inspection of material (to identify organisms) completed by the Barrow Island workforce involved in these processes. Information (on the sources of infection) will be fed back through an open communication pathway.

Barrier 27: Sand and aggregate is mixed with cement, and placed as concrete on site. None of the sand and aggregate transported from the

Mainland is to be used as “raw” fill, with direct contact to the Barrow Island environment.

The cement batching plant and adjacent stockpiles will have restricted access, and be operated by a prequalified concrete supplier.

Barrier 28: The Project will establish contingency plans for adverse weather conditions (including cyclones) and on site stormwater management. The contingency plan will entail securing of the stockpiles (e.g. tie down and weighted tarps) to reduce potential sand/aggregate loss to the Barrow Island environment.

4.0 ASSESSMENT OF QUARANTINE BARRIERS

Quarantine barriers to prevent the introduction of organisms were assessed in the QHAZ with respect to seven pathway steps: quarry, stockpile and surrounds; loading and transport to wharf; wharf; transport to Barrow Island; arrival and unloading at Barrow Island MOF; concrete batch plant on Barrow Island development site; and utilisation in construction. The proposed barriers and the details of each barrier subject to the QHAZ are presented in Table 1.

Table 1: Assessment of quarantine barriers, sand and aggregate material pathway

Barrier	Barrier parameter	Barrier failure causes	Recommended treatment	Adopted Yes (Y) No (N) To be reviewed (TBR)	Explanation
Sourcing of sand and aggregate from mainland quarries					
B1. Pre-qualification of suppliers and their quarries	Quarry site selection	Ineffective EMP in place	If there is no effective EMP, supplier will not be considered credible. Non-compliant quarries will not be invited to bid	Y	All subcontractors will be prequalified.
	Sampling of soil and rock	Very small organisms (e.g. aphids) may get through	Information in the sampling standards should be made available for review. Adherence to Australian Standards by all suppliers	Y	Sampling as per AS1141.31
B2. Quarry workforce training and awareness	Quarantine induction	Lack of reinforcement of quarantine	Signage Quarantine on the agenda of toolbox meetings	Y	Development of quarantine culture key part of quarantine management system. Toolbox meeting will include quarantine.
B3. Quarry management	Delineated quarry	Downdraught on leeward side of fence	A fence is required to reduce windblown seeds from being carried onwards	TBR	Effectiveness of fence on wind to be reviewed
	Mechanical Crushing/ Screening Process		Equipment cleaned immediately prior to production run; continuous production after cleaning	Y	The project will implement this through the batching process proposed.
	Covered storage			Y	Storage system proposed
	Pesticide treatment	Insufficient treatment around base of stockpile (knee brace)	Regular treatment around knee brace of stockpile	Y	Pesticide spraying.
	Herbicide treatment	Insufficient treatment around base of stockpile (knee brace)	Regular treatment around knee brace of stockpile	TBR	Herbicide spraying if required following inspection. Herbicides only work on germinated plants, so regular spraying not necessarily

Barrier	Barrier parameter	Barrier failure causes	Recommended treatment	Adopted Yes (Y) No (N) To be reviewed (TBR)	Explanation
					effective.
	Baits/ traps for vertebrates and invertebrates	Baiting/ trapping ineffective	Monitor effectiveness of baiting/ trapping regime and feed back to optimise pathway management; Trapping provides feedback (monitoring) on effectiveness of spraying for invertebrates. Use passive traps or baits which are fatal to organisms attracted	Y	To be adopted. Feedback through non-compliance/ incident reporting process. Eradication is good prevention practice.
		Some traps may not attract organisms	Treatment includes base and walls inside and outside	Y	Seek advice and monitor
	Cleaning of crusher, screens	Introduction of seeds	Monitor contents of washings and/ or monitor the wash down area for what germinates (provides feedback on what organisms/seeds are present)	Y	Detection and monitoring included in the systematic barriers implemented for the pathways.
	Verification of cleaning	Introduction of seeds from boots of quarry workers	Personnel will be trained on personal inspection. Boot cleaners provided at quarry entrance.	Y	Inspection and cleaning to ensure quarantine compliance is met and maintained.
Transport by road to mainland marine loading facility					
B6. Allocated fleet of road transport vehicles and drivers	Allocated fleet	Overnight parking	Trucks to remain in the yard on quarry site overnight or at the wharf. Control of lighting in truck parking areas overnight. Develop checklist for overnight truck parking.	Y	Reduces risk of contamination of fleet
B7. Cleaning of transport	Cleaning of vehicles	Chassis of transport vehicles	Insecticide treatment to trays of trucks (loading bay area)	Y	This is included in the prequalification of trucks and

Barrier	Barrier parameter	Barrier failure causes	Recommended treatment	Adopted Yes (Y) No (N) To be reviewed (TBR)	Explanation
vehicles at point of entry					ongoing regime of cleaning and inspection.
		Seeds on tarpaulins	Compressed air to clean tarpaulins (trucks); consider vacuuming	Y	Additional cleaning mechanisms as required to ensure quarantine compliance is met and maintained.
B8. Loading to road transport vehicles			Insecticide treatment to pony wall between transport vehicle and loading vehicle	Y	Residual insecticide applied where there is benefit to minimising organisms.
B9. End tipper trucks	Contingency	Breakdown during road transport	Establish contingency plans for the range of road transport events. Take into account time to restore normal operations, for a range of scenarios.	Y	The project will develop a number of contingency plans to manage breakdowns, weather conditions etc.
B10. Loaded vehicle transport	Designated route	Overhanging trees or other sources of infestation on designated route	Road maintained to ensure vehicles are always able to follow designated route	Y	Part of route maintenance, and will be done in liaison with relevant authorities.
Lay down at marine loading facility, and transfer to barge					
B11. Designated wharf with controlled access	Fenced with shade cloth	Shade cloth results in downdraughts on the downwind side of the fence (needs more analysis)	Eliminate shade cloth from proposal	TBR	Functional evaluation of the benefit of having this barrier in place.
B13. Lay down at wharf	Enclosure of stockpile perimeter with skirts	Salt water environment	Consider salt water environment when obtaining advice about pesticide treatment; Consider method for easily evaluating the condition of the insecticide barrier	Y TBR	Comply with environmental requirements, and functional outcomes expected from treatment application. Requires advice from technical experts
	Covered storage		Once delivered to site, material is immediately moved to covered storage	Y	Topsoil be removed only for offloading/ loading

Barrier	Barrier parameter	Barrier failure causes	Recommended treatment	Adopted Yes (Y) No (N) To be reviewed (TBR)	Explanation
			area.		
	Treated tarpaulins	UV light / exposure time leading to degradation of tarp	Testing of tarpaulins taken out of service to evaluation integrity, length of use; Advice from supplier on resistant to chemical loading	TBR Y	Tarpaulins are consumable items with an expected life. Optimise tarpaulins used, thickness of tarpaulins and maintenance schedule. Evaluation of tarpaulins upon selection
B14. Stockpile on hardstand	Treated hardstand	Stormwater	Manage stormwater to prevent flooding of stockpile	Y	Stormwater included in design of supply bases
B15. Insecticide treatment of stockpiles	Insecticide treatment	Opening tarps	Keep stockpiles covered until time of loading	Y	Part of stockpile operations procedure, stockpiles will only be uncovered for minimal duration of time.
B17. Hopper loading of barge	Mechanical destruction of organisms	Infection of hopper between loading runs	Regular cleaning of hopper; also chemical and/ or physical isolation of the hopper from infecting organisms. Sampling of post hopper and germination trials to continuously evaluate the effectiveness of controls. Test effectiveness of seed destruction due to mechanical agitation (ability to be windblown as well as crushing of seeds)	Y Y Y	All site equipment will have a maintenance regime, including quarantine cleaning and compliance. Sampling of sand and aggregate will be undertaken on a scheduled basis, for organic content and germination trials. Selection requirement on hopper – vibration frequency and energy requirement
	Insecticide treatment		Application rate for insecticides to be determined	Y	Seek advice from technical experts, WA Department of Agriculture

Barrier	Barrier parameter	Barrier failure causes	Recommended treatment	Adopted Yes (Y) No (N) To be reviewed (TBR)	Explanation
B18. Inspection of point at loading	Visual inspection	Unable to detect seeds by visual inspection during loading	Sampling for organic matter and germination trial	Y	Suitability of insecticide applied. Sampling of sand and aggregate will be undertaken on a scheduled basis, for organic content and germination trials.
Arrival and unloading at Barrow Island MOF					
B22. MOF quarantine requirements	Visual inspection	Visual inspection fails to identify organisms	Availability of pesticides in a readily useable state on the MOF for emergency response; Tarpaulin cleaning at mainland only, prior to next loading.	Y Y	On recommendation from technical experts, implemented through emergency response plans. Included in tarpaulin maintenance schedule.
	Unloading to trucks	Light sources required at night will attract flying insects	If lighting is required at night on the MOF, the use of light sources which don't attract flying insects is recommended.	Y	In accordance with project EIS commitments.
	Covered truck transport	Incidental spillage during unloading onto MOF	Housekeeping after unloading from MOF	Y	Part of unloading procedure and MOF housekeeping.
Lay down on Barrow Island Gorgon development site					
B23. Stockpiling of sand and aggregate (normal operations)	Enclosure of stockpile perimeter with skirts		General recommendations from earlier steps in this pathway to be adopted.	Y	
	Enclosure of stockpile perimeter with skirts	Unexpected contamination of stockpiles with organisms	Routine inspection and treatment of any plants germinated with glyphosate	Y	In accordance with project EIS commitments
B24. Stockpiling	Pesticide/ herbicide	Certain pesticides unable to	Review requirements for use of pesticides	Y	In accordance with project

Barrier	Barrier parameter	Barrier failure causes	Recommended treatment	Adopted Yes (Y) No (N) To be reviewed (TBR)	Explanation
of sand and aggregate (precautionary treatment)	treatment	be used within Class A reserve	in Class A reserve		EIS commitments
B25. Stockpiling of sand and aggregate (inspection and response)	Contingency treatment	Quarantine breach (introduced plant)	Develop appropriate contingency plans (e.g. collection and identification, eradication, stockpile sampling and staff training); Monitoring and surveillance program to complement the quarantine pathway control process.	Y	In accordance with project EIS commitments
			Time lag in identification of the source of any identified breaches needs to be considered	Y	Identification and location schedule of batch maintained throughout the supply chain
Construction works on Barrow Island Gorgon development site					
B26. Assessing stockpile at point of use	Inspection of material	Quarantine breach (introduced plant)	Develop appropriate contingency plans (e.g. collection and identification, eradication, stockpile sampling and staff training); Monitoring and surveillance program to complement the quarantine pathway control process.	Y	All non compliances will result in response mechanism incident investigation
		Lack of training	Provide appropriate training for workforce on the island;	Y	Quarantine management system and project quarantine commitments encompass the training and quarantine culture of the workforce

Barrier	Barrier parameter	Barrier failure causes	Recommended treatment	Adopted Yes (Y) No (N) To be reviewed (TBR)	Explanation
			The objective is to ensure that information is fed back on the sources of infection (communication process as well as continuous improvement for pathway management)	Y	The risk assessment process and quarantine management system are iterative and ongoing benchmarking will be undertaken