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INITIAL PRE FEASIBILITY STUDY:

"Post farm gate processing options for large scale Barramundi farming enterprise in the Kimberley region of Western Australia"

Applicant:

MARINE PRODUCE AUSTRALIA LIMITED (MPA)

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Disclaimer

The Aquaculture Development Council ("ADC") has provided a grant to Marine Produce Australia ("MPA") to prepare a pre feasibility study ("the Report") on establishing suitable processing infrastructure to handle the proposed barramundi farm production from the Kimberley region of Western Australia.

The Report has been produced on the understanding that MPA will use the outcomes to consider the appropriate processing infrastructure, the location of this infrastructure and whether to proceed to a full feasibility study.

It is understood that the Report will also be used by the ADC to better understand the requirements to process large scale aquaculture barramundi from the Kimberley region.

The Report is based on best estimate assumptions which reflect the writer's judgment, based on present circumstances, as to both the most likely set of operating and economic conditions and the course of action any potential barramundi processing project would take, as well as hypothetical assumptions about future events that are not necessarily expected to take place.

The Report is based on a large number of assumptions and is subject to significant uncertainties and contingencies, many of which are outside the writer's control. The Report includes cost estimates to construct a processing facility, the necessary processing equipment and fixed and variable costs to process the farm output. These results reflect the order of magnitude of costs and accordingly, the actual results of a processing operation may differ materially from those projected as it is often the case that some events and circumstances do not occur as expected or are not anticipated.

The writer does not express an opinion as to whether the actual results will approximate those projected because the assumptions regarding future events by their very nature are not capable of independent substantiation.

Whilst the information contained in the Report has been prepared with all reasonable care from sources that are considered reliable, no responsibility or liability is accepted for any errors, omissions or misstatements however caused.

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1 Project Rationale

Marine Produce Australia (MPA) has identified two critical elements necessary to support large scale growth of barramundi at the existing and proposed farm sites in the Kimberley region.

These are the establishment of suitable processing infrastructure to handle the output from the farm and a hatchery facility capable of supplying high quality disease free seed stock needed to meet the farming strategy.

Trial harvests have confirmed that the existing farm site is capable of delivering fish within forecast parameters and MPA have commenced a program of cage expansion.

This is necessitating the immediate development of an appropriate processing strategy to meet this expected growth in output.

The development and location of a hatchery to produce healthy and disease free fingerlings to the farms is not the subject of this report. Some general comments are made where the potential location of a processing facility may have some attributes that are considered important when assessing the future location of a hatchery.

There are to be two primary outcomes from this pre initial feasibility study:

1. A detailed analysis of the movement of fish from the farm gate through to processing. This detailed analysis can then be used as a key input into a bankable feasibility study in the future; and

2. Identification and definition of the best and economically practical solution for processing fish produced by aquaculture in the Kimberley region. This study could serve as a template to assess similar options and solutions for other regions and species.

The initial feasibility study is being funded by the Aquaculture Development Council (ADC)

2 Executive Summary

2.1 Project Requirements

The project has sought to evaluate the most appropriate model for processing Barramundi from the farms located at Cone bay Buccaneer Archipelago.

The assessment is based on the expected production growth from the existing and proposed farm sites.

The key areas of analysis include:

- Possible location of a processing facility
- Land component – size and cost
- Facility design and indicative cost to construct
- Plant and Equipment options including an indicative cost.
- Fixed and variable costs to process barramundi based on various budgeted product inflows.

Based on the expected output from the farm both in respect to annual and weekly volumes, a processing plant has been designed to handle this growing output and also allow for capacity to grow beyond current projections.

A range of locations were considered for the placement of a processing plant. These are Derby, Broome and Perth. An analysis of these three sites demonstrates the issues that work for and against having processing infrastructure at the closest point to the farm, a location within a relatively short distance and moving the product to a major city for processing.

A review of the cost of construction for the plant and the appropriate land component has been undertaken. These cost estimates are provided as a guide to the order of magnitude that would need to be spent to buy a property and construct the facility.

At present there is minimal mechanisation in fin fish processing across Australia, the most obvious exception being the Salmon producers in Tasmania. As a result of initial research it was considered highly likely that the processing of Barramundi could be automated.

Both manual and fully mechanised processing scenarios were evaluated in terms of cost to acquire the necessary plant and equipment.

Based on various throughput volumes an analysis of the processing costs was made in order to assess the cost per kilo of input and output weight. The significant drivers being the amount of mechanisation adopted (potential impact on labour), pack types and associated recovery from whole fish and packaging.

2.2 Feasibility Assessment Results

2.2.1 Processing Facility

A processing facility of 1,185 square metres located on a 4,000 square metres of land is required to meet the processing objectives of the Barramundi farm as well as allow for some future expansion.

The construction of a facility will cost $2,862,000 (excluding plant and Equipment) if built in Perth and will take a minimum of 12 months to build the shell once a suitable site is selected. This does not include additional time to install and commission plant and equipment, however, the extent of this is reliant on the level of technology employed in the processing operation.

The building and refrigeration construction estimates also include a loading factor for construction in a regional area like Derby, the closest land based access point to the farm.

This additional cost has been estimated to be $888,000 or a total project construction cost of $3,750,000.

2.2.2 Land Component

Land prices vary considerably in the Perth, Broome and Derby and a general range of prices (High/Low) was used to estimate the likely cost to site the processing facility.

4,000 square metres of vacant developed land will cost (mid point between high and low) $720,000 compared with Broome $180,000 and Derby $60,000.

When adding this cost to the construction component the total cost to place the facility in Perth is $3,582,000, Broome $3,930,000 and Derby $3,810,000.

The additional loading to build the facility in a regional area results in a comparable cost over the three sites.

2.2.3 Processing Equipment

The processing facility will require a minimum amount of equipment to start processing and this option will cost $719,000 compared to implementing a fully automated facility that has been estimated to cost in the order of $2,593,000.

It should be noted that there is a level of automation required above the minimum amount if there is a greater sophistication in pack types produced.

While it is possible to introduce automation as volumes or pack types change there is significant lead time to order, commission and train staff on how to use the technology. Allowing a 12 month period to do this would be prudent.

2.2.4 Processing Costs

The cost to process Barramundi is dependent on a range of variables however to illustrate some sensitivity input volumes of 1,000, 2,000 and 3,000 tonnes were used in the analysis. In order to produce more sophisticated pack types utilising a high degree of technology the costs were also compared using the three input volumes above.

The cost per kilo as expected is sensitive to volume in a manual process but the high degree of variable cost, largely manual labour to fillet the fish reduces the impact on economies of scale as the volume grows.

As Production increases the mechanised process sees a decline in cost per kilo of input weight though the production of a greater percentage of higher value retail packs results in a smaller net weight, thereby increasing the cost per kilo.

The production cost per kilo for both input and output weight is:

	Manual Operation			Mechanised Operation		
	1,000 tonnes	2,000 tonnes	3,000 tonnes	1,000 tonnes	2,000 tonnes	3,000 tonnes
Cost per Kilo Output	$ 3.11	$ 2.48	$ 2.31	$ 3.15	$ 2.25	$ 1.94
Cost per Kilo Input	$ 1.55	$ 1.24	$ 1.15	$ 1.36	$ 0.97	$ 0.83

No assessment has been made as to whether the magnitude of these costs positively or negatively impacts the viability of the project.

While the starting point may be something closer to the manual operation there is a compelling argument that the consistent volume of single specie graded product to the facility lends itself to automation. With the advancements in process technology and the desire to produce innovative pack types a mechanical processing solution would ultimately suit this operation.

The mechanical option will require skilled engineering capability to ensure the continuity of operation and this level of complexity should not be underestimated. In the remote locations the use of technology creates am issue, however, retaining a few experienced staff will be much less of a challenge than attracting and maintaining a larger fish filleting workforce.

2.2.5 Placement of the Facility

Locate Processing Infrastructure in Perth

Logistics

Cone bay farm:

- Fish harvested on platform located on the farm site.
- Fish harvested and pumped into ice slurry – temperature brought down to 1 degree prior to transport.
- Each bin holds 500 kg of Barramundi
- Vessel steams to the Port of Derby.

Derby Transit

- Fish bins unloaded at the wharf to meet road transport
- Transported via chilled van to Perth
- Fish are not re iced during this process to ensure no double handling and damage via a repack.
- Road freight transport cost to Perth is 28 cents per kilo or 51 cents per kilo for the net weight of the fish.

Perth

- Fish held in chilled storage prior to processing.

Infrastructure

▪ Land (mid point)	$720,000
▪ Building	2,862,000
▪ Manual processing equipment	719,000
Total	**$4,301,000**

Assumptions

1. Minimal Infrastructure
   The process for harvesting and transporting the fish to the processing facility is based on the premise that the bare minimum infrastructure is maintained at the farm and that the proposed process does not add an additional layer of complexity and cost to the business.

2. Marine Based Assets
   Other than some capacity parameters required to service the increasing volumes the report does not seek to provide detailed analysis or costing of the marine based assets that will be required to harvest the fish as this does not fall within the project scope.

3. Maintenance of Fish Quality
   Small scale harvests have demonstrated that there does not appear to be any obvious detriment in product quality by transporting the fish to Perth prior to processing. Barramundi is a hardy fish and much the same as other Western Australian fish species, the product quality is maintained even after extended periods in ice slurry.

   While initial market reaction to fish taste, texture and freshness has been encouraging further detailed testing should be undertaken prior to a final decision.

Issues to be Considered

1. Tidal movement
   The most significant issue in utilising the Derby wharf is the influence of the tides both in terms of steaming in and out of the port and at low tide the area along side the wharf is dry.

2. Transport
   In the short to medium term it is not intended that specific staging infrastructure will be developed in Derby rather utilising an existing wharf facility.

   By controlling the harvest and delivery around the road transport times from Derby to Perth there should be sufficient flexibility to ensure the product makes the road transport connection.

   The transport of feed will increase rapidly as the number of cages expands. If feed is transported through Perth from the existing suppliers in Queensland, a feed plant is established in Perth or imported from overseas manufacturers there is a need to link the supply of feed to Derby and the return of the harvested fish.

   The humid conditions in this region make the dry storage of feed an important consideration to the project and any extended storage will require an air conditioned environment.

3. Access to Derby
   There is potential for the town of Derby to be isolated during the wet season due to excessive rain flooding the major road into the town. While these delays have been fairly infrequent in recent years there could be significant delays in transport vehicles delivering product in and out of the town.

   While the harvest of fish could be delayed, the most significant issue is the delivery of feed. A storage facility may be required as the volumes grow, however as this does not impact where the processing facility is located, no additional work has been done other than to get an estimated cost to build a stand alone storage area.

The cost to construct a 500 square metre freestanding feed store in Derby, that would hold up to 600 pallets, would cost $340,000. To buy necessary land to place this structure would represent less than 10 percent of the construction cost.

2.2.6 Processing Options

The scope of the initial pre feasibility study has been the investigation into the construction of a suitable fish processing facility, appropriate plant and equipment to meet expected production volumes and consideration to the cost per kilo to process.

Other than MPA committing to the construction of a facility three other alternatives exist:

1. Contract pack with an existing operator
2. Lease an existing processing plant.
3. Buy an existing seafood processing business

The three options only relate to Perth as there are no suitable sites to lease or existing commercial seafood processing facilities close to the farming operation.

The total investment in this infrastructure should be weighed against these options and the initial feasibility study does not seek to analyse alternative process investment strategies.

The background research does however highlight the indicative cost of the required plant and equipment and processing rates, which could be used to evaluate a contract packing rate or leasing an existing processing facility.

The following highlights some of the key areas to review if the three other options were considered:

1. Contract pack with an existing operator
   - Should allow for cost savings to the operator as the MPA volumes are significant and harvest planning allows for consistent supply (translating into lower cost per kilo rates).
   - Would not require the significant capital investment in the construction of a new facility.
   - No Perth fish processor has an internal source of production although some operators have contracts with existing fisherman to buy their catch.
   - All fish processing in Perth has minimal automation as there is little sophistication in the pack types produced.
   - Minimal investment into research and development with most packers supplying fresh fish only to the domestic market.

2. Lease an existing processing plant
   - Would not require the significant capital investment in the construction of a new facility.
   - Focus to develop innovative pack types and expertise for the mechanised processing operation.
   - Potential to take on seafood processing of other fish species or related seafood products.

3. Buy an existing seafood processing business
   - Ability to add significantly to the profitability of the target business, with the planned barramundi production.
   - Greater recovery of fixed overhead.
   - Market or process and market an increased product range.
   - Provides MPA with sales growth until internal production grows to a commercial scale.
   - Tap into existing established domestic distribution channels.

2.3 Overall Outcome

The option to establish processing capacity in Perth as opposed to a regional centre is based on a key assumption that there is no material degradation in the quality of the barramundi being transported to Perth.

Early market feed back indicates that there were no material issues with the taste, freshness and colour for the barramundi processed and frozen by Perth processors.

In the current economic climate the attraction and maintenance of a skilled processing workforce will be a significant issue. The regional centres create another level of complexity as the cost to attract, train and retain key staff is likely to be a significant impediment.

The marketing initiatives are likely to require focused attention from the marketing staff that is going to want direct access to the facility for themselves and customers to work with processing staff to design and develop finished packs.

Historically the focus on building processing capability close to the operation is now of lesser importance as the market focused strategies and the cost to maintain and operate facilities in regional areas makes it an unviable option.

From an operating cost perspective the table below shows a range of costs (depending on the level of technology employed in the processing equipment) between $3,581,000 and $5,455,000.

▪ Building	$2,862,000	$2,862,000
▪ Processing Equipment		
Option 1 - Manual	719,000	
Option 2 – Mechanical		2,593,000
	$3,581,000	**$5,455,000**

It should be noted that these capital costs are indicative of the order of cost required to establish the operation.

The processing costs per kilo change with the volume of product processed through the facility and these costs need to be considered as part of the total cost to farm, harvest, transport, process and market the barramundi.

Given the magnitude of a likely investment into land, building and plant and equipment, consideration should be given to alternate processing strategies. Assuming that MPA desire to develop internal capability in the formulation of market based strategies around innovative and sophisticated consumer pack types it would appear logical to consider evaluate the construction option against some of the other processing investment strategies.

3 Problem Statement

3.1 Business Environment

While MPA has established infrastructure to test grow out barramundi fingerlings in the Kimberley it is now poised, based on the results to date, to establish a profitable farming operation.

The key success factors in achieving a profitable farming operation are:

- Ongoing access to barramundi fingerlings to support the production targets.
- Cage infrastructure that will ensure that economies of scale are achieved as production grows.
- Best practice farming and quality standards to ensure production optimises all market opportunities.
- Access to a processing facility that will allow the business to implement market strategies to maximise the value of production.

With initial grow out results indicating that the farm site is far exceeding expectations the next phase (short term) will be to increase the farming capacity to allow for an increase in production.

MPA believe that putting in place suitable processing capacity in the short term is fundamental to the implementation of its marketing strategies to maximise the value of production.

3.2 External Analysis

Barramundi farming in Australia commenced in the 1980's and is now farmed in most states.

It is hardy and fast growing and universally known as a premium table fish. It is also suited to aquaculture as the fish can be grown at high densities and weans readily to a pellet based diet.

Due to the nature of the fish a number of alternative farming styles have developed. The culture of barramundi occurs in cages (either in fresh or salt water marine environments) or in re circulating tanks.

In order to be successful fish farms require:

- Proven grow out technology
- A year round supply of disease free fingerlings
- Cost effective feeds
- Best practice farm management techniques and equipment; and
- Strong marketing

In the Australian domestic market there has been a good acceptance of the fish through the wholesale market and demand is expected to grow.

Traditionally aquaculture barramundi has been grown to a plate size (between 400 to 650 grams), however the Australian domestic market appears unlikely to grow at a pace that will cope with the existing and planned growth in production volumes.

The focus for a number of larger barramundi aquaculture producers has been to direct their farms to grow larger fish that can be filleted.

Ideally fish weighing between two and four kilos (whole weight) are harvested for processing into value added portion controlled fillets for sale into the domestic and international market.

This focus on moving away from fresh whole fish being delivered to wholesalers is seen as a critical step for MPA in order to achieve their expected returns on the growing farm output.

A dedicated processing facility will require the flexibility to produce multiple pack types while employing or developing technology that will allow it to meet the business plan projections.

3.3 Farm Location – Existing and Proposed

MPA currently grows out barramundi in farm cages located close to Turtle Island in Cone Bay.

Farm staff either fly or steam in and out of Turtle Island to service the cages with feed and equipment being either flown in or brought out by Barge from Derby.

A dedicated nursery is also located on the island where fingerlings are reared to an appropriate size for distribution into grow out cages.

Small harvests are undertaken by the farm vessel and the fish are transported in ice slurry back to the Port of Derby. From here they are transported by refrigerated truck to Perth where they are processed by independent fish processors.

Figure 1 Hatchery and support facilities of Marine Produce Australia on Turtle Island, Cone Bay, in the Buccaneer Archipelago, Kimberley region.

The existing and proposed farm sites are approximately 60 nautical miles from the Port of Derby, which is the closest marine access point to the farm.

Broome, the next closest Port is almost three times this distance by sea.

Any large scale transfer of product needs to occur by sea and therefore Derby is the likely location for a vessel to travel to the farm site due to the extended down time crews would experience servicing the farm out of Broome.

Figure 2 Turtle Island and surrounding waters of Cone Bay, showing deployed sea cages stocked with barramundi.

3.4 Farming Processes

In order to meet the needs of an expanded farm in this remote location there are several key processes:

- Hatchery Nursery
- Feeding
- Farm management
- Harvest
- Processing

Large scale farming will require sufficient logistics both on land and on the water to transport feed to the cages and the fish, once harvested, to the processing facility.

At present this infrastructure does not exist and needs to be developed in the short term to allow for the programmed farm expansion.

Figure 3 Looking eastwards at Cone Bay and Crawford Bay, respectively to the left and right of the headland.

3.5 Aquaculture Licenses

Applications have been lodged with the relevant government agencies for an aquaculture licence to culture 1,000 tonnes per annum in Crawford Bay in the Buccaneer Archipelago, Western Australia.

Applications have also been prepared to seek variation on the Cone Bay license to increase the biomass to 150 tonnes per annum and for a third site in the Buccaneer Archipelago to culture 1,000 tonnes per annum.

4 Full description of the Core Problem

MPA has established a pilot Barramundi farm in Cone Bay in Buccaneer Archipelago in the Kimberly region in Western Australia.

The company has key established infrastructure that includes a barramundi nursery and support operations on Turtle Island in Cone Bay.

Using Polar Circle type cages MPA has successfully grown out barramundi juveniles in Cone Bay.

Fingerlings for the farming operation are supplied through commercial arrangements with local and interstate hatcheries.

Initial harvests of barramundi from the Cone Bay operation have proven the concept with grow out exceeding MPA forecasts and good market acceptance of the fish.

By August/September 2006 MPA expects to be harvesting fish weekly.

By December 2006 it is expected that a total of 12 cages will be in operation in Cone Bay that are capable of lifting annual production to in excess of 1,000 tonnes.

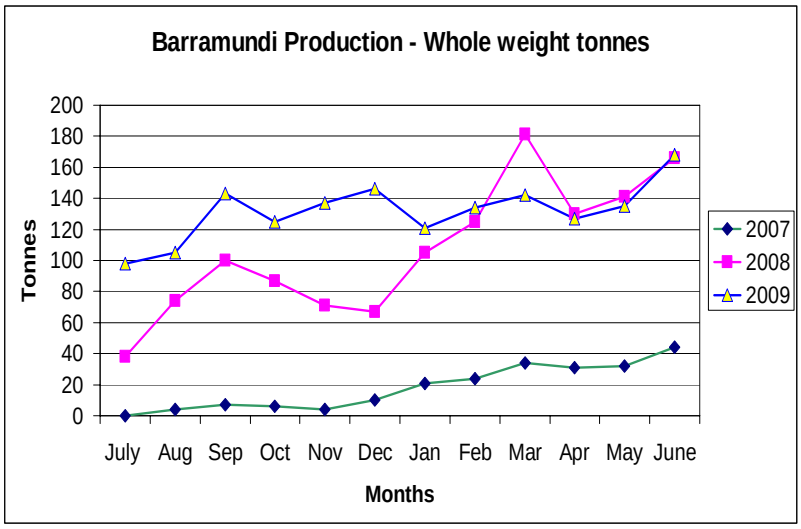
Within 18 months, MPA expects to have 18 operational cages, located in Cone Bay and a new site in Crawford Bay. An aquaculture license application is currently in progress and with this additional area MPA expects to be in a position to expand the output to in excess of 1,500 tonnes per annum.

The Cone Bay site has achieved better than forecast results in grow out of Juveniles and this is prompting an accelerated investment program.

The rapid early development of production capability is fundamental to achieving the economies of scale necessary for it to be competitive and therefore commercially successful.

The situation is exacerbated by the remote location and comparatively high capital and operating costs.

In order to achieve these production forecasts the establishment of post farm gate facilities to handle the harvested fish, transfer them to the processing facility and convert the barramundi into the pack types that will deliver the highest value for this fish is seen as critical.



4.1 Reasons why the Problem Exists

Other than established Pearl farms in the Kimberley region there is little other marine based aquaculture activity.

Most of the wild catch fin fish caught along the coast is unloaded at the nearest wharf where it is mostly transported fresh/chilled by road to Perth.

The bulk of this product is processed by a small number of fish processors in Perth and competition for catch is strong.

Infrastructure for unloading product and storage of feed and equipment is almost non existent within close proximity to the farm site.

Due to the remoteness of the farm location there is no established infrastructure for fish farming of the scale proposed and in order to meet market expectations it is critical to develop adequate processing resources for the farm output.

The marketing strategy is centred on the fish being further processed into a range of portion controlled sides and fillets and retail packs destined for the export market.

The increased quality import requirements of overseas countries places another level of complexity as food traceability from the farm to the destination port must be considered.

Future market requirements could necessitate technology to further value add. Modified atmosphere packaging (MAP) to improve the products shelf life (fresh fillet portions), value added ready to eat meals and freezing options are all areas that require further consideration in the future.

4.2 Timeframe for a Solution

The better than expected grow out results from the pilot program have created a sense of urgency in establishing processing capability.

MPA is now moving to be in a position to harvest up to 1,000 tonnes of barramundi in the 12 month period from September 2007.

To build a facility, assuming that appropriate land is available will take between 12 to 15 months to build, which could be further impacted by the level of process technology adopted.

4.3 Impact on the Business

Operational

Infrastructure exists to meet the first stages of the expansion program, however the harvest, transport and processing of the farms production represents a key part of the operations growth.

Further investment in infrastructure will hinge on the model developed to harvest the fish and transport to the processing facility.

Aquaculture feed requirements will grow rapidly and the ability to store and transport feed to the farm site will feature in the business solution.

There is significant lead time in performing a detailed analysis of the processing options identified and with a construction lead time a minimum 12 months away once an appropriate location is found, MPA would be expecting to be harvesting significant volumes of fish by this time.

Marketing

The traditional fresh supply of whole fish to the wholesale sector in the domestic market is not considered a viable strategy for the fish produced from of the Kimberley farm. MPA is looking for innovative process and marketing solutions that will add value to the harvested fish.

Having access to a dedicated processing facility that allows for this product Research and Development and market development is critical to the marketing effort to establish customer channels prior to production volumes increasing.

The risk is that without this investment increasing volumes of fish will be sold as a commodity product on the domestic market negatively impacting returns for the fish.

Hatchery

At present there is no dedicated supply of fingerlings to the farm either from internal production or contracts with external suppliers.

The flying in of significant quantities of quality fingerlings to stock the farm is costly and there is no tenure over supply.

The development of a dedicated hatchery supply from an internal or contracted third party at commercially competitive rates forms an important part of the short to medium term future of the farm.

5 Description of the Solution

5.1 Option 1 – Processing Facility in Perth

Logistics

Processing operation at farm site:

- Fish harvested on an independent platform.
- Fish pumped into ice slurry – temperature must be brought down to 1 degree prior to transport.
- Each bin holds 500 kg of Barramundi.
- Vessel steams to the Port of Derby.

Derby Transit

- Fish bins unloaded onto wharf.
- Transported via chilled van to Perth.
- Anticipated that fish are not re iced during this process to ensure no double handling and damage via a repack.

Processing Facility

- Fish stored in chilled room prior to being processed.

Infrastructure Cost

Land (mid point valuation)	$720,000
Building	2,862,000
Manual processing equipment	719,000
Total	**$4,301,000**

Assessment

The key factors for the success of this solution will be:

- Fish are correctly iced to ensure quality of the fish is best managed in the process.
- Derby, being the closest port is an obvious unload point, however it also has physical constraints due to the extreme tidal movements.
- Commercially viable alternative – cost to transport the fish to Perth, presently 51 cents per kilo net weight for small loads.
- Minimal infrastructure – farm operation only.

Risks

- Tidal movement makes the Derby wharf commercially unsuitable.
- Transport logistics too difficult to allow for efficient movement of product – requirement to add chilled storage for fish bins. This would add a further $340,000 to the total cost.
- Inconsistent product quality due to extended travel time.

5.2 Option 2 – Processing Facility in Derby

Logistics

Processing at the farm site:

- Fish harvested on an independent platform.
- Fish pumped into ice slurry – temperature must be brought down to 1 degree prior to transport.
- Each bin holds 500 kg of Barramundi.
- Vessel steams to the Port of Derby.

Derby Transit

- Fish transported to processing facility located in the town of Derby.

Processing Facility

- Fish stored in chilled room prior to being processed.

Infrastructure

▪ Land	$60,000
▪ Building	3,750,000
▪ Manual processing equipment	719,000
Total	**$4,529,000**

Assessment

The key factors for the success of this solution will be:

- Fish are correctly iced to ensure quality of the fish is best managed in the process.
- Derby, being the closest port is an obvious unload point however it also has physical constraints due to the extreme tidal movements.
- Ability to obtain, train and maintain a processing workforce.
- All packaging, consumables, equipment spares relating to the processing facility must be sent to Derby along with other farm freight.
- All frozen production to be sent to Perth for storage thereby reducing the net benefit against freighting whole fish to Perth.

Risks

- Tidal movement makes the Derby wharf commercially unsuitable.
- Attracting skilled processing staff to fillet fish or if a more technical solution is implemented, trained engineers would be key to the success of the processing line.
- Implementation of market based strategies – contact with marketing staff and customers if regionally based.

5.3 Option 3 – Processing Facility in Broome

Logistics

The Processing at the farm site:

- Fish harvested on an independent platform.
- Fish pumped into ice slurry – temperature must be brought down to 1 degree prior to transport.
- Each bin holds 500 kg of Barramundi.
- Vessel steams to the Port of Derby.

Derby Transit

- Transported via chilled van to Broome.
- Anticipated that fish are not re iced during this process to ensure no double handling and damage via a repack.

Processing Facility

- Fish stored in chilled room prior to being processed.

Infrastructure

▪ Land	$180,000
▪ Building	3,750,000
▪ Manual processing equipment	719,000
Total	**$4,649,00**

Assessment
The key factors for the success of this solution will be:

- Fish are correctly iced to ensure quality of the fish is best managed in the process.
- Derby, being the closest port is an obvious unload point however it also has physical constraints due to the extreme tidal movements.
- Commercially viable alternative to unload product in Broome – There would be a significant increase in transport times to and from the farm.
- Transport to Broome via local transport (product still unloaded in Derby) - minimal cost as less than 200 km from Derby Wharf.
- Broome would improve the ability to obtain, train and maintain a processing workforce as there is a greater population.
- All packaging, consumables, equipment spares relating to the processing facility must be sent to Broome along with other farm freight.
- All frozen production to be sent to Perth for storage thereby reducing the net benefit against freighting whole fish to Perth.

Risks

- Tidal movement makes the Derby wharf commercially unsuitable. While not considered commercially practical the Broome wharf represents an alternative unload point where product could be shipped there directly from the harvest.
- Attracting skilled processing staff to fillet fish or if a more technical solution is implemented, trained engineers would be key to the success of the processing line.
- Implementation of market based strategies – contact with marketing staff and customers if regionally based.

6 Maintenance of Fish Quality Post Harvest

Trawl, trap and line caught fin fish off the coast of Western Australia are traditionally placed into ice tubs for transport to Perth for further processing.

The ice tubs once delivered to the processing facility are stored in a chilled room and pulled out for processing in accordance with the facilities production planning schedule.

Trial shipments of barramundi from the Cone bay farm site have mirrored this process and initial results indicate that there is no degradation in taste, freshness and texture if the product is iced properly during the transit time to Perth.

One of the advantages that aquaculture fish has over wild catch product is the ability to control the timing and volume of product delivered to the factory. If the product was delivered directly to Perth for processing, assuming that the processing of MPA's barramundi takes priority, then the transit time should be reduced to a few days only.

Maintenance of fish quality is a key assumption in the potential placement of a processing facility in order to ensure that MPA's marketing strategies can be fully implemented.

While MPA will conduct more sophisticated quality testing programs it is expected to confirm that locating the processing facility away from the farm site will have no measurable impact on the quality of the product.

What this will necessitate is a cold chain strategy that ensures that the fish are:

1. Either pre cooled prior to whole fish being placed into transit bins or a sufficient ice to fish ratio in the transit bins that will ensure the core temperature of the fish is brought down quickly.
2. Preferable that fish are not re-iced during transit to stop double handling (potential to damage fish) and additional cost to ice.
3. Where fish are not unloaded directly into a chilled transport vehicle they are to be held in a chilled room.
4. Road transport is undertaken in chilled vans.
5. On arrival at the processing facility all fish bins are stored in a chilled storage area prior to processing.

7 Unloading Wharf Facilities

7.1 Derby

The closest marine access point with available infrastructure is Derby, located some 60 nautical miles from the existing Cone bay and proposed barramundi farm sites.

When the Wharf/Jetty was established in 1964, live cattle were exported and fuel, oil and provisions were the main imports.

Today barges accessing local mine developments and pleasure and tourist craft are the main vessels using the facility. Access to the local barge service is expensive and there is little in the way of other commercial vessels able to support the farm.

The Wharf is subject to some of the highest tidal movements in Australia and at times access into the channel will provide logistic problems.

The level of water at the Derby wharf is nil at low tide. One of the current users of the wharf being a landing barge of 46m in length / draft of 2.496m can usually berth when the tide is at around 3 m of water utilising belly ropes around the fenders until surface tie up can proceed.

The window of opportunity for berthing at the wharf is therefore dependant on the level of the tides.

Approximately 100metres from the wharf face, vessels are able to moor or anchor in an area where there is water at all tide levels.

There is a maximum tide of approximately 11.3metres, which gives a tidal range of 11 plus metres at the Derby wharf.

Triple road trains are able to enter the Derby wharf decking with usual weight of approximately 130 tonnes.

There is no existing infrastructure for the cool storage or processing of food products in Derby.

Regular freight services in and out of Derby occur on most days of the week. Potential delays due to flooding periodically close the main transport route; however, in recent years these delays have been minimal and have lasted less than a few days.

7.2 Broome

The Port of Broome is the deepwater port servicing Western Australia's Kimberley region. The Port is located some 180 nautical miles from the Cone bay farm. Broome port supports livestock export, offshore oil and gas exploration supply vessels, pearling, fishing and charter boats, cruise liners and is the main fuel and container receival point for the region.

The jetty is a steel piled structure with a concrete deck and spring fendering. The outer berth is 183 metres long and the inner berth 170 metres long. At zero datum it is 12.5m from the waterline to the deck of the wharf and 11.34m to the top of the fender system.

The tidal range is about 8m, and strong tides can be experienced across the entrance channel and at the berth, however, commercial vessels of the size contemplated for the Cone bay operation pose no issues as far as permanent access is concerned.

No commercial seafood processing operations exist in Broome.

Broome as an unload Port
Broome is capable of acting as a load/unload Port but is considered to be too far away from the farm site from a commercial perspective.

The distance from the farm site would require:
- Larger capacity vessel, with the potential for increased crewing.
- Increased running costs between the farm and the port.
- Significant down time during transit to and from the farm. The travel time at 15 knots would most likely be in excess of 12 hours one way, compared to 4 hours from Derby.
- Logistically more difficult to plan harvest and unloads due to significant transit time.

On this basis the Derby wharf is considered to be the most efficient load and unload point for the farming operation in Cone bay. With the right marine assets it should be possible to work within the tidal movements to achieve an efficient outcome.

8 Harvest and Logistics

In assessing the most practical solution to meet the growing volume of fish expected from the farm, a number of criteria have been considered. These include:
- Maintaining fish quality in order to satisfy the marketing strategy.
- Ease and consistency of harvesting fish to reach the processing facility.
- Transport of feed to the farm from existing suppliers

The farm is approximately 60 nautical miles from the Derby wharf, which is the nearest commercial unload point. While the Derby wharf is subject to extreme tidal movements, with the right equipment, it should be possible to continuously harvest and deliver product to a processing facility.

Utilising the Derby wharf would appear to be the most effective access point as Broome (the second closest unload facility) is almost 3 times the distance by sea.

There is existing mooring and accommodation at the farm site that allows vessels to overnight at the farm.

MPA also has access to existing storage facilities at the Derby wharf that allows for the potential storage of equipment and feed supplies.

Harvest and Transport Assets
1. Harvest/Transport Vessel
   - 30 to 40 tonne carrying capacity on deck and in the holds The vessel will be able to carry feed to the farm and the harvested fish back to the Derby wharf.
   - Without pay load (18 to 22 knots) and loaded 14 – 16 knots.
   - Crew and vessel based in Derby.
   - Hiab 175 crane that will allow for autonomous unloading of cargo on and off the wharf.
   - The vessel would ideally be able to sit on the bottom at the Derby wharf at low tide, making a twin hulled vessel the most appropriate vessel.

2. Harvest/farm Barge
   - Barge fitted with large knuckle-boom crane and fish pump.
   - Slides and chutes to minimise movement of bins and fish during harvest.
   - Harvest table and dewatering equipment.

Forklift at Derby to unload truck or move bins on wharf.

Harvest Schedule

Day 1

- Load vessel with feed, ice, fuel and other supplies in Derby (departure time dependent on tides).
- Travel to farm late morning/early afternoon (steaming time approximately 4 hours).
- Unload feed onto barge, fuel and supplies to island/barge.
- Overnight at the farm site (Cone Bay).

Day 2

- Harvest fish during morning. Approximately 1,000 to 1,500 fish per hour plus set up and clean up time.
- Depart farm site and steam back to Derby (Travel time 4 hours).
- Unload fish to jetty.

Day 3

- Lay day for boat and crew.
- Allowing for poor weather days where it is not possible for the crew to travel to the farm site the program allows for a minimum of two harvests per week.

To increase capacity during peak months, an extra trip could be made each week.

Road transport

There is a refrigerated trucking service to Perth that could service the businesses requirements in the short to medium term. The service offers attractive freight rates as shipments of product from Derby to Perth is considered back freight.

Each 900 kilo fish bin holds approximately 500 kilo of whole Barramundi. Freight rates to Perth including all miscellaneous charges are 51 cents per kilo based on the net weight of fish delivered.

Freight Rates	**Kg**	**Per Kg**
Full bins	900	0.28
Fish	500	0.51
Full truck (20 pallets)	20,000	0.14
Fish	10,000	0.28

The existing rates are paid based on a few pallets and there would be scope to improve the rate/kilo charge if a whole van was booked on the return leg to Perth. Initial inquiries show the rate for a full van, assuming 10 tonnes could be transported, to be almost half the current rate.

The net cost of bringing whole fish to Perth should be weighed up against the cost of freighting product to and from a regional centre if the processing facility is located away from Perth.

Feed

Once the farm volume starts to grow significantly the quantity of feed required does as well. With a feed ratio of in excess of 1:1 there will be significant volumes of feed that need to be transported to Derby.

This creates an opportunity to tie in the supply of feed and transport of fish to the processing facility.

Another option that may present itself is the importation of feed direct from international producers. This would further highlight the need to have an incorporated transport solution to and from the port closest to the farm.

Operating in a tropical environment poses a problem for short term storage of feed prior to being used at the farm. A dedicated air conditioned facility in Derby to store pallets of feed and even hold fish bins where a delay in transport occurs may be required.

This facility would ensure that there is sufficient backup in feed stored to allow for continuous supply to the farm.

9 Broome Aquaculture Park

The western Australian Department of Fisheries and the Kimberley Development Commission are working co-operatively to oversea the development of the aquaculture industry and manage the implementation of the Kimberley Aquaculture Plan produced in 1996.

The Department of Fisheries has established a tropical aquaculture park in Broome with the aim of assisting the ongoing development of aquaculture.

Commercial leaseholders are able to secure the right to access and develop leasehold areas within the park.

A number of hatcheries already exist in the Park, one of which has produced some small quantities barramundi fingerlings.

At the time of writing this report there are commercial lots available of a sufficient size to house a processing facility.

Hatchery

At present MPA source almost all barramundi fingerlings from the Northern Territory where they are flown to Derby and transferred by vessel to the nursery at Cone Bay.

Some small batches of fingerlings are produced from the TAFE hatchery in the Broome aquaculture park, however as this is a teaching facility there is little scope to expand supply without a significant upgrade to dedicated infrastructure.

As the farming operation is scaled up there is an increased risk that supply is restricted due to other operators competing for fingerling stock and the additional freight cost utilising hatcheries where the fingerlings need to be air freighted.

The existing hatchery facilities in Broome would appear to be the most favoured option in the supply of fingerlings, however, feedback to date suggests they do not have sufficient existing capacity to be able to service the farm.

In considering where to locate a hatchery there are a range of different environmental and technical considerations in order to ensure that high quality disease free fingerlings are delivered to the nursery.

A separate risk analysis needs to be undertaken as to whether the existing hatcheries in Broome would be capable of supplying MPA's requirements.

Turtle Island does have an existing Pearl Spat hatchery that could be transformed into a barramundi hatchery, thereby complementing the nursery facilities that already exist. The placement of further infrastructure in this remote location must be weighed up against other potential sites or commercial arrangements that could be made to service the farms growing requirements.

10 Barramundi Processing

10.1 Forecast Production

The current MPA farming strategy sees annual production moving to in excess of 120 tonnes per month at the commencement of the 2008 calendar year, which equates to approximately 1,500 tonnes per annum. From here production increases marginally, however, MPA believe there are few technical barriers to increasing production output further.

The processing model for barramundi is based on production volumes of 1,000, 2,000 and 3,000 tonnes per annum of harvest weight.

The higher production volumes have been included to demonstrate the sensitivity of the operation to volume.

10.2 Technology

Traditionally almost all wet fish processing in Australia, other than Salmon produced in Tasmania has been performed manually. This has necessitated large numbers of skilled operators, particularly in the filleting operation to cope with the volume. Technology has been improving, which is allowing traditional "cold water specie" processing machines to be integrated into the warmer water fish process.

An existing barramundi farmer in Queensland is utilising a Baader 200 filleting machine in the production process and it is understood that the process results, specifically recovery to fillet, is comparable to manual processing.

An automated processing line would ideally suit predominantly single specie processing. Based on preliminary research there is sufficient anecdotal evidence to suggest that this option be considered, particularly if more sophisticated pack types are to be targeted.

Two options have been considered in fitting out a processing facility. The first option is to build the factory based on manual processes, thereby creating a low capital cost for equipment. The other option will seek to employ a high level of technology to handle process and pack the barramundi.

One option is to commence processing on a manual basis and gradually increase the amount of technology employed in the facility. The introduction of highly technical equipment from European suppliers will require a lead time of almost 12 months from the time the equipment is ordered to the commissioning and training of technical staff using it.

There is also a research and development lead time in the development of new packs to get the process right and ramp up the volumes to commercial quantities.

Prior to any decision on the nature of technology to be used in the process a first step would be to test the key process machines by sending a number of whole barramundi of the target size range to the supplier to test speed, quality and product recoveries from whole fish.

10.3 Production Strategy

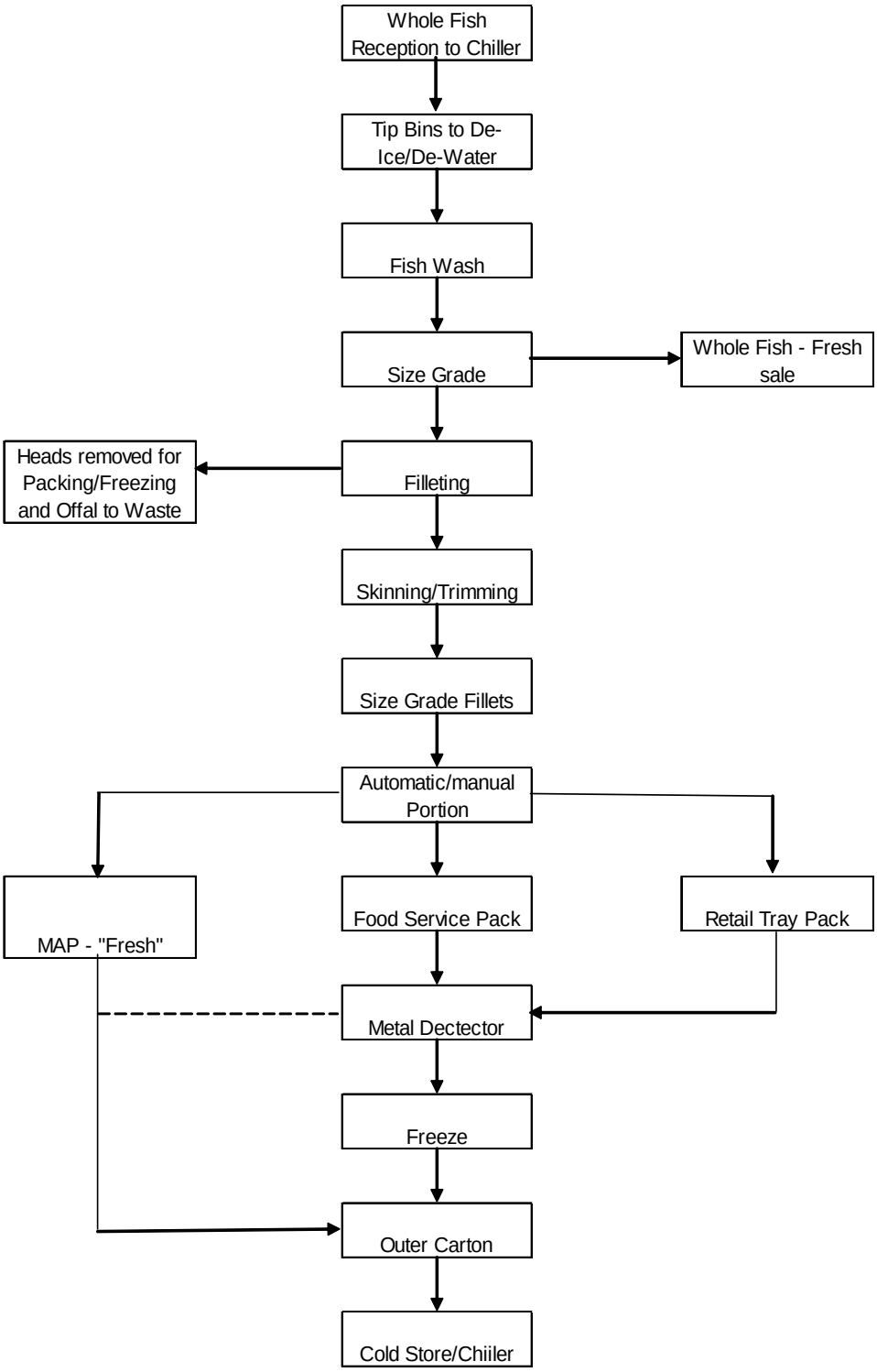
The production strategy will largely influence the level of technology adopted as only fairly basic pack types can be produced with a manually operated processing facility.

Based on this the comparison may not simply come down to analysing savings based on utilising either a manual or mechanised process but rather the cost to produce the pack types in the marketing strategy.

10.4 Process Flow Chart

In designing a processing facility and the equipment register the following process was considered appropriate for the operation.

The amount of technology utilised in the process will determine the pack types that can be produced, however, the majority of operations exist for all processes.


Whole Fish Reception to Chiller
Tip Bins to De-Ice/De-Water
Fish Wash
Size Grade
Whole Fish - Fresh sale
Heads removed for Packing/Freezing and Offal to Waste
Filleting
Skinning/Trimming
Size Grade Fillets
Automatic/manual Portion
MAP - "Fresh"
Food Service Pack
Retail Tray Pack
Metal Dectector
Freeze
Outer Carton
Cold Store/Chiiler

10.5 Processing Cost Assumptions

The cost to process barramundi should be considered in the context of the total cost to grow out, harvest, transport, process and market the finished product. While the initial costing estimates are based on related fish processes the project should be viewed in totality.

All endeavours have been made to test the veracity of the processing cost assumptions, however, until final throughput rates and the average size of the fish is better understood the cost to process represents a best estimate.

Set out below are the material assumptions used in calculating the cost to process Barramundi at:

- Whole weight volumes of 1,000, 2,000 and 3,000 tonnes.
- Production strategies based around manual operations or an investment in machinery to reduce the labour content; and
- Creation of more sophisticated pack types.

Processing seafood in regional areas can allow for significant savings in the unskilled labour component, however, this is balanced up by the additional cost of attracting and maintaining quality skilled staff.

A base case has been created that does not take into account potential differences in pay scales if the operation was located in a regional location. There would need to be a more detailed review of the likely possibility of attracting skilled staff (once a decision as to technology use was made) to a regional location.

1. Filleting Rates

The most significant operating costs in the manual system will be the filleting staff and there are some assumptions made relating to the number of fish that can be processed per hour and the rate per hour that will be paid.

Filleting Rates

				1,000 tonnes		2,000 tonnes		3,000 tonnes	
Wages	59,000	kg/hr	60	8	472,000	16	944,000	24	1,416,000
Wages	59,000	kg/hr	90	5	295,000	11	649,000	16	944,000
Wages	59,000	kg/hr	120	4	236,000	8	472,000	12	708,000

The wages total represents the base rate and a loading for employment on costs.

No processor is handling consistent volumes of barramundi from farming operations and it may in fact be possible to process up to 120 kilo of whole fish per hour. At this stage a rate of 90 kilo of whole fish per hour has been used to test the economies of processing, however, more significant trials would need to be run to test processing assumptions and target rates.

2. Recovery from whole fish – per pack Type

The recovery percentages from whole weight represent conservative estimates based on initial processing volumes. It should be noted that as the volume increases and staff gain more experience with the fish scope exists to improve the recovery percentages from whole fish.

The table below represents the estimated recovery percentage if fish are sold fresh, food service (fillets) and retail (skinless fillets)

Pack Type	Recovery	Manual Production %	Mechanical Production %
Fresh	98%	20%	10%
Food service	38%	80%	60%
Retail	35%	0%	30%
		100%	100%

3. Depreciation Rates

The rates applied are estimating useful life of the Building and Equipment

- Building 2.5 percent
- Plant & Equipment 12.5 percent

4. Wages and on costs

Salaries and wages base rates are categorised as follows:

- Production manager $90,000
- Production supervisor $60,000
- Engineering $60,000
- Labour – skilled $50,000
- Labour – unskilled $30,000

On costs of 18 percent are also added to the above rates to cover items such as superannuation, payroll tax and workers compensation.

The schedule below sets out the labour required to process the fish at the various tonnages and whether the operation is manual or adopts a high degree of automation.

Detailed Labour Schedule		Manual Operation						Mechanical Operation					
		1,000 tonnes		2,000 tonnes		3,000 tonnes		1,000 tonnes		2,000 tonnes		3,000 tonnes	
Factory Staff													
Production Mgr (package)	Fixed	1	106,000	1	106,000	1	106,000	1	106,000	1	106,000	1	106,000
Production Supervisor	Fixed	-	-	1	71,000	1	71,000	-	-	1	71,000	1	71,000
Engineer	Fixed	1	71,000	1	71,000	2	142,000	2	142,000	2	142,000	2	142,000
Labour - cleaner	Fixed	2	71,000	2	71,000	3	106,000	2	71,000	2	71,000	3	106,000
labour QC	Fixed	1	35,000	1	35,000	2	53,000	1	35,000	1	35,000	2	53,000
		5	283,000	6	354,000	9	478,000	6	354,000	7	425,000	9	478,000
Labour - filleting	Variable	-	315,000	-	630,000	-	946,000	-	-	-	-	-	-
Labour - skinning	Variable	2	71,000	4	142,000	6	212,000	-	-		-		-
Labour - packers	Variable	5	177,000	10	354,000	14	496,000	5	177,000	10	354,000	14	496,000
Labour - forklift driver	Variable	1	35,000	1	35,000	1	35,000	1	35,000	1	35,000	1	35,000
Labour - chiller hand	Variable	1	35,000	1	35,000	1	35,000	1	35,000	1	35,000	1	35,000
Labour - line service	Variable	2	71,000	3	106,000	4	142,000	1	35,000	2	71,000	3	106,000
Labour - machine operator	Variable	-	-	-	-	-	-	3	106,000	3	106,000	3	106,000
		11	705,000	19	1,303,000	26	1,866,000	11	389,000	17	602,000	22	779,000
		16	988,000	25	1,657,000	35	2,344,000	17	743,400	24	1,027,000	31	1,257,000

The wage cost for experienced filleting staff is difficult to assess as there is no excess capacity amongst existing operators in Perth. The difficulty in attracting skilled staff to run a manual processing line should not be underestimated and could impact costs by having to pay above market rates to attract experienced staff.

5. Administration

Some limited administration to account and provide support to the Production Manager. This would include general accounting, payroll, production scheduling and recoveries and actual versus budget results.

6. Process Waste

As the operation moves away from whole fish production there will be significant fish waste produced (over 60 percent waste for each filleted fish). Possibilities exist for part of the fish waste to be sold to recover waste removal cost, however the model assumes it will be removed each day at a commercial rate of $100 per tonne.

10.6 Results

Processing Costs Summary	Manual Operation			Mechanised Operation		
	1,000 tonnes	2,000 tonnes	3,000 tonnes	1,000 tonnes	2,000 tonnes	3,000 tonnes
	1,000	2,000	3,000	1,000	2,000	3,000
Total Fixed Costs	517,000	600,000	736,000	597,000	680,000	745,000
Total Variable Costs	950,000	1,792,000	2,598,000	675,000	1,171,000	1,631,000
Total Administration Costs	87,000	87,000	127,000	87,000	87,000	127,000
Total Cost	**1,554,000**	**2,479,000**	**3,461,000**	**1,359,000**	**1,938,000**	**2,503,000**
Production Output	**500,000**	**1,000,000**	**1,500,000**	**431,000**	**862,000**	**1,293,000**
Cost per Kilo Output	$ 3.11	$ 2.48	$ 2.31	$ 3.15	$ 2.25	$ 1.94
Cost per Kilo Input	$ 1.55	$ 1.24	$ 1.15	$ 1.36	$ 0.97	$ 0.83
Non-Cash Costs						
Depreciation	135,317	135,317	135,317	369,630	369,630	369,630

The analysis does highlight the following:

- Increased volumes of throughput will defray fixed costs to a point, however, the corresponding increase in labour required to head, clean and fillet fish (in a manual process) starts to reduce the net benefit of increased volume.
- Manual operation production strategies are based on either fresh delivery or food service packs that provide higher yields, but lower selling prices.
- At a production volume of 2,000 tonnes per annum the mechanised process provides a saving in operating costs of $541,000. At larger volumes this saving grows (i.e. 958,000 at 3,000 tonnes).

11 Processing Operation Equipment

There are a number of design permutations that are available based on process technology.

In order to simplify the analysis two options were used to cost the capital equipment that would be required in the fish processing facility.

11.1 Option 1 – Manual Operation

This option represents a minimum start up cost and reflects a relatively low input with a high labour process. Automation is limited to traditional mechanical equipment used by most seafood processing facilities to unload, de-ice and pack the finished product.

11.2 Option 2 – Mechanical Operation

A fully automated operation utilising key grading, filleting, skinning, portioning and tray pack technology. While some of this technology is currently applied to other fish processing operations there would need to be a high level of Research and Development to make the operation seamless and build the technical competency within the processing team.

11.3 Capital Cost of the Equipment

While much of the capital equipment in Option 1 is based on tested and readily available equipment in the market some assumptions were made as to the cost of non supplier specific equipment. The costs therefore represent the order of magnitude in the construction of a processing line.

A final detailed costing would need to be undertaken in order to arrive at an accurate budget.

Processing Equipment Cost

		Option 1 Cost	Option 2 Cost
Unload/Weight/Grade		160,000	410,000
Head/Fillet/skinning/portioning/weigh		100,000	1,075,000
Packing		365,000	770,000
Contingency	15%	93,750	338,250
Total Cost		$ 718,750	$ 2,593,250

The greatest area of automation revolves around the automation of the heading, filleting, skinning and portioning of the fish.

A detailed listing of Plant and Equipment for Option 1 and Option 2 is attached as Appendix B.

12 Processing Facility

12.1 Design Assumptions

A purpose built fish processing facility has been designed to meet the proposed capacity and marketing requirements for the planned internal production of Barramundi.

The initial throughput of barramundi will be approximately 1,000 tonnes that will increase to meet the current production forecast of 1,500 tonnes per annum. In designing the processing infrastructure there is capacity to allow for a doubling of fish throughout to 3,000 tonnes per annum.

Creating additional capacity provides room for growth in the existing specie or other fin fish if the farming activities were to diversify. It should be noted that further structural modifications would need to be made to incorporate a raw and cooked processing line to meet quality standards.

235 square metres of office space has been included to potentially house the MPA management and administration staff if a factory is located in Perth.

A maximum chilled storage capacity for up to 108 fish bins – in excess of 50 tonnes of whole fish being stored for processing.

Freezer storage for 128 pallets, which will service short term needs with any excess requirements, met through local commercial cold storage facilities in Perth.

Traditional air blast and plate freezing options have been included in the design, however, depending on the level of mechanisation some form of in line freezing solution may be required in the longer term.

A mixture of pack types can be accommodated through this facility, including fresh, retail and food service styles. The ability to produce more sophisticated pack types will be dependent on the processing equipment utilised.

The processing floor is capable of accommodating both a manual or mechanical processing operation.

The operation will meet existing and planned volume projections processing 5 days per week and in one shift.

A minimum land footprint of approximately 4,000 square metres is required to house the facility and allow for articulated vehicles to unload/load at the main dock.

The facility is designed to meet food safety and quality standards for importation of product into the United States and the European Union.

12.2 Processing Facility Cost Estimate

The cost estimate to construct the processing facility is based on the drawing 4104-01 (see Appendix A) that shows an indicative design to meet the processing requirements.

The cost estimates are based on a hypothetical site in Perth with the necessary size required to adequately suit the design and for the required truck access and car parking. It is also assumed that the site will have the necessary services available.

A further contingency of 5 percent has been added to the construction cost for some change in building costs in the short term.

Proccesing Facility Construction Cost estimate

			Perth	Load	Regional
Building	1,185 m2		$		
Cost per m2		$ 1,250	1,481,250	40%	2,074,000
Refrigeration Plant			975,000	25%	1,219,000
Landscaping	1,030 m2		15,000	40%	21,000
Fencing			7,000	40%	10,000
Cintingency		5%	124,000		166,000
			2,602,000		3,490,000
Architect/Engineers fees allowance		10%	260,000		260,000
			$ 2,862,000		$ 3,750,000
					$ 888,000

In looking at the cost to construct the facility in a regional location such as Derby, the closest access point to the farm, there would be an additional loading on construction costs. The building would require a loading of 40 percent and the refrigeration plant would be 25 percent.

In total this could add a further $888,000 to the construction cost of locating the facility in a regional centre close to the farming operation.

In considering the building of a facility on a vacant piece of land it is estimated that it will take at least 12 months from the time the appropriate land is purchased to gain all necessary building approvals and build the shell. Additional time will also be necessary to fit and commission the processing equipment and depending on the level of technology being considered could add a further 2 to 4 months to the process.

13 Site Requirements to House the facility

13.1 Perth, Derby and Broome

Three sites were chosen to house the processing facility. The options were considered on the basis of having one facility in a major centre such as Perth or Darwin. Perth was chosen as the transport distances are not that different between these locations and frozen sea container options are far greater in Fremantle.

Secondly, Derby was chosen as it is the closest commercial access point and there would be minimal transport costs to deliver the product to the facility from the wharf.

Broome was chosen as a third location if the Derby wharf was considered too difficult to operate from, due to the tidal movements and being the next closest marine access point.

13.2 Assessment Criteria

The purpose of reviewing the land component is to compare the purchase and construction of a suitable facility in the locations selected.

The High and Low range of prices for vacant land in these three locations is not based on a specific property but rather a range of values drawn from discussion with real estate agents and shire councils and a review of commercial real estate publications.

No consideration has been given to likely discounts in a regional location such as Derby, where the council would almost certainly look favourably on a new enterprise in the community that could be a significant local employer.

A notional rental of 10 percent has been applied to the three locations and as the lease cost would not cause a material impact on the processing costs, no further work was undertaken to clarify these numbers further.

13.3 Property Values

The table below demonstrates that based on the additional loading to build a facility in a regional location nullifies any additional advantage from the cheaper land values.

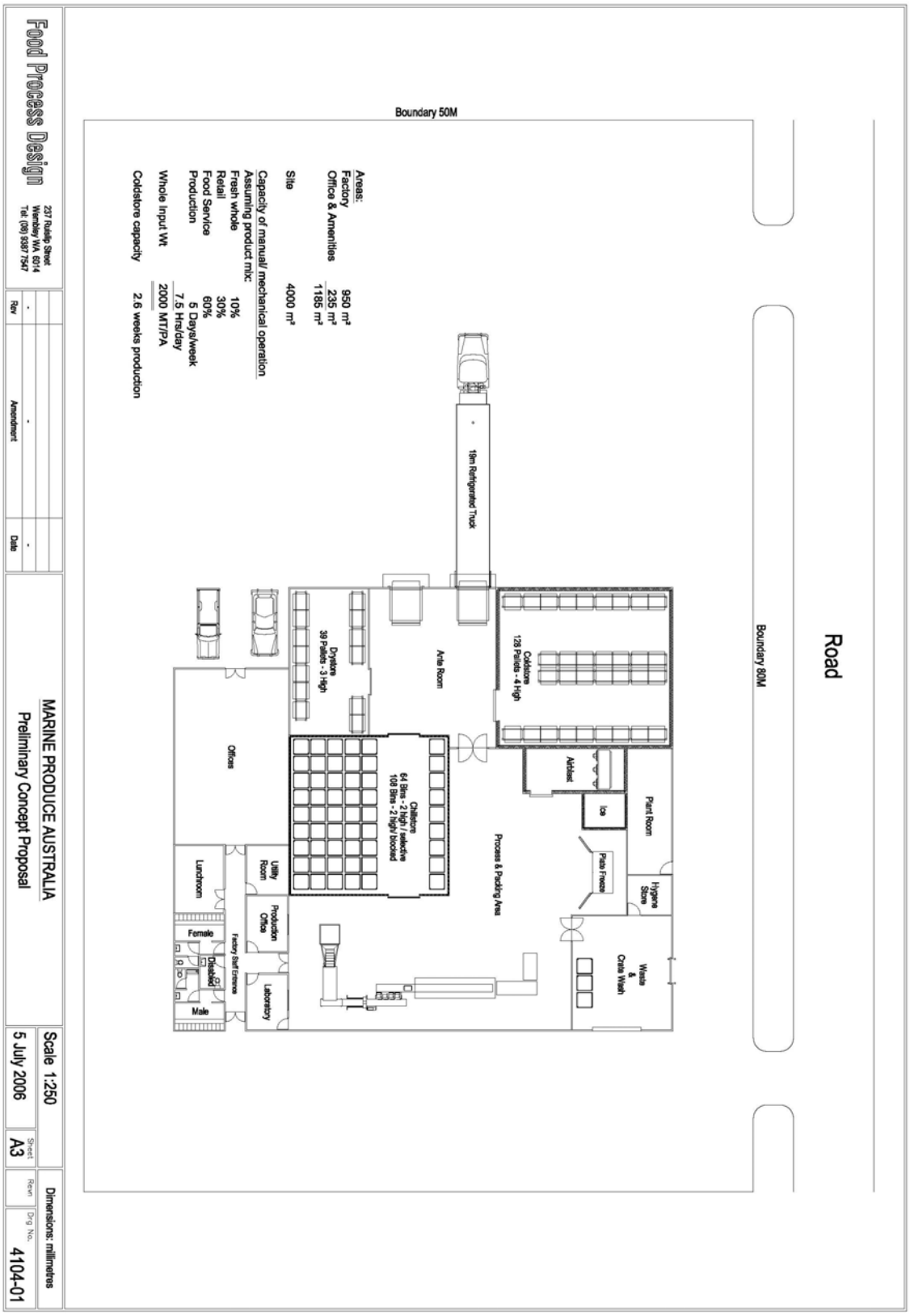
land Component

	Yield	Rate m2	Perth	Rate m2	Broome	Rate m2	Derby
Land area (square metres)			4,000		4,000		4,000
Building Cost			2,862,000		3,750,000		3,750,000
Land - Vacant							
High		220	880,000	50.0	200,000	20.0	80,000
Low		140	560,000	40.0	160,000	10.0	40,000
Mid Point			720,000		180,000		60,000
Lease							
High	10%	22.0	88,000	5.0	20,000	2.0	8,000
Low	10%	14.0	56,000	4.0	16,000	1.0	4,000
Total Cost (Land Purchased)							
High			3,742,000		3,950,000		3,830,000
Low			3,422,000		3,910,000		3,790,000
Mid Point			3,582,000		3,930,000		3,810,000

The decision to place the processing infrastructure at anyone of these locations would not be based on an economic argument driven by processing infrastructure costs alone.

Appendix A

Facility Drawing 4104 – 01



Appendix B

Processing Equipment Requirements & Capital Cost		Option 1		Option 2	
		Units	Cost	Units	Cost
Fork Lift		1	75,000	1	75,000
Bin Tipper		1	25,000	1	25,000
De-Water/De-Ice Table/Conveyor		1	20,000	1	20,000
Fish Wash		1	10,000	1	10,000
Platform Scale		1	30,000	1	30,000
Whole Fish Grader				1	250,000
Filleting Tables (6 to 8 stations)		1	100,000		
Heading Machine				1	50,000
Filleting Machine				1	350,000
Skinning Machine				1	125,000
Fillet Grader				1	200,000
Automatic Portion Cutter				1	250,000
Automatic weigher				1	100,000
Packing Table/Conveyor		1	30,000	1	30,000
Skin - Pack Machine		1	30,000	1	50,000
Vacuum Pack Machine		1	60,000	1	60,000
1 Thermo Form Tray Machine (include MAP)				1	400,000
Weigh Scales		4	50,000	2	25,000
Metal Detector		1	50,000	1	50,000
Electric Pallet Mover		1	50,000		
Freezer Stillages		1	25,000	1	25,000
Strapping/Taping Machine		1	15,000	2	30,000
Labeller		1	20,000	2	40,000
Cleaning Equipment		1	25,000	1	40,000
Plastic Trays		1	10,000	1	20,000
			625,000		2,255,000
Contingency	15%		94,000		338,000
Total Processing Equipment Cost			$ 719,000		$ 2,593,000

1 MAP - Modified Atmosphere Packing

Appendix C

Processing Cost Analysis

	Manual Operation			Mechanised Operation		
	1,000 tonnes	2,000 tonnes	3,000 tonnes	1,000 tonnes	2,000 tonnes	3,000 tonnes
Fixed Costs						
Salaries and wages	283,000	354,000	478,000	354,000	425,000	478,000
R&M Refrigeration	30,000	30,000	30,000	30,000	30,000	30,000
R&M Building	12,000	12,000	12,000	12,000	12,000	12,000
R&M Engineering	40,000	40,000	40,000	40,000	40,000	40,000
R&M General	5,000	5,000	5,000	5,000	5,000	5,000
General Insurance	13,000	13,000	13,000	22,000	22,000	22,000
Leasing Charges	3,000	3,000	3,000	3,000	3,000	3,000
Motor Vehicle expenses	15,000	15,000	15,000	15,000	15,000	15,000
Electricity	72,000	84,000	96,000	72,000	84,000	96,000
Water	2,000	2,000	2,000	2,000	2,000	2,000
Local Rates	30,000	30,000	30,000	30,000	30,000	30,000
Consumables General	2,000	2,000	2,000	2,000	2,000	2,000
Cleaning	10,000	10,000	10,000	10,000	10,000	10,000
Total Fixed Costs	517,000	600,000	736,000	597,000	680,000	745,000
Variable Costs						
Salaries and wages	705,000	1,303,000	1,866,000	389,000	602,000	779,000
Staff amenities	6,000	11,000	15,000	5,000	7,000	9,000
Waste	50,000	100,000	150,000	43,100	86,200	129,300
Quality Control	15,000	30,000	45,000	15,000	30,000	45,000
Packaging material	174,000	348,000	522,000	222,900	445,800	668,700
Total Variable Costs	950,000	1,792,000	2,598,000	675,000	1,171,000	1,631,000
Administration						
Salaries and wages	40,000	40,000	80,000	40,000	40,000	80,000
Accounting	10,000	10,000	10,000	10,000	10,000	10,000
Consultant (Manuals)	5,000	5,000	5,000	5,000	5,000	5,000
Domestic travel	5,000	5,000	5,000	5,000	5,000	5,000
IT Support	5,000	5,000	5,000	5,000	5,000	5,000
Phones	15,000	15,000	15,000	15,000	15,000	15,000
Staff training	2,000	2,000	2,000	2,000	2,000	2,000
Stationery	5,000	5,000	5,000	5,000	5,000	5,000
Total Administration Costs	87,000	87,000	127,000	87,000	87,000	127,000
Total Cost	**1,554,000**	**2,479,000**	**3,461,000**	**1,359,000**	**1,938,000**	**2,503,000**
Production	**500,000**	**1,000,000**	**1,500,000**	**431,000**	**862,000**	**1,293,000**
Cost per Kilo - Input weight	**1.55**	**1.24**	**1.15**	**1.36**	**0.97**	**0.83**
Cost per Kilo - Output weight	**3.11**	**2.48**	**2.31**	**3.15**	**2.25**	**1.94**
Non Cash Costs						
Depreciation	135,317	135,317	135,317	369,630	369,630	369,630