

## EXECUTIVE SUMMARY

### Project Background

Caribbean Mariculture Products Limited (CMPL) is a joint venture between the Jamaica Agricultural Development Foundation (JADF) and the University of the West Indies (UWI) to produce and market farm-raised shrimp. The 29 hectare (70 acre) shrimp farm is located on flat and gently sloping land, south of Old Harbour at Brampton, St. Catherine. The project lands are owned by the JADF and are occupied by earthen shrimp ponds, mango orchards, cotton fields and thorn scrub vegetation. The CMPL proposes to expand its existing shrimp farm facility on immediately adjacent lands.

### Environmental Impact Assessment

This document, prepared by Caribbean Environmental Consulting Services Limited (CARECS), is an environmental impact assessment (EIA) of the project which is required by the National Environment and Planning Agency (NEPA). It identifies the environmental issues that may arise as a consequence of project implementation and the measures to mitigate the negative impacts.

### Existing Farm Operations

The CMPL farm currently produces 130,000 kg of White Shrimp (*Litopenaeus vannamei*) annually. The farm employs a project manager, 13 skilled and unskilled pond workers, 14 processing plant workers and 2 technical persons (operations management). The existing project draws seawater from Fraser's Gully with a single pump at a rate of 6,000 US gallons per minute (23 m<sup>3</sup>/min) for 18 hours each day. This is pumped to a reservoir. From there the water is gravity fed to the production ponds through open concrete drains or PVC pipes. The shrimp are fed pelleted rations over a 5-6 month grow out period and are then harvested by slowly emptying the ponds and passing the discharge through a meshed wooden cage. The shrimp are processed at the farm and sold locally to hotel chains, wholesalers, retail outlets and middlemen.

### Proposed Expansion

It is proposed to expand the existing farm by 72 ha (180 acres) to 101 ha (250 acres), most of which will be devoted to seawater grow-out ponds. Two new buildings, a shrimp processing and packing plant and an administration building with offices and laboratory will also be constructed. A security fence will be erected around the entire property. The pond construction and expansion works will be organized into three main phases:

➤ *Phase 1*

- construction of a new water pumping station able to deliver 18,000 US gallons per minute (69 m<sup>3</sup>/min),
- deepening of the sump area,
- extension of the intake water reservoir from 2.3 ha to 6.0 hectares,
- installation of pumps and a water distribution system
- construction of 13 ha of production ponds
- construction of berms in the 'artificial wetland' buffering zone area

- establishment of a fuel pumping station and vehicle service facility.
- **Phase 2**
  - construction of 36 ha of production ponds
  - construction of the processing and packing facility
  - construction of the administrative offices and related buildings.
- **Phase 3**
  - construction of a further 23 ha of production ponds.

At full capacity (6,000 gpm x 4 pumps), the total water usage for the production ponds will be 24,000 US gallons per minute (91 m<sup>3</sup>/min). At full operation, the farm will discharge pond effluent at a rate of approximately 98,000 m<sup>3</sup>/day, comprising exchange water from the ponds during grow out and water from ponds being drained during harvesting.

At this stage only imported specific pathogen free (SPF) post larvae will be used to stock the ponds and the target culture species will continue to be the White Shrimp. It will be grown under semi-intensive culture conditions at stocking densities of approximately 100,000 PL/ha. All ponds will be mechanically aerated. Shrimp will be harvested at the end of a 5-6 month production cycle by draining the ponds and passing the water through a meshed cage at the outlet. Harvested shrimp will be sorted, cleaned, packaged, frozen and stored on site.

The new processing plant will have the capacity to process about 400,000 kg (882,000 lbs) of shrimp per year. Plant operations will generate BOD rich wastewater and about 360 - 500 kg of waste heads and other solid waste every day. The plant will conform to United States HACCP and European processing standards. All waste wash-water will be collected in floor drains and disposed of in septic tank and absorption pit.

The expanded farm operations will ultimately require, approximately 100 persons in addition to the present staff complement. The training of personnel will done 'on-the-job' in their respective areas/roles and supervisors will also be sent for overseas training courses. In addition, workers at the processing plant will obtain food-handler's permits.

### **Potential Environmental Impacts**

The major impacts related to project implementation are:

- Site clearance entailing the removal of the existing scrub vegetation and associated arboreal habitat.
- Cut vegetation burned on site will give rise to smoke and air borne particulates that could cause respiratory health and nuisance impacts on the surrounding communities.
- Soil exposure resulting from vegetation clearance during site preparation works may result in wind and water erosion of the soil.

- Excavation of the new intake channel between Fraser's Gully and the new pumping station will necessitate soil disturbance that could introduce suspended sediments into Frasers Gully, increasing turbidity levels in the canal and ultimately the receiving waters at Galleon Harbour, during the period of construction.
- The construction of ponds and embankments will involve the use of heavy earth moving equipment on soils containing a high proportion of fine particles that will, in turn, generate dust and noise.
- The construction of the ponds for the existing shrimp farm has modified surface drainage on the site and the proposed expansion will further modify this pattern.
- The sourcing of marl for road surfacing may lead to indirect adverse impacts in terms of public health and environmental degradation if obtained from unlicensed quarries.
- The movement of trucks and equipment over local parochial roads during the construction and the operations phases could lead to their further deterioration. This would increase the difficulties presently being encountered by vehicles in the area and could lead to ill feeling towards the project.
- The pond embankments will be 2-3m high and those at the western side of the property will be visible from the main road and cause some measure of visual intrusion.
- The project entails the conversion of a terrestrial habitat to an aquatic one and the replacement of agricultural resources with those suited for aquaculture.
- The installation of a barbed wire fence around the site that is required to achieve the necessary levels of farm security will debar access to the area by traditional/informal users of the land.
- The project will have positive benefits for local employees as well as for contracted support services, at a time when the national economy is depressed and particularly in an area where chronic unemployment exists.
- Given the current levels of soil erosion from the pond embankments and effluent drains, increases in the transport of suspended solids in the pond effluents can be expected as the farm expansion proceeds and that will be exacerbated during periods of intense rainfall. As a result there would be increased deposition of sediments in the 'artificial wetland' area, but more importantly at the culverts under the Thompson Pen Lane road as well as in the drain, beyond the farm perimeter. Sedimentation and blockage of these drainage features will worsen the impacts of natural flood events on the local community. The backup/retention of water on the farm property under these circumstances would increase the likelihood of breaching of the earth berm on the southern boundary of the property.
- High nutrient levels in effluent pond water may give rise to eutrophication in the mangrove forests and coastal waters of Galleon Harbour, to the detriment of these vital coastal ecosystems.
- Shrimp stocks are vulnerable to viral diseases, especially under the stressful and crowded conditions that prevail in intensive monoculture. Viruses can cause major losses in farmed shrimp and deplete local stocks of crustaceans.

No major viruses have been identified in Jamaica to date, but a rigorous disease prevention and biosecurity programme is essential.

- There is a risk of groundwater contamination due to improper disposal of sewage, and hazardous materials such as petroleum hydrocarbons and lead batteries. However, this is not considered significant.
- Increased abstraction of groundwater from the aquifer at the site could cause increased salinity of the groundwater given the proximity of the farm to the sea.
- The National Water Commission provides domestic water to the property. The proposed expansion will increase the staff complement by about 100 persons, which is not expected to significantly increase the domestic demand at the site.
- The constant transit of refrigerated transport trucks along the local parochial roads during the operations phase would lead to further deterioration of the roads. This would increase the difficulties presently being encountered by taxis and other vehicles in the area and could lead to animosity towards the project.
- There will be some level of dust generated by the movement of project related vehicles over the marl roads on the farm, especially during the dry season. This may be an infrequent nuisance factor to farm workers but should not affect the adjacent communities due to the remoteness of the farm.

All of the identified significant potential impacts can be avoided or mitigated through careful project planning and project implementation practices. The irreversible loss of terrestrial vegetation and habitat through site clearing represents an environmental trade-off between unproductive agricultural lands and a highly productive saltwater aquaculture system.

There are also some potential adverse impacts on the project, apart from natural hazards (see below), arising from activities, events and conditions occurring outside of the project boundaries. These include:

- **Intake water quality.** The existing saltwater intake for the farm is situated on the estuarine portion of Fraser's Gully, where water salinities are dictated by the relative flows of surface water from the catchment system and the tidal stage. Whereas the salinity concentrations are acceptable under normal circumstances, salinities as low as 5 parts per thousand have been recorded at the inlet. Also, the quality of the water at the intake to the farm can be compromised by poor quality pond effluent discharges from the fish farms located on the opposite side of Fraser Gully.

There are some potential hazards associated with natural events. These are:

- **Flooding.** The site is prone to flooding by surface runoff generated north of the site. During several recent flood events, the farm was not affected directly but sediments eroded from the ponds blocked the culverts at Thompson Pen Lane and worsened flooding in the local community.
- **Earthquakes.** Most of the larger earthquakes impacting Jamaica over the past 300 years originated offshore. Earthquakes occurring on land tend to be

of low magnitude. The single-storey structures to be constructed at the site constitute a moderate to low earthquake hazard risk with respect to life and property. The subsurface condition below the site is also typically not conducive to soil liquefaction and therefore this impact is not considered significant.

- **Hurricanes and Storm Surges.** Hurricanes, tropical storms and tropical depressions are frequent occurrences in Jamaica. Based on the record of hurricanes affecting the island over the past 300 years, the south coast lies within the track of major hurricanes and tropical storms. Hurricanes and tropical storms may generate storm surge and cause coastal flooding. Whereas there are no direct measurements of storm surge on the island, in general, coastal areas below 6m above sea level are considered to be at risk to storm surge. Most of the shrimp farm site is above 6m and therefore the hazard relating to storm surges is not considered to be significant.
- **Crocodiles.** To date there has been a very low incidence of crocodiles being found on the site. However, these animals are known to frequent the general area, especially after prolonged rainfall events when there are extensive areas of flooded land. Although records of attacks on human beings are few, it would be advisable for workers on the shrimp farm to be constantly vigilant, especially during harvesting.
- **Birds.** The potential impact of birds on the shrimp farm is not restricted to predation, a management issue, but to the possibility that they can catch, carry and drop shrimps in nearby local waters, thus becoming agents for non-native species introductions.
- **Rats.** These vermin are known to infest feed manufacturing operations in the region. This population thus becomes a source of animals that could infest the shrimp feed store on the farm and increase the human health risk.
- **Radiation.** Two JPSCo 138 kV transmission lines enter and cross the northern section of the project site. The new farm access road has been placed beneath these transmission lines. It has been confirmed that there are no radiation risks associated with these lines. In the case of a line breakage, immediate fatality would result should the line hit anyone before it touched ground.

**Project alternatives and risk assessment:**

This project is an expansion of an existing shrimp farm operation, taking place on lands owned by the JADF, which does not compromise coastal wetlands. Consequently, no consideration has been given to any alternative project site.

Three types of systems used for shrimp farming depending on the desired level of production and investment in pond management. These are extensive, semi-intensive and intensive. This classification is based on variations in stocking density, rate of water exchange, the extent of aeration of the system, the feeding regime and fertilization of the pond water, with the most input into intensive systems resulting in highest production. The CMPL project is undertaking semi-intensive culture. The project currently operates as an open water supply and discharge system and intends to do so for the expansion phase.

The use of large mesh traps to harvest the shrimp necessitates the excavation of the embankments in order to fit the boxes. This exacerbates the problem of embankment soil erosion. Instead, it is suggested that long harvest nets be used to help alleviate this problem.

Much of the proposed expansion area was under mango orchards, a fruit for which the export market is no longer economically feasible. Shrimp farming offers a use of these lands that are not ideally suitable for conventional agriculture. Without the project, the national economy, and particularly the local communities faced with chronic unemployment, would not benefit from productive use of the lands.

The impact monitoring programme is designed to overcome the deficiencies in the current monitoring programme, which is focused solely on water quality measurements, and which does not incorporate response and feedback mechanisms. The final programme should include the objectives, standards and management responsibilities, the details of the proposed sampling methodology, the monitoring frequency schedule, and the formats for the monitoring reports.

It is understood that NEPA will allow the Client to undertake the monitoring and make the results available to the agency in a manner to be specified. Also, NEPA has the legal right to enter the premises at any time to conduct its own independent monitoring for data verification purposes.

The programme should be initiated with a baseline study of the air quality parameters to be monitored, prior to project construction, followed by the procedures for monitoring the construction and operation phases. It should be borne in mind that regular harvesting operations will continue during the construction of the new ponds. The duration of the construction phases and the appropriate frequency and type of monitoring should emerge later in the project design and planning process.

Pre-project air quality background data include ambient noise levels and levels of suspended particulates (dust) at two stations located at the edge Thompson Pen Lane, in the vicinity of the houses, and along the main road at the western (downwind) side of the property. Fortnightly site visits will facilitate inspections to ensure compliance with mitigation measures and collection of biweekly data on the following to ensure compliance with NEPA standards:

- Air quality measurements (noise and dust) at selected stations
- Effluent water quality<sup>1</sup> - measured at the stations corresponding to each effluent outfall from the farm as well as at sedimentation basin, culvert, drain, salina, and mangroves.
- Sewage treatment plant effluent quality – (monthly samples, initially)

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<sup>1</sup> *Water quality parameters should include pH, TSS, TDS, BOD<sub>5</sub>, DO, COD, phosphates, nitrates (nitrate + nitrite), salinity, faecal and total coliforms.*

- Site inspections to ensure compliance with mitigation measures, including:
  - Preparation of viral outbreak contingency plan (at project outset).
  - Harvesting methods (measures taken to reduce re-suspension of sediments and prevent species escape).
  - Solid waste management practices.
  - Verification of SPF source of PL's.
  - Establishment of an emergency response plan.