Aquaculture Feasibility Study

THE CORPORATION OF THE TOWNSHIP OF MANITOUWAGDE

Final Report - March 27, 2019
Firedog Communications Inc. & TBT Engineering Ltd.
Dear Florence,

Please accept this document as the final copy of the Feasibility Study for Aquaculture in Manitouwadge.

Thank you for the opportunity to work on this important project with yourself, The Township of Manitouwadge, and members of the Manitouwadge community.

Sincerely,

Stephanie Ash
President & CEO
Firedog Communications
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1.0 Preamble

In February 2019 the Township of Manitouwadge hired Firedog Communications to research and explore the general feasibility of an aquaculture industry in Manitouwadge, Ontario.

During the start-up meeting between the consultants and the Township of Manitouwadge it was revealed that the potential of an aquaculture industry had been the subject of a one-day workshop hosted in 2018 by the Ministry of Energy, Northern Development and Mines and the Ministry of Agriculture, Food and Rural Affairs. Specifically, the Ontario government had presented an overview of the provincial aquaculture market and opportunities for growth in rural and remote areas of Ontario.

As a result of the workshop, the Township of Manitouwadge, with support from the Manitouwadge Economic Development Corporation, submitted a funding application to the Province of Ontario to undertake an Aquaculture Feasibility Study. The intent was to look at the opportunities for aquaculture in Manitouwadge from an economic perspective. It was proposed that the Aquaculture Feasibility Study would be an economic development tool for a private sector business that would provide an excellent overview of what aquaculture is, the market and opportunities within the industry.

In mid-February 2019, the Province advised Manitouwadge that the funding for the project had been approved with completion required by March 31, 2019.

The Study is designed to provide a solid foundation to allow for further dialog surrounding an aquaculture opportunity to be located in Manitouwadge either by an entrepreneur and/or as a partnership.
2.0 Introduction

Firedog Communications was hired in February 2019 to undertake an Aquaculture Feasibility Study for the Town of Manitouwadge. This Study is the first exploratory phase in a potentially multi-phase effort dedicated to researching and analyzing the opportunities for an aquaculture industry in Manitouwadge. It is intended to be an overarching document which broadly reviews aquaculture as a potential economic opportunity and sets the framework for more detailed plans to be prepared for the most feasible opportunities.

For the purposes of this Study, Firedog Communications worked with TBT Engineering Limited to assess and evaluate the benefits of pursuing aquaculture opportunities in Manitouwadge from a socio-economic and technical perspective.

2.1 Objectives of the Study

As previously stated, the overall objective of this Study is to identify and evaluate the most feasible opportunities, if any, for sustainable aquaculture development in Manitouwadge, Ontario. Within this, the consultants sought to address three broad issues: the potential local appetite for aquaculture; identification of local assets that would support an aquaculture business opportunity, and market opportunities to inspire entrepreneurship and community economic development.

Specifically, the project objectives includes:

- An overview of what aquaculture is
- The market and opportunities within the industry
- Information about the types of aquaculture facilities (open net pen, land based or aquaponics)
- The key attributes needed including:
  - asset mapping,
  - preferred species for the area,
  - land based or water-based options,
  - potential locations,
  - market assessment,
  - Class D cost estimates for construction,
  - start up and operational costs.

This Study recommends how aquaculture could be implemented in Manitouwadge; the types of fish species that would be viable in the area, as well as market, facility and location options. The information contained in this report is to help identify, guide and develop the most appropriate and sustainable aquaculture development opportunities.
2.1 Our Approach

The consultants’ approach to this Study was developed to involve people who have a stake in the potential Manitouwadge aquaculture industry. This included internal and external stakeholders including residents, entrepreneurs, business owners, local officials, and economic development groups in Manitouwadge as well as regional Municipalities, First Nations and private sector businesses.

Through focused research and community outreach, the stakeholder groups generated ideas about the community’s resources, capacity, barriers and opportunities, as well as suggestions for ways that regional stakeholder groups can better work together on economic development.

This type of consultation process generally allows for the development of plans that will be supported by internal and external stakeholders, build community interest, and serve as a community-wide guide for coordinated private and public development at a local and regional level.

2.2 Study Process

The Aquaculture Feasibility Study was conducted in a short time period between February – March 2019 across five phases as outlined below.

**Phase 1: Information Gathering** - Pertinent background documents were reviewed in order to gain a broader understanding of Manitouwadge and its assets. These documents included the Manitouwadge Community Strategic Plan, 2017; Community Profile, 2014; Marketing Study, 2013; and Needs and Gaps Analysis, 2013. Broader projects and trends regarding the community’s current and future economic development priorities were also reviewed.

**Phase 2: Consultation** - Residents of Manitouwadge were surveyed through online and paper questionnaires to gather their opinions about the potential for an Aquaculture Industry.

A Public Open House & Information Session was hosted on March 17, 2019 at the Manitouwadge Town Hall to bring information to local residents and businesses, and to better understand their perspectives on potential aquaculture opportunities. Consultation was also undertaken with the Ministry of Natural Resources and Forestry to inform the Study.

**Phase 3: Market Research** - Regional and provincial research was conducted to learn more about aquaculture operations in other regions of Ontario. as well as market trends and demands. This work connected the consultants to the Ontario Aquaculture Association, successful Aquaculture operations in Ontario, and regional seafood buyers including restaurants, wholesalers, grocery retailers and consumers. The consultants also reviewed aquaculture best practises in other Canadian and International jurisdictions to inform their decision-making and recommendations.

**Phase 4: Draft Aquaculture Feasibility Study** - A draft Study was prepared for input and feedback as part of the corporation review process.

**Phase 5: Finalize Study** - The feedback gathered during Phase 4 was compiled, and the Study was finalized for presentation by the consultants to the Township of Manitouwadge Council.
In this Study, we summarize our findings and provide strategic recommendations for the pursuit of an aquaculture industry in Manitouwadge. The views expressed to us during the consultation process by individuals, groups and organizations for the purposes of this Study have not been attributed unless derived from formal reports or statements.

At the conclusion of this Study, it is intended that the Township of Manitouwadge will continue working locally and with regional communities to explore interest where viable opportunities exist. These identified opportunities should be fully explored and their viability fully determined in the concurrent phases of this feasibility process.
3.0 Community Profile: Township Of Manitouwadge

The Township of Manitouwadge is a picturesque municipality located in Northern Ontario between the urban centres of Thunder Bay and Sault Ste. Marie. It is situated on the shores of Manitouwadge Lake, North of Lake Superior, and is easily accessible to major markets, as it is conveniently only 55-kilometres north of the Trans-Canada Highway. The name Manitouwadge comes from the word “Manitouwadj”, meaning “Cave of the Great Spirit” in Ojibway. The town was originally established as a mining community back in the mid 1900’s.

The town is comprised of many community assets including a grocery store, Library, community rink, golf course, hospital, banks, a school and a variety of other small retail spaces, businesses and services.

Within the township there is a vast array of landscapes, including a large supply of residential land, both developed and undeveloped, and an industrial area that has space for additional establishments. Manitouwadge’s outdoor spaces provide opportunities for active and healthy lifestyles for all ages. With its many lakes and rivers, the Township has thousands of kilometers of shoreline to experience.

Manitouwadge offers very affordable options for residents and newcomers, with the cost of living significantly lower than the provincial average. The local economy consists of commercial, and industrial businesses that are located throughout the town, along with successes in Forestry, Mining, Construction, Healthcare and Social assistance. As many of the main industries that have dominated the Township in the past have seen a decline throughout the years, Manitouwadge continues to explore new options and opportunities including tourism, recreation, and as a retirement community.

According to Statistics Canada, Manitouwadge’s population in 2016 was 1,708, seeing a small decline of only 4% since 2011, while the average age of its residents is 45 years old. Manitouwadge’s participation and employment rate is lower than Ontario’s average, with employment 43.6 % and unemployment being recorded at 9.5%.

The governing body for the Township is the Manitouwadge Town Council that is comprised of a Mayor and four Councillors. The Mayor and Councillors are elected by the town’s constituents for a four-year term, with the current Council beginning its term on December 1, 2018.

“People choose to live in Manitouwadge because of the connection they feel with the community – the residents, geography, community groups and organizations and employment are reasons why so many call Manitouwadge their home.”

- Township of Manitouwadge

3.1 Manitouwadge Aquaculture Assets

A review of Manitouwadge’s key assets connected to an aquaculture industry promotes planning that builds on existing strengths and opportunities. Community assets are the resources and characteristics that improve the quality of life in Manitouwadge and provide an advantageous environment for society and the local economy to flourish. In analyzing Manitouwadge’s community assets in relation to aquaculture, there are clearly key attributes and features that could be significant to the pursuit of new aquaculture opportunities.
Natural Resources

Like many communities in Northwestern Ontario, natural resources are one of the Municipality’s primary assets. However, what makes Manitouwadge unique is the diversity of its natural resources which include surface and ground water resources, biological resources, forestry lands, hills, parklands, wetlands, minerals, soils and aggregates and other natural habitats - all within a short distance from the town centre. Manitouwadge is located in the Ontario Fisheries Management Zone 7 in northern Ontario.

Natural resources are a vital component of community life in Manitouwadge because they service environmental, commercial, industrial, recreational and human needs. The environmental functions provided by the area’s natural resources are critical to the beauty, health, safety and quality of life found in the community. As well, they service commercial and industrial needs as sources of raw materials for extraction, product and service development. The recreational needs of the Municipality are supported year-round by natural resources through activities including fishing, boating, hiking, snowmobiling and skiing. Lastly, they cater to human needs as a source of food supply, culture and other lifestyle opportunities. It is generally accepted that natural resources become increasingly important assets for a community when people have rights to access their benefits. This is clearly the case in Manitouwadge.

The key local and area assets in Manitouwadge that should be considered in relation to aquaculture industry development include:

Natural Resources:

- Located in Ontario Fisheries Management Zone 7.
- Geographic rural location in the heart of the Canadian Boreal Forests.
- Rounded hills up to 40 meters.
- Over 400 clean freshwater lakes.
- Hundreds of river systems, tributaries, ponds and streams. (Foch River, Flanders River, and White Otter River, and Osawin River).
- Thousands of kilometers of lakeshores/shoreline.
- Surface and ground water resources.
- Native and wild stocks of fish species (walleye, northern pike, perch, whitefish, salmon, lake, brook, and speckled trout).
- Current brook trout stocking activities in this fisheries management zone.
- Abundant aquatic plant life.
- Wildlife (moose, black bear, partridge, beaver, otter, caribou).
- Over 300 average hours of sunshine per year.
- Humid continental climate (northern temperate zone).
- Dense hard and soft wood tree species (black spruce, jackpine, cedar, tamarack, aspen, white birch).
- Proximity to the Lake Superior shoreline (the world’s largest freshwater lake).
- Regional research in freshwater ecology, fisheries and fish health at Lakehead University.
- Local and regional college and university programs offering natural resource management, biology and related fields of study.
- Provincial, federal and private research for aquaculture.

Business Infrastructure:

- Municipal accessibility by Highway and air (60 km from the TransCanada Highway).
- Significant municipal fishing infrastructure (boats, docks, feed, service, supplies and equipment).
- Road access to many lakes and river systems.
- Proximity to Thunder Bay (397 km) and major transportation/export infrastructure (rail, air, port, roads).
- Available utilities (water, hydro).
- Modern telecommunications.
- Natural gas availability by 2020.
Manitouwadge Aquaculture Feasibility Study 2019

- Strong and well-established business community.
- Local business expertise; engineering, technical, legal, environmental etc.
- Mixed use Industrial Park.
- Availability of low-cost industrial and commercial lands.
- Low commercial and industrial tax rates.
- Proximity to larger food processing and consumer base in Thunder Bay.
- High percentage of skilled tradespeople.
- Large local and remote labour pool.
- Diverse business and funding support for start-up and commercialization through Superior North Community Futures and the Ministry of Northern Development and Mines.
- Business friendly political leadership, policies, zoning and permitting.
- Successful wood harvesting businesses in the area.

Community/Social Strengths

- Welcoming community.
- Proactive approach to investment, business and population attraction and retention.
- Community principles founded upon sustainability and environmental stewardship.
- High quality of life (disposable income and work/life balance).
- High median family income.
- Low cost housing.
- Varied recreational assets (golf course, ski hill, arena, gym).
- Workforce experience and history in natural resources (forestry and mining).
- 20% French speaking population.
- Strong local culture of entrepreneurship.
- Strong local knowledge of and interest in area natural resources; fish, lakes, waterways etc.
- Local fishing interest groups and volunteer associations.
- Good relationships with Ontario Government Ministries and their agencies (MNRF, MNDM).
- Proximity and collaborative working relationships with neighbouring municipalities and particularly North Shore communities (Marathon, Wawa, Greenstone, Terrace Bay, Schreiber, Nipigon etc.)
- Proximity and positive relationships with potential First Nation partners.
4.0 What is Aquaculture?

Aquaculture, also known as aquafarming, is defined by the Canadian Aquaculture Industry Alliance (2018) as the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. It involves cultivating freshwater or saltwater populations under controlled conditions for commercial benefit. The farming of fish is the most common form of aquaculture. It involves raising fish commercially in tanks, fish ponds, or ocean enclosures, usually for food.

Aquaculture is the fastest-growing food production sector in the world and already provides about half of all the fish we eat.

Farming implies individual or corporate ownership of the aquatic stock being cultivated as well as some sort of intervention in the rearing process to enhance production such as regular stocking, feeding, or protection from predators.¹

The decline in wild fish stocks globally has increased the demand for farmed fish in all countries. In the Canadian aquaculture industry, there are approximately 45 different species of Finfish, Shellfish, and Marine Fish cultivated commercially.² In Canada, Finfish represent the largest component of the farmed seafood sector with 27 species grown in both marine and freshwater environments.³

Depending on the species being farmed, the culture technologies and systems used (land-based, water-based) and the type of environment (i.e. freshwater, brackish water and marine water) of aquaculture operations can vary substantially.⁴

In the following sections of this report, we will look at the operations associated with aquaculture using various cultivation models/systems.

4.1 Aquaculture as a Socio-Economic Driver

Sustainable aquaculture has the potential to be very impactful in communities of all sizes but particularly in smaller, rural areas.

Aquaculture can become an important economic driver, generating direct jobs through all facets of the aquaculture value chain (hatchery, raising, harvesting, processing, packaging, and shipping or delivery), as well as indirect jobs through the provision of support services (environmental services, construction, diving, boat repair, water taxi services, etc.). Aquaculture also provides solutions for the commercial market by producing a sought-after Finfish supply for retailers locally, across North America or even globally.

From a community health perspective, aquaculture addresses food security concerns through open net pen or land-based facilities.

Another benefit is the rehabilitation of targeted species which can reduce pressure off the wild stock and can help with population recovery and increased activity within the sport and commercial fishing sector.

1 Canadian Aquaculture Industry Alliance, 2018
2 Fisheries and Oceans Canada (DFO), 2014
3 RIAS Inc., 2017
4 Fisheries and Oceans Canada, 2013a
5.0 Aquaculture Industry Overview

5.1 Global Overview

Aquaculture is recognized globally as an important and growing industry that serves an increasing demand worldwide for sustainably sourced seafood. According to the latest market report from Technavio - Global Aquaculture Market 2018-2022\(^1\) - the global aquaculture market is expected to accelerate considerably over the next five years with a predicted annual growth rate of 4.46 percent until 2022.

According to the United Nations Food and Agriculture Organization (FAO 2016), world seafood consumption continues to rise substantially and overall seafood production continues to increase to accommodate demand. While traditional wild-caught production worldwide has largely plateaued since the 1990s conversely aquaculture production has continued to grow during the same period.

Today, total global seafood production by aquaculture remains lower than captured fisheries but experts predict that aquaculture production will overtake wild caught fisheries by 2022. Worldwide, food sourced from aquaculture (inland and marine) grew from 7 per cent of total seafood consumed in 1971 to 44 per cent in 2014\(^2\). With continued improvements in aquaculture systems, the growth of sustainable farming practices and the diversification of farmed fish species, the global aquaculture market – currently valued at USD 180.2 billion – is anticipated to reach USD 224.2 billion by 2022 to help meet global demand for fish and seafood products.

**Figure 1:** Global consumption of seafood derived from aquaculture.

**Figure 2:** Global harvest of aquatic organisms in million tonnes, 1950–2010.\(^3\)

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3. The Food and Aquaculture Organization (FAO)
**Figure 3:** Countries dominating the aquaculture market in volume and value (2018).

1. China  
2. India  
3. Indonesia  
4. Chile  
5. Norway  
6. Vietnam  
7. Japan  
8. South Korea  
9. United States  
10. United Kingdom

These leading aquaculture countries are expected to see annual growth rates of between four and nine percent in the sector by 2022. This translates to significant economic development for these countries as well as major national and regional investments in market research and innovation, and improved government legislation and policies related to food security.

### 5.2 Global Market Drivers

The growth of aquaculture is attached to the world’s growing population, increasing demand for seafood and the declining populations of the captured fish industry. The most common form of aquaculture around the world involves the farming of fish species for food, and comprises the commercial farming of fish in tanks, ponds, or other enclosures. Indeed, it is expected that aquaculture will supply over 60% of the world’s seafood for direct human consumption by 2030.

The global shift towards farmed seafood is a result of several market drivers:

- A potential solution to the insufficient supply of seafood;
- Consumer concerns related to the depletion of natural fish stocks;
- Increased awareness of fish as a nutritious food source (low fat and high protein);
- A potential source of medicinal properties in fish among some cultures; and
- Consumers around the world recognize farmed fish as a quality, trusted, safe and sustainable food source which continues to drive healthy market growth.

With this global growth in the industry there is the potential for significant investment opportunities in the production of a range of “fish” species including Algae, Finfish, Crustaceans and Molluscs. Worldwide, the most important fish species used in fish farming are Carp, Salmon, Tilapia and Catfish.

In terms of freshwater species, Carp dominates freshwater aquaculture production, followed by Molluscs. In the United States, farmed Catfish accounts for the largest aquaculture production and revenues nationally, followed by Clams, Crawfish, Mussels, Oysters, Salmon, Shrimp, Striped Bass, Tilapia and Trout.

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4 Food and Agriculture Association, 2013.  
5 Food and Agriculture Association, 2013.  
5.3 Canada Overview

In Canada, aquaculture was originally used to stock depleting natural and native fish species. Over the past three decades, the industry has evolved to become a large-scale and growing commercial industry providing direct and indirect economic impacts to local and regional communities.

In just 30 years, Canada’s aquaculture industry has become an important employer and economic driver in many coastal, rural and Indigenous communities. Economic activities focus on fish production as well as in spin-off supply and service businesses.

In all coastal regions, Shellfish is the most prominent aquaculture sector with 16 different species being farmed. Mussels, Oysters, Clams and Scallops are the dominant products in terms of volumes produced and sales revenues. Mussel is the country’s top shellfish aquaculture export.

Across the country, Finfish represent the largest component of the farmed seafood sector with 27 species grown in both marine and freshwater environments. Canada is the fourth-largest producer of farmed Salmon (Atlantic, Chinook and Coho) in the world. Several species of Trout and Arctic char also generate considerable market demand. Looking to the future, experts predict considerable diversification in the types of aquaculture species produced in Canada.

The type of aquaculture operations found across Canada are varied with culture technologies and systems changing depending on the type of species being farmed. Systems include land-based and water-based systems, as well as freshwater, brackish water and marine water environments.

Today, the majority of Canada’s aquaculture operations are located along marine coastlands, delivering popular products such as Atlantic Salmon, Mussels, Trout, Oysters and Clams to domestic and international markets. Inland freshwater operations focus primarily on Trout and provide important aquaculture across Canada’s provinces.

In 2006, the economic contribution by the aquaculture industry to the economy (or “gross value added”) reached $395.8 million, up 58.4% from 2005. By 2010, the estimated value of output produced by the Canadian aquaculture industry was at $1.1 billion. Today, aquaculture represents over a third of Canada’s total fisheries value and about 25% of total seafood production. According to the Canadian Aquaculture Industry Alliance, aquaculture generates $5.16 billion in total economic activity and provides 25,000 full-time jobs across the country.
5.4 Canadian Market Drivers

Like the rest of the world, the growth of aquaculture in Canada can be attributed to global market trends. Population growth, rising per capita incomes and urbanization are expected to continue to fuel a growing demand for fish. Canadians find considerable value in seafood farming for various socio-economic reasons including but not limited to:

- A healthy food source – Canada’s Food Guide promotes eating fish as a healthy protein food;
- An increased supply of safe, local and sustainable seafood;
- Economic participation in the growing global farmed seafood market;
- Business and job creation in coastal and rural communities;
- Local socio-economic benefits (population growth, housing starts etc.); and
- Environmental protection of wild seafood stocks facing sustainability pressures.

Eight in ten Canadians support regulated expansion of our national aquaculture industry.
- Canadian Agriculture Industry Alliance
5.5 Canadian Industry Outlook & Opportunities

Demand for seafood will continue to grow globally with a projected increase of 11% by 2027. As a major global seafood exporter, Canada is well positioned to expand its export industry and meet growing market demands through aquaculture production.

According to the Outlook to 2027 for Canadian Fish and Seafood\(^\text{11}\) a growing share of global seafood demand will be met by aquaculture production, which will expand by almost 20% by 2027, as strong global prices for seafood encourage expansion.

While the Canadian aquaculture industry is currently one of the country’s smallest employers, it is also the fastest growing. Indeed, aquaculture presents major export and domestic opportunities for Canada, and has the potential to improve the country’s economy by creating new jobs and businesses in direct seafood production as well as in processing and associated goods and services. Meeting this growing market demand will boost the demand for labour; the number of workers needed to meet production targets is forecasted to increase from 4,000 in 2014 to 5,800 by 2025.\(^\text{12}\)

The opportunity also exists to commission new research, inspire innovations and develop advanced culture systems to improve the aquaculture industry. With Canada’s world-famous coastlines and abundant freshwater lakes and rivers, the potential to innovate, farm new fish species, create new technologies and test leading-edge management practices is real.

**Canadian Aquaculture industry at a glance\(^\text{13}\)**

**In 2014:**
- Fastest-growing agriculture industry
- 4,000 people employed
- 450 jobs left unfilled
- $57 million in lost sales due to labour shortages

**In 2025:**
- Growing global market for product
- Growing labour shortages
- 1,300 jobs predicted to go unfilled
- Rural depopulation is a significant issue
- Labour shortages continue to impact sales

\(^\text{11}\) Fisheries and Oceans Canada
\(^\text{12}\) Aquaculture Labour Market Forecast to 2025, Canadian Agricultural Resource Council
\(^\text{13}\) Aquaculture Labour Market Forecast to 2025, Canadian Agricultural Resource Council
## 2017 Canadian Aquaculture Production Statistics (tonnes)

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</tr>
<tr>
<td>Mussels</td>
<td>2,890</td>
<td>20,004</td>
<td>1,019</td>
<td>0</td>
<td>274</td>
<td>0</td>
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<td></td>
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<td>261</td>
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<tr>
<td>Scallops</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>74</td>
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<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>66</td>
<td>0</td>
<td>61</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Total Shellfish</td>
<td>2,890</td>
<td>24,056</td>
<td>1,704</td>
<td>1,298</td>
<td>685</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9,442</td>
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<tr>
<td><strong>Total Aquaculture</strong></td>
<td>21,712</td>
<td>24,520</td>
<td>13,352</td>
<td>25,165</td>
<td>1,854</td>
<td>5,900</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>96,608</td>
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## 2017 Canadian Aquaculture Production Statistics ($000)

<table>
<thead>
<tr>
<th></th>
<th>Nfld</th>
<th>PEI</th>
<th>NS</th>
<th>NB</th>
<th>Que</th>
<th>Ont</th>
<th>Man</th>
<th>Sask</th>
<th>Alta</th>
<th>BC</th>
<th>CANADA (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Finfish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmon</td>
<td></td>
<td></td>
<td></td>
<td>99,644</td>
<td>227,843</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>728,589</td>
</tr>
<tr>
<td>Trout</td>
<td></td>
<td></td>
<td></td>
<td>3,331</td>
<td>9,365</td>
<td>31,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>183</td>
</tr>
<tr>
<td>Steelhead</td>
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<td></td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9,931</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td>4,549</td>
<td>0</td>
<td>160</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7,506</td>
</tr>
<tr>
<td>Total Finfish</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>227,843</td>
<td>9,525</td>
<td>34,000</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>746,209</td>
</tr>
<tr>
<td><strong>Shellfish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clams</td>
<td>0</td>
<td>319</td>
<td>593</td>
<td>175</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6,319</td>
</tr>
<tr>
<td>Oysters</td>
<td>0</td>
<td>13,857</td>
<td>3,167</td>
<td>12,112</td>
<td>1,702</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14,282</td>
</tr>
<tr>
<td>Mussels</td>
<td>x</td>
<td>28,666</td>
<td>x</td>
<td>0</td>
<td>566</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,211</td>
</tr>
<tr>
<td>Scallops</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>109</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>508</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>3,160</td>
<td>0</td>
<td>615</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Total Shellfish</td>
<td>x</td>
<td>42,842</td>
<td>x</td>
<td>12,289</td>
<td>2,992</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22,320</td>
</tr>
<tr>
<td><strong>Total Aquaculture</strong></td>
<td>x</td>
<td>x</td>
<td>116,004</td>
<td>240,132</td>
<td>12,517</td>
<td>34,000</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>768,529</td>
</tr>
</tbody>
</table>

(1) Provinces with data not available are not included in the Canada totals.

Note(s): The production and value of aquaculture includes the amount and value produced on sites and excludes hatcheries or processing. Shellfish also includes some wild production.

The data are collected from each of the provincial departments responsible for aquaculture.

Source: Statistics Canada. Table 32-10-0107-01 Aquaculture, production and value
## 5.8 Value Added Account - Aquaculture Industry

### A. Sources of output

<table>
<thead>
<tr>
<th>Product</th>
<th>NL</th>
<th>PE</th>
<th>NS</th>
<th>NB</th>
<th>QC</th>
<th>ON</th>
<th>BC</th>
<th>Canada (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales of aqua products/services</td>
<td>x</td>
<td>x</td>
<td>119,055</td>
<td>244,250</td>
<td>12,745</td>
<td>34,190</td>
<td>775,780</td>
<td>1,400,855</td>
</tr>
<tr>
<td>Whole fish dressed, fresh or chilled</td>
<td>x</td>
<td>x</td>
<td>0</td>
<td>17,250</td>
<td>1,025</td>
<td>24,725</td>
<td>711,850</td>
<td>813,090</td>
</tr>
<tr>
<td>Fish eggs &amp; live fish for grow-out</td>
<td>0</td>
<td>x</td>
<td>2,045</td>
<td>x</td>
<td>1,390</td>
<td>5,365</td>
<td>15,625</td>
<td>29,275</td>
</tr>
<tr>
<td>Whole fish live (ex for grow-out)</td>
<td>x</td>
<td>0</td>
<td>x</td>
<td>5,290</td>
<td>1,330</td>
<td>0</td>
<td>383,675</td>
<td></td>
</tr>
<tr>
<td>Whole fish dressed &amp; frozen</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>x</td>
<td>0</td>
<td>x</td>
<td>4,445</td>
</tr>
<tr>
<td>Fish fillets, fresh or frozen</td>
<td>x</td>
<td>0</td>
<td>x</td>
<td>x</td>
<td>2,580</td>
<td>13,565</td>
<td>55,270</td>
<td></td>
</tr>
<tr>
<td>Fish, dried, smoked or in brine</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>x</td>
<td>0</td>
<td>x</td>
<td>1,500</td>
</tr>
<tr>
<td>Total finfish</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>227,840</td>
<td>9,525</td>
<td>34,000</td>
<td>746,210</td>
<td>1,287,255</td>
</tr>
<tr>
<td>Total molluscs</td>
<td>x</td>
<td>42,840</td>
<td>x</td>
<td>12,290</td>
<td>2,375</td>
<td>0</td>
<td>22,320</td>
<td>92,445</td>
</tr>
<tr>
<td>Other goods &amp; services NES (3)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>4,120</td>
<td>845</td>
<td>190</td>
<td>7,250</td>
<td>21,155</td>
</tr>
<tr>
<td>Subsidies</td>
<td>x</td>
<td>405</td>
<td>x</td>
<td>x</td>
<td>475</td>
<td>x</td>
<td>2,340</td>
<td>3,605</td>
</tr>
<tr>
<td>Other operating revenue</td>
<td>405</td>
<td>x</td>
<td>x</td>
<td>1,085</td>
<td>x</td>
<td>4,455</td>
<td>11,565</td>
<td></td>
</tr>
<tr>
<td><strong>Total operating revenue</strong></td>
<td>163,465</td>
<td>52,840</td>
<td>120,875</td>
<td>247,155</td>
<td>14,305</td>
<td>34,810</td>
<td>782,575</td>
<td>1,416,025</td>
</tr>
</tbody>
</table>

### B. Product inputs

<table>
<thead>
<tr>
<th>Product</th>
<th>'000 of dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed</td>
<td>111,350</td>
</tr>
<tr>
<td>Therapeutants</td>
<td>430</td>
</tr>
<tr>
<td>Purchases, eggs/fish - grow-out</td>
<td>15,865</td>
</tr>
<tr>
<td>Purchases, fish - processing/resale</td>
<td>4,630</td>
</tr>
<tr>
<td>Insurance premiums</td>
<td>695</td>
</tr>
<tr>
<td>Energy (electricity, fuel, etc.)</td>
<td>1,385</td>
</tr>
<tr>
<td>Goods transportation &amp; storage</td>
<td>2,365</td>
</tr>
<tr>
<td>Processing services</td>
<td>65</td>
</tr>
<tr>
<td>Rental &amp; leasing expenses</td>
<td>735</td>
</tr>
<tr>
<td>Maintenance/repairs (4)</td>
<td>8,605</td>
</tr>
<tr>
<td>Professional services</td>
<td>1,900</td>
</tr>
<tr>
<td>Other operating expenses NES (3)</td>
<td>6,595</td>
</tr>
<tr>
<td>Change in inventory value - raw materials</td>
<td>-685</td>
</tr>
<tr>
<td><strong>Total of product inputs</strong></td>
<td>30,245</td>
</tr>
</tbody>
</table>

### C. Gross value added (factor cost)

<table>
<thead>
<tr>
<th>'000 of dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries &amp; wages</td>
</tr>
<tr>
<td>Employer portion of employee benefits</td>
</tr>
<tr>
<td>Depreciation</td>
</tr>
<tr>
<td>Interest paid</td>
</tr>
</tbody>
</table>

### Notes:

1. Data and account structure are subject to revision.
2. Canada total excludes Manitoba, Saskatchewan & Alberta.
3. NES = not elsewhere specified.
4. Starting in 2013, maintenance and repair expenses for buildings and machinery are combined.

Source: Statistics Canada. Table 32-10-0108-01 Aquaculture economic statistics, value added account (x 1,000)
5.9 Ontario Industry Overview

With support from the Ontario Government, the Ontario aquaculture industry has experienced significant growth over the past ten years. This growth has been fueled by increasing demand locally, nationally and globally for fresh farmed fish.

By Canadian standards, Ontario’s aquaculture industry is small compared to coastal provinces like British Columbia. However, Ontario has a reputation for producing safe and high-quality freshwater products with more than 40 species of fish now eligible to be raised under provincial regulation. In many small and rural communities, aquaculture is a key growth industry. According to statistics compiled by the University of Guelph, nearly 6,000 tons of fish were produced in Ontario in 2017.

In 2017, the economic contribution of aquaculture production was valued at approximately $110 million. Rainbow trout is the most commonly grown fish species in Ontario with a total output of 5,060 tons in 2016. According to the Minister of Agriculture, Food and Rural Affairs, more than 85 per cent of this output occurred in Northern Ontario through open water cage aquaculture. Lake-based cage production of Rainbow Trout in the Georgian Bay area continues to dominate other land-based production systems.

Land-based production of Arctic Char and Tilapia is limited to only a few commercial facilities in southern Ontario. Most recently, a Land-Based Pacific White Shrimp operation was opened near Sudbury, Ontario. The majority of other operations in Ontario are primarily focused on harvesting and stocking operations.

The emergence of new freshwater technologies, sectors and products is also further diversifying and growing the aquaculture industry. The growth of aquaculture production in the North also has the potential to create further opportunities for aquaculture processing.

### Ontario Aquaculture Industry Snapshot, 2016

<table>
<thead>
<tr>
<th>Major Species Produced</th>
<th>Rainbow Trout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Species Produced</td>
<td>Tilapia, Arctic Char, Brook Trout, Smallmouth and Largemouth Bass, Walleye, Cyprinid Baitfish and Shrimp</td>
</tr>
<tr>
<td>Total Rainbow Trout Production</td>
<td>5,060 tonnes</td>
</tr>
<tr>
<td>Total Other Fish Production</td>
<td>500 tonnes</td>
</tr>
<tr>
<td>Farm-gate Value of Rainbow Trout</td>
<td>$26.8 million</td>
</tr>
<tr>
<td>Farm-gate Value of Other Fish</td>
<td>$3.5 million</td>
</tr>
<tr>
<td>Economic Contribution</td>
<td>$100 million</td>
</tr>
<tr>
<td>Job Creation</td>
<td>190 person-years direct and 150 person-years indirect</td>
</tr>
<tr>
<td>Projected Rainbow Trout Production</td>
<td>approx. 5,700 tonnes in 2017</td>
</tr>
</tbody>
</table>

Aboriginal peoples have managed Ontario’s aquatic resources and practised aquaculture for thousands of years. They are participating across all areas of the province’s growing aquaculture industry, including investment, processing, training, employment and RD&E activities. This substantial expertise in aquaculture provides significant economic benefits for First Nation communities and corporations, as well as area partnerships. First Nations communities and entrepreneurs are the important contributors to the aquaculture industry in Northern Ontario. Today, Ontario First Nations are expressing interest in farming Walleye, Perch, Arctic Char, Sturgeon and Whitefish. The establishment of strategic partnerships...
between First Nation communities and corporate ventures could further enhance sustainable aquaculture economic development in Northern Ontario.

Aquaculture operations are largely regulated by the Ministry of Natural Resources and Forestry with rules covering environmental impacts, licensing, land use and planning. Responsibility for environmental regulation, including the approval of new aquaculture developments and ongoing monitoring and compliance, is generally a matter for the Ministry of Natural Resources and Forestry.

5.10 Ontario Aquaculture Markets: Competitive Advantage

A range of biophysical, technological and demographic factors suggest that aquaculture in Ontario has every opportunity to compete and succeed, owing to the following competitive advantages:

- A biophysical resource base well suited for the production of trout (i.e. water supplies, production sites, etc.);
- Potential to increase exports to the U.S., which is increasingly dependent on imported seafood and where the market for trout is supply-limited;
- A considerable potential and need for agricultural diversification and latent infrastructure to support development;
- Favourable currency exchange rates;
- Leading freshwater aquaculture R&D capacity, namely at the University of Guelph, Fisheries and Oceans Canada’s Experimental Lakes Area, Environment Canada’s Canadian Centre for Inland Waters;
- Established infrastructure for transportation, communication, low-cost energy, etc.;
- An available skilled and trainable labour pool;
- Knowledgeable and experienced aquaculture management with a desire to support sustainable development and expand operations.

5.11 Opportunities in Northern Ontario

With high food prices and accessibility issues, food security is an important priority for Northern Ontario. This is providing new and unique food production and processing opportunities for northern entrepreneurs and businesses. The demand for sustainable local foods has also surged in recent years. This trend is particularly evident in cities like Thunder Bay where a strong local food movement has emerged including farms, greenhouses, local food brands and restaurants.

Initiatives like The Northern Ontario Growth Plan and the Northern Ontario Agri-Food Strategy from the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), have provided new opportunities for the development of local food projects, aquaculture and food processing. Funding is also available to support new entrepreneurial activities and help Northern Ontario producers address issues such as transportation and distribution.

For northern communities like Manitouwadge, opportunities present in fish production as well as in related businesses for goods and services in the value chain. Hatchery, harvesting, cage fabrication, fish feed, fingerling producers, rigging, maintenance supplies and service, trucking, fuel supply, and construction materials are all part of the value-added chain.

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AQUACULTURE IN ONTARIO

“Ontarians have been farming sustainable seafood for more than 60 years.”
- Ontario Aquaculture Association

The industry is seen as an important employer and economic driver throughout much of the province (rural, remote, and Indigenous communities).

135%
Increase in annual seafood production since 2011 (2017)

$110M+
Economic contribution to Ontario’s economy (Aquastats 2017)

106M+
Meals of farmed seafood grown in Ontario every year (8,000 tonnes)

550+
Direct and indirect jobs in Ontario’s aquaculture industry (2017)

*Source: Ontario Aquaculture Association

Ontario possesses many assets for aquaculture development:

- Availability of water resources
- Established industry infrastructure
- Access to large domestic markets
- Equipment, services, supplies and technical expertise
5.12 Potential First Nation Partners in Proximity to Manitouwadge

- Pic River First Nation
- Missanabie Cree First Nation
- Metis of Ontario
- Jackfish Metis
- Red Rock First Nation
- Biinjitiwaabik Zaaging Anishinaabek
- Pays Plat First Nation
- Gull Bay First Nation (Kiashke Zaaging Anishinaabek)
- Fort William First Nation
- Michipicoten First Nation
- Brunswick House First Nation
- Chapleau Ojibwe First Nation
- Kingfisher Lake First Nation
- Constance Lake First Nation
- Mishkeegogamang Ojibway Nation
- Ojibway Nation of Saugeen
- Long Lake No. 58 First Nation
- Whitesand First Nation
- Animbiigoo Zaagi’igan Anishinaabek
- Pic Mobert First Nation
- Bingwi Neyaashi Anishinaabek (Sand Point First Nation)
5.13 Ontario’s Aquaculture Farms

- GOOD4Ushrimp, Estaire
- Eastern Island Farm, Manitoulin Island
- Wabuno Farm, Manitoulin Island
- Fisher Harbour Farm, Manitoulin Trout
- Eagle Rock Farm, Manitoulin Island
- Northwinds Farm, Manitoulin Island
- Mink Island Farm, Manitoulin Island
- Caselton Aquaculture, Manitouwaning
- Buzwah Fisheries, Wikwemikong
- Buzwah Fisheries, Manitouwaning
- Wollesley Farm, Manitoulin Island
- Odawa Island Farms, Sheshegwaning First Nation, Manitoulin Island
- Burnt Island Hatchery, Manitoulin Island
- Aqua-Cage Fisheries, Parry Sound
- Milford Bay Trout Farm, Bracebridge
- Manitoulin Trout Hatchery, Coldwater
- Haliburton Highlands Outdoor Association, Haliburton
- Kinmount Fish Farm, Kinmount
- First Ontario Shrimp, Harcourt
- Fleming College – Aquaculture Program, Peterborough
- Linwood Acres Trout Farms, Cambellcroft
- Kolapore Springs, Ravenna
- Bruce Peninsula Sportsmen’s Association, Wiarton
- Springhills Trout Farm, Holland Centre
- Trillium Springs Fish Farm, Holland Centre
- Williamsford Trout Farm, Chatsworth
- Blue Spring Trout Farm, Hanover
- Cedar Crest Trout Farms, Hanover
- Blue Spring Trout Hatchery, Durham
- Camp Creek Trout Farm, Durham
- Primrose Trout Farm, Mono
- Humber Springs Trout Club & Hatchery, Mono
- Silvercreek Aquaculture, Erin
- Mimosa Springs Trout Farm, Hillsburgh
- Alma Aquaculture Research Station (University of Guelph & Ontario Ministry of Food and Rural Affairs)
- Halton Hills Trout Farm, Georgetown
- Izumi Aquaculture, McMillan Pond, Aberfoyle
- Lyndon Fish Hatcheries, New Dundee
- Belnheim Springs Trout Farm, Bright
- Sandplains Aquaculture, Mossley
- Gehring’s Fish Farm, Otterville
- Goosen’s Trout Farm, Otterville
- Planet Shrimp, Aylmer
- Cole-Munro Fisheries, St. Thomas

Northern Ontario’s Aquaculture Farms

- Eagle Ride Trout Ponds, Neebing
6.0 Species Selection

Around the world there are roughly 100 different species farmed in aquaculture operations. In Canada, there are approximately 45 commercially cultivated species of Finfish, shellfish and marine algae. In Ontario, aquaculture takes place in freshwater environments such as lakes and rivers, land-based ponds, or tanks. Freshwater trout operations are the most popular in almost every Canadian province including Ontario.

Commercially successful aquaculture operations farm species that are:

- Well-suited to the environmental features of a community/region/site;
- In demand locally and regionally;
- Certain to be effectively bred/produced to meet market demand;
- Can be efficiently and cost-effectively transported to market.

In selecting appropriate species for culture, it is also essential that there is access to appropriate technology, systems, feed stock, as well as local operator knowledge of the species. When producing any specie, farm operators must obtain all of the necessary licenses and follow required federal, provincial and municipal regulations. The regulation of aquaculture and farmed fish species is intended to ensure fish health, food security and the sustainability of the aquatic environment.

Regulatory information for the Manitouwadge area is available from The Ministry of Natural Resources and Forestry (MNRF), who has the lead legislative mandate for the management of Ontario’s natural resources and has the authority to issue approvals for aquaculture. MNRF works with other responsible regulatory or government agencies, First Nation and Métis communities, and others who have a shared interest in the stewardship of natural resources.¹

6.1 Potential Species for Manitouwadge

For Manitouwadge, the consultants were directed to focus on eight Finfish species as having potential for commercial aquaculture development. The selection process included detailed consideration of desktop information, technical advice from aquaculture experts, existing known environmental parameters and production efficiency.

The following species were studied as potential preferred species for the area:

- Trout (Rainbow, Brook/Speckled, etc.)
- Salmon (Atlantic)
- Lake Whitefish
- Yellow Perch
- Bass (Largemouth, Smallmouth)
- Walleye
- Tilapia
- Artic Char

¹ Canadian Agriculture Industry Alliance, www.aquaculture.ca
² Application Guidelines for Aquaculture Facilities, Ontario Ministry of Natural Resources and Forestry
Trout

Rainbow trout (Steelhead trout), Brown trout, Lake trout (Lake char) and Brook Trout (Speckled Trout) are all farmed in Canada and largely in Ontario. The farming of trout is considered to be an established industrial aquaculture sector in Canada. In 2013, Canadian trout farmers produced 6,700 tonnes of high-quality trout valued at about $39 million. The most common freshwater Finfish farmed in the country are Rainbow trout and Brook trout with the province of Ontario producing the largest amount of farmed trout. Other Canadian provinces that are farming trout include Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Quebec, Prince Edward Island and Saskatchewan.

The common method for farming trout in Canada starts with eggs that are either imported or produced by healthy brood stock in land-based flow-through or recirculation systems. Freshwater hatcheries typically place fertilized trout eggs in an incubator tank until they hatch. After hatching, juvenile trout are raised in freshwater land-based recirculation or flow-through hatchery facilities in circular tanks and cement raceways. Once the juvenile trout have reached 8-10 cm in length they are transferred for grow-out. Grow-out methods for trout include pond culture, fresh water net pens, salt water net pens (for Steelhead Culture), land-based raceways or large indoor or outdoor tanks.

According to the Ontario Aquaculture Association (2018), raising rainbow trout to maturity in net-pens compared to land-based technologies is better for the environment and more sustainable, financially and logistically viable. Trout are typically harvested between the size of 0.5 to 1.0 kg. Depending on the grow out method being used, this process can take 9-22 months. Rainbow trout are a versatile, hardy fish that can thrive in numerous freshwater sources and a wide range of water temperatures.

Salmon

Atlantic Salmon, Chinook Salmon and Coho Salmon are all farmed in Canada. The farming of Atlantic Salmon is considered to be a dominant and established industrial aquaculture sector in Canada. Atlantic Salmon is Canada’s top Finfish aquaculture export with Canada ranked as the fourth largest producer of farmed Salmon in the world. Canadian provinces that currently farm Salmon include British Columbia, New Brunswick, Nova Scotia, Newfoundland and Labrador and Prince Edward Island.

The common method for farming salmon in Canada starts with eggs that are either imported or produced by healthy brood stock in land-based flow-through or recirculation systems. At a freshwater hatchery, the fertilized eggs are incubated in temperature-controlled tanks. After hatching, juvenile salmon are raised in freshwater land-based recirculation or flow-through hatchery facilities. In the hatchery, just-hatched alevins grow into fry and are vaccinated, monitored and reared until they begin to smoltify. Once the juvenile salmon, smolts, are ready for the marine environment they are transferred to saltwater net pen grow-out facilities, or less commonly, land-based systems. In the ocean or land-based grow-out facility, smolts grow into adults (salmon) before they are harvested at 2.5 - 3 years of age or a weight of 4.5 kg.

At every stage in the farmed Salmon’s life cycle, farm operators must follow strict federal, territorial and provincial laws, protocols and regulations. This ensures animal health, food safety and the sustainability of the environment, aquatic ecosystems and salmon farms.

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3 Canadian Aquaculture Industry Alliance, www.aquaculture.ca
4 Fisheries and Oceans Canada, 2017
5 Nguyen & Williams, 2013.
**Lake Whitefish**

Lake whitefish is a freshwater Finfish that belongs to the salmon family and bears many similarities to salmon. Lake whitefish inhabit cold-water lakes and rivers and are native to Canada and the northern United States America.

Whitefish production can be considered a “new species” and an economic development opportunity in the Canadian aquaculture industry. In the last decade, Whitefish have been raised from eggs to market size in recirculation and flow-through systems. According to a report prepared by RIAS Inc, Ontario First Nations have expressed interest in farming Whitefish.

**Yellow Perch**

Yellow Perch, or Lake perch, is a small freshwater Finfish that produces high-valued firm, white flesh. Yellow Perch are found in North America and prefer cool, open water and moderate vegetation. In Canada, Yellow Perch are abundant in Manitoba lakes and the Great Lakes drainage system. In their natural environment, Yellow Perch consume planktonic food and prey on the juveniles of other fish species.

According to Fisheries and Oceans Canada, efficient aquaculture methods for Yellow Perch have not been developed. Research in Canada is currently ongoing to develop genetically diverse brood stock, optimize feeding and husbandry techniques, establish flesh quality and industry guidelines and determine optimum rearing temperatures and feed timing.

Based on research and tests to date, intensive recirculation systems are considered to be the optimal grow-out method for Yellow Perch. During the warmest summer months, pond culture is being considered for fry. According to a report prepared by RIAS Inc, Ontario First Nations have expressed interest in farming yellow Perch. This fish is considered a new species in Canada’s aquaculture industry. In Ontario, there is good potential for the development of commercial Yellow Perch culture.

**Bass**

In Ontario, the culture of Bass is primarily geared towards recreational sport-fishing and pond-stocking purposes.

**Largemouth Bass**

Native to North America, the Largemouth Bass is a freshwater Finfish that inhabits the warm, shallow bodies areas of lakes and rivers. This species prefers soft bottom lakes with a variety of vegetation and can tolerate slight turbidity and high temperatures. The Largemouth Bass is a fish-eating predator although as it matures its food type changes from plankton to insects, fish, crayfish, and frogs. Largemouth Bass have a fast growth rate.
Currently, in Canada, Largemouth Bass are farmed in Ontario. According to Steve Naylor\(^8\), there is no standard method of rearing Largemouth Bass. However, they are typically raised in ponds or raceways. Culturing Largemouth Bass can be challenging due to their cannibalistic tendencies and a resistance to adapt to artificial feeding.

**Smallmouth Bass**

Native to the lakes and rivers of eastern central North America, the Smallmouth Bass is a warm-freshwater Finfish. It is a predatory fish capable of reducing native fish populations and altering their behaviour. Smallmouth Bass inhabit offshore shoals and clear lakes and rivers with rocky or sandy bottoms. Currently, in Canada, smallmouth bass are farmed in Ontario and Quebec.

**Walleye**

Walleye, commonly called Pickerel, are large, predatory, freshwater Finfish that are adapted to low light. Walleye can be found throughout Ontario but are especially abundant in Northern Ontario and the Great Lakes basin.\(^9\) Walleye inhabit a range of lakes and rivers including waters that are warm, shallow and murky as well as cold, deep and clear.

Walleye are considered to be one of Canada’s most economically viable freshwater fish species. However, significant research is still required before Walleye can be cultured at a level that is comparable to industry dominants like Salmon and Trout. Currently, in Canada, Walleye are farmed in Quebec.

The Ontario Ministry of Natural Resources and Forestry (MNRF) uses extensive pond culture methods to rear Walleye for stocking, but with some Walleye populations in decline, this method has not been able to fill the demand. To meet stocking targets, the MNRF is working to develop intensive indoor culture methods. To date, the MNRF has made significant progress that will also benefit Canada’s commercial aquaculture sector. Desired survival rates have been achieved using a flow-through system and trials using a recirculating system are close to achieving the same level of performance. Temperature, light, turbidity, feeding regime and fish diet must be carefully controlled. A project through the Aquaculture Collaborative Research and Development Program (ACRDP) is also working, “to identify the best wild Walleye stock in Ontario for domestication, to determine the optimal conditions for the culture of this Walleye stock in ponds and recirculation systems, and to develop better techniques for maintaining brood stock and for inducing spawning in captivity”.

According to a report prepared by RIAS Inc, Ontario First Nations have expressed significant interest in Walleye aquaculture. Walleye are considered a new species in Canada’s aquaculture industry and experts believe there is good potential for the development of commercial Walleye culture in Ontario.


\(^9\) Government of Ontario, 2014
**Tilapia**

Tilapia is a freshwater Finfish that requires warm water temperatures above 24 Celsius. The main species of tilapia farmed in Canada is the Nile tilapia.\(^{10}\) Tilapia aquaculture facilities are currently located in Ontario, Alberta, and British Columbia.

Methods for raising Tilapia are well established. Small tilapia fingerlings (less than 2 grams) supplied from Canadian hatchery breeding stocks are stocked for grow-out in heated land-based tanks with recirculation systems. Compared to cold-water fish species, Tilapia grow quickly, reach maturity at a couple of months of age and can produce several broods each year. In land-based rearing systems, Tilapia can grow to market size in less than 10 months. In Alberta, Tilapia is the most commonly reared fish in aquaponic systems. The land-based systems used for Tilapia production allow for the fish to be produced in high densities, with minimal access to water and extremely low environmental impact.

In Canada, all Tilapia production is sold to live local markets at premium prices. In Ontario, there is good potential for the development of commercial tilapia culture.\(^{11}\)

**Arctic Char**

In Canada, freshwater Arctic Char aquaculture is a small, diverse and developing industry. Arctic Char aquaculture facilities are currently located in Alberta, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Quebec, and the Yukon. Operators of Arctic char facilities produce both eggs for international export and mature fish for domestic markets and international export. In Ontario, there is good potential for the development of commercial Arctic Char culture.

Arctic Char thrives in cold water and are reared and produced in land-based systems. Eggs are hatched in flow through and recirculation hatchery facilities. After hatching, juvenile Arctic Char are raised in the hatchery until they reach the desired size of 100 grams. This growth phase typically takes close to 12 months. Once the juvenile Arctic Char are ready for grow-out they are transferred to large land-based tank systems (flow through and recirculation) or saltwater net pens. To ensure proper growth and prevent illness, tanks rearing Arctic char must be stocked at high densities to mimic how Arctic Char gather in close together in the wild.

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\(^{10}\) Canadian Aquaculture Industry Alliance www.aquaculture.ca

\(^{11}\) Moccia, 2009.
6.2 Other Species Approved for Aquaculture

Other species approved for culture in Ontario include:

- Lake Sturgeon
- Goldfish
- American Eel
- Bluegill
- Lake Herring (Cisco)
- Muskelunge, Northern Pike
- Creek Chub
- White Sucker
- Brown Bullhead
- Pumpkinseed
- Sauger
- Crayfish
- Bluntnose Minnow
- Fathead Minnow
- Redbelly Dace
- Finescale Dace
- Common Shiner
- Golden Shiner
- Emerald Shiner
- Common Carp
- Channel Catfish
- Black Crappie

6.3 Preferred Finfish Species for the Area

The following matrix provides a summary of the preferred species of aquaculture recommended for the Manitouwadge area. It provides a high-level analysis and categorization of potentially suitable species based on the following criteria:

- Species (Typical Adult Life Size)
- Life Stage
- Production Efficiency
- Prospective Farming Sites
- Compatible Production Systems
- Environmental & Planning Considerations
- Market Demand

The matrix highlights the species that are recommended as the best options for species selection. In terms of Finfish species, the top three recommended species, in order of importance, for further study are:

1. Tilapia (high market demand) Grow-Out
2. Rainbow Trout (high market demand) Grow-Out
3. Lake Whitefish (medium market demand) Grow-Out

It should be noted that Walleye was not considered a viable aquaculture species on this list due to the cannibalistic nature when in high densities.

6.4 Top Recommended Specie – Pacific White Shrimp Grow Out

In the course of the consultant’s research, a specie that was not identified on the original list of potential fish for Manitouwadge has emerged as presenting the greatest opportunity for aquaculture. Pacific White Shrimp is recommended as the number one overall specie for further study and analysis. With a short cultivation and production period (5-6 months), and high market demand regionally, Pacific White Shrimp presents considerable potential for a future aquaculture opportunity in Manitouwadge.

Pacific White Shrimp is a native specie of the Pacific Ocean, between California and Peru, and is typically imported to Canada in a frozen form. It is a highly cultivated shrimp around the world due to its rapid growth rate and ease of cultivation. Harvesting of Pacific White Shrimp typically begins at 120 days and the specie can reach up to 9 inches in length.

In 2018, a new Pacific White Shrimp aquaculture operation was opened in Sudbury to serve markets in Northeastern and Southern Ontario. The business, GOOD4Ushrimp, is located in Estaire in southeast Sudbury and is only the third shrimp aquaculture operation of its kind in Canada. The company operates from an 18,000 square foot facility in a series of tanks using a closed recirculation system (CRS). The facility also includes a lab, office, and will eventually include a packaging and shipping area.
### Preferred Species Matrix

<table>
<thead>
<tr>
<th>Species (Typical Adult Length)</th>
<th>Life Stage</th>
<th>Production efficiency</th>
<th>Prospective sites</th>
<th>Compatible Production System</th>
<th>Environmental &amp; Planning Considerations</th>
<th>Market demand</th>
</tr>
</thead>
</table>
| Pacific White Shrimp (20 cm)  | Grow-out   | 5 – 6 months from hatch to market size | • Vacant industrial / commercial land (new build)  
• Existing industrial / commercial | Land-based system (tanks or ponds) | • Supply of eggs could be difficult to obtain locally due to remote geographical location; Common suppliers come from southern USA.  
• Usually live in waters warmer than 20°C.  
• Pond production is common in milder climates like USA; Manitouwadge might have better success if they set up indoor tank system. | • High |
| Tilapia (20 – 45 cm)          | Hatchery and/or Grow-out | Grow-out – approx. 6 - 10 months | • Vacant industrial / commercial land (new build)  
• Existing industrial / commercial | Land-based system (tanks or ponds) | • Warmwater species (approx. 25°C)  
• Omnivore species (can get nutrition from plants [like algae] and animals).  
• Commonly farmed in isolated ponds; indoor tank system would be recommended for Manitouwadge. | • High |
| Trout – Rainbow (20 – 60 cm)  | Hatchery and/or Grow-out | Grow-out stage can reach market size within 4 – 7 months | • Vacant industrial / commercial land (new build)  
• Existing industrial / commercial | Land-based system (tanks or ponds) | • Coldwater species (12°C - 18°C) that is fast growing compared to other trout species.  
• Commonly farmed in isolated ponds or within tanks.  
• Lots of resources and information about species.  
• Can be grown in ponds but | • Medium  
(market saturation from southern Ontario) |
## Preferred Species Matrix

<table>
<thead>
<tr>
<th>Species</th>
<th>Method</th>
<th>Timeframe</th>
<th>Setup Details</th>
<th>Most Common Within Ontario to Have RAS Tank Setup</th>
<th>Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Whitefish (30 – 66 cm)</td>
<td>Grow-out</td>
<td>Approx. 24 months to market size</td>
<td>• Large deep lake with Lake Whitefish present (Possible Waterbody – Wowun Lake)</td>
<td>• Need large &amp; deep coldwater lake (8°C - 14°C)</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lake-based system</td>
<td>• Wowun Lake, if suitable, may have a max capacity if commercial operation is within lake – possible that only a small cage operation can be active in lake to not have negative effects to ecosystem.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Outdoor overwintering considerations due to multi-year growth.</td>
<td>• Location of Lake Whitefish fry/fingerling for purchase/transport.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Not a common aquaculture species and could encounter difficulties due to lack of feed and unknown success rates.</td>
<td>• Not a common aquaculture species and could encounter difficulties with success</td>
<td></td>
</tr>
<tr>
<td>Hatchery and/or Grow-out</td>
<td>Approx. 24 months to market size</td>
<td></td>
<td>• Vacant industrial / commercial land (new build)</td>
<td>• Coldwater species (8°C - 14°C)</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Existing industrial / commercial</td>
<td>• Where to purchase eggs; or, have competent staff to get permits and collect brood stock with local genetics</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Land-based system (tanks)</td>
<td>• Not a common aquaculture species and could encounter difficulties with success</td>
<td></td>
</tr>
<tr>
<td>Trout - Brook, Brown, Lake etc. (Brook – 15 – 40 cm)</td>
<td>Hatchery and/or Grow-out</td>
<td>Variable depending on species – usually 2 years</td>
<td>• Only lake presently with Trout species in township is Gaug Lake (brook trout) o Gaug Lake</td>
<td>• Due to size (11.3 ha; 14.9 m deep) this lake may not be large enough not deep enough to sustain a large operation. If chosen, more communication with Government bodies is</td>
<td>Low</td>
</tr>
</tbody>
</table>
### Preferred Species Matrix

<table>
<thead>
<tr>
<th>Species</th>
<th>Phase</th>
<th>Habitat and/or Species Size</th>
<th>Feasibility</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon – Atlantic (50 – 75 cm)</td>
<td>Hatchery</td>
<td>From egg to market size will take approximately 3 years Grow-out – approx. 24 months</td>
<td>Variable depending on species – usually 2 years</td>
<td>Vacant industrial / commercial land (new build)  &lt;br&gt;Existing industrial / commercial</td>
</tr>
<tr>
<td>Arctic Char (38 – 64 cm)</td>
<td>Hatchery and/or Grow-out</td>
<td>Variable growth rates (approx. 17 - 20 months at start of grow-out stage to market size)</td>
<td>Vacant industrial / commercial land (new build)  &lt;br&gt;Existing industrial / commercial</td>
<td>Land-based system</td>
</tr>
<tr>
<td>Perch (Yellow) (15 – 30 cm)</td>
<td>Hatchery and/or Grow-out</td>
<td>2 years to reach market size under ideal conditions</td>
<td>Vacant industrial / commercial land (new build)  &lt;br&gt;Existing industrial /</td>
<td>Land-based system (tanks or ponds)</td>
</tr>
</tbody>
</table>
## Preferred Species Matrix

<table>
<thead>
<tr>
<th>Species</th>
<th>Commercial</th>
<th>Commonly farmed in isolated ponds.</th>
<th>Lake-based system</th>
<th>Can be cannibalistic in certain densities</th>
<th>Can live in warm waters (18°C - 24°C)</th>
<th>Outdoor overwintering considerations</th>
<th>Low – Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grow-out</strong></td>
<td>2 + years to reach market size</td>
<td>• Perch located in multiple water bodies within township – if this is the desired species, further investigation if lake-based aquaculture can be feasible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bass - Largemouth &amp; Smallmouth (25 – 50 cm)</strong></td>
<td>Hatchery and/or Grow-out</td>
<td>Variable growth rates (1-2 years)</td>
<td>• Vacant industrial / commercial land (new build) • Existing industrial / commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Land-based system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Warmwater species that is relatively tolerant to water quality changes (26°C and up) • Commonly farmed in isolated ponds</td>
<td></td>
<td></td>
<td>Low</td>
</tr>
</tbody>
</table>

**Notes:**
- Walleye was not considered a viable aquaculture species on this list due to the cannibalistic nature when in high densities.
- Highlighted species near the top of the table are the suggested best options for species selection.
7.0 Aquaculture Models & Production Systems

With over 100 species of fish farmed globally, the range of available aquaculture models and production systems is diverse. Depending on the species being farmed, the required culture technologies and the type of environment, preferred aquaculture models and systems vary substantially.

In this section of the Study, we will look at the business operations associated with the cultivation of various freshwater Finfish species using different aquaculture systems (land-based and water-based) for grow-out operations.

7.1 Aquaculture Models in Canada

There are currently six popular models of aquaculture in operation across Canada. They include:

- **Cage Culture** – this model involves growing fish stocks in cages that are submerged in lakes or oceans. Common cage culture species are Salmon and Rainbow Trout.
- **Long-line** – this model involves anchored trays, racks and lines that float in marine waters to grow aquatic plants and shellfish.
- **Bottom Culture (Intertidal)** – this model involves the seeding, management and harvesting of aquatic plants and shellfish in intertidal waters.
- **Bottom Culture (Subtidal)** – this model involves the seeding, management and harvesting of aquatic plants and shellfish in subtidal waters.
- **Land Based** – this model involves growing fresh or saltwater fish species in tanks or ponds on land systems.
- **Enhancement/sea ranching** – this model involves the release of hatchery raised migratory fish into the ocean for harvesting upon their return to freshwaters.

The most popular and growing aquaculture operations in Canada include: freshwater net pen and land-based systems; bottom culture shellfish operations in intertidal zones; long-lines, net pens and restocking operations in open water; and bottom culture shellfish grow-out areas in sub-tidal zones. The types of aquaculture operations used are determined by the species being farmed, the environment and culture technologies used.
7.2 *Aquaculture Production Systems in Canada*

For the purposes of this Study, the models and systems associated with raising and harvesting Shrimp and Finfish to grow out are most pertinent. There are a number of production systems and technologies available and currently used to sustainably raise freshwater Finfish. These include hatcheries, pond culture, cage culture, recirculating systems, flow-through systems (raceways), and Integrated Multi-Trophic Aquaculture. Understanding the differences between the various systems and their capacities is essential to the aquaculture future of Manitouwadge.

**Water or Land Based Hatcheries – most aquaculture fish begin their lives in a hatchery.**

Most fish in the aquaculture industry begin their lives in fish hatcheries as eggs or larvae and are nurtured there until they have reached a certain size or the desired stage in their life cycle. Depending on the species being reared, some fish can be held in land-based facilities for their entire life cycle, while others are released into their natural environment or transferred to one or more grow-out facilities. Grow-out facilities provide an environment for fish to grow until they are the desired market size for harvesting. These operations can take place in a natural body of water (freshwater facility) or in a contained land-based facility.

**Land-Based Pond Culture – earthen ponds are used to culture freshwater fish.**

According to Halwart, Martinez and Schückler (2000) in their report for the Food and Agriculture Organization of the United Nation (FAO), “Ponds are globally the most common aquaculture system and “range from small, rudimentary, gravity-fed facilities to large geometric ones, constructed using machines and with sophisticated water management regimes.”

Pond culture allows for fish to swim freely in fully or semi-enclosed bodies of water. The main advantage of pond culture operations versus other types of pen and tank systems is cost. They also require less technical expertise in management and operations. Pond systems are well suited to smaller operations and smaller rural communities when managed efficiently.
7.0

Water-Based Cage culture – enclosed cages are submerged in aquatic environments

Currently, in Canada, cage culture net pens are the mostly widely used form of large-scale, commercially operating aquaculture systems. Cage culture operations involve rearing fish in enclosed cages or nets that are floating or submerged in an aquatic environment such as a freshwater lake or river. In cage culture, water flows freely and circulates between the cages and water source to supply fish with their oxygen requirements. The size of cages and nets can vary substantially and is dependant on the species of fish and their biological needs. Advantages of cage culture include the ability to rear fish at high densities, simplified harvesting and husbandry practices, low capital costs compared other land-based aquaculture facilities, and resource flexibility. Cage culture operations can be set-up in virtually any body of water provided that the water quality is high and that the operator has legal access. Disadvantages of this method include water quality, disease control, vandalism and poaching, predation and critical feed requirements.

Land-Based Recirculating Systems (RAS) – fish are raised in “closed-loop” systems that continuously filter and recycle water and waste.

Aquaculture facilities and hatcheries using recirculating systems raise fish in tanks that utilize a production system to continuously add oxygen to the water, recycle, treat and filter the water, and remove waste products. In a 2015 report published by the Food and Agriculture Organization of the United Nations (FAO) and EUROFISH International Organisation, A Guide to Recirculation Aquaculture, Jacob Bredgnaballe defined the basic principle of recirculation system as, “From the outlet of the fish tanks, the water flows to a mechanical filter and further on to a biological filter before it is aerated and stripped of carbon dioxide and returned to the fish tanks.” Depending on the size of the facility and how much water is being recycled recirculation can be carried out at different intensities. Common tank shapes include circular, d-ended raceway, and raceway systems.

RAS systems are considered to be environmentally-friendly for their use and recirculation of limited water supply. This technology also reduces the potential risks of invasive species or diseases entering the fish farm environment. Other benefits include greater system control related to climate, temperature and oxygen levels, producing more stable conditions and healthier fish. Despite the advantages, RAS does require increased operational expertise and management, and requires significant investments in capital, equipment and maintenance costs.

Land-Based and Water-Based Integrated Multi-Trophic Aquaculture/Aquaponics – several species are raised together in a way that allows one species’ by-products to be recycled as feed for another.

Integrated Multi-Trophic Systems raise several species together to mimic a natural ecosystem, which allows for the by-products of one species to be recycled as feed for another. This concept is a new approach to sustainable fish and seafood farming that is adaptable to both land-based and freshwater aquaculture systems. According to the Department of Fisheries and Oceans Canada², “an effective IMTA operation requires the selection, arrangement and placement of various components or species, so as to capture both particulate and dissolved waste materials generated by fish farms”.

A possible route to IMTA in Central Canada’s freshwater areas is aquaponics. Aquaponic facilities are advanced recirculation systems where both fish and plant life are raised to create a mutually beneficial environment. Typically, in this type of system, water is circulated between a fish rearing environment and a hydroponic plant growing bed. The waste produced by the fish specie serves as a nutritious food source for plant life and in return, the plants clean the water before it is cycled back to the fish.

² Department of Fisheries and Oceans Canada, 2013
Selecting the most appropriate production system for an aquaculture project typically considers the following:

- Location;
- Management intensity;
- Species;
- Scale; and
- Integration (vertically, within the individual production system; and horizontally, with related industries that provide feeds and marketing or transport).

### 7.3 Preferred Aquaculture Models & Systems for Manitouwadge

The most preferred aquaculture systems for Manitouwadge, and specifically catered to the top three preferred species of Shrimp, Tilapia and Rainbow Trout, are Land-Based Systems for grow out with the option of using either tank or pond technologies. The assets required for these Land-Based Systems include:

- Tanks and/or raceway’s (steel with liner, concrete, fiberglass, etc.);
- Effluent management system (collection sumps and water treatment);
- Sophisticated water chemistry equipment including managing and manipulating (temperature, dissolved gasses levels, turbidity, pH, salinity and dissolved solids);
- Heavy-duty Pumps and associated piping for source water to tanks and for tank to tank movements;
- Filters (Bio-filters, UV filters, CO2 & nitrogen filters, and mechanical filters);
- Competent and knowledgeable staff including expert staff on managing water quality and aquaculture fish concerns/issues (commonly staffed 24 hours a day or large operations; shrimp usually just day-shifts);
- A large land-based operation could have approximately 4 managers and 14 technicians;
- Large industrial back-up generator able to run all electrical systems on site;
- Site security (simplified if enclosed within buildings);
- Specialized underwater lights for inside tanks;
- Feeders (manual or automated);
- Refrigeration and equipment for receiving supply stock before putting into the system;
- On-site transportation of supplies and/or equipment (forklifts, trucks, etc.);
- Monitoring and control equipment (specialized operating systems, cameras and/or sensors depending on automation);
- Associated annual fees for software needs for specialized operating systems;
- Harvesting and grading equipment.
7.3.1 Assets Required for Water-Based Operations

Should the Municipality choose to pursue water-based aquaculture opportunities, and specifically related to Lake Whitefish, the following system assets would be required:

- Anchors and buoys;
- Cages and walkways long enough to reach ideal water depths;
- Large nets and net cleaners;
- Regular water chemistry and sediment monitoring & sampling programs within water body;
- Boats and/or barges;
- Competent knowledgeable staff (could be ran only during business hours if automated);
- Large cage operation could have approximately 2 managers, 1 maintenance and 7 technicians;
- Back-up generator for running all electrical systems on site;
- Site security due to exposed nature of operation (poachers, wildlife, etc.);
- Lights and reflective identifiers on equipment within water for visual identification during the day and night;
- Feeders (manual or automated);
- Refrigeration and equipment for receiving supply stock before putting into system;
- On-site transportation of supplies and/or equipment (forklifts, trucks, etc.);
- Monitoring and control equipment (specialized operating systems, cameras and/or sensors depending on automation);
- Associated annual fees for software needs for specialized operating systems;
- Harvesting and grading equipment.
8.0 Site Assessment & Selection

Site selection plays an essential role in the success of aquaculture operations. Site selection must be determined by the aquaculture activity planned and the existing environmental conditions. It involves a technical and administrative procedure to establish areas of interest for further socioeconomic, environmental and technological analysis.

In studying the feasibility of aquaculture for the Township of Manitouwadge, the consultants have considered the many criteria that make a site suitable for aquaculture, as well as potential locations in the area. This Study aims to summarize the factors considered and the future work to be done in selecting optimal sites for aquaculture farming.

8.1 Manitouwadge Site Assessment Criteria

The criteria used to assess the potential for sites for commercial aquaculture farming include physical, biological, environmental, financial, social, cultural, legal and regulatory factors.

Physical factors involve the study of potential locations with considerations given to inland or shoreline sites, as well as physical infrastructure requirements for specific production systems. It also involves assessing proximity to markets and transportation for supply and demand calculations.

Biological factors involve reviewing the species to be produced, the required resources available for production i.e. feed, stocking materials, water requirements, and the type of culture method.

Environmental factors involve assessing adequate water supply and quality, climate, land and soil conditions, and hydrological characteristics.

Financial factors involve the capital and operating costs to design and develop aquaculture operations including gaining access to the required services and infrastructure in rural and remote areas.

Social factors include acceptance by local people and the availability of experience, technical knowledge, workforce, facilities and materials to support the type of operation.

Cultural factors involve ensuring that proposed sites are not protected, of cultural interest or traditional territories of Indigenous people.

Legal and regulatory factors mean reviewing potential sites for ownership, alternative development plans, legal and regulatory restrictions imposed by administrative authorities.

Some common questions to research and consider about a potential aquaculture site include:

Water-based:
1. Does the site have good depth, water flow and quality?
2. What are the seasonal water temperatures at the site?
3. How exposed is the site and from what direction(s)?
4. Is the site susceptible to poachers?
5. Are there potential contaminants in the area?
6. Is there a history of fish disease or parasites in the waters?

Land-Based:
1. Is the site close to a quality and reliable water supply?
2. Are local infrastructure supplies and production materials available locally?
3. Can the market and processing facilities be easily accessed from the location?
4. Is the land area large enough for future business expansion?
5. Is the site accessible to workers and transportation year-round?
6. Is it financially viable to develop infrastructure at this location?

Selected aquaculture sites do not typically satisfy all the required selection criteria. As such, options and variables
are assessed from a risk mitigation perspective and according to their importance. When it comes to final site selection, the greatest consideration is given to the biological needs of the fish specie, as well as economic viability for start-up and operation.

8.2 Potential Aquaculture Sites in Manitouwadge

An area of interest for aquaculture is one where it is appropriate to install an aquatic operation that is compatible with the local ecosystem, socially acceptable and economically feasible. For the purposes of this Study, specific criteria have been used to identify and select potential water-based and land-based aquaculture site options for Shrimp and Finfish. Identification of prospective aquaculture sites also included consideration of advice from the Ministry of Natural Resources and Forestry.

8.2.1 Location Assets Required for Water-Based Operations:

- Crown land procurement adjacent to suitable chosen water body with enough space for needed out-buildings; or
- Procurement of private land adjacent to suitable chosen water body with enough space for needed out-buildings;
- Easy truck assess for fish, supplies and feed; or
- Construction of a road to connect site to town or major road;
- Depending on operation size, need for electricity could be supplied by generators on an as-needed basis.

To successfully accommodate a water-based model and system in Manitouwadge, a large and deep lake is required. Possible water bodies are: Wowun Lake for Lake Whitefish or Gaug Lake for Trout species.

8.2.2 Location Assets Required for Land-Based Operations:

- Procurement of land that is large enough to house buildings and space required for species selected;
- Close proximity to major road for truck transport of fish, supplies and feed; or
- Building within town to set up as central hub for business;
- Site has electricity or can easily be connected to the hydro-grid;
- Site is large enough to construct a new building to house all operations;
- If site is within town limits, zoning amendments to property may need to be completed and approved;
- Close proximity to good quality surface water and a mechanism for transport of said water to facility; or
- Property has a water well on-site and the quality meets standards for use; or
- Drill a well on-site to provide water;
- Connected to municipal sewer system; or
- Enough area on site to construct a waste water system.

The successful development of a land-based model and system in Manitouwadge requires a large commercial or industrial space. The consultants recommend exploring existing commercial or industrial buildings within the Municipality as a priority or vacant commercial/industrial land for a new building development.

An important aspect to consider when in the design stage will be the ability for the land-based facility to be expanded. To maximize the original capital investment and to minimize subsequent expansion or development it is important that land-based facilities be originally designed to accommodate some form of expansion and that the initial spaces be designed for growth. Should a decision be made to proceed with
more detailed consideration of any these options for aquaculture, additional research and analysis should be conducted that includes a comprehensive physical and economic analysis based on an on-site evaluation to identify and quantify finer-scale attributes.

8.3 Next Steps

Aquaculture as an economic activity involves large investments and substantial risk directly related to site selection and site management. Knowledge is needed in the environmental, technical, legal and socioeconomic areas to improve decision making and enhance the viability of the process. The more data that is available and the higher its quality, the better the decisions for site selection can be made.

Moving forward, a clear and sequential site selection process should be put in place in order to ensure sustainable aquaculture development in the Manitouwadge area. The analysis must first involve final determination of the species to be farmed and the type/size of production process planned. The future site of a potential aquaculture industry in Manitouwadge will be ultimately determined by the physical, process and financial resources required in order to balance the site investment against expected production results.
9.0 Community Engagement

Effective community engagement is an integral component in how the Township of Manitouwadge conducts its affairs and is seen as a foundation of good governance. There is an increasing expectation amongst community members to be consulted on decisions that affect them. Community capacity building developed through engagement activities will provide significant long-term benefits for the Township of Manitouwadge. Public participation has provided insight into this Study and will continue to enhance knowledge, skills and resources for a potential aquaculture industry.

Through this Study, community engagement has intended to:

- Inspire enthusiasm and get people involved;
- Demonstrate to residents that their feedback and opinions matter;
- Indicate how the information collected will be used;
- Share information through small group discussions;
- Show participants that their input has been heard;
- Indicate why and how decisions are reached;
- Include a range of opinions and perspectives;
- Change direction if the community points in that way;
- Ensure residents know that it is important and meaningful for them to be involved in community decision-making.

9.1 Community Engagement Spectrum

This framework is based on the International Association for Public Participation (IAP2) model, which is considered to be the gold standard amongst community engagement practitioners. The IAP2 identifies and defines a range of levels of community engagement, with increasing levels of public influence. These are referred to as the Spectrum of Public Participation:

Inform:
One-way communication providing balanced and objective information to assist understanding about something that is going to happen or has happened.

Consult:
Two-way communication designed to obtain public feedback about ideas on rationale, alternatives and proposals to inform decision making.

Involve:
Participatory process designed to help identify issues and views to ensure that concerns and aspirations are understood and considered prior to decision making.

Collaborate:
Working together to develop understanding of all issues and interests to work out alternatives and identify preferred solutions.

Empower:
Providing opportunities and resources for residents to contribute to solutions by valuing local talents and skills and acknowledging their capacity to be decision-makers in their own lives.

This kind of engagement process ensures that community stakeholders are invested, whether mentally, emotionally or physically, in the long-term success of the project. It creates a sense of ownership and pride in the final project outcomes and consequently, the continued investment required to keep a new industry thriving.
9.2 Engagement Process

In order to make informed and accurate recommendations to the Township of Manitouwadge in regards to potential of future opportunities in the aquaculture industry, it was vital for the consultants to engage with community members. Research and consultation was undertaken in March of 2019, and involved a formal Open House event and resident surveys.

Engagement Results:

Open House Summary

An Open House event was held in Manitouwadge, Ontario, in Manitouwadge Council Chambers on Wednesday, March 13, 2019 from the hours of 4:30 PM to 6:00 PM. The Open House objectives were to inform residents of Manitouwadge and provide them with the most up to date information about the aquaculture industry while exploring the potential industry opportunities in Manitouwadge. It was a comfortable learning experience for the general community and encouraged people to comment and provide feedback. 22 residents attended the Open House, along with two Ministry of Natural Resources and Forestry (MNRF) representatives. The event was led by Florence McLean, Economic Development Officer for the Township of Manitouwadge, with support from two representatives from the hired consulting firm Firedog Communications and a Fish Biologist from TBT Engineering.

Information was provided to attendees in multiple formats with representatives walking around to answer questions and spark conversations. Poster board displays were placed around the entire room that encouraged attendees to circulate. The poster boards covered the following topics:

- What Is Aquaculture?
- Aquaculture In Canada
- Potential Opportunities
- Potential Opportunities: Ontario
- Species Selection
- Potential Sites
- Production Systems (Land-Based And Water)

A Power Point presentation played on rotation that also highlighted key information. There was also a verbal presentation made by the Florence McLean, and hired consultant Stephanie Ash of Firedog Communications, to provide an overview of the project, Open House objectives and a summary of the details provided in the poster boards. The presentation was followed by a Question and Answer session for those in attendance. Attendees were also encouraged to fill out a Residents Survey and if they weren’t comfortable asking questions in the formal setting, a Q & A box was also provided for written questions. Eight surveys were completed and returned onsite.

Many of the attendees stayed for the entire duration of the Open House. It was immediately identified that there was confusion amongst residents in regards to stocking fish versus fish farming. During the Q&A, this was discussed and more information was provided to clearly define the difference between the two activities. Concerns were brought forward about the depth of the potential lakes surrounding Manitouwadge. There was also discussion surrounding lakes being downstream from inactive mine sites and the environmental impacts they might have in regards to aquaculture. Residents also asked about MNRF regulations and how to move forward to retain approvals and if that was even possible.
Attendees asked some of the following questions:

- How many people would this industry employ? Are we talking hundreds of jobs?
- Did we get any sort of go ahead from the MNRF?
- Does it matter if neighbouring communities participate?
- There is only so far you can travel with fish. Will transportation be an issue?
- Is there a current operation that offers all life stages of fish farming?
- Have you done consultations with any surrounding communities?
- Was any water sampling done?
- Who will be involved in the construction? Can this be done all in Manitouwadge?

Attendees at the Open House event were very engaged in the discussions and interested in the overall session. By a show of hands, all those in attendance were supportive of exploring the aquaculture industry further as an economic opportunity for Manitouwadge, and also stated that they would in fact consume fish grown through local aquaculture. Many identified that they believed only a land-based option would be viable for the community.

**Survey Results**

Residents of Manitouwadge have indicated that they are not that familiar with the aquaculture and seafood farming industry, with only 35% saying they are moderately familiar. However, after exploring the topic, 70.5% are in support of a future of the industry in Manitouwadge.

![Q2 Do you support a future aquaculture/seafood farming industry in Manitouwadge?](image)

While community members are in support of the aquaculture industry, they had many different perceptions in regards to how the Township should be involved when it comes to pursuing the industry as an economic driver. While 18.7% are in favour of a hatchery, 12.5% support the processing phase, 69% indicated that they have other ideas for involvement. They are as follows:

- Raising & Harvesting
- Hatchery, Raising, Harvesting & Processing
- Aquaponics
Residents had varying opinions when it came to what species of fish they would be interested in seeing being farmed in Manitouwadge. The most popular responses were Rainbow Trout and Salmon, both with a response rate of 11.76%.

However 58.82% responded other, specifying the following combination of species:

- Rainbow Trout, Perch, Shrimp
- Rainbow Trout, Shrimp, Tilapia
- Rainbow Trout, Pickerel
- Rainbow Trout, Shrimp, Salmon & Walleye

Exploring the type of aquaculture operation that is best suited for Manitouwadge, residents believed that the best option for the industry would be a land-based operation at 47% - 21% reporting that they were unsure, and 12% feeling that a water-based option was most viable.

As Manitouwadge is surrounded by several lakes and waterways, residents were given the opportunity to suggest which lake offers the best potential site for water-based aquaculture development in the area. The following water bodies were suggested:

- Little Moose
- Bear Head
- White Lake
- Manitouwadge Lake
One respondent said that lakes around Manitouwadge are too small to accommodate the industry while others said they didn’t have enough information to provide a response. When asked a similar question in regards to a land-based operation, suggestions were as follows:

- By Emerald Lake
- Cold Storage Facility
- PRT Building
- Vacant Building
- Industrial Area
- Old Golden Age Club

Survey respondents expressed concerns over the potential smell of the site and its proximity to the town.

From a consumer’s perspective, the residents of Manitouwadge are greatly in favour of supporting the opportunity of an aquaculture industry and purchasing locally farmed seafood and fish, with 75% reporting that they would buy local if the product was available.

In terms of forward thinking, citizens support the establishment of a community working group to pursue community economic development opportunities in aquaculture and seafood farming, and believe the Township should back innovation and commercialization opportunities for the industry. They believe that there are some specific initiatives that could support the creation of local businesses and jobs in the aquaculture industry and establish Manitouwadge as a leader:

- Feasibility regarding transportation
- Packaging, accounting
- Extensive research
- Exploring Aquaponics
- Ability to offer many suitable water-based as well as land-based options
- Workforce ready population
- First Nations partnerships

Overall the resident respondents believe the aquaculture industry has the potential for benefits in the Township. They agree that it will relieve pressure on wild stock, provide locally produced seafood, create jobs, improve the local economy and create business opportunities.

Comments from survey respondents:

“We have the means to do this so go forward and see where it leads to.”

“Economic impact is variable depending on the scale of the farming. I think it’s awesome that different ideas are being explored to bring economic benefit to the community. That said, our northern communities are already challenged with more health issues, so I’d prefer to see the healthiest & most environmentally focused initiative possible - this would also help to make Manitouwadge a leader.”
10.0 Market Engagement

It is crucial to determine if there is a market to sustain an expanded aquaculture industry in Northwestern Ontario, and if there is a want and need for the desired product(s). This means understanding the attitudes and opinions of key target markets and audiences.

10.1 Market Outreach Survey Results

The aquaculture industry has several markets with direct to consumer and direct to wholesale buyers, which include restaurants, grocery stores/retailers, bait shops and other aquaculture businesses.

The farm to table movement continues to boom across Canada, with locally sourced meats and seafood on the rise and consumers caring deeply about where their food is coming from. As a result, there is an increasing demand for fresh local fish and seafood supply, and restaurant owners believe that the demand could be met through aquaculture.

Preliminary research indicates that restaurants in the region have an appetite for the industry, seeking freshness, taste, and being able to support local business and the regional economy. However, producers need to understand chefs’ needs and be acquainted with the types of dishes their customers prefer.

A survey was conducted with key restaurants and caterers in Thunder Bay, Ontario. Key findings are as follows:

- Respondents serve on average 7 seafood/fish dishes on their menu
- Respondents serve seafood/fish year round

The most popular seafood/fish served in Northwestern Ontario restaurants is Salmon and Shrimp, followed by Trout, Pickerel and Haddock. Other prominent seafood/fish listed include: Lake Trout, Pike, Smoked Trout, Cod, Cat Fish, Basa, Scallops, Oysters, Calamari and Lobster.

Restaurants report that they are purchasing their seafood and fish supplies from:

- Sysco (23%)
- Eat the Fish (Thunder Bay producer)
- East Coast Lobster

Other producers/areas that they purchase from include:

- Pickerel from Manitoba
- Pratts Foods
- Toronto
- Winnipeg
- Slate Falls Reservation (North of Sioux Lookout)

Many respondents stated that the majority of what they purchase is frozen.

30% reported difficulty acquiring quality seafood and fish for their businesses.

Thinking outside the box, respondents did express that there are species of fish and seafood that they would like to incorporate into their menu if it was more readily available. They include:

- Local fish in large quantities
- More of a fresh fish selection
- Tuna
- Snapper
- Mahi Mahi
- Jumbo Prawns
- Pickerel
- Mackerel
- Flat Fish
- Crayfish
- Ahi Tuna
- Crab

When asked if they would purchase regionally farmed seafood and fish, 54% said it was very likely while 30% said it was likely. No respondents reported that it was very unlikely.
Comments from survey respondents:

“I would use local if the MNR didn’t show up at the restaurant in the middle of business and want to view receipts and count the number of fish etc to make sure we weren’t purchasing it illegally”

“Fresh and local is always best. We would be interested to see new items and look at the potential of adding them to our menu.”

“This could be a great opportunity to increase NWO economy and because we are so central in Canada, shipping to other provinces would be easy”

“A reasonable price needs to accompany these items also. Guests will not pay outrages prices. They want “Bang for their Buck”.

“Love the idea of a holistic approach to farming”

Overall the restaurant sector is looking for something new, helpful, affordable and scalable for addressing their fish and seafood needs and feeding their customers. They suggest that globally we are eating more fish than ever before, and are excited for a way to acquire more product(s).

10.2 Market Assessment At A Glance

Operators in Manitouwadge have the potential to produce fish and shellfish (crustaceans) in land-based and water-based aquaculture operations. The top presenting specie opportunities are:

- Pacific White Shrimp
- Tilapia
- Rainbow Trout
- Lake Whitefish
10.3 Market Segmentation

Based on the consultant’s research, the most presenting geographic markets for these products are:

**Primary:** Manitouwadge and Northshore communities and First Nations

**Secondary:** Thunder Bay & District

**Tertiary:** Northern Ontario and Manitoba

10.4 Key Target Markets:

- Direct to consumer (farm sales)
- Farmer’s Markets
- Grocery Stores
- Restaurants

10.5 Next Steps

A future aquaculture industry in Manitouwadge will require further local and regional engagement with key constituents and organizations to bring people together on key opportunities. Engagement must involve diverse community stakeholders across various sectors in visioning, strategy development, planning, partnership and business development. Community target audiences include local residents but also neighbouring municipalities, First Nations, governments, the private sector, institutions and media.

Regional collaboration will foster the required networks and new relationships to secure the long-term sustainability of an aquaculture industry in Manitouwadge. In order to build support, a community engagement framework is required that includes:

- **Consultations** - input on decision-making and planning with all stakeholders;
- **Information** - communicating and educating stakeholders through meetings, presentations, open houses, information sessions, etc.;
- **Involvement** - formalized participation through committee structures and partnerships;
- **Collaboration** - support and promotion of private initiatives or strategic partnerships that boost local and regional economic development in aquaculture;
- **Empowerment** - encourage stakeholder action and innovation to increase the potential growth and impact of an aquaculture industry.
11.0 General Economic & Financial Assessment

Comprehensive economic and financial assessments with firm costings will be required should any entrepreneur or business choose to pursue a particular fish species for aquaculture in Manitouwadge. For the purposes of this Study, a broad economic and financial assessment was conducted to identify the general realities facing a future aquaculture operation in terms of start-up costs and economic feasibility.

11.1 Economic Assessment

The general economic and financial implications for an aquaculture operator in Manitouwadge are:

- Cost of training and recruitment to ensure a team with good understanding of the fish species and production system used (understanding feeding, growth performance, aeration needs etc.);
- High R&D costs associated with hatchery and nursery requirements, particularly for Finfish species;
- Potential environmental impact assessment requirements, management and decommissioning plans and license/permitting applications to meet regulatory processes;
- Capital investments associated with the start-up of Land-Based infrastructure and tank systems;
- On-going operating costs (manpower and essential services such as power and water including on-site management presence, feed supply, electricity, biosecurity and fish health);
- Difficulty accessing veterinary chemicals and medicines;
- Maintaining water quality and disease-free status;
- Operating in a location generally remote from regional, provincial, national and international consumer markets;
- Immature processing, wholesale and retail network locally and regionally;
- Lack of established market reputation in aquaculture;
- Transportation, logistics and distribution costs to reach regional and provincial markets.

Generally speaking, the lack of high-quality infrastructure and supply services will be the largest challenge for aquaculture industry in Manitouwadge —the seafood industry relies on getting fresh product to markets quickly. Other difficulties will include achieving the necessary scale of operation to be economically viable, putting in place logistics to get product to markets, maintaining product quality and developing a recognized brand name. In short, the economics of an aquaculture operation are bio-economic; meaning that if the biology works efficiently and at lower cost, then the economic viability improves proportionately. In the case of Manitouwadge, pursuing Land-Based systems certainly requires more initial capital investment but these systems ultimately have a higher likelihood of producing quality and efficient stocks.

The economic advantage for Northern Ontario operators is that Government funding supports do exist for entrepreneurs and businesses with an interest in aquaculture. The Northern Ontario Agri-Food Strategy highlights government support for industry-led efforts to take advantage of growing opportunities in aquaculture.¹

There are many areas of positive economic impact also for Governments when new industries start-up in a community. From a governmental return on investment point of view, the return on taxation is

¹ Northern Ontario Agri-Food Strategy, Strengthening the Agriculture, Aquaculture and Food Sector, 2016.
realized from taxes paid by the corporation and employees working at the operation.

Despite the challenges, aquaculture can result in many socio-economic benefits at a local community level including increased employment, income and food security, which are particularly important to rural communities. Aquaculture can help address poverty and food insecurity in a variety of ways and at different scales. For small scale operators, it provides nutritious food for their own families, neighbours and local community, while potentially generating surplus product for sale. Larger commercial operators create income and employment opportunities throughout the value chain and provide affordable, highly nutritious food in response to market demand.

From a community perspective, the potential economic impact is primarily seen through job creation and the purchase of goods and services. In terms of job creation, both direct and indirect, the impact is relatively small for a small-scale operation in a rural area. Direct employment associated with this type of opportunity could be as minimal as 2 full-time salaried positions, as well as 4-6 part-time and seasonal labour positions required to maintain operations. Indirect employment will be in processing, transportation and associated services and supplies. Further economic impact will be seen in terms of goods and services purchased through the operation as well as a quality local food supply.

Other factors of economic impact that are more difficult to measure quantitatively are improved reputation and increased profile. As a new industry but a growing industry, Manitouwadge has the opportunity to put its name on the Canadian map as a community known for producing high quality, sustainable and safe products in a pristine environmental setting. Through innovation, imagination and risk-readiness, Manitouwadge could improve aquaculture production techniques for existing products, identify new products, develop new markets and continue to expand research, education and training.

Clearly, aquaculture alone, cannot fulfil the demand for job creation in Manitouwadge. However, it has the potential to contribute meaningfully to employment and economic growth for the local community and region.

11.2 Financial Assessment

The financial feasibility and long-term viability of aquaculture is essential as positive economic impacts can only flow from a project that is financially viable. Any operation must also be compatible with current legislation, policy, and guidelines that address the development of aquaculture facilities. These requirements are a critical aspect relating to economic desirability, ensuring that the proposed venture compliments economic development and planning as reflected in existing policy and development guidelines for aquaculture. In addition, the development of an aquaculture operation should also be desirable from a societal cost-benefit perspective.

Certain segments of the aquaculture industry can have high profitability. The industry requires higher capital investments than other forms of agriculture in start-up due to the assets required and the immaturity of its technology. However, the sector can also attract higher returns and profitability due to market demand for a unique local product.

The prediction of potential costs to start-up an aquaculture operation are projected at a high level at this stage. As noted earlier in this Study, the need for further business analysis and planning will be paramount to the proper implementation of an aquaculture opportunity.

There is very little comparative data specific to the start-up and operation of an aquaculture facility in Northern Ontario, so assumptions have been made by extrapolating information from similar facilities. The financial assessment is based on a series of assumptions based on the research and market data obtained to date. As the feasibility process proceeds, the assumptions should be refined.
A number of factors determine the start-up cost of an aquaculture operation. These include:

- What resources an entrepreneur already owns (e.g., capital, land, farm buildings / structures, lake);
- Intended size of the operation (i.e., how many pounds of fish to produce);
- Production system intended to use (ponds, cages/net pens, raceways/flow-through, recirculating/water reuse), and
- Where to market the product from the operation.

The viability of a typical aquaculture venture depends on:

- Suitable environmental conditions to support production;
- Availability of seed stock;
- Access to feeds and production technology;
- Access to equipment and supplies;
- Access to markets;
- Access to health management services, consultants and technical services;
- A supportive regulatory environment that facilitates aquaculture development; and
- Public acceptance of the impacts associated with aquaculture development and production.

The following development process is suggested as an introduction to the necessary financial modeling and to contextualize the data:

- Secure egg/fry/hatchery life cycle through partnership opportunities in the region (Municipal or First Nations);
- Investigate and negotiate regional partnerships to develop a solid network reputation in the industry;
- Develop detailed product, sales & marketing, pricing and distribution plans;
- Conduct a thorough analysis to confirm the physical space requirements and establish the program of spaces required;
- Identify human resource requirements;
- Develop a detailed management and operational plan;
- Develop a detailed funding and financing model using predictive break-even analysis;

It should also be noted that this analysis did not investigate alternative business models, such as cooperatives, joint ventures (including with Indigenous corporations), use of existing common-use infrastructure and investors with existing aquaculture equipment and infrastructure seeking to diversify their businesses.

Financial assessments have been undertaken for several preferred species however, it is important to note that the capital investment and operating expenditure assumptions are projected high.
11.2.1 Operating Budget - Facility Design & Operating Parameters (Land-Based)

A. Fixed Costs associated with Facility Form and Function:
- Land and property costs (New construction/existing building renovation)
- Indoor and outdoor space (truck loading and parking)
- Equipment, tools and vehicles
- Salaries
- Security systems (24 hours)
- Licensing fees
- Depreciations.

B. Variable Costs that change with Production Quantity (Land-Based):
- Eggs, fingerlings, juveniles
- Feed
- Hired labour
- Chemicals
- Utilities
- Taxes
- Transportation & Distribution
- Marketing
- Processing
- Legal & Accounting
11.2.2 Class D Cost Estimates

Option 1: Land Based Grow-out Recirculating Aquaculture System (RAS):
- Pacific White Shrimp (depending on the size of the operation.)

Indoor shrimp farming start-up expenses can be relatively low. A 40-tank farm with building costs included can cost as much as $500,000. However, an eight-tank farm that already has a building can be as little as $150,000.

- Capital Costs $200,000 - $600,000 (land purchase/building etc.)
- Start-Up Costs $100,000 - $300,000 (equipment/training/supplies etc.)
- Annual Operating Costs $130,000 - $400,000 (cost of production, feed, utilities etc.)

- Finfish (depending on the size of the operation and scale of automation)
  - Capital Costs $1 - $2 million (land purchase/building etc.)
  - Start-Up Costs $300,000 - $650,000 (equipment/training/supplies etc.)
  - Operational Costs $400,000 - $1 million (cost of production, feed, utilities etc.)

NOTE: Costs for land-based grow-out systems using pond technology as opposed to RAS tank systems as referenced above will be significantly cheaper.

Option 2: Water Based Grow-out Cage System

Costs are extremely variable depending on the selected Finfish species and accessibility of the water body location.

- Finfish (depending on the size of the operation.)
  - $350,000 - $2 million depending on the size of the operation.

Sample budgets are provided to offer insight into the level of investment capital and operating costs required for Finfish species.
### Freshwater Aquaculture Pre-Feasibility Assessment Checklist

#### General Prefeasibility Considerations
What is your purpose in pursuing aquaculture (e.g., personal consumption, community consumption, commercial production, fishery enhancement, or fingerling supply?)

Comment: ____________________________________________

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<tr>
<th></th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Do you know what species of aquaculture you would like to pursue?</td>
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<tr>
<td>Type of production? (i.e., cage culture, raceway, tank, closed containment, etc.)</td>
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<td>Do you have a site or potential sites in mind?</td>
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<td>If multiple sites, do you have a process for assessing them?</td>
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#### Physical Feasibility

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<tr>
<th>Question</th>
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<th>No</th>
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<td>Does the site have good flow?</td>
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<td>Does it have acceptable water quality?</td>
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<td>What are the seasonal water temperatures in the water column at the site?</td>
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<td>Have water quality and currents been measured in all seasons?</td>
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<tr>
<td>What is the nature of the water column at the site? Does it have thermal stratification in the major growing season?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How exposed is the site and from what direction(s)? Does exposure match predominate wind direction?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the prospective culture site located near the market and processing facilities?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the site sufficiently large for expansion if desired in the future?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can the site be made suitable for aquaculture production with an acceptable amount of investment?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you live close enough to the culture site to visit and monitor as needed, and to ensure security?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can you prevent wild fish, birds and other predators, diseases, and parasites from entering or impacting your system?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can you treat diseases and parasites that may infect your fish?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the site easily accessible year round for you and transport trucks?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Economic Feasibility

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you developed a realistic written business plan with monthly objectives and projected cash flows for the first year and annually for each of the next three to five years?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you own or have access to property needed for the proposed aquaculture operation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you determined an approximate cost for new infrastructure construction or site improvements?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you own or have access to any of the necessary equipment (e.g., pumps, tanks, boats)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can you secure the capital for start-up and operation at a reasonable cost?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What are your potential sources of capital?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will your lender accommodate your production/marketing cycle (which differs from traditional livestock or row crops)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the profit potential for aquaculture higher than that of other possible investments?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will the expected profit be adequate compensation for your labor and resources?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can you afford to wait 6 to 18 or more months for income until your first crop attains marketable size and can be sold?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have an adequate cash reserve for unanticipated rests (e.g., equipment failure, system modification, crop losses)?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Market

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there an established market for your fish?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a market for your fish when you plan to sell them?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will fish be available year-round if so required by the market?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are other fish products available at prices lower than your profitable selling price that will out-compete you in the market?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have an alternative marketing strategy on which to fall back?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Marketing Considerations

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you assessed the existing situation (e.g., market size and demands, potential competitors) and determined an area where you can compete effectively?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you identified primary and alternate markets?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you know in what form you will market your product (e.g., alive, head-off split dressed fillets)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can you continuously harvest and market your product throughout much or all of the year?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have the means to harvest handle hold and transport your product?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If desirable, can you join or form an aquaculture cooperative?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you familiar with legal issues of marketing your product?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have the resources to construct and operate a Health Department-approved facility if fish will be processed (e.g. dressed, filleted)?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Personal/Community Considerations

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you willing to work long, hard and irregular hours (e.g., 16 hours/day, 7 days/week)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you get along well and communicate effectively with people? (Producers not only grow fish, they must also promote and market themselves and their product.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you comfortable with mathematical problem-solving and mechanical troubleshooting?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will you seek help when needed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you personally have the technical expertise with fish or shellfish to manage the operation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can you afford to hire an experienced technician?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you know others in the business that will provide help or information?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you aware of an aquaculture producer association that you can join?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you access information about aquaculture?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you willing to take a course in aquaculture or attend “how to” workshops to become informed of current practices and new developments?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Risks: Are you equipped to handle the following challenges or problems

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor water quality?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish disease and parasites?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poachers and vandals?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential chemical contamination?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business management and taxation?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 12.0 Cost Estimates

### Sample Budgets for Land-Based Tilapia (Pond System)

**TILAPIA BUDGETS**

**INVESTMENT COSTS**

**New Construction & Equipment**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>PRICE ($)/UNIT</th>
<th># OF UNITS</th>
<th>TOTAL ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land ...........................................</td>
<td>4,000.00</td>
<td>2</td>
<td>8,000</td>
</tr>
<tr>
<td>Waste Removal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>settling pond ..................................</td>
<td>10,000.00</td>
<td>0.5</td>
<td>5,000</td>
</tr>
<tr>
<td>aerator (1/2 hp) ................................</td>
<td>2,500.00</td>
<td>1</td>
<td>2,500</td>
</tr>
<tr>
<td>composter .....................................</td>
<td>7500.00</td>
<td>1</td>
<td>7,500</td>
</tr>
<tr>
<td><strong>Subtotal ....................................</strong></td>
<td></td>
<td></td>
<td><strong>15,000</strong></td>
</tr>
<tr>
<td>Building</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>building, 32’x130’ pole barn ................</td>
<td>14.64</td>
<td>4224</td>
<td>61,858</td>
</tr>
<tr>
<td>electrical ....................................</td>
<td>7,395.00</td>
<td>1</td>
<td>7,395</td>
</tr>
<tr>
<td>plumbing ......................................</td>
<td>7,200.00</td>
<td>1</td>
<td>7,200</td>
</tr>
<tr>
<td>HVAC (heating &amp; cooling) ....................</td>
<td>5,200.00</td>
<td>1</td>
<td>5,200</td>
</tr>
<tr>
<td><strong>Subtotal ....................................</strong></td>
<td></td>
<td></td>
<td><strong>81,653</strong></td>
</tr>
<tr>
<td>Well &amp; 3/4 hp pump (35 gpm) ...............</td>
<td>4,000.00</td>
<td>1</td>
<td>4,000</td>
</tr>
<tr>
<td>Per-tank system equipment (detailed equip. list on next page)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>grow-out systems ................................</td>
<td>89,660.00</td>
<td>1</td>
<td>89,660</td>
</tr>
<tr>
<td>quarantine 1 ..................................</td>
<td>11,897.00</td>
<td>1</td>
<td>11,897</td>
</tr>
<tr>
<td>quarantine 2 ..................................</td>
<td>18,771.00</td>
<td>1</td>
<td>18,771</td>
</tr>
<tr>
<td><strong>Subtotal ....................................</strong></td>
<td></td>
<td></td>
<td><strong>120,328</strong></td>
</tr>
<tr>
<td>System-wide equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>feed bins ....................................</td>
<td>3,000.00</td>
<td>2</td>
<td>6,000</td>
</tr>
<tr>
<td>feeders ......................................</td>
<td>300.00</td>
<td>6</td>
<td>1,800</td>
</tr>
<tr>
<td>feeder controller ................................</td>
<td>510.00</td>
<td>1</td>
<td>510</td>
</tr>
<tr>
<td>gas generators ................................</td>
<td>4,200.00</td>
<td>1</td>
<td>4,200</td>
</tr>
<tr>
<td>oxygen monitor ................................</td>
<td>5,234.00</td>
<td>1</td>
<td>5,234</td>
</tr>
<tr>
<td>hoist, trolley &amp; track .....................</td>
<td>2,000.00</td>
<td>1</td>
<td>2,000</td>
</tr>
<tr>
<td>crowder (for harvest) ......................</td>
<td>2,500.00</td>
<td>1</td>
<td>2,500</td>
</tr>
<tr>
<td>misc. harvest equipment (nets, baskets, etc)</td>
<td>1,000.00</td>
<td>1</td>
<td>1,000</td>
</tr>
<tr>
<td>2-ton water heat pumps ....................</td>
<td>2,000.00</td>
<td>2</td>
<td>4,000</td>
</tr>
<tr>
<td>telephone dialer ................................</td>
<td>350.00</td>
<td>1</td>
<td>350</td>
</tr>
<tr>
<td>lab equipment ..................................</td>
<td>4,000.00</td>
<td>1</td>
<td>4,000</td>
</tr>
<tr>
<td>misc. equipment ................................</td>
<td>1,000.00</td>
<td>1</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Subtotal ....................................</strong></td>
<td></td>
<td></td>
<td><strong>32,594</strong></td>
</tr>
<tr>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For building electrical and plumbing ......</td>
<td>20,000</td>
<td></td>
<td>20,000</td>
</tr>
<tr>
<td>For equipment set-up ........................</td>
<td>20,000</td>
<td></td>
<td>20,000</td>
</tr>
<tr>
<td><strong>Subtotal ....................................</strong></td>
<td></td>
<td></td>
<td><strong>40,000</strong></td>
</tr>
<tr>
<td><strong>TOTAL ......................................</strong></td>
<td></td>
<td></td>
<td><strong>301,575</strong></td>
</tr>
</tbody>
</table>
## Sample Budgets for Land-Based Tilapia (Pond System)

### TILAPIA BUDGETS

**OPERATING COSTS AND RETURNS**

**Year 1**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>PRICE/UNIT($)</th>
<th># UNIT</th>
<th>TOTAL($)</th>
<th>% OF TOTAL</th>
<th>$ PER LB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Receipts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tilapia</td>
<td>1.40</td>
<td>180,000</td>
<td>18,000</td>
<td>14.42%</td>
<td>$0.31</td>
</tr>
<tr>
<td>Variable Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fingerlings</td>
<td>0.10</td>
<td>120,393</td>
<td>12,039</td>
<td>1.16%</td>
<td>$0.10</td>
</tr>
<tr>
<td>feed</td>
<td>0.18</td>
<td>21,175</td>
<td>3,801</td>
<td>0.32%</td>
<td>$0.18</td>
</tr>
<tr>
<td>bicarbonate</td>
<td>0.16</td>
<td>21,069</td>
<td>3,371</td>
<td>0.28%</td>
<td>$0.16</td>
</tr>
<tr>
<td>rock salt</td>
<td>50.00</td>
<td>12</td>
<td>600</td>
<td>0.05%</td>
<td>$0.50</td>
</tr>
<tr>
<td>chloride</td>
<td>50.00</td>
<td>12</td>
<td>600</td>
<td>0.05%</td>
<td>$0.50</td>
</tr>
<tr>
<td>electrical usage</td>
<td>1150.00</td>
<td>12</td>
<td>13,800</td>
<td>11.66%</td>
<td>$1.15</td>
</tr>
<tr>
<td>building heat and AC</td>
<td>200.00</td>
<td>12</td>
<td>2,400</td>
<td>1.92%</td>
<td>$0.20</td>
</tr>
<tr>
<td>propane</td>
<td>300.00</td>
<td>4</td>
<td>1,200</td>
<td>0.96%</td>
<td>$0.30</td>
</tr>
<tr>
<td>oxygen</td>
<td>0.30</td>
<td>8,719</td>
<td>2,616</td>
<td>2.10%</td>
<td>$0.30</td>
</tr>
<tr>
<td>repair &amp; maint. of equip.</td>
<td>300.00</td>
<td>12</td>
<td>3,600</td>
<td>2.88%</td>
<td>$0.30</td>
</tr>
<tr>
<td>labor, transfer &amp; harvest</td>
<td>640.00</td>
<td>12</td>
<td>7,680</td>
<td>6.15%</td>
<td>$0.64</td>
</tr>
<tr>
<td>office overhead</td>
<td>100.00</td>
<td>12</td>
<td>1,200</td>
<td>0.96%</td>
<td>$0.10</td>
</tr>
<tr>
<td>interest on above operating funds</td>
<td>1,649</td>
<td>1.32%</td>
<td>$0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>marketing cost</td>
<td>1,000</td>
<td>0.80%</td>
<td>$0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SUBTOTAL, VARIABLE COSTS</strong></td>
<td>78,891</td>
<td>63.21%</td>
<td>$1.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Costs*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>payment on land and const. debt</td>
<td>18,838</td>
<td>15.10%</td>
<td>$0.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>payment on equipment debt</td>
<td>19,663</td>
<td>15.28%</td>
<td>$0.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>property taxes and insurance</td>
<td>5,000</td>
<td>4.01%</td>
<td>$0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>oxygen tank rental</td>
<td>250.00</td>
<td>3,000</td>
<td>2.40%</td>
<td>$0.05</td>
<td></td>
</tr>
<tr>
<td><strong>SUBTOTAL, FIXED COSTS</strong></td>
<td>46,501</td>
<td>36.79%</td>
<td>$0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL COSTS</strong></td>
<td>125,392</td>
<td></td>
<td>$2.19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Excludes annual depreciation, estimated at $21,246

### RETURNS SUMMARY

Returns to owner’s management, labor, and capital

<table>
<thead>
<tr>
<th>PER LB</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returns above variable costs</td>
<td>$0.02</td>
</tr>
<tr>
<td>Returns above total costs</td>
<td>($0.79)</td>
</tr>
<tr>
<td>Breakeven price/lb above variable costs</td>
<td>$1.38</td>
</tr>
<tr>
<td>Breakeven price/lb above all costs</td>
<td>$2.19</td>
</tr>
</tbody>
</table>
13.0 Summary of Findings and Next Steps

Natural resources have been the foundation of Manitouwadge’s economic prosperity for decades and have sustained the area’s First People and Indigenous communities since time immemorial. Manitouwadge is surrounded by freshwater lakes, river systems and is home to dozens of native fish species and aquatic life. Natural resources already contribute immense socio-economic benefits to the town through mining, forestry and tourism, and have the potential to do more.

There is interest and support among residents of Manitouwadge to investigate new sources of economic development through aquaculture. The community is keen to receive further research, analysis and information about aquaculture as a community development and business opportunity.

In light of the information presented throughout this Study there are a number of conclusions that can be drawn.

13.1 Summary of Findings

Related to the feasibility of an aquaculture industry in Manitouwadge, the following findings are offered:

1. At the pre-feasibility stage, aquaculture offers economic development potential as a new industry for Manitouwadge.
2. There is community support and market demand to pursue aquaculture as a new industry for Manitouwadge.
3. Based on early stage desk-top research, the preferred specie for aquaculture in Mantouwadge is Pacific White Shrimp.
4. Based on early stage research, the top three recommended Finfish species, in order of importance, for further study are:
   1. Tilapia (high market demand)
   2. Rainbow Trout (high market demand)
   3. Lake Whitefish (medium market demand)
5. In terms of aquaculture models, a Land-Based System (Pond or Tank) is the most feasible for aquaculture in Manitouwadge.
6. Vacant industrial spaces and lands should be studied as potential locations for a Land-Based aquaculture operation.
7. Partnership opportunities exist on a regional level with regional municipalities and First Nations in aquaculture.
13.2 Moving Forward

Recommendations for next steps have been developed over the short and mid-term. Overall these recommendations suggest proceeding immediately with more detailed research, feasibility analysis, planning and partnership development. The recommendations identify a number of options for consideration.

Short and Mid-Term Recommendations

- **Community & Public Consultations** - Further communication and information sharing is needed with local residents, the business community, economic development agencies, neighbouring municipalities, proximate First Nations and Government agencies. This Study recommends a Community Engagement Plan to ensure effective and meaningful consultations that inspire entrepreneurship, forge collaborations and create potential strategic partnerships in aquaculture.

- **Market Survey** - An important aspect of feasibility studies for aquaculture is market survey for: the existing fish market, the price pattern, the preference and biases, the existing sources of fish supply (level of competition), the elasticity of demand pattern for fish, the cost of labour and services, etc. The market survey is important in the preparation of capital costs, running costs, projected revenue and benefits to be expected.

- **Economic & Biological Feasibility Study** - As with any new industry, a thorough planning stage is necessary to justify any large capital investments. An exhaustive planning stage is necessary before any large capital investment in aquaculture is made. The planning stage involves a detailed evaluation of the biologic, economic, and legal feasibility of raising particular fish species.

- **Site Considerations** - The preferred siting of an aquaculture operation should be determined over the course of the next study phases. There are many potential locations for a Land-Based System but also many technical considerations— such as proximity to other key buildings, proximity to water supply, truck and employee access, zoning bylaws and other land use policies that influence location and siting.
• **Strengthening Community Capacity** – To achieve a new industry and ensure its sustainability, the community’s knowledge base, capacity and connections in aquaculture must be strengthened. The potential to innovate within aquaculture is an opportunity. Developing scientific and technological capacity for improved habitat management, stock assessment, rearing and genomics-led understanding of individual species is an important consideration for Manitouwadge.

• **Partnership Development** - As aquaculture, the local food industry and food processing operations continue to grow in Northern Ontario, Manitouwadge will benefit from new regional strategic partnerships. Regional municipalities, First Nations, businesses and organizations may emerge to be worthy of partnership consideration in future community aquaculture development.

Manitouwadge recognizes that a new aquaculture industry will require investment in the future and support from community and business minded individuals such as those who provided input into this Study’s development. Small to medium scale, land-based aquaculture ventures could be considered most viable, noting such projects have the potential to deliver significant dividends to the local community.
14.0 Conclusion

Aquaculture is recognized internationally and in Northern Ontario as a significant and growing industry that has an important place in meeting the increasing global and local demand for premium, sustainable seafood. Indeed, it is expected that aquaculture will supply over 60% of the world’s sea food for direct human consumption by 2030.¹ With this growth in the industry there is the potential for significant investment opportunities in the production of a range of “fish” species.

The Township of Manitouwadge is a progressive and forward-looking community that is constantly evolving and seeking new economic development opportunities. The Municipality and its residents view aquaculture development as a potential source for promoting diversity and growth, largely due to the area’s abundant natural resources, significant freshwater lakes and large areas of relatively unpopulated land.

To investigate this opportunity further, the Township engaged Firedog Communications in partnership with TBT Engineering Ltd to undertake this preliminary feasibility work. This Study and the recommendations provided are intended to assist the Township, its residents and other interested parties to understand the technical and economic viability of aquaculture within the local water and land-based environments of the area.

The Study found:

- Numerous sites are potentially suited for land-based grow-out aquaculture in Manitouwadge;
- Several fish species are potentially best suited for aquaculture within the region; namely, Pacific White Shrimp and three Finfish species (Tilapia, Rainbow Trout and Lake Whitefish); and
- There is potential for suitable aquaculture systems to be located in the region to grow these species.

As reported Pacific Shrimp is the specie most likely to be of interest to potential aquaculture business operators, as well as Tilapia, Rainbow Trout and Lake Whitefish – all recommended to be cultured in grow-out land-based facilities.

Land-based grow-out aquaculture operations will potentially incur higher start-up and operating costs in view of the sophistication of the systems, equipment and technical expertise required, as well as the rural location of the area. However, small to medium scale, land-based aquaculture ventures, particularly pond systems, could be considered viable, noting such projects have the potential to deliver significant dividends to the local community.

The report concludes that a water-based aquaculture in the Manitouwadge area is not as environmentally, technically or economically viable as land-based options at this point. Despite the abundant lakes and waterways in the Manitouwadge area, the potential for water-based cage systems is limited due to the limited sizes, depths and water flow rates of area lakes, as well as the winter climate and other native species.

Should a decision be made to proceed with more detailed consideration of any of these opportunities for aquaculture, further reports focused on the commerciality of such ventures including detailed market analysis for these species is required. Also, additional studies including a comprehensive biological and economic analysis based on an on-site evaluation to identify and quantify finer-scale location and system attributes is needed.

In light of the global push to expand aquaculture, and the commitment from the Ontario Government to support the unique economic development potential for the aquaculture and food processing sector in Northern Ontario, Manitouwadge could benefit considerably from pursuing aquaculture as a future economic driver in its region with opportunities for significant local, provincial and national investment.

¹ Food and Agriculture Association of the United Nations, 2013
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