Environmental Assessment Information

Feed Shellfish Chitin Processing Plant
Old Perlican, NL.

Quinlan Brothers Limited
Atlantic Place, 302 – 215
Water St., St. John's,
NL A1C 6C9

Date: January 14, 2009

Contact

Robin Quinlan
Ph: 709-739-6960
Fax: 709-739-0586
Email: rquinlan@quinlanbros.ca

SIGNING OFFICER:

_____ _____

Date Signature

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1.0 NAME OF UNDERTAKING:

Old Perlican Chitin Plant

2.0 PROPONENT:

Quinlan Brothers Ltd.

(i) Name of Corporate Body: Quinlan Brothers Ltd.
(ii) Mailing Address: Atlantic Place, 302 – 215
Water St., St. John's,
NL A1C 6C9

(iii) Chief Executive Officer: Pat Quinlan
Address: as above
Telephone No.: 709-739-6960

(iv) Principal Contact Person for purposes of environmental assessment:

Robin Quinlan
Address: as above
Telephone No.: 709-739-6960

3.0 THE UNDERTAKING:

(i) Nature of the Undertaking:

Quinlan Brothers, Ltd is a major shellfish processor in Newfoundland. The company's two processing facilities account for a significant portion of both the snow crab and shrimp harvests. The processing of shellfish generates a waste stream of shell. There is minimal value in raw shell and it has become a disposal issue for the industry. The company has long studied an alternative use for the by-products of shell. This interest is shared by the provincial government, expressed in past RFP's on the matter, however prohibitively high costs of production have traditionally discouraged past efforts to utilize this resource. Traditional production methods include using chemical products for the extraction of chitin, which is costly and presents operational hazards.

The greatest value of the shell is the chitin content. Chitin is a naturally occurring biopolymer; further processing of chitin yields chitosan or glucosamin. China dominates production for the health care markets primarily due to price. Cheap labor, inexpensive chemicals, and disregard for effluent discharges have made the Chinese factories tough competitors. Despite the popularity of the health food products, there has been little development of large volume industrial markets. One of the major obstacles is cost due largely to conventional methods of production. Chitosan needs to compete with hydrocarbon based synthetic polymers that can be produced at a fraction of the price. The cost of production of chitosan must be driven down for this increasingly important molecule to be able to open up and penetrate large volume markets.

In 2008 Quinlan Brothers was successful in its application for approximately $2.5M in financing to ACOA’s Atlantic Innovation Fund (AIF) for a three year project to research, develop and construct an innovative new type of chitin/chitosan production facility. Over the next three years Quinlan Brothers proposes to carry out the project in partnerships industry, ACOA, DFA, NRC, the Marine Institute, and Memorial University of

Newfoundland, with the final stage being to build a full scale in Old Perlican. To date, and for the first 12 to 16 months most of the work will take place at Memorial University and the Marine Institute Centre for Seafood Development and partner facilities in the US. The majority of the work will begin following environmental release which will allow ACOA begin its releasing its investment in the project. Once the process technology is refined and the design is finalized the plant will be installed at the site of the old RIFFS building in Old Perlican. When completed, this facility will be a fully functioning laboratory as well, with researchers, technicians and production analysts carrying out research over a three year period. This research work will help turn this facility into one of the most efficient and technologically advanced chitin plants built to date.

(ii) Purpose/Rationale/Need for the Undertaking:

Waste management has become an important issue for seafood processors from both an environmental and financial perspective. Quinlan Brothers Ltd., part of the Quinlan Group of Companies, is Newfoundland and Labrador's largest processor of snow crab and shrimp, processing over 20 million lbs of snow crab and 40 million lbs of shrimp annually. Their processing facilities in Old Perlican and Bay de Verde produce over 13 million tonnes of shrimp byproduct waste each year alone.

The primary commercial application potential derived from this byproduct is the biopolymer chitin. Recognizing the global market opportunities for a high quality chitin supply, Quinlan Brothers has been working aggressively over the past year to assemble a development team and plan and secured access to market. As well, Quinlan Brothers has an R&D technology plan that will allow the maximum harvesting gains needed to capitalize on this market potential while resolving a waste disposal dilemma.

4.0 DESCRIPTION OF THE UNDERTAKING:

(i) Geographical Location:

The location under consideration is in the community of Old Perlican on the Bay de Verde Peninsula: an existing building originally occupied by Riff's Department Store on Route 80

The existing building on Route 80 has been identified as the optimal site for the location of the facility. The following issues were considered in making the decision:

- Accessibility to existing municipal waste disposal/outfall systems
- Lead time required for construction/site preparation

Please refer to the attached aerial photograph (Appendix A) for site location and surrounding structures. The building is located approximately 100m from the nearest structure, a gas station/restaurant. The surrounding area is generally unpopulated, heavily treed and outside the town centre and core residential population.

(ii) Physical Features:

The proposed operation will occupy less than 929 square meters (10,000 square feet) of space and requires limited storage space for finished product. Raw product will not require storage and will be pumped directly from a transport truck into the primary stage processing unit. Please refer to the Operations Plan for process details.

The Riffs building is a one story structure with dimensions of 24.4m (80)' x 36.6m (120'). The site has access to town water and sewer services. It is located approximately one kilometer from the Quinlan's Old Perlican processing plant. The proposed transportation route of the waste shells to the new processing facility is identified on the map. The plant facility is not located near any rivers or streams and all effluent would be neutralized. Please refer to the attached map (Appendix A) for location, transportation route and other pertinent information.

(iii) Construction:

The plant's initial design has been completed with a start date for equipment assembly by late Fall 2008 with a 6 month completion period. This schedule coincides with the operation of the annual shrimp fishery.

Construction Schedule

Building Preparation	November, 2009
Equipment Delivery	June, 2010
Installation Completion	August, 2010
Pilot Operation	October, 2010
Production Start	March 2011

The building preparation is expected to start in late fall 2009. Modifications are required to accommodate secured chemical holding tanks and storage areas; no sources of pollutants are expected during this construction phase, aside from those typically produced during construction.

(iv) Operation:

Process Description

Quinlan Brothers is proposing construction of a full scale chitin production facility in Old Perlican. the facility will be operating 18 hours a day for approximately eight months of the year (closed from November through February). The plant will be a fully functioning laboratory facility as well, with researchers, technicians and production analysts carrying out research activities over a three year period. This research work will help turn this facility into one of the most efficient and technologically advanced chitin plants built to date in North America.

The project will initially draw on the 5.9 million kilograms (13 million lbs) of shrimp byproduct from Quinlan's Bay de Verde and Old Perlican processing plants, as these

plants are located in close enough proximity to one another to make transportation viable. The byproduct, primarily shrimp shell, will be transported to the processing facility in trucks and will then be pumped directly into the primary continuous feed processing unit. Each load should provide up to twelve hours of processing time. As the science develops and new technologies are established, it is hopeful that local crab shell may be utilized as well. It is Quinlan's goal to be processing its entire shellfish waste to chitin when the plant reaches full capacity.

The process to be implemented in the Quinlan Brothers' plant will exploit the structure of the shrimp shell, so that most of the mineral and protein can be removed under mild conditions, producing a higher quality and higher valued end product while minimizing waste. To achieve this, it will utilize a series of special mechanical processing, mild chemical treatments and wash steps. This process will also allow for the controlled recovery of valuable protein fractions, allowing for the greatest level possible of waste product utilization.

An overview of the process follows.

1. A truck collects from Bay de Verde and Old Perlican locations and delivers to receiving tank in factory.
2. Shell transferred to receiving storage tank
3. Shell continuously pumped to macerator and washed on a screen.
4. Effluent flows to Protein Recovery and Water Recycling Units
5. Shell subjected to emulsification (small amount of dilute base added), and washed on a screen
6. Effluent sent to Protein Recovery and Water Recycling Units
7. Washed shell treated with dilute HCl to yield chitin.
8. Small amount of fumes exhausted and neutralized.
9. Dilute acid effluent captured and neutralized prior to sewer discharge.
10. Chitin pumped to drying system.
11. Effluent is discharged; pH adjusted if necessary.
12. Drying system produces dry finished chitin.

13. Chitin is compacted and baled in 50 kg sacks.
14. Protein Recovery Unit produces a concentrate, stored in vault.
15. Protein stabilized as a powder by spray drying, stored in 50 kg sacks
16. Any effluent from unit not recycled is treated to reduce TDS, TSS, BOD, etc. prior to sewer discharge.

A key feature of the proposed process is the Protein Recovery Unit. At least 90% of the protein from the shrimp shell feed will be found in wash streams from both maceration/screening and emulsification/ screening steps. The Protein Recovery Unit will contain Dissolved Air Flotation (DAF)[1] and Hydroclone[2] units, allowing these streams to be combined and the protein concentrated. The process water will be recycled to the first wash station.

To maximize waste product conversion, scientists from MUN and Marine Institute will also be working to identify advanced processes for separation and removal of protein, as well as the utilization of this by-product. Quinlan Brothers' intent is to have a full scale working production plant laboratory in which the company and its collaborators can produce product while continuously running a series of research activities both onsite and at collaborator locations.

[1] **Dissolved air flotation** (DAF) is a water treatment process that clarifies wastewaters (or other waters) by the removal of suspended matter such as oil or solids. The removal is achieved by dissolving air in the water or wastewater under pressure and then releasing the air at atmospheric pressure in a flotation tank or basin. The released air forms tiny bubbles which adhere to the suspended matter causing the suspended matter to float to the surface of the water where it may then be removed by a skimming device. Dissolved air flotation is very widely used in treating the industrial wastewater effluents from oil refineries, petrochemical and chemical plants, natural gas processing plants and similar industrial facilities.

[2] A Hydroclone is a static device that applies centrifugal force to a liquid mixture so as to promote the separation of heavy from light components which are suspended in solution

Chemical Usage

Traditional shellfish chitin production facilities require large volumes of concentrated acid and strong alkali solutions. With the new technology proposed by Quinlan's chemical usage will be reduced.

The chemicals used in the process are:

- 5% aqueous potassium hydroxide ("dilute base"), prepared from solid potassium hydroxide supplied in pre-weighed and secured containers
- 1.5 % aqueous hydrochloric acid ("dilute acid"), diluted from concentrated (35%) hydrochloric acid (Please refer to Appendix B for chemical data sheets.)

The dilute base will be added to the crude product after shrimp shell maceration screening/ wash and before emulsification. The separate maceration and emulsification steps are called the mechanical de-proteination processes. The addition of small amount of dilute base will assist, chemically, in enhancing the second de-proteination.

The dilute acid will be added after the second de-proteination/ screening/ wash step described above. At this stage about 30-40 % of the minerals (chiefly calcium carbonate) have been mechanically removed. The remaining carbonate present in chitin will be effectively removed by this acid treatment.

Chemical Storage and Handling

The dilute acid and dilute base (prepared on site) will be stored in 20,000 liter Poly tanks separated by greater than 20 metres. Each tank will be surrounded with an acid or base resistant retaining wall of 3.66m x 3.66m x 1.83m(h) (12'x 12' x 6'). The dilute acid tanks will be fitted with a neutralizing vent for filling. The tanks will be placed inside the plant but away from the processing line. Proper signage and safety/ spillage response protocols will be in place.

The dilute acid will be prepared from concentrated (35%) hydrochloric acid by simple dilution. Concentrated acid will stored in 100L sealed heavy-duty Poly barrels specially ordered from the supplier for ease of handling and safety. Barrels will be carefully stored in a dedicated secured shed constructed with acid-resistant material and equipped with

proper ventilation and neutralization vents in case of leakage. The shed will be secured under lock and key and will be an attached structure to the main plant. Proper industrial training and safeguards will be implemented.

The dilute base will be prepared from supplied pre-weighed solid potassium hydroxide for ease of handling and safety. Because the potassium hydroxide is hydroscopic it will be stored in a dry separate storage area inside the plant. Proper safety protocols will be implemented.

Reusable plastic containers will be used to ship the concentrated acid and solid base. These containers will be shipped back to the suppliers for reuse.

Safety of the workers will be of prime importance and all regulatory safety/ handling protocols will be followed. The facility will contain appropriate spill response equipment and specified procedures will be developed and strictly adhered.

5.0 ENVIRONMENT

(i) Effluent Treatment System

! Provide detailed information regarding the wastewater treatment technology to be used to ensure that effluent discharged to the environment from the proposed chitin plant meets the discharge limits specified in Schedule "A" of the *Environmental Control Water and Sewer Regulations* and the general provisions of the federal *Fisheries Act.* All sources of effluent must be identified and characterized, and treatment efficiencies for each component of the treatment plant must be provided, so as to demonstrate that the discharge limits specified in Schedule "A" for B.O.D., dissolved solids, and other relevant parameters, and the requirements of the *Fisheries Act* (non acutely lethal discharge), will be met. It should be noted that intentional dilution of effluent for the purposes of meeting discharge limits is not acceptable.

In November 2008 Quinlan Brothers contracted the Marine Institute Centre for Seafood Development to carry out a pilot project in order to characterize the effluent from the proposed plant. The actual equipment proposed for the plant was shipped from the USA

to the Marine institute pilot facility on Mt. Scio Rd. including a 2 Seepex Progressive Cavity Pumps, 1 Seepex Macerator, 1 Vibroscreening unit and a Mincemaster Emulsifier. A pilot of proposed Quinlan Brothers chitin processing line was run and Marine Institute staff sampled the effluent coming directly off the discharge line. This effluent was floc'ed and sent to Maxxam Analytics in Bedford Nova Scotia. Maxxam produced a complete characterization analysis of the effluent sample (Appendix C).

The BOD level of the sample was found to be 660mg/L confirmed the requirement for biologic effluent treatment equipment. Quinlan Brothers and their partners have been dealing with BioProcessH20 as an effluent treatment equipment supplier for the project. BioProcessH2O provides full service pretreatment systems for wastewater management that uses microbes to clean water prior to its release into municipal water treatment systems. From conducting an initial waste analysis to the design, build and installation, and then maintenance of a complete water-treatment system, bioprocessH2O puts a high priority on ensuring that each customer is outfitted with a solution that meets their needs. As the project nears the latter stages of design, BioProcessH2O offers customers a pilot program where clients can test a unit before moving ahead with a full-scale project.

A pilot project was established at one of Coca-Cola's bottling facilities in the United States. Each bottling facility produces millions of gallons of wastewater annually that contains average BOD of 30,000-40,000mg/l. Following evaluation of the demonstration project, the company approved the BioProcess system as one of three, pre-approved treatment technologies for use in its plants around the country and world.

Quinlan's is working with BioProcess on early stage system design so the effluent profile, along with the Schedule "A" of the *Environmental Control Water and Sewer Regulations* was provided to BioProcessH2O in order to determine the treatability using their equipment. They have provided a letter (Appendix D) confirming that their equipment can effectively treat the effluent to the desired specification, as well as some case studies demonstrating other similar successful projects (Appendix D).

While the reduction of BOD levels was a priority in this analysis, the overall effluent treatment process has been planned out to include the flocculation and cyclonic

mechanical separation as well as chemical neutralization. Of concern to ECW&S regulations is the effluent coming from the Protein Recovery Unit. At least 90% of the protein from the shrimp shell feed will be found in wash streams from both maceration/screening and emulsification/screening steps. Extracting the protein as a viable byproduct drastically reduces the waste created by the chitin extraction process. The effluent will consist mainly of dissolved proteins

In-line filters will be used to lower the total suspended solids (TSS) to approximately 10 mg/L. Treatment with DAF units in combination with flocculation towers will result in a preliminary reduction of BOD levels in the wastewater as well as total dissolved solids (TDS) values of less than 500 mg/L.

Wash water from the acid and base treatment process will be neutralized before being discharged in the municipal sewage. The excess dilute base will be neutralized by dilute acid to neutral pH. The excess dilute acid will be neutralized by dilute base to neutral pH. As a result of the treatment, effluent and wash water will consist of less than 1% aqueous potassium chloride and trace amounts of residual protein.

The neutralized effluent will be settled, floc'ed, and cyclonically separated to bring TDS values to within required levels. An estimated 15 000 L/day will be discharged to the municipal sewer; however, continuing improvements in water recirculation should reduce this number even further.

Once the plant is up and running, all effluent from the processing facility will be routinely monitored and treated prior to discharge, in accordance with the Sewage Discharge Compliance requirements as per the Environmental Control Water and Sewer Regulations 2003.

Apart from treated effluent no other waste materials will be generated by the process.

(ii) Water Supply

Quinlan Brothers has met with the town council of Town of Old Perlican and discussed the water requirements for the plant. The council indicated that while the proposed water

requirement may be able to be supplied, that alternatives should be considered. Quinlan Brothers confirmed that, if necessary, they would drill its own wells to make up any additional water supply.

(iii) Odors from Transportation and Operation

Quinlan Brothers has met with the town council of Town of Old Perlican and discussed the concerns about odor and transportation or raw material. The town council was informed that due to some key features of the proposed process, odor would be minimal:

- All product will be moved to the plant with 10 hours of processing at the shrimp plant
- Transportation off materials in an enclosed truck or pump truck
- the closed nature of the continuous feed process itself
- no outside storage of product

(iv) Wildlife Management

As discussed with the town council, because the material will not be stored outside and all material will be transported in closed trucks, this should not result in any issue for the town.

(v) Environmental Contingency Emergency Plan

An Environmental Safety and Emergency Contingency Plan will be developed, prior to start of operations to ensure environmental emergency and safety procedures are established and all personnel/stakeholders receive the appropriate training.

A Health, Safety and Regulatory Policy will be developed and a team member assigned specifically to its management and enforcement. As well, an Emergency Response and Safety Policy will be developed, again with a team member dedicated to its management and enforcement. Key topics to be covered by the policies include:

- Hazard Awareness
- Employees

- Firefighting
- Medical Facility and Personnel
- Incident Command
- Off-site Responders Coordination
- Community Notification
- Spill Preparedness, Prevention and Response

Quinlan's will work with NEIA (Newfoundland Environmental Industry Assoc.) members, environmental engineers, other team members, Occupational Health and Safety Representatives, Municipal Council and local Fire Protection and Health Services to ensure comprehensive and effective policies are developed, with appropriate measures in place for adherence prior to commencement of operations. Ongoing training and safety awareness will be a high priority at the facility.

(vi) Occupations

It is anticipated that upon full production start six employees will work at the facility in a full time capacity, with an additional 1-2 supplemental staff as needed. There will be a trained chemical technician, who will be the only person to handle the preparation of acid and the base solutions. Chemists or chemical technicians are not classifieds as a hazardous occupation according to the National Occupational Classification 2006.

A Safety Officer will also be hired, trained in the following: proper handling of the chemicals with associated labeling and signage, MSDS and WIMIS documents, easily accessible to all workers, training of workers for emergency response protocols, etc.

6.0 PROJECT RELATED DOCUMENTS

No other environmental work has been completed for the project. Project-related documents submitted with this proposal are listed below:

- Aerial view of site location
- 1:50,000 Map of area
- Letter from Town of Old Perlican Council

- Letter From BioProcessH2O
- Case Studies: Blount Seafood Corporation & Highland Meadows
- Effluent Characterization from Maxxam Analytic

7.0 APPROVAL OF THE UNDERTAKING:

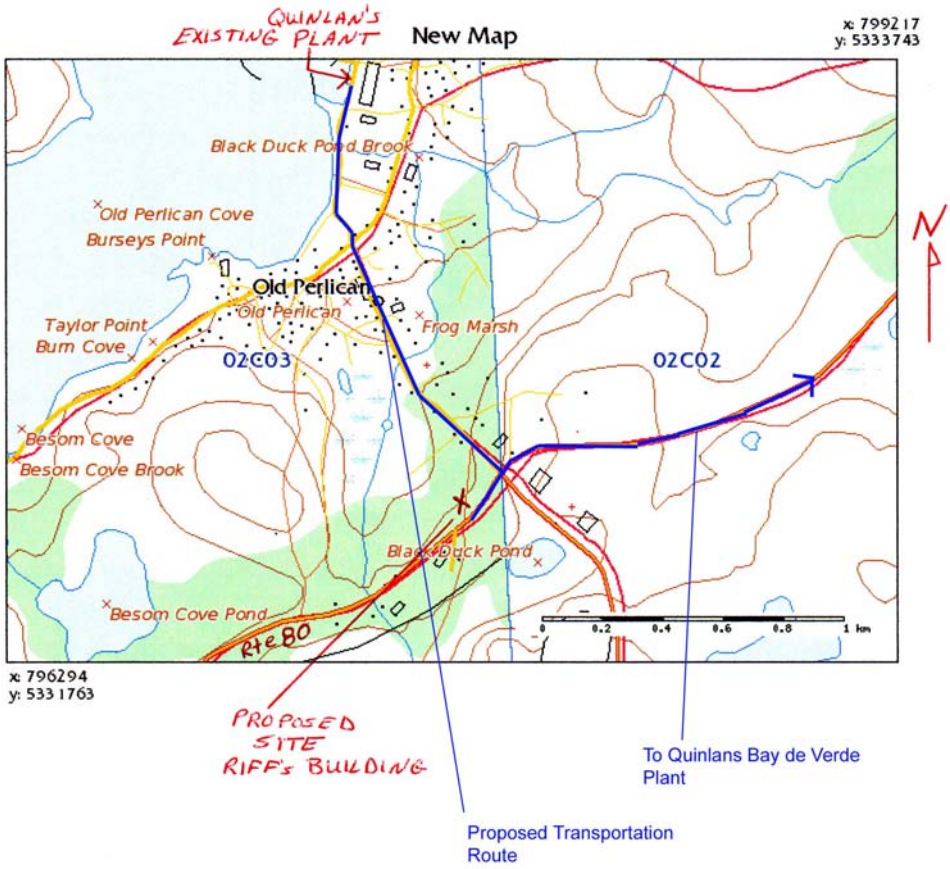
It is anticipated that further permits, licenses, approvals and authorizations may be required from the following:

- Town of Old Perlican Municipal Council
- DFO
- Government Services – OHS
- Dept Fisheries and Aquaculture

9.0 FUNDING:

Quinlan Brothers has been selected to receive investment from ACOA's Atlantic Innovation Fund for a portion of the project costs. With Quinlan Brothers' investments in the project the company will also attempt to leverage additional financing from NSERC, NRC, CCFI (confirmed), DFA (confirmed), and DITRD. The overall costs of the plant facility and the 3-year R&D initiative with MUN and MI will be just over $5 Million dollars.

Appendix A: Maps and Aerial Photo of Proposed Location


QUINLAN'S EXISTING PLANT
New Map
x: 799217
y: 5333743
Black Duck Pond Brook
Old Perlican Cove
Burseys Point
Old Perlican
Old Perlican
Taylor Point
Burn Cove
Frog Marsh
02C03
02C02
Besom Cove
Besom Cove Brook
Black Duck Pond
Besom Cove Pond
Rte 80
0 0.2 0.4 0.6 0.8 1 km
N
x: 796294
y: 5331763
PROPOSED SITE RIFF's BUILDING
To Quinlans Bay de Verde Plant
Proposed Transportation Route


PROPOSED SITE


N
70
80
249 m
Image © 2009 DigitalGlobe
Image © 2009 GeoEye
© 2008 Tele Atlas
© 2008 YellowPages.ca
Google
48°04'28.68" N 52°59'53.01" W
elev 77 m
May 26, 2002
Eye alt 905 m

Appendix B: Letter from BioProcessH2O

Chitin Works America, LLC
306 Mill St
Cambridge, MD 21613

January 6, 2009

Attention: Pat Condon & Steve Mercer

Regarding Request for Treatment of wastewater from Shrimp processing operation in Newfoundland, Canada

Gentlemen,

Based solely on the information that Chitin Works America provided to BioprocessH2O in the lab report from Maxxam Analytics dated 11/19/2009 and the Consolidated Newfoundland Regulation 1996 Schedule A, the waste water can be treated. The treatment required will need to be a combination of physical/chemical treatment for the metals present in the wastewater and biological treatment for the BOD present in the wastewater. Based on the lab report we see no significant challenges to treating the waste stream biologically.

Regards,

John Durant
207 Highpoint Avenue
Suite 6
Portsmouth, Rhode Island 02871
Phone: 401.683.5400
Fax: 401.683.5449
Mobile: 401.499.5392
www.bioprocessh2o.com

Appendix C: Maxxam Analytic Report

Your P.O. #: P0058113
Your Project #: SHRIMP CHITIN
Site: ST. JOHN'S,NL
Your C.O.C. #: 30130

Attention: Heather Manuel
Marine Institute
Aquaculture & Seafood Developm
PO Box 4920
St. John's, NL
A1C 5R3

Report Date: 2008/11/19

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A8D1340
Received: 2008/11/06, 8:50

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	1	N/A	2008/11/14		
Alkalinity	1	N/A	2008/11/13	ATL SOP 00013 R3	Based on EPA310.2
Carbonaceous BOD	1	N/A	2008/11/17	ATL SOP 00041 R2	Based on APHA 5210B
Chloride	1	N/A	2008/11/13	ATL SOP 00014 R5	Based on SM4500-Cl-
Str. Acid Diss. Cyanide water ◊	1	N/A	2008/11/13	ATL SOP 00040 R2	Based on EPA335.3
Chemical Oxygen Demand (COD)	1	N/A	2008/11/12	ATL SOP 00042 R2	Based on SM5220D
Colour	1	N/A	2008/11/13	ATL SOP 00020 R2.	Based on SM2120C
Conductance - water	1	N/A	2008/11/13	ATL SOP 00004 R3/00006 R3	Based on SM2510B
Hardness (calculated as CaCO3)	1	N/A	2008/11/14	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	1	N/A	2008/11/17	ATL SOP 00026 R4	Based on EPA245.1
Metals Water Total OES - Partial Scan	1	N/A	2008/11/13	ATL SOP 00025 R3	Based on EPA200.7
Metals Water Total MS	1	N/A	2008/11/13	ATL SOP 00024 R3	Based on EPA6020A
Ion Balance (% Difference)	1	N/A	2008/11/14		
Anion and Cation Sum	1	N/A	2008/11/14		
Nitrogen Ammonia - water	1	N/A	2008/11/12	ATL SOP 00015 R4	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	1	N/A	2008/11/12	ATL SOP 00016 R3	Based on USGS - Enz.
Nitrogen - Nitrite	1	N/A	2008/11/12	ATL SOP 00017 R3	Based on USEPA 354.1
Nitrogen - Nitrate (as N)	1	N/A	2008/11/13	ATL SOP 00018 R2	Based on ASTMD3867
pH	1	N/A	2008/11/13	ATL SOP 00003 R4/00005 R5	Based on EPA150.1
Phosphorus - ortho	1	N/A	2008/11/12	ATL SOP 00021 R2	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	1	N/A	2008/11/14		
Sat. pH and Langelier Index (@ 4C)	1	N/A	2008/11/14		
Reactive Silica	1	N/A	2008/11/12	ATL SOP 00022 R2	Based on EPA 366.0
Sulphate	1	N/A	2008/11/13	ATL SOP 00023 R2	Based on EPA 375.4
Total Dissolved Solids (Filt. Residue)	1	N/A	2008/11/12	ATL SOP 00009 R2	APHA 2540C
Total Dissolved Solids (TDS calc)	1	N/A	2008/11/14		
Nitrogen TKN - water (as N)	1	N/A	2008/11/14	ATL SOP 00019 R3	Based on USEPA 351.2
Organic carbon - Total (TOC) ◊	1	N/A	2008/11/19	ATL SOP 00037 R2	Based on SM5310C
Total Oil and Grease - Water	1	2008/11/10	2008/11/12	ATL SOP 00101 R2	Based on EPA1664
Phosphorus Total Colourimetry ◊	2	N/A	2008/11/17	ATL SOP 00057 R1	Based on EPA365.1
Total Solids	1	N/A	2008/11/12	ATL SOP 00010	based on EPA 160.3
Total Suspended Solids ◊	1	N/A	2008/11/10	ATL SOP 00007 R2	based on EPA 160.2
Turbidity ◊	1	N/A	2008/11/17	ATL SOP 00011 R3	based on EPA 180.1

../2

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Your P.O. #: P0058113
Your Project #: SHRIMP CHITIN
Site: ST. JOHN'S,NL
Your C.O.C. #: 30130

Attention: Heather Manuel
Marine Institute
Aquaculture & Seafood Developm
PO Box 4920
St. John's, NL
A1C 5R3

Report Date: 2008/11/19

CERTIFICATE OF ANALYSIS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Strong acid dissociable cyanide value may include contribution from thiocyanate.
(2) SCC/CAEAL

Encryption Key

Sarah Callahan
20 Nov 2008 09:38:02 -04:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

MARIE (MCNAIR) MUISE, Project Manager
Email: marie.muise.reports@maxxamanalytics.com
Phone# (902) 420-0203 Ext:236

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

Total cover pages: 2

Maxxam Job #: A8D1340
Report Date: 2008/11/19

Marine Institute
Client Project #: SHRIMP CHITIN
Project name: ST. JOHN'S,NL
Your P.O. #: P0058113

RESULTS OF ANALYSES OF WATER

Maxxam ID		AZ5455	AZ7432		
Sampling Date		2008/11/03	2008/11/03		
COC Number		30130	30130		
	Units	**PRIMARY WASH FLOC**	**(SOLUBLE PHOSPHOROUS) PRIMARY WASH FLOC**	**RDL**	**QC Batch**
Calculated Parameters					
Anion Sum	me/L	69.1		N/A	1666433
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	937		1	1666429
Calculated TDS	mg/L	4150		1	1666438
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		1	1666429
Cation Sum	me/L	72.6		N/A	1666433
Hardness (CaCO3)	mg/L	1400		1	1666431
Ion Balance (% Difference)	%	2.49		N/A	1666432
Langelier Index (@ 20C)	N/A	-0.946			1666436
Langelier Index (@ 4C)	N/A	-1.19			1666437
Nitrate (N)	mg/L	0.31		0.05	1666434
Saturation pH (@ 20C)	N/A	6.26			1666436
Saturation pH (@ 4C)	N/A	6.50			1666437
Inorganics					
Total Alkalinity (Total as CaCO3)	mg/L	940		100	1668243
Carbonaceous BOD	mg/L	660		100	1670295
Total Chemical Oxygen Demand	mg/L	2300		100	1670080
Dissolved Chloride (Cl)	mg/L	1600		30	1668251
Colour	TCU	45		5	1668258
Strong Acid Dissoc. Cyanide (CN)	mg/L	0.005 (1)		0.002	1671861
Total Dissolved Solids	mg/L	4800		400	1667963
Nitrate + Nitrite	mg/L	0.34		0.05	1668255
Nitrite (N)	mg/L	0.03		0.01	1668256
Nitrogen (Ammonia Nitrogen)	mg/L	4.8		0.3	1670593
Total Organic Carbon (C)	mg/L	640		50	1677731
Orthophosphate (P)	mg/L	70		2	1668254
pH	pH	5.31		N/A	1672730
Total Phosphorus	mg/L	100	96	3	1672688
Reactive Silica (SiO2)	mg/L	3.7		0.5	1668253

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) The sample was decanted due to turbidity.

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Maxxam Job #: A8D1340
Report Date: 2008/11/19

Marine Institute
Client Project #: SHRIMP CHITIN
Project name: ST. JOHN'S,NL
Your P.O. #: P0058113

RESULTS OF ANALYSES OF WATER

Maxxam ID		AZ5455	AZ7432		
Sampling Date		2008/11/03	2008/11/03		
COC Number		30130	30130		
	Units	**PRIMARY WASH FLOC**	**(SOLUBLE PHOSPHOROUS) PRIMARY WASH FLOC**	**RDL**	**QC Batch**
Total Solids	mg/L	4800		400	1667971
Total Suspended Solids	mg/L	110		2	1667975
Dissolved Sulphate (SO4)	mg/L	240		10	1668252
Total Kjeldahl Nitrogen	mg/L	85		10	1671991
Turbidity	NTU	51		0.3	1674933
Conductivity	uS/cm	7100		1	1672731
Petroleum Hydrocarbons					
Total Oil & Grease	mg/L	ND		5	1668186

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		AZ5455		
Sampling Date		2008/11/03		
COC Number		30130		
	Units	**PRIMARY WASH FLOC**	**RDL**	**QC Batch**
Metals				
Total Mercury (Hg)	ug/L	0.02	0.01	1674754

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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ELEMENTS BY ICP-AES (WATER)

Maxxam ID		AZ5455		
Sampling Date		2008/11/03		
COC Number		30130		
	Units	**PRIMARY WASH FLOC**	**RDL**	**QC Batch**
Metals				
Total Calcium (Ca)	mg/L	360	0.1	1671661
Total Magnesium (Mg)	mg/L	130	1	1671661
Total Phosphorus (P)	mg/L	87	1	1671661
Total Potassium (K)	mg/L	54	0.1	1671661
Total Sodium (Na)	mg/L	980	1	1671661

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: A8D1340
Report Date: 2008/11/19

Marine Institute
Client Project #: SHRIMP CHITIN
Project name: ST. JOHN'S,NL
Your P.O. #: P0058113

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		AZ5455		
Sampling Date		2008/11/03		
COC Number		30130		
	Units	**PRIMARY WASH FLOC**	**RDL**	**QC Batch**
Metals				
Total Aluminum (Al)	ug/L	ND	100	1671726
Total Antimony (Sb)	ug/L	ND	20	1671726
Total Arsenic (As)	ug/L	54	20	1671726
Total Barium (Ba)	ug/L	ND	50	1671726
Total Beryllium (Be)	ug/L	ND	20	1671726
Total Bismuth (Bi)	ug/L	ND	20	1671726
Total Boron (B)	ug/L	450	50	1671726
Total Cadmium (Cd)	ug/L	7	3	1671726
Total Chromium (Cr)	ug/L	ND	20	1671726
Total Cobalt (Co)	ug/L	ND	10	1671726
Total Copper (Cu)	ug/L	29	20	1671726
Total Iron (Fe)	ug/L	ND	500	1671726
Total Lead (Pb)	ug/L	ND	5	1671726
Total Manganese (Mn)	ug/L	21	20	1671726
Total Molybdenum (Mo)	ug/L	ND	20	1671726
Total Nickel (Ni)	ug/L	ND	20	1671726
Total Selenium (Se)	ug/L	ND	20	1671726
Total Silver (Ag)	ug/L	ND	5	1671726
Total Strontium (Sr)	ug/L	5300	50	1671726
Total Thallium (Tl)	ug/L	ND	1	1671726
Total Tin (Sn)	ug/L	ND	20	1671726
Total Titanium (Ti)	ug/L	ND	20	1671726
Total Uranium (U)	ug/L	ND	1	1671726
Total Vanadium (V)	ug/L	ND	20	1671726
Total Zinc (Zn)	ug/L	220	50	1671726

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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GENERAL COMMENTS

Sample AZ5455-01: Elevated reporting limits for trace metals due to high chloride content.

Results relate only to the items tested.

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Marine Institute
Attention: Heather Manuel
Client Project #: SHRIMP CHITIN
P.O. #: P0058113
Project name: ST. JOHN'S,NL

Quality Assurance Report

Maxxam Job Number: DA8D1340

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1667963	ZZH	QC STANDARD	Total Dissolved Solids	2008/11/12		93	%	80 - 120
		Method Blank	Total Dissolved Solids	2008/11/12	ND, RDL=10		mg/L	
		RPD [AZ5455-01]	Total Dissolved Solids	2008/11/12	4.1		%	25
1667971	ZZH	QC STANDARD	Total Solids	2008/11/12		93	%	80 - 120
		Method Blank	Total Solids	2008/11/12	ND, RDL=10		mg/L	
		RPD [AZ5455-01]	Total Solids	2008/11/12	0.4		%	25
1667975	ZZH	QC STANDARD	Total Suspended Solids	2008/11/10		97	%	80 - 120
		Method Blank	Total Suspended Solids	2008/11/10	ND, RDL=1		mg/L	
		RPD	Total Suspended Solids	2008/11/10	0.6		%	25
1668186	DML	MATRIX SPIKE	Total Oil & Grease	2008/11/12		75	%	70 - 130
		Spiked Blank	Total Oil & Grease	2008/11/12		85	%	70 - 130
		Method Blank	Total Oil & Grease	2008/11/12	ND, RDL=5		mg/L	
		RPD	Total Oil & Grease	2008/11/12	NC		%	40
1668243	JBK	MATRIX SPIKE	Total Alkalinity (Total as CaCO3)	2008/11/13		107	%	80 - 120
		QC STANDARD	Total Alkalinity (Total as CaCO3)	2008/11/13		111	%	80 - 120
		Spiked Blank	Total Alkalinity (Total as CaCO3)	2008/11/13		111	%	80 - 120
		Method Blank	Total Alkalinity (Total as CaCO3)	2008/11/13	ND, RDL=5		mg/L	
		RPD	Total Alkalinity (Total as CaCO3)	2008/11/13	NC		%	25
1668251	JPU	MATRIX SPIKE	Dissolved Chloride (Cl)	2008/11/13		103	%	80 - 120
		QC STANDARD	Dissolved Chloride (Cl)	2008/11/13		99	%	80 - 120
		Spiked Blank	Dissolved Chloride (Cl)	2008/11/13		103	%	80 - 120
		Method Blank	Dissolved Chloride (Cl)	2008/11/13	ND, RDL=1		mg/L	
		RPD	Dissolved Chloride (Cl)	2008/11/13	1.1		%	25
1668252	JPU	MATRIX SPIKE	Dissolved Sulphate (SO4)	2008/11/13		109	%	80 - 120
		QC STANDARD	Dissolved Sulphate (SO4)	2008/11/13		100	%	80 - 120
		Spiked Blank	Dissolved Sulphate (SO4)	2008/11/13		107	%	80 - 120
		Method Blank	Dissolved Sulphate (SO4)	2008/11/13	ND, RDL=2		mg/L	
		RPD	Dissolved Sulphate (SO4)	2008/11/13	NC		%	25
1668253	JBK	MATRIX SPIKE	Reactive Silica (SiO2)	2008/11/12		NC	%	80 - 120
		QC STANDARD	Reactive Silica (SiO2)	2008/11/12		100	%	75 - 125
		Spiked Blank	Reactive Silica (SiO2)	2008/11/12		101	%	80 - 120
		Method Blank	Reactive Silica (SiO2)	2008/11/12	ND, RDL=0.5		mg/L	
		RPD	Reactive Silica (SiO2)	2008/11/12	7.6		%	25
1668254	SMT	MATRIX SPIKE	Orthophosphate (P)	2008/11/12		94	%	80 - 120
		QC STANDARD	Orthophosphate (P)	2008/11/12		102	%	80 - 120
		Spiked Blank	Orthophosphate (P)	2008/11/12		101	%	80 - 120
		Method Blank	Orthophosphate (P)	2008/11/12	ND, RDL=0.01		mg/L	
		RPD	Orthophosphate (P)	2008/11/12	NC		%	25
1668255	JPU	MATRIX SPIKE	Nitrate + Nitrite	2008/11/12		101	%	80 - 120
		QC STANDARD	Nitrate + Nitrite	2008/11/12		108	%	80 - 120
		Spiked Blank	Nitrate + Nitrite	2008/11/12		101	%	80 - 120
		Method Blank	Nitrate + Nitrite	2008/11/12	ND, RDL=0.05		mg/L	
		RPD	Nitrate + Nitrite	2008/11/12	NC		%	25
1668256	JPU	MATRIX SPIKE	Nitrite (N)	2008/11/12		101	%	80 - 120
		QC STANDARD	Nitrite (N)	2008/11/12		101	%	80 - 120
		Spiked Blank	Nitrite (N)	2008/11/12		101	%	80 - 120
		Method Blank	Nitrite (N)	2008/11/12	ND, RDL=0.01		mg/L	
		RPD	Nitrite (N)	2008/11/12	NC		%	25
1668258	SMT	QC STANDARD	Colour	2008/11/13		102	%	80 - 120
		Method Blank	Colour	2008/11/13	ND, RDL=5		TCU	
		RPD	Colour	2008/11/13	2.1		%	25
1670080	CAC	MATRIX SPIKE	Total Chemical Oxygen Demand	2008/11/12		106	%	80 - 120
		QC STANDARD	Total Chemical Oxygen Demand	2008/11/12		104	%	80 - 120
		Spiked Blank	Total Chemical Oxygen Demand	2008/11/12		104	%	80 - 120
		Method Blank	Total Chemical Oxygen Demand	2008/11/12	ND, RDL=20		mg/L	

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Attention: Heather Manuel
Client Project #: SHRIMP CHITIN
P.O. #: P0058113
Project name: ST. JOHN'S,NL

Quality Assurance Report (Continued)

Maxxam Job Number: DA8D1340

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1670080	CAC	RPD	Total Chemical Oxygen Demand	2008/11/12	2.2		%	25
1670295	DVB	QC STANDARD	Carbonaceous BOD	2008/11/17		93	%	80 - 120
		Method Blank	Carbonaceous BOD	2008/11/17	ND, RDL=5		mg/L	
		RPD	Carbonaceous BOD	2008/11/17	NC		%	25
1670593	JBK	MATRIX SPIKE	Nitrogen (Ammonia Nitrogen)	2008/11/12		NC	%	80 - 120
		QC STANDARD	Nitrogen (Ammonia Nitrogen)	2008/11/12		103	%	80 - 120
		Spiked Blank	Nitrogen (Ammonia Nitrogen)	2008/11/12		95	%	80 - 120
		Method Blank	Nitrogen (Ammonia Nitrogen)	2008/11/12	ND, RDL=0.05		mg/L	
		RPD	Nitrogen (Ammonia Nitrogen)	2008/11/12	7.9		%	25
1671661	SSI	MATRIX SPIKE	Total Calcium (Ca)	2008/11/13		96	%	80 - 120
			Total Magnesium (Mg)	2008/11/13		93	%	80 - 120
			Total Phosphorus (P)	2008/11/13		96	%	80 - 120
			Total Potassium (K)	2008/11/13		99	%	80 - 120
			Total Sodium (Na)	2008/11/13		95	%	80 - 120
		QC STANDARD	Total Calcium (Ca)	2008/11/13		100	%	80 - 120
			Total Magnesium (Mg)	2008/11/13		97	%	80 - 120
			Total Phosphorus (P)	2008/11/13		95	%	80 - 120
			Total Potassium (K)	2008/11/13		105	%	80 - 120
			Total Sodium (Na)	2008/11/13		105	%	80 - 120
		Spiked Blank	Total Calcium (Ca)	2008/11/13		96	%	80 - 120
			Total Magnesium (Mg)	2008/11/13		93	%	80 - 120
			Total Phosphorus (P)	2008/11/13		97	%	80 - 120
			Total Potassium (K)	2008/11/13		99	%	80 - 120
			Total Sodium (Na)	2008/11/13		101	%	80 - 120
		Method Blank	Total Calcium (Ca)	2008/11/13	ND, RDL=0.1		mg/L	
			Total Magnesium (Mg)	2008/11/13	ND, RDL=0.1		mg/L	
			Total Phosphorus (P)	2008/11/13	ND, RDL=0.1		mg/L	
			Total Potassium (K)	2008/11/13	ND, RDL=0.1		mg/L	
			Total Sodium (Na)	2008/11/13	ND, RDL=0.1		mg/L	
		RPD	Total Calcium (Ca)	2008/11/13	2.5		%	25
			Total Magnesium (Mg)	2008/11/13	1.8		%	25
			Total Phosphorus (P)	2008/11/13	NC		%	25
			Total Potassium (K)	2008/11/13	2.7		%	25
			Total Sodium (Na)	2008/11/13	3.6		%	25
1671726	DLB	MATRIX SPIKE	Total Aluminum (Al)	2008/11/13		102	%	80 - 120
			Total Antimony (Sb)	2008/11/13		114	%	80 - 120
			Total Arsenic (As)	2008/11/13		108	%	80 - 120
			Total Barium (Ba)	2008/11/13		NC	%	80 - 120
			Total Beryllium (Be)	2008/11/13		101	%	80 - 120
			Total Bismuth (Bi)	2008/11/13		101	%	80 - 120
			Total Boron (B)	2008/11/13		NC	%	80 - 120
			Total Cadmium (Cd)	2008/11/13		104	%	80 - 120
			Total Chromium (Cr)	2008/11/13		100	%	80 - 120
			Total Cobalt (Co)	2008/11/13		103	%	80 - 120
			Total Copper (Cu)	2008/11/13		96	%	80 - 120
			Total Lead (Pb)	2008/11/13		102	%	80 - 120
			Total Manganese (Mn)	2008/11/13		103	%	80 - 120
			Total Molybdenum (Mo)	2008/11/13		111	%	80 - 120
			Total Nickel (Ni)	2008/11/13		100	%	80 - 120
			Total Selenium (Se)	2008/11/13		99	%	80 - 120
			Total Silver (Ag)	2008/11/13		98	%	80 - 120
			Total Strontium (Sr)	2008/11/13		NC	%	80 - 120
			Total Thallium (Tl)	2008/11/13		103	%	80 - 120
			Total Tin (Sn)	2008/11/13		110	%	80 - 120
			Total Titanium (Ti)	2008/11/13		102	%	80 - 120

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Quality Assurance Report (Continued)

Maxxam Job Number: DA8D1340

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1671726 DLB	MATRIX SPIKE	Total Uranium (U)	2008/11/13		107	%	80 - 120
		Total Vanadium (V)	2008/11/13		104	%	80 - 120
		Total Zinc (Zn)	2008/11/13		97	%	80 - 120
	QC STANDARD	Total Aluminum (Al)	2008/11/13		101	%	80 - 120
		Total Antimony (Sb)	2008/11/13		108	%	80 - 120
		Total Arsenic (As)	2008/11/13		101	%	80 - 120
		Total Barium (Ba)	2008/11/13		102	%	80 - 120
		Total Beryllium (Be)	2008/11/13		104	%	80 - 120
		Total Boron (B)	2008/11/13		85	%	80 - 120
		Total Cadmium (Cd)	2008/11/13		100	%	80 - 120
		Total Chromium (Cr)	2008/11/13		96	%	80 - 120
		Total Cobalt (Co)	2008/11/13		102	%	80 - 120
		Total Copper (Cu)	2008/11/13		99	%	80 - 120
		Total Iron (Fe)	2008/11/13		103	%	80 - 120
		Total Lead (Pb)	2008/11/13		99	%	80 - 120
		Total Manganese (Mn)	2008/11/13		101	%	80 - 120
		Total Molybdenum (Mo)	2008/11/13		104	%	80 - 120
		Total Nickel (Ni)	2008/11/13		102	%	80 - 120
		Total Selenium (Se)	2008/11/13		90	%	80 - 120
		Total Strontium (Sr)	2008/11/13		106	%	80 - 120
		Total Thallium (Tl)	2008/11/13		113	%	80 - 120
		Total Uranium (U)	2008/11/13		80	%	80 - 120
		Total Vanadium (V)	2008/11/13		96	%	80 - 120
		Total Zinc (Zn)	2008/11/13		101	%	80 - 120
	Spiked Blank	Total Aluminum (Al)	2008/11/13		110	%	80 - 120
		Total Antimony (Sb)	2008/11/13		105	%	80 - 120
		Total Arsenic (As)	2008/11/13		98	%	80 - 120
		Total Barium (Ba)	2008/11/13		103	%	80 - 120
		Total Beryllium (Be)	2008/11/13		99	%	80 - 120
		Total Bismuth (Bi)	2008/11/13		102	%	80 - 120
		Total Boron (B)	2008/11/13		83	%	80 - 120
		Total Cadmium (Cd)	2008/11/13		102	%	80 - 120
		Total Chromium (Cr)	2008/11/13		99	%	80 - 120
		Total Cobalt (Co)	2008/11/13		100	%	80 - 120
		Total Copper (Cu)	2008/11/13		102	%	80 - 120
		Total Lead (Pb)	2008/11/13		99	%	80 - 120
		Total Manganese (Mn)	2008/11/13		103	%	80 - 120
		Total Molybdenum (Mo)	2008/11/13		102	%	80 - 120
		Total Nickel (Ni)	2008/11/13		103	%	80 - 120
		Total Selenium (Se)	2008/11/13		90	%	80 - 120
		Total Silver (Ag)	2008/11/13		100	%	80 - 120
		Total Strontium (Sr)	2008/11/13		101	%	80 - 120
		Total Thallium (Tl)	2008/11/13		100	%	80 - 120
		Total Tin (Sn)	2008/11/13		108	%	80 - 120
		Total Titanium (Ti)	2008/11/13		97	%	80 - 120
		Total Uranium (U)	2008/11/13		101	%	80 - 120
		Total Vanadium (V)	2008/11/13		100	%	80 - 120
		Total Zinc (Zn)	2008/11/13		100	%	80 - 120
	Method Blank	Total Aluminum (Al)	2008/11/13	ND, RDL=10		ug/L	
		Total Antimony (Sb)	2008/11/13	ND, RDL=2		ug/L	
		Total Arsenic (As)	2008/11/13	ND, RDL=2		ug/L	
		Total Barium (Ba)	2008/11/13	ND, RDL=5		ug/L	
		Total Beryllium (Be)	2008/11/13	ND, RDL=2		ug/L	
		Total Bismuth (Bi)	2008/11/13	ND, RDL=2		ug/L	
		Total Boron (B)	2008/11/13	ND, RDL=5		ug/L	

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Marine Institute
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Project name: ST. JOHN'S,NL

Quality Assurance Report (Continued)

Maxxam Job Number: DA8D1340

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1671726 DLB	Method Blank	Total Cadmium (Cd)	2008/11/13	ND, RDL=0.3		ug/L	
		Total Chromium (Cr)	2008/11/13	ND, RDL=2		ug/L	
		Total Cobalt (Co)	2008/11/13	ND, RDL=1		ug/L	
		Total Copper (Cu)	2008/11/13	ND, RDL=2		ug/L	
		Total Iron (Fe)	2008/11/13	ND, RDL=50		ug/L	
		Total Lead (Pb)	2008/11/13	ND, RDL=0.5		ug/L	
		Total Manganese (Mn)	2008/11/13	ND, RDL=2		ug/L	
		Total Molybdenum (Mo)	2008/11/13	ND, RDL=2		ug/L	
		Total Nickel (Ni)	2008/11/13	ND, RDL=2		ug/L	
		Total Selenium (Se)	2008/11/13	ND, RDL=2		ug/L	
		Total Silver (Ag)	2008/11/13	ND, RDL=0.5		ug/L	
		Total Strontium (Sr)	2008/11/13	ND, RDL=5		ug/L	
		Total Thallium (Tl)	2008/11/13	ND, RDL=0.1		ug/L	
		Total Tin (Sn)	2008/11/13	ND, RDL=2		ug/L	
		Total Titanium (Ti)	2008/11/13	ND, RDL=2		ug/L	
		Total Uranium (U)	2008/11/13	ND, RDL=0.1		ug/L	
		Total Vanadium (V)	2008/11/13	ND, RDL=2		ug/L	
		Total Zinc (Zn)	2008/11/13	ND, RDL=5		ug/L	
	RPD	Total Aluminum (Al)	2008/11/13	3.9		%	25
		Total Antimony (Sb)	2008/11/13	NC		%	25
		Total Arsenic (As)	2008/11/13	NC		%	25
		Total Barium (Ba)	2008/11/13	3.6		%	25
		Total Beryllium (Be)	2008/11/13	NC		%	25
		Total Bismuth (Bi)	2008/11/13	NC		%	25
		Total Boron (B)	2008/11/13	NC		%	25
		Total Cadmium (Cd)	2008/11/13	NC		%	25
		Total Chromium (Cr)	2008/11/13	NC		%	25
		Total Cobalt (Co)	2008/11/13	NC		%	25
		Total Copper (Cu)	2008/11/13	NC		%	25
		Total Iron (Fe)	2008/11/13	NC		%	25
		Total Lead (Pb)	2008/11/13	NC		%	25
		Total Manganese (Mn)	2008/11/13	2.5		%	25
		Total Molybdenum (Mo)	2008/11/13	NC		%	25
		Total Nickel (Ni)	2008/11/13	NC		%	25
		Total Selenium (Se)	2008/11/13	NC		%	25
		Total Silver (Ag)	2008/11/13	NC		%	25
		Total Strontium (Sr)	2008/11/13	2.1		%	25
		Total Thallium (Tl)	2008/11/13	NC		%	25
		Total Tin (Sn)	2008/11/13	NC		%	25
		Total Titanium (Ti)	2008/11/13	NC		%	25
		Total Uranium (U)	2008/11/13	NC		%	25
		Total Vanadium (V)	2008/11/13	NC		%	25
		Total Zinc (Zn)	2008/11/13	NC		%	25
1671861 CRA	MATRIX SPIKE	Strong Acid Dissoc. Cyanide (CN)	2008/11/13		93	%	N/A
	QC STANDARD	Strong Acid Dissoc. Cyanide (CN)	2008/11/13		95	%	80 - 120
	Spiked Blank	Strong Acid Dissoc. Cyanide (CN)	2008/11/13		100	%	80 - 120
	Method Blank	Strong Acid Dissoc. Cyanide (CN)	2008/11/13	ND, RDL=0.002		mg/L	
	RPD [AZ5455-01]	Strong Acid Dissoc. Cyanide (CN)	2008/11/13	NC (1)		%	25
1671991 JPU	MATRIX SPIKE	Total Kjeldahl Nitrogen	2008/11/14		104	%	80 - 120
	Spiked Blank	Total Kjeldahl Nitrogen	2008/11/14		97	%	80 - 120
	Method Blank	Total Kjeldahl Nitrogen	2008/11/14	ND, RDL=0.2 (2)		mg/L	
	RPD	Total Kjeldahl Nitrogen	2008/11/14	NC		%	25
1672688 MCN	MATRIX SPIKE	Total Phosphorus	2008/11/17		NC	%	75 - 125
	Spiked Blank	Total Phosphorus	2008/11/17		115	%	80 - 120
	Method Blank	Total Phosphorus	2008/11/17	ND, RDL=0.02		mg/L	

This document is in electronic format, hard copy is available on request.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Appendix D: BioProcessH2O

About BioProcessH2O

Mission
Our mission: to design, develop, produce and install wastewater purification products and systems that allow our customers to reliably and affordably protect our world's most precious natural resource-clean water.

Objectives
Our objective is to simplify wastewater treatment. Our specialty is identifying complete solutions, including Membrane Bioreactor (MBR) systems for water reuse or high-concentrate wastewater streams that can be segregated and treated at a lower cost than a facility designed to treat total flow at all times. bioprocessH2O's technology also lends itself well to retrofitting existing systems or components.

About Us
bioprocessH2O was founded on the belief that better methods for purifying commercial and agricultural wastewater were within reach.

In 2003, bioprocessH2O founders Tim Burns and John Haley recognized that farms and businesses needed a pre-treatment system that was practical and affordable, always reliable and convenient to install and use.

Burns and Haley used their combined expertise in wastewater management to develop a new pre-treatment method that uses microbes to clean water prior to its release into municipal water treatment systems.

But bioprocessH2O didn't stop there. Aware of the challenges organizations face when implementing any major change, bioprocessH2O made a commitment to stay with their customers from start to finish.

From conducting an initial waste analysis to the design, build and installation, and then maintenance of a complete water-treatment system, **bioprocessH2O puts a high priority on ensuring that each customer is outfitted with a solution that meets their needs.** bioprocessH2O even offers customers a pilot program where clients can test a unit before moving ahead with a full-scale project.

Our technology produces nutrient reductions that are rapidly becoming benchmarks in their field.

Customers are happy with the cost savings in power consumption and low-solids production and reductions in the cost of compliance and regulatory oversight.

Communities are happy because together we are protecting our water supplies for generations to come.

Management Team

The bioprocessH2Omanagement team has critical on the-ground technical, manufacturing, regulatory and operations expertise and 70 combined years of experience building environmental systems and organizations that work.

Tim Burns is an alumnus of Providence College and Brown University with more than 20 years of applied environmental, marketing and general management experience in the environmental industry.

Mr. Burns earned his relevant experience with as a founder in three successful companies:

- Eco Resources - a developer, licensee and manufacturer of onsite membrane filtration equipment for inorganic applications
- 21st EMI - a state-of-the-art technology company for recycling of inorganic and organic waste streams in the fields of electronics, printed circuits and photo imaging
- BurnsProperties LLC - a company that purchases industrial properties to initiate long-term commitments to retain manufacturing and employment at these facilities.

Mr. Burns is past president of the Board of Save the Bay, a nationally recognized environmental advocacy organization.
timburns@bioprocessh2o.com

John Haley III is a co-founder of bioprocessH2O and inventor of the High Rate BioFilter (HRBF). Prior to forming the company, Mr. Haley was employed in various research and development positions at the New England Aquarium in Boston.

Mr. Haley is a graduate of Harvard University and a leading biologist in the areas of microbial mats and bacterial holdfast processes. While at Harvard he was involved with research and development of innovative, cost-effective technologies for nitrogen recovery and efficient treatment of polluted waste streams. He served as technical assistant in Dr. Harold Edgerton's laboratory at the Massachusetts Institute of Technology where he developed first-hand knowledge of experimental procedures and development of innovative processes. His later work for the World Wildlife Foundation included investigating the impact of nutrient loading on Sudan's White Nile Swamp.

Mr. Haley designed and produced the first biofilm-based filtration system, or BioFilter, and also achieved national recognition by the National Oceanographic and Atmospheric Administration for his BioFilter design. Most recently, Mr. Haley received the Innovative Technology Award for his nitrogen removal system.
johnhaley@bioprocessh2o.com

Jeff Marshall is responsible for the planning and execution of waste-stream treatment projects utilizing Membrane Bioreactors (MBR) and BioProcess patented high rate BioFilter technology (HRBF) technology at customer sites worldwide.

Mr. Marshall is an engineer and construction manager with more than 20 years of experience in the construction of wastewater, advanced technology, manufacturing and commercial facilities around the world. Projects he has worked on include:

- New England's largest water reuse project, Gillette Stadium
- Package regional systems
- Construction management consulting to owners
- Building third-party designed projects
- Building fast-track facilities designed in-house

Prior to joining BioProcess, he was vice president and New England regional manager for the Applied Water group at American Water.

Case Study: Highland Meadows

Installing Pre-Design Treatment Plant for a Residential Development
Client: Highland Meadows
Industry: Commercial/Residential
Location: Westin, Massachusetts

Customer Need
The BioProcess installation group was hired to install a pre-designed package wastewater-treatment plant for a residential community of 380 people. The plant processes water by using advanced anoxic nitrogen removal, aerobic biological treatment, and ultra-filtration by membrane separation, by disinfection using ultra-violet light.
Additionally, treated water is discharged for water recharging, which helps maintain a plentiful groundwater supply in the local environment.
Project Profile

- Initial Service Date: Spring 2008
- Gallons Per Day: 24,000
- Population Served: 380
- Community Size: 140 units

Wastewater Characteristics	Effluent
TSS	<10 mg/L
BOD	<10 mg/L
TKN	<10 mg/L

Status/Result
The plant will deliver water meeting reuse standards (i.e. below < 10mg/l BOD, 10mg/l Total Nitrogen and 10mg/l TSS) and will come online in the winter of 2007/2008.

Case Study: Pretreatment at Seafood Processing Facilities

Client: Blount Seafood Corporation
Industry: Food & Beverage
Location: Warren, Rhode Island, and Fall River, Massachusetts

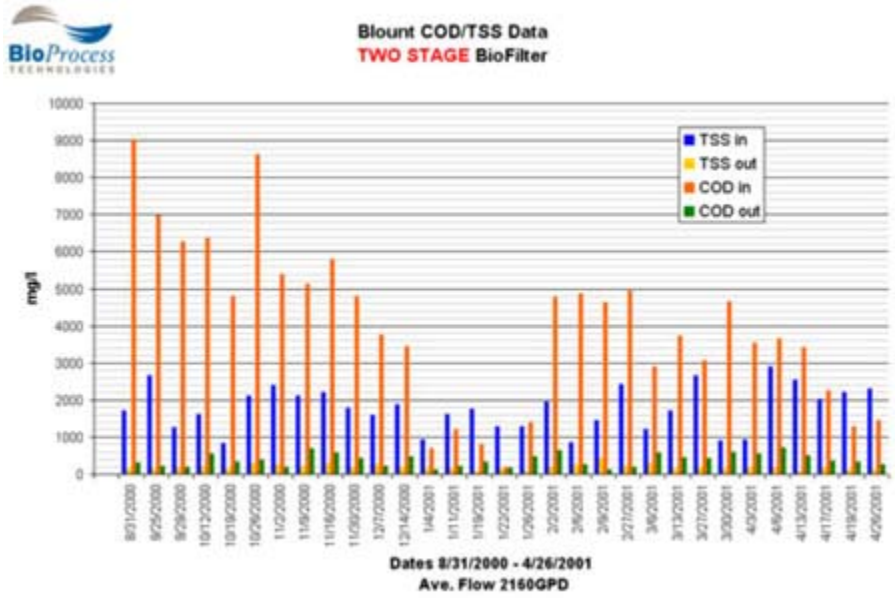
Customer Need
Blount Seafood Corporation has processed clams and other shellfish since 1890. It serves the U.S. market for clams, mussels, calamari, crab cakes, seafood dips, chowders, soups and sauces. Blount operates production facilities in Warren, RI, and Fall River, MA, as well as a distribution center in East Providence, RI.

Wastewater is generated by eviscerating processes as well as cleaning of soup kettles and breading/freezing equipment, thawing of frozen ingredients, rinsing floors and sanitizing ancillary equipment and workspaces. Wastewater is discharged directly to the Warren River and to municipal sewer systems in Fall River. Significant reduction of nutrients and TSS in these discharges is required to comply with local and state regulations.

Solution
BioProcess installed two Biotowers at the Warren plant to demonstrate cost-effectiveness for nutrient reduction in the wastewater. The pilot project was designed to operate for six months but has been operating for over five years, during which its performance has been monitored regularly. Reductions in BOD/COD and TSS are significant and consistent.

Based on the impressive results of the pilot, BioProcess installed a full-scale pretreatment system for a new state-of-the-art gourmet soup plant in Fall River, designed for BOD and TSS discharges below 250 mg/l an average annual flow of over eight million gallons. The design needed to accommodate a possible future expansion to 50,000 gpd. The system includes prescreening and equalization, dissolved air flotation, biological treatment in four Biotowers and effluent clarification. Continuous controls for air, temperature and pH are incorporated into the system.

Status/Results
The treatment system in Fall River has been operating for three years. Data indicates that reductions for BOD, TSS and FOG remain have kept the company in compliance. For the Warren facility, BioProcess technology was included in the Basis of Design developed for regulatory review.



Case Study: Odor Removal at Seafood Company

Odor Removal at Seafood Company
Client: Blount Seafood Company
Industry: Food & Beverage
Location: Warren, Rhode Island

Customer Need
Blount Seafood's supplied restaurants with squid processed in a facility located within an industrial park. While allowing the new processing facility to be constructed, the wastewater treatment authority for the park required reduction in odors associated with wastewater discharged into underground tanks for equalization prior to discharge into the sewer system. The authority also indicated it would impose limits on flow, solids and BOD/COD. The company sought a cost-efficient pretreatment solution that utilized its existing underground capacity and could be implemented quickly.

Solution
Having determined that the odor is associated with BOD in the process wastewater, BioProcess

Technologies conducted a treatability analysis and designed a preliminary treatment system that includes a retrofit of existing underground tanks with submerged BioFilter frames. The system provides for settling and equalization, preheating, aeration to improve circulation and biological activity, ventilation and a custom-designed wet scrubber. The system is extremely simple to operate and maintain.

Status/Result

The pretreatment system was installed in Spring 2005. After some fine-tuning during start-up, the odor problem was eliminated. Preliminary performance data also show significant reductions in BOD/COD. This became important since the sewer authority added limits for BOD/COD, as well as solids, in its draft permit. Based on initial performance, the authority agreed to postpone the effective date of these limits and allow the company to propose system enhancements based on further baseline testing. BioProcess Technologies is assisting with data collection and analysis. Treatment capacity can be easily expanded by adding more BioFilters in aboveground towers.

Parameter	Effluent Limit
BOD monthly average	
TSS monthly average	160/mg/l
Oil and grease	100mg/l
pH	5-10
Flow	16,000 gpd av/mo
	20,000 gpd max/day
Temperature	104°F

Appendix E: Old Perlican Council Letter

January 12, 2009

Dept of Environment and Conservation
P.O. Box 8700
St. John's, NL
A1B 4J6

Att: Environmental Review Division

Re: Proposed Chitin Development-Old PERLICAN.

Dear Sirs:

On December 14, 2008, members of Council met with Mr. Robin Quinlan and Mr. Steve Mercer of Quinlan Brothers Ltd to discuss the company's proposal to establish a Chitin facility in the Municipality.

Both Mr. Quinlan and Mr. Mercer gave extremely interesting presentations and explained what a chitin development was and the stages it needed to progress through before the company made a final decision to operate the facility.

Prior to the meeting, Council had a number of concerns, as it was not familiar with such a project. Both gentlemen explained details of the proposed development to Council's satisfaction.

The company also committed to providing the town with information concerning the testing results, as well as a copy of the environmental assessment . We look forward to receiving these documents in due course.

Yours truly,
TOWN OF OLD PERLICAN

Don Burt
Mayor

/jb

cc Mr. Robin Quinlan, Quinlan Brothers Ltd.