MACKENZIE
PULP MILL CORPORATION
A PAPER EXCELLENCE COMPANY

May 02, 2018

Mr. Sajid Barlas

Section Head
Authorizations North
Ministry of Environment + Climate Change
Penticton, BC

Dear Sir:

**Re: March 2018 - Effluent Monitoring Report**

Attached is the effluent monitoring results for the current reporting period according to Permit PE-01138.

There was no flow in the Ash Pond Effluent swamp, thus no sample was collected for this quarter.

Sincerely,

Raghunath Varanasi
Technical Manager

Randeep Sandhu
Pulp Technician

Mackenzie Pulp Mill Corporation, a Paper Excellence Company
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B.C. Ministry of Environment - Waste Management Branch

Permit Number: PE-01138
Sampling Location: Paper Excellence Mackenzie Pulp Mill Corp

Calculated Final Effluent Maximum Concentration Limits for: 01-MAR-18 - 31-MAR-18

| Parameter | Monthly Average | Daily Maximum |
|---|---|---|
| TSS | 121 mg/l | 202 mg/l |
| BOD5 | | 81 mg/l |
| AOX | 0.6 kg/ADt | |

The 90th percentile for the previous 100 days was:

PROD : 702 ADt/D

CBPROD : 702 ADt/D

EFF : 65.3 1000 M3/D

Date: 02-MAY-18 Monitoring Results -ST500-

B.C. Ministry of Environment - Waste Management Branch

Permit Number: PE01138
Sampling Location: Paper Excellence Mackenzie Pulp Mill Corp

Final Effluent

| Date | Production Adt/Day | Flow 1000M3/D | AOX mg/l | AOX kg/ADt | pH | Dissolved Oxygen mg/l | Total Susp. Solids mg/l | Volatile Susp Solids mg/l | BOD5 mg/l | Final Effluent DHA mg/l |
|---|---|---|---|---|---|---|---|---|---|---|
| 01-MAR-18 | 570 | 56.8 | | | 7.5 | 1.2 | 58 | | | |
| 02-MAR-18 | 584 | 58.9 | | | 7.4 | 1.4 | 48 | | | |
| 03-MAR-18 | 650 | 58.1 | | | 7.4 | 3.7 | 42 | | | |
| 04-MAR-18 | 659 | 58.0 | | | 7.3 | 3.8 | 41 | | 21 | |
| 05-MAR-18 | 641 | 58.1 | | | 7.2 | 2.8 | 36 | | 18 | |
| 06-MAR-18 | 685 | 57.9 | 3.9 | 0.3 | 7.3 | 1.6 | 28 | 24 | 17 | 0.001 |
| 07-MAR-18 | 643 | 57.7 | | | 7.4 | 0.3 | 38 | | | |
| 08-MAR-18 | 650 | 57.1 | | | 7.3 | 0.3 | 36 | | | |
| 09-MAR-18 | 620 | 58.3 | | | 7.4 | 0.4 | 44 | | | |
| 10-MAR-18 | 549 | 59.4 | | | 7.3 | 0.5 | 39 | | | |
| 11-MAR-18 | 606 | 60.2 | | | 7.2 | 0.3 | 30 | | 22 | |
| 12-MAR-18 | 631 | 60.2 | | | 7.4 | 0.5 | 47 | | 20 | |
| 13-MAR-18 | 550 | 61.4 | 3.8 | 0.3 | 7.5 | 0.3 | 38 | 35 | 14 | 0.001 |
| 14-MAR-18 | 565 | 62.6 | | | 7.5 | 0.3 | 38 | | | |
| 15-MAR-18 | 651 | 61.8 | | | 7.4 | 0.5 | 38 | | | |
| 16-MAR-18 | 546 | 58.1 | | | 7.4 | 0.6 | 43 | | | |
| 17-MAR-18 | 327 | 58.1 | | | 7.2 | 0.3 | 42 | | | |
| 18-MAR-18 | 641 | 59.7 | | | 7.5 | 0.3 | 41 | | 24 | |
| 19-MAR-18 | 646 | 59.7 | | | 7.5 | 0.4 | 42 | | 20 | |
| 20-MAR-18 | 628 | 62.1 | 3.5 | 0.3 | 7.4 | 0.6 | 39 | | 16 | 0.001 |
| 21-MAR-18 | 525 | 54.3 | | | 7.4 | 1.1 | 47 | 44 | | |
| 22-MAR-18 | 513 | 61.3 | | | 7.6 | 1.8 | 47 | | | |
| 23-MAR-18 | 554 | 63.2 | | | 7.4 | 0.3 | 48 | | | |
| 24-MAR-18 | 425 | 61.6 | | | 7.3 | 0.3 | 48 | | | |
| 25-MAR-18 | 94 | 56.0 | | | 7.3 | 0.3 | 52 | | 21 | |
| 26-MAR-18 | 250 | 49.2 | | | 7.5 | 0.8 | 42 | | 15 | |
| 27-MAR-18 | 586 | 59.3 | 2.9 | 0.2 | 7.5 | 1.0 | 40 | 35 | 26 | 0.001 |
| 28-MAR-18 | 631 | 59.7 | | | 7.3 | 0.3 | 35 | | | |
| 29-MAR-18 | 632 | 63.0 | | | 7.3 | 0.3 | 48 | | | |
| 30-MAR-18 | 617 | 62.7 | | | 7.3 | 0.5 | 46 | | | |
| 31-MAR-18 | 637 | 64.2 | | | 7.4 | 0.4 | 44 | | | |
| Averages: | 565 | 59.3 | 3.5 | 0.3 | 7.4 | 0.9 | 42 | 35 | 20 | 0.001 |

Note: Results represent discharges for a 24-hour period from 08:00AM on the indicated day to 08:00AM the following day.

**Mackenzie Pulp Mill Corporation**
**Biobasin #2 - Temperature (°C)**
**March 2018**

| DATE | Minimum Temperature | Maximum Temperature |
|---|---|---|
| 01-Mar | 19.0 | 23.9 |
| 02-Mar | 19.8 | 23.1 |
| 03-Mar | 19.7 | 24.1 |
| 04-Mar | 21.7 | 25.2 |
| 05-Mar | 24.7 | 25.7 |
| 06-Mar | 21.8 | 26.0 |
| 07-Mar | 20.4 | 26.2 |
| 08-Mar | 19.8 | 25.4 |
| 09-Mar | 24.5 | 26.4 |
| 10-Mar | 25.0 | 26.0 |
| 11-Mar | 25.8 | 26.9 |
| 12-Mar | 23.9 | 27.2 |
| 13-Mar | 22.1 | 26.4 |
| 14-Mar | 23.2 | 26.8 |
| 15-Mar | 23.4 | 27.1 |
| 16-Mar | 23.0 | 26.4 |
| 17-Mar | 21.8 | 27.0 |
| 18-Mar | 25.1 | 27.3 |
| 19-Mar | 24.2 | 26.3 |
| 20-Mar | 24.6 | 26.3 |
| 21-Mar | 19.2 | 26.0 |
| 22-Mar | 18.3 | 23.4 |
| 23-Mar | 18.9 | 23.5 |
| 24-Mar | 19.9 | 24.0 |
| 25-Mar | 19.3 | 23.8 |
| 26-Mar | 19.9 | 22.8 |
| 27-Mar | 20.3 | 22.6 |
| 28-Mar | 20.5 | 23.2 |
| 29-Mar | 19.6 | 24.4 |
| 30-Mar | 19.1 | 22.9 |
| 31-Mar | 19.9 | 24.3 |

| | | |
|---|---|---|
| **Monthly Min./Max.** | 18.3 | 27.3 |
| **Monthly Average** | 23.9 | |

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# Biobasin #2
## pH & Temperature
## Mar-18

| | Field | | Laboratory | |
|---|---|---|---|---|
| Date | pH | Temperature (°C) | pH | Temperature (°C) |
| 01-Mar | 7.03 | 22.6 | 7.51 | 21.8 |
| 02-Mar | 7.04 | 20.8 | 7.40 | 18.2 |
| 03-Mar | 7.10 | 20.5 | 7.39 | 19.1 |
| 04-Mar | 7.00 | 23.2 | 7.28 | 22.1 |
| 05-Mar | 6.99 | 25.1 | 7.23 | 19.6 |
| 06-Mar | 6.96 | 25.7 | 7.29 | 23.0 |
| 07-Mar | 7.04 | 21.6 | 7.38 | 20.0 |
| 08-Mar | 7.04 | 22.2 | 7.32 | 21.1 |
| 09-Mar | 7.01 | 25.0 | 7.42 | 21.4 |
| 10-Mar | 7.06 | 25.5 | 7.31 | 22.5 |
| 11-Mar | 7.04 | 26.0 | 7.21 | 23.1 |
| 12-Mar | 7.04 | 26.6 | 7.42 | 22.2 |
| 13-Mar | 7.07 | 24.6 | 7.45 | 23.2 |
| 14-Mar | 7.06 | 26.0 | 7.48 | 22.3 |
| 15-Mar | 7.05 | 26.8 | 7.40 | 23.6 |
| 16-Mar | 7.03 | 24.2 | 7.37 | 21.7 |
| 17-Mar | 7.04 | 26.1 | 7.18 | 24.1 |
| 18-Mar | 7.05 | 25.7 | 7.45 | 24.7 |
| 19-Mar | 7.07 | 25.7 | 7.45 | 21.8 |
| 20-Mar | 7.00 | 25.8 | 7.44 | 21.8 |
| 21-Mar | 7.02 | 25.5 | 7.36 | 22.5 |
| 22-Mar | 7.04 | 19.9 | 7.56 | 19.8 |
| 23-Mar | 7.03 | 20.1 | 7.37 | 19.3 |
| 24-Mar | 7.00 | 22.0 | 7.31 | 22.5 |
| 25-Mar | 7.01 | 21.3 | 7.26 | 21.0 |
| 26-Mar | 7.29 | 23.5 | 7.49 | 22.1 |
| 27-Mar | 7.07 | 22.2 | 7.53 | 21.4 |
| 28-Mar | 6.93 | 22.1 | 7.34 | 19.3 |
| 29-Mar | 6.13 | 22.8 | 7.28 | 20.6 |
| 30-Mar | 7.01 | 19.4 | 7.31 | 19.4 |
| 31-Mar | 6.99 | 23.0 | 7.37 | 21.2 |

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# Biobasin #2 Chemical Oxygen Demand (COD)
## March 2018

| Date | #2BO-24hr COD (mg/L) | | |
|---|---|---|---|
| 01-Mar | 596 | | |
| 02-Mar | 575 | | |
| 03-Mar | 567 | | |
| 04-Mar | 511 | | |
| 05-Mar | 550 | | |
| 06-Mar | 552 | | |
| 07-Mar | 490 | | |
| 08-Mar | 536 | | |
| 09-Mar | 572 | | |
| 10-Mar | 514 | | |
| 11-Mar | 520 | | |
| 12-Mar | 574 | | |
| 13-Mar | 533 | | |
| 14-Mar | 501 | | |
| 15-Mar | 495 | | |
| 16-Mar | 511 | | |
| 17-Mar | 496 | | |
| 18-Mar | 589 | | |
| 19-Mar | 466 | | |
| 20-Mar | 459 | | |
| 21-Mar | 476 | | |
| 22-Mar | 475 | | |
| 23-Mar | 425 | | |
| 24-Mar | 431 | | |
| 25-Mar | 464 | | |
| 26-Mar | 439 | | |
| 27-Mar | 413 | | |
| 28-Mar | 446 | | |
| 29-Mar | 494 | | |
| 30-Mar | 482 | | |
| 31-Mar | 478 | | |
| **Monthly Min/Max** | **413** | | **596** |
| **Monthly Average** | | **504** | |

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# Biobasin #2 - Nutrients (mg/L)
## March 2018

| | Tested In-house | Tested by ALS Environmental | | | | | |
|---|---|---|---|---|---|---|---|
| DATE | Ammonia $NH_4$ - N | Ammonia $NH_4$ - N | Nitrate $NO_3$ - N | Nitrite $NO_2$ - N | Total Kjeldahl Nitrogen | Phosphorus Dissolved $PO_4$ - P | Phosphorus Total $PO_4$ - P |
| 01-Mar | 4.550 | | | | | | |
| 02-Mar | 5.010 | | | | | | |
| 03-Mar | 3.220 | | | | | | |
| 04-Mar | 3.930 | | | | | | |
| 05-Mar | 3.130 | | | | | | |
| 06-Mar | 4.610 | 1.55 | 0.050 | 0.016 | 5.37 | 0.019 | 0.461 |
| 07-Mar | 4.960 | | | | | | |
| 08-Mar | 3.060 | | | | | | |
| 09-Mar | 1.510 | | | | | | |
| 10-Mar | 2.150 | | | | | | |
| 11-Mar | 2.440 | | | | | | |
| 12-Mar | 3.160 | | | | | | |
| 13-Mar | 5.620 | | | | | | |
| 14-Mar | 3.340 | | | | | | |
| 15-Mar | 4.150 | | | | | | |
| 16-Mar | 3.460 | | | | | | |
| 17-Mar | 2.190 | | | | | | |
| 18-Mar | 2.210 | | | | | | |
| 19-Mar | 5.470 | | | | | | |
| 20-Mar | 2.700 | | | | | | |
| 21-Mar | 2.500 | | | | | | |
| 22-Mar | 2.000 | | | | | | |
| 23-Mar | 2.480 | | | | | | |
| 24-Mar | 3.160 | | | | | | |
| 25-Mar | 3.330 | | | | | | |
| 26-Mar | 3.060 | | | | | | |
| 27-Mar | 2.940 | | | | | | |
| 28-Mar | 2.860 | | | | | | |
| 29-Mar | 3.190 | | | | | | |
| 30-Mar | 1.510 | | | | | | |
| 31-Mar | 3.180 | | | | | | |

NAUTILUS
ENVIRONMENTAL

# Acute Toxicity Test Results

Sample #2BO-Grab-Mar. 06/18,
collected March 6, 2018

Final Report

March 20, 2018

Submitted to: **Mackenzie Pulp Mill Corporation**
Mackenzie, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

## SAMPLE INFORMATION

| Sample ID | Dates | | | | Receipt temp. |
|---|---|---|---|---|---|
| | Collected | Received | Rainbow trout test initiation | *Daphnia magna* test initiation | |
| #2BO-Grab-Mar. 06/18 | 06-Mar-18 at 0800h | 07-Mar-18 at 1110h | 08-Mar-18 at 1335h | 07-Mar-18 at 1630h | 12.2°C |

## TESTS

- Rainbow trout 96-h LC50 test
- *Daphnia magna* 48-h LC50 test

## RESULTS

### Toxicity test results

| Sample ID | LC50 (% v/v) | |
|---|---|---|
| | Rainbow trout | *Daphnia magna* |
| #2BO-Grab-Mar. 06/18 | >100 | >100 |

## QA/QC

| QA/QC summary | Rainbow trout | *Daphnia magna* |
|---|---|---|
| Reference toxicant LC50 (95% CL) | 132.1 (105.3 – 184.0) µg/L Zn[1] | 7.8 (5.5 – 11.0) g/L NaCl[2] |
| Reference toxicant historical mean (2 SD range) | 96.5 (58.2 – 160.0) µg/L Zn | 6.0 (4.3 – 8.4) g/L NaCl |
| Reference toxicant CV | 29% | 18% |
| Organism health history | Acceptable | Acceptable |
| Protocol deviations | None | None |
| Water quality range deviations | None | None |
| Control performance | Acceptable | Acceptable |
| Test performance | Valid | Valid |

[1]Test date: March 5, 2018; [2]Test date: March 7, 2018; LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist

Reviewed By:
Edmund Canaria, R.P.Bio
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

# APPENDIX A – Summary of test conditions

**Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.**

| | |
|---|---|
| Test species | *Oncorhynchus mykiss* |
| Organism source | Hatchery |
| Organism age | Juvenile |
| Test type | Static |
| Test duration | 96 hours |
| Test vessel | 20-L glass aquarium |
| Test volume | 10 to 20 L (depending on size of fish) |
| Test solution depth | ≥15 cm |
| Test concentrations | Five concentrations, plus laboratory control |
| Test replicates | 1 per treatment |
| Number of organisms | 10 per replicate |
| Control/dilution water | Dechlorinated Metro Vancouver municipal tapwater |
| Test solution renewal | None |
| Test temperature | 15 ± 1°C |
| Feeding | None |
| Light intensity | 100 to 500 lux |
| Photoperiod | 16 hours light / 8 hours dark |
| Aeration | 6.5 ± 1 mL/min/L |
| Test measurements | Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily |
| Test protocol | Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments |
| Statistical software | CETIS Version 1.8.7 |
| Test endpoints | Survival (96-hour LC50) |
| Test acceptability criterion for controls | Survival ≥90% |
| Reference toxicant | Zinc (added as $ZnSO_4$) |

**Table 2. Summary of test conditions: 48-h *Daphnia magna* LC50 test.**

| | |
|---|---|
| Test species | *Daphnia magna* |
| Organism source | In-house culture |
| Organism age | <24-hour old neonates |
| Test type | Static |
| Test duration | 48 hours |
| Test vessel | 385-mL plastic container |
| Test volume | 150 mL |
| Test concentrations | Five concentrations, plus laboratory control |
| Test replicates | 1 per treatment |
| Number of organisms | 10 per replicate |
| Control/dilution water | Moderately-hard reconstituted water + 2.5 µg/L Se |
| Test solution renewal | None |
| Test temperature | 20 ± 2°C |
| Feeding | None |
| Light intensity | 400 to 800 lux |
| Photoperiod | 16 hours light / 8 hours dark |
| Aeration | None |
| Test measurements | Temperature, dissolved oxygen, pH and conductivity measured at test initiation and termination; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; survival checked daily |
| Test protocol | Environment Canada (2000), EPS 1/RM/14, with 2016 amendments |
| Statistical software | CETIS Version 1.8.7 |
| Test endpoints | Survival (48-hour LC50) |
| Test acceptability criterion for controls | Survival ≥90% |
| Reference toxicant | Sodium chloride (NaCl) |

# APPENDIX B – Toxicity test data

# Rainbow Trout Summary Sheet

Client: Mackenzie

Start Date/Time: March 8, 2018 @1335h

Work Order No.: 180349

Test Species: *Oncorhynchus mykiss*

**Test Validity Criteria:**
≥ 90% control survival
**WQ Ranges:**
T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

**Sample Information:**

Sample ID: #2Bo-Grab-Mar.06/18
Sample Date: March 6, 2018
Date Received: March 7, 2018
Sample Volume: 2 x 20L
Other: –

**Dilution Water:**

Type: Dechlorinated Municipal Tap Water
Hardness (mg/L $CaCO_3$): 12
Alkalinity (mg/L $CaCO_3$): 10

**Test Organism Information:**

Batch No.: 012218a
Source: Spring Valley
No. Fish/Volume (L): 10/10
Loading Density (g/L): 0.28
Mean Length ± SD (mm): 35 ± 1 Range: 33 – 38
Mean Weight ± SD (g): 0.28 ± 0.06 Range: 0.22 – 0.39

**Zinc Reference Toxicant Results:**

Reference Toxicant ID: RTZn108
Stock Solution ID: 18Zn02
Date Initiated: March 5, 2018
96-h LC50 (95% CL): 132.1 (105.3 – 184.0) µg/L Zn

Reference Toxicant Mean and Historical Range: 96.5 (58.2 – 160.0) µg/L Zn
Reference Toxicant CV (%): 29

Test Results: The 96h LC50 is estimated to be >100% (v/v)

Reviewed by: [signature] Date reviewed: March 16, 2018

# 96-Hour Rainbow Trout Toxicity Test Data Sheet

**Client/Project#:** Mackenzie Pulp Mill Corporation
**Sample I.D.** # 280 - Grab - Mar. 06/18
**W.O. #** 180349
**RBT Batch #:** 012218a
**Date Collected/Time:** 06Mar18 @ 0800 h
**Date Setup/Time:** 08Mar18 @ 1335 h
**CER #:** 2
**Sample Setup By:** RC

**Number Fish/Volume:** 10 / 10 L
**7-d % Mortality:** 0.8%
**Total Pre-aeration Time (mins):** 30
**Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N):** Y

**Thermometer:** CH 2
**D.O. meter/probe:** 2 / D2
**Cond./Salinity meter/probe:** 2 / LP2
**pH meter/probe:** 2 / P2

| Undiluted Sample WQ | | | |
|---|---|---|---|
| Parameters | Initial WQ | Adjustment | 30 min WQ |
| Temp °C | 14.0 | | 14.0 |
| D.O. (mg/L) | 5.0 | | 7.5 |
| pH | 7.3 | | 7.5 |
| Cond. (µS/cm) | 1686 | | 1689 |
| Salinity (ppt) | 0.8 | | 0.8 |

| Concentration | # Survivors | | | | | | | Temperature (°C) | | | | | Dissolved Oxygen (mg/L) | | | | | pH | | | | | Conductivity (µS/cm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (% v/v) | 1 | 2 | 4 | 24 | 48 | 72 | 96 | 0 | 24 | 48 | 72 | 96 | 0 | 24 | 48 | 72 | 96 | 0 | 24 | 48 | 72 | 96 | 0 | 96 |
| Ctrl | | | | 10 | 10 | 10 | 10 | 14.0 | 14.5 | 14.5 | 15.0 | 14.5 | 10.1 | 9.8 | 9.9 | 9.9 | 9.1 | 7.0 | 7.0 | 6.9 | 7.0 | 7.0 | 36 | 42 |
| 6.25 | | | | 10 | 10 | 10 | 10 | 14.0 | 14.5 | 14.5 | 15.0 | 14.5 | 10.0 | 10.0 | 9.8 | 9.9 | 9.5 | 7.1 | 7.2 | 7.1 | 7.1 | 7.3 | 135 | 139 |
| 12.5 | | | | 10 | 10 | 10 | 10 | 14.0 | 14.5 | 14.5 | 15.0 | 14.5 | 9.9 | 9.9 | 9.9 | 9.9 | 9.7 | 7.2 | 7.3 | 7.3 | 7.2 | 7.5 | 238 | 243 |
| 25 | | | | 10 | 10 | 10 | 10 | 14.0 | 14.5 | 14.5 | 15.0 | 14.5 | 9.3 | 9.9 | 9.9 | 9.9 | 9.7 | 7.2 | 7.9 | 7.7 | 7.7 | 7.9 | 490 | 495 |
| 50 | | | | 10 | 10 | 10 | 10 | 14.0 | 14.5 | 14.5 | 15.0 | 14.5 | 8.7 | 10.0 | 9.7 | 9.9 | 9.8 | 7.3 | 8.1 | 8.2 | 8.1 | 8.2 | 823 | 828 |
| 100 | | | | 10 | 9 | 8 | 8 | 14.0 | 14.5 | 14.5 | 15.0 | 14.5 | 7.5 | 9.9 | 9.7 | 9.7 | 9.8 | 7.5 | 8.6 | 8.6 | 8.6 | 8.7 | 1689 | 1692 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Initials | | | | RC | AP | EV | RC | RC | RC | AP | EV | RC | RC | RC | AP | EV | RC | RC | RC | AP | EV | RC | RC | RC |

**Sample Description/Comments:** Very turbid, dark brown liquid, pulp mill odour, no particulates

**Fish Description at 96 h** Ctrl, 6.25, 12.5 → fish appear normal; 25, 50, 100 → fish appear dark

**Number of Stressed Fish at 96 h** Ctrl, 6.25, 12.5 → 0, 25, 50, 100 → 10, 10, 8

**Other Observations:**

**Reviewed by:** [signature]

**Date Reviewed:** March 16, 2018

Version 2.5; Issued July 19, 2017

Nautilus Environmental Company Inc.

## *Daphnia magna* Summary Sheet

Client: Mackenzie
Work Order No.: 180348

Start Date/Time: March 7, 2018 @ 1630h
Test Species: *Daphnia magna*
Set up by: CW

**Sample Information:**

Sample ID: #2B0-Grab-Mar. 06/18
Sample Date: March 6, 2018
Date Received: March 7, 2018
Sample Volume: 2 x 20L

**Test Validity Criteria:**

≥ 90% mean control survival and/or mobility and ≤2 daphnids exhibit immobility and/or mortality in any single control replicate.
**WQ Ranges:**
T (°C) = 20 ± 2; DO (mg/L) = 3.5 to 9.4; pH = 6 to 8.5

**Test Organism Information:**

Broodstock No.: 020718K
Age of young (Day 0): <24 h
Avg No. young per brood in previous 7 d: 24
Mortality (%) in previous 7 d: 0
Days to first brood: 11

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: DmDC7
Stock Solution ID: 18Na01
Date Initiated: March 7, 2018
48-h LC50 (95% CL): 7.8 (5.5 - 11.0) g/L NaCL

Reference Toxicant Mean and Historical Range: 6.0 (4.3 - 8.4) g/L NaCL
Reference Toxicant CV (%): 18

Test Results: The 48h LC50 is estimated to be >100% (v/v)

Reviewed by: [signature]

Date reviewed: March 16, 2018

## Freshwater Acute
## 48 Hour Toxicity Test Data Sheet

Client: Mackenzie Pulp
Sample ID: #280 - Grab - Mar. 06/18
Work Order No.: 180348

Start Date/Time: Mar 7/2018 @ 1630h
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: D.magna
Set up by: CW

Thermometer: CER#5 pH meter/probe: 3 / 3 DO meter/probe: 3 / 3 Cond./Salinity meter/probe: 3 / 3

| Concentration (%v/v) | Rep | Number of Live Organisms 24 | 48 | No. Immobilized 48 | Temperature (°C) 0 | 24 | 48 | Dissolved oxygen (mg/L) 0 | 24 | 48 | pH 0 | 24 | 48 | Conductivity (µS/cm) 0 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | A | 10 | 10 | 0 | 18.5 | 19.0 | 19.0 | 9.1 | 8.9 | 7.9 | 7.5 | 7.6 | 7.4 | 344 | 346 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 6.25 | A | 10 | 10 | 0 | 18.5 | 19.0 | 19.5 | 8.3 | 8.7 | 8.1 | 7.2 | 7.6 | 7.5 | 452 | 457 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 12.5 | A | 10 | 10 | 0 | 18.5 | 19.0 | 19.5 | 8.4 | 8.5 | 8.1 | 7.2 | 7.6 | 7.6 | 555 | 557 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 25 | A | 10 | 10 | 0 | 18.5 | 19.0 | 19.5 | 8.4 | 7.9 | 7.8 | 7.3 | 7.6 | 7.6 | 774 | 756 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 50 | A | 10 | 10 | 0 | 18.5 | 19.0 | 19.5 | 8.3 | 7.5 | 7.3 | 7.3 | 7.6 | 7.6 | 889 | 896 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 100 | A | 10 | 10 | 0 | 19.5 | 19.0 | 19.5 | 7.5 | 6.0 | 6.1 | 6.9 | 7.7 | 7.8 | 1694 | 1685 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| Technician Initials | | CW | CW | CW | CW | CW | CW | CW | CW | CW | CW | CW | CW | CW | CW |

| Concentration | Hardness* | Alkalinity* |
|---|---|---|
| | *(mg/L as CaCo3) | |
| Control (MHW) | 100 | 64 |
| Highest conc. | 260 | 260 |
| Hardness adjusted | — | — |

| | Initial WQ | Adjustment | Adjusted WQ |
|---|---|---|---|
| Temp (°C) | 19.5 | | |
| DO (mg/L) | 7.5 | | |
| pH | 6.9 | | |
| Cond (µS/cm) | 1694 | | |
| Salinity (ppt) | 0.8 | | |

Comments:

Mortality: Heartbeat checked under microscope, No

Sample Description: turbid, dark brown, pulp odour, no particulates

Batch#: 0207 RA 7-d previous # young/brood: 24 Previous 7-d Mortality (%): 0 Day of 1st Brood: 11

Reviewed by: Date reviewed: March 16, 2018

# APPENDIX C – Chain-of-custody form

# NAUTILUS ENVIRONMENTAL

**TESTING LOCATION (Please Circle)**

**Burnaby** (●)
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

**Calgary** ( )
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121

WO# 18034 18034

## Chain of Custody

Date 31/10/17 Page __ of __

**Report to:**

| | |
|---|---|
| Company | Mackenzie Pulp Mill Corporation |
| Address | PO Box 2809, 1000 Coquiwaldi Rd. |
| City/Prov/PC | Mackenzie, BC, V0J 2C0 |
| Contact | Randeep Sandhu |
| Phone | 250-997-2444 |
| Email | RSandhu@mackenziepulp.com |

**Invoice To:**

| | |
|---|---|
| Company | Mackenzie Pulp Mill Corporation |
| Address | PO Box 2809, 1000 Coquiwaldi Rd. |
| City/Prov/PC | Mackenzie, BC, V0J 2C0 |
| Contact | Kim Hornett |
| Phone | 250-997-2473 |
| Email | AP@mackenziepulp.com |
| PO No. | 43011427 |

**Sample Collection By:** RS

**Sample Type:** Grab (●) OR Composite ( )

**ANALYSES REQUIRED**

| | SAMPLE ID | DATE (DD/MM/YY) | TIME | MATRIX | # OF CONTAINERS AND VOLUME (e.g. 1 x 20 L) | COMMENTS | 48-h D. magna LC50 | 96-h RBT LC50 | 7-d C. dubia | 72-h P. subcapitata | 96-h RBT LC50 - pH control | | | | | | Receipt Temperature (°C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | #2BO-Grab-Mar. 06/18 | 06/03/18 | 08:00 | water | 2 x 20 L | | ✓ | ✓ | | | | | | | | | 12 |
| 2 | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | |

**SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)**

Confirmation receipt to Randeep required

**SAMPLE RECEIPT DETAILS (LABORATORY)**

| | | | |
|---|---|---|---|
| 1. Total No. of Containers | 2 | 4. Ice Present in Cooler? | (Y)/N |
| 2. Courier | Loomis | 5. Seal Present? | (Y)/N |
| 3. Good Condition? | (Y)/N | 6. Initials Present on Seal? | Y/(N) |

**SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)**

**RELINQUISHED BY (CLIENT)**

Randeep Sandhu (Printed Name) (Signature)

Mack (Company) 06/03/18 1100 (Date DD/MM/YY and Time)

**RECEIVED BY (LABORATORY)**

Christine Martinez (Printed Name) CM (Signature)

Nautilus (Company) March 07/18 @ 11:10 (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

**Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.**

END OF REPORT

NAUTILUS
ENVIRONMENTAL

# Acute Toxicity Test Results

Sample #2BO-Grab-Mar. 13/18,
collected March 13, 2018

Final Report

April 2, 2018

Submitted to: **Mackenzie Pulp Mill Corporation**
Mackenzie, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

## SAMPLE INFORMATION

| Sample ID | Dates | | | Receipt temperature |
|---|---|---|---|---|
| | Collected | Received | *Daphnia magna* test initiation | |
| #2BO-Grab-Mar. 13/18 | 13-Mar-18 at 0700h | 14-Mar-18 at 1135h | 15-Mar-18 at 1640 | 8.9°C |

## TEST

- *Daphnia magna* 48-h LC50 test

## RESULTS

### Toxicity test results

| Sample ID | LC50 (%v/v) |
|---|---|
| #2BO-Grab-Mar. 13/18 | >100 |

## QA/QC

| QA/QC summary | *Daphnia magna* |
|---|---|
| Reference toxicant LC50 (95% CL) | 7.8 (5.5 – 11.0) g/L NaCl[1] |
| Reference toxicant historical mean (2 SD range) | 6.0 (4.3 – 8.4) g/L NaCl |
| Reference toxicant CV | 18% |
| Organism health history | Acceptable |
| Protocol deviations | None |
| Water quality range deviations | None |
| Control performance | Acceptable |
| Test performance | Valid |

[1] Test date: March 7, 2018, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist

Reviewed By:
Edmund Canaria, R.P.Bio
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

# APPENDIX A – Summary of test conditions

**Table 1. Summary of test conditions: 48-h *Daphnia magna* LC50 test.**

| | |
|---|---|
| Test species | *Daphnia magna* |
| Organism source | In-house culture |
| Organism age | <24-hour old neonates |
| Test type | Static |
| Test duration | 48 hours |
| Test vessel | 250-mL glass beaker |
| Test volume | 200 mL |
| Test solution depth | 6 cm |
| Test concentrations | Five concentrations, plus laboratory control |
| Test replicates | 1 per treatment |
| Number of organisms | 10 per replicate |
| Control/dilution water | Moderately-hard reconstituted water + 2.5 µg/L Se |
| Test solution renewal | None |
| Test temperature | 20 ± 2°C |
| Feeding | None |
| Light intensity | 400 to 800 lux |
| Photoperiod | 16 hours light / 8 hours dark |
| Aeration | None |
| Test measurements | Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily |
| Test protocol | Environment Canada (2000), EPS 1/RM/14, with 2016 amendments |
| Statistical software | CETIS Version 1.8.7 |
| Test endpoints | Survival (48-hour LC50) |
| Test acceptability criterion for controls | Survival ≥90% |
| Reference toxicant | Sodium chloride (NaCl) |

# APPENDIX B – Toxicity test data

## *Daphnia magna* Summary Sheet

Client: Mackenzie Pulp
Work Order No.: 180382

Start Date/Time: March 15, 2018 @ 1640h
Test Species: *Daphnia magna*
Set up by: CW

**Sample Information:**

Sample ID: #2 BO - Grab - Mar. 13/18
Sample Date: March 13, 2018
Date Received: March 14, 2018
Sample Volume: 2 ft L

**Test Validity Criteria:**
**≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.**
**WQ Ranges:**
**T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5**

**Test Organism Information:**

Broodstock No.: 022218B
Age of young (Day 0): <24 h
Avg No. young per brood in previous 7 d: 21
Mortality (%) in previous 7 d: 7
Days to first brood: 9

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: DmDC7
Stock Solution ID: 18Na01
Date Initiated: March 7, 2018
48-h LC50 (95% CL): 7.8 (5.5 - 11.0) g/L NaCL

Reference Toxicant Mean and Historical Range: 6.0 (4.3 - 8.4) g/L NaCL
Reference Toxicant CV (%): 18

Test Results: The 48h LC50 is estimated to be >100% (v/v)

Reviewed by: [signature]

Date reviewed: April 2, 2018

# Freshwater Acute
## 48 Hour Toxicity Test Data Sheet

Client: ~~Ho~~ OW Mackenzie Pulp
Sample ID: #280 GRAB - Mar 13'18
Work Order No.: 180382

Start Date/Time: Mar 15/2018 16~~30~~ 40h
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: D.magna
Set up by: CW

Thermometer: CER#5 pH meter/probe: 3 / 3 DO meter/probe: 3 / 3 Cond./Salinity meter/probe: 3 / 3

| Concentration (%v/v) | Rep | Number of Live Organisms 24 | 48 | No. Immobilized 48 | Temperature (°C) 0 | 24 | 48 | Dissolved oxygen (mg/L) 0 | 24 | 48 | pH 0 | 24 | 48 | Conductivity (µS/cm) 0 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | A | 10 | 10 | 0 | 18.0 | 19.5 | 20.0 | 9.4 | 8.5 | 8.6 | 7.4 | 7.4 | 7.9 | 337 | 346 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 6.25 | A | 10 | 10 | 0 | 18.5 | | 20.0 | 9.0 | 8.3 | 8.4 | 7.4 | 7.5 | 7.9 | 434 | 436 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 12.5 | A | 10 | 10 | 0 | 18.5 | | 20.0 | 9.0 | 8.1 | 8.1 | 7.4 | 7.5 | 7.9 | 509 | 511 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 25 | A | 10 | 10 | 0 | 18.5 | | 20.0 | 8.7 | 7.5 | 7.9 | 7.4 | 7.5 | 7.8 | 750 | 745 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 50 | A | 10 | 10 | 0 | 19.0 | | 20.0 | 7.9 | 6.8 | 7.1 | 7.4 | 7.5 | 7.8 | 1078 | 1069 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 100 | A | 10 | 10 | 0 | 19.0 | | 20.0 | 7.2 | 5.0 | 6.4 | 7.0 | 7.6 | 7.8 | 1935 | 1821 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| Technician Initials | | CW | | | CW | CW | | CW | CW | | CW | CW | | CW | |

| | Hardness* | Alkalinity* |
|---|---|---|
| Concentration | *(mg/L as CaCo3) | |
| Control (MHW) | ~~72~~ 100 | ~~100~~ 72 |
| Highest conc. | 510 | 300 |
| Hardness adjusted | — | — |

| | Initial WQ | Adjustment | Adjusted WQ |
|---|---|---|---|
| Temp (°C) | 19.0 | | 19.0 |
| DO (mg/L) | 1.0 | 10 min aeration | 5.0 |
| pH | 7.0 | | 7.2 |
| Cond (µS/cm) | 1932 | | 1935 |
| Salinity (ppt) | 0.9 | | 0.9 |

Comments:

Mortality: Heartbeat checked under microscope NO

Sample Description: Slightly cloudy brown liquid, pulp odour, no particulates.

Batch#: 0222186 7-d previous # young/brood: ~~1621~~ CW Previous 7-d Mortality (%): ~~14~~ CW 7 Day of 1st Brood: ~~8~~ CW 9

Reviewed by: Date reviewed: April 2, 2018

# APPENDIX C – Chain-of-custody form

# NAUTILUS ENVIRONMENTAL

**TESTING LOCATION (Please Circle)**

**Burnaby** (●)
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

**Calgary** ( )
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121

## Chain of Custody

WO# 180382

Date 31/10/17 Page __ of __

**Report to:**

| | |
|---|---|
| Company | Mackenzie Pulp Mill Corporation |
| Address | PO Box 2609, 1000 Coquiwaldi Rd. |
| City/Prov/PC | Mackenzie, BC, V0J 2C0 |
| Contact | Randeep Sandhu |
| Phone | 250-997-2444 |
| Email | RSandhu@mackenziepulp.com |

**Invoice To:**

| | |
|---|---|
| Company | Mackenzie Pulp Mill Corporation |
| Address | PO Box 2609, 1000 Coquiwaldi Rd. |
| City/Prov/PC | Mackenzie, BC, V0J 2C0 |
| Contact | Kim Hornett |
| Phone | 250-997-2473 |
| Email | AP@mackenziepulp.com |
| PO No. | 43011427 |

**Sample Collection By:** RS

**Sample Type:** Grab (●) OR Composite ( )

| | SAMPLE ID | DATE (DD/MM/YY) | TIME | MATRIX | # OF CONTAINERS AND VOLUME (e.g. 1 x 20 L) | COMMENTS | 48-h D. magna LC50 | 96-h RBT LC50 | 7-d C. dubia | 72-h P. subcapitata | 96-h RBT LC50 - pH control | | | | | | Receipt Temperature (°C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | #2BO-Grab-Mar. 13/18 | 13/03/18 | 07:00 | water | 2 x 1 L | | ✓ | | | | | | | | | | 8.9 |
| 2 | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | |

**SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)**

Confirmation receipt to Randeep required

**SAMPLE RECEIPT DETAILS (LABORATORY)**

| | | | |
|---|---|---|---|
| 1. Total No. of Containers | 2 | 4. Ice Present in Cooler? | Y/N |
| 2. Courier | Loomis | 5. Seal Present? | Y/N |
| 3. Good Condition? | Y/N | 6. Initials Present on Seal? | Y/N |

**SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)**

**RELINQUISHED BY (CLIENT)**

Randeep K. Sandhu (Printed Name) (Signature)

Mackenzie Pulp (Company) 13/03/18 1100 (Date DD/MM/YY and Time)

**RECEIVED BY (LABORATORY)**

Nimi Tran (Printed Name) (Signature)

Nautilus Environmental (Company) 14/03/18 @ 1125h (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

**Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.**

Form 020; Version 1.2; Revised by CC 2016/10/06

END OF REPORT

NAUTILUS ENVIRONMENTAL

# Acute Toxicity Test Results

Sample #2BO-Grab-Mar. 20/18,
collected March 20, 2018

Final Report

April 5, 2018

Submitted to: **Mackenzie Pulp Mill Corporation**
Mackenzie, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

## SAMPLE INFORMATION

| Sample ID | Dates | | | Receipt temperature |
|---|---|---|---|---|
| | Collected | Received | *Daphnia magna* test initiation | |
| #2BO-Grab-Mar. 20/18 | 20-Mar-18 at 0700h | 21-Mar-18 at 1100h | 21-Mar-18 at 1530h | 5.5°C |

## TEST

- *Daphnia magna* 48-h LC50 test

## RESULTS

### Toxicity test results

| Sample ID | LC50 (%v/v) |
|---|---|
| #2BO-Grab-Mar. 20/18 | >100 |

## QA/QC

| QA/QC summary | *Daphnia magna* |
|---|---|
| Reference toxicant LC50 (95% CL) | 4.5 (3.8 – 5.4) g/L NaCl[1] |
| Reference toxicant historical mean (2 SD range) | 6.3 (4.4 – 9.0) g/L NaCl |
| Reference toxicant CV | 20% |
| Organism health history | Acceptable |
| Protocol deviations | None |
| Water quality range deviations | None |
| Control performance | Acceptable |
| Test performance | Valid |

[1] Test date: March 30, 2018, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist

Reviewed By:
Edmund Canaria, R.P.Bio
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

# APPENDIX A – Summary of test conditions

**Table 1. Summary of test conditions: 48-h *Daphnia magna* LC50 test.**

| | |
|---|---|
| Test species | *Daphnia magna* |
| Organism source | In-house culture |
| Organism age | <24-hour old neonates |
| Test type | Static |
| Test duration | 48 hours |
| Test vessel | 250-mL glass beaker |
| Test volume | 200 mL |
| Test solution depth | 6 cm |
| Test concentrations | Five concentrations, plus laboratory control |
| Test replicates | 1 per treatment |
| Number of organisms | 10 per replicate |
| Control/dilution water | Moderately-hard reconstituted water + 2.5 µg/L Se |
| Test solution renewal | None |
| Test temperature | 20 ± 2°C |
| Feeding | None |
| Light intensity | 400 to 800 lux |
| Photoperiod | 16 hours light / 8 hours dark |
| Aeration | None |
| Test measurements | Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily |
| Test protocol | Environment Canada (2000), EPS 1/RM/14, with 2016 amendments |
| Statistical software | CETIS Version 1.8.7 |
| Test endpoints | Survival (48-hour LC50) |
| Test acceptability criterion for controls | Survival ≥90% |
| Reference toxicant | Sodium chloride (NaCl) |

# APPENDIX B – Toxicity test data

# *Daphnia magna* Summary Sheet

Client: Mackenzie Pulp Mill Corporation
Work Order No.: 180428

Start Date/Time: Mar 21/2018@ 1530h
Test Species: *Daphnia magna*
Set up by: YYL

**Sample Information:**

Sample ID: #2BD-Grab-Mar.20/18
Sample Date: Mar.20/2018
Date Received: Mar 21/2018
Sample Volume: 2x1L

**Test Validity Criteria:**

≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.

**WQ Ranges:**

T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5

**Test Organism Information:**

Broodstock No.: 030718A
Age of young (Day 0): <24 h
Avg No. young per brood in previous 7 d: 16
Mortality (%) in previous 7 d: 0
Days to first brood: 10

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: DM DC 8
Stock Solution ID: 18Na 01
Date Initiated: March 30, 2018
48-h LC50 (95% CL): 4.5 (3.8 – 5.4) g/LNaCL

Reference Toxicant Mean and Historical Range: 6.3 (4.4 – 9.0) g/L NaCL
Reference Toxicant CV (%): 20%

Test Results: The 48h LC50 is estimated to be >100% (v/v).

Reviewed by: [signature]

Date reviewed: April 3, 2018

## Freshwater Acute
## 48 Hour Toxicity Test Data Sheet

Client: Mackenzie Pulp Mill Corporation
Sample ID: #2B0 - Grab - Mar.20/18
Work Order No.: 1804290

Start Date/Time: March 21, 2018 @ 1530h
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: *D.magna*
Set up by: YM

Thermometer: CER#5 pH meter/probe: 3 / 3 DO meter/probe: 3 / 3 Cond./Salinity meter/probe: 3 / 3

| Concentration (%v/v) | Rep | Number of Live Organisms 24 | 48 | No. Immobilized 48 | Temperature (°C) 0 | 24 | 48 | Dissolved oxygen (mg/L) 0 | 24 | 48 | pH 0 | 24 | 48 | Conductivity (µS/cm) 0 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| control | A | 10 | 10 | 0 | 18.5 | 19.5 | 20.5 | 8.6 | 8.2 | 8.1 | 7.6 | 7.5 | 7.5 | 345 | 348 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 6.25 | A | 10 | 10 | 0 | 18.5 | 19.5 | 20.0 | 8.5 | 8.1 | 8.0 | 7.6 | 7.4 | 7.6 | 440 | 450 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 12.5 | A | 10 | 10 | 0 | 18.5 | 19.5 | 20.5 | 8.5 | 8.0 | 7.7 | 7.4 | 7.5 | 7.7 | 519 | 527 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 25 | A | 10 | 10 | 0 | 18.5 | 19.5 | 20.5 | 8.5 | 7.6 | 7.4 | 7.3 | 7.5 | 7.7 | 703 | 717 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 50 | A | 10 | 10 | 0 | 18.5 | 19.5 | 20.5 | 8.0 | 7.0 | 6.6 | 7.2 | 7.6 | 7.8 | 1009 | 1013 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 100 | A | 10 | 10 | 0 | 19.0 | 19.5 | 21.0 | 6.6 | 5.3 | 4.7 | 7.1 | 7.6 | 7.8 | 1684 | 1686 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| Technician Initials | | CW | CW | CW | YM | CW | CW | YM | CW | CW | YM | CW | CW | YM | CW |

| Concentration | Hardness* | Alkalinity* |
|---|---|---|
| | *(mg/L as CaCo3) | |
| Control (MHW) | 100 | 74 |
| Highest conc. | 440 | 272 |
| Hardness adjusted | — | — |

| | Initial WQ | Adjustment | Adjusted WQ |
|---|---|---|---|
| Temp (°C) | 19.0 | | |
| DO (mg/L) | 6.6 | | |
| pH | 7.1 | | |
| Cond (µS/cm) | 1684 | | |
| Salinity (ppt) | 0.8 | | |

Comments:

Mortality: Heartbeat checked under microscope No

Sample Description: Clear, brown liquid, no odour, fluffy brown particulates.

Batch#: 030718A 7-d previous # young/brood: 16 Previous 7-d Mortality (%): 0 Day of 1st Brood: 6

Reviewed by: Date reviewed: April 3, 2018

# APPENDIX C – Chain-of-custody form

**NAUTILUS ENVIRONMENTAL**

**TESTING LOCATION (Please Circle)**

**Burnaby** (●)
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

**Calgary** ( )
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121

# Chain of Custody

WO# 180428

Date 31/10/17 Page __ of __

**Report to:**

| | |
|---|---|
| Company | Mackenzie Pulp Mill Corporation |
| Address | PO Box 2609, 1000 Coquiwaldi Rd. |
| City/Prov/PC | Mackenzie, BC, V0J 2C0 |
| Contact | Randeep Sandhu |
| Phone | 250-997-2444 |
| Email | RSandhu@mackenziepulp.com |

**Invoice To:**

| | |
|---|---|
| Company | Mackenzie Pulp Mill Corporation |
| Address | PO Box 2609, 1000 Coquiwaldi Rd. |
| City/Prov/PC | Mackenzie, BC, V0J 2C0 |
| Contact | Kim Hornett |
| Phone | 250-997-2473 |
| Email | AP@mackenziepulp.com |
| PO No. | 43011427 |

**Sample Collection By:** VH

**Sample Type:** Grab (●) OR Composite ( )

**ANALYSES REQUIRED**

| | SAMPLE ID | DATE (DD/MM/YY) | TIME | MATRIX | # OF CONTAINERS AND VOLUME (e.g. 1 x 20 L) | COMMENTS | 48-h D. magna LC50 | 96-h RBT LC50 | 7-d C. dubia | 72-h P. subcapitata | 96-h RBT LC50 - pH contr | | | | | | Receipt Temperature (°C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | #2BO-Grab-Mar. 20/18 | 20/03/18 | 07:00 | water | 2 x 1 L | | ✓ | | | | | | | | | | 5.5 |
| 2 | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | |

**SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)**

Confirmation receipt to Randeep required

**SAMPLE RECEIPT DETAILS (LABORATORY)**

| | | | |
|---|---|---|---|
| 1. Total No. of Containers | 2 | 4. Ice Present in Cooler? | (Y) N |
| 2. Courier | Loomis | 5. Seal Present? | (Y) N |
| 3. Good Condition? | (Y) N | 6. Initials Present on Seal? | Y (N) |

**SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)**

**RELINQUISHED BY (CLIENT)**

Victoria Hodson (Printed Name) — (Signature)

Mackenzie Pulp Mill Corp (Company) — 20/03/2018 11:00 (Date DD/MM/YY and Time)

**RECEIVED BY (LABORATORY)**

Nair Yamamoto (Printed Name) — NY (Signature)

Nautilus (Company) — Mar 21/18 @ 11:00 (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

**Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.**

Form 020; Version 1.2; Revised by CC 2016/10/06

END OF REPORT

NAUTILUS ENVIRONMENTAL

# Acute Toxicity Test Results

Sample #2BO-Grab-Mar. 27/18,
collected March 27, 2018

Final Report

April 11, 2018

Submitted to: **Mackenzie Pulp Mill Corporation**
Mackenzie, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

## SAMPLE INFORMATION

| Sample ID | Dates | | | Receipt temperature |
|---|---|---|---|---|
| | Collected | Received | *Daphnia magna* test initiation | |
| #2BO-Grab-Mar. 27/18 | 27-Mar-18 at 0700h | 28-Mar-18 at 1105h | 30-Mar-18 at 1520h | 8.8°C |

## TEST

- *Daphnia magna* 48-h LC50 test

## RESULTS

### Toxicity test results

| Sample ID | LC50 (%v/v) |
|---|---|
| #2BO-Grab-Mar. 27/18 | >100 |

## QA/QC

| QA/QC summary | *Daphnia magna* |
|---|---|
| Reference toxicant LC50 (95% CL) | 4.5 (3.8 – 5.4) g/L NaCl[1] |
| Reference toxicant historical mean (2 SD range) | 6.3 (4.4 – 9.0) g/L NaCl |
| Reference toxicant CV | 20% |
| Organism health history | Acceptable |
| Protocol deviations | None |
| Water quality range deviations | None |
| Control performance | Acceptable |
| Test performance | Valid |

[1] Test date: March 30, 2018, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist

Reviewed By:
Edmund Canaria, R.P.Bio
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

# APPENDIX A – Summary of test conditions

**Table 1. Summary of test conditions: 48-h *Daphnia magna* LC50 test.**

| | |
|---|---|
| Test species | *Daphnia magna* |
| Organism source | In-house culture |
| Organism age | <24-hour old neonates |
| Test type | Static |
| Test duration | 48 hours |
| Test vessel | 250-mL glass beaker |
| Test volume | 200 mL |
| Test solution depth | 6 cm |
| Test concentrations | Five concentrations, plus laboratory control |
| Test replicates | 1 per treatment |
| Number of organisms | 10 per replicate |
| Control/dilution water | Moderately-hard reconstituted water + 2.5 µg/L Se |
| Test solution renewal | None |
| Test temperature | 20 ± 2°C |
| Feeding | None |
| Light intensity | 400 to 800 lux |
| Photoperiod | 16 hours light / 8 hours dark |
| Aeration | None |
| Test measurements | Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily |
| Test protocol | Environment Canada (2000), EPS 1/RM/14, with 2016 amendments |
| Statistical software | CETIS Version 1.8.7 |
| Test endpoints | Survival (48-hour LC50) |
| Test acceptability criterion for controls | Survival ≥90% |
| Reference toxicant | Sodium chloride (NaCl) |

# APPENDIX B – Toxicity test data

## *Daphnia magna* Summary Sheet

Client: Mackenzie Pulp Mill
Work Order No.: ~~#280 Grab Mar 27/18~~ 180469

Start Date/Time: Mar 30/2018 @ 1520h
Test Species: *Daphnia magna*
Set up by: YYL

**Sample Information:**

Sample ID: #280 - Grab - Mar - 27/18
Sample Date: Mar 27/2018
Date Received: Mar 28/2018
Sample Volume: 2x1L

**Test Validity Criteria:**

≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.

**WQ Ranges:**

T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5

**Test Organism Information:**

Broodstock No.: D30718A
Age of young (Day 0): <24 h
Avg No. young per brood in previous 7 d: 21
Mortality (%) in previous 7 d: 20
Days to first brood: 10

**NaCl Reference Toxicant Results:**

Reference Toxicant ID: DMDC8
Stock Solution ID: 18NaCl
Date Initiated: Mar. 30/2018
48-h LC50 (95% CL): 4.5 (3.8 - 5.4) g/LNaCL

Reference Toxicant Mean and Historical Range: 6.3 (4.4 - 9.0) g/L NaCL
Reference Toxicant CV (%): 20%

Test Results: ~~100~~ ow The 48h LC50 is estimated to be >100% (v/v).

Reviewed by: [signature]

Date reviewed: April 9, 2018

## Freshwater Acute
## 48 Hour Toxicity Test Data Sheet

Client: Mackenzie Pulp Mill
Sample ID: #280 - Grab - Mar. 27/18
Work Order No.: 1804469

Start Date/Time: March 30, 2018 @1520h
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: D.magna
Set up by: YM

Thermometer: CER#5 pH meter/probe: 3 / 3 DO meter/probe: 3 / 3 Cond./Salinity meter/probe: 3 / 3

| Concentration (%v/v) | Rep | Number of Live Organisms 24 | 48 | No. Immobilized 48 | Temperature (°C) 0 | 24 | 48 | Dissolved oxygen (mg/L) 0 | 24 | 48 | pH 0 | 24 | 48 | Conductivity (µS/cm) 0 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | A | 10 | 10 | 0 | 19.0 | 21.0 | 19.5 | 8.8 | 8.6 | 8.4 | 7.7 | 7.9 | 7.7 | 356 | 360 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 6.25 | A | 10 | 10 | 0 | 19.0 | 21.0 | 19.5 | 8.6 | 8.7 | 8.5 | 7.6 | 7.9 | 7.8 | 441 | 452 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 12.5 | A | 10 | 10 | 0 | 19.0 | 21.0 | 19.5 | 8.7 | 8.6 | 8.4 | 7.6 | 7.8 | 7.8 | 518 | 523 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 25 | A | 10 | 10 | 0 | 19.5 | 21.0 | 19.5 | 8.3 | 8.1 | 8.3 | 7.4 | 7.7 | 7.8 | 673 | 689 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 50 | A | 10 | 10 | 0 | 19.5 | 21.0 | 19.5 | 7.4 | 7.6 | 8.2 | 7.3 | 7.6 | 7.7 | 988 | 985 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| 100 | A | 10 | 0 | 0 | 20.0 | 21.0 | 19.5 | 4.0 | 6.0 | 7.0 | 7.1 | 7.4 | 7.7 | 1607 | 1610 |
| | B | | | | | | | | | | | | | | |
| | C | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | |
| Technician Initials | | AT | AT | AT | YM | AT | AT | YM | AT | AT | YM | AT | AT | YM | AT |

| | Hardness* | Alkalinity* |
|---|---|---|
| Concentration | *(mg/L as CaCo3) | |
| Control (MHW) | 100 | 78 |
| Highest conc. | 490 | 240 |
| Hardness adjusted | — | — |

| | Initial WQ | Adjustment | Adjusted WQ |
|---|---|---|---|
| Temp (°C) | 20.5 | | 20.0 |
| DO (mg/L) | 2.7 | (2 min aeration) | 4.0 |
| pH | 6.7 | | 7.1 |
| Cond (µS/cm) | 1625 | | 1607 |
| Salinity (ppt) | 0.8 | | 0.8 |

Comments:

Mortality: Heartbeat checked under microscope no

Sample Description: slightly turbid, amber brown, pulpy odour, some particulates

Batch#: 0307IBA 7-d previous # young/brood: 21 Previous 7-d Mortality (%): 20 Day of 1st Brood: 10

Reviewed by: Date reviewed: April 9, 2018

# APPENDIX C – Chain-of-custody form

# NAUTILUS ENVIRONMENTAL

**TESTING LOCATION (Please Circle)**

**Burnaby** (●)
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

**Calgary** ( )
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121 WO# 180469

## Chain of Custody

Date 31/10/17 Page __ of __

**Report to:**

| | |
|---|---|
| Company | Mackenzie Pulp Mill Corporation |
| Address | PO Box 2609, 1000 Coquitwaldi Rd. |
| City/Prov/PC | Mackenzie, BC, V0J 2C0 |
| Contact | Randeep Sandhu |
| Phone | 250-997-2444 |
| Email | RSandhu@mackenziepulp.com |

**Invoice To:**

| | |
|---|---|
| Company | Mackenzie Pulp Mill Corporation |
| Address | PO Box 2609, 1000 Coquitwaldi Rd. |
| City/Prov/PC | Mackenzie, BC, V0J 2C0 |
| Contact | Kim Hornett |
| Phone | 250-997-2473 |
| Email | AP@mackenziepulp.com |
| PO No. | 43011427 |

**Sample Collection By:** VH

**Sample Type:** Grab (●) OR Composite ( )

| | SAMPLE ID | DATE (DD/MM/YY) | TIME | MATRIX | # OF CONTAINERS AND VOLUME (e.g. 1 x 20 L) | COMMENTS | 48-h D. magna LC50 | 96-h RBT LC50 | 7-d C. dubia | 72-h P. subcapitata | 96-h RBT LC50 - pH control | | | | | | Receipt Temperature (°C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | #2BO-Grab-Mar. 27/18 | 27/03/18 | 07:00 | water | 2 x 1 L | | ✓ | | | | | | | | | | 8.8 |
| 2 | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | |

**SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)**

Confirmation receipt to Randeep required

**SAMPLE RECEIPT DETAILS (LABORATORY)**

| | | | |
|---|---|---|---|
| 1. Total No. of Containers | 2 | 4. Ice Present in Cooler? | (Y) / N |
| 2. Courier | Loomis | 5. Seal Present? | (Y) / N |
| 3. Good Condition? | (Y) N | 6. Initials Present on Seal? | Y / (N) |

**SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)**

**RELINQUISHED BY (CLIENT)**

Victoria Hodson (Printed Name) [signature] (Signature)

MACKENZIE PULP MILL CORP (Company) 27/03/2018 11:00am (Date DD/MM/YY and Time)

**RECEIVED BY (LABORATORY)**

Jeffrey Du (Printed Name) JD (Signature)

Nautilus (Company) Mar 28/18 (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

**Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.**

Form 020; Version 1.2; Revised by CC 2016/10/06

END OF REPORT

MACKENZIE
PULP MILL CORPORATION
A PAPER EXCELLENCE COMPANY

# Quality Assurance Data
## March 2018

| Precision | | | | | Accuracy | | | | | Blanks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Test Results | Average | % Deviation from Average | Acceptance Criteria | Date | Std. Value | Test Result | % Deviation from Standard | Acceptance Criteria | Date | Test Results mg/l | Acceptance Criteria |
| **A) Non-Filterable Residue (TSS)** | | | | | | | | | | | | |
| 06-Mar-18 | 28.10 | 28.1 | 0.1 | 15.0 | | | | | | 06-Mar-18 | -2.45 | < 2.0 mg/l |
| | 28.05 | | | | | | | | | 13-Mar-18 | -1.30 | |
| 13-Mar-18 | 38.00 | 38.5 | 1.3 | | | | | | | 20-Mar-18 | -2.80 | |
| | 39.00 | | | | | | | | | 27-Mar-18 | -3.65 | |
| 20-Mar-18 | 49.30 | 48.4 | 1.9 | | | | | | | | | |
| | 47.45 | | | | | | | | | | | |
| 27-Mar-18 | 39.80 | 39.8 | 0.0 | | | | | | | | | |
| | 39.80 | | | | | | | | | | | |
| *Note: extremely low concentrations represent greater deviation possibilities | | | | | | | | | | | | |
| **B) pH** | | | | | | | | | | | | |
| 07-Mar-18 | 7.38 | 7.38 | 0.0 | 15.0 | | | | | | Not applicable for pH test. | | |
| | 7.38 | | | | | | | | | | | |
| 14-Mar-18 | 7.44 | 7.46 | 0.3 | | | | | | | | | |
| | 7.48 | | | | | | | | | | | |
| 22-Mar-18 | 7.39 | 7.48 | 1.1 | | | | | | | | | |
| | 7.56 | | | | | | | | | | | |
| 28-Mar-18 | 7.27 | 7.28 | 0.1 | | | | | | | | | |
| | 7.28 | | | | | | | | | | | |
| **C) Nutrients** (TESTING DONE BY ALS Environmental)<br>**D) BOD** (TESTING DONE BY ALS Environmental)<br>**E) AOX** (TESTING DONE BY ECONOTECH SERVICES LTD.)<br><br>See attached Certificate of Accreditation and Final Scope of Testing documentation for Econotech Services Ltd & ALS Environmental issued by the Canadian Association for Laboratory Accreditation Inc. (CALA). Subsequent submissions will refer to this documentation.<br>See also last PT test done by Mackenzie Pulp Mill. | | | | | | | | | | | | |

# Canadian Association for Laboratory Accreditation Inc.

CALA

## Certificate of Accreditation

ALS Environmental (Vancouver)
ALS Canada Ltd.
8081 Lougheed Highway
Suite 100
Burnaby, British Columbia

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

| | |
|---|---|
| Accreditation No.: | A1719 |
| Issued On: | November 4, 2016 |
| Accreditation Date: | January 3, 2005 |
| Expiry Date: | May 5, 2019 |

President & CEO

CALA

This certificate is the property of the Canadian Association for Laboratory Accreditation Inc. and must be returned on request; reproduction must follow policy in place at date of issue. For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.cala.ca.

# Canadian Association for Laboratory Accreditation Inc.

CALA

## Certificate of Accreditation

Econotech Services Limited
852 Derwent Way
Delta, British Columbia

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

| | |
|---|---|
| Accreditation No.: | A2454 |
| Issued On: | March 30, 2016 |
| Accreditation Date: | January 3, 2005 |
| Expiry Date: | September 28, 2018 |

President & CEO

ilac-MRA

CALA

This certificate is the property of the Canadian Association for Laboratory Accreditation Inc. and must be returned on request; reproduction must follow policy in place at date of issue. For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.cala.ca.

# Canadian Association for Laboratory Accreditation Inc.

CALA

## Certificate of Accreditation

Nautilus Environmental-Calgary
Nautilus Environmental Company Inc.
#4, 6125 12th St. S.E.
Calgary, Alberta

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

CALA

Accreditation No.: A2800
Issued On: February 10, 2017
Accreditation Date: January 3, 2005
Expiry Date: August 11, 2019

President & CEO

CALA

This certificate is the property of the Canadian Association for Laboratory Accreditation Inc. and must be returned on request. reproduction must follow policy in place at date of issue For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.cala.ca

# CALA PROFICIENCY TESTING REPORT



**LABORATORY NAME:** Mackenzie Pulp Mill - Internal Compliance Lab
**STUDY DATE:** October 2017 Study
**MATRIX:** Water (Inorganic)

**PARTICIPANT NO.:** 3033

| SAMPLE | CODE | APP | ANALYTE | METHOD | N | UNITS | ASSIGNED | ±U | REPORTED | S | Z SCORE | SCORE | BIAS | SUMMARY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TEST GROUP:** Solids | | | | | | | | | | | | | | |
| C04A-1 | 033246 | | Total Suspended Solids | GRAVIMETRIC | 202 | mg/L | 22 | .2 | 18 | 2 | -2 | | | |
| C04A-2 | 033246 | | Total Suspended Solids | GRAVIMETRIC | 205 | mg/L | 68 | .5 | 64 | 6 | -.667 | | | |
| C04A-3 | 033246 | | Total Suspended Solids | GRAVIMETRIC | 203 | mg/L | 126 | .8 | 123 | 10 | -.3 | | | |
| C04A-4 | 033246 | | Total Suspended Solids | GRAVIMETRIC | 205 | mg/L | 212 | 1 | 208 | 16 | -.25 | 88 | | Acceptable |
| **TEST GROUP:** BOD/CBOD | | | | | | | | | | | | | | |
| C04B-1 | 033247 | | BOD (5 day) | D.O. METER | 115 | mg/L | 50 | 1 | 51 | 9 | .111 | | | |
| C04B-2 | 033247 | | BOD (5 day) | D.O. METER | 116 | mg/L | 58 | 1 | 62 | 10 | .4 | | | |
| C04B-3 | 033247 | | BOD (5 day) | D.O. METER | 114 | mg/L | 99 | 2 | 107 | 16 | .5 | | | |
| C04B-4 | 033247 | | BOD (5 day) | D.O. METER | 117 | mg/L | 170 | 3 | 187 | 27 | .63 | 94 | | Acceptable |
| **TEST GROUP:** COD | | | | | | | | | | | | | | |
| C04D-1 | 044972 | | COD | COLORIMETRIC | 99 | mg/L | 41 | .6 | 45 | 5 | .8 | | | |
| C04D-2 | 044972 | | COD | COLORIMETRIC | 97 | mg/L | 207 | 1 | 208 | 10 | .1 | | | |
| C04D-3 | 044972 | | COD | COLORIMETRIC | 96 | mg/L | 296 | 2 | 313 | 12 | 1.417 | | | |
| C04D-4 | 044972 | | COD | COLORIMETRIC | 99 | mg/L | 455 | 2 | 449 | 17 | -.353 | 90 | | Acceptable |
| **TEST GROUP:** pH | | | | | | | | | | | | | | |
| C15-1 | 033248 | | pH | pH METER | 250 | pH units | 4.21 | .008 | 4.19 | .1 | -.2 | | | |
| C15-2 | 033248 | | pH | pH METER | 248 | pH units | 6.59 | .008 | 6.58 | .1 | -.1 | | | |
| C15-3 | 033248 | | pH | pH METER | 247 | pH units | 2.94 | .008 | 2.97 | .1 | .3 | | | |
| C15-4 | 033248 | | pH | pH METER | 251 | pH units | 8.71 | .008 | 8.70 | .1 | -.1 | 97 | | Acceptable |

*DNS = Did Not Submit Results ± U = uncertainty of the Assigned Value