2018 Performance Presentation

Devon Canada Corporation
Jackfish SAGD Project

Commercial Scheme Approval No. 10097 (as amended)
October 2018
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Subsurface Operations
Project Background

Section 3.1.1-1
Brief Background of Scheme

3.1.1-1

- Jackfish 1, 2, and 3 utilize steam-assisted gravity drainage (SAGD) to recover bitumen from the McMurray formation
- Located 150 km south of Fort McMurray
- Jackfish 1 scheme approval granted in August 2006; first steam was August 2007
- Jackfish 2 scheme approval granted in August 2008; first steam was May 2011
- Amalgamation of Jackfish approvals (including Jackfish 3) in November 2011; first steam was July 2014
Brief Background of Scheme

3.1.1-1
# Brief Background of Scheme

## 3.1.1-1

<table>
<thead>
<tr>
<th>Asset</th>
<th>Number of Operating Pads</th>
<th>Number of Operating Well Pairs</th>
<th>Upcoming Pads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackfish 1</td>
<td>11</td>
<td>78</td>
<td>EX</td>
</tr>
<tr>
<td>Jackfish 2</td>
<td>8</td>
<td>60</td>
<td>QQ</td>
</tr>
<tr>
<td>Jackfish 3</td>
<td>6</td>
<td>53</td>
<td>III</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>25</strong></td>
<td><strong>191</strong></td>
<td>-</td>
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</table>
Geology

Section 3.1.1-2
Gross Rock Volume (GRV)

- Characterizes the complete package accessible through SAGD
- Defined by:
  - $S_o > 50\%$
  - $V_{sh} < 40\%$
  - can contain up to 3m continuous non-reservoir
  - encompasses all brecciated intervals
- $V_{sh}$ and $S_o$ are standard petrophysical curves calculated from gamma ray, resistivity, and porosity logs, and correlated to image logs and core data
Geology

Jackfish Net Continuous Bitumen Pay Definition

3.1.1-2a

Net Continuous Bitumen (NCB)*

- More conservative definition used to define continuous bitumen pay, used for pad and well pair planning

- Defined by:
  - \( V_{sh} < 40\% \)
  - can contain up to 1m continuous non-reservoir
  - excludes breccias that do not meet \( V_{sh} \) cutoff
  - base defined by producer (actual or estimated) elevation

- \( V_{sh} \) and \( S_o \) are standard petrophysical curves calculated from gamma ray, resistivity, and porosity logs, and correlated to image logs and core data

*Prior submissions defined net pay based on a net-to-gross ratio calculation, not a net continuous bitumen pay zone
# Geology

## Jackfish Volumetrics and Average Reservoir Properties

### 3.1.1-2b

<table>
<thead>
<tr>
<th>Property</th>
<th>Area (Ha)</th>
<th>OBIP ($10^6 m^3$)</th>
<th>Avg. GRV thickness (m)*</th>
<th>Avg. Oil Saturation (So)*</th>
<th>Avg. Porosity (%)*</th>
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<tr>
<td>Project Area</td>
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<td>367.3</td>
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<td>Development Area</td>
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<td>325.0</td>
<td>27.0</td>
<td>67.4</td>
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*Prior submissions calculated OBIP and average parameters only within the net pay portion, not for the complete GRV interval

<table>
<thead>
<tr>
<th>Property</th>
<th>Jackfish 1</th>
<th>Jackfish 2</th>
<th>Jackfish 3</th>
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</thead>
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<tr>
<td>OBIP ($10^6 m^3$)**</td>
<td>75.3</td>
<td>81.3</td>
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<td>Avg. Reservoir Depth (mTVD)</td>
<td>400</td>
<td>459</td>
<td>428</td>
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<tr>
<td>Avg. Reservoir Depth (mASL)</td>
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<tr>
<td>Avg. Original Reservoir Pressure (kPa)</td>
<td>2,700 @ scheme startup</td>
<td>2,700 @ scheme startup</td>
<td>2,700 @ scheme startup</td>
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<tr>
<td>Avg. Reservoir Temp. (°C)</td>
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<tr>
<td>Avg. Kh (md)</td>
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<td>3,000</td>
<td>4,000</td>
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<tr>
<td>Avg. Kv (md)</td>
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<td>1,500</td>
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<tr>
<td>Avg. Phi (%)</td>
<td>33</td>
<td>33</td>
<td>33</td>
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<tr>
<td>Avg. Bitumen Viscosity (Cp)</td>
<td>1,000,000+</td>
<td>1,000,000+</td>
<td>1,000,000+</td>
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<tr>
<td>Original Bottom Water Pressure (kPa)</td>
<td>2,300</td>
<td>2,300</td>
<td>2,300</td>
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</table>

**Total for all producing, drilled, and planned pads
Geology

*Jackfish Gross Rock Volume Pay Thickness*

3.1.1-2c
Geology

*Prior submissions defined net pay based on a net-to-gross ratio calculation, not a net continuous bitumen pay zone*
Geology

*Jackfish McMurray Water Contact to Paleozoic Isopach*

3.1.1-2c
Geology

*Jackfish Top Structure of Gross Rock Volume*

3.1.1-2d
Geology

*Jackfish Base Structure of Gross Rock Volume*

3.1.1-2d
Geology

Jackfish 1 Representative Well Log

3.1.1-2e
Geology

Jackfish 2 Representative Well Log

3.1.1-2e
Geology

Jackfish 3 Representative Well Log

3.1.1-2e
Geology

Jackfish 2018 Drilling Program and Cored Wells

3.1.1-2f

Special Core Analysis
No special core analysis conducted on core from the 2018 drilling program.

Project Area
2017-2018 Wells: 26
2017-2018 Core: 12
Total Well Count: 459
Total Core: 208
No new implications on ultimate recovery at this point in time.
Geology

Jackfish 1 Representative Structural Cross-section

3.1.1-2i
Geology

3.1.1-2i

B

AA01-29-075-07W4/0

00/10-28-075-07W4/0

00/09-28-075-07W4/0

280m

AA08-28-075-07W4/0

1530m

GR

MD

RESM

DPLB

DPLN_SO

GR

MD

RESM

DPLB

DPLN_SO

GR

MD

RESM

DPLB

DPLN_SO

GR

MD

RESM

DPLB

DPLN_SO

Cheyenne Fm. Caprock
Waskesiu Mbr. SG
McMurray Fm
GRV Top
NCB Top
NCB Base
GRV Base
Devonian Unconformity
Geology

Jackfish 3 Representative Structural Cross-section

3.1.1-2i
Interpretation complete on 2015 mini frac program:
- Lowest Wabiskaw shale fracture closure gradient of 14.1kPa/m at AA/10-31
- Fracture closure gradient of 18.6kPa/m from the 2011 mini frac program was utilized for the earlier MOP approval
- Category 2 Amendment to adjust the Jackfish MOP submitted in Q3 2016 and subsequently approved
Seismic

*Historical Surveys*

3.1.1-6a

- No seismic was acquired in 2018
- Historically, seismic acquisition is extensive, totaling 21.7 km²
Seismic

2017 4D Results

3.1.1-6a

- Time delay is in direct relation to steam chamber development
- Colour gradient represents Paleozoic reflector time change from 2003 (baseline) to 2017
Jackfish 1
Accumulated Displacement 2008-2018

3.1.1-2k

<table>
<thead>
<tr>
<th>Cumulative Ground Motion [mm]</th>
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<tr>
<td>&gt; 150</td>
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<tr>
<td>100 to 150</td>
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<td>35 to 50</td>
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<td>-50 to -100</td>
</tr>
<tr>
<td>-100 to -150</td>
</tr>
<tr>
<td>&lt; -150</td>
</tr>
</tbody>
</table>

TS-1 Max 190.0mm
TS-2 Max 113.6mm
TS-3 Max 140.8mm
Jackfish 1

Comparing Accumulated Displacement 2017 to 2018

3.1.1-2k
Jackfish 2
Accumulated Displacement 2011-2018

3.1.1-2k

TS-1 Max 117.9mm

TS-2 Max 55.0mm

TS-3 Max 87.0mm
Jackfish 2

Comparing Accumulated Displacement 2017 to 2018

3.1.1-2k
Jackfish 3
Accumulated Displacement 2014-2018

3.1.1-2k

Cumulative Ground Motion [mm]

> 150
100 to 150
50 to 100
35 to 50
20 to 35
20 to -20
-20 to -35
-35 to -50
-50 to -100
-100 to -150
< -150

TS - 1 Max
66.4mm

TS - 2 Max
61.5mm
Jackfish 3

Comparing Accumulated Displacement 2017 to 2018

3.1.1-2k

Cumulative Ground Motion [mm]
- > 150
- 100 to 150
- 50 to 100
- 25 to 50
- 20 to 25
- 10 to 20
- 5 to 10
- 0 to 5
- 0 to -5
- -5 to -10
- -10 to -15
- < -15

11 Apr 2014 to 30 June 2017

11 Apr 2014 to 05 Sept 2018
Drilling and Completions

Section 3.1.1-3
Operating SAGD Horizontal Wells
• **Jackfish 1:** 78 well pairs on eleven pads (horizontal sections are 790 – 1,200m)
• **Jackfish 2:** 60 well pairs on eight pads (horizontal sections are 790 – 1,200m)
• **Jackfish 3:** 53 well pairs on six pads (horizontal sections are 720 – 1,200m)

Observation Wells
• 65 active SAGD observation wells (two to three wells per operating pad)
• 21 regional multi-zone monitoring wells equipped with piezometers

Service Wells
• Six Grand Rapids brackish source water wells
• Two McMurray brackish source water wells
• 14 water disposal wells (Class 1b)
  • 12 active wells
  • 1 inactive well (102/12-05-076-06W4)
  • 1 suspended well (102/03-22-075-06W4)
3.1.1-3a

**Existing Pads**

- Pad A, B, C, D, E, G, H, I, O: Seven well pairs per pad
- Pad F: Ten well pairs
- Pad R: Six well pairs
  - Steam on three wellpairs Q2 2018
- Two observation wells per pad (heel and toe)
3.1.1-3a

**Existing Pads**

- Pad AA, BB, CC, DD, and KK: Seven well pairs per pad
- Pad OO and PP: Eight well pairs per pad
- Pad FF: Nine well pairs
- Pad QQ: Ten well pairs, planned for steam Q4 2018
- Two observation wells per pad (heel and toe), three wells at Pad FF
3.1.1-3a

**Existing Pads**

- Pad J and EE: Seven well pairs per pad
- Pad VV and K: Ten well pairs per pad
- Pad RR: Nine well pairs
- Pad EEE: Ten well pairs, five operating
- Pad III: eight well pairs, planned for steam Q1 2019
Drilling and Completions

Inter-well Spacing

3.1.1-3a

• Standard lateral inter-well spacing at Jackfish is 80m

• Currently drilled pads that differ from the standard are:
  • Pad VV: Spacing of 60m
  • Pad F: Spacing of 60m at the heels fanning to 90m at the toes
  • Pad O: Spacing of 75m at the heels fanning to 90m at the toes
  • Pad R: Spacing varies from 71 to 90m due to boundary restrictions
  • Pad III: Spacing of 80m at the heels fanning to 90m at the toes
• Shiftable steam subs utilized on several injection wells
  – Majority of new wells have a steam sub installed on the long injection string to improve steam distribution

406.4 mm (16”) surface casing

298.5 mm (11 ¾”) intermediate casing

Short and long tubing are from 88.9 to 114.3 mm (3 ½” to 4 ½”)

25.4 mm (1”) coil tubing instrument string with thermocouples and a conduit to pump down fiber optics

219.1 mm (8 5/₈”) slotted liner
Drilling and Completions

Typical Gas Lift Production Well Schematic

- Inflow Control Devices (ICDs) are trialed on select wells
  - Goal is to gain better understanding of this technology in SAGD environment
  - Devices promote production through uniform inflow

- 406.4 mm (16”) surface casing
- 298.5 mm (11 ¾”) intermediate casing
- 31.8 mm (1 ¼”) lift gas coils

Short and long tubing are from 88.9 to 114.3 mm (3 ½” to 4 ½”)

- 25.4 mm (1”) coil tubing instrument string with thermocouples and a conduit to pump down fiber optics
- 219.1 mm (8 5/8”) slotted liner or wire wrap screen
Drilling and Completions

Typical ESP Production Well Schematic

3.1.1-3c

Surface Casing Point

88.9 mm Production Tubing

Electrical Cable for ESP

52.4 mm Guide Tubing

25.4 mm Instrumentation Coiled Tubing (ICT)
- 8 Thermocouples Spaced Evenly in Lateral
- 6.4mm Capillary Loop (Optional Fibre)

High Temperature ESP
Bottom: 884.1mKB, 418.2mVD

ICP: 697.0 mKB
416.3 mVD

Guide String TD: 1251.0 mKB

DSP: 689.7 mKB

Liner TD: 1712.0 mKB

4x3/4 Holes: 618.0 mKB
414.0 mVD
Drilling and Completions

Inflow Control Devices (ICDs)

3.1.1-3c

• Tubing-deployed systems on wells CC1P, DD2P, DD7P, OO1P, OO8P
  • Installed successfully via service rig

• Liner-deployed systems on wells RR2P, RR6P, QQ(1,3,5,7,9)P, III3P, III5P
  • Installed successfully via drilling rig

• Key learnings to date:
  • Actual pressure drops in original ICDs different than design. Incorporated lab test data in recent deployments and pressure drop to date is within expected design range.
  • Observed well production improvements range from 0 to 100%, uplift sustainability is being evaluated
  • Able to operate wells at lower subcool with positive impact on temperature conformance
Wire Wrapped Screens

3.1.1-3c

• Wire wrapped screens are the producer sand control standard for all future pads at Jackfish

• Expected benefits of wire wrapped screens:
  • Reduced liner pressure drop
  • Increased open flow area
  • Mechanical strength
  • Sand control

• First implementation at Jackfish 1 was at Pad F
  • Successful start-up in 2016
Well Integrity Summary

• There were no wellhead or intermediate casing failures at any of the Jackfish Thermal wells since the last Directive 054 update.

• As per Devon’s Well Integrity Management System (WIMS), annual SCVF/GM surveys are conducted on injection and production wells
  • Also, annual wellhead preventative maintenance program is executed on all thermal wells

• Devon reports findings from these surveys to AER through its DDS system as per ID 2003-01.
  • Issues identified are managed accordingly through communication and approval with AER

• Devon implemented a Surface Casing Coating program as of December 2015.
  • Producers at Pads C, E and AA were inspected in 2018 – 5 corrosion issues were identified and repaired (external corrosion on surface casings)
Well Integrity Summary

• Devon is fully compliant with AER regarding reporting, repairing wells with wellbore integrity issues

• No suspended or abandoned thermal wells in Devon Jackfish Operations as of November 2018.

• Initiatives for 2019:
  – Evaluate impact of casing grade on intermediate casing failures
  – VIT pilot on Pad-MM (Monitor SCVF/GM in this pad to see impact of VIT on SCVF/GM)
Artificial Lift

Section 3.1.1-4
Artificial Lift

3.1.1-4a, b

- Combination of Gas lift and ESP utilized for artificial lift at Jackfish District

- Gas lift continues to be an effective lift strategy for Jackfish operating conditions
  - Typical producer operating pressure above 1,800 kPag
  - Ability to handle over 1,000 m³/day emulsion flow
  - No operating temperature limitation

- ESP use has expanded from single well (B3P) in 2015 to Full pad install (Pad O) in 2018
  - ESP Wells (B3P, F10P, O1P-O7P
    - R1-R6P (following circulation)
  - Plan to continue to deploy ESPs as deemed necessary
Instrumentation

Section 3.1.1-5
Instrumentation in Wells

*SAGD Injection and Producer Wells*

3.1.1-5b

- 25.4 mm (1”) coil tubing instrument string with four to eight evenly spaced thermocouples and a conduit to pump down fiber optics
- Fiber optics currently in 39 wells on Pads I, J, CC, DD, KK, FF, and RR
Instrumentation in Wells

Injector Downhole Pressure Monitoring

3.1.1-5b

As of September 2017 all injector wells use annulus gas pressure measurement (AGPM) with the exception of NCG injection wells.

**For Typical Injector Wells:**
- Utilizing our fuel gas source at the pad to inject a small amount of gas into the annulus space of the tubing and casing to create a bubble tube affect
  - BHP = surface pressure + methane hydrostatic

**For NCG Injector Wells:**
- Calculate downhole pressure based on surface steam injection pressures on short and long tubing strings
  - BHP = steam injection surface pressure – frictional losses
- Calculate downhole pressure based on surface annulus NCG gas injection pressure and accounting for frictional losses
  - BHP = NCG gas injection surface pressure – frictional losses
- Conduct a NCG injection step rate test periodically to ensure accurate friction losses
- Using thermocouples / fiber optics temperature data to convert downhole live steam temperature from $T_{sat}$ to $P_{sat}$
Instrumentation in Wells

*Producer Downhole Pressure Monitoring*

3.1.1-5b

As of September 2017 all gas lift producer wells use annulus gas pressure measurement (AGPM). ESP wells use a bubble tube or a downhole sensor.

**For Gas Lift Producer Wells:**

- Using annulus gas pressure measurement with periodic blanket gas purges to verify pressures
- Option to use concentric open-ended lift gas (LG) coiled tubing to calculate down hole pressure
  - BHP = LG surface pressure – frictional losses + static head
  - Frictional losses are correlated/calculated by performing numerous gas lift step rate tests

**For ESP Producer Wells:**

- Use guide string that is installed in well for instrument coil as a bubble tube, gas discharge is above the ESP
- B3P and F10P have sensors in the ESP assembly
Instrumentation in Wells

Annulus Gas Pressure Measurement (AGPM) Update

• Utilizing our fuel gas source at the pad a small amount of gas is injected into the annulus space of the tubing and casing to create a bubble tube affect, 

$$BHP = \text{surface pressure} + \text{methane hydrostatic}$$

• Benefits of AGPM:
  • Low rate dry gas injected into annular space gives reduced friction loss inaccuracies
  • All gas returns up the short production tubing string
  • Constant injection ensures no liquid level build up in the annulus space
Devin - Internal

**SAGD Observation Wells**

Jackfish 1, 2, and 3 SAGD observation wells contain:

- 20 points thermocouples (25 points in more recently drilled wells), spaced above, below, and within pay interval
- Two to four pressure sensors spaced above, below, and within pay interval

![Diagram showing instrumentation in wells](image-url)
Instrumentation in Wells

Regional Monitoring Well Locations

3.1.1-5b
Instrumentation in Wells

Regional Multi-zone Monitoring Wells

Monitoring wells cover areas of Jackfish 1, 2, and 3

Twenty-one wells

- 00/07-32-75-6W4 (5 piezometers)
- F1/08-28-75-6W4 (4 piezometers)
- F1/09-14-75-6W4 (4 piezometers)
- F1/12-31-75-6W4 (4 piezometers)
- F1/10-22-75-6W4 (5 piezometers)
- F1/04-26-75-7W4 (5 piezometers)
- F1/06-28-75-7W4 (5 piezometers)
- F1/15-19-75-6W4 (5 piezometers)
- F1/09-24-75-7W4 (5 piezometers)
- F1/14-25-75-6W4 (5 piezometers)
- F1/05-12-75-6W4 (5 piezometers)
- F1/09-22-75-7W4 (4 piezometers)
- 02/12-23-75-7W4 (4 piezometers)*
- 02/01-35-75-7W4 (3 piezometers)
- 00/15-07-75-5W4 (4 piezometers)
- 00/07-22-75-7W4 (2 piezometers)
- 00/03-15-75-6W4 (3 piezometers) **
- 02/09-33-75-6W4 (4 piezometers)
- 00/04-30-75-7W4 (3 piezometers)
- 00/01-19-75-6W4 (3 piezometers) **
- AA/11-30-75-6W4 (5 piezometers)

* Perf with a Level Logger
** Perf for water sampling
## Instrumentation in Wells

### Regional Multi-Zone Monitoring Wells

#### 3.1.1-5b

<table>
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<tr>
<th>UWI</th>
<th>Rig Release</th>
<th>Quaternary</th>
<th>Colorado Group</th>
<th>Grand Rapids</th>
<th>Clearwater</th>
<th>Wabiskaw</th>
<th>McMurray Bitumen</th>
<th>Basal McMurray Water</th>
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</tbody>
</table>
Scheme Performance

Section 3.1.1 - 7
3.1.1-7a

- Well pad performance forecasts generated using Jackfish and industry analogues; validated with numerical simulation and analytical methods

- Facility service factors based on historical data, future plans, and quantified risks
Scheme Performance

*Jackfish 1 Project Life Plot*

3.1.1-7a

- **Flow Rate (m³/d)**
- **SOR (m³/m³), Gas Injection (e3m³/d), Well Pairs**

- **Daily Steam Injection**
- **Daily Oil Production**
- **Daily Water Production**
- **Daily Gas Injection**
- **ISOR**
- **CSOR**
- **Well Pairs**

Key events:
- Pad F start
- Pad G start
- Turn around
- Turn around
- Turn around
Scheme Performance

Jackfish 2 Project Life Plot

3.1.1-7a

Flow Rate (m³/d)

SOE (m³/m³), Gas Injection (e3m³/d), Well Pairs

- Pad FF startup
- Pad OO, Pad PP startup
- Turn around
- Maintenance
- Pad KK startup

Legend:
- Daily Steam Injection
- Daily Oil Production
- Daily Water Production
- ISOR
- CSOR
- Well Pairs
- Daily Gas Injection
Scheme Performance

Jackfish 3 Project Life Plot

3.1.1-7a

- Pad RR startup
- Pad K startup
- Turn around

Flow Rate (m$^3$/d)

SOR (m$^3$/m$^3$), Well Pairs

- Daily Steam Injection
- Daily Oil Production
- Daily Water Production
- ISOR
- CSOR
- Well Pairs
Devon manages injection pressures to maximize producing rates, manage leak-off and increase overall reservoir recovery. A reduction in operating pressure was implemented in 2013 and continued into 2018.
Scheme Performance

Jackfish 2 Bottom Hole Injector Pressures

3.1.1-7b

[Graph showing pressure data with annotations for 'Turn around' and 'Maintenance' events, along with color-coded lines for different pads.]
Scheme Performance

*Jackfish 3 Bottom Hole Injector Pressures*

3.1.1-7b

Chart showing the pressure trends for different pads over time. The chart highlights a significant change or "turn around" in the pressure data. The x-axis represents time from August 2014 to December 2018, while the y-axis represents pressure in kPa.
# 2018 Scheme Performance

## Jackfish 1 Pad Recoveries

### 3.1.1-7c

<table>
<thead>
<tr>
<th>Pad</th>
<th>Area (m²)</th>
<th>Avg. GRV Pay (m)</th>
<th>Net GRV Pay S₀ (%)</th>
<th>Net GRV Pay Porosity (%)</th>
<th>OBIP (10⁶m³)</th>
<th>Ult Rec (10⁶m³)</th>
<th>Cum Prod ¹ (10⁶m³)</th>
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¹ Effective August 31/2018
# 2018 Scheme Performance

## Jackfish 2 Pad Recoveries

### 3.1.1-7c

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¹ Effective August 31/2018
## 2018 Scheme Performance

*Jackfish 3 Pad Recoveries*

### 3.1.1-7c

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¹ Effective August 31/2018
Jackfish 2 - Pad DD Highlights

Low Performer

3.1.1-7c

• First steam occurred in June 2011
• NCG injection commenced as of March 2016 on wells DD1, DD3, DD5, and DD6
• Heterogeneous reservoir with low mid-heel ceiling of ~5m pay thickness
  • Limited vertical steam chamber growth
  • Regions of poor temperature conformance
• Inflow Control Device installed in September 2013 (DD2)
• Inflow Control Device installed in November 2014 (DD7)
• Potential fluid interaction with Pad AA due to chamber growth on DD1-DD3 wells
Pad DD Toe Observation Well Temp

(10.5m from DD3 well pair)

3.1.1-7c
Jackfish 3 - Pad EE Highlights

Medium Performer

3.1.1-7c

- First steam occurred in July 2014
- Seven well pairs in operation
- Production currently in plateau phase
- Wells EE1 – EE5 have clean sand with uniform ceiling
- Wells EE6 – EE7 have low ceiling at toe of wells
- Steam subs opened on EE1 – EE5 in 2015 to increase steam injection rates
- Pad SOR historical average between 2.0 – 2.5
- EE exhibiting signs of transition into decline
Pad EE Performance

Jackfish 3 Pad EE Life Plot

3.1.1-7c

![Graph showing Pad EE Performance]

- Daily Steam Injection
- Daily Oil Production
- Daily Water Production
- ISOR
- CSOR
- Well Pairs
Pad EE Heel Observation Well Temp

(4.8m from EE5 well pair)

3.1.1-7c
Jackfish 3 - Pad K Highlights

*High Performer*

3.1.1-7c

- First steam occurred in February 2015
- Ten well pairs are in operation
- Best performing pad at Jackfish 3
- Clean sand throughout all ten well pairs
- Historical SOR < 2
- Pad K starting to exhibit signs of potential decline
Pad K Performance

*Jackfish 3 Pad K Life Plot*

3.1.1-7c
Pad K Toe Observation Well Temp

(9.5m from K5 well pair)

3.1.1-7c
Five Year Outlook

*Jackfish Pad Abandonments*

3.1.1-7c

- No anticipated pad abandonments at Jackfish within the next five years
## Wellhead Steam Quality

### 3.1.1-7d

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<th>Pressure (kPag)</th>
<th>Temperature (°C)</th>
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<td>97%</td>
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<tr>
<td>JF3 Wellhead</td>
<td>2,500-4,400*</td>
<td>226-256</td>
<td>97%</td>
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* Maximum injection pressure for each facility in line with MOP

- Losses in steam quality occur as steam is transported to the pads
- Utilize condensate traps at each pad to maximize wellhead steam quality
NCG Co-Injection

3.1.1-7e, g

• Overview
  • NCG source is fuel gas, primarily composed of methane
  • 6 Pads online: B, C, D, DD, KK & FF

• Learnings to date:
  • NCG injection rates within expected range (1 – 4 mole%, per pad)
  • NCG successful in maintaining chamber pressure with reduced steam
  • No negative impact to resource recovery observed in late life NCG co-injection
  • Improved SOR observed

• Go Forward Plan
  • 10 new Pads planned to be available for co-injection by end of 2019
  • Continuing to monitor and evaluate NCG performance
Steam Additive Update

3.1.1-7e, g

• Overview
  • Additive (water-oil mutual solvent) is co-injected with steam
  • First stage of the testing will evaluate the impact of the product in the CPF
  • Additive co-injection was implemented as follows:
    • OO3 well pair initiated on May 13, 2018
    • OO5 well pair initiated on June 4, 2018
    • Injecting ~11.0-18.0 e3m3/month gas equivalent

• Learnings to date
  • No noticeable impact to fluid treatment and separation in the CPF

• Go-Forward Plan
  • Continue to evaluate well performance and potential impact on CPF
Jackfish Performance

Key Learnings

3.1.1-7f

- District SOR improvements tied to pressure reduction and optimization
- Maintained focus on pressure balance with the aquifer is beneficial
- Successful use of NCG enables steam transfer to higher quality pads
Future Plans

Section 3.1.1-8
Future Plans

Well Operations, Drilling, and Trials

3.1.1-8a, b

Jackfish 1
• Pad EX – SAGD completions planned Q1 2019

Jackfish 2
• Pad MM – SAGD drilling planned Q3 2018
• Pad TT – SAGD drilling planned Q2 2019
• Pad XX – SAGD drilling planned Q3 2019

Jackfish 3
• Pad OOO SAGD drilling planned Q2 2019
Future Plans

*Jackfish District Steam Strategy*

3.1.1-8c

**Jackfish 1**
- Utilizing steam capacity while managing SOR through steam allocation, execution of NCG co-injection, and continuing to balanced chamber pressures with aquifer

**Jackfish 2**
- Utilizing steam capacity while managing SOR through steam allocation, pressure management, and leveraging NCG co-injection across asset

**Jackfish 3**
- Utilizing steam capacity while managing SOR through steam allocation, pressure management, and leveraging NCG co-injection across asset
Surface Operations
Facilities

Section 3.1.2-1
Facilities

Plot Plan – Jackfish 1

3.1.2-1a
Facilities

Plot Plan – Jackfish 3

3.1.2-1a
Facilities

Plant Schematic

3.1.2-1b

[Diagram of a plant schematic with various labeled components such as Topsoil Storage, Stormwater Retention Pond, Inlet Separation & Oil Treating, Control Room & Warehouse, Steam Generation, Boiler Feed Water Tank, Hot Lime Softener, Water Recycling & Treatment, De-Oiled Produced Water Tank, Process Tanks, Area 2000, Area 3000, Area 4000, Diluent Storage, Bitumen Storage, Flare Stack, Sewage Lagoon, and other labeled parts of the plant.]
Facilities Performance

Section 3.1.2-2
Facilities Performance

3.1.2-2a-c

Turnarounds/Outages
• Jackfish 1 maintenance turnaround completed June 2018

Bitumen Treatment
• Stable operation production rates at J2/J3

Water Treatment
• Utilized brackish water wells with TDS ranging from 4,000-22,000 ppm for all make up water requirements
• Addition of 4th LSF at Jackfish 2, and Jackfish 3

Steam Generation
• 80% overall steam quality targeted to decrease blowdown disposal volumes and increase steam generation
Facilities Performance

Power Consumption

3.1.2-2d

Power consumption was low in May-July 2018 for planned maintenance turnaround
Flared Gas Volume

3.1.2-2e

Flare volumes include produced gas only. Volumes are aligned with MARP reporting requirements for Jackfish.

- J1: May/June – Maintenance Turnaround
- J2: July/August – Process upsets
- J3: April – Gas boot compressor maintenance

Devon notified the AER of all events as per Directive 60
Facilities Performance

**Vented Gas Volume**

- **J1**: August – Plant trip, process upset
- **J2**: May/July – VRU Trips

Devon notified the AER of all events as per Directive 60
Facilities Performance

Solution Gas Recovery

3.1.2-2e

- J1: June – Lower gas recovery due to turnaround gas flaring events
Facilities Performance

Fuel Gas Consumption

3.1.2-2e

Fuel Gas Consumption J1

- J1: May/June – Volumes lower due to planned maintenance turnaround
Facilities Performance

Fuel Gas Consumption

Fuel Gas Consumption J2

Monthly Volume (e³m³)

- Purchased Gas
- Produced Gas

Facilities Performance

Fuel Gas Consumption

3.1.2-2e

Fuel Gas Consumption J3

[Bar chart showing monthly fuel gas consumption for J3 from Sep 2017 to Aug 2018, with purchased gas represented in blue and produced gas in orange.]
Facilities Performance

Greenhouse Gas Emissions (GHG)

3.1.2-2f

- J1: June/July – Volumes lower due to planned maintenance turnaround
Measurement and Reporting

Section 3.1.2-3
Well Bitumen / Water Production

- The total battery production is allocated to each SAGD producing well based on individual well tests

- Battery Bitumen Production = Dispositions – Receipts + ∆Inventory + Blending Shrinkage

- Battery Water Production = Inlet Produced Water + ∆Inventory + Truck Out – Truck in – Desand Water to Treater and FWKO

- Individual well test:
  - Each pad equipped with test separator along with coriolis meter and watercut analyzer on liquid leg
  - Vortex meter for gas measurement / water vapor calculation
  - Tested water volume includes the calculated water vapor (from \( \frac{P_{\text{sat}}}{P_{\text{measured}}} \))
  - Typical well test duration is nine hours
Well Gas Production

- Well estimated test gas production = GOR x test bitumen production
- Battery Gas Production = Fuel + Fuel to IF + Flare – TCPL Purchase – Receipt Gas – Diluent Flash
- Battery gas is allocated to each well based on well test

Steam Injection

- Total steam to field measured downstream of HP separators minus the steam condensate
  - Alternate steam determination in place at J2 and J3
- Vortex meters at each wellhead are used to allocate the total steam
Measurement and Reporting

Proration Factors

3.1.2-3a, b

Bitumen / Water Proration Factor

• Typically within AER target tolerances on an ongoing basis
• Jackfish 1 extended facility outage June / July 2018
• Jackfish 1 bitumen proration being monitored by Devon
3.1.2-3d

Plant Gate Steam Metering with Bypass

- Replacement meters (dual path ultrasonic) installed in Q3-2018 – in service Q4-2018
Water Production, Injection, and Uses
Section 3.1.2-4
Water Disposal Operations

*Basal McMurray Pressure in 75-6W4, 75-7W4*

3.1.2-4a
Water Usage - Brackish

3.1.2-4a

- Brackish source water produced from the Grand Rapids ‘C’ and McMurray zones
- Available for Jackfish 1, Jackfish 2, and Jackfish 3
- Two McMurray Wells:
  - F1/07-30-075-06W4
  - F1/03-15-075-06W4
- Six Grand Rapid Wells:
  - F1/12-15-075-06W4
  - F1/15-15-075-06W4
  - F1/03-10-075-06W4
  - F1/03-11-075-06W4
  - F1/04-16-075-06W4
  - F1/05-17-075-06W4
Source Water Geology

Grand Rapids C Aquifer

3.1.2-4a
Brackish water production from the Grand Rapids ‘C’ commenced on July 12/2007 and McMurray commenced on October 2/2014

Brackish water quality analyzed 1-2 times per year
J1 produced water was low in June/July 2018 due to a planned maintenance turnaround.
Steam Injection Volume

3.1.2-4d

Steam Injection

- J1 steam injection was low in June/July 2018 due to a planned maintenance turnaround
3.1.2-4e

- Only brackish water is used for required makeup volumes
- Jackfish disposal limit = 12 - 15%

\[ \text{Disp} \% = \frac{(\text{Brackish Water} \times D_b) + (\text{Produced Water} \times D_p)}{(\text{Brackish Water} + \text{Produced Water})} \times 100\% \]
Disposal System is shared between Jackfish 1, 2, and 3

- Two disposal streams:
  - Blowdown and regen waste
- Fourteen Class 1b disposal wells in total:
  - Twelve active (see list below)
  - One inactive (102/12-05-076-06W4)
  - One suspended (102/03-22-075-06W4)
- Approved MWIP of 6,000 kPa (July 2009)
- Jackfish 1 disposal wells:
  - 00, 02, and 03/09-14-075-06W4 (blowdown)
  - 00 and 02/12-14-075-06W4 (regen)
- Jackfish 2 disposal wells:
  - 02 and 03/07-13-075-06W4 (blowdown)
  - 02 and 04/12-15-075-06W4 (regen)
- Jackfish 3 disposal wells:
  - 00 and 02/05-12-075-06W4 (blowdown)
  - 00/03-22-075-06W4 (regen)
Water Disposal – Approval No. 10790

Volume Summary

3.1.2-4h

Blowdown Water Volumes

Regen Water Volumes

Monthly Volume (m³)

[Charts showing monthly volumes for Blowdown and Regen Water Volumes for J1, J2, and J3]
Water Disposal – Approval No. 10790

00/09-14-075-06W4

3.1.2-4h

00/09-14-075-06W4 BD Disposal Well
MWIP 6,000 KPag

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<thead>
<tr>
<th>Month</th>
<th>Monthly Volume (m³)</th>
<th>Average Wellhead Pressure (KPag)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep-17</td>
<td>32000</td>
<td>6000</td>
</tr>
<tr>
<td>Oct-17</td>
<td>39000</td>
<td>5500</td>
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<tr>
<td>Nov-17</td>
<td>32000</td>
<td>6000</td>
</tr>
<tr>
<td>Dec-17</td>
<td>31000</td>
<td>5500</td>
</tr>
<tr>
<td>Jan-18</td>
<td>31000</td>
<td>5500</td>
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<tr>
<td>Feb-18</td>
<td>31000</td>
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<tr>
<td>Mar-18</td>
<td>31000</td>
<td>5500</td>
</tr>
<tr>
<td>Apr-18</td>
<td>40000</td>
<td>6000</td>
</tr>
<tr>
<td>May-18</td>
<td>31000</td>
<td>5500</td>
</tr>
<tr>
<td>Jun-18</td>
<td>10000</td>
<td>5000</td>
</tr>
<tr>
<td>Jul-18</td>
<td>31000</td>
<td>5500</td>
</tr>
<tr>
<td>Aug-18</td>
<td>39000</td>
<td>5500</td>
</tr>
</tbody>
</table>
Water Disposal – Approval No. 10790

02/09-14-075-06W4

3.1.2-4h

02/09-14-075-06W4 BD Disposal Well
MWIP 6,000 KPag

Average Wellhead Pressure (KPag)

Monthly Volume (m³)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- Monthly Volumes
- Average Wellhead Pressure
Water Disposal – Approval No. 10790

03/09-14-075-06W4

3.1.2-4h

03/09-14-075-06W4 BD Disposal Well
MWIP 6,000 KPag

Average Wellhead Pressure

Monthly Volume (m³)

January 2000 to January 2000

- Monthly Volumes
- Average Wellhead Pressure
Water Disposal – Approval No. 10790

02/07-13-075-06W4

3.1.2-4h

02/07-13-075-06W4 BD Disposal Well
MWIP 6,000 KPag

Monthly Volumes
Average Wellhead Pressure

<table>
<thead>
<tr>
<th>Month</th>
<th>Volume (m^3)</th>
<th>Pressure (KPag)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep-17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oct-17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nov-17</td>
<td>15,000</td>
<td>0</td>
</tr>
<tr>
<td>Dec-17</td>
<td>5,000</td>
<td>0</td>
</tr>
<tr>
<td>Jan-18</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Feb-18</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mar-18</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Apr-18</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>May-18</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jun-18</td>
<td>40,000</td>
<td>0</td>
</tr>
<tr>
<td>Jul-18</td>
<td>10,000</td>
<td>0</td>
</tr>
<tr>
<td>Aug-18</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Water Disposal – Approval No. 10790

03/07-13-075-06W4

3.1.2-4h

03/07-13-075-06W4 BD Disposal Well
MWIP 6,000 KPag

Average Wellhead Pressure (KPag)

Monthly Volume (m³)


Monthly Volumes

Average Wellhead Pressure
Water Disposal – Approval No. 10790

00/12-14-075-06W4

3.1.2-4h

00/12-14-075-06W4 Regen Disposal Well
MWIP 6,000 KPag

Average Wellhead Pressure (KPag)

Monthly Volumes (m³)

- Sep-17
- Oct-17
- Nov-17
- Dec-17
- Jan-18
- Feb-18
- Mar-18
- Apr-18
- May-18
- Jun-18
- Jul-18
- Aug-18

Average Wellhead Pressure

Monthly Volumes

- Monthly Volumes
- Average Wellhead Pressure
Water Disposal – Approval No. 10790

02/12-14-075-06W4

3.1.2-4h

02/12-14-075-06W4 Regen Disposal Well
MWIP 6,000 KPag

Average Wellhead Pressure

Monthly Volumes
Water Disposal – Approval No. 10790

02/12-15-075-06W4

3.1.2-4h

02/12-15-075-06W4 Regen Disposal Well
MWIP 6,000 KPag

Average Wellhead Pressure

Monthly Volume (m³)


0  5000  10000  15000  20000  25000  30000  35000  40000  45000  50000  55000

Average Wellhead Pressure (KPag)

Monthly Volumes

0  5000  10000  15000  20000  25000  30000  35000  40000  45000  50000  55000

Average Wellhead Pressure

Monthly Volumes

0  5000  10000  15000  20000  25000  30000  35000  40000  45000  50000  55000

Average Wellhead Pressure

Monthly Volumes

0  5000  10000  15000  20000  25000  30000  35000  40000  45000  50000  55000

Average Wellhead Pressure

Monthly Volumes

0  5000  10000  15000  20000  25000  30000  35000  40000  45000  50000  55000

Average Wellhead Pressure

Monthly Volumes

0  5000  10000  15000  20000  25000  30000  35000  40000  45000  50000  55000

Average Wellhead Pressure

Monthly Volumes

0  5000  10000  15000  20000  25000  30000  35000  40000  45000  50000  55000
Water Disposal – Approval No. 10790

04/12-15-075-06W4

3.1.2-4h

04/12-15-075-06W4 Regen Disposal Well
MWIP 6,000 KPag

Monthly Volume (m³)

Average Wellhead Pressure (KPag)

- Monthly Volumes
- Average Wellhead Pressure

00/05-12-075-06W4 BD Disposal Well
MWIP 6,000 KPag

Monthly Volumes
Average Wellhead Pressure (KPag)

0 5000 10000 15000 20000 25000 30000 35000 40000 45000 50000 55000


0 10000 20000 30000 40000 50000 60000

Monthly Volume (m3)

0 5000 10000 15000 20000 25000 30000 35000 40000 45000 50000 55000


Average Wellhead Pressure (KPag)

Monthly Volumes
Average Wellhead Pressure
Water Disposal – Approval No. 10790

02/05-12-075-06W4

3.1.2-4h

02/05-12-075-06W4 BD Disposal Well
MWIP 6,000 KPag

Average Wellhead Pressure (KPag)

Monthly Volume (m³)

Monthly Volumes

Average Wellhead Pressure

- Monthly Volumes
- Average Wellhead Pressure
Water Disposal – Approval No. 10790

00/03-22-075-06W4

3.1.2-4h

00/03-22-075-06W4 Regen Disposal Well
MWIP 6,000 KPag

![Graph showing average wellhead pressure and monthly volumes from Sep-17 to Aug-18. The graph includes a line for average wellhead pressure and bars for monthly volumes.]
## Off-site Water Disposal Volumes

### Disposal Facility Volume Injected ($m^3$)

<table>
<thead>
<tr>
<th>Disposal Facility</th>
<th>Volume Injected ($m^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tervita Lindbergh Cavern Facility</td>
<td>2,225</td>
</tr>
<tr>
<td>Cancen New Serepta</td>
<td>4,431</td>
</tr>
<tr>
<td>Tervita Ft. McMurray</td>
<td>2,634</td>
</tr>
<tr>
<td>CEIBA ATHABASCA</td>
<td>615</td>
</tr>
<tr>
<td>White Swan Atmore</td>
<td>3,568</td>
</tr>
<tr>
<td>White Swan Conklin</td>
<td>24,932</td>
</tr>
<tr>
<td>Cancen Morinville</td>
<td>1,326</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>39,731</strong></td>
</tr>
</tbody>
</table>
Sulphur Production and Air Emissions
Section 3.1.2-5
Sulphur Production

Operations with Sulphur Recovery

3.1.2-5a (i) and (ii)

Jackfish 2 Sulphur Recovery

* Jackfish 1 - Sulphur recovery is not required as inlet Sulphur content is <1t/d.
Sulphur Production

Operations with Sulphur Recovery

3.1.2-5a (i) and (ii)

Jackfish 3 Sulphur Recovery

Sulphur recovery not required

<table>
<thead>
<tr>
<th>Date</th>
<th>Daily Recovery</th>
<th>Quarterly Average Recovery</th>
<th>Required Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-Sep-17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29-Oct-17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-Dec-17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-Feb-18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28-Mar-18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-May-18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-Jul-18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-Aug-18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.1.2-5c

### Sulphur Production

*Peak Daily and Rolling Averages – $SO_2$ Emissions*

**Notes:**

- The ID 2001-03 waiver was used in March due to maintenance related process upsets.
- Emissions throughout year remained below allowable emissions limits permitted during maintenance outages.
- All reporting required under the EPEA approval has been completed.
Ambient Air Quality Monitoring

3.1.2-5d

**Passive air monitoring**
- At minimum there are four passive stations located at each Jackfish site to monitor sulphur dioxide and hydrogen sulphide.
- Monitored parameters: sulphur dioxide and hydrogen sulphide.

**Continuous ambient monitoring**
- September 2018: Jackfish 1 and Jackfish 2/3 continuous monitoring stations joined the Wood Buffalo Environmental Associations (WBEA)’s integrated monitoring network. The monitoring stations are now operated by WBEA, on behalf of Devon.
- Monitored parameters: sulphur dioxide, hydrogen sulphide, nitrogen dioxide, total hydrocarbons, wind speed, and direction.

All ambient air quality monitoring and reporting requirements were satisfactorily met in 2017-2018.
Ambient Air Quality Monitoring

3.1.2-5d
Ambient Air Quality Monitoring

*Jackfish 1 Results*

### 3.1.2-5d

**Jackfish 1 Ambient Monitoring**

**NO2, SO2, THC Hourly Maximum**

- NO2 (ppb)
- SO2 (ppb)
- THC (ppm)
- NO2 AAAQO (ppb)
- SO2 AAAQO (ppb)

**H2S Hourly Maximum**

- H2S (ppb)
- H2S AAAQO (ppb)
Ambient Air Quality Monitoring

Jackfish 2/3 Results

3.1.2-5d

Jackfish 2/3 Ambient Monitoring
NO2, SO2, THC Hourly Maximum

<table>
<thead>
<tr>
<th>Ambient Concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO2 (ppb)</td>
</tr>
<tr>
<td>SO2 (ppb)</td>
</tr>
<tr>
<td>THC (ppm)</td>
</tr>
<tr>
<td>NO2 AAAQO (ppb)</td>
</tr>
<tr>
<td>SO2 AAAQO (ppb)</td>
</tr>
</tbody>
</table>

Jackfish 2/3 Ambient Monitoring
H2S Hourly Maximum

<table>
<thead>
<tr>
<th>Ambient Concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2S (ppb)</td>
</tr>
<tr>
<td>H2S AAAQO (ppb)</td>
</tr>
</tbody>
</table>

[Graphs showing ambient concentrations over time for NO2, SO2, THC, and H2S]
Environmental Issues

Section 3.1.2-6
Environmental Issues

3.1.2-6a

- Jackfish 1 CPF Action Leakage Rate (ALR) exceedance
  - Voluntary self-disclosure exceedance was reported to the AER.
  - Devon repaired liner and ALR has since been maintained within allowable limits.
## AER Regulatory Approval Summary

### D78 Amendments – September 2017 to August 2018

<table>
<thead>
<tr>
<th>Amendment</th>
<th>Date</th>
<th>Approval Number</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackfish Scheme Capacity Increase</td>
<td>October 10, 2017</td>
<td>10097NN</td>
<td>2</td>
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<tr>
<td>Jackfish Expansion Area</td>
<td>Under Review</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Jackfish 2 Pad MM Proposal</td>
<td>November 20, 2017</td>
<td>10097OO</td>
<td>2</td>
</tr>
<tr>
<td>Jackfish 2 Pad TT Proposal</td>
<td>November 20, 2017</td>
<td>10097OO</td>
<td>2</td>
</tr>
<tr>
<td>Jackfish NCG Co-Injection</td>
<td>December 19, 2017</td>
<td>10097PP</td>
<td>2</td>
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<tr>
<td>Jackfish Sulphur Recovery Variance</td>
<td>January 11, 2018</td>
<td>10097QQ</td>
<td>2</td>
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<tr>
<td>Pad OO Steam Additive Pilot</td>
<td>April 6, 2018</td>
<td>10097RR</td>
<td>2</td>
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<tr>
<td>Jackfish 2 Pad MM – Additional Well Pair</td>
<td>July 30, 2018</td>
<td>10097SS</td>
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<tr>
<td>Pad OOO Proposal</td>
<td>Under Review</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Pad S Proposal</td>
<td>Under Review</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
AER Regulatory Approval Summary

3.1.2-6b

**D56 Facilities Licences**
- Temporary waiver for D56 Sulphur Emission Limit:
  - Jackfish 3 CPF (F44113)
- Amendment to the continuous emission rates at:
  - Jackfish 3 CPF (F44113)
AER Regulatory Approval Summary

*Jackfish Class II Landfill*

<table>
<thead>
<tr>
<th>Date Issued</th>
<th>Approval To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 17, 2017</td>
<td>• One time approval to accept OSE waste from the Jackfish East &amp; West Project Areas</td>
</tr>
<tr>
<td>Nov 28, 2017</td>
<td>• One time approval to accept contaminated soil from the Devon NE Gas Project Area</td>
</tr>
</tbody>
</table>
| Jun 21, 2018 | • One time approval to accept contaminated soil from the Devon NE Gas Project Area  
• One time approval to accept contaminated soil from NE Gas Compressor Facility at 02-04-078-06 W4M  
• One time approval to accept contaminated soil from Devon Pike Yard at NW-09-075-06 W4M |
| Aug 22, 2018 | • One time approval to accept contaminated soil from NE Gas lease at 08-29-076-06 W4M |
AER Regulatory Approval Summary

Jackfish District

3.1.2-6b

**EPEA Operating Approval No. 00224816-01-00**

- EPEA renewal received July 2018

**Water Diversion Licences**

- No amendments
AER Regulatory Reporting Requirements

3.1.2-6c

- Industrial Wastewater and Industrial Runoff Report
- Groundwater Monitoring Report
- Wetland and Waterbody Monitoring Report
- Potable Water Monitoring Report
- Air Monitoring Report
- Soil Management Report
- Soil Monitoring Report
- Conservation and Reclamation Annual Report
- Project Level Conservation and Closure Plan
- Wildlife Mitigation and Monitoring Program
- Caribou Mitigation and Monitoring Program
Water Management

*Jackfish 1, 2, and 3*

### Groundwater

- Jackfish 1, 2, and 3 groundwater monitoring twice yearly at CPF, well pads, and tank farm as per EPEA approval

- No significant impacts observed to date

- Minor issues to date include:
  - Slightly elevated chlorides due to de-icing agents and dust suppressants
  - Trace hydrocarbons identified at a single well downgradient of Jackfish 2.

### Wetlands

- Wetland monitoring sites were surveyed in Q2 and Q3 2018

- No significant impacts observed to date
Soil Monitoring and Soil Management

*Jackfish 1, 2, and 3*

3.1.2-6c

• District soil monitoring program for Jackfish 1, 2, and 3 was executed in August 2017
  • District soil monitoring report and soil management program proposal submitted to AER November 2017
  • Execution of the soil management program to occur Fall 2018
Environmental Monitoring and Progress

Wildlife Monitoring

3.1.2-6c

• As per EPEA approval condition, Devon’s Jackfish Wildlife Monitoring Program was authorized in July 2012
• First comprehensive wildlife report was submitted July 2015
• Long term monitoring ongoing
• No significant project related impacts observed to date
Regional and Other Initiatives

3.1.2-6d

- Christina Lake Regional Water Management Agreement (CLRWMMA)
- Canada’s Oil Sands Innovation Alliance (COSIA)
- Alberta Biodiversity Monitoring Institute (ABMI)
- Regional Aquatics Monitoring Program (RAMP)
- Monitoring Avian Productivity and Survivorship (MAPS Program)
- Regional Industry Caribou Collaboration (RICC)
- Clean Air Strategic Alliance (CASA)
- Wood Buffalo Environmental Association (WBEA)
- Oil Sands Environmental Monitoring Program (OSM)
Other Environmental Initiatives

Canada’s Oil Sands Innovation Alliance (COSIA)

• Devon is an active participant of the Water, Land, and greenhouse gas (GHG) Environmental Priority Areas (EPAs) and the COSIA Monitoring Working Group

• Aspirations for each EPA have been developed and Devon is striving to:
  • GHG: Produce oil with lower GHG emissions than other sources of oil
  • Land: Be world leaders in land management, restoring the land and preserving biodiversity of plants and animals
  • Water: Be world leaders in water management, producing Canadian energy with no adverse impact on water

• Devon is either leading or participating in Joint Industry Projects in each of the EPAs
Other Environmental Initiatives

3.1.2-6d

**Monitoring Avian Productivity and Survivorship (MAPS Program)**
- Continued annual support (technical and financial) of the MAPS Program
- This program analyzes the influence of industry throughout NE Alberta on productivity and survivorship of migratory birds

**Regional Industry Caribou Collaboration (RICC)**
- Devon is leading a consortium of organizations in implementing a collaborative caribou conservation program for the Cold Lake Range, which includes the Jackfish and Pike areas
- This program focuses on:
  - Managing and reducing industry’s footprint
  - Monitoring wildlife use of linear features
  - Identifying effective techniques to reduce wolf and bear movements throughout the caribou habitat
Regulatory Compliance

Section 3.1.2-7, -8
Devon Canada Corporation believes the Jackfish Project is in compliance with AER approvals and regulatory requirements. As of August 31/2018, Devon has no unaddressed non-compliant events.
The following list summarizes spills reported to the AER within the reporting period.

<table>
<thead>
<tr>
<th>Site</th>
<th>No. of Reportable Spills</th>
<th>Volume Released (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackfish 1</td>
<td>9</td>
<td>6.6</td>
</tr>
<tr>
<td>Jackfish 2</td>
<td>2</td>
<td>0.12</td>
</tr>
<tr>
<td>Jackfish 3</td>
<td>4</td>
<td>8.5</td>
</tr>
</tbody>
</table>
The following list summarizes non-compliant events within the reporting period. For all events corrective actions were identified and tracked to completion.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 2017</td>
<td>Notice of Noncompliance (4) re: Failure to submit RASTER/LASS well logs.</td>
<td>Devon submitted required information.</td>
</tr>
<tr>
<td>December 2017</td>
<td>Notice of Noncompliance re: Failure to meet D-13 suspension requirements.</td>
<td>Well was recompleted and reactivated in Q1 2018.</td>
</tr>
</tbody>
</table>
Future Plans

Section 3.1.2-9

Surface Operations

3.1.2-9a, b, c, d

**Jackfish 1**
- Soda ash injection into HLS is starting up to reduce regen waste disposal volumes
- CPF modifications in preparation for ESP conversion

**Jackfish 2**
- Plant maintenance turnaround planned for 2019
- Soda ash injection into HLS is starting up to reduce regen waste disposal volumes

**Jackfish 3**
- Soda ash injection into HLS is starting up to reduce regen waste disposal volumes
Thank you.