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Introduction: Project Location

Orion is an in situ oil sands steam-assisted gravity drainage (SAGD) project consisting of a central processing facility (CPF) and five well pads situated in 13-16-064-03 W4M, approximately 30 km north-west of Cold Lake, Alberta.
Subsurface

Orion In Situ Oil Sands
2020 Annual Performance Report
From inception to December 31, 2020. Provincial production curtailment impact in 2018 and 2019; reduced production in Mar-Apr 2020 due to poor market conditions.
Drilled and Approved Drainage Patterns
Geoscience

Orion In Situ Oil Sands

2020 Annual Performance Report
Project Area and Well Data
Seismic Data

3D, 2D & Swath Datasets:

- Hilda 3D – 2005, 1.8 km²
- 2D – 2005, 3 lines
- Swath – 2007, 1522 records
- Orion 3D – 2009, 6.6 km²
- Swath – 2009, 1705 records
- Swath – 2011, 1074 records
- Swath – 2014, 1708 records
- 2D – 2014, 1 lines
- Orion 3D & Hilda 3D Merged - 2015
- Swath – 2016, 1688 records

No Seismic Data Acquired Since 2016
Mini-frac testing completed in well 1AA/03-16-064-03W4/00 on March 5, 2020

Objective: To determine the minimum stress gradient in the Joli Fou, Grand Rapids, and Clearwater caprock intervals

Results Summary:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Test Depth (m MD)</th>
<th>Minimum Stress Gradient (kPa/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joli Fou Shale</td>
<td>269.0</td>
<td>19.9</td>
</tr>
<tr>
<td>Grand Rapids Shale</td>
<td>312.0</td>
<td>19.0</td>
</tr>
<tr>
<td></td>
<td>315.5</td>
<td></td>
</tr>
<tr>
<td>Clearwater Shale</td>
<td>401.0</td>
<td>20.9</td>
</tr>
</tbody>
</table>
Clearwater SAGD Reservoir Isopach
Clearwater Gas Cap Isopach
Clearwater Reservoir Basal Water Isopach
Significant production has been achieved from oil sands in the Clearwater Formation. Oil production has been achieved from two wells that have been drilled from the north and south. The oil production is from the Orion lease area.
Structural Cross-Section

Northwest

Hilda Pilot Obs-1 102/15-17-064-03W4

100/07-16-064-03W4

1AA/01-16-064-03W4

1AA/03-12-064-03W4

SAGD Interval

Clearwater Shale

Clearwater Sand

TOP PAY

Base Pay

Basal Water Wabiskaw

Facies from Core:
- Very fine- to medium-grained sand
- Very fine- to medium-grained sand to muddy sand or sand with interbedded mud
- Mud with interbedded sand
- Carbonate concretion

Southeast

Osum Production Corp.
# Reservoir Properties and Producible Bitumen in Place (PBIP)

## PBIP and Recovery to Date

<table>
<thead>
<tr>
<th>Pad</th>
<th>Start Date</th>
<th>Operating Well Pairs</th>
<th>Well Length</th>
<th>Well Pair Spacing&lt;sup&gt;(2)&lt;/sup&gt;</th>
<th>Total PBIP&lt;sup&gt;(3)&lt;/sup&gt;</th>
<th>Current Recovery (4)</th>
<th>Estimated Ultimate Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot</td>
<td>Sep 1997</td>
<td>2</td>
<td>950</td>
<td>100</td>
<td>1.14</td>
<td>69</td>
<td>&gt;70</td>
</tr>
<tr>
<td>Pad 103</td>
<td>Oct 2009</td>
<td>4</td>
<td>670</td>
<td>100</td>
<td>1.53</td>
<td>65</td>
<td>&gt;70</td>
</tr>
<tr>
<td>Pad 104</td>
<td>Oct 2007</td>
<td>4</td>
<td>695</td>
<td>100</td>
<td>1.79</td>
<td>33</td>
<td>50-60</td>
</tr>
<tr>
<td>Pad 105</td>
<td>May 2008</td>
<td>4</td>
<td>675</td>
<td>100</td>
<td>1.46</td>
<td>67</td>
<td>&gt;70</td>
</tr>
<tr>
<td>Pad 106</td>
<td>Sep 2007</td>
<td>4</td>
<td>730</td>
<td>100</td>
<td>1.76</td>
<td>32</td>
<td>50-60</td>
</tr>
<tr>
<td>Pad 107</td>
<td>Sep 2007</td>
<td>4</td>
<td>700</td>
<td>100</td>
<td>1.67</td>
<td>50</td>
<td>50-60</td>
</tr>
<tr>
<td>Pad 108</td>
<td>Jun 2017</td>
<td>2</td>
<td>1,000</td>
<td>70</td>
<td>0.88</td>
<td>24</td>
<td>50-60</td>
</tr>
<tr>
<td>Pad 109</td>
<td>Sep 2018</td>
<td>5</td>
<td>1,000</td>
<td>80</td>
<td>1.74</td>
<td>13</td>
<td>50-60</td>
</tr>
<tr>
<td>Pad 204</td>
<td>Jun 2017</td>
<td>7</td>
<td>1,000</td>
<td>80</td>
<td>2.76</td>
<td>22</td>
<td>50-60</td>
</tr>
<tr>
<td>Pad 205</td>
<td>Jul 2018</td>
<td>3</td>
<td>1,000</td>
<td>80</td>
<td>1.00</td>
<td>18</td>
<td>50-60</td>
</tr>
<tr>
<td>Pad 206</td>
<td>Sep 2018</td>
<td>4</td>
<td>800</td>
<td>80</td>
<td>1.21</td>
<td>17</td>
<td>50-60</td>
</tr>
</tbody>
</table>

## SAGD Reservoir Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>425 metres</td>
</tr>
<tr>
<td>Pay Thickness</td>
<td>16-25 metres</td>
</tr>
<tr>
<td>Average Porosity</td>
<td>%</td>
</tr>
<tr>
<td>Average Oil Saturation</td>
<td>%</td>
</tr>
<tr>
<td>Average Bitumen Weight</td>
<td>%</td>
</tr>
<tr>
<td>Horizontal Permeability</td>
<td>Darcies 2 to 6</td>
</tr>
<tr>
<td>Kv:Kh</td>
<td>X 0.8-0.9</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C 15</td>
</tr>
<tr>
<td>Pressure</td>
<td>MPa 3.2</td>
</tr>
<tr>
<td>Oil Gravity</td>
<td>°API 10 to 11</td>
</tr>
<tr>
<td>Viscosity at 16°C</td>
<td>cP 200,000</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> As of December 2020  
<sup>(2)</sup> Approximate Well Pair Spacing, m  
<sup>(3)</sup> PBIP = Area x Thickness Above Producer x Porosity x Oil Saturation  
<sup>(4)</sup> Recovery as of December 2020, on PBIP basis
## Producible Bitumen in Place Continued (PBIP)

<table>
<thead>
<tr>
<th>Area</th>
<th>Drainage Size</th>
<th>Operating Well Pairs</th>
<th>Total PBIP(^{(1,2)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating area</td>
<td>3681 (10^3)m(^2)</td>
<td>43</td>
<td>16.9 (10^6)m(^3)</td>
</tr>
<tr>
<td>Development and Project Area (^{(3)})</td>
<td>10523 (10^3)m(^2)</td>
<td>43</td>
<td>50.1 (10^6)m(^3)</td>
</tr>
</tbody>
</table>

---

(1) As of December 2020
(2) \(PBIP = \text{Area} \times \text{Thickness Above Producer} \times \text{Porosity} \times \text{Oil Saturation}\)
(3) Development Area and Project Area cover the same geographic extent
Surface Operations

Orion In Situ Oil Sands
2020 Annual Performance Report
Facility Highlights

No major modifications were done to the CPF requiring AER approval for 2020; facility highlights are associated with operation optimization activities such as:

• Multiple chemical trials/pilots (Reverse Emulsion Breaker (REB), Emulsion Breaker (EB), viscosity reduction chemistry trail performed in the facility.)

• Gas lift completions: 15 Phase 2 wells converted in 2020

• Increased gas lift volumes from field into CPF, identified needs for enhanced boiler master control logic along with inlet control edits and tuning. Plant logic addition and tuning completed in June.

• Steam valve and bonnet leak issues resolved with material change on ring gaskets. Continuing with ongoing inspection and preventative maintenance program.

• 2020 facility turnaround deferred until Sept 2021 due to pandemic impacts.

• Pipeline sales butane trim injection system commissioned Nov 2020.
Orion Central Processing Facility Plot Plan
Orion Bitumen and Steam Performance

### Annual Bitumen Rates against Design Throughput

![Graph showing annual bitumen rates against design throughput.]

### Annual Steam Production against Design Throughput

![Graph showing annual steam production against design throughput.]

- **Monthly Production**: Represents the monthly production volumes.
- **Daily**: Represents the daily production volumes.
- **Annual Average**: Represents the annual average production volumes.
- **Design Throughput**: Represents the design throughput volumes.
## 2020 Compliance Summary

<table>
<thead>
<tr>
<th>Approval Number</th>
<th>Compliance Reporting</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPEA 00141258</td>
<td>Compliant with all conditions of approval.</td>
<td></td>
</tr>
<tr>
<td>Water Act License 00242090</td>
<td>Compliant with all conditions of approval.</td>
<td></td>
</tr>
<tr>
<td>Directive 13/IWCP Program</td>
<td>Compliant.</td>
<td>Completed all required suspensions and abandonments</td>
</tr>
</tbody>
</table>
Wellbore Integrity

• Casing inspection logs were conducted on P107 P2 COLD LK 14-16-64-3W4 and OPC P3 ETHELKK 13-17-64-3 W4. The 9-5/8” intermediate casing was intact and corrosion was within specifications.

• Eight (8) damaged Surface Casing Vent Assemblies (SCVA) were repaired in 2020, six (6) more are planned to be repaired in middle of 2021.

• As a preventive measure, wellhead casing and tubing outlet valves were regularly inspected by a third party. Valves with bonnet gaps out of specification were repaired or replaced.

• Implemented a torque verification program targeting 20% of the serviced wells.
## 2020 Scheme Amendments

<table>
<thead>
<tr>
<th>Approval/Application Number</th>
<th>Description</th>
<th>Approval/Submission Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>10103Y App# 1925684</td>
<td>Request to install Purlucid Replaceable Skin Layer Ultra Filtration waste water treatment technology. Not currently pursuing.</td>
<td>Submitted Nov. 20th, 2019 Approved Feb. 3rd, 2020</td>
</tr>
<tr>
<td>8175G App# 1928432</td>
<td>Request to utilize Granite Wash (06/16-17-064-03W4) as Class II Disposal Well</td>
<td>Submitted April 29, 2020 Issued June 1, 2020</td>
</tr>
<tr>
<td>App # 1928691</td>
<td>Request approval to construct and integrate a Butane Blending Facility into the bitumen blending process. To supplement diluent with butane for blending bitumen to achieve pipeline transportation viscosity and density specifications.</td>
<td>Submitted May 19th, 2020 Approved June 16th, 2020</td>
</tr>
<tr>
<td>10103Z_141258-01-03 App# 1929312</td>
<td>Waste Heat (ORC) application. Joint Application to AER, EPEA to add an Organic Rankine Cycle Power Generation Plant.</td>
<td>Submitted July 30th, 2020 Approved Nov. 18th, 2020</td>
</tr>
</tbody>
</table>
### 2021 Scheme Amendments

<table>
<thead>
<tr>
<th>Scheme 10103 Amendments</th>
<th>Description</th>
<th>Submission Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Grand Rapids-Reservoir Addition App# 1929868</td>
<td>Request to add the Upper Grand Rapids Formation to the approved scheme for commercial production predominantly within the approved project area; additionally, request for addition of two legal subdivisions to the project area (LSD 9 and 16 in Section 08-064-03W4M).</td>
<td>Submitted Oct. 6th, 2021 Pending Approval</td>
</tr>
<tr>
<td>10103AA App# 1932012</td>
<td>I3/P3 Pilot Pad NCG Injection. Revision of Condition 12 for maximum NCG injection rate to 40 E3M3/D and minimum steam injection rate to 0 m3/d.</td>
<td>Submitted Jan. 22nd, 2021 Approved March 9th, 2021</td>
</tr>
</tbody>
</table>
Osum executed a four-well delineation program in 2020 to further understand the extent and quality of an Upper Grand Rapids Formation (UGR) channel-fill bitumen reservoir that overlies the Clearwater Formation.

- The UGR at Orion was deposited in a fluvial to estuarine environment and is a reservoir suited for SAGD development.
  - Up to 23 m thick
  - Porosity: 35%, Oil Saturation: 75%, Bitumen Viscosity: 65,000 cP at 16 °C
- Project amendment submitted in Oct. 6, 2020 included the addition of 23 UGR well pairs to be added to existing and approved Orion surface well pads.
2020 Scheme Amendments
Upper Grand Rapids (UGR) Formation

Upper Grand Rapids Isopach

Orion Project Area
Orion Lease Area
5 Year Development Plan: Summary

• Central Processing Facility (CPF): add remaining components for completion of approved Phase 2 development extent.

• Development Wells (map on next slide): continue project operations and resource recovery, subject to available CPF capacities, by adding production from a subset combination of (timing and number will depend on performance and declines of currently operating well pairs):
  
  • Approved 6 remaining Clearwater SAGD well pairs from existing surface pads;
  (Commercial Scheme Approval 10103Q)
  
  • Approved 9 Clearwater SAGD well pairs from existing surface pads;
  (Commercial Scheme Approval 10103U)
  
  • Approved 8 Clearwater Lower Drainage Wells (LDWs) from existing surface pads;
  (Commercial Scheme Approval 10103U)
  
  • Approved 20 Clearwater SAGD well pairs from new surface pads A and B; and
  (Commercial Scheme Approval 10103V);
  
  • Proposed 16 Upper Grand Rapids SAGD well pairs from existing surface pad extensions.
  (Scheme amendment application 1929868 submitted in Q4 2020)

• Initiated Non-Condensable Gas (NCG) Co-injection (with steam) in mature Pilot pad in Q2 2021
  (Commercial Scheme Approval 10103AA)

• Proposed initiation of NCG Co-injection (with steam) in rest of the mature Phase 1 well pairs for pressure maintenance and SOR reduction.

• Proposed eventual transition of mature Phase 1 well pairs to a terminal gas injection phase (no steam injection).
5 Year Development Plan: Map
5 Year Development Plan: Plot Plan

Planned Infrastructure (App# 1929868, submitted Oct. 6, 2020)

Planned Infrastructure (10103Q, 10103U, 10103V)
5 Year Development Plan: **Surface**
Osum Production Corp.

Subsidiary of Osum Oil Sands Corp.

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