An Oily Summerland Century Story

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Office of Spill Prevention and Response

Prevention First
Long Beach, California
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The Problem

Despite multiple abandonment efforts, persistent but intermittent beach oiling continues causing community concern.
The Solution

A scientific study to quantify the amount of oil emitted and to understand the intermittency and persistence of oil emissions at Summerland
The Answer

There is a geologic reason why Summerland reports persistent oiling.
Root Cause - Historical and Geological

416 wells drilled 1895-1906
220 wells drilled nearshore and offshore
Abandonment Efforts

Historical- Rags & Telephone Poles

Modern - Reduced Oil Emissions Significantly
Approaches

• Aerial Surveys
• Underwater Surveys & Quantification
• Boat Surveys
• Beach Surveys & Quantification
How Much Oil?
Summerland is a 15-45 minute drive east from Santa Barbara
Underwater Surveys & Quantification

Video-Monitored Seep Tents
Underwater Surveys & Quantification
Video-Monitored Seep Tents
Underwater Surveys & Quantification

Video-Monitored Seep Tents
Underwater Surveys & Quantification

A) $t = 0.0 \text{ s}$  
B) $t = 1.0 \text{ s}$  
C) $t = 2.0 \text{ s}$
Oct 27-28, 2003 Seabed Deployment

Tide Height (m)

Local Time

Site 1

Site 2

Site 3
Oct 27-28, 2003 Sites 1-3 Emissions

<table>
<thead>
<tr>
<th>Site Sample</th>
<th>Time deploy</th>
<th>Time (min)</th>
<th>Oil (ml)</th>
<th>Oil Flux (ml dy⁻¹)</th>
<th>Gas (ml)</th>
<th>Gas Flux (L dy⁻¹)</th>
<th>Gas/Oil ratio</th>
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<tbody>
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<td>14:35</td>
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<td>8.00</td>
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<td>9</td>
<td>15:56</td>
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<td>2.3360</td>
<td>126.46</td>
<td>12.40</td>
<td>0.67</td>
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</table>

**Mean Site Values**

- Oil Flux (ml dy⁻¹)
- Gas Flux (L dy⁻¹)

<table>
<thead>
<tr>
<th>Site</th>
<th>Oil Flux</th>
<th>Gas Flux</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.979±0.4</td>
<td>90.4±14</td>
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<tr>
<td>2</td>
<td>1.072±0.4</td>
<td>96.2±20</td>
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<tr>
<td>3</td>
<td>51.5±65.5</td>
<td>0.35±0.33</td>
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</table>
SCUBA Survey Dec 2004

Treadwell was active, S-3 was not. High profile tent was rapidly degraded by the surge. Two other minor emission sites, S-4 and S-5, further offshore from T-10 were identified.
SCUBA Survey July 19-20 2005

Treadwell T-10 was active, S-3 was inactive. Tube and Cone Tents were deployed.
Emission for July 2005

Figure Here
Oct 27, 2005 Seabed Deployment
T10 (combined) Emission
Oil to Gas Ratios
Curve Fit to Data

- Cone Tent Oil
- Cone Fit
- Tube Tent Oil (*4)
- Tube Fit
- Combined
- Combined Fit

Oil Emission (L hr⁻¹)

Depth (m)

\[ E = 0.020 T + 0.13 \]

\[ E = -0.11 T + 0.70 \]
Bottom Line:

2.62 liters oil day\(^{-1}\) from T-10 Well
Why?
Why?
Why?
Carpinteria Basin Geologic Structure
Summerland Area Geologic Structure

Qoa - alluvium
Qca-Casitas Formation
Tr- Rincon Formation
Qt-Terrace
North-South Summerland Cross-section MM’

Tv - Vaqueros Formation
Tr - Rincon Formation
Ts - Sespe Formation
Qca - Casitas Formation
Qoa - Alluvium
Qt - Terrace
Tm - Monterey Formation
Treadwell Pier Cross-section

SECTION THROUGH TREADWELL (SOUTHERN PACIFIC COMPANY'S) WELLS.

N. 12° E. to a point immediately northwest of big oil tank in Summerland. Section is about 1,000 feet west of Oxnard wharf.

from Grosbard (2002)
Boat Surveys
Bottom Line:
Geologic Evidence and Sea Surface Seep

Trends show Treadwell T-10 was drilled into a fault
We propose the fault is the Ortega Fault
Summerland Seepage Conceptual Model
Conclusions

- First quantification of submarine oil emission rates from an abandoned oil well
- Total T-10 oil emission Oct 18, 2005 was 2.6 liters per day
- S-3 Site, was active when T-10 was not, at other times, T-10 was active. Likely due to tapping the same faulted reservoir along the Treadwell Pier
- Although T-10 was the dominant oil emission source, sea surface surveys showed a trend of natural oil and gas seepage offshore Summerland
- The oil to gas ratios at S-3 and T-10 both surveys was approximately 1 to 10. Very oily bubbles (black bubbles) were mostly gas
Conclusions

• Geologic data indicates a fault passes through the Treadwell Pier
• Seep trend indicates a fault offshore Summerland - Proposed as the Ortega Fault
• The Proposed Ortega Fault passes through T-10 and likely other wells on the Treadwell Pier
Conclusions

The failures of multiple T-10 abandonments is due to geological factors, which indicate that future abandonment(s) to decrease oil emissions will be of short-lived success.

Moreover, seepage likely would increase from other conduits - natural seepage or human created, such as Site S-3.