Legend
- 2011 Soil Boring
- 2012 Soil Boring
- FHRA Property Boundary
SULFOLANE CONCENTRATIONS IN SOIL AT NORTHERN INVESTIGATION AREAS VADOSE ZONE

NOTES:

- **mg/kg**
- **DUP** Field-duplicate sample
- < Not detected; limit of detection (LOD) listed
- J Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ)
- R Laboratory could not quantify sulfolane due to hydrocarbon interference; datum is rejected
- R* Laboratory could not quantify sulfolane due to QC failures; datum is rejected
- JH* Result is considered estimated, biased high, due to QC failures (flag applied by SWI)
- JL* Result is considered estimated, biased low, due to QC failures (flag applied by SWI)
- J* Result is considered estimated (no direction of bias), due to QC failures (flag applied by SWI)
- JH Result is considered estimated, biased high, due to potential low bias from sample handling or holding time issues (flag applied by SWI)

LEGEND

- **2011 SOIL BORING SULFOLANE RESULTS**
  - **MATRICE INTERFERENCE**
    - NOT DETECTED
    - <0.043 MG/KG
    - 0.043 - 0.43 MG/KG
    - 0.43 - 4.3 MG/KG
    - >43 MG/KG

- **2012 SOIL BORING SULFOLANE RESULTS**
  - **MATRICE INTERFERENCE**
    - NOT DETECTED
    - <0.043 MG/KG
    - 0.043 - 0.43 MG/KG
    - 0.43 - 4.3 MG/KG
    - >43 MG/KG
### 2012 Soil Borings Sulfolane Results

<table>
<thead>
<tr>
<th>Depth</th>
<th>Sulfolane Concentration</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB-105</td>
<td>0.43 - 4.3 MG/KG</td>
<td>Not Detected</td>
</tr>
<tr>
<td>SB-233</td>
<td>4.3 - 43 MG/KG</td>
<td>Low bias from sample handling or holding time issues (flag applied by SWI)</td>
</tr>
<tr>
<td>SB-119</td>
<td>&gt;43 MG/KG</td>
<td>Low bias from sample handling or holding time issues (flag applied by SWI)</td>
</tr>
<tr>
<td>SB-106</td>
<td>0.043 - 0.43 MG/KG</td>
<td>Not detected; limit of detection (LOD) listed</td>
</tr>
<tr>
<td>SB-107</td>
<td>&lt;0.043 MG/KG</td>
<td>Laboratory could not quantify sulfolane due to hydrocarbon interference; datum is rejected</td>
</tr>
<tr>
<td>SB-228</td>
<td>0.43 - 4.3 MG/KG</td>
<td>Not detected; limit of detection (LOD) listed</td>
</tr>
<tr>
<td>SB-227</td>
<td>&gt;43 MG/KG</td>
<td>Low bias from sample handling or holding time issues (flag applied by SWI)</td>
</tr>
<tr>
<td>O-27</td>
<td>11/09/2011</td>
<td>Not detected; limit of detection (LOD) listed</td>
</tr>
<tr>
<td>O-1</td>
<td>06/05/2011</td>
<td>Not detected; limit of detection (LOD) listed</td>
</tr>
<tr>
<td>O-11</td>
<td>06/05/2011</td>
<td>Not detected; limit of detection (LOD) listed</td>
</tr>
<tr>
<td>SB-124</td>
<td>0.043 - 0.43 MG/KG</td>
<td>Not detected; limit of detection (LOD) listed</td>
</tr>
<tr>
<td>SB-128</td>
<td>0.43 - 4.3 MG/KG</td>
<td>Not detected; limit of detection (LOD) listed</td>
</tr>
<tr>
<td>SB-132</td>
<td>&gt;43 MG/KG</td>
<td>Low bias from sample handling or holding time issues (flag applied by SWI)</td>
</tr>
</tbody>
</table>

### Sulfolane Concentrations in Soil at Northern Investigation Areas Smear Zone

**Matrix Interference**

- **SB-105**: 0.43 - 4.3 MG/KG
- **SB-233**: 4.3 - 43 MG/KG
- **SB-119**: >43 MG/KG
- **SB-106**: 0.043 - 0.43 MG/KG
- **SB-107**: <0.043 MG/KG
- **SB-228**: 0.43 - 4.3 MG/KG
- **SB-227**: >43 MG/KG
- **O-27**: 11/09/2011
- **O-1**: 06/05/2011
- **O-11**: 06/05/2011
- **SB-124**: 0.043 - 0.43 MG/KG
- **SB-128**: 0.43 - 4.3 MG/KG
- **SB-132**: >43 MG/KG
- **SB-133**: 09/19/2011

**Site Characterization Report - 2012 Addendum**

**Flint Hills Resources Alaska, LLC**

**North Pole Refinery, North Pole, Alaska**

**Site Characterization Results for 2012 Addendum**

**Sulfolane Concentrations in Soil**

**At Northern Investigation Areas Smear Zone**

**Legend**

- **SB-105**: 0.43 - 4.3 MG/KG
- **SB-233**: 4.3 - 43 MG/KG
- **SB-119**: >43 MG/KG
- **SB-106**: 0.043 - 0.43 MG/KG
- **SB-107**: <0.043 MG/KG
- **SB-228**: 0.43 - 4.3 MG/KG
- **SB-227**: >43 MG/KG
- **O-27**: 11/09/2011
- **O-1**: 06/05/2011
- **O-11**: 06/05/2011
- **SB-124**: 0.043 - 0.43 MG/KG
- **SB-128**: 0.43 - 4.3 MG/KG
- **SB-132**: >43 MG/KG
- **SB-133**: 09/19/2011

**Notes:**

- **Scale in Feet**
- **DUP**: Field-duplicate sample
- **<**: Not detected; limit of detection (LOD) listed
- **J**: Estimated concentration, detected above the detection limit (DL), and below the limit of quantitation (LOQ)
- **R**: Laboratory could not quantify sulfolane due to background interference; datum is rejected
- **R***: Result is considered estimated, biased high, due to QC failures; datum is rejected
- **J***: Result is considered estimated, biased low, due to QC failures; datum is rejected
- **JH**: Result is considered estimated, biased high, due to QC failures (flag applied by SWI)
- **JR**: Result is considered estimated, biased low, due to QC failures (flag applied by SWI)
- **JH***: Limit of detection is considered in question due to potential low bias from sample handling or holding time issues (flag applied by SWI)
- **JR***: Result is considered estimated (no direction of bias), due to QC failures (flag applied by SWI)
LIF RESULTS - PERCENT MAXIMUM FLUORESCENCE

- >200%
- 140 - 200%
- 70 - 140%
- 3 - 70%
- 0 - 3%
- COULD NOT COMPLETE
- OBSERVATION WELL

**SITE CHARACTERIZATION REPORT – 2012 ADDENDUM**

**LIF INVESTIGATION FLUORESCENCE RESULTS**

**FIGURE 35**

**SCALE: IN FEET**

**Path:** V:\FHR_AK\NorthPoleRefinery\SiteCharacterization2012\MXD\Site Characterization Report – 2012 Addendum\Fig 36 LIF_InvestigationFluorescenceResults.mxd

**Date:** 1/24/2013

**Time:** 3:40:45 PM

**FLINT HILLS RESOURCES, ALASKA, LLC**

**NORTH POLE REFINERY, NORTH POLE, ALASKA**