**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

October 16, 2015

(b) (6) [redacted]

RE: Wilcox Oil Company Superfund Site – Residential Data Results

Dear Mr. (b) (6) [redacted]

This letter provides you with a summary of the soil data results for your property. Based on our review of the data, soil samples collected from your property did not exceed levels considered acceptable by EPA for short-term exposures. Although some concentrations exceeded their Residential Screening Level (RSL) for soil, this is merely an indication that further evaluation may be needed. The concentrations that exceeded the RSL are expected to fall within the accepted range established by EPA for long term exposures.

Table 1 presents the results for those chemicals detected in the soil and exceeding the RSL. All other data concentrations fell below the RSL. Two metals and several organic chemicals were detected as levels that exceed the Residential Soil Screening Levels (RSL). Arsenic was detected in every sample with the highest result being 5.9 milligrams per kilogram (mg/kg) at a depth of 0 - 2 inches below ground surface (bgs). Published reports have documented the background range of arsenic concentrations for Oklahoma as being 0.6 to 21 mg/kg. The highest result of 5.9 mg/kg falls within the range of background concentrations. Cadmium was detected within sample Grid 1 at a depth of 0 – 2 inches bgs and a concentration of 80.2 mg/kg. Several Polycyclic Aromatic Hydrocarbons and Benzene were detected as presented below. In addition to these chemicals, dark-stained soils were visually identified within all sample grids along with strong odors.

**Table 1**

| Grid | Depth | Chemical | Concentration mg/kg | Screening Level mg/kg |
|---|---|---|---|---|
| Grid 1 | 0 – 2 inches bgs | Benzo(a)anthracene | 0.8 | 0.16 |
| | | Benzo(a)pyrene | 0.46 | 0.016 |
| | | Benzo(b)fluoranthene | 0.46 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.16 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.26 | 0.16 |
| | | Cadmium | 80.2 | 71 |
| | 2 – 6 inches bgs | Benzo(a)anthracene | 0.42 | 0.16 |
| | | Benzo(a)pyrene | 0.25 | 0.016 |
| | | Benzo(b)fluoranthene | 0.26 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.084 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.16 | 0.16 |
| | 12 – 24 inches bgs | Benzo(a)pyrene | 0.025 | 0.016 |

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| Table 1 | | | | |
|---|---|---|---|---|
| **Grid** | **Depth** | **Chemical** | **Concentration mg/kg** | **Screening Level mg/kg** |
| Grid 2 | 0 – 2 inches bgs | Benzo(a)anthracene | 0.88 | 0.16 |
| | | Benzo(a)pyrene | 0.81 | 0.016 |
| | | Benzo(b)fluoranthene | 1.5 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.2 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.77 | 0.16 |
| | 0 – 2 inches bgs Duplicate | Benzo(a)anthracene | 1.1 | 0.16 |
| | | Benzo(a)pyrene | 0.98 | 0.016 |
| | | Benzo(b)fluoranthene | 1.8 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.24 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.94 | 0.16 |
| | 2 – 6 inches bgs | Benzo(a)anthracene | 0.87 | 0.16 |
| | | Benzo(a)pyrene | 0.73 | 0.016 |
| | | Benzo(b)fluoranthene | 0.44 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.22 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.43 | 0.16 |
| | 6 – 12 inches bgs | Benzo(a)pyrene | 0.13 | 0.016 |
| | | Dibenzo(a,h)anthracene | 0.044 | 0.016 |
| | 12 – 24 inches bgs | Benzo(a)pyrene | 0.016 | 0.016 |
| | | Benzene | 1.9 | 1.2 |
| Grid 3 | 0 – 2 inches bgs | Benzo(a)anthracene | 0.68 | 0.16 |
| | | Benzo(a)pyrene | 0.61 | 0.016 |
| | | Benzo(b)fluoranthene | 0.48 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.19 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.42 | 0.16 |
| | 2 – 6 inches bgs | Benzo(a)anthracene | 0.64 | 0.16 |
| | | Benzo(a)pyrene | 0.55 | 0.016 |
| | | Benzo(b)fluoranthene | 0.79 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.14 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.43 | 0.16 |
| | 6 – 12 inches bgs | Benzo(a)pyrene | 0.1 | 0.016 |
| | | Dibenzo(a,h)anthracene | 0.033 | 0.016 |

| Table 1 | | | | |
|---|---|---|---|---|
| **Grid** | **Depth** | **Chemical** | **Concentration mg/kg** | **Screening Level mg/kg** |
| Grid 4 | 0 – 2 inches bgs | Benzo(a)anthracene | 1.6 | 0.16 |
| | | Benzo(a)pyrene | 1.5 | 0.016 |
| | | Benzo(b)fluoranthene | 2.7 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.37 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 1.5 | 0.16 |
| | 2 – 6 inches bgs | Benzo(a)anthracene | 0.59 | 0.16 |
| | | Benzo(a)pyrene | 0.5 | 0.016 |
| | | Benzo(b)fluoranthene | 0.83 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.15 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.46 | 0.16 |
| | 6 – 12 inches bgs | Benzo(a)anthracene | 3.6 | 0.16 |
| | | Benzo(a)pyrene | 1.9 | 0.016 |
| | | Benzo(b)fluoranthene | 1.6 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.67 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 1 | 0.16 |
| | 12 – 24 inches bgs | Benzo(a)anthracene | 2 | 0.16 |
| | | Benzo(a)pyrene | 1.7 | 0.016 |
| | | Benzo(b)fluoranthene | 1.4 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.6 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.91 | 0.16 |
| | 12 – 24 inches bgs Duplicate | Benzo(a)anthracene | 1.1 | 0.16 |
| | | Benzo(a)pyrene | 0.7 | 0.016 |
| | | Benzo(b)fluoranthene | 0.6 | 0.16 |
| | | Dibenzo(a,h)anthracene | 0.25 | 0.016 |
| | | Indeno(1,2,3-cd)pyrene | 0.39 | 0.16 |

The Residential Soil Screening Levels represent conservative levels developed using risk assessment guidance from the EPA Superfund program. RSLs are considered by the Agency to be protective for humans (including sensitive groups) over a lifetime of exposure. RSLs are not cleanup standards and are used for site "screening" to help identify areas, contaminants, and conditions that may require further investigation at a particular site. Generally, at sites where contaminant concentrations fall below RSLs, no further action or study is warranted under the Superfund program, so long as the exposure assumptions at a site match those used to develop the RSL. Chemical concentrations above the RSL do not automatically trigger a response action; however, exceeding the RSL suggests that further evaluation of the potential risks by site contaminants is appropriate. In addition, further evaluation of the potential risks related to site contaminants that were detected in the soil but have no RSL is appropriate. As we move forward with our site investigation, we will be evaluating these contaminants in more detail through a Site-specific Human Health Risk Assessment to determine the potential risks these contaminants may pose. For additional information related to Arsenic and Polycyclic Aromatic Hydrocarbons, please see the enclosed contaminant profiles developed by the Agency for Toxic Substances and Disease Registry (ATSDR).

If you are concerned, please consider some of these options while we evaluate these contaminants in more detail.

- Ensure proper hygiene, especially frequent hand washing.
- Soil should be thoroughly shaken off clothes and footwear, before entering homes.
- Use a dust mask when mowing.
- Limit outside digging and soil moving activities.

We would like to follow-up with you during the week of October 26, 2015, to discuss the data presented in this letter and answer any questions that you may have. We will contact you by phone to schedule a time that fits your schedule. In the interim, should you want to talk with us, please contact me at 214-665-8143, or 1-800-533-3508, or contact Todd Downham, Oklahoma Department of Environmental Quality at 405-702-5136.

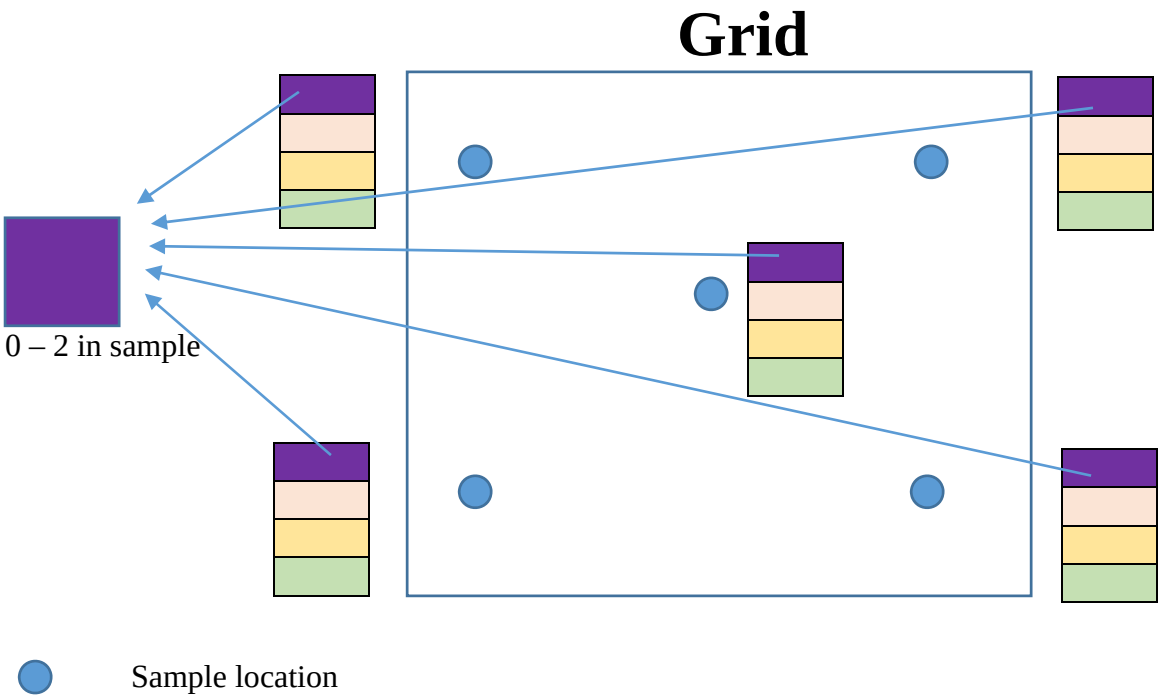
Sincerely,

Katrina Higgins-Coltrain,
Remedial Project Manager
LA/OK/NM Section

**Enclosure 1: Understanding the Soil Collection Process**

The following summary is provided to help you better understand how we sampled your property. The figure provided as Enclosure 2 shows that your property was divided into several sample grids. As shown in Figure 2, each Grid has five sample locations. From each of these five locations, a 24 inch long soil core was taken. The soil core was divided into depth intervals of 0-2 inches below ground surface (bgs), 2–6 inches bgs, 6-12 inches bgs, and 12-24 inches bgs. The soil from each depth interval was combined together to produce one sample representing that depth interval. For example, soil from 0–2 inches bgs was collected from each of the five sample locations and then combined into one sample that represents the 0–2 inch depth interval for that Grid. This process was used for each depth interval and results in a total of 4 soil samples for each Grid. One sample represents the 0–2 inches bgs, the second represents 2–6 inches bgs, the third represents 6–12 inches bgs, and the fourth represents 12–24 inches bgs. Figure 2 shows an example of the sample process. If there is no sample result for a depth interval, then we were not able to collect that sample due to little soil recovery or the core could not be pushed deeper because of rock. The table provided in Enclosure 3 summarizes the data results for all chemicals detected in the soil and provides the full list of chemicals that were analyzed. If a chemical is not summarized, then that chemical was not detected in the soil.

**Figure 2: Example of Soil Collection Process**




| Depths for each Sample Location | |
|---|---|
| | 0 – 2 inches below ground surface (bgs) |
| | 2 – 6 inches bgs |
| | 6 – 12 inches bgs |
| | 12 – 24 inches bgs |

Enclosure 2: Figure of Sample Grids

LEGEND

Property Boundary

Sample Grid Location

0 60 120

Feet

US EPA REGION 6

PROPERTY 008
SAMPLE LOCATION MAP
WILCOX OIL
WEST 221st STREET/REFINERY ROAD
BRISTOW, CREEK COUNTY, OKLAHOMA

| DATE | PROJECT NO | SCALE |
|---|---|---|
| OCTOBER, 2015 | 20406.012.005.0919.01 | AS SHOWN |

TDD NO: 5/WESTON-042-15-004

SOURCE: 2010 Microsoft Corporation and its data suppliers

FILE: L:\20406_START3_R6\WILCOX_OIL\GIS\MXDs\Sample Location Maps\Property 008 - Sample Location Map.mxd 11:34:06 AM 10/2/2015 bondp

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 1 0-2in bgs 6/1/2015 | Grid 1 2-6in bgs 6/1/2015 | Grid 1 6-12in bgs 6/1/2015 | Grid 1 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | |
| Aluminum | 7429-90-5 | mg/kg | 77000 | -- | **5070** | **6760** | **16200** | **12900** |
| Arsenic | 7440-38-2 | mg/kg | 0.68 | -- | **3.5 J** | **2.4 J** | **2.3 J** | **2.2 J** |
| Barium | 7440-39-3 | mg/kg | 15000 | -- | **41.5** | **48.2** | **73.2** | **64.7** |
| Beryllium | 7440-41-7 | mg/kg | 160 | -- | 0.67 U | 0.42 U | **0.74** | **0.69** |
| Cadmium | 7440-43-9 | mg/kg | 71 | -- | **80.2 J** | 0.42 UJ | 0.5 UJ | 0.48 UJ |
| Calcium | 7440-70-2 | mg/kg | NP | -- | **15300 J** | **2620 J** | **1200 J** | **1050 J** |
| Chromium | 7440-47-3 | mg/kg | NP | -- | **18.2 J** | **12.7 J** | **20.3 J** | **17.5 J** |
| Cobalt | 7440-48-4 | mg/kg | 23 | -- | **2.5** | **3.1** | **3.5** | **3.4** |
| Copper | 7440-50-8 | mg/kg | 3100 | -- | **20.4 J** | **8.2 J** | **7.6 J** | **7.2 J** |
| Iron | 7439-89-6 | mg/kg | 55000 | -- | **9940** | **8520** | **14600** | **13200** |
| Lead | 7439-92-1 | mg/kg | 400 | -- | **235** | **123** | **7.1** | **5.5** |
| Magnesium | 7439-95-4 | mg/kg | NP | -- | **6970 J** | **1350 J** | **1360 J** | **1110 J** |
| Manganese | 7439-96-5 | mg/kg | 1800 | -- | **444 J** | **170 J** | **110 J** | **69.9 J** |
| Mercury | 7439-97-6 | mg/kg | 9.4 | -- | **0.28** | **0.32** | **0.018 LJ** | 0.11 U |
| Nickel | 7440-02-0 | mg/kg | 1500 | -- | **6.7** | **7.3** | **10.8** | **9.5** |
| Potassium | 7440-09-7 | mg/kg | NP | -- | **743** | **837** | **1760** | **1320** |
| Selenium | 7782-49-2 | mg/kg | 390 | -- | **1.6 LJ** | 2.1 UJ | 2.5 UJ | 2.4 UJ |
| Vanadium | 7440-62-2 | mg/kg | 390 | -- | **12.3** | **20.1** | **33.4** | **28.1** |
| Zinc | 7440-66-6 | mg/kg | 23000 | -- | **13800 J** | **91.2 J** | **19.2 J** | **18.8 J** |

# Wilcox Oil
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## Bristow, OK

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|---|---|---|---|---|---|---|---|---|
| **Polychlorinated Biphenyls (None Detected)** | | | | | | | | |
| **Pesticides** | | | | | | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 2.3 | -- | **0.016 LJ** | **0.0042 LJ** | **0.00088 LJ** | **0.00037 LJ** |
| 4,4'-DDE | 72-55-9 | mg/kg | 2 | -- | **0.0069 LJ** | **0.0047 LJ** | 0.0039 U | **0.00033 LJ** |
| 4,4'-DDT | 50-29-3 | mg/kg | 1.9 | -- | **0.018 LJ** | **0.0079 LJ** | **0.00046 LJ** | **0.00036 LJ** |
| Acetophenone | 98-86-2 | mg/kg | 7800 | -- | 2.1 U | 2 U | 0.2 U | 0.77 U |
| Aldrin | 309-00-2 | mg/kg | 0.039 | -- | 0.021 U | 0.021 U | 0.002 U | 0.0019 U |
| alpha-BHC | 319-84-6 | mg/kg | 0.086 | -- | 0.021 U | **0.00058 LJ** | 0.002 U | **0.00036 LJ** |
| beta-BHC | 319-85-7 | mg/kg | 0.3 | -- | 0.021 U | **0.0013 LJ** | 0.002 U | **0.00037 LJ** |
| Carbazole | 86-74-8 | mg/kg | NP | -- | 2.1 U | 2 U | 0.2 U | 0.77 U |
| delta-BHC | 319-86-8 | mg/kg | NP | -- | 0.021 U | **0.0012 LJ** | **0.00015 LJ** | **0.00051 LJ** |
| Dieldrin | 60-57-1 | mg/kg | 0.034 | -- | **0.0011 LJ** | **0.0016 LJ** | **0.00017 LJ** | **0.000028 LJ** |
| Endosulfan I | 959-98-8 | mg/kg | NP | -- | 0.021 U | 0.021 U | 0.002 U | 0.0019 U |
| Endosulfan II | 33213-65-9 | mg/kg | NP | -- | **0.0043 LJ** | **0.00085 LJ** | 0.0039 U | **0.00075 LJ** |
| Endosulfan sulfate | 1031-07-8 | mg/kg | NP | -- | 0.042 U | 0.04 U | 0.0039 U | **0.00045 LJ** |
| Endrin | 72-20-8 | mg/kg | 19 | -- | **0.0052 LJ** | **0.00071 LJ** | **0.0005 LJ** | **0.00013 LJ** |
| Endrin ketone | 53494-70-5 | mg/kg | NP | -- | **0.014 LJ** | **0.014 LJ** | **0.00049 LJ** | 0.0038 U |
| gamma-BHC (Lindane) | 58-89-9 | mg/kg | 0.57 | -- | 0.021 U | **0.00032 LJ** | 0.002 U | **0.000074 LJ** |
| gamma-Chlordane | 5103-74-2 | mg/kg | NP | -- | **0.016 LJ** | **0.007 LJ** | **0.00014 LJ** | **0.00046 LJ** |
| Heptachlor | 76-44-8 | mg/kg | 0.13 | -- | 0.021 U | 0.021 U | 0.002 U | **0.0001 LJ** |
| Heptachlor epoxide | 1024-57-3 | mg/kg | 0.07 | -- | 0.021 U | 0.021 U | 0.002 U | **0.00083 LJ** |
| Methoxychlor | 72-43-5 | mg/kg | 320 | -- | **0.016 LJ** | **0.0076 LJ** | 0.02 U | **0.0019 LJ** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

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|---|---|---|---|---|---|---|---|---|
| **Semi-volatile Organic Compounds** | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 | -- | **NA** | **NA** | **NA** | **NA** |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 | -- | **NA** | **NA** | **NA** | **NA** |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 | -- | **NA** | **NA** | **NA** | **NA** |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | mg/kg | 39 | -- | 2.1 U | 2 U | 0.2 U | 0.77 U |
| Chrysene | 218-01-9 | mg/kg | 16 | -- | **NA** | **NA** | **NA** | **NA** |
| Phenanthrene | 85-01-8 | mg/kg | NP | -- | **NA** | **NA** | **NA** | **NA** |
| Pyrene | 129-00-0 | mg/kg | 1800 | -- | **NA** | **NA** | **NA** | **NA** |
| **Semi-volatile Organic Compounds (SIM)** | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 | -- | **0.11 LJ** | **0.085** | **0.0059 LJ** | **0.027 LJ** |
| Acenaphthene | 83-32-9 | mg/kg | 3600 | -- | 0.17 U | 0.079 U | 0.0078 U | 0.038 U |
| Acenaphthylene | 208-96-8 | mg/kg | NP | -- | 0.17 U | **0.02 LJ** | 0.0078 U | 0.038 U |
| Anthracene | 120-12-7 | mg/kg | 18000 | -- | **0.094 LJ** | **0.067 LJ** | **0.0031 LJ** | 0.038 U |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 | -- | **0.8** | **0.42** | **0.019** | **0.033 LJ** |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.016 | -- | **0.46** | **0.25** | **0.0088** | **0.025 LJ** |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 | -- | **0.46** | **0.26** | **0.0074 LJ** | **0.023 LJ** |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | NP | -- | **0.38** | **0.18** | **0.0034 LJ** | 0.038 U |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 1.6 | -- | **0.066 LJ** | **0.041 LJ** | 0.0078 U | 0.038 U |
| Chrysene | 218-01-9 | mg/kg | 16 | -- | **1.4** | **0.74** | **0.033** | **0.068** |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.016 | -- | **0.15 LJ** | **0.084** | **0.0032 LJ** | 0.038 U |
| Fluoranthene | 206-44-0 | mg/kg | 2400 | -- | **0.27** | **0.17** | **0.0065 LJ** | **0.0077 LJ** |
| Fluorene | 86-73-7 | mg/kg | 2400 | -- | 0.17 U | 0.079 U | 0.0078 U | 0.038 U |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.16 | -- | **0.26** | **0.16** | **0.0051 LJ** | **0.016 LJ** |
| Naphthalene | 91-20-3 | mg/kg | 3.8 | -- | **0.035 LJ** | **0.028 LJ** | **0.0024 LJ** | **0.013 LJ** |
| Phenanthrene | 85-01-8 | mg/kg | NP | -- | **1.2** | **0.68** | **0.047** | **0.018 LJ** |
| Pyrene | 129-00-0 | mg/kg | 1800 | -- | **1.1** | **0.6** | **0.032** | **0.14** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 1 0-2in bgs 6/1/2015 | Grid 1 2-6in bgs 6/1/2015 | Grid 1 6-12in bgs 6/1/2015 | Grid 1 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | |
| 2-Butanone | 78-93-3 | mg/kg | 27000 | -- | 0.013 U | 0.01 U | 0.01 U | 0.0095 U |
| 4-Methyl-2-Pentanone | 108-10-1 | mg/kg | 5300 | -- | 0.013 U | 0.01 U | 0.01 U | 0.0095 U |
| Acetone | 67-64-1 | mg/kg | 61000 | -- | **0.0032 LJ** | **0.0013 LJ** | **0.0023 LJ** | **0.0063 LJ** |
| Benzene | 71-43-2 | mg/kg | 1.2 | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |
| Chloroform | 67-66-3 | mg/kg | 0.32 | -- | **0.00056 LJ** | **0.00046 LJ** | 0.0051 U | **0.00039 LJ** |
| Cyclohexane | 110-82-7 | mg/kg | 6500 | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |
| Ethylbenzene | 100-41-4 | mg/kg | 5.8 | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |
| Isopropylbenzene | 98-82-8 | mg/kg | 1900 | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |
| m,p-Xylene | 108-38-3/106-42-3 | mg/kg | 550 | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |
| Methylcyclohexane | 108-87-2 | mg/kg | NP | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |
| o-Xylene | 95-47-6 | mg/kg | 650 | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |
| Toluene | 108-88-3 | mg/kg | 4900 | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |
| Trichlorofluoromethane | 75-69-4 | mg/kg | 730 | -- | 0.0067 U | 0.005 U | 0.0051 U | 0.0048 U |

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL
Yellow highlighted cells exceed RSL
U - Not Detected at reported quantitation limit
L - Reported concentration is below the CRQL
mg/kg-milligrams per kilogram
BOLD-indicates a detected concentration
bgs-below ground surface

NA - Not Analyzed
NP - Not Published
J - Estimated Value
R - Unusable
SIM-selected ion monitoring
in-inches

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 2 0-2in bgs 6/1/2015 | Grid 2-Duplicate 0-2in bgs 6/1/2015 | Grid 2 2-6in bgs 6/1/2015 | Grid 2 6-12in bgs 6/1/2015 | Grid 2 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | | |
| Aluminum | 7429-90-5 | mg/kg | 77000 | -- | **3820** | **2690** | **10500** | **8420** | **12000** |
| Arsenic | 7440-38-2 | mg/kg | 0.68 | -- | **5.9 J** | **5.2 J** | **1.8 J** | **2.3 J** | **2 J** |
| Barium | 7440-39-3 | mg/kg | 15000 | -- | **53.2** | **54.6** | **46.8** | **55.7** | **103** |
| Beryllium | 7440-41-7 | mg/kg | 160 | -- | 0.61 U | 0.48 U | 0.53 U | **0.55** | **0.66** |
| Cadmium | 7440-43-9 | mg/kg | 71 | -- | **1.8 J** | **1.7 J** | **0.56 J** | 0.4 UJ | 0.4 UJ |
| Calcium | 7440-70-2 | mg/kg | NP | -- | **21000 J** | **20800 J** | **8020 J** | **942 J** | **657 J** |
| Chromium | 7440-47-3 | mg/kg | NP | -- | **11.1 J** | **10.7 J** | **15 J** | **18.9 J** | **19.9 J** |
| Cobalt | 7440-48-4 | mg/kg | 23 | -- | **3.1** | **2.9** | **2.8** | **3** | **5.1** |
| Copper | 7440-50-8 | mg/kg | 3100 | -- | **23.8 J** | **21.3 J** | **9 J** | **7.8 J** | **7.1 J** |
| Iron | 7439-89-6 | mg/kg | 55000 | -- | **11000** | **8640** | **15800** | **12500** | **11800** |
| Lead | 7439-92-1 | mg/kg | 400 | -- | **274** | **248** | **80.4** | **10** | **5.6** |
| Magnesium | 7439-95-4 | mg/kg | NP | -- | **9050 J** | **9460 J** | **1940 J** | **873 J** | **948 J** |
| Manganese | 7439-96-5 | mg/kg | 1800 | -- | **600 J** | **563 J** | **140 J** | **65.6 J** | **66.3 J** |
| Mercury | 7439-97-6 | mg/kg | 9.4 | -- | **0.12** | **0.18** | **0.43** | **0.033 LJ** | 0.098 U |
| Nickel | 7440-02-0 | mg/kg | 1500 | -- | **9.1** | **8.6** | **11.7** | **9.4** | **11.7** |
| Potassium | 7440-09-7 | mg/kg | NP | -- | **753** | **546** | **1230** | **833** | **1200** |
| Selenium | 7782-49-2 | mg/kg | 390 | -- | 3.1 UJ | 2.4 UJ | 2.7 UJ | 2 UJ | 2 UJ |
| Vanadium | 7440-62-2 | mg/kg | 390 | -- | **12.3** | **11.9** | **26.8** | **29.1** | **29.4** |
| Zinc | 7440-66-6 | mg/kg | 23000 | -- | **288 J** | **274 J** | **153 J** | **90.6 J** | **16.6 J** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 2 0-2in bgs 6/1/2015 | Grid 2-Duplicate 0-2in bgs 6/1/2015 | Grid 2 2-6in bgs 6/1/2015 | Grid 2 6-12in bgs 6/1/2015 | Grid 2 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Polychlorinated Biphenyls (None Detected)** | | | | | | | | | |
| **Pesticides** | | | | | | | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 2.3 | -- | **0.011 LJ** | **0.021 LJ** | **0.063 LJ** | **0.0043 LJ** | 0.018 U |
| 4,4'-DDE | 72-55-9 | mg/kg | 2 | -- | **0.01 LJ** | **0.012 LJ** | **0.017 LJ** | **0.0017 LJ** | **0.00025 LJ** |
| 4,4'-DDT | 50-29-3 | mg/kg | 1.9 | -- | **0.024 LJ** | **0.029 LJ** | **0.021 LJ** | **0.0025 LJ** | 0.018 U |
| Acetophenone | 98-86-2 | mg/kg | 7800 | -- | 2.1 U | 2.1 U | 2 U | 1.9 U | **0.081 LJ** |
| Aldrin | 309-00-2 | mg/kg | 0.039 | -- | 0.021 U | 0.021 U | 0.098 U | 0.019 U | 0.0095 U |
| alpha-BHC | 319-84-6 | mg/kg | 0.086 | -- | **0.0016 LJ** | **0.0011 LJ** | **0.00083 LJ** | **0.0017 LJ** | **0.00061 LJ** |
| beta-BHC | 319-85-7 | mg/kg | 0.3 | -- | **0.0017 LJ** | **0.0026 LJ** | **0.0012 LJ** | **0.0022 LJ** | **0.0004 LJ** |
| Carbazole | 86-74-8 | mg/kg | NP | -- | 2.1 U | 2.1 U | 2 U | 1.9 U | 0.76 U |
| delta-BHC | 319-86-8 | mg/kg | NP | -- | 0.021 U | 0.021 U | 0.098 U | 0.019 U | 0.0095 U |
| Dieldrin | 60-57-1 | mg/kg | 0.034 | -- | **0.0028 LJ** | **0.0031 LJ** | 0.19 U | **0.0025 LJ** | 0.018 U |
| Endosulfan I | 959-98-8 | mg/kg | NP | -- | 0.021 U | 0.021 U | 0.098 U | 0.019 U | 0.0095 U |
| Endosulfan II | 33213-65-9 | mg/kg | NP | -- | **0.0019 LJ** | **0.0038 LJ** | **0.018 LJ** | **0.0024 LJ** | **0.00069 LJ** |
| Endosulfan sulfate | 1031-07-8 | mg/kg | NP | -- | 0.04 U | 0.041 U | **0.003 LJ** | 0.036 U | **0.00041 LJ** |
| Endrin | 72-20-8 | mg/kg | 19 | -- | **0.00039 LJ** | **0.0036 LJ** | **0.016 LJ** | **0.0015 LJ** | 0.018 U |
| Endrin ketone | 53494-70-5 | mg/kg | NP | -- | **0.022 LJ** | **0.018 LJ** | **0.045 LJ** | **0.0057 LJ** | 0.018 U |
| gamma-BHC (Lindane) | 58-89-9 | mg/kg | 0.57 | -- | **0.00021 LJ** | 0.021 U | 0.098 U | **0.00028 LJ** | 0.0095 U |
| gamma-Chlordane | 5103-74-2 | mg/kg | NP | -- | **0.014 LJ** | **0.019 LJ** | 0.098 U | **0.0049 LJ** | **0.00037 LJ** |
| Heptachlor | 76-44-8 | mg/kg | 0.13 | -- | 0.021 U | **0.0031 LJ** | 0.098 U | 0.019 U | 0.0095 U |
| Heptachlor epoxide | 1024-57-3 | mg/kg | 0.07 | -- | **0.0036 LJ** | **0.004 LJ** | 0.098 U | 0.019 U | 0.0095 U |
| Methoxychlor | 72-43-5 | mg/kg | 320 | -- | **0.02 LJ** | 0.21 U | **0.041 LJ** | **0.0093 LJ** | 0.095 U |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 2 0-2in bgs 6/1/2015 | Grid 2-Duplicate 0-2in bgs 6/1/2015 | Grid 2 2-6in bgs 6/1/2015 | Grid 2 6-12in bgs 6/1/2015 | Grid 2 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Semi-volatile Organic Compounds** | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 | -- | **NA** | **NA** | **NA** | **NA** | **NA** |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 | -- | **NA** | **NA** | **NA** | **NA** | **NA** |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 | -- | **NA** | **NA** | **NA** | **NA** | **NA** |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | mg/kg | 39 | -- | **0.24 LJ** | 2.1 U | 2 U | 1.9 U | 0.76 U |
| Chrysene | 218-01-9 | mg/kg | 16 | -- | **NA** | **NA** | **NA** | **NA** | **NA** |
| Phenanthrene | 85-01-8 | mg/kg | NP | -- | **NA** | **NA** | **NA** | **NA** | **NA** |
| Pyrene | 129-00-0 | mg/kg | 1800 | -- | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Semi-volatile Organic Compounds (SIM)** | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 | -- | **0.13 LJ** | **0.13 LJ** | **0.94** | **1.3 J** | **0.24** |
| Acenaphthene | 83-32-9 | mg/kg | 3600 | -- | 0.16 U | 0.2 U | 0.19 U | 0.072 U | 0.037 U |
| Acenaphthylene | 208-96-8 | mg/kg | NP | -- | **0.23** | **0.27** | 0.19 U | 0.072 U | 0.037 U |
| Anthracene | 120-12-7 | mg/kg | 18000 | -- | **0.25** | **0.28** | **0.25** | **0.097** | 0.037 U |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 | -- | **0.88** | **1.1** | **0.87** | **0.15** | **0.023 LJ** |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.016 | -- | **0.81** | **0.98** | **0.73** | **0.13** | **0.016 LJ** |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 | -- | **1.5** | **1.8** | **0.44** | **0.11** | **0.016 LJ** |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | NP | -- | **0.66** | **0.77** | **0.93** | **0.058 LJ** | 0.037 U |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 1.6 | -- | **0.38** | **0.53** | **0.053 LJ** | 0.072 U | 0.037 U |
| Chrysene | 218-01-9 | mg/kg | 16 | -- | **1.3** | **1.5** | **1.5** | **0.53** | **0.074** |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.016 | -- | **0.2** | **0.24** | **0.22** | **0.044 LJ** | 0.037 U |
| Fluoranthene | 206-44-0 | mg/kg | 2400 | -- | **0.81** | **1** | **0.32** | **0.12** | **0.015 LJ** |
| Fluorene | 86-73-7 | mg/kg | 2400 | -- | 0.16 U | 0.2 U | **0.04 LJ** | **0.13** | **0.024 LJ** |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.16 | -- | **0.77** | **0.94** | **0.43** | **0.072 LJ** | **0.01 LJ** |
| Naphthalene | 91-20-3 | mg/kg | 3.8 | -- | **0.052 LJ** | **0.051 LJ** | **0.25** | **0.36** | **0.11** |
| Phenanthrene | 85-01-8 | mg/kg | NP | -- | **0.81** | **0.72** | **1.8** | **0.52** | **0.093** |
| Pyrene | 129-00-0 | mg/kg | 1800 | -- | **1.2** | **1.4** | **1.7** | **0.56** | **0.089** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 2 0-2in bgs 6/1/2015 | Grid 2-Duplicate 0-2in bgs 6/1/2015 | Grid 2 2-6in bgs 6/1/2015 | Grid 2 6-12in bgs 6/1/2015 | Grid 2 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | | |
| 2-Butanone | 78-93-3 | mg/kg | 27000 | -- | 0.011 U | 0.012 U | 0.016 U | 1.1 U | 2.7 U |
| 4-Methyl-2-Pentanone | 108-10-1 | mg/kg | 5300 | -- | 0.011 U | 0.012 U | 0.016 U | 1.1 U | 2.7 U |
| Acetone | 67-64-1 | mg/kg | 61000 | -- | **0.0013 LJ** | 0.012 U | 0.016 U | 1.1 U | 2.7 U |
| Benzene | 71-43-2 | mg/kg | 1.2 | -- | 0.0053 U | 0.0058 U | **0.0044 LJ** | **1** | **1.9** |
| Chloroform | 67-66-3 | mg/kg | 0.32 | -- | 0.0053 U | 0.0058 U | **0.0023 LJ** | 0.55 U | 1.3 U |
| Cyclohexane | 110-82-7 | mg/kg | 6500 | -- | 0.0053 U | 0.0058 U | **0.0018 LJ** | **3.7** | **13** |
| Ethylbenzene | 100-41-4 | mg/kg | 5.8 | -- | 0.0053 U | 0.0058 U | 0.0082 U | **0.42 LJ** | **2.9** |
| Isopropylbenzene | 98-82-8 | mg/kg | 1900 | -- | 0.0053 U | 0.0058 U | 0.0082 U | **0.2 LJ** | **1.7** |
| m,p-Xylene | 108-38-3/106-42-3 | mg/kg | 550 | -- | 0.0053 U | 0.0058 U | 0.0082 U | **1.4** | **2.4** |
| Methylcyclohexane | 108-87-2 | mg/kg | NP | -- | 0.0053 U | 0.0058 U | **0.0011 LJ** | **8.1** | **26** |
| o-Xylene | 95-47-6 | mg/kg | 650 | -- | 0.0053 U | 0.0058 U | **0.00039 LJ** | **0.18 LJ** | **0.54 LJ** |
| Toluene | 108-88-3 | mg/kg | 4900 | -- | 0.0053 U | 0.0058 U | 0.0082 U | **0.64** | **0.43 LJ** |
| Trichlorofluoromethane | 75-69-4 | mg/kg | 730 | -- | 0.0053 U | 0.0058 U | 0.0082 U | 0.55 U | 1.3 U |

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL
Yellow highlighted cells exceed RSL
U - Not Detected at reported quantitation limit
L - Reported concentration is below the CRQL
mg/kg-milligrams per kilogram
BOLD-indicates a detected concentration
bgs-below ground surface

NA - Not Analyzed
NP - Not Published
J - Estimated Value
R - Unusable
SIM-selected ion monitoring
in-inches

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008<br>Sample ID<br>Depth<br>Date | Grid 3<br>0-2in bgs<br>6/1/2015 | Grid 3<br>2-6in bgs<br>6/1/2015 | Grid 3<br>6-12in bgs<br>6/1/2015 | Grid 3<br>12-24in bgs<br>6/1/2015 |
|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | |
| Aluminum | 7429-90-5 | mg/kg | 77000 | -- | **1830** | **3110** | **5490** | **4170** |
| Arsenic | 7440-38-2 | mg/kg | 0.68 | -- | **1.6 J** | **2.8 J** | **1.5 J** | **1** |
| Barium | 7440-39-3 | mg/kg | 15000 | -- | **25.5** | **36.3** | **56.6** | **42.7** |
| Beryllium | 7440-41-7 | mg/kg | 160 | -- | 0.46 U | 0.41 U | 0.39 U | 0.44 U |
| Cadmium | 7440-43-9 | mg/kg | 71 | -- | **1.5 J** | 0.41 UJ | 0.39 UJ | 0.44 U |
| Calcium | 7440-70-2 | mg/kg | NP | -- | **117000 J** | **3700 J** | **1170 J** | **792** |
| Chromium | 7440-47-3 | mg/kg | NP | -- | **5.4 J** | **8.1 J** | **9.6 J** | **9.2** |
| Cobalt | 7440-48-4 | mg/kg | 23 | -- | **1.6** | **2.3** | **2.4** | **2.4** |
| Copper | 7440-50-8 | mg/kg | 3100 | -- | **10.7 J** | **8.8 J** | **5.4 J** | **4.6** |
| Iron | 7439-89-6 | mg/kg | 55000 | -- | **7790** | **5910** | **7210** | **5360** |
| Lead | 7439-92-1 | mg/kg | 400 | -- | **138** | **66.1** | **72.9** | **19** |
| Magnesium | 7439-95-4 | mg/kg | NP | -- | **5770 J** | **1420 J** | **694 J** | 451 U |
| Manganese | 7439-96-5 | mg/kg | 1800 | -- | **504 J** | **231 J** | **160 J** | **141** |
| Mercury | 7439-97-6 | mg/kg | 9.4 | -- | **0.08 LJ** | **0.17** | **0.12** | **0.082 LJ** |
| Nickel | 7440-02-0 | mg/kg | 1500 | -- | **12** | **4.6** | **5.2** | **5.2** |
| Potassium | 7440-09-7 | mg/kg | NP | -- | 522 U | 510 U | **609** | **483** |
| Selenium | 7782-49-2 | mg/kg | 390 | -- | 2.3 UJ | 2 UJ | 2 UJ | 2.2 U |
| Vanadium | 7440-62-2 | mg/kg | 390 | -- | **14.1** | **11.7** | **15.9** | **13.4** |
| Zinc | 7440-66-6 | mg/kg | 23000 | -- | **231 J** | **66.2 J** | **30 J** | **18.6** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008<br>Sample ID<br>Depth<br>Date | Grid 3<br>0-2in bgs<br>6/1/2015 | Grid 3<br>2-6in bgs<br>6/1/2015 | Grid 3<br>6-12in bgs<br>6/1/2015 | Grid 3<br>12-24in bgs<br>6/1/2015 |
|---|---|---|---|---|---|---|---|---|
| **Polychlorinated Biphenyls (None Detected)** | | | | | | | | |
| **Pesticides** | | | | | | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 2.3 | -- | **0.11 LJ** | **0.051 LJ** | 0.038 U | **0.0007 LJ** |
| 4,4'-DDE | 72-55-9 | mg/kg | 2 | -- | **0.0042 LJ** | **0.0017 LJ** | **0.00028 LJ** | **0.00024 LJ** |
| 4,4'-DDT | 50-29-3 | mg/kg | 1.9 | -- | **0.04 LJ** | **0.03 LJ** | **0.0039 LJ** | **0.00034 LJ** |
| Acetophenone | 98-86-2 | mg/kg | 7800 | -- | 2.3 U | 2 U | 1.9 U | 0.2 UJ |
| Aldrin | 309-00-2 | mg/kg | 0.039 | -- | 0.12 U | 0.1 U | 0.019 U | **0.000039 LJ** |
| alpha-BHC | 319-84-6 | mg/kg | 0.086 | -- | **0.002 LJ** | 0.1 U | 0.019 U | 0.002 U |
| beta-BHC | 319-85-7 | mg/kg | 0.3 | -- | 0.12 U | 0.1 U | 0.019 U | 0.002 U |
| Carbazole | 86-74-8 | mg/kg | NP | -- | 2.3 U | 2 U | 1.9 U | 0.2 UJ |
| delta-BHC | 319-86-8 | mg/kg | NP | -- | 0.12 U | **0.0024 LJ** | **0.0008 LJ** | 0.002 U |
| Dieldrin | 60-57-1 | mg/kg | 0.034 | -- | 0.23 U | **0.0075 LJ** | **0.00063 LJ** | **0.000068 LJ** |
| Endosulfan I | 959-98-8 | mg/kg | NP | -- | 0.12 U | 0.1 U | 0.019 U | **0.00019 LJ** |
| Endosulfan II | 33213-65-9 | mg/kg | NP | -- | **0.018 LJ** | **0.0034 LJ** | 0.038 U | **0.00033 LJ** |
| Endosulfan sulfate | 1031-07-8 | mg/kg | NP | -- | **0.015 LJ** | 0.19 U | 0.038 U | **0.00049 LJ** |
| Endrin | 72-20-8 | mg/kg | 19 | -- | **0.029 LJ** | **0.024 LJ** | 0.038 U | **0.00021 LJ** |
| Endrin ketone | 53494-70-5 | mg/kg | NP | -- | **0.069 LJ** | **0.0099 LJ** | **0.0013 LJ** | 0.0038 U |
| gamma-BHC (Lindane) | 58-89-9 | mg/kg | 0.57 | -- | 0.12 U | 0.1 U | 0.019 U | **0.00032 LJ** |
| gamma-Chlordane | 5103-74-2 | mg/kg | NP | -- | **0.0064 LJ** | **0.022 LJ** | **0.0017 LJ** | **0.00049 LJ** |
| Heptachlor | 76-44-8 | mg/kg | 0.13 | -- | 0.12 U | 0.1 U | 0.019 U | **0.00003 LJ** |
| Heptachlor epoxide | 1024-57-3 | mg/kg | 0.07 | -- | **0.0064 LJ** | **0.0011 LJ** | 0.019 U | 0.002 U |
| Methoxychlor | 72-43-5 | mg/kg | 320 | -- | **0.083 LJ** | **0.033 LJ** | 0.19 U | **0.00071 LJ** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 3 0-2in bgs 6/1/2015 | Grid 3 2-6in bgs 6/1/2015 | Grid 3 6-12in bgs 6/1/2015 | Grid 3 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|
| **Semi-volatile Organic Compounds** | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 | -- | **NA** | **NA** | **NA** | **NA** |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 | -- | **NA** | **NA** | **NA** | **NA** |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 | -- | **NA** | **NA** | **NA** | **NA** |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | mg/kg | 39 | -- | 2.3 U | **0.2 LJ** | 1.9 U | 0.2 UJ |
| Chrysene | 218-01-9 | mg/kg | 16 | -- | **NA** | **NA** | **NA** | **NA** |
| Phenanthrene | 85-01-8 | mg/kg | NP | -- | **NA** | **NA** | **NA** | **NA** |
| Pyrene | 129-00-0 | mg/kg | 1800 | -- | **NA** | **NA** | **NA** | **NA** |
| **Semi-volatile Organic Compounds (SIM)** | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 | -- | **0.79** | **0.43** | **0.048** | **0.0069 J** |
| Acenaphthene | 83-32-9 | mg/kg | 3600 | -- | 0.18 U | 0.12 U | 0.038 U | 0.0038 UJ |
| Acenaphthylene | 208-96-8 | mg/kg | NP | -- | **0.042 LJ** | **0.13** | **0.008 LJ** | 0.0038 UJ |
| Anthracene | 120-12-7 | mg/kg | 18000 | -- | **0.23** | **0.2** | **0.027 LJ** | 0.0038 UJ |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 | -- | **0.68** | **0.64** | **0.15** | 0.0038 UJ |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.016 | -- | **0.61** | **0.55** | **0.1** | 0.0038 UJ |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 | -- | **0.48** | **0.79** | **0.089** | **0.0019 LJ** |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | NP | -- | **0.9** | **0.32** | **0.055** | **0.0025 LJ** |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 1.6 | -- | **0.076 LJ** | **0.22** | **0.014 LJ** | 0.0038 UJ |
| Chrysene | 218-01-9 | mg/kg | 16 | -- | **1.2** | **0.99** | **0.24** | **0.013 J** |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.016 | -- | **0.19** | **0.14** | **0.033 LJ** | 0.0038 UJ |
| Fluoranthene | 206-44-0 | mg/kg | 2400 | -- | **0.32** | **0.47** | **0.047** | **0.0026 LJ** |
| Fluorene | 86-73-7 | mg/kg | 2400 | -- | 0.18 U | 0.12 U | 0.038 U | **0.0022 LJ** |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.16 | -- | **0.42** | **0.43** | **0.059** | **0.0013 LJ** |
| Naphthalene | 91-20-3 | mg/kg | 3.8 | -- | **0.22** | **0.19** | **0.019 LJ** | **0.0042 J** |
| Phenanthrene | 85-01-8 | mg/kg | NP | -- | **1.5** | **0.94** | **0.2** | **0.011 J** |
| Pyrene | 129-00-0 | mg/kg | 1800 | -- | **1.3** | **1** | **0.19** | **0.0061 J** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 3 0-2in bgs 6/1/2015 | Grid 3 2-6in bgs 6/1/2015 | Grid 3 6-12in bgs 6/1/2015 | Grid 3 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | |
| 2-Butanone | 78-93-3 | mg/kg | 27000 | -- | 0.016 U | 0.012 U | **0.013** | **0.028 J** |
| 4-Methyl-2-Pentanone | 108-10-1 | mg/kg | 5300 | -- | 0.016 U | 0.012 U | **0.0039 LJ** | 0.016 U |
| Acetone | 67-64-1 | mg/kg | 61000 | -- | **0.0022 LJ** | 0.012 U | **0.009 LJ** | **0.038 J** |
| Benzene | 71-43-2 | mg/kg | 1.2 | -- | 0.0078 U | 0.0061 U | 0.0057 U | 0.008 U |
| Chloroform | 67-66-3 | mg/kg | 0.32 | -- | 0.0078 U | **0.0005 LJ** | 0.0057 U | 0.008 UR |
| Cyclohexane | 110-82-7 | mg/kg | 6500 | -- | 0.0078 U | 0.0061 U | 0.0057 U | 0.008 U |
| Ethylbenzene | 100-41-4 | mg/kg | 5.8 | -- | 0.0078 U | 0.0061 U | 0.0057 U | **0.00036 LJ** |
| Isopropylbenzene | 98-82-8 | mg/kg | 1900 | -- | 0.0078 U | 0.0061 U | 0.0057 U | 0.008 U |
| m,p-Xylene | 108-38-3/106-42-3 | mg/kg | 550 | -- | 0.0078 U | 0.0061 U | 0.0057 U | **0.00091 LJ** |
| Methylcyclohexane | 108-87-2 | mg/kg | NP | -- | 0.0078 U | 0.0061 U | 0.0057 U | 0.008 U |
| o-Xylene | 95-47-6 | mg/kg | 650 | -- | **0.00024 LJ** | 0.0061 U | **0.0003 LJ** | 0.008 U |
| Toluene | 108-88-3 | mg/kg | 4900 | -- | **0.01 J^** | 0.0061 U | **0.017** | **0.089 J** |
| Trichlorofluoromethane | 75-69-4 | mg/kg | 730 | -- | **0.00033 LJ** | 0.0061 U | 0.0057 U | 0.008 UR |

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL
Yellow highlighted cells exceed RSL
U - Not Detected at reported quantitation limit
L - Reported concentration is below the CRQL
mg/kg-milligrams per kilogram
BOLD-indicates a detected concentration
bgs-below ground surface

NA - Not Analyzed
NP - Not Published
J - Estimated Value
R - Unusable
SIM-selected ion monitoring
in-inches

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 4 0-2in bgs 6/1/2015 | Grid 4 2-6in bgs 6/1/2015 | Grid 4 6-12in bgs 6/1/2015 | Grid 4 12-24in bgs 6/1/2015 | Grid 4-Duplicate 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | | |
| Aluminum | 7429-90-5 | mg/kg | 77000 | -- | **4370** | **4150** | **4100** | **12200** | **9010** |
| Arsenic | 7440-38-2 | mg/kg | 0.68 | -- | **3.8 J** | **1.4 J** | **2.2 J** | **1.9 J** | **1.8 J** |
| Barium | 7440-39-3 | mg/kg | 15000 | -- | **49.1** | **34.8** | **41.9** | **61.2** | **71** |
| Beryllium | 7440-41-7 | mg/kg | 160 | -- | 0.5 U | 0.43 U | 0.51 U | 0.55 U | **0.81** |
| Cadmium | 7440-43-9 | mg/kg | 71 | -- | **2.2 J** | 0.43 UJ | 0.51 UJ | 0.55 UJ | 0.48 UJ |
| Calcium | 7440-70-2 | mg/kg | NP | -- | **27000 J** | **10200 J** | **8670 J** | **2250 J** | **2770 J** |
| Chromium | 7440-47-3 | mg/kg | NP | -- | **13.6 J** | **8.9 J** | **9.2 J** | **12.3 J** | **19.5 J** |
| Cobalt | 7440-48-4 | mg/kg | 23 | -- | **2.9** | **2.3** | **2.4** | **5.4** | **6.6** |
| Copper | 7440-50-8 | mg/kg | 3100 | -- | **23.1 J** | **5.5 J** | **10 J** | **9.6 J** | **10.6 J** |
| Iron | 7439-89-6 | mg/kg | 55000 | -- | **11700** | **6120** | **6420** | **12600** | **13000** |
| Lead | 7439-92-1 | mg/kg | 400 | -- | **235** | **36.9** | **21.2** | **31.5** | **14.1** |
| Magnesium | 7439-95-4 | mg/kg | NP | -- | **6710 J** | **2220 J** | **1030 J** | **903 J** | **1100 J** |
| Manganese | 7439-96-5 | mg/kg | 1800 | -- | **503 J** | **171 J** | **979 J** | **134 J** | **215 J** |
| Mercury | 7439-97-6 | mg/kg | 9.4 | -- | **0.18** | **0.021 LJ** | **0.071 LJ** | **0.047 LJ** | **0.13** |
| Nickel | 7440-02-0 | mg/kg | 1500 | -- | **10.5** | **6.4** | **7.5** | **10.3** | **12.2** |
| Potassium | 7440-09-7 | mg/kg | NP | -- | **880** | **823** | **776** | **1060** | **913** |
| Selenium | 7782-49-2 | mg/kg | 390 | -- | 2.5 UJ | 2.1 UJ | 2.5 UJ | 2.8 UJ | 2.4 UJ |
| Vanadium | 7440-62-2 | mg/kg | 390 | -- | **12.4** | **13.3** | **16.5** | **18.4** | **27.8** |
| Zinc | 7440-66-6 | mg/kg | 23000 | -- | **407 J** | **36.9 J** | **19.3 J** | **25.6 J** | **21.3 J** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 4 0-2in bgs 6/1/2015 | Grid 4 2-6in bgs 6/1/2015 | Grid 4 6-12in bgs 6/1/2015 | Grid 4 12-24in bgs 6/1/2015 | Grid 4-Duplicate 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Polychlorinated Biphenyls (None Detected)** | | | | | | | | | |
| **Pesticides** | | | | | | | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 2.3 | -- | **0.047 LJ** | **0.069 LJ** | **0.019 LJ** | **0.015 LJ** | **0.0092 LJ** |
| 4,4'-DDE | 72-55-9 | mg/kg | 2 | -- | **0.012 LJ** | 0.18 U | **0.0016 LJ** | 0.19 U | **0.0019 LJ** |
| 4,4'-DDT | 50-29-3 | mg/kg | 1.9 | -- | **0.022 LJ** | **0.022 LJ** | **0.018 LJ** | **0.016 LJ** | **0.0086 LJ** |
| Acetophenone | 98-86-2 | mg/kg | 7800 | -- | 2 U | 1.9 U | 3.8 U | 1.9 U | 1.9 U |
| Aldrin | 309-00-2 | mg/kg | 0.039 | -- | 0.1 U | 0.095 U | 0.096 U | 0.096 U | 0.019 U |
| alpha-BHC | 319-84-6 | mg/kg | 0.086 | -- | **0.001 LJ** | **0.0016 LJ** | **0.0035 LJ** | 0.096 U | **0.00077 LJ** |
| beta-BHC | 319-85-7 | mg/kg | 0.3 | -- | 0.1 U | 0.095 U | 0.096 U | 0.096 U | **0.00093 LJ** |
| Carbazole | 86-74-8 | mg/kg | NP | -- | 2 U | 1.9 U | 3.8 U | **0.46 LJ** | 1.9 U |
| delta-BHC | 319-86-8 | mg/kg | NP | -- | 0.1 U | 0.095 U | 0.096 U | 0.096 U | 0.019 U |
| Dieldrin | 60-57-1 | mg/kg | 0.034 | -- | **0.001 LJ** | **0.0049 LJ** | 0.19 U | 0.19 U | 0.036 U |
| Endosulfan I | 959-98-8 | mg/kg | NP | -- | 0.1 U | 0.095 U | 0.096 U | 0.096 U | 0.019 U |
| Endosulfan II | 33213-65-9 | mg/kg | NP | -- | **0.0054 LJ** | **0.015 LJ** | **0.0063 LJ** | **0.0077 LJ** | **0.0058 LJ** |
| Endosulfan sulfate | 1031-07-8 | mg/kg | NP | -- | **0.015 LJ** | **0.017 LJ** | **0.0086 LJ** | 0.19 U | **0.0022 LJ** |
| Endrin | 72-20-8 | mg/kg | 19 | -- | **0.0083 LJ** | **0.027 LJ** | **0.013 LJ** | **0.0099 LJ** | **0.0019 LJ** |
| Endrin ketone | 53494-70-5 | mg/kg | NP | -- | **0.046 LJ** | **0.033 LJ** | **0.046 LJ** | **0.035 LJ** | **0.017 LJ** |
| gamma-BHC (Lindane) | 58-89-9 | mg/kg | 0.57 | -- | 0.1 U | 0.095 U | 0.096 U | 0.096 U | 0.019 U |
| gamma-Chlordane | 5103-74-2 | mg/kg | NP | -- | **0.05 LJ** | **0.025 LJ** | **0.0044 LJ** | **0.0017 LJ** | **0.0034 LJ** |
| Heptachlor | 76-44-8 | mg/kg | 0.13 | -- | 0.1 U | 0.095 U | 0.096 U | 0.096 U | 0.019 U |
| Heptachlor epoxide | 1024-57-3 | mg/kg | 0.07 | -- | 0.1 U | **0.0033 LJ** | **0.0012 LJ** | 0.096 U | **0.0031 LJ** |
| Methoxychlor | 72-43-5 | mg/kg | 320 | -- | 1 U | 0.95 U | 0.96 U | **0.031 LJ** | **0.0077 LJ** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 4 0-2in bgs 6/1/2015 | Grid 4 2-6in bgs 6/1/2015 | Grid 4 6-12in bgs 6/1/2015 | Grid 4 12-24in bgs 6/1/2015 | Grid 4-Duplicate 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Semi-volatile Organic Compounds** | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 | -- | **NA** | **NA** | **6.6** | **2.5** | **NA** |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 | -- | **NA** | **NA** | **NA** | **2** | **NA** |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 | -- | **2.7** | **NA** | **NA** | **NA** | **NA** |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | mg/kg | 39 | -- | 2 U | **0.17 LJ** | 3.8 U | 1.9 U | 1.9 U |
| Chrysene | 218-01-9 | mg/kg | 16 | -- | **NA** | **NA** | **5.2** | **3.9** | **NA** |
| Phenanthrene | 85-01-8 | mg/kg | NP | -- | **NA** | **NA** | **11** | **6.6** | **2.2** |
| Pyrene | 129-00-0 | mg/kg | 1800 | -- | **NA** | **NA** | **9.3** | **5.7** | **2** |
| **Semi-volatile Organic Compounds (SIM)** | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 | -- | **0.33** | **0.33** | **NA** | **NA** | **1.2** |
| Acenaphthene | 83-32-9 | mg/kg | 3600 | -- | 0.2 U | 0.11 U | 0.37 U | **0.17 LJ** | **0.052 LJ** |
| Acenaphthylene | 208-96-8 | mg/kg | NP | -- | **0.55** | **0.13** | 0.37 U | 0.19 U | 0.18 U |
| Anthracene | 120-12-7 | mg/kg | 18000 | -- | **0.58** | **0.2** | **1.3** | **0.61** | **0.19** |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 | -- | **1.6** | **0.59** | **3.6** | **NA** | **1.1** |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.016 | -- | **1.5** | **0.5** | **1.9** | **1.7** | **0.7** |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 | -- | **NA** | **0.83** | **1.6** | **1.4** | **0.6** |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | NP | -- | **1.2** | **0.36** | **1.4** | **1.3** | **0.48** |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 1.6 | -- | **0.83** | **0.19** | **0.17 LJ** | **0.11 LJ** | **0.074 LJ** |
| Chrysene | 218-01-9 | mg/kg | 16 | -- | **2.1 J** | **0.89** | **NA** | **NA** | **2 J** |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.016 | -- | **0.37** | **0.15** | **0.67** | **0.6** | **0.25** |
| Fluoranthene | 206-44-0 | mg/kg | 2400 | -- | **1.5** | **0.42** | **1.8** | **1.1** | **0.4** |
| Fluorene | 86-73-7 | mg/kg | 2400 | -- | 0.2 U | **0.025 LJ** | **1.3** | **0.48** | **0.15 LJ** |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.16 | -- | **1.5** | **0.46** | **1** | **0.91** | **0.39** |
| Naphthalene | 91-20-3 | mg/kg | 3.8 | -- | **0.11 LJ** | **0.13** | **1.6** | **0.84** | **0.68** |
| Phenanthrene | 85-01-8 | mg/kg | NP | -- | **0.98** | **0.7** | **NA** | **NA** | **NA** |
| Pyrene | 129-00-0 | mg/kg | 1800 | -- | **2.2 J** | **0.85** | **NA** | **NA** | **NA** |

# Wilcox Oil
## Soil Analytical Data
## Bristow, OK

| Analyte | CAS.NO | Units | EPA Residential Soil | Property 008 Sample ID Depth Date | Grid 4 0-2in bgs 6/1/2015 | Grid 4 2-6in bgs 6/1/2015 | Grid 4 6-12in bgs 6/1/2015 | Grid 4 12-24in bgs 6/1/2015 | Grid 4-Duplicate 12-24in bgs 6/1/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | | |
| 2-Butanone | 78-93-3 | mg/kg | 27000 | -- | 0.014 U | 0.0089 U | **0.0047 LJ** | 0.67 U | 0.01 U |
| 4-Methyl-2-Pentanone | 108-10-1 | mg/kg | 5300 | -- | 0.014 U | 0.0089 U | 0.01 U | 0.67 U | 0.01 U |
| Acetone | 67-64-1 | mg/kg | 61000 | -- | **0.0016 LJ** | 0.0089 U | **0.0069 LJ** | 0.67 U | 0.01 U |
| Benzene | 71-43-2 | mg/kg | 1.2 | -- | 0.0071 U | 0.0045 U | 0.005 U | **0.058 LJ** | **0.022 J** |
| Chloroform | 67-66-3 | mg/kg | 0.32 | -- | 0.0071 U | 0.0045 U | 0.005 U | 0.34 U | 0.0051 U |
| Cyclohexane | 110-82-7 | mg/kg | 6500 | -- | 0.0071 U | 0.0045 U | 0.005 U | **0.12 LJ** | **1.4 J^** |
| Ethylbenzene | 100-41-4 | mg/kg | 5.8 | -- | 0.0071 U | 0.0045 U | 0.005 U | **0.034 LJ** | **0.052 J^** |
| Isopropylbenzene | 98-82-8 | mg/kg | 1900 | -- | 0.0071 U | 0.0045 U | 0.005 U | **0.11 LJ** | **0.48 J^** |
| m,p-Xylene | 108-38-3/106-42-3 | mg/kg | 550 | -- | 0.0071 U | 0.0045 U | 0.005 U | **0.045 LJ** | **0.034 J^** |
| Methylcyclohexane | 108-87-2 | mg/kg | NP | -- | 0.0071 U | **0.00061 LJ** | 0.005 U | **0.52** | **2.4 J^** |
| o-Xylene | 95-47-6 | mg/kg | 650 | -- | 0.0071 U | **0.00024 LJ** | 0.005 U | 0.34 U | **0.0095 J^** |
| Toluene | 108-88-3 | mg/kg | 4900 | -- | 0.0071 U | **0.0047** | 0.005 U | **0.039 LJ** | **0.029 J^** |
| Trichlorofluoromethane | 75-69-4 | mg/kg | 730 | -- | 0.0071 U | 0.0045 U | 0.005 U | 0.34 U | 0.0051 U |

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL
Yellow highlighted cells exceed RSL
U - Not Detected at reported quantitation limit
L - Reported concentration is below the CRQL
mg/kg-milligrams per kilogram
BOLD-indicates a detected concentration
bgs-below ground surface

NA - Not Analyzed
NP - Not Published
J - Estimated Value
R - Unusable
SIM-selected ion monitoring
in-inches

# Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Full List of Chemicals Anlyzed in the Soil

| Analyte | CAS.NO | Units | EPA Residential Soil Screening Level |
|---|---|---|---|
| **Metals** | | | |
| Aluminum | 7429-90-5 | mg/kg | 77000 |
| Antimony | 7440-36-0 | mg/kg | 31 |
| Arsenic | 7440-38-2 | mg/kg | 0.68 |
| Barium | 7440-39-3 | mg/kg | 15000 |
| Beryllium | 7440-41-7 | mg/kg | 160 |
| Cadmium | 7440-43-9 | mg/kg | 71 |
| Calcium | 7440-70-2 | mg/kg | NP |
| Chromium | 7440-47-3 | mg/kg | NP |
| Cobalt | 7440-48-4 | mg/kg | 23 |
| Copper | 7440-50-8 | mg/kg | 3100 |
| Iron | 7439-89-6 | mg/kg | 55000 |
| Lead | 7439-92-1 | mg/kg | 400 |
| Magnesium | 7439-95-4 | mg/kg | NP |
| Manganese | 7439-96-5 | mg/kg | 1800 |
| Mercury | 7439-97-6 | mg/kg | 9.4 |
| Nickel | 7440-02-0 | mg/kg | 1500 |
| Potassium | 7440-09-7 | mg/kg | NP |
| Selenium | 7782-49-2 | mg/kg | 390 |
| Silver | 7440-22-4 | mg/kg | 390 |
| Sodium | 7440-23-5 | mg/kg | NP |
| Thallium | 7440-28-0 | mg/kg | 0.78 |
| Vanadium | 7440-62-2 | mg/kg | 390 |
| Zinc | 7440-66-6 | mg/kg | 23000 |
| **Pesticides** | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 2.3 |
| 4,4'-DDE | 72-55-9 | mg/kg | 2 |
| 4,4'-DDT | 50-29-3 | mg/kg | 1.9 |
| Acetophenone | 98-86-2 | mg/kg | 7800 |
| Aldrin | 309-00-2 | mg/kg | 0.039 |
| alpha-BHC | 319-84-6 | mg/kg | 0.086 |
| alpha-Chlordane | 5103-71-9 | mg/kg | NP |
| Atrazine | 1912-24-9 | mg/kg | 2.4 |
| Benzaldehyde | 100-52-7 | mg/kg | 7800 |
| beta-BHC | 319-85-7 | mg/kg | 0.3 |
| Caprolactam | 105-60-2 | mg/kg | 31000 |
| Carbazole | 86-74-8 | mg/kg | NP |
| delta-BHC | 319-86-8 | mg/kg | NP |
| Dieldrin | 60-57-1 | mg/kg | 0.034 |
| Endosulfan I | 959-98-8 | mg/kg | NP |
| Endosulfan II | 33213-65-9 | mg/kg | NP |
| Endosulfan sulfate | 1031-07-8 | mg/kg | NP |
| Endrin | 72-20-8 | mg/kg | 19 |
| Endrin aldehyde | 7421-93-4 | mg/kg | NP |
| Endrin ketone | 53494-70-5 | mg/kg | NP |
| gamma-BHC (Lindane) | 58-89-9 | mg/kg | 0.57 |
| gamma-Chlordane | 5103-74-2 | mg/kg | NP |
| Heptachlor | 76-44-8 | mg/kg | 0.13 |
| Heptachlor epoxide | 1024-57-3 | mg/kg | 0.07 |
| Methoxychlor | 72-43-5 | mg/kg | 320 |
| Toxaphene | 8001-35-2 | mg/kg | 0.49 |

mg/kg-milligrams per kilogram

NP - Not Published

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

| Analyte | CAS.NO | Units | EPA Residential Soil Screening Level |
|---|---|---|---|
| **Polychlorinated Biphenyls** | | | |
| Aroclor-1016 | 12674-11-2 | mg/kg | 4.1 |
| Aroclor-1221 | 11104-28-2 | mg/kg | 0.17 |
| Aroclor-1232 | 11141-16-5 | mg/kg | 0.17 |
| Aroclor-1242 | 53469-21-9 | mg/kg | 0.23 |
| Aroclor-1248 | 12672-29-6 | mg/kg | 0.23 |
| Aroclor-1254 | 11097-69-1 | mg/kg | 0.24 |
| Aroclor-1260 | 11096-82-5 | mg/kg | 0.24 |
| Aroclor-1262 | 37324-23-5 | mg/kg | NP |
| Aroclor-1268 | 11100-14-4 | mg/kg | NP |
| **Volatile Organic Compounds** | | | |
| 1,1,1-Trichloroethane | 71-55-6 | mg/kg | 8100 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | mg/kg | 0.6 |
| 1,1,2-Trichloroethane | 79-00-5 | mg/kg | 1.1 |
| 1,1-Dichloroethane | 75-34-3 | mg/kg | 3.6 |
| 1,1-Dichloroethene | 75-35-4 | mg/kg | 230 |
| 1,2,3-Trichlorobenzene | 87-61-6 | mg/kg | 63 |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | mg/kg | 0.0053 |
| 1,2-Dibromoethane | 106-93-4 | mg/kg | 0.036 |
| 1,2-Dichlorobenzene | 95-50-1 | mg/kg | 1800 |
| 1,2-Dichloroethane | 107-06-2 | mg/kg | 0.46 |
| 1,2-Dichloropropane | 78-87-5 | mg/kg | 1 |
| 1,3-Dichlorobenzene | 541-73-1 | mg/kg | NP |
| 1,4-Dichlorobenzene | 106-46-7 | mg/kg | 2.6 |
| 2-Butanone | 78-93-3 | mg/kg | 27000 |
| 2-Hexanone | 591-78-6 | mg/kg | 200 |
| 4-Methyl-2-Pentanone | 108-10-1 | mg/kg | 5300 |
| Acetone | 67-64-1 | mg/kg | 61000 |
| Benzene | 71-43-2 | mg/kg | 1.2 |
| Bromochloromethane | 74-97-5 | mg/kg | 150 |
| Bromodichloromethane | 75-27-4 | mg/kg | 0.29 |
| Bromoform | 75-25-2 | mg/kg | 19 |
| Bromomethane | 74-83-9 | mg/kg | 6.8 |
| Carbon disulfide | 75-15-0 | mg/kg | 770 |
| Carbon tetrachloride | 56-23-5 | mg/kg | 0.65 |
| Chlorobenzene | 108-90-7 | mg/kg | 280 |
| Chloroethane | 75-00-3 | mg/kg | 14000 |
| Chloroform | 67-66-3 | mg/kg | 0.32 |
| Chloromethane | 74-87-3 | mg/kg | 110 |
| cis-1,2-Dichloroethene | 156-59-2 | mg/kg | 160 |
| cis-1,3-Dichloropropene | 10061-01-5 | mg/kg | NP |
| Cyclohexane | 110-82-7 | mg/kg | 6500 |
| Dibromochloromethane | 124-48-1 | mg/kg | 0.75 |
| Dichlorodifluoromethane | 75-71-8 | mg/kg | 87 |
| Ethylbenzene | 100-41-4 | mg/kg | 5.8 |
| Isopropylbenzene | 98-82-8 | mg/kg | 1900 |
| m,p-Xylene | 8-38-3/106-4 | mg/kg | 550 |
| Methyl acetate | 79-20-9 | mg/kg | 78000 |
| Methyl tert-butyl ether | 1634-04-4 | mg/kg | 47 |
| Methylcyclohexane | 108-87-2 | mg/kg | NP |
| Methylene chloride | 75-09-2 | mg/kg | 57 |
| o-Xylene | 95-47-6 | mg/kg | 650 |
| Styrene | 100-42-5 | mg/kg | 6000 |
| Tetrachloroethene | 127-18-4 | mg/kg | 24 |
| Toluene | 108-88-3 | mg/kg | 4900 |
| trans-1,2-Dichloroethene | 156-60-5 | mg/kg | 1600 |
| trans-1,3-Dichloropropene | 10061-02-6 | mg/kg | NP |
| Trichloroethene | 79-01-6 | mg/kg | 0.94 |
| Trichlorofluoromethane | 75-69-4 | mg/kg | 730 |
| Vinyl chloride | 75-01-4 | mg/kg | 0.059 |

# Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Full List of Chemicals Anlyzed in the Soil

| Analyte | CAS.NO | Units | EPA Residential Soil Screening Level |
|---|---|---|---|
| **Semi-volatile Organic Compounds** | | | |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 76-13-1 | mg/kg | 40000 |
| 1,1'-Biphenyl | 92-52-4 | mg/kg | 47 |
| 1,2,4,5-Tetrachlorobenzene | 95-94-3 | mg/kg | 23 |
| 1,2,4-Trichlorobenzene | 120-82-1 | mg/kg | 24 |
| 1,4-Dioxane | 123-91-1 | mg/kg | 5.3 |
| 2,2'-Oxybis(1-chloropropane) | 108-60-1 | mg/kg | 4.9 |
| 2,3,4,6-Tetrachlorophenol | 58-90-2 | mg/kg | 1900 |
| 2,4,5-Trichlorophenol | 95-95-4 | mg/kg | 6300 |
| 2,4,6-Trichlorophenol | 88-06-2 | mg/kg | 49 |
| 2,4-Dichlorophenol | 120-83-2 | mg/kg | 190 |
| 2,4-Dimethylphenol | 105-67-9 | mg/kg | 1300 |
| 2,4-Dinitrophenol | 51-28-5 | mg/kg | 130 |
| 2,4-Dinitrotoluene | 121-14-2 | mg/kg | 1.7 |
| 2,6-Dinitrotoluene | 606-20-2 | mg/kg | 0.36 |
| 2-Chloronaphthalene | 91-58-7 | mg/kg | 4800 |
| 2-Chlorophenol | 95-57-8 | mg/kg | 390 |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 |
| 2-Methylphenol | 95-48-7 | mg/kg | 3200 |
| 2-Nitroaniline | 88-74-4 | mg/kg | 630 |
| 2-Nitrophenol | 88-75-5 | mg/kg | NP |
| 3,3'-Dichlorobenzidine | 91-94-1 | mg/kg | 1.2 |
| 3-Nitroaniline | 99-09-2 | mg/kg | NP |
| 4,6-Dinitro-2-methylphenol | 534-52-1 | mg/kg | 5.1 |
| 4-Bromophenyl-phenylether | 101-55-3 | mg/kg | NP |
| 4-Chloro-3-methylphenol | 59-50-7 | mg/kg | 6300 |
| 4-Chloroaniline | 106-47-8 | mg/kg | 2.7 |
| 4-Chlorophenyl-phenylether | 7005-72-3 | mg/kg | NP |
| 4-Methylphenol | 106-44-5 | mg/kg | 6300 |
| 4-Nitroaniline | 100-01-6 | mg/kg | 27 |
| 4-Nitrophenol | 100-02-7 | mg/kg | NP |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.016 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 |
| Bis(2-chloroethoxy)methane | 111-91-1 | mg/kg | 190 |
| Bis(2-chloroethyl)ether | 111-44-4 | mg/kg | 0.23 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | mg/kg | 39 |
| Butylbenzylphthalate | 85-68-7 | mg/kg | 290 |
| Chrysene | 218-01-9 | mg/kg | 16 |
| Dibenzofuran | 132-64-9 | mg/kg | 73 |
| Diethylphthalate | 84-66-2 | mg/kg | 51000 |
| Dimethylphthalate | 131-11-3 | mg/kg | NP |
| Di-n-butylphthalate | 84-74-2 | mg/kg | 6300 |
| Di-n-octylphthalate | 117-84-0 | mg/kg | 630 |
| Fluoranthene | 206-44-0 | mg/kg | 2400 |
| Hexachlorobenzene | 118-74-1 | mg/kg | 0.21 |
| Hexachlorobutadiene | 87-68-3 | mg/kg | 1.2 |
| Hexachlorocyclopentadiene | 77-47-4 | mg/kg | 1.8 |
| Hexachloroethane | 67-72-1 | mg/kg | 1.8 |
| Isophorone | 78-59-1 | mg/kg | 570 |
| Nitrobenzene | 98-95-3 | mg/kg | 5.1 |
| N-Nitroso-di-n-propylamine | 621-64-7 | mg/kg | 0.078 |
| N-Nitrosodiphenylamine | 86-30-6 | mg/kg | 110 |
| Pentachlorophenol | 87-86-5 | mg/kg | 1 |
| Phenanthrene | 85-01-8 | mg/kg | NP |
| Phenol | 108-95-2 | mg/kg | 19000 |
| Pyrene | 129-00-0 | mg/kg | 1800 |

| Analyte | CAS.NO | Units | EPA Residential Soil Screening Level |
|---|---|---|---|
| **Semi-volatile Organic Compounds (SIM)** | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 240 |
| Acenaphthene | 83-32-9 | mg/kg | 3600 |
| Acenaphthylene | 208-96-8 | mg/kg | NP |
| Anthracene | 120-12-7 | mg/kg | 18000 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.16 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.016 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.16 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | NP |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 1.6 |
| Chrysene | 218-01-9 | mg/kg | 16 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.016 |
| Fluoranthene | 206-44-0 | mg/kg | 2400 |
| Fluorene | 86-73-7 | mg/kg | 2400 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.16 |
| Naphthalene | 91-20-3 | mg/kg | 3.8 |
| Pentachlorophenol | 87-86-5 | mg/kg | 1 |
| Phenanthrene | 85-01-8 | mg/kg | NP |
| Pyrene | 129-00-0 | mg/kg | 1800 |

mg/kg-milligrams per kilogram

SIM-selected ion monito

NP - Not Published

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

**Enclosure 4: Agency for Toxic Substances and Disease Registry fact sheets for Arsenic and Polycyclic Aromatic Hydrocarbons**

# Arsenic - ToxFAQs™

**CAS # 7440-38-2**

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).**

## What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

## What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

## How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

## How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic

# Arsenic

**CAS # 7440-38-2**

compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

## How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

## How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

## How can families reduce the risks of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

## Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

## Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

## References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Health and Human Services. Public Health Service.

## Where can I get more information?

**For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.**

**Phone: 1-800-232-4636**

**ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.**

**ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.**

# Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).**

## What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

## What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

## How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

# Polycyclic Aromatic Hydrocarbons

## How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

## How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

## Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

## Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 $mg/m^3$). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 $mg/m^3$ averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 $mg/m^3$ for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

## Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

## References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

## Where can I get more information?

**For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.**

**Phone: 1-800-232-4636.**

**ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.**

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