# FINAL DIOXIN-LIKE POLYCHLORINATED BIPHENYL (PCB) CONGENERS STUDY REPORT

## Chemical Waste Management, Inc. Kettleman Hills Facility (KHF)

**Wenck File #0742-820**

Prepared for:

**CHEMICAL WASTE MANAGEMENT, INC.**
**KETTLEMAN HILLS FACILITY (KHF)**
**KINGS COUNTY, CALIFORNIA**

November 2010

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# Table of Contents

# Table of Contents (Cont.)

# Table of Contents (Cont.)

# Table of Contents (Cont.)

**LIST OF TABLES**

# Table of Contents (Cont.)

# Table of Contents (Cont.)



**FIGURES**

# Table of Contents (Cont.)

**APPENDICES**

# List of Acronyms

| | |
|---|---|
| 95% UCL | 95th percentile upper confidence limit on the mean |
| AAMP | Ambient Air Monitoring Program |
| AFF | area foraging factor |
| ALT | alternate location |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| AUF | area use factor |
| BAF | bioaccumulation factors |
| BSAF | biota soil accumulation factor |
| BTF | biotransfer factors |
| BTAG | Biological Technical Assistance Group |
| BW | body weight |
| CalEPA | California Environmental Protection Agency |
| CARB | California Air Resources Board |
| CB | chlorinated biphenyl |
| CCR | California Code of Regulations |
| CDA | Community Development Agency |
| CDI | chronic daily intake |
| CFR | Code of Federal Regulations |
| CNPS | California Native Plant Society |
| COC | chemical of concern |
| COPC | chemical of potential concern |
| COPEC | chemical of potential ecological concern |
| CSM | conceptual site model |
| CWMI | Chemical Waste Management, Inc. |
| cy | cubic yard |
| DMS | downwind monitoring station |
| DTSC | Department of Toxic Substances Control |
| DQO | data quality objectives |
| EDL | estimated detection limit |
| EDS | Environmental Disposal Services |
| EISOPQAM | Environmental Investigations Standard Operating Procedures and Quality Assurance Manual |
| EPC | exposure point concentration |
| ERA | ecological risk assessment |
| ERAGS | Ecological Risk Assessment Guidance for Superfund |
| ERT | Emergency Response Team |
| ESV | Ecological Screening Value |
| °F | degrees Fahrenheit |
| FIR | food ingestion rate |
| FMR | field metabolic rate |

# List of Acronyms (cont.)

| | |
|---|---|
| FSU | final stabilization unit |
| GPS | Global Positioning System |
| HHRA | human health risk assessment |
| HRGC | high resolution gas chromatography |
| HRMS | high resolution mass spectrometry |
| HQ | hazard quotient |
| IRIS | Integrated Risk Information System |
| IUR | inhalation unit risk |
| KHF | Kettleman Hills Facility |
| LOAEL | lowest-observed-adverse-effect level |
| m | meter |
| MDLS | lowest method detection limits |
| ME | metabolizable energy |
| m/s | meters per second |
| msl | mean sea level |
| mph | miles per hour |
| MSP | meteorological station pad |
| MSW | municipal solid waste |
| $\mu g/m^3$ | micrograms per cubic meter |
| µg/L | micrograms per liter |
| mg/kg | milligrams per kilogram |
| mg/kg-day | milligrams per kilogram per day |
| ND | not detected |
| NDAMN | National Dioxin Air Monitoring Network |
| NFA | No Further Action |
| NOAEL | no-observed-adverse-effect level |
| OEHHA | Office of Environmental Health Hazard Assessment |
| PCB | polychlorinated biphenyl |
| PCDD | polychlorinated dibenzo-*p*-dioxin |
| PCDF | polychlorinated dibenzofuran |
| PEF | particulate emission factor |
| PUF | polyurethane foam |
| pg | picogram |
| pg/kg | picograms per kilogram |
| ppbv | parts per billion by volume |
| ppm | parts per million |
| QAPP | Quality Assurance Project Plan |
| QA/QC | quality assurance/quality control |
| RA | Risk Assessment |
| RAGS | Risk Assessment Guidance for Superfund |
| RCRA | Resource Conservation and Recovery Act |

# List of Acronyms (cont.)

| | |
|---|---|
| RfD | reference dose |
| RL | reporting limit |
| RME | reasonable maximum exposure |
| RPD | relative percent difference |
| RTI | Research Triangle Institute |
| RWQCB | Regional Water Quality Control Board |
| SDI | subchronic daily intakes |
| SESD | Science and Ecosystem Support Division |
| SF | slope factor |
| SJV | San Joaquin Valley |
| SLERA | screening-level ecological risk assessment |
| SMDP | scientific/management decision point |
| SOP | Standard Operating Procedures |
| SQL | sample quantitation limits |
| TCDD | tetrachlorodibenzo-p-dioxin |
| TEC | toxicity equivalence concentration |
| TEF | toxicity equivalence/equivalency factor |
| TEQ | toxicity equivalence |
| TRV | toxicity reference value |
| TSCA | Toxic Substances Control Act |
| TSDF | Treatment, Storage, and Disposal Facility |
| UCL | upper confidence limit |
| UMS | upwind monitoring station |
| USEPA | United States Environmental Protection Agency |
| USEPA-IX | United States Environmental Protection Agency Region 9 |
| USFWS | U.S. Fish and Wildlife Service |
| US NLM | U.S. National Library of Medicine |
| WHO | World Health Organization |

# Executive Summary

**FINAL DRAFT REPORT:**
**DIOXIN-LIKE POLYCHLORINATED BIPHENYL (PCB) CONGENERS STUDY**
Prepared for Chemical Waste Management, Inc., Kettleman Hills Facility, California
Prepared by Wenck Associates, Inc.
October 2010

**SUMMARY**

At the request of USEPA Region IX, the Kettleman Hills Facility (KHF) has completed one of the most extensive studies ever conducted at an active and permitted hazardous waste management facility focusing on dioxin-like polychlorinated biphenyl (PCB) congeners. In accordance with a Workplan developed in close coordination with USEPA Region IX over a two-year period, KHF measured dioxin-like PCB congeners in soil, air, and vegetation within the KHF property boundary in order to evaluate the potential human health and ecological risks that may be posed by the management, storage, and disposal of PCB wastes at the facility.

The key conclusions of this study are as follows:

- The human health risk assessment results show that potential human health risks based on exposures assumed to occur essentially at the facility boundary are well below target risk levels of concern under current land use conditions (for a rancher), and are within USEPA's target risk management range even for several conservative hypothetical worst-case future land use conditions (for residents or ranchers assumed to live at the facility boundary).
- The ecological risk assessment results show that potential risks to wildlife are well below target risk levels of concern.
- The conservative, health-protective methods and assumptions that were used in the risk assessments ensured that potential risks were not underestimated.

- Potential risks associated with exposures to PCB congeners resulting from KHF activities would be even lower farther from the facility than those calculated in this study.
- The concentrations of dioxin-like PCB congeners found in soil at KHF are similar to those measured elsewhere in the country, including in rural soils located away from industrial land uses and even in remote wilderness areas.

**OVERVIEW**

In December 2008, the United States Environmental Protection Agency Region IX (USEPA-IX) requested that Chemical Waste Management, Inc. (CWMI) conduct extensive monitoring for the purpose of assessing the presence of polychlorinated biphenyl (PCB) congeners in soil, air, and vegetation at the perimeter of CWMI's Kettleman Hills Facility (KHF).[1] In accordance with the request from USEPA-IX, KHF contracted with Wenck Associates for the collection of extensive monitoring data and the subsequent determination of the potential human health and ecological risks that may be posed by the management, storage, and disposal of PCB wastes at KHF.

PCB-containing wastes received at KHF are disposed of in the facility's permitted B-18 hazardous waste landfill. In addition, a small percentage (less than 2%) of the wastes received at the facility are managed in the permitted PCB flushing/storage unit which is used to process and temporarily store PCB-containing transformers and capacitors.

This report marks the completion of one of the most extensive PCB congener studies ever conducted at an active and permitted hazardous waste management facility. All aspects of this

[1] Polychlorinated biphenyls (PCBs) are a mixture of individual organic chemicals which were used for 50 years until their manufacture was banned in 1979 by the United States Congress because of their toxicity and environmental persistence. Although they are no longer produced, PCBs can still be found in old transformers, electrical equipment, fluorescent light ballasts, and other industrial products such as paints and caulking. Each individual PCB compound is called a congener, and is made up of from 1 to 10 chlorine atoms attached to biphenyl, which is a molecule composed of two benzene rings. There are 209 individual PCB congeners, among which twelve (12) are currently of greatest potential health concern because of their similarities to dioxin. These 12 PCB congeners, which have been identified by the World Health Organization (WHO) as having dioxin-like properties, are referred to by their PCB number (i.e., PCB 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, and 189). At the request of USEPA Region IX, these 12 dioxin-like PCB congeners are the focus of this study.

study were conducted in close coordination with staff from USEPA-IX over a period of two years. This included development of a study Workplan which was reviewed and approved by USEPA-IX, as well as additional study modifications requested by USEPA-IX throughout the course of this project. The Workplan and additional USEPA-IX inputs defined the data quality objectives and specific protocols for sampling, analysis, data validation, and the assessment of ecological and human health risks. The sampling and analysis methods used in this study were consistent with USEPA protocols and requirements.

The goal of this study was to scientifically assess the potential ecological risks both within and outside the boundaries of the KHF property, and the potential human health risks outside the boundaries of the facility property, associated with both current and historical handling and disposal of PCB wastes at KHF. The risk calculations were performed using sampling data collected from air, soil, and vegetation within the facility property boundary. The use of on-site data is a very conservative (i.e., health protective) aspect of this study that is expected to result in overestimates of risk because potential PCB congener concentrations within the facility, that may originate from KHF waste handling and disposal operations, would be expected to be highest on KHF property compared to any off-site locations.

## ENVIRONMENTAL MONITORING

### Air Sampling

Air sampling for PCB congeners began in January 2009 and continued for a one-year period through December 2009. Samples were collected each month. Each month-long sample consisted of four 5-day sampling periods, each separated by 24 hours, resulting in 480 hours of sample collection time within each month from each of the three air monitoring stations. Meteorological conditions (wind speed, wind direction, temperature, and barometric pressure) were also continuously measured at KHF throughout the monitoring effort at an existing on-site meteorological monitoring station.

The air sampling strategy was designed to measure PCB congeners in both the volatile and particulate bound phase. The air sampling is expected to reflect concentrations near the perimeter of the property boundary from current handling practices of PCB waste at the site as well as from PCBs that may have historically been deposited on soil at the site and subsequently may become airborne (e.g., due to resuspension of soil by wind or through other surface disturbances).

Air samples were collected at three air monitoring station locations that were selected based on well-documented prevailing wind directions, as follows:

- One monitoring station just within the north-northwestern property boundary (designated UMS-1),
- One monitoring station just within the eastern property boundary (designated MSP), and
- One monitoring station just within the south-southeast property boundary (designated DMS-1).

At the direction of USEPA-IX, the Wenck team performed an air dispersion analysis to verify that the selected air monitoring stations were appropriately located to capture potential PCB impacts to ambient air from the facility. The results of this air dispersion modeling analysis indicate that the air monitoring stations are appropriately located to meet the study needs.

**Soil Sampling**

Surface soil samples were collected in the spring of 2009 during one sampling event. The soil sampling strategy was designed to measure particulate-bound PCB congeners that were deposited on the soil over time and to try to distinguish between PCB congeners that may potentially have originated from KHF versus those present due to unrelated factors (i.e., background). Soil samples were collected from seven segments along the entire KHF property boundary, producing seven multi-increment samples. Each multi-increment sample consisted of material collected from ten individual sample points that were spatially separated along each property boundary segment. The ten individual samples were composited in the laboratory to generate one single multi-increment sample. Based on historically observed wind direction averages, and the distance of the property boundary from facility waste management activities, each multi-increment property boundary sample may reflect varying contributions from both potential site-related activities as well as background conditions. In general, however, it is expected that soil samples collected along the northern and northwestern property boundary are more likely to reflect background concentrations while soil samples collected along the southeastern boundary are potentially more likely to have been affected by site activities.

In addition to the seven property boundary multi-increment soil samples, an eighth multi-increment sample was also collected on-site from an adjacent area in the predominant downwind direction from the B-18 landfill for use in the Ecological Risk Assessment. This eighth location was selected because wildlife may access all areas in KHF and the selected area for sampling was considered most likely to reflect potential impacts to soil from the B-18 landfill.

**Vegetation Sampling**

The vegetation sampling was identical to the soil sampling in both strategy and locations except that vegetation was collected in two phases - green and dry. The climate around KHF is extremely arid with the majority of annual rainfall occurring in February and March. During this wet period the plants turn green and bloom. The remainder of the year the plants are primarily dry and dormant. Therefore, the vegetation sampling attempted to encompass each of these two phases to represent the condition of plant material throughout the year and to reflect potential differences in PCB congener concentrations in vegetation during different seasons.

**Monitoring Results**

The collected air, soil, and vegetation samples, along with the many associated samples collected for quality assurance/quality control, were submitted to a USEPA-approved analytical laboratory for sample preparation and analysis following the USEPA-approved methodologies identified in the Workplan.

In accordance with the Workplan, all of the sampling and analytical data were subjected to a thorough data validation process before the risk assessments were performed. Both the Ecological and the Human Health Risk Assessments were based on the measured concentrations of all congeners detected at or above the estimated detection limit (EDL). If a congener was not detected at or above the EDL, a surrogate concentration of one-half of the reporting limit (RL) was used to conservatively represent that particular congener in the sample dataset. Reporting limits for soil, vegetation, and air were established for the study and identified in the Workplan. For soil and vegetation, these were 2 picograms/gram (pg/g), which is equivalent to a concentration of 2 parts per trillion. For air, the reporting limit was 0.15 picograms/cubic meter ($pg/m^3$), which is equivalent to a concentration of approximately 0.02 parts per trillion.

All twelve of the targeted PCB congeners were detected in at least one of the samples of air, soil, and/or vegetation at or above the laboratory EDL. Briefly, the sampling results detected at or above the reporting limit were as follows:

- In the air, only PCB congeners 105 and 118 were detected above the reporting limit at varying concentrations ranging up to 2.7 $pg/m^3$.
- In the soil, PCB congeners 105, 110, 167, 156, 189 were detected at varying concentrations ranging up to 100 pg/g.
- In the vegetation, PCB congeners 105, 114, 118, 156, 157, 167, and 169 were detected at varying concentrations up to 520 pg/g. The number of detected PCB congeners and the concentrations were observed to be higher in the summer (dry season) than in the spring (green season).

The concentrations of dioxin-like PCB congeners found in soil at KHF were compared with levels that have been measured elsewhere in the United States, including results from a USEPA study that measured concentrations in rural soils. This comparison showed that the levels of dioxin-like PCB congeners measured at KHF are similar to those measured elsewhere in the country, including in rural soils located away from industrial land uses and even in remote wilderness areas.

## RISK ASSESSMENT RESULTS

In accordance with directions from USEPA-IX, Wenck Associates, with assistance from AECOM, performed a risk assessment to evaluate potential ecological and human health risks from the PCB congeners. Potential exposures in the risk assessment were evaluated based on the air, soil, and vegetation sampling measurements described above.

The risk assessment incorporated a number of conservative assumptions to ensure that risks would not be underestimated. This means that the risk assessment results are expected to be over-estimated and thus protective of ecological and public health. In particular, risks for off-site ecological or human scenarios are expected to be over-estimated because they were calculated using sampling data collected on site, where potential site-related concentrations are expected to be higher than at any off-site locations.

### Human Health Risk Assessment

The Human Health Risk Assessment (HHRA) calculated potential risks under both current and hypothetical worst-case future land use conditions based on the measured on-site PCB congener concentrations in the seven property boundary segment areas. Since there is no exposure to the sampled on-site locations by the public, the risk assessment results are expected to be significantly overestimated for any off-site exposure situation. In addition, although the highly conservative, hypothetical worst-case future scenarios addressed in the HHRA are unlikely to occur, they were addressed at the request of USEPA-IX to ensure that risks would not be underestimated.

The HHRA calculated exposures to the PCB congeners for several different types of individuals who could hypothetically be exposed: adult ranchers, adult and child residents, adult and child resident ranchers, adult and child subsistence ranchers, and a nursing infant. In risk assessment terminology, these groups of individuals are known as "receptors". The receptors evaluated in this study are described below.

1. Current conditions:
    - A rancher assumed to routinely work at a location adjacent to KHF. This receptor was assumed to be exposed to PCB congeners as a result of inhalation in addition to incidental ingestion of and dermal absorption from contacted soil for a total exposure duration of 25 years.

2. Hypothetical worst-case future conditions:
    - A resident rancher assumed to live adjacent to KHF who raises beef cattle at home. This receptor was assumed to be exposed to PCB congeners via inhalation, incidental ingestion of and dermal absorption from contacted soil, and regular ingestion of beef from cattle raised at home. The total exposure duration for this receptor was 40 years.
    - A resident subsistence rancher assumed to live adjacent to KHF who raises beef and dairy cattle at home and maintains a home produce garden. This receptor was assumed to be exposed to PCB congeners via inhalation, incidental ingestion of and dermal absorption from contacted soil, regular ingestion of home-raised produce, regular ingestion of beef from cattle raised at home, and regular ingestion of unprocessed dairy milk from dairy cattle raised at home. The total exposure duration for this receptor was 40 years.
    - A resident non-farmer assumed to live adjacent to KHF who maintains a home produce garden. This receptor was assumed to be exposed to PCB congeners via inhalation, incidental ingestion of and dermal absorption from contacted soil, and regular ingestion of home-raised produce for a total exposure duration of 30 years.
    - A nursing infant whose mother was assumed to be an adult from each of the hypothetical future exposure scenarios.

Potential excess lifetime cancer risks were calculated for adult and child receptors for each of the current and hypothetical worst-case future receptor scenarios. Exposures were based on the measured concentrations of PCB congeners in air, soil and vegetation or based on concentrations calculated using USEPA-recommended mathematical models (e.g., concentrations in beef, dairy milk, produce, and breast milk). For each receptor, seven sets of exposures and potential risks were calculated to correspond to each of the seven property boundary segment areas. The potential toxicity of the PCBs was evaluated using recommended USEPA risk assessment methods. The excess lifetime cancer risk results were evaluated relative to a USEPA and CalEPA target risk level of $1 \times 10^{-6}$ (one in one million) and also USEPA's target risk management range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$ (one in one million to one in ten thousand). Potential exposures to the nursing infant receptor were evaluated, in accordance with current USEPA guidance, by comparison to typical background levels.

Under current conditions, for a ranch worker who is the only likely receptor that may be present adjacent to the facility, the cancer risks from the 12 PCB congeners in the seven evaluated property boundary segment areas were calculated to range from $6 \times 10^{-9}$ to $1 \times 10^{-8}$. These risks are 100 or more times lower than the USEPA and CalEPA target risk level of $1 \times 10^{-6}$ (one in one million) and are lower than USEPA's target risk management range.

The excess lifetime cancer risks from the 12 PCB congeners under hypothetical worst-case future conditions were equal to or greater than the USEPA and CalEPA target risk level of $1 \times 10^{-6}$ (one in one million) but all three hypothetical scenarios were within USEPA's target risk management range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$ (a range of one in one million to one in ten thousand). None of these hypothetical future scenarios are likely to represent a plausible residential situation given the presence of the current waste management facility. The total excess lifetime cancer risks were highest for the hypothetical subsistence resident rancher, ranging from $1 \times 10^{-5}$ to $5 \times 10^{-5}$. The predominant exposure pathway, accounting for roughly 70% of the total risk results, was regular ingestion of unprocessed dairy milk from home-raised dairy cattle followed by regular ingestion of home-raised beef over a 40-year exposure period. The risk results for the other hypothetical future scenarios were somewhat lower, $3 \times 10^{-6}$ for the resident non-farmer (due primarily to ingestion of homegrown produce) and ranging from $1 \times 10^{-6}$ to $8 \times 10^{-6}$ for the resident rancher (due primarily to home-raised beef ingestion). The calculated exposures of a nursing infant were all found to be well below typical background levels of exposure to the 12 PCB congeners through breast milk ingestion.

The human health risk assessment results show that potential human health risks based on exposures assumed to occur essentially at the facility boundary are well below target risk levels of concern for current off-site receptors and are within USEPA's target risk management range even for the conservatively evaluated hypothetical worst-case future receptors. The conservative methods and assumptions used in the HHRA provide confidence that there is minimal potential for risks to have been underestimated for receptors. Moreover, because potential environmental concentrations would decrease at greater distances from the facility, the potential risks from off-site exposures farther from the facility would be even lower than those calculated in this study. Consequently, it can be concluded that the presence of PCB congeners at KHF does not pose risks of concern to public health.

**Ecological Risk Assessment**

The Ecological Risk Assessment (ERA) was conducted in accordance with USEPA guidelines to evaluate whether the 12 PCB congeners could pose significant ecological risks. The ERA evaluated potential impacts to selected species that were chosen based on input from USEPA-IX and were considered to be at greatest potential risk based on consideration of ecological assessment endpoints (e.g., sustainability of wildlife populations), habitat use, and population status. The six species selected for evaluation were as follows:

- Western meadowlark [*Sturnella neglecta*]: representative of populations of birds that feed on invertebrates and vegetation in the study area;
- Burrowing owl [*Athene cunicularia*]: representative of populations of predatory birds that feed on the food web of the study area;
- San Joaquin pocket mouse [*Perognathus inornatus*]: representative of populations of herbivorous small mammals that feed on vegetation in the study area;
- Tulare grasshopper mouse [*Onychomys torridus tularensis*]: representative of populations of carnivorous small mammals that feed on invertebrates in the study area;
- San Joaquin kit fox [*Vulpes macrotis mutica*]: representative of populations of predatory mammals that feed on the food web of the study area, including survival and

reproduction of individual San Joaquin kit foxes (an endangered species known to occur in the vicinity and likely to occur within the study area); and

- Blunt-nosed leopard lizard [*Gambelia sila*]: representative of reptiles, including survival and reproduction of individual blunt-nosed leopard lizards (an endangered species with a potential to occur in the region) should they inhabit the study area.

Potential exposures to the selected species were based on the measured on-site concentrations of PCB congeners in soil and vegetation in each of the eight exposure areas (seven property boundary segment areas and the B-18 landfill area). PCB concentrations in food items for the selected species were calculated from the measured concentrations using USEPA-recommended mathematical models. For example, mathematical models were used to calculate concentrations in invertebrates ingested by the grasshopper mouse and western meadowlark, as well as in prey (mice) consumed by the San Joaquin kit fox and the burrowing owl. Assumptions about food items for each selected species were developed in accordance with input from USEPA-IX. The potential toxicity of the PCBs to the selected receptors was evaluated in accordance with guidance obtained from USEPA-IX and USEPA-recommended methods for evaluating ecological risks from PCB congeners.

The ecological risk assessment results were evaluated using a hazard quotient (HQ) approach in which calculated exposures to the selected species were divided by toxicity reference values (TRVs). In this approach, which is consistent with standard USEPA practice, HQs less than a target level of 1 indicate that adverse ecological effects are unlikely to occur.
All of the hazard quotients calculated for all of the selected ecological receptors were more than 10 times lower than the target level of 1.0. These ecological risk assessment results demonstrate that none of the selected representative receptors are at significant risk from PCB congeners measured around the KHF property boundary or near the B-18 landfill.

## CONCLUSIONS

The Human Health and Ecological Risk Assessments showed that potential risks associated with PCB congeners at the Kettleman Hills Facility are below regulatory and other target risk levels for human health and ecological receptors under current conditions. Potential human health risks under very conservative hypothetical worst-case future scenarios are within USEPA's target regulatory risk management range. Based on this analysis, dioxin-like PCB congeners at the Kettleman Hills Facility or in immediate proximity to the facility are not anticipated to have an adverse impact on human health or the environment.

# 1.0 Introduction

The Chemical Waste Management, Inc. (CWMI) – Kettleman Hills Facility (KHF) is a commercial Class I/II hazardous waste/designated waste treatment, storage, and disposal facility (TSDF), and Class II/III designated waste/municipal solid waste (MSW) disposal facility owned and operated by Waste Management, Inc. (US EPA Facility Identification Number CAT 000646117). In April and July 1997, KHF submitted requests to United States Environmental Protection Agency Region IX (USEPA-IX) to renew the existing KHF Approvals to Operate for the B-18 landfill and the Polychlorinated Biphenyl (PCB) Flushing/Storage Unit for continued handling and disposal of PCBs regulated by the Toxic Substances Control Act (TSCA). During the lengthy renewal process, at the request of USEPA-IX, in October 2003 KHF requested a Coordinated Approval, using the (then) recently renewed June 2003 Hazardous Waste Facility "Part B" Permit as the basis for the Coordinated Approval. After another lengthy renewal process, the Draft Coordinated Approval was issued by USEPA-IX February 2007.

Based on public comments on the Draft Coordinated Approval submitted by community stakeholders and environmental activists concerned with the potential impacts of the facility's PCB handling on the surrounding community, USEPA-IX sent a letter to KHF requesting more information prior to making a decision on the coordinated approval. In the letter dated December 2, 2008, USEPA-IX requested that KHF sample air, soil, and vegetation for PCB congeners with the objective of providing sufficient data to assess the magnitude of potential human and ecological impact to off-site receptors from PCB disposal activities at KHF (hereby referred to as the "PCB Congeners Study"). The overall purpose of this PCB Congeners Study is to characterize and quantify the potential human and ecological risk that may be posed by the management, storage, and disposal of PCB contaminated waste at KHF. As determined in several conference calls with USEPA-IX, this study focuses only on the 12 World Health Organization (WHO) Dioxin-Like PCB Congeners due to the risk these compounds pose relative to the other congener species. These dioxin-like PCB congeners include:

- Congener 77 - 3,3',4,4'-Tetrachlorobiphenyl (CAS 32598-13-3)
- Congener 81 - 3,4,4',5-Tetrachlorobiphenyl (CAS 70362-50-4)
- Congener 105 - 2,3,3',4,4'-Pentachlorobiphenyl (CAS 32598-14-4)
- Congener 114 - 2,3,4,4',5-Pentachlorobiphenyl (CAS 74472-37-0)
- Congener 118 - 2,3',4,4',5-Pentachlorobiphenyl (CAS 31508-00-6)
- Congener 123 - 2,3',4,4',5'-Pentachlorobiphenyl (CAS 65510-44-3)
- Congener 126 - 3,3',4,4',5-Pentachlorobiphenyl (CAS 57465-28-8)
- Congener 156 - 2,3,3',4,4',5-Hexachlorobiphenyl (CAS 38380-08-4)
- Congener 157 - 2,3,3',4,4',5'-Hexachlorobiphenyl (CAS 69782-90-7)
- Congener 167 - 2,3',4,4',5,5'-Hexachlorobiphenyl (CAS 52663-72-6)
- Congener 169 - 3,3',4,4',5,5'-Hexachlorobiphenyl (CAS 32774-16-6)
- Congener 189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (CAS 39635-31-9)

To assess the potential off-site risk associated with current and cumulative impacts of handling and disposal of PCB contaminated waste at KHF, various types of media were sampled in accordance with USEPA-IX approved Final PCB Congeners Study Workplan (Wenck, April 2009a), here on referred to as the Workplan. Sampling was done within the KHF facility for the identified congeners at or near the property line. These include:

- ambient air;
- surficial soil; and
- vegetation, (both green (spring) and dry (summer) phases).

As discussed in the Workplan, the purpose for sampling within the KHF facility, at or near the property line, was to conservatively represent the buffer zone. The buffer zone is the area immediately outside the facility property line to which the general public could access. However, the buffer zone around the KHF is privately owned and currently is open range used for periodically grazing cattle. To avoid any access and/or legal issues associated with sampling on non KHF property, this PCB Congeners Study was conducted using sampling data collected from within the facility property boundary (i.e., inside and near the property line, inside the fire break, and around the perimeter of the facility property line). This sampled area is outside the permitted conditional use boundary and is undisturbed and similar to the area outside the facility property line. Focusing this study inside the property boundary (i.e., redefining the buffer zone) brings a high level of conservatism to the PCB Congeners Study because the area is closer to the source of potential PCB emissions and would be expected to be higher in deposited PCB congener concentrations than those areas farther away.

The presumed transport mechanism of PCBs in the waste towards the KHF property boundary would consist of PCBs adhering to wind-blown resuspended dust originating inside the facility. However, since PCBs can also volatilize, the transport mechanism can also include wind dispersion of PCBs in the volatile phase. PCB-bound particulates have the potential to deposit on the surficial soil in the buffer zone and be taken up by the vegetation. Since PCBs have the potential to bioaccumulate over time, the impact to human and ecological receptors can possibly increase with accumulation of PCBs in the vegetation which can be taken up by animal species and further consumed by humans (cattle grazing). The sampling strategy for air, surficial soil, and vegetation was designed with these factors in mind for collecting the appropriate analytical data used in the RA. The accredited Test America laboratory used US EPA Method 1668A (2003), as specified by USEPA-IX, to quantify specific congeners targeted by this study.

The facility is submitting this report to USEPA-IX, including the results of the human health and ecological risk assessments (RAs), based on data from one year of air sampling along with all surface soil and spring/summer vegetation sampling results. Air sampling began in January 2009 and continued for a one-year monitoring period through the end of December 2009. The spring vegetation and surface soil sampling was completed during a two-day sampling event on March 31 – April 1, 2009. The dry (summer) vegetation sampling was completed on August 3-4, 2009. The sampling schedule and data included in the RAs herein were done in accordance with the Workplan.

This report summarizes the validated sampling and analytical results through December 2009. All data through December 2009 served as the basis of the Human Health Risk Assessment

(HHRA) and Ecological Risk Assessment (ERA) included in this document. Along with this information, this report contains a summary of:

- Field sampling data, field notes, data sheets, etc., that were collected in accordance with the Quality Assurance Project Plan (QAPP) included in the Workplan,
- Data validation reports,
- Windrose summaries of the meteorological conditions monitored at the site from January – December 2009,
- Quality Assurance/Quality Control (QA/QC) summaries as required in the QAPP,
- The Air Dispersion Modeling Report that was completed to verify the air sampling locations were sited to meet the objectives of the PCB Congeners Study, and
- Other supporting data required by the Workplan and lines of evidence used to support the conclusions and outcomes of the RAs.

# 2.0 Facility Background

KHF is located in Kings County, California southwest of the intersection of Interstate 5 and Highway 41, approximately 3.5 miles southwest of Kettleman City and 6.5 miles southeast of Avenal (Figure 1). The facility owns and occupies 1,600 acres of property, of which 499 acres are located inside the conditional use permit boundary which is permitted for waste management operations (Figure 2).

## 2.1 SURROUNDING AREA LAND USE

The KHF is surrounded by general agriculture and grazing lands for several miles in all directions. KHF is also located at the southeastern end of the Kettleman Hills, an extensive area that has been active for decades in the production of natural gas and oil. The closest non-agricultural areas, and the nearest permanent residents, are located in Kettleman City, 3.5 miles to the northeast of KHF.

## 2.2 FACILITY HISTORY

The first disposal activities at the KHF site began in 1975 when the McKay Trucking Company was issued a permit to use a 60-acre portion of the site as a petroleum waste disposal facility. Environmental Disposal Services (EDS) purchased McKay Trucking Company in 1978 and expanded both the size and operations at KHF making it a Class I disposal site. In April 1979, CWMI purchased and began operating the KHF site. At that time, it was a 1,280-acre facility that was authorized as a treatment, storage, and disposal facility for designated wastes. Also in 1979, CWMI obtained authorization to operate the site as a hazardous waste management facility, and hazardous wastes were permitted for treatment, storage, and disposal at KHF. Operations consisted of landfilling solid waste, and use of evaporation ponds/tanks for liquid waste.

In the early 90s, a project was undertaken to combine closure of a number of landfills and evaporation ponds. The Combined Closure Area was completed in 1996, and under the 69-acre closure cap it includes landfill units B-1, B-4, B-5, B-6, B-7, B-8, B-9 with expansions, B-10, and B-11; ponds P-5, P-12, P-12A, P-13, and P-17; and spreading area S-3. There are no PCB disposal units located in the combined closure area.

In April and July 1997, KHF submitted timely applications to renew existing TSCA Approvals, which included the currently operating PCB Flushing/Storage Unit, and the B-18 Landfill Unit. In October 2003, during a thorough and comprehensive permit renewal process, KHF requested a Coordinated Approval as per the recommendation of USEPA-IX TSCA Group. In February 2007, USEPA-IX released a Draft Coordinated Approval, along with a Draft Refined Environmental Justice Assessment. At the time of this report, the Coordinated Approval has not been finalized.

At KHF, PCB waste processing and storage is conducted in the PCB Flushing/Storage Unit, which began operations in 1983. The PCB Flushing/Storage Unit is a containment building with an epoxy-coated concrete containment slab encompassing indoor PCB storage and processing areas, including a 10,000-gallon aboveground storage tank. Processing includes the draining of PCB liquids from transformers into the tank, then flushing the transformer with diesel, which also goes into the tank. Liquids collected in the tank are sent off-site via tanker for final disposal.

TSCA landfill units that previously received TSCA PCB waste include:

- B-14, 0.8 acres, capacity 6,000 cubic yards (cy), operated from 1982 to 1984, TSCA waste only, closed in 1985.
- B-16, 5 acres, capacity 290,000 cy, operated from 1983 to 1987, approximately 230,000 cy of TSCA waste only. In 2004, 60,000 cy non-hazardous waste was disposed of in B-16 to bring the unit up to final grade, and the unit was closed.

- B-19, 40 acres, capacity 3,000,000 cy, 1987 to 1991, TSCA, Resource Conservation and Recovery Act (RCRA), non-RCRA, and non-hazardous wastes, closed 2006[2].

## 2.3 CURRENT WASTE DISPOSAL & TREATMENT OPERATIONS

The active waste treatment, handling, and disposal units at KHF include:

- B-17 Landfill - (active landfill for disposal of Class II/III designated waste/municipal solid waste)
- B-18 Landfill - (active landfill for disposal of Class I/II hazardous waste/designated waste)
- B-19 Landfill - (active for disposal of Class II/III, designated waste/municipal solid waste. Class I/II portion completed Closure in 2006)
- Final Stabilization Unit (FSU) and adjacent Bulk Stabilization Units (I & II)
- Surface Impoundments P-9, P-14, P-16
- Drum Storage Unit
- PCB Storage/Flushing Unit

Figure 2 shows the site layout along with identification of the active waste treatment and disposal units and major facility structures located on the property.

At KHF, the only active TSCA landfill unit is B-18 which has a footprint of 53 acres and a permitted capacity 10,700,000 cy. From 1991 to the present the landfill has received TSCA, RCRA, non-RCRA, and non-hazardous wastes. The only other unit that actively handles TSCA regulated waste containing PCBs is the PCB Storage/Flushing Unit. Less than 2% of the wastes received at the facility are managed in the PCB Flushing/Storage Unit.

[2] KHF submitted the "Construction Quality Assurance Report" (Closure Certification) in December 2006. The California Regional Water Quality Control Board (RWQCB) concurred on July 15, 2010. KHF awaits Department of Toxic Substances Control (DTSC) concurrence.

The overall hazardous waste stream accepted by KHF consists of RCRA, non-RCRA, non-hazardous, and TSCA designated waste. The total annual volumes of each fluctuate from year-to-year. However, from 2006 forward the total annual volume disposed in B-18 has been around 536,000 cy (750,000 tons). Of this, only about 50,000 cy has been TSCA-designated waste.

## 2.4 TOPOGRAPHY

KHF is located on the western slope of the Kettleman Hills, a low range of steep hills bordering the western margin of the San Joaquin Valley. The sloping topography in the vicinity of the facility includes arroyos and other erosional features, but there are no perennial surface water bodies within one mile of the facility. The vegetation community of the area consists mainly of sparse grasses and low shrubs.

The surface elevation of KHF ranges from approximately 700 feet above mean sea level (msl) to 1100 feet above msl. The site generally slopes from the northwest to the southeast. The highest point surrounding the facility is Cerro Ultimo (approximate elevation 1144 feet above msl) adjacent to the northern property line.

## 2.5 CLIMATE

The climate of the region is semiarid and characterized by extremely low rainfall. Average annual precipitation is 6.12 inches, with 90 percent of the rainfall occurring between November and April. The estimated 100-year, 24-hour storm is 2.4 inches of precipitation (Centra 2009). Mean annual evaporation is 102.94 inches (pan measurement). The mean annual temperature is 65 degrees Fahrenheit (Wenck 2009a) Seasonal average temperatures range from the low 50s °F in the winter to the high 90s °F in the summer. Historical average winds of 5.8 meters per second (m/s) (13 miles per hour (mph)) are predominantly from the north-northwest and winds are rarely calm. Winter conditions include variable winds and dense valley fog. Additional information related to the local climate and meteorology is provided later in Section 5 as it relates to the RAs.

## 2.6 PREVIOUS PCB STUDIES

Throughout the years KHF has been in operation, numerous environmental sampling studies and on-going compliance monitoring has been conducted to measure potential off-site impacts to air, groundwater, soil, human health, and ecological receptors. These monitoring programs, sampling studies, and impacts analyses have either been voluntarily performed or required by the numerous State and Federal regulations to which KHF is subject. Two such studies, which included monitoring for PCB impacts, were performed as a result of compliance requirements related to KHF's RCRA Part B permit. These include the (1) 1994 Topographical, Meteorological and Airborne Contaminant Characterization at Kettleman Hills Facility; and the (2) currently ongoing Ambient Air Monitoring Program (AAMP).

### 2.6.1 1994 Topographical, Meteorological and Airborne Contaminant Characterization Study

In 1994, KHF conducted the Topographical, Meteorological and Airborne Contaminant Characterization Study to estimate releases of chemicals from the active treatment and disposal units at the facility. The study was designed to measure on-site emissions and potential releases of regulated chemical species and, through the use of air dispersion modeling, predict ambient air concentrations at the fenceline and in the buffer zone surrounding the facility. To determine emission rates from KHF's waste treatment and disposal units, environmental sampling was performed at or near the sources. This included sampling soil and soil pore-gas emissions from the uncapped landfills, liquids from the surface impoundments, breathing zone air downwind of the waste treatment and disposal units, and stack emissions from the FSU.

The report entitled "1994 Topographical, Meteorological, and Airborne Contaminant Characterization at Kettleman Hills Facility" (KHF 1994 Emission Characterization Study) was submitted to the Department of Toxic Substances Control (DTSC) on April 28, 1995. This complete report was included in the Workplan.

The table below shows that of all the samples that were collected and analyzed, PCBs were not detected in any air samples. PCBs were detected in the liquid hazardous waste contained in the surface impoundments, but only at extremely low levels (ug/L or parts per billion), orders of magnitude less than the TSCA regulatory level (50 ppm). PCBs were detected in the hazardous waste within TSCA landfill B-18, as should be expected.

| Compound | Air Analysis Method | Concentration Range of Detected Compounds (ppbv) | Water Analysis Method | Concentration Range of Detected Compounds (µg/L) | Soil Analysis Method | Concentration Range of Detected Compounds (mg/kg) |
|---|---|---|---|---|---|---|
| PCB 1016 | TO-13 | ND | 8080 | 1.8 | 8080 | ND |
| PCB 1221 | TO-13 | ND | 8080 | ND | 8080 | ND |
| PCB 1232 | TO-13 | ND | 8080 | ND | 8080 | ND |
| PCB 1242 | TO-13 | ND | 8080 | ND | 8080 | ND |
| PCB 1248 | TO-13 | ND | 8080 | 1.6-2.6 | 8080 | ND |
| PCB 1254 | TO-13 | ND | 8080 | 1.8 | 8080 | 36-260 |
| PCB 1260 | TO-13 | ND | 8080 | 0.89-2.5 | 8080 | ND |

### 2.6.2 AAMP Air Study

On June 16, 2003, the California DTSC issued the RCRA Part B Permit renewal to KHF. Part III, Section 4 - Environmental Monitoring, of the permit requires KHF to implement an AAMP that complies with the Environmental Monitoring and Response Programs for Air and Soil-Pore Gas provisions of the California Code of Regulations, Title 22, Section 66264.700, et seq. (Article 17). The Final AAMP (Earth Tech, 2006) was developed and approved by DTSC on March 29, 2006. This included identification of the air monitoring locations originally proposed for this PCB Congeners study. The primary monitoring network design criteria for locating the monitoring sites were: (1) up and downwind of KHF; (2) near the property line; and (3) based on predominant annual wind patterns.

In a letter dated April 10, 2008, DTSC approved the discontinuation of sampling for PCBs because they were not detected in a single sample collected during that time. PCB sampling and analysis was suspended after 18 months of monitoring.

The table below shows the targeted PCB aroclors and the number of PCB samples that were collected.

| Compound | Samples Collected | Samples Analyzed | Number of Valid* Samples | Detection Limit (µg/m$^3$) | # of PCB Detections in Samples Analyzed |
|---|---|---|---|---|---|
| Aroclors 1016/1242 | 144 | 140 | 103 | 0.003 | 0 |
| Aroclor-1221 | 165 | 161 | 124 | 0.003 | 0 |
| Aroclor-1232 | 165 | 161 | 124 | 0.003 | 0 |
| Aroclor-1242 | 21 | 21 | 21 | 0.003 | 0 |
| Aroclor-1248 | 165 | 161 | 124 | 0.003 | 0 |
| Aroclor-1254 | 165 | 161 | 124 | 0.003 | 0 |
| Aroclor-1260 | 165 | 161 | 124 | 0.003 | 0 |

*Valid- the sample meets data validation criteria identified in the Quality Assurance Project Plan (QAPP) for the AAMP Air Study.

# 3.0 Sampling

The following sections describe the air sampling completed from January – December 2009, the spring vegetation and soil sampling completed in March/April 2009, and the summer vegetation sampling completed in August 2009. All of the sampling has been conducted in accordance with the approved Workplan, industry standards, USEPA guidance -- *Data Quality Objectives Process for Hazardous Waste Site Investigations* (USEPA QA/G-4HW), January 2000, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual* (USEPA Region 4 EISOPQAM), November 2001 -- and good engineering and scientific practice to provide accurate, defensible, representative, and conservative data on which the RA is based.

## 3.1 AIR SAMPLING

The air sampling strategy was designed to capture dioxin-like PCB congeners in both the volatile and particulate-bound phase. While dioxin-like PCB congeners potentially measured in ambient air may have originated from accumulated on-site deposition, (re-suspension of crustal particulates), the air sampling is primarily reflective of "current" potential impacts from handling PCB contaminated waste during the 12-month sampling period of the PCB Congeners Study.

Based on historical and current meteorological conditions (wind direction), the air sampling strategy was designed to measure both facility-impacted and background ambient air.  This strategy is supported by air dispersion modeling that was performed to validate the placement of the sampling locations (see Appendix A which includes the Dispersion Modeling Report Associated with the PCB Congeners Study). The air dispersion modeling protocol was prepared by KHF and its consultants and approved by USEPA-IX in August 2009. The protocol was developed for performing the necessary modeling and providing a report to USEPA-IX summarizing the modeling results and the appropriateness of the air sampling locations to meet the objectives of this study.

### 3.1.1 Sampling Locations

The strategy for assessing off-site impacts from dioxin-like PCB congeners at KHF was to monitor ambient air upwind (background) and downwind (impact) from the facility. As discussed earlier and supported by the data presented in the Workplan and Dispersion Modeling Report (Appendix A), the predominant wind direction at KHF originates from the northwest and blows to the southeast. This predominant wind pattern was the basis for the monitoring network design and has been validated with the modeling that was completed for this study.

Considering that winds predominantly come from the north-northwest the air sampling locations consist of the following:

- One stationary monitoring site located in the predominant downwind direction and southeast of the B-18 landfill near the property line (DMS-1);
- One stationary monitoring site located at the original meteorological station pad (MSP) which is northeast of the B-18 landfill and located in line between the B-18 landfill and Kettleman City;
- One stationary monitoring site located near the property line in the farthest north-northwest section of the facility to measure background ambient air entering the facility property in the predominant upwind direction from B-18 (UMS-1).
- A mobile station used to collect rotating duplicate samples for precision quality control as discussed in the QAPP of the Workplan.

The stationary monitoring sites are identified in Figure 3.

Though there is predominant wind direction pattern observed at KHF which served as a basis for the sampling network design, wind directions may vary during each month-long sampling event. Therefore, monitoring locations named upwind/downwind (UMS/DMS) are not meant to identify wind directions during a sampling event, but rather be reflective of annual wind directions used to identify impact and background locations relative to emissions from the B-18 landfill.

When not located at a stationary monitoring site collecting a duplicate sample, the mobile station was used for the purpose of collecting information from other potential sources of interest, such as the Fresno, Coalinga, and Hanford air samples.

At the request of USEPA-IX, the mobile station was used to collect a month-long air sample at a location near the administration building at KHF in April. This location was identified in the sample name as MSP-ALT. The purpose of collecting this sample was to compare the results to those measured at MSP as a means to address concerns expressed from USEPA-IX technical staff about the MSP sampling location. The primary concern was that the MSP location may be impacted by localized meteorological effects from the B-19 landfill immediately to the northwest of MSP. These localized meteorological effects may have the potential to impact the MSP location's suitability to represent maximum potential impacts from the B-18 landfill emissions. If the sample results collected near the administration building were significantly higher than those collected from the MSP location, then collecting the remaining air samples at MSP-ALT would be considered.

The MSP-ALT sample was collected near the administration building during the month of April and correlated to the April results collected at the MSP site. While the MSP-ALT results were slightly higher than those collected at the MSP site, a decision was made by the KHF team to continue sampling at the MSP location for the remainder of the sampling events. The basis for this decision was as follows:

- PCB Congener concentrations at MSP-ALT were of the same order of magnitude and only were slightly higher than the concentrations detected at MSP.
- Validated results from the April MSP-ALT and MSP samples were not available until June 2009. If sampling was discontinued at MSP at this time, then half of the air sampling results would be collected at one location and half at another.

- Continuing using MSP would yield location-comparable data that reflected seasonal changes and site operations throughout 2009,
- The MSP site is at a higher elevation and more directly in-line between the B-18 landfill and Kettleman City. Therefore, it was concluded that the MSP location better represented transport of potential wind-blown emissions from the B-18 landfill to the location of nearest residents.
- Based on the slight difference in detected concentrations between the MSP-ALT and MSP samples collected in April 2009, a conservative correlation factor was applied to all MSP data for use in the RA as discussed in Section 5. This was done to ensure a level of conservatism was retained even though a decision was made to continue sampling at MSP only.

### 3.1.2 Sampling Frequency

KHF began sampling ambient air in January 2009 to initiate the one-year period for collecting (12) 1-month samples at each of the stationary monitoring sites. Each month-long sample consisted of four 5-day sampling segments, each separated by 24 hours, giving 25 days to complete the sample collection time within each month. The first segment began at 0001 hours on the scheduled start day every month and continuously operated until 23:59 hours of the 5$^{th}$ day. The 24-hour period between segments is used to remove the top filter collecting dioxin-like PCB congeners in the particulate phase, perform a calibration check, and adjust the sampling flow rate as necessary for the next segment. The same polyurethane foam (PUF) plug used to capture PCBs in the vapor phase remains in the sampler for all four 5-day sampling segments each month. Sampling resumed at 0001 hours after the down day and the cycle continued for each of the four segments. The month-long sample was collected in this manner to ensure air was collected at the design flow rate throughout the 20 days and that particulate buildup on the top filter did not create pressure drop and impede the desired sample collection flow rate. At the end of the fourth segment, the PUF plug and four respective top filters at each site were combined and sent to the lab and digested and analyzed as one sample.

After the fourth sampling segment was completed each month, there were typically several days of down time before the next month sample was initiated. This period was used to perform any required maintenance such as motor rebuild or replacement, recalibration, completion of all required documentation and recordkeeping, and preparation for the next scheduled sampling event to occur the following month.

The first sampling event began on January 6, 2009. Sampling continued for one year with the final sample collected in December 2009. The proposed sampling schedule was provided by USEPA-IX and is outlined in the Workplan.

On March 30, 2009, Mr. Matt Plate from USEPA-IX visited KHF and observed the final PUF sampling takedown at the end of the fourth segment of the March event. Based on his review of the air monitoring practices, he submitted a draft letter of comments and suggestions. A copy of this draft letter is included in Appendix B.

### 3.1.3 Sampling and Analytical Methods

Air sampling was performed in accordance with US EPA Compendium Method TO-9A (1999) and the Standard Operating Procedures (SOP) and QAPP in the Workplan. Subsequent sample analysis was done in accordance with the analytical procedures identified in US EPA Method 1668A (2003) and respective SOP and QAPP in the Workplan. All sampling activities were recorded and maintained on-site. A summary of all field data sheets and sampling location photos are included in Appendix C. Chain-of-custody documentation accompanied the samples from the time they were collected until they were received by the laboratory. The QAPP was explicitly executed to ensure that all data is accurate, defensible, and useable for the RA and purposes of this PCB Congeners Study.

## 3.2 SURFACE SOIL SAMPLING

The surface soil sampling was completed to collect dioxin-like PCB congeners that may have been deposited and accumulated in the surface soil around the facility. While the air sampling is more representative of current activities, the surface soil sampling is assumed to primarily reflect historical and potentially accumulated impacts to the buffer zone from handling PCB contaminated waste at KHF. The overly conservative bias of this assumption is discussed later in Section 4.

The approach for sampling the surface soils was developed using EPA's Data Quality Objective (DQO) Process for Hazardous Waste Investigations (USEPA QA/G-4HW, 2000), USEPA Region 9 Laboratory Field Sampling Guidance Document #1205 Soil Sampling (USEPA Region 9 Soil Sampling, 1999), and USEPA Region 4 Science and Ecosystem Support Division (SESD), Field Branches Quality System and Technical Procedures, Operating Procedure for Soil Sampling (SESDPROC-300-R1, 2007) and Operating Procedure for Field Sampling Quality Control (SESDPROC-011-R2, 2007), which are based on USEPA Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM, 2001). While the DQO process has not been stated step-by-step, the basic elements of the DQO process have been considered and sampling is designed in the context of the DQOs (p. 5-5, EISOPQAM). Based on this information a project-specific approach and SOP was developed for this PCB Congeners Study and included with the QAPP in the Workplan. These procedures were explicitly followed to collect the surface soils during the March-April 2009 sampling event.

### 3.2.1 Sampling Locations

Seven multi-increment samples intended to characterize surface soil concentrations were collected around the perimeter of KHF near the property line from locations that are generally downwind (potentially affected) and upwind (unaffected) from the B-18 landfill based on historical recorded and observed meteorological conditions.

For highly conservative use in the ERA, an eighth multi-increment sample was collected from a location immediately downwind from the B-18 landfill, well within the property boundary, since animal species have on-site access to the entire KHF. Animal species not used for human consumption have access to the property inside the KHF property line. As discussed later in Section 5, potential risks to ecological receptors were evaluated using the sampling and analytical results from all eight multi-increment samples, including the perimeter multi-increment samples and the multi-increment sample collected adjacent to the B-18 landfill. The area from which the multi-increment sample adjacent to B-18 was collected includes a valley that serves as a drainage pathway near the landfill. Just prior to collecting the surface soil samples, USEPA-IX staff selected sampling locations in the drainage pathways near the hillside to the south of the B-18 landfill. Collecting samples in the drainage pathways was intended to capture runoff from the hillsides that would have been highly impacted by deposition of particulate emissions containing PCBs from the B-18 landfill.

Shown in Figure 4 is the location adjacent to the B-18 landfill where this sample (referred to as the B-18 multi-increment sample) was collected. The Workplan had identified a spacing of approximately 100 feet between increments and Figure 4 approximately presents it that way due to the scale of the figure. However, the field conditions and intent to sample runoff swales led to the selection of increments that did not have a consistent spacing. The individual increments of the B-18 sample were selected under the guidance and direction of USEPA-IX field personnel based on site criteria listed in the Workplan. Therefore, from the context of DQO and EISOPQAM sampling design, the B-18 multi-increment sample has a positive bias based on USEPA-IX knowledge of the site and their intent to address potential for differential (elevated) concentration of potential PCBs concentrated in sediment contained in the sampled runoff swales. These sediments have the potential to contain concentrated PCBs deposited in the general area from air transport of particulate emissions coming from the B-18 landfill.

The surface soil sampling took place on Tuesday, March 31, 2009 and Wednesday, April 1, 2009. Two sampling teams were utilized to collect impact and background samples. These two teams included staff from CWMI-KHF, Wenck Associates, and USEPA-IX. The following table identifies the respective team members:

| Background Sampling Team | Impact Sampling Team |
|---|---|
| Mr. Steve Holshouser - CWMI-KHF | Mr. Rob Fadden- CWMI-KHF |
| Mr. Bill Brown- Wenck Associates | Mr. Dan Sola- Wenck Associates |
| Ms. Haley Hudson- Wenck Associates | Mr. Mike Shoemaker- Wenck Associates |
| Mr. Kevin Wong- USEPA-IX | Mr. John Beach- USEPA-IX |
| Ms. Kathy Baylor- USEPA-IX | Mr. Matt Plate- USEPA-IX |

Using two teams with separate sampling supplies and equipment for sample collection greatly reduced the potential for cross-contamination between the background and impact areas.

With the exception of the multi-increment sample collected immediately adjacent to the B-18 landfill, surficial soil samples (0-2 inches below ground surface) were collected along the facility property boundary (within the redefined buffer zone, defined in Section 1.0) for this PCB Congeners Study.

The systematic linear sampling grid was established by multiplying the desired number of discrete increments for each multi-increment sample by the total desired number of multi-increment samples for each area and then dividing the area by their respective number of samples. For this study, it was determined that ten discrete increments would be collected per multi-increment sample. The number of increments was determined based on discussions with USEPA-IX representatives, site history, and site characteristics while considering the framework set forth in the DQOs, and the referenced sampling guidance documents.

The guidance documents referenced earlier, and discussions with USEPA-IX staff, suggested that multi-increment samples consisting of equally distributed increments (a systematic grid) reduces the variability while providing more representative data (pp 55-58 QA/G-4HW, pp 5-10 – 5-13 EISOPQAM). Therefore, the site boundary, within the context of the design guidance, was divided into seven sampling areas, four background areas and three impact areas. The spatial boundaries of all surface soil multi-increment samples followed the guidelines in Chapter 4 of USEPA QA/G-4HW (pp. 27- 29, 2000) and in consideration of Chapter 5 of USEPA Region 4 EISOPQAM.

Figure 4 shows the multi-increment sample locations based on the linear grid following along the KHF property boundary. The seven multi-increment sample areas were based on an approximate incremental sample location grid spacing of 525 feet along the property line. Due to the need for soil and vegetation samples to be taken in the same area, and the necessity to include representative amount of the various vegetation types, the sampling teams had the discretion to slightly offset from the planned location based on the observed conditions at the sampling point. The sample area, labeling designation, and potential sample purpose is shown below.

| **Sample Area (Associated Labeling Designator)** | **Samples for Analysis (Potential Purpose)** |
|---|---|
| (1) Northern Half of Eastern Property Line (NE) | 1 (Background) |
| (2) Northern Property Line (N) | 1 (Background) |
| (3) Northwest Corner of Property Line (NW) | 1 (Background) |
| (4) Northern Portion of Western Property Line (W) | 1 (Background) |
| (5) Southern Portion of Western Property Line (SW) | 1 (Impact) |
| (6) Southern Property Line (S) | 1 (Impact) |
| (7) Southern Half of Eastern Property Line (SE) | 1 (Impact) |
| (8) B-18 Adjacent Area (ERA ONLY) | 1 (Impact – ERA ONLY) |
| TOTAL | 8 analyzed |

Any minor field adjustments to the discrete sample point locations other than offset distance perpendicular to point locations were noted in the field notes, sampling data sheets, and shown in the table below. Copies of the field notes, data sheets, and photo logs are included in Appendix D.

| Multi-increment Sample Location Name | Discrete Increment | Distance Moved | Direction Moved | Reason for move |
|---|---|---|---|---|
| Northeast | 2 | 8m | South | Sample taken in selected swale |
| Northeast | 3 | 6m | South | Sample taken in selected swale |
| Northwest | 3 | 2m | East | Soil sample moved after vegetation was collected and the presence of a rattlesnake was identified. |
| Northwest | 7 | 65m | South | Moved to undisturbed area due to scrapped equipment location |

Following the Workplan, as well as guidance provided by USEPA-IX sampling team personnel, selection of each sampling location in the field adhered to the following guidelines:

- Planned grid location was marked and identified using a "near-survey grade" handheld global positioning system (GPS) device.
- Location was assessed to ensure it hadn't been recently disturbed.
- Location was assessed to determine if sufficient and varied vegetation was available.
- If original grid location did not meet selection criteria, the sampling team offset the location along a line perpendicular to sampling boundary, moving farther into the KHF property, until a suitable sampling location was identified.
- Sampling locations offset from the perpendicular line were chosen when appropriate.
- Offset locations were marked and recorded in a logbook and using GPS.

A total of 80 discrete samples, not including QA/QC samples, were collected from the targeted sampling areas and sent to the laboratory. The multi-increment surficial soil samples were then composited by the laboratory to form the eight multi-increment samples characterizing eight soil sampling areas including seven segments from the property boundary (the redefined buffer zone) and one from the B-18 area. The laboratory followed the compositing procedures identified in the Workplan.

USEPA-IX personnel collected one field composited multi-increment sample from all but the Southeast and West sampling areas. USEPA-IX sampling team personnel took an aliquot of each discrete increment sample and after all 10 increments were collected, mixed the soil sample in the field and collected a sample of the mixed composite. The Wenck/KHF team also collected a split of this composite. The USEPA-IX sample, in the custody of USEPA-IX staff was sent to their own laboratory for independent analysis. The split of this duplicate USEPA-IX sample in the custody of the Wenck/KHF team was sent to their laboratory and placed on hold for future analysis if desired.

### 3.2.2 Sampling Frequency

Following the approved Workplan, surface soil samples were only collected one time during this PCB Congeners Study. As discussed in the previous section, all sample locations targeted for this study were sampled on March 31 and Apri1 1, 2009.

### 3.2.3 Sampling and Analytical Methods

Soil sampling, analysis, and data validation was completed in accordance with the guidelines in: USEPA soil sampling guidance (USEPA QA/G-4HW Final, Region 9 Soil Sampling, SESDPROC-300-R1, SESDPROC-011-R2, EISOPQAM); USEPA Method 1668A; the respective SOPs and the QAPP included in the Workplan).

## 3.3 VEGETATION SAMPLING

The vegetation sampling strategy was designed to measure dioxin-like PCB congeners that may have been: 1) deposited around the facility, accumulated in surface soil, and taken up by the vegetation; 2) deposited on vegetation tissue; and 3) taken up in gaseous form through plant leafy tissues. For the purpose of this study, the vegetation sampling is assumed to be reflective of both historical and current potential impacts to the buffer zone around the facility from the handling PCB-contaminated waste at KHF.

### 3.3.1 Sampling Locations

The locations for sampling vegetation were centered on the same locations where surface soil was sampled. Selection of the sampling locations followed the same logic and guidance as for surface soils as previously discussed in Section 3.2.1. During the March 31 – April 1, 2009 sampling event, the respective sampling teams made various judgment calls in the field to ensure that enough vegetation was present at a discrete location to collect at least 50 grams of vegetation tissue. During the August 3 – 4, 2009 sampling event, only four targeted locations had to be slightly modified or expanded to have enough vegetation tissue to meet this requirement during the dry (summer) phase sampling. These modifications included:

SW-5: Expanded 0.25 meter on all sides due to lack of vegetation (very sparse).

S - 10: Expanded 0.5 meter on all sides due to lack of vegetation (very sparse).

S - 2: Expanded one meter on all sides due to lack of vegetation (very sparse).

SE - 9: Location covered by extensive tumbleweed, Tumbleweed moved to collect sample.

When making these adjustments, the teams followed the logic and procedures previously discussed in Section 3.2.1. The locations of each collected sample are shown on Figure 4 and the field notes, data sheets, types of vegetation collected, and photo logs are included in Appendix D.

### 3.3.2 Sampling Frequency

As discussed in Section 1, the vegetation was sampled twice during this study:

1. Target scenario: green (spring); sampled March 31 – April 1, 2009
2. Target scenario: dry (summer); sampled August 3-4, 2009

The intent of sampling the vegetation twice was to collect the vegetation in both phases that exist at the site throughout the year. There is very little rainfall in the region with most of the annual rainfall occurring in the spring (see Section 2.5 for discussion of the regional climate). The intent of sampling vegetation in the green phase was to represent the vegetation when it was more likely to be consumed by cattle (discussed further in Section 5.3.2.3) and wildlife. Further, according to USEPA-IX toxicologists, sampling during the green season provides a level of conservatism based on the increased uptake of substances in the soil during this time. Sampling vegetation in the dormant (dry) phase was intended to represent the vegetation in the form in which it exists for the majority of the year and may still be consumed by cattle and wildlife. Any detects of dioxin-like PCB congeners in the vegetation samples collected in the spring and summer were used in the RA. .

The first sampling event took place on March 31 and April 1, 2009 with the intent of catching the green (or wet) season which typically occurs between February and April. However, given the length of time to obtain final approval of the Workplan, the rainy season ended and the vegetation at the site was beginning to transition into the dormant phase. While not all vegetation was entirely green, the vegetation that was collected included portions of fully green vegetation as sample locations were offset to identify optimal vegetation selection. Furthermore, vegetation that had begun to dry out was only recently brown according to frequent updates on site conditions provided by KHF. The types of vegetation collected and their respective percentages for each increment are included Appendix D. The approximate percentage of rye grasses in the collected vegetation material was 86% in the samples collected in the spring (March 31 and April 1, 2009) and 92% of samples collected in the summer (August 2009). The balance of collected vegetation included saltbrush, leaves, seeds, flowers, whole plants, and other grasses.

The second event took place during the dry season in early August. USEPA-IX staff, Kathy Baylor, was present during the sampling and accompanied the Wenck/CWM team to all the sampling points. Dry phase samples were collected from the same locations as established for the green phase sampling. In the event that vegetation was too sparse to collect a sufficient volume for analysis, the original sampling location plot (one square meter) was extended in all directions until sufficient volume could be collected. The extension of the sampling area was approved by USEPA-IX as an addendum to the vegetation sampling SOP contained in the Workplan. The vegetation sampling SOP addendum is included in Appendix E.

### 3.3.3 Sampling and Analytical Methods

Vegetation sampling, analysis, and data validation were completed in accordance with the guidelines in: USEPA Emergency Response Team (ERT) vegetation sampling guidance; USEPA Method 1668A; the respective SOPs; and the QAPP included in the Workplan.
Collected vegetation consisted of plant tissue types that potentially would be consumed by herbivores such as those to be evaluated as representative receptors in the ERA (see Section 5.4). A mammalian herbivore (a rodent) may consume a variety of vegetation, such as seeds, fruit, grasses, forbs, and the leaves of shrubs; an avian herbivore may consume seeds and fruit. Based on discussions with personnel at the site, larger mammals (i.e., cattle) have been observed to consume a variety of fresh vegetation such as grasses, saltbrush, and other leafy plants of various sizes. Therefore, a variety of green vegetation (not woody material), seeds, and fruit found to be present at each sample location was collected and combined in a sample container to provide a representation of the plant material on which herbivores in the area may feed.

## 3.4 METEOROLOGY

An on-site meteorological station has been continuously collecting hourly wind speed, wind direction, precipitation, and temperature data since 1986. The location of this meteorological station is shown on Figure 3 and corresponds to the MSP sampling site. The representativeness of meteorological data (specifically wind direction and wind speed) collected from this location has been suspected of being impacted by the vertical build-out of the B-16 and B-19 landfills.

With the exception of frontal weather pattern changes, a typical wind direction observed at KHF is from the north-northwest. These typical wind patterns, observed in the field at KHF, have not changed with time and are still observed today at the higher elevations at the facility. Therefore, during the initial months of the PCB Congeners Study, mobile meteorological equipment was used to find an alternate location which would collect data that represents the wind patterns observed each day at the site as a whole. As shown in Figure 3, the hilltop to the west of the

B-18 landfill was selected as a new stationary meteorological monitoring site. During the first week of April 2009, meteorological sensing equipment was removed from the MSP site, installed, calibrated by an independent firm in accordance with the manufacturer's guidelines and USEPA requirements, and began continuously collecting on-site meteorological at this new location on April 10, 2009.

Horizontal wind speed and direction sensors are installed at 10 meters (m) above the ground surface on top of a telescopic met tower. An ambient temperature sensor is installed about 1.7 m above the ground surface. At ground level, the meteorological station includes components for measuring barometric pressure. Calibration and maintenance of the meteorological station is conducted semiannually by AMEC Geomatrix, Inc. in accordance with *US EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Methods*. Performance audits are conducted quarterly by AMEC Geomatrix, Inc. Copies of the calibration and audit reports are included in Appendix F.

# 4.0 Results

The following section presents an overview of the dioxin-like PCB congeners data detected in air samples collected from January – December 2009, soil samples, and spring and summer vegetation samples. This is the body of analytical data that was used as the basis for performing the RAs presented in Section 5.

To understand the results presented in the following sections, key definitions of certain terminology are presented below as they relate to the sampling results and their subsequent use in the human health and ecological risk assessments:

Estimated Detection Limit (EDL)

The EDL is generated by the high-resolution mass detector during the run of the sample. As the sample is running the instrument samples "noise" in areas where there are no peaks. From this it calculates an average height of the noise signal. It then compares that noise height to the height of the internal standard. It then uses this to calculate a "concentration" for the noise. To be considered a real positive in USEPA Method 1668 the target peak must be 2.5 times the signal to noise. To accommodate this, the computer multiplies the noise "concentration" by three rounding 2.5 up) and this is the EDL. When evaluating peaks the computer or the analyst compare the concentration of the positive peak to the EDL. The EDL is considered the true limit of detection for that compound, in that sample, during that run.

Reporting Limit (RL)

For the purpose of this study the laboratory's RL is essentially the sample quantitation limit – the lowest level that can be reliably quantified within specified limits of precision and accuracy. It is matrix-dependent because it accounts for sample size, moisture content, and dilution. The RLs used for this study were proposed and subsequently approved in the Final Congeners Study Workplan (Wenck, 2009a).

Detection

A detection is the measurement of a concentration of a congener that exceeds the EDL for that congener in that sample. The tables in the following sections also compare the results to the RLs.

Exposure Point Concentration (EPC)

The EPC is the measured concentration of a congener in each respective matrix that is used in the risk assessments to represent the exposure concentration for the various receptors. The EDLs were used as the limit of detection for assigning the EPCs. How EPCs were quantified and assigned is discussed later in Section 5.0.

With the exception of PCB congener 169, all of the targeted PCB congeners were detected above the EDL in all three sampled matrices. PCB congener 169 was not detected above the EDL in any of the collected soil samples. When compared to the RLs only two of the targeted PCB congeners were detected in the air matrix, five in the soil matrix, and seven in the vegetation matrix.

To assess the precision of the sampling methods, which included soil and vegetation compositing performed in the laboratory; duplicate samples were collected throughout the study. The Congeners Study Workplan specified that one lab duplicate in each of the soil and vegetation matrices would be prepared and analyzed. The soil and vegetation duplicates were prepared in the laboratory from each of the collected increment samples. For the air matrix, the Congeners Study Workplan specified that four duplicates would be collected through the year, as well one co-located sample to determine if the MSP sampling location was optimally sited. The duplicate and co-located samples are further discussed in the following sections.

Also included in this section are a brief discussion of the meteorological data collected from January – December 2009, the data validation and air sampling audit that was performed in accordance with the QAPP in the Workplan, and the air dispersion modeling that was performed to assess the appropriateness of the air sampling location selection.

## 4.1 AMBIENT AIR SAMPLING RESULTS

Air samples were collected each month throughout the year in accordance with the approved Workplan (Wenck 2009a). As with any long-term air sampling program, there were a number of mechanically related sampling issues that were encountered throughout the duration of the sampling. Generally these issues fell into the following categories:

- Motor and timer failures,
- Sampling run times slightly falling short or beyond the targeted duration,
- Average setup and takedown flow rates being slightly outside the target +/- 10% range, and
- Power failures.

All of these sampling-related issues are common to ambient air sampling programs. However, the extreme summer temperatures, inconsistent power supply, and 5-day (120 hour) continuous sampling durations for this project caused the sampling equipment at KHF to be more vulnerable to these type of problems. The vast majority of sampling issues only slightly to moderately affected the run time duration which therefore affected the respective volume collected within the specific 5-day sampling period during the month. While these issues caused a slight deviation from the sampling procedures, their impacts did not necessitate rejecting data. When all four 5-day sample segments are combined into a month long sample the overall sampling period is more than adequately represented. The samples that encountered some type of sampling problem are flagged in Table 4.1.1 and specific details summarized in the air sampling audit report presented in Appendix I. Figure 5 presents graphically the air sampling data capture for the samples collected at KHF throughout 2009.

Two samples that were significantly affected by power outages causing them to be rejected for use in the RA due to the lack of sufficient sample volume. These samples were the November UMS-1 and MSP samples. In addition, the Fresno air sample collected in August also had insufficient sample volume and the Coalinga air sample collected in October had low sample volume, both due to power outages during sample collection. However, data from the Fresno and Coalinga samples were never intended to be used in the RA.

Collected air samples were analyzed by Test America following analytical procedures identified in US EPA Method 1668A (2003). Analytical data provided by the laboratory are presented in units of picograms (pg) per filter. For each collected sample the results are converted to units of picograms per cubic meter (pg/$m^3$) by dividing the pg/filter results by the corresponding air volume that was collected over the month-long sampling event. Table 4.1.1 presents the concentrations of dioxin-like PCB congeners that were detected in each of the samples collected from January – December 2009. A copy of the electronic data deliverable (EDD) from Test America containing all of the analytical data and chain-of-custodies is located in Appendix G.

The analytical results presented in Table 4.1.1 show that, of the 12 WHO PCB congeners, all 12 congeners were detected in the air matrix above the EDL in various samples collected throughout the 12 months of sampling. Only two congeners were detected at KHF above the RL.

The co-located air sample to assess the MSP location was collected in April 2009. The sample was identified as APR09-MSP-ALT-TO9A. Although a relative percent difference (RPD) calculation was not required to be performed on this co-located sample, the RPD calculation was performed anyway just to assess the comparability of results from these sampling locations. As shown in the Table 4.1.2, all of the RPDs for the congeners were above 50%. Clearly this indicates a difference in air concentrations between these locations which resulted in creating a scaling factor that was applied to the MSP results for use in the RAs. How these results were used to develop the scaling factor for the MSP sampling location results is discussed in Section 5.0.

The air sampling duplicates were collected by locating a second portable air sampling unit at each of the respective UMS-1, DMS-1, and MSP sampling locations during a month-long sampling event. While a month-long duplicate was taken at each of three monitoring stations, a total of four air duplicates suggested in the QAPP were not collected due to a scheduling oversight. These three samples represent 8.3% of all the samples used in the RA, close to the 10% sample representation target for precision. The duplicate air samples were collected in May 2009 at the UMS-1 location, June 2009 at the DMS-1 location, and July 2009 at the MSP location. As shown in Table 4.1.2, the RPD for the congeners detected greater than two times the EDL were all within the measurement performance criteria of 50% specified in the QAPP.

## 4.2 RESULTS FROM SOIL SAMPLING

Collected multi-increment soil samples were composited and analyzed by Test America in following the compositing and analysis SOPs presented in the Workplan, in accordance with US EPA Method 1668A (2003), and following all of the QA/QC procedures and criteria identified in the QAPP of the Workplan.

Table 4.2.1 presents the concentrations of dioxin-like PCB congeners that were detected in each of the multi-increment soil samples collected on March 31 – April 1, 2009. A copy of the EDDs from Test America containing all of the analytical data and chain-of-custodies is located in Appendix G.

The analytical results show that of the target 12 dioxin-like PCB congeners, all but PCB 169, were detected above the EDL. Only five of the 12 PCB congeners were detected above the RL.

The soil duplicate was prepared and analyzed as specified in the Workplan and the results are presented in Table 4.2.2. With the exception of PCB 167 (RPD: 65.2%) the RPD for the remaining congeners detected greater than two times the EDL were all within the measurement performance criteria of 50% specified in the QAPP.

## 4.3 RESULTS FROM VEGETATION SAMPLING

Collected multi-increment vegetation samples were composited and analyzed by Test America in following the compositing and analysis SOPs presented in the Workplan, in accordance with US EPA Method 1668A (2003), and following all of the QA/QC procedures and criteria identified in the QAPP of the Workplan.

Table 4.3.1 presents the concentrations of dioxin-like PCB congeners that were detected in each of the multi-increment vegetation samples collected on March 31 – April 1, 2009 and on August 3-4, 2009. A copy of the EDDs from Test America containing all of the analytical data and chain-of-custodies is located in Appendix G.

The analytical results show that of the targeted 12 dioxin-like PCB congeners, all 12 were detected above the EDL in various congeners samples collected during the spring and summer. Seven congeners were detected above the RL.

The laboratory duplicate of the vegetation sample was not prepared or analyzed because the vegetation was dry and sparse in many of the increment sample locations. Therefore, it was not possible to collect enough vegetation material in the 4 ounce sample vessel to yield 10 grams of vegetation for the sample along with another 10 grams of sample material for the lab duplicate. Because the samples were not weighed in the field, the deficiency of vegetation material for lab duplicate preparation was not known until after all the sampling was completed.

While not appropriate for an assessment of precision, the RPDs were calculated to compare the spring and summer samples. This comparison was performed to get a general understanding of the difference in congener concentrations between the active and dormant vegetation phases. Since the summer vegetation samples were collected from the same sampling plot as the spring samples, this general comparability is appropriate. As shown in the Table 4.3.2, some congener results compare fairly well with RPDs < 50%, while a significant portion of other results were much greater than 50% RPD. The difference in results may be attributed to PCB congener concentrations changing as the vegetation becomes dormant and dehydrated, as well as the potential impact from differing quantities of resuspended dust containing congeners that becomes deposited on the vegetation as the seasons change from wet in the spring to dry in the summer. The ecological and human health risk assessments were performed using both the spring and summer vegetation results.

## 4.4 METEOROLOGICAL RESULTS

Using the meteorological data collected at KHF, wind rose diagrams have been developed using the averaged hourly wind speed and wind direction data representing each of the monthly sampling events. These wind roses diagrams are temporally matched to each air sampling interval and are located in Appendix H.

As discussed earlier, the KHF meteorological monitoring station was relocated on-site on April 10, 2009. Copies of the associated calibration and audit reports are also included in Appendix F.

The final approved Workplan (Wenck, April 2009) contains wind roses of historical meteorological data collected at the KHF from 2000 through 2008 at what is now referred to as "the old Met site".

## 4.5 AIR DISPERSION MODELING

Air dispersion modeling was completed using the protocol (Wenck, 2009b) approved by USEPA-IX in August 2009. The protocol was prepared to perform air dispersion modeling to assess the appropriateness of the site selection of the air monitoring locations. The air dispersion modeling was completed in October 2009 and a draft copy of the report submitted to USEPA-IX in October 2009. A copy of the final report is located in Appendix A.

The results of this air dispersion modeling analysis indicate that DMS-1 and UMS-1 are appropriately located to meet the objectives of the PCB Congeners Study at KHF. Further, while the MSP location is not sited in an area of modeled maximum potential impacts, this monitoring location can be effectively used to measure PCB congener concentrations in the direction of Kettleman City.

### 4.6 AIR SAMPLING AUDIT

In accordance with the QAPP in the Workplan, on August 5, 2009, Mr. Mike Shoemaker of Wenck Associates conducted a performance and field portion of a systems audit of the ambient air monitoring network used in this study. Ms. Haley Hudson of Wenck Associates also routinely conducts a system audit of the field sampling data provided to her after each sampling event. The complete Audit Report, including all performance audit and systems audit results, is attached in Appendix I.

The performance audit was a quantitative assessment to measure the accuracy and precision of the sampling equipment. At the time the audit was performed, all instruments used to collect air samples were within the performance criteria presented in the Workplan. The systems audit was a qualitative assessment to determine overall QA/QC compliance with QAPP and adherence to the SOPs in the Workplan. Overall, during the twelve months encompassing this systems audit (January 2009 - December 2009) the majority of air samples were collected within the specifications within the QAPP. Where minor deviations occurred, the data was flagged and discussed in the audit report found in Appendix I. There were no critical data collection errors that resulted in rejected data thus the percent data recovery was 100%. All sampling procedure and equipment issues were addressed as they occurred, thus providing a generally consistent data capture. The outcome of this audit determined that the Workplan was implemented properly and the sampling equipment was operating in accordance with the method requirements.

## 4.7 DATA VALIDATION

Data validation is the systematic review of analytical measurement data for outlier identification and error detection. A complete discussion of the data validation process used for this study was included in the Workplan.

Data validation for all sample (soil, vegetation, and air) analytical results collected by KHF was performed by Diane Short and Associates, Inc. Copies of these reports and respective data qualifiers are included in Appendix J.

The outcome of this data validation process determined that with the inclusion of minor data qualifiers, the sample analysis was conducted within the requirements of the methods, QAPP, and overall Workplan. The qualifiers attached to some of the data results are presented in the data validation reports found in Appendix J.

Due to a lack of sufficient sample volume collected, the November UMS-1 and MSP air samples were rejected for use in the RAs. Though the PCB congener concentrations are still presented in Table 4.1.1, the data results are flagged “R” as rejected. The same is true for the air sampling results in presented in Table 4.10.1 in which the results for the Fresno air sample collected in August are flagged “R” for rejected and the results for the Coalinga air sample collected in October are flagged “E” for estimated.

## 4.8 USEPA-IX SPLIT SOIL SAMPLING RESULTS

As discussed in Section 3.2.1, USEPA-IX collected their own field composited splits of the multi-increment soil samples collected on March 31 – April 1, 2009. USEPA-IX staff maintained custody of these samples and had them analyzed in their own laboratory. As discussed later in Section 5.2.3, the analytical results of these samples were used to assess the appropriateness of using the KHF/Wenck sample results in the RAs.

## 4.9 QUALITY ASSURANCE/QUALITY CONTROL SAMPLE RESULTS

In accordance with the QAPP presented in the Workplan, there were a number of QA/QC samples collected in the field and prepared and analyzed by the laboratory. All of the required analytical QA/QC samples were prepared and analyzed by Test America and are presented in the EDDs located in Appendix G, as well as discussed in the data validation reports located in Appendix J. The QA/QC samples collected in the field consisted of duplicate samples, trip blanks with the air samples, and equipment rinsate blanks prepared and collected during the vegetation and soil sampling. No dioxin-like PCB congeners were detected in the air sample trip blanks, nor the vegetation and soil sampling equipment rinsate blanks. To assess precision of the sampling and compositing methods, duplicate samples were also collected as discussed and results presented in earlier sections.

## 4.10 FRESNO, HANFORD, AND COALINGA SAMPLE RESULTS

In order to gather more information on the background levels of dioxin-like PCB congeners within the San Joaquin Valley (SJV), KHF collected air, soil, and vegetation samples at three locations away from KHF following the same procedures and protocols as approved in the Workplan. Month-long air samples along with soil and vegetation samples were collected at the following SJV locations: Fresno, CA in August 2009, Hanford, CA in September 2009, and Coalinga, CA October 2009. Similar to the results collected within the KHF facility, the dioxin-like PCB congeners were found in nearly every sample, at levels comparable to the levels found in the KHF samples. The air, soil, and vegetation results are presented in Tables 4.10.1, 4.10.2, and 4.10.3 respectively. These results provide further evidence that, for the purpose of performing the RAs, assuming all PCB congeners detected in the KHF samples originated from KHF operations is overly conservative and biased without consideration of background concentrations of dioxin-like PCB congeners unrelated to KHF.

## 4.11 USEPA PILOT STUDY OF PCB CONGENERS IN BACKGROUND SOILS

Another, even more significant, piece of information regarding PCB congeners in the background was the Pilot Survey of Levels of Polychlorinated Dibenzo-p-dioxins, Polychlorinated Dibenzofurans, Polychlorinated Biphenyls, and Mercury in Rural Soils of the United States (USEPA, April 2007), provided to CWMI-KHF by USEPA-IX in September 2009. As stated in this Pilot Survey:

> "The soil samples were collected in 2003 at 27 monitoring stations of the National Dioxin Air Monitoring Network (NDAMN) (U.S. EPA, 2005a). These stations are located in rural/remote areas, matching the areas of interest for the soil survey. Also they are distributed across the continental United States and Alaska, providing the nation-wide perspective desired for this study."

Appendix E of this Pilot Survey contains the laboratory analytical results for PCB congeners collected from the 27 NDAMN locations. PCB congeners were detected at all 27 NDAMN locations. The Pilot Survey results, along with the soil results above the RLs from KHF, Fresno, Coalinga, and Hanford, are presented in Appendix K The presented results clearly indicate that dioxin-like PCB congeners are present in soils across the continental United States and Alaska at levels comparable to, and in many cases much higher than, levels found at KHF. As further evidence of the widespread presence of dioxin-like PCB congeners in soils, the Pilot Survey states;

> "The range of concentrations found here is similar to the range across three published studies on PCB levels in soils from rural areas worldwide."

Detections of dioxin-like PCB congeners in soil samples from KHF, three locations in the San Joaquin Valley, and background locations across the United States, clearly demonstrates that the presumption that all dioxin-like PCB congeners found in the air, soil, or vegetation at KHF must have originated from KHF is *false*. It appears that the distribution of dioxin-like PCB congeners at KHF is consistent with nationwide data.

# 5.0 Risk Assessment

The RA is presented in four major sections: Section 5.1, Introduction; Section 5.2, Data Collection and Evaluation; Section 5.3, Human Health Risk Assessment; and Section 5.4, Ecological Risk Assessment.

## 5.1 INTRODUCTION

The following section presents the risk assessment (RA) analysis that was performed for dioxin-like polychlorinated biphenyl (PCB) congeners at the Kettleman Hills Facility (KHF), including a human health risk assessment (HHRA) and an ecological risk assessment (ERA).
The objective of this RA is to assess the magnitude of potential risks to on-site and off-site ecological receptors and off-site human receptors from dioxin-like PCB congeners in environmental media at KHF that may be associated with current and historical PCB disposal activities at KHF. The RA for dioxin-like PCB congeners at KHF assesses potential off-site risks under current and hypothetical worst-case future conditions based on data collected through ambient air monitoring, surficial soil sampling, and vegetation sampling.

The risk assessment focuses on the 12 dioxin-like PCB congeners that have been identified by United States Environmental Protection Agency Region IX (USEPA-IX) as the human health chemicals of potential concern (COPCs) and chemicals of potential ecological concern (COPECs) for this RA. COPCs and COPECs are those chemicals that warrant a detailed assessment of the risks they may pose. The dioxin-like PCB congeners are evaluated collectively to determine if they are likely to pose a potentially significant risk to a receptor.
The scope of the RA for KHF is to estimate potential risks to human health and ecological receptors based on dioxin-like PCB congener data collected within the facility fenceline. In accordance with USEPA guidance for baseline risk assessment (USEPA 1989), the HHRA assesses impacts that could occur under both current and hypothetical future land use conditions.

The current land use scenario conservatively reflects existing land use and activity patterns in the area adjacent to KHF. The future land use scenarios address hypothetical worst-case future land uses which assume residential development essentially at the facility property boundary. The PCB congener concentrations measured in environmental media under current conditions are used to represent concentrations under the future exposure scenarios. The ERA identifies potential ecological receptors at the site, evaluates receptor exposures and potential risks, and determines whether the site-related dioxin-like PCB congeners pose risks of concern to ecological receptors.

An air dispersion and deposition modeling analysis (Wenck October 2009) was conducted to identify those locations subject to maximum potential impacts from on-site PCB disposal operations. This analysis confirmed that the greatest deposition would be expected to occur on and adjacent to the facility, and deposition would decrease rapidly with distance from the facility. Thus, the soil and vegetation sampling and air monitoring locations used in the PCB Congeners Study were expected to provide conservative data that would maximize risk estimates based on near-field exposures assumed to occur essentially adjacent to the facility boundary. This was intended to ensure that PCB concentrations and potential human health and ecological risks associated with the presence of dioxin-like PCB congeners were not underestimated for receptors located either near the facility or far from the facility.

## 5.2 DATA COLLECTION AND EVALUATION

### 5.2.1 Data Collection

The dioxin-like PCB congener data used in this RA were collected during the sampling activities at KHF described in Section 3.0, Sampling, of this report. The media sampled included surface soil, vegetation, and ambient air. Surface soil samples were collected during March and April 2009; vegetation samples were collected during March and April 2009 and again in August 2009; and ambient air samples were collected on a monthly basis from January through December 2009. All samples were analyzed by USEPA Method 1668A. A summary of the samples (including sample locations and types, dates collected, and laboratory methods) used in the RA is presented in Table 5.2.1, and sample locations are shown on Figure 3 for ambient air sampling and Figure 4 for soil and vegetation sampling.

Surface soil samples were collected from the perimeter of the site from locations generally in the predominant downwind direction (areas considered impacted by emissions) and in the predominant upwind direction (areas considered less impacted by emissions) from B-18, the currently active PCB landfill, and from additional locations within the facility boundary immediately adjacent to and in the predominant downwind direction of B-18 (see Section 3.2, Surface Soil Sampling). Based on historically recorded and observed meteorological conditions, areas designated southeast, south, southwest, and B-18 are predominant downwind areas potentially impacted by the site, and areas designated west, northwest, north, and northeast are considered predominant upwind reference areas. The ten multi-increment surface soil samples collected from each area were composited by the laboratory, resulting in eight multi-increment samples representing the eight sampling areas and two duplicate samples.

Vegetation samples were collected from plant material in the immediate area of each discrete surface soil sampling location, as discussed in Section 3.3, Vegetation Sampling. These samples were collected during the green (or wet) season at the same time as the collection of soil samples and again during the dry season in late summer. A variety of green vegetation (not woody material), seeds, and fruit found to be present at each sample location were collected and combined in a sample container. As with the surface soil samples, the ten multi-increment vegetation samples collected from each area were composited at the laboratory, resulting in eight multi-increment samples representing the eight sampling areas for each of the two sampling events.

Ambient air samples were collected from one stationary monitoring site location in the predominant downwind direction from the B-18 landfill (DMS-1); one location at the existing meteorological station pad (MSP), which is northeast of B-18, southeast of B-19, and north of the administration building; and one stationary monitoring site located near the property line in the north-northwest section of the facility (UMS-1), as discussed in Section 3.1, Air Sampling. Locations DMS-1 and MSP represent areas considered likely to be impacted by KHF emissions because they are in the predominant downwind direction from B-18, while UMS-1 is a reference monitoring site in the predominant upwind direction intended to measure ambient air entering and not affected by potential facility-related emissions to air. Samples were collected each month from January through December 2009 using a strategy designed to measure dioxin-like PCB congeners in both the volatile and particulate-bound phase.

In April 2009, an ambient air sample was collected from a mobile monitoring station located near the administration building parking lot, a location suggested by USEPA-IX to correlate to concentrations measured at MSP. This sample was collected in addition to the regular MSP sample. This location was designated "MSP-ALT." Eight dioxin-like PCB congeners (PCB 77, PCB 105, PCB 118, PCB 123, PCB 156, PCB 157, PCB 167, and PCB 169) were detected in each sample. The MSP-ALT sample contained slightly higher concentrations of the PCB congeners than were detected in the regular MSP location during April. Therefore, for the month of April, the MSP-ALT data were included in the RA dataset instead of the regular MSP data. The MSP-ALT sample was previously discussed in Section 3.1.1. Data Evaluation.

### 5.2.2 Data Evaluation

The analytical data obtained from sampling activities were evaluated prior to use in the RA. The steps involved in evaluation and aggregation of data are common to both the HHRA and ERA. The goal of data evaluation is to select those chemical data that are potentially site-related and are valid for use in the RA. This includes primary field samples with no associated qualifiers, data with qualifiers that indicate uncertainties in concentration but not in constituent identification, and data detected at levels significantly elevated above concentrations detected in associated sample blanks. All field quality control data (such as field blanks and rinsate samples) were eliminated from the dataset used for the RA. A detection is considered to be a measured concentration of a congener equal to or greater than the EDL.

The data evaluation for the RA included seven main steps, as discussed below.

Step 1: Sort the data into exposure groups.

The principal areas of concern for this dioxin-like PCB congener RA are those off-site locations that are potentially impacted by PCB releases from KHF disposal activities. Surface soil and vegetation samples were collected from locations within KHF near the property line, areas that are considered to conservatively represent off-site concentrations. Samples were also collected within the facility boundary adjacent to and southeast of the B-18 landfill to assess potential ecological risk in that area. Air monitoring samples were collected from three locations. An air dispersion and deposition modeling analysis was conducted to identify those locations subject to maximum impacts from on-site PCB disposal operations. This analysis showed that contaminant concentrations measured in soil, vegetation, and air samples at the facility boundary provide conservative estimates of exposures and would not result in underestimation of off-site exposures farther from the facility.

Data from surface soil, vegetation, and air were grouped into medium-specific exposure groups for the site based on potential exposures of receptors. In aggregating the data into exposure groups, each air sampling location was evaluated separately, with locations DMS1, MSP, and UMS1 representing three exposure areas for evaluation of human health risk. The surface soil and vegetation samples were aggregated into exposure groups according to location. Thus, the samples collected along the southeast, south, southwest, west, northwest, north, and northeast areas of the property line represent seven exposure areas for evaluation of potential human health and ecological risks. In addition, the area adjacent to B-18 represents an exposure area only for ecological receptors.

Step 2: Evaluate the analytical data on the basis of quality.

The analytical data were evaluated with respect to sample quantitation limits and data qualifiers and codes. Laboratory qualifiers and data validation qualifiers were evaluated. If contradictory, data validation qualifiers took precedence over laboratory data qualifiers. Data with no associated qualifiers and data with qualifiers that indicate uncertainties in concentration but not in chemical identification were retained for use in the RA. With the exception of the air samples collected in November at UMS-1 and MSP, no data were excluded from the RA because of an "R" qualifier (rejected); that is, no data were rejected by the laboratory or during validation.

Step 3: Evaluate duplicate samples.

Field duplicate samples collected and analyzed during sampling events were evaluated for inclusion in the dataset of detected concentrations. Duplicate sampling data are available for soil at the southeast area and for air at DMS-1, MSP, and UMS-1 locations. Each duplicate sample result was compared to the corresponding primary sample result. If one sample result was a detect and the other was not, the value for the detect was used. If both sample results were detects, the value for the higher sample result was used. If neither sample result was a detect, the sample result with the lower RL was used. For all comparisons, the sample result not used was removed from the dataset.

Step 4: Compare vegetation results collected during wet and dry seasons.

Vegetation samples were collected from plant material during the green (or wet) season in the spring and again during the dry season in late summer. Each spring sample result was compared to the corresponding summer sample result. If both sample results were detects, the value for the higher sample result was used. If one sample result was a detect and the other was not, the value for the detect was used. If neither sample result was a detect, the summer sample result (which generally has the lower RL) was used.

Step 5: Adjust detected air concentrations at location MSP.

As discussed in Section 5.2.1, the results (concentrations detected) from the alternate location (MSP-ALT), which were slightly greater, were used in the RA instead of the MSP April results. The eight detected congeners had results from the alternate location that ranged from 1.72 to 2.59 times greater than the results from the MSP location. Based on this comparison of April results, the detected concentrations of these eight detected congeners in the January, February, March, May, June, July, August, September, October, November, and December MSP samples were adjusted (scaled up) using their associated factors to estimate the concentrations that potentially would have been detected at the alternate location during those months.

Step 6: Address non-detected dioxin-like PCB congeners.

One or more of the 12 dioxin-like PCB congeners were detected in each medium and exposure area. However, PCB congener 169 was not detected above the EDL in any of the collected soil samples. As discussed in Section 4, a congener was considered not detected if it could not be quantified at or above the EDL. In order to conservatively address potential risk to human health and ecological receptors, each of these non-detected dioxin-like PCB congeners was assumed to be present and was included in the RA for all media and exposure groups, with one-half the RL used as a surrogate concentration. This is a conservative measure used to ensure that the environmental concentrations, and associated potential risks, would not be underestimated.

Step 7: Address dioxin-like PCB congeners using toxicity equivalence methodology.

The 12 dioxin-like PCB congeners were analyzed using congener-specific methods. These dioxin-like PCB congeners appear to share a common mode of action with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), and toxicity equivalence factors (TEFs) have been developed that relate their toxicity to that of 2,3,7,8-TCDD (USEPA 2000; USEPA September 2009). To evaluate dioxin-like PCB congeners in the HHRA and ERA, the concentration of each individual congener was multiplied by its corresponding TEF, as per USEPA (2000; June 2008), to express the concentration as a 2,3,7,8-TCDD toxicity equivalence concentration (TEC). The TEFs used, shown in the table below, are the values recommended for humans (USEPA September 2009) and other mammals and for birds (USEPA June 2008), which were developed by the World Health Organization (WHO) (Van den Berg et al. 2006).

| Congener Number | Congener Name[1] | WHO TEFs[2] | |
|---|---|---|---|
| | | Humans/Mammals | Birds |
| PCB-77 | 3,3′,4,4′-TetraCB | 0.0001 | 0.05 |
| PCB-81 | 3,4,4′,5-TetraCB | 0.0003 | 0.1 |
| PCB-105 | 2,3,3′,4,4′-PentaCB | 0.00003 | 0.0001 |
| PCB-114 | 2,3,4,4′,5-PentaCB | 0.00003 | 0.0001 |
| PCB-118 | 2,3′,4,4′,5-PentaCB | 0.00003 | 0.00001 |
| PCB-123 | 2’,3,4,4′,5-PentaCB | 0.00003 | 0.00001 |
| PCB-126 | 3,3′,4,4′,5-PentaCB | 0.1 | 0.1 |
| PCB-156 | 2,3,3′,4,4′,5-HexaCB | 0.00003 | 0.0001 |
| PCB-157 | 2,3,3′,4,4′,5′-HexaCB | 0.00003 | 0.0001 |
| PCB-167 | 2,3′,4,4′,5,5′-HexaCB | 0.00003 | 0.00001 |
| PCB-169 | 3,3′,4,4′,5,5′-HexaCB | 0.03 | 0.001 |
| PCB-189 | 2,3,3′,4,4′,5,5′-HeptaCB | 0.00003 | 0.00001 |

[1] CB = chlorinated biphenyl
[2] Source: Van den Berg *et al*. (2006)

Summary

Through the data evaluation process, the environmental measurements that are valid for use in the RA have been identified for the 12 dioxin-like PCB congeners. The soil, vegetation, and air data from the exposure areas identified for use in the evaluation of human health and ecological risk are presented in Tables 5.2.2, 5.2.3, and 5.2.4, respectively. The exposure point concentrations (EPCs) provided consist of the detected concentrations and, for non-detected congeners, one-half the reporting limit.

### 5.2.3 Data Collection and Evaluation Uncertainty

Uncertainty is inherent in the RA process. The evaluation of chemical risks to human health and ecological receptors is, by necessity, based on a number of assumptions. This section provides a discussion of the uncertainties associated with data collection and evaluation in order to address their potential effects on the risk assessment results. The sampling data collected at KHF were collected during several specific events and at specified locations on the KHF property, and as a result, may not completely represent potential concentrations present at the facility. However, elements of the sampling were specifically designed to minimize this uncertainty. For example, a total of ten multi-increment surface soil samples and ten multi-increment vegetation samples were collected from each of the eight exposure areas within the KHF perimeter in order to increase spatial coverage and provide more comprehensive contaminant characterization. Air samples collected from January through December 2009, were assumed to represent ambient air concentrations throughout the year. Also, results from the air dispersion and deposition modeling were examined to ensure the soil, vegetation, and air samples were collected at locations that are either subject to maximal impact from PCB congeners potentially originating from KHF or could be specifically related to those areas. Because the modeling effort incorporated extensive amounts of local meteorological data, its results allow a reliable assessment of the sampling locations selected and confirm that they are likely to experience among the highest concentrations expected from site activities.

The data validation and quality assurance/quality control procedures applied to sample collection, analysis, and data evaluation were rigorous and, as a result, little uncertainty is expected to affect the measured concentration data used in this risk assessment. The detection limits for the dioxin-like PCB congeners analyzed are the lowest practicable in accordance with the USEPA-approved analytical methods provided by the laboratory. All detected results, including those with data qualifiers, were evaluated as part of the dataset.

As discussed in Section 3.0, replicate sets of samples (splits) were obtained from the multi-increment soil samples from most of the exposure areas. These split samples were submitted by USEPA to a different laboratory for analysis to validate the quality of the primary data set. Based on the results of this analysis, the primary data set used in this RA was determined by USEPA to be of acceptable quality.

Those analytes not detected in any samples in a particular exposure area were also included in the dataset, using one-half the RL as a surrogate concentration. This is a very conservative step that will tend to overestimate environmental concentrations and associated potential risks. As the laboratory methods used in analyzing the samples provide essentially the lowest detection and reporting limits practicable, there is the possibility that several dioxin-like PCB congeners thus included are, in reality, not present. Therefore, the overestimation of risks in the RA is likely. There is also the possibility that some dioxin-like PCB congeners that were not detected may be present at levels slightly above one-half their reporting limit. However, the significance of such chemicals at consistently low concentrations (never above the EDL) to the overall risk posed by chemicals at the site is expected to be minimal. Thus, the underestimation of risks in the RA from such an occurrence is unlikely.

As described in the discussion of the data evaluation methodology in Section 5.2.2, analytical results from both primary and duplicate (quality control) samples were used in the dataset. The primary and duplicate results were compared to provide the representative chemical concentration for that sample. Overall, the comparison of primary and duplicate samples would likely decrease uncertainty associated with potential risks in this RA. Considering that the value for the higher sample result was used when both sample results were detected, risks are likely overestimated in the RA.

The comparison of results from vegetation samples collected during spring versus summer resulted in use of the higher detected concentration, which would increase the conservatism of the RA. Similarly, use of scaling factors derived from the April air sampling at the MSP alternate location (which detected higher concentrations than those detected at the regular MSP sample location) to estimate (scale up) concentrations that potentially would have been detected at the regular MSP sample location during other months also contributes to conservatism.

There is uncertainty associated with use of contaminant concentrations measured in environmental media under current conditions to represent concentrations under future exposure scenarios. However, there is no apparent reason to expect that potential future facility emissions of dioxin-like PCB congeners will result in environmental concentrations exceeding those currently present due to past emissions. Accordingly, the use of current concentrations is unlikely to result in the underestimation of potential future risks.

## 5.3 HUMAN HEALTH RISK ASSESSMENT

This section presents the human health risk assessment methods and results. The HHRA was performed in accordance with USEPA guidance on risk assessment, including the following:

- *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part A), Interim Final* (USEPA 1989);
- *RAGS, Volume :, Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments), Final* (USEPA December 2001);
- *RAGS, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final* (USEPA July 2004);
- *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Final* (USEPA September 2005); and
- *RAGS, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final* (USEPA January 2009).

### 5.3.1 Identification of Human Health COPCs

As outlined in the project Workplan (Wenck April 2009), which was approved by USEPA-IX, the human health risk assessment focused on the 12 dioxin-like PCB congeners. These congeners are designated as the COPCs to be evaluated. It should be noted, however, that the selection of a compound as a COPC, does not mean that the chemical poses a potential health risk above regulatory risk targets set by the state or USEPA. All 12 of the dioxin-like PCB congeners analyzed for in the multi-increment samples representing each of the medium-specific exposure areas are identified as COPCs for each exposure group, even if one or more individual congeners were not detected in the composite sample. The EPCs for the COPCs are presented in Tables 5.2.2 through 5.2.4 for soil, vegetation, and ambient air, respectively. The EPC is the detected concentration for congeners detected above the EDL and is one-half the RL for congeners not detected above the EDL. Along with the EPC, the reporting limit and the basis for EPC selection are shown for each congener for each of the seven human health exposure areas: southeast, south, southwest, west, northwest, north, and northeast. The "Basis for EPC" column indicates whether the congener was detected at a concentration above the RL, it was detected at a concentration between the EDL and the RL, or it was not detected above the EDL.

The 12 dioxin-like PCB congeners analyzed for in ambient air monitoring samples collected over a 12-month period, from January through December at the three air sampling locations DMS1, MSP, and UMS1, are presented in Table 5.2.4. As discussed in Section 5.2.2, the April ambient air sampling results from MSP-ALT were used in the HHRA in lieu of the MSP results. In addition, as described in Section 5.2.2, a scaling factor based on the ratio of the April MSP-ALT concentration to the April MSP concentration was used to adjust upwards the detected concentrations of the eight detected congeners from the other months' MSP samples, to estimate the concentrations that potentially could have been detected at the alternate location during these months. The scaling factors and resultant scaled EPCs are provided in Table 5.2.4.

### 5.3.2 Exposure Assessment

The exposure assessment evaluates the potential human exposure to the selected COPCs. This section of the HHRA addresses the potential pathways by which human populations could be exposed to the COPCs under current conditions (existing land use and activity patterns in the area adjacent to KHF) and under potential hypothetical worst-case future land use conditions assuming unrestricted (i.e., residential) use immediately adjacent to KHF. The exposure assessment describes exposure scenarios, develops information on exposure pathways, estimates the concentrations of COPCs at points of human exposure, and determines receptor intakes.

#### 5.3.2.1 Characterization of Exposure Setting

The exposure setting is described in terms of the natural environment and local land use and demographics. The purpose of this discussion is to provide information pertinent to the identification of exposure pathways and the estimation of exposure factors for human receptors.

Site Description

KHF is a commercial Class I/II hazardous waste/designated waste treatment, storage, and disposal facility (TSDF) and Class II/III designated waste/municipal solid waste disposal facility owned and operated by Chemical Waste Management, Inc (CWMI). As shown in Figure 1, KHF is located in Kings County, California, southwest of the intersection of Interstate 5 and Highway 41, approximately 3.5 miles southwest of Kettleman City and 6.5 miles southeast of the City of Avenal. The site is 1600 acres, including approximately 499 acres within the Conditional Use Permit Boundary (approved for hazardous waste activity by various agencies).

Topography

KHF is located on the crest and western slope of the Kettleman Hills, a low range of steep hills bordering the western margin of the San Joaquin Valley. Arroyos and other erosional features of an arid to semiarid climate characterize the slopes, which are sparsely vegetated with annual grasses and low shrubs. The San Joaquin Valley is surrounded on three sides (east, south, and west) by mountains. There are no perennial surface water bodies within one mile of the facility (Kearney 1987).

The surface elevation of KHF ranges from approximately 700 feet above mean sea level (msl) to 1100 feet above msl. The site generally slopes from the northwest to the southeast. The highest point surrounding the facility is Cerro Ultimo (approximate elevation 1144 feet above msl) adjacent to the northern property line.

Climate

A semiarid climate and an extremely low rainfall characterize the San Joaquin Valley region. Precipitation is confined mainly to the winter months. Average annual precipitation for the entire valley floor is around 9.25 inches. Precipitation recorded at KHF from 1986 through 1996 averaged only 5.8 inches annually, substantially less than for the San Joaquin Valley (TRC 1997). The estimated 100-year, 24-hour storm would result in 2.4 inches of precipitation (Centra 2009). Mean annual evaporation is 102.94 inches (pan measurement). The mean annual temperature is 65 degrees Fahrenheit (°F) (Wenck April 2009). Seasonal average temperatures range from the low 50s °F in the winter to the high 90s °F in the summer (TRC 1997). Historic average winds of 13 miles per hour (mph) are predominantly from the north-northwest. Conditions are rarely calm. Winter conditions include variable winds and occasional dense valley fog (Wenck April 2009).

Geology and Soils

KHF is located in the northern part of the Kettleman Hills on the western side of the San Joaquin Valley, which is located in the southern portion of the Great Valley geomorphic province of California. Most of Kings County is within the topographically flat San Joaquin Valley. The San Joaquin Valley contains deposits of marine origin overlain by continental deposits formed by streams flowing from the Sierra Nevada Range on the east and the Coast Ranges on the west, as well as old floodplain and lakebed deposits. On the west side of the valley, in the vicinity of KHF, the continental deposits are unconsolidated alluvium composed of material eroded from the Coast Ranges. The Kettleman Hills were formed through geologic structural folding. Beneath KHF, the geologic formations are present in a series of folded layers. Minor fracturing and jointing occur locally in the sediments (TRC 1997).

The alluvial plains of the San Joaquin Valley floor contain large areas of prime agricultural soils. Surface soils at KHF, as classified by the United States Natural Resources Conservation Service, are the Kettleman Loam, the Kettleman-Cantua Complex, and the Mercey Loam. All three are well-drained, moderately deep soils derived from sandstone or shale (TRC 1997).

Land Use and Demographics

KHF is surrounded by agricultural land for several miles in all directions (Kings County CDA 2010). These agricultural properties are zoned AG-40, General Agriculture – 40 acre minimum, by Kings County (Kings County 1964) and are primarily used for livestock grazing. The recently updated Kings County General Plan (effective February 25, 2010) includes the designation of open space as an overlay zone in the area east and north of KHF as a means to prevent encroachment of urban development towards the facility (Kings County CDA 2010). When the County begins their Zoning Ordinance update to establish consistency with the new General

Plan, the "Open Space" overlay zone may result in some form of additional development restrictions (Gatzka 2010).

The closest non-agricultural areas, and the nearest permanent residents, are located in Kettleman City, 3.5 miles to the northeast of KHF (see Figure 1). In 2000, Kettleman City had a population of 1,499 (U.S. Census Bureau 2008) and in 2009 it had an estimated 1,620 residents (Kings County CDA 2010). The next closest community is the City of Avenal, 6.5 miles to the northwest, which had a year 2000 population of 14,674 (U.S. Census Bureau 2008) and an estimated 2006 population of 15,871 (Kings County CDA 2010). There are no sensitive receptors such as schools, hospitals or daycare centers in close proximity to the KHF property line (TRC 1997).

Based on site and COPC characteristics, the potential receptors most likely to exist under current conditions are ranchers who raise cattle on the agricultural land surrounding KHF, that is, the ranch workers who visit the area on an occasional basis to tend to the cattle. The future land use of the area is expected to remain primarily open space and agricultural based on the 2035 Kings County General Plan (Kings County CDA 2010). Therefore, potential receptors under the future land use scenario are assumed to remain the same as under current conditions, i.e., ranchers. However, in order to represent more conservative potential exposure scenarios, two future hypothetical rancher receptors are assumed to reside adjacent to the KHF property: a resident rancher and a subsistence resident rancher. These ranchers are assumed to be long-term residents and to consume beef from the cattle they raise. The subsistence resident rancher, which is consistent with the most conservative exposure assessment strategy that USEPA risk assessment guidance currently recommends, is also considered to raise dairy cattle and grow fruits and vegetables (homegrown produce) for personal use. These two resident rancher scenarios include both an adult and child receptor. In order to represent a less conservative potential exposure scenario, a resident assumed to reside adjacent to the KHF property is also considered as a future hypothetical receptor. This receptor represents a resident living in a nonfarm setting who is assumed to consume homegrown produce. The resident scenario includes both an adult and child receptor. This receptor is considered to more closely represent current and future residents that may live within the general area of KHF.

#### 5.3.2.2 Identification of Human Health Exposure Pathways

Potential human exposure pathways are identified in the context of current and potential future land uses. A complete pathway includes: a chemical source and release mechanism, a transport or retention medium, an exposure point where human contact with the contaminated medium occurs, and a route of intake for the contaminant into the body at the exposure point. If any of these elements is missing, the pathway is incomplete and is not considered further in the HHRA. A conceptual site model (CSM) was developed to illustrate the potential exposure pathways for the site. It is presented in Figure 6. In the CSM diagram, the potentially complete pathways to be quantitatively evaluated in the HHRA are indicated by an "X" in a box. A box without an "X" indicates an incomplete pathway (which occurs when at least one of the pathway elements is missing) or an insignificant pathway.

The source of potential dioxin-like PCB congener contamination at KHF is the historical and current handling and disposal of PCB wastes. Assumed migration of contaminants from the initially contaminated media (PCB wastes being disposed of in TSCA-approved landfills, PCB wastes being processed and stored in TSCA-approved PCB Building) to exposure media (media to which human receptors may be exposed within or beyond the facility boundary) would likely involve multiple release mechanisms, exposure media, and exposure routes. Potentially complete pathways for exposure of human receptors to dioxin-like PCB congeners at this site would likely result from the release of PCBs from soil to the surrounding environment via suspension of contaminated soil particulates (dust) by wind, as well as via volatilization of PCBs, followed by deposition onto downwind soils and vegetation, dissolution of PCBs in soil by precipitation, and uptake of the airborne vapors and PCBs in deposited particulates by aboveground plant parts as well as uptake of dissolved PCBs by plant root systems. Subsequently, PCBs that could be deposited on plant surfaces or have been absorbed by plants in the vapor, particulate, or dissolved phase could then be taken up by the animals that consume these plants and transferred through food chains.

Under current land use conditions, ranchers are assumed to be the human receptors for direct and indirect exposure to dioxin-like PCB congeners in ambient air and surface soil. The potential direct exposure route for the hypothetical rancher is inhalation of dioxin-like PCB congeners in the particulate phase and the vapor phase. Other potential direct exposure routes for the rancher include incidental ingestion and dermal absorption of dioxin-like PCB congeners in surface soil, assuming that particulate phase dioxin-like PCB congeners deposit on the soil surface, and inhalation of resuspended soil particulates. Indirect exposure to dioxin-like PCB congeners in beef tissue from cattle that graze near KHF, via consumption of tissue from the cattle, was evaluated for the current rancher and determined to be an incomplete pathway. Cattle production on the ranchland surrounding KHF is a cow-calf operation. The mother brood cows and their calves graze on this land for approximately three months of each year. The calves are sold on the market each year to a feedlot operation, generally located out-of-state, and then sent for slaughter when they reach approximately 1,100 pounds. The brood cows are similarly sold to a feedlot operation after producing calves for approximately 10 years. None of the cattle grazed on the ranchland surrounding KHF are kept for personal consumption by the ranch workers because of the toughness and strong-flavor of the meat. The cattle must spend time at a feedlot where their meat is softened and sweetened in order to make it suitable for consumption.

Under hypothetical worst-case future land use conditions, it is assumed that a residence would be located immediately adjacent to KHF. Although such development is unlikely to occur given the presence of the current waste management facility, the hypothetical future scenarios were addressed at the request of USEPA-IX to ensure that risks would not be underestimated. The three hypothetical worst-case future receptors consisted of: a resident rancher, a subsistence resident rancher, and a resident non-farmer. The hypothetical resident ranchers could be directly and indirectly exposed to dioxin-like PCB congeners in ambient air, surface soil, and beef tissue. The hypothetical future resident rancher is assumed to be exposed to dioxin-like PCB congeners in surface soil and ambient air through the same intake routes described above for the current rancher. The hypothetical future resident rancher is also assumed to experience indirect exposure to dioxin-like PCB congeners via consumption of beef tissue from cattle raised at home that graze near KHF, assuming dioxin-like PCB congeners have been taken up by plants and the cattle then ingest the dioxin-like PCB congeners through grazing on the plants and through incidental ingestion of soil.

The hypothetical future subsistence resident rancher is assumed to be exposed to dioxin-like PCB congeners in surface soil and ambient air through the same intake routes described above for the resident rancher. The hypothetical future subsistence resident rancher is also assumed to be indirectly exposed to dioxin-like PCB congeners through the ingestion of milk from dairy cattle they raise and through the ingestion of homegrown produce in which fruits and vegetables may take up contaminants and transfer them to edible portions.

The hypothetical future resident non-farmer is assumed to be exposed to dioxin-like PCB congeners in surface soil and ambient air with potential exposure routes including inhalation of dioxin-like PCB congeners in the particulate and vapor phases and incidental ingestion, dermal absorption, and inhalation of airborne particulates from surface soil. An additional potential exposure route is the ingestion of homegrown produce in which vegetables or other produce may take up contaminants and transfer them to edible portions.

Along with the exposure routes discussed above, exposure of an infant to dioxin-like PCB congeners via ingestion of human breast milk is evaluated for the hypothetical future resident rancher, subsistence resident rancher, and resident non-farmer scenarios, as recommended by USEPA (September 2005).

#### 5.3.2.3 Exposure Point Concentrations

An EPC is the concentration of a COPC at the point of contact made between the COPC and the outer boundary of a human receptor. EPCs used in the HHRA are the reasonable maximum exposure (RME) concentrations for each potentially complete pathway. The RME is the maximum exposure that is reasonably expected to occur at a site and, although it is a conservative exposure case, is still within the range of possible exposures (USEPA 1989). Sampling data collected from characterization investigations at KHF were used to calculate EPCs.

Because of the uncertainty associated with any estimate of EPC, the 95 percent upper confidence limit on the arithmetic mean (95% UCL) is generally used as the RME concentration (USEPA 1989). However, the number of samples available for statistical analysis from the dioxin-like PCB congeners study is not adequate to support 95% UCL calculations. Therefore, the detected concentration, or one-half the RL (for non-detects), of each dioxin-like PCB congener in the multi-increment soil and vegetation samples from each of the seven exposure areas was used as the EPC for that area. Air monitoring data were collected during month-long sampling events. Twelve months of analytical data from each of the three locations are available for use in the HHRA. For each month's sampling event, either the detected concentration or one-half the RL (for non-detects) was used as the EPC for each dioxin-like PCB congener. As described in Section 5.2.2, scaling factors based on the ratio of the April alternate (MSP-ALT) concentration to the April MSP concentration were used to adjust the detected concentrations of congeners in the January, February, March, May, June, July, August, September, October, November, and December MSP samples, to estimate the concentrations that potentially would have been detected at the alternate location during these months. Therefore, for location MSP, the scaled concentrations were used as the EPCs.

Assessment of the potential for the dioxin-like PCB congeners to cause toxicity in humans was based on the toxicity equivalence methodology adopted by USEPA (2000; September 2009). This methodology is based on the relative potency of each of the dioxin-like PCB congeners in comparison to the toxicity of 2,3,7,8-TCDD. It involves the use of TEFs that are numerical estimates of the potency of individual dioxin-like PCB congeners relative to 2,3,7,8-TCDD. To evaluate dioxin-like PCB congeners in the HHRA, the concentration of each individual detected congener (or one-half the RL for non-detected congeners) was multiplied by its corresponding TEF, as per USEPA (2000 and June 2008), to express the concentration as a 2,3,7,8-TCDD TEC.

The TEFs used are the values recommended for humans (USEPA September 2009), which were developed by the WHO (Van den Berg et al. 2006).

For each exposure area, the individual TECs for each congener were summed to obtain the total TEC for the exposure area. For ambient air, samples were collected on a monthly basis. The individual TECs for each congener at each location were first summed, to obtain the total TEC for the location for the month. Then the total TECs for each of the twelve months (eleven months for locations MSP and UMS-1) were averaged to obtain a total TEC for the location. The individual dioxin-like PCB congeners and their associated TEFs and calculated TECs used in the HHRA are shown in Tables 5.3.1, 5.3.2, and 5.3.3 for soil, vegetation, and air, respectively.

The total TECs for ambient air are based on samples collected at locations DMS1, MSP, and UMS1 while the surface soil and vegetation total TECs are based on samples collected at the seven exposure areas (southeast, south, southwest, west, northwest, north, and northeast). Given that the air and soil/vegetation sampling locations do not coincide, it was necessary to determine which air TEC would be used to represent ambient air concentrations for the seven exposure areas evaluated in the HHRA. In order to provide a more conservative estimate of the EPC of dioxin-like PCB congeners, the highest calculated EPC for air (for the MSP sampling location) was used as the ambient air EPC at each exposure area.

Analytical data are not available for the potential human health exposure points that involve the transfer of contaminants from one medium to another: airborne soil particulates, homegrown produce, beef tissue, and milk. Therefore, appropriate modeling techniques were used to estimate EPCs for these exposure points, as described below.

Particulates

EPCs for particulates in air were modeled for the surface soil exposure groups. EPCs for resuspended soil particulates for the current rancher, future resident rancher, future subsistence resident rancher, and future resident were derived using a particulate emission factor (PEF) developed based on simplified soil-to-air transmission relationships as described in *Supplemental*

*Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA 2002). The PEF was derived using Equation 4-5 (USEPA 2002). A standard PEF depends on physical features of the soil and site that affect the resuspension of soil particles as well as local climatic conditions that influence dispersion of particulates. The Q/C variable used (31.90), which reflects the local climate and the size of the site, was based on Fresno, California (Table 3 in USEPA 1996) and a 30-acre contaminated area. A fraction of vegetative cover value (V) of 20 percent was used, based on the locally sparse vegetation. The mean annual windspeed ($U_m$) of 5.8 meters per second (m/s) was identified in the Workplan (Wenck April 2009). The $U_t$ of 5.4 m/s, which is the equivalent threshold value of windspeed at 7 meters, and F(x) value of 1.88, the function dependent on $U_m/U_t$, are from Cowherd et al (1985). The calculated PEF was used for the current and future land use scenarios for the southeast, south, southwest, west, northwest, north, and northeast exposure areas of the facility. Particulate concentrations in air were calculated by dividing the surface soil concentration at each exposure area by the PEF of 6.11E+05 $m^3$/kg.

Produce

Food chain models provided in *Exposure and Human Health Reassessment of 2,3,7,8-TCDD and Related Compounds* (USEPA December 2003) and *Human Health Risk Assessment Protocol* (USEPA September 2005) were used to estimate EPCs for aboveground and belowground produce, respectively. Measured on-site surface soil and ambient air concentrations were used as input to this modeling. The derivation of EPCs in aboveground and belowground produce is presented in Tables 5.3.4 and 5.3.5, respectively.

The measured ambient air concentrations used to model aboveground produce concentrations are based on samples collected at locations DMS1, MSP, and UMS1 while the measured surface soil concentrations used to model belowground produce are based on samples collected at the seven exposure areas (southeast, south, southwest, west, northwest, north, and northeast). Given that the air and soil sampling locations do not coincide, it was necessary to determine which combination of aboveground and belowground produce concentrations would be used. In order to provide a more conservative estimate of the EPC of dioxin-like PCB congeners in homegrown produce, the highest calculated aboveground produce EPC (for the MSP sampling location) was added to the belowground produce EPC at each exposure area to represent total homegrown produce for that exposure area.

*Aboveground Produce*

Estimates of COPC concentrations in aboveground produce are derived using the following equation (from USEPA December 2003):

$$C_{abv} = C_{vpa} + C_{ppa}$$

Where:

| | | |
|---|---|---|
| $C_{abv}$ | = | concentration in aboveground vegetation, expressed on a dry weight basis (pg/g) |
| $C_{vpa}$ | = | plant concentration due to vapor-phase absorption of airborne contaminants (pg/g, dry weight basis) |
| $C_{ppa}$ | = | plant concentration due to wet plus dry deposition of contaminated particulates onto plant matter (pg/g, dry weight basis) |

$C_{vpa}$ is derived using the following equation (from USEPA December 2003):

$$C_{vpa} = ( Bv_{ag} \times C_v \times VG_{ag} ) / d_a$$

Where:

| | | |
|---|---|---|
| $Bv_{ag}$ | = | mass-based air-to-plant biotransfer factor (unitless) |
| $C_v$ | = | vapor-phase concentration of contaminant in air (pg/m$^3$) |
| $VG_{ag}$ | = | empirical correction factor which reduces vegetative concentration considering that $Bv_{ag}$ was developed for transfer of airborne contaminants into leaves rather than into bulky aboveground vegetation |
| $d_a$ | = | density of air (g/m$^3$) |

The derivation of the mass-based air-to-plant biotransfer factor ($Bv_{ag)}$ is presented in Table 5.3.4 (Step 1). The vapor-phase concentration in air ($C_v$) is modeled from the measured concentrations in air (which include both vapor and particulates) using Fv, a factor representing the fraction of contaminant in the vapor phase (Table 5.3.4). Fv was derived using an equation from USEPA (September 2005). The values used for $VG_{ag}$ (0.01) and $d_a$ (1190 g/$m^3$) are USEPA default values (USEPA December 2003 and September 2005).

$C_{ppa}$ is derived using the following equation (from USEPA December 2003):

$$C_{ppa} = ( F_p ) / ( 1000 \times k_w \times Y_j )$$

Where:

| | | |
|---|---|---|
| $F_p$ | = | unit contaminant wet plus dry deposition rate onto plant surfaces (pg/$m^2$-yr) |
| $k_w$ | = | first-order weathering dissipation constant (1/yr) |
| $Y_j$ | = | dry matter yield of crop j (kg/$m^2$) |
| 1/1000 | = | converts pg/kg to pg/g |

The derivation of $F_p$, using an equation from USEPA (December 2003), is shown on Table 5.3.4. The values used for $k_w$ (18) and $Y_j$ (2.24) are default values (USEPA September 2005). 1000 is a unit conversion constant.

*Belowground Produce*

The following equation (from USEPA September 2005) is used to estimate COPC concentrations in belowground produce:

$$Pr_{bg} = Cs \times Br_{rootveg} \times VG_{rootveg}$$

Where:

| | | |
|---|---|---|
| $Pr_{bg}$ | = | concentration in belowground vegetation due to root uptake (mg/kg) |
| Cs | = | concentration in soil (mg/kg) |
| $Br_{rootveg}$ | = | soil-to-plant bioconcentration factor for belowground produce (unitless) |
| $VG_{rootveg}$ | = | empirical correction factor for belowground produce (unitless) |

The concentrations in soil (Cs) are based on measured concentrations of soil found in samples from each exposure area (Table 5.3.1). The derivation of the bioconcentration factor ($Br_{rootveg}$) for each congener is presented in Table 5.3.5. The $VG_{rootveg}$ value of 0.01 is the default value for COPCs with a log $K_{ow}$ greater than 4 (USEPA September 2005).

Beef Tissue

The food chain model provided in *Human Health Risk Assessment Protocol* (USEPA September 2005) was used to estimate EPCs for this exposure point. Measured on-site surface soil and vegetation concentrations were used as input to this modeling.

Estimates of COPC concentrations in beef tissue are derived based on the amount of COPCs consumed by cattle through their diet, which is assumed to consist of forage (primarily grass and hay), silage (forage that has been stored and fermented), and grain, as well as through ingesting soil (USEPA September 2005). EPCs were derived using the following equation (from USEPA September 2005) to estimate ingestion of contaminated soil and feed items. The equation includes biotransfer and metabolism factors to transform the daily animal intake of a COPC (mg/day) into an animal tissue COPC concentration (mg COPC/kg tissue).

The equation used to estimate COPC concentrations in beef tissue based on ingestion of contaminated feed and soil is:

$$A_{beef} = [ (Fp \times Qp \times P) + (Fs \times Qs \times Cs \times Bs) ] \times Ba_{beef} \times MF$$

Where:

| | | |
|---|---|---|
| $A_{beef}$ | = | concentration of COPC in beef (mg/kg fresh weight tissue) |
| Fp | = | fraction of plant type grown on contaminated soil and ingested by cattle (unitless) |
| Qp | = | quantity of plant type eaten by cattle per day (kg dry weight plant/day) |
| P | = | concentration of COPC in plant type eaten by cattle (mg/kg dry weight) |
| Fs | = | fraction of contaminated soil ingested by cattle (unitless) |
| Qs | = | quantity of soil eaten by cattle each day (kg/day) |
| Cs | = | average soil concentration over exposure duration (mg COPC/kg soil) |
| Bs | = | soil bioavailability factor (unitless) |
| $Ba_{beef}$ | = | COPC biotransfer factor for beef (day/kg fresh weight tissue) |
| MF | = | metabolism factor (unitless) |

A value of 0.25 was used for F, based on the amount of time cattle graze on potentially contaminated soil and plants at the site (3 months) as a fraction of their total grazing time at all locations (12 months). Based on site-specific information for ranching activities in the vicinity of KHF, the grassland and shrubland vegetation communities on the ranchland adjacent to KHF can support cattle grazing for a total of 3 months out of every year (Hewitson 2009). They spend 1.5 months on the land first when the grass is green and then another 1.5 months later after the grass has been replenished. The Qp of 11.77 kg dry weight plant/day is the sum of the quantity of each plant type eaten by the cattle (forage: 8.8 kg dry weight/day; silage: 2.5 kg dry weight/day; and grain: 0.47 kg dry weight/day) (USEPA September 2005). This is a conservative assumption that all of the cattle diet consists of forage containing dioxin-like PCB congeners at the concentrations measured in vegetation samples from KHF.

The concentrations in plants (P) and soil (Cs) are based on measured concentrations of vegetation and soil, respectively, found in samples from each exposure area (Tables 5.3.2 and 5.3.1, respectively). The Qs of 0.5 kg/day, MF of 1, and soil bioavailability factor (Bs) of 1 are USEPA default values (USEPA September 2005).

The biotransfer factor from diet to beef tissue ($Ba_{beef}$) is calculated using the following equation from RTI (2005):

$$\log Ba_{fat} = -0.099(\log K_{ow})^2 + 1.07(\log K_{ow}) - 3.56$$

The resulting biotransfer factor is then multiplied by the fat composition of beef (0.19 kg fat/kg body weight) to convert the biotransfer factor to a whole body basis:

$$Ba_{beef} = 10^{\log Ba_{fat}} \times 0.19$$

Table 5.3.6 presents the derivation of EPCs in beef tissue including log $K_{ow}$s for the COPCs, which are used in the biotransfer equation. These log $K_{ow}$s were obtained from the Oak Ridge National Laboratory Risk Assessment Information System (2009).

Milk from Dairy Cattle

The food chain model provided in Human Health Risk Assessment Protocol (USEPA September 2005) was used to estimate EPCs for this exposure point. Measured on-site surface soil and vegetation concentrations were used as input to this modeling.

Estimates of COPC concentrations in milk are derived based on the amount of COPCs consumed by dairy cattle through their diet, which is assumed to consist of forage (primarily grass and hay), silage (forage that has been stored and fermented), and grain, as well as through ingesting soil (USEPA September 2005). EPCs were derived using the following equation (from USEPA September 2005) to estimate ingestion of contaminated soil and feed items. The equation includes biotransfer and metabolism factors to transform the daily animal intake of a COPC (mg/day) into an animal (dairy cattle) milk COPC concentration (mg COPC/kg milk).
The equation used to estimate COPC concentrations in dairy cattle milk based on ingestion of contaminated feed and soil is:

$$A_{milk} = [\ (Fp \times Qp \times P) + (Fs \times Qs \times Cs \times Bs)\ ] \times Ba_{milk} \times MF$$

Where:

| | | |
|---|---|---|
| $A_{milk}$ | = | concentration of COPC in milk (mg/kg wet weight) |
| Fp | = | fraction of plant type grown on contaminated soil and ingested by dairy cattle (unitless) |
| Qp | = | quantity of plant type eaten by dairy cattle per day (kg dry weight plant/day) |
| P | = | concentration of COPC in plant type eaten by dairy cattle (mg/kg dry weight) |
| Fs | = | fraction of contaminated soil ingested by cattle (unitless) |
| Qs | = | quantity of soil eaten by dairy cattle each day (kg/day) |
| Cs | = | average soil concentration over exposure duration (mg COPC/kg soil) |
| Bs | = | soil bioavailability factor (unitless) |
| $Ba_{milk}$ | = | COPC biotransfer factor for milk (day/kg wet weight) |
| MF | = | metabolism factor (unitless) |

A value of 0.25 was used for F, as described above for derivation of beef tissue EPCs. The Qp of 20.3 kg dry weight plant/day is the sum of the quantity of each plant type eaten by the dairy cattle (forage: 13.2 kg dry weight/day; silage: 4.1 kg dry weight/day; and grain: 3.0 kg dry weight/day) (USEPA September 2005). This is a conservative assumption that all of the dairy cattle diet consists of forage containing dioxin-like PCB congeners at the concentrations measured in vegetation samples from KHF.

The concentrations in plants (P) and soil (Cs) are based on measured concentrations of vegetation and soil, respectively, found in samples from each exposure area (Tables 5.3.2 and 5.3.1, respectively). The Qs of 0.4 kg/day, MF of 1, and soil bioavailability factor (Bs) of 1 are USEPA default values (USEPA September 2005).

The biotransfer factor from diet to milk tissue ($Ba_{milk}$) is calculated using the following equation from RTI (2005):

$$\log Ba_{fat} = -0.099(\log K_{ow})^2 + 1.07(\log K_{ow}) - 3.56$$

The resulting biotransfer factor is then multiplied by the fat composition of milk (0.04 kg fat/kg wet weight) to convert the biotransfer factor to a whole body basis.

$$Ba_{milk} = 10^{\log Ba_{fat}} \times 0.04$$

Table 5.3.7 presents the derivation of EPCs in milk tissue including log $K_{ow}$s for the COPCs, which are used in the biotransfer equation. These log $K_{ow}$s were obtained from the Oak Ridge National Laboratory Risk Assessment Information System (2009).

#### 5.3.2.4 Development of Chemical Intakes

Chemical-specific intakes were calculated for the receptors and exposure pathways identified for quantitative evaluation in the CSM for KHF. The development of chemical intakes is based on USEPA methodology presented in *RAGS, Part A* (USEPA 1989) and Office of Solid Waste and Emergency Response Directive 9285.6-03 (USEPA 1991).

An RME estimate of intake was developed for each exposure pathway. The RME estimate is the highest exposure that is reasonably expected to occur in a small but definable "high-end" segment of a potentially exposed population. It is derived using upper-bound values for a few of the most sensitive exposure parameters (e.g., contact rate, exposure frequency and duration) and average values for the remaining parameters (USEPA 1991).

Estimates of chemical intake were developed based on the EPCs identified for the COPCs and on site-specific exposure assumptions developed using USEPA guidance such as *RAGS Part A* (USEPA 1989), *Exposure Factors Handbook* (USEPA August 1997), *Human Health Risk Assessment Protocol* (USEPA September 2005), *RAGS Part E* (USEPA July 2004), and *RAGS Part F* (January 2009).

Chronic daily intakes (CDIs) are generally estimated for long-term exposures and subchronic daily intakes (SDIs) are generally used to evaluate shorter-term exposures. As a guideline under *RAGS Part A* (USEPA 1989), CDIs are recommended for exposures between seven years and a lifetime, while SDIs are recommended for exposures between two weeks and seven years. These definitions are considered guidelines only because other considerations, such as type of analysis, may influence whether exposures are considered chronic or subchronic. For example, exposure to residential children, although subchronic by definition, is often considered a chronic exposure because it is evaluated as part of a 30-year child/adult scenario. For the HHRA, CDIs were estimated for current ranchers and for future adult and child resident ranchers, subsistence resident ranchers, and residents.

Intake Equations

Intake equations obtained from *RAGS Part A* (USEPA 1989) were used to calculate intake from incidental ingestion of soil, dermal absorption of soil, inhalation of airborne particulates resuspended from soil, ingestion of produce, ingestion of beef tissue, ingestion of milk (from dairy cattle), and inhalation of vapor and particulates in air. The basic formula used to estimate these intakes is the following:

$$CDI\ (mg/kg - day) = C\ x\ \frac{CR\ x\ EF\ x\ ED}{BW}\ x\ \frac{1}{AT}$$

Where:

| | | |
|---|---|---|
| CDI | = | CDI by the receptor in mg/kg body weight-day |
| C | = | Chemical concentration; the EPC (e.g., mg/kg) |
| CR | = | Contact rate; the amount of contaminated medium contacted per unit time or event (e.g., mg/day) |
| EF | = | Exposure frequency (days/year) |
| ED | = | Exposure duration (years) |
| BW | = | Body weight of receptor; the average body weight over the exposure period (kg) |
| AT | = | Averaging time; period over which the exposure is averaged (days or hours) |

The intake equations used in the HHRA are presented in Tables 5.3.8 through 5.3.16. The equations were modified as recommended by USEPA (1989 and 1991) to apportion intake between the hypothetical future resident rancher, subsistence resident rancher, and resident as a young child aged 0 to 6 years and as an older child and adult based on their differing exposure factors, in particular contact rates, body weights, and exposure durations.

<u>Intake Parameters</u>

The values used for the RME exposure parameters and the guidance on which they are based are presented in Tables 5.3.8 through 5.3.10 for the current rancher receptor and in Tables 5.3.11 through 5.3.16 for the hypothetical worst-case future resident rancher, subsistence resident rancher, and resident receptors. Most of the exposure parameters are standard values that are available in the risk assessment guidance documents (as referenced in Tables 5.3.8 through 5.3.16). These include such factors as soil ingestion rates, skin surface areas, residential exposure frequency and duration, body weight, and averaging time; however, some parameters are derived from site-specific information and professional judgment regarding the specific exposure scenario. These scenario-specific exposure parameters are discussed below for each of the receptors.

*Current Land Use Scenario: Rancher*

Under the current land use scenario, the rancher is assumed to be an adult who works on the cattle ranch adjacent to KHF on a regular basis. Most of the values used for the intake parameters are the standard default values for the RME occupational scenario (Tables 5.3.8 through 5.3.10). The exposure frequency used for the current rancher, however, is based on site-specific information (Hewitson 2009). Cattle graze on the ranchland adjacent to KHF for a total of three months out of every year. They spend 1.5 months on the land first when the grass is green and then another 1.5 months later after the grass has been replenished. During the three months of each year that cattle graze on the ranch, ranch workers visit the cattle range one day per week, spending the entire workday checking on the cattle. The workers also visit the ranch when the cattle are rounded up and transported off of the ranch and when they are brought to the ranch. Therefore, the exposure frequency assumed for the current ranch worker is 19 days/year (1 day/week for 13 weeks/year, plus 2 days/year for cattle drop off and 4 days/year for pick up = 19 days/year.

*Hypothetical Future Land Use Scenario: Resident Rancher*

Under the hypothetical worst-case future land use scenario, the resident rancher is assumed to be an adult member of a family who lives immediately adjacent to KHF and raises beef that they consume. The intake parameters used for this receptor are taken from the farmer exposure scenario presented in the *Human Health Risk Assessment Protocol* guidance document (USEPA September 2005), which is recommended when ranching may take place. The scenario assumes the farmer/rancher child is exposed through the same exposure pathways as the adult and provides child intake parameters. Many of the intake parameters are the standard default values for the RME residential scenario (Tables 5.3.11, 5.3.12, 5.3.13, and 5.3.15). The assumed adult farmer/rancher exposure duration of 40 years as specified in USEPA (September 2005), however, is greater than the standard 30-year residential exposure duration.

*Hypothetical Future Land Use Scenario: Subsistence Resident Rancher*

Under the hypothetical worst-case future land use scenario, the subsistence resident rancher is assumed to be an adult member of a family who lives immediately adjacent to KHF and consumes homegrown produce and beef and milk from cattle they raise. The intake parameters used for this receptor are taken from the farmer exposure scenario presented in the *Human Health Risk Assessment Protocol* guidance document (USEPA September 2005), which is recommended when ranching may take place. The scenario assumes the farmer/rancher child is exposed through the same exposure pathways as the adult and provides child intake parameters. Many of the intake parameters are the standard default values for the RME residential scenario (Tables 5.3.11 through 5.3.16). The assumed adult farmer/rancher exposure duration of 40 years as specified in USEPA (September 2005), however, is greater than the standard 30-year residential exposure duration.

*Hypothetical Future Land Use Scenario: Resident*

Under this hypothetical worst-case future land use scenario, the resident is assumed to be an adult member of a family who lives immediately adjacent to KHF in a nonfarm setting and consumes homegrown produce. The intake parameters are the standard default values for the RME residential scenario, including an exposure duration of 30 years (Tables 5.3.11 through 5.3.14).

USEPA (September 2005) also recommends evaluating the risks to infants from exposure to dioxin-like PCBs in human breast milk. Analytical models were used to calculate the infant exposure dose for each future land use scenario/receptor by estimating uptake of the COPCs through the mother's diet and their accumulation in milk fat and subsequent transfer to the exposed infant (Table 5.3.17). The derivation of the average daily dose to the exposed infant is given in the following equation (USEPA September 2005):

$$ADD_{infant} = [\ C_{milkfat} \times f3 \times f4 \times IR_{milk} \times ED\ ] \ / \ [\ BW_{infant} \times AT\ ]$$

Where:

| | | |
|---|---|---|
| $ADD_{infant}$ | = | average daily intake for infant exposed to contaminated breast milk (pg/kg body weight-day) |
| $C_{milkfat}$ | = | concentration in milk fat of breast milk (pg/kg milk fat) |
| f3 | = | fraction of mother's breast milk that is fat (unitless) |

| | | |
|---|---|---|
| f4 | = | fraction ingested that is absorbed (unitless) |
| $IR_{milk}$ | = | ingestion rate of breast milk by the infant (kg/day) |
| ED | = | exposure duration (year) |
| $BW_{infant}$ | = | body weight of infant (kg) |
| AT | = | averaging time (year) |

The $C_{milkfat}$ value, derived in Step 4 on Table 5.3.17, is comprised of the maternal daily intake from soil (Step 1), produce, beef, and milk (Step 2), and the maternal daily intake via inhalation (Step 3), as shown on Table 5.3.17. Separate $C_{milkfat}$ values were calculated for each of the seven exposure areas and for each future land use scenario/receptor evaluated in the HHRA. The remaining factors used in the above equation (f3, f4, $IR_{milk}$, ED, $BW_{infant}$, and AT) are default values provided in USEPA (September 2005). The equations and factors used in Steps 1 through 4 in determining the $C_{milkfat}$ value are shown in the footnotes of Table 5.3.17. (The average daily dose to the infant for each future land use scenario/receptor is compared to national average background exposure levels as part of the Risk Characterization presented in Section 5.3.4 and shown on Table 5.3.30.)

### 5.3.3 Toxicity Assessment

The following section provides an overview of the human health toxicity of the COPCs, i.e., the 12 dioxin-like PCB congeners identified by USEPA-IX and evaluated in the HHRA for KHF. The objective of the toxicity assessment is to weigh available evidence regarding the potential for each COPC to cause adverse health effects in exposed individuals and to provide, where possible, an estimate of the relationship between the extent of exposure and the severity of the adverse effects (USEPA 1989).

Research on PCB congeners has found that some of the moderately chlorinated PCB congeners can have dioxin-like effects for carcinogenic risks. Because the combined effects of these compounds were shown to be dose-additive, USEPA generally recommends estimating risks from those dioxin-like PCB congeners by computing a TEC for the dioxin-like PCB mixture and then applying a toxicity value for dioxin (USEPA 2000, September 2005, September 2009). As described in Section 5.2.2, the concentration of each individual dioxin-like PCB congener was multiplied by its corresponding TEF, as per USEPA (2000 and September 2009), to express the concentration as a 2,3,7,8-TCDD TEC. The TEFs used were the 2005 values recommended for humans and other mammals by the WHO (USEPA September 2009; Van den Berg et al. 2006). For each exposure area, the individual TECs for each congener at the location were summed to obtain the dioxin-like PCB total TEC for the location.

#### 5.3.3.1 Carcinogens

As previously discussed, TEFs relate the toxicity of the dioxin-like PCB congeners to that of 2,3,7,8-TCDD. The toxicity criteria for carcinogens are the slope factor (SF) and unit risk. SFs are defined as the "plausible upper-bound estimate of the probability of a response (i.e., cancer) per unit intake of a chemical over a lifetime" and unit risks are "expressed in terms of risk per unit concentration of the substance in the medium where human contact occurs" (USEPA 1989). SF and unit risk values are specific to the route of exposure (i.e., ingestion or inhalation) and are accompanied by their weight-of-evidence classification to indicate the strength of evidence that the chemical is a human carcinogen (USEPA 1989).

The USEPA Weight-of-Evidence Classification system, based on the strength of evidence that a chemical exhibits human carcinogenic effects, assigns each chemical to one of the following classes:

- A Human carcinogen.
- B1 Probable human carcinogen – limited human data are available.
- B2 Probable human carcinogen – sufficient evidence in animals and inadequate or no evidence in humans.
- C Possible human carcinogen.
- D Not classifiable as a human carcinogen.

2,3,7,8-TCDD is classified as a potential carcinogen and is assigned to a carcinogenicity weight-of-evidence group of B2 (CalEPA 2009) for both the ingestion and inhalation routes of exposure.

The primary source of toxicity values is the USEPA Integrated Risk Information System (IRIS). However, the IRIS database does not include toxicity values for 2,3,7,8-TCDD. Therefore, the toxicity values developed for 2,3,7,8-TCDD by the California Environment Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) were used in the HHRA, including an oral SF of 1.3E+5 $(mg/kg\text{-}day)^{-1}$ and an inhalation unit risk (IUR) of 3.8E+1 $(\mu g/m^3)^{-1}$ (CalEPA 2009). The CalEPA toxicity values were derived using methodologies very similar to those used by USEPA's IRIS (USEPA September 2008).

#### 5.3.3.2 Noncarcinogens

A reference dose (RfD), reported as a chemical intake (mg/kg-day), is the toxicity value used most often in evaluating noncarcinogenic effects. RfDs are developed and verified by USEPA, and are defined as "an estimate of a daily exposure level (to a specific chemical) for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime" (USEPA 1989). Neither oral nor inhalation RfDs are available for the dioxin-like PCB congeners from any of the following hierarchy of sources based on USEPA guidance (USEPA March 2004): (1) IRIS, (2) USEPA Provisional Peer-Reviewed Toxicity Values Database, or (3) the USEPA Superfund Health Risk Technical Support Center-National Center for Environmental Assessment, the Health Effects Assessment Summary Tables, or CalEPA/OEHHA.

Therefore, noncancer hazards associated with the dioxin-like PCB congeners are not evaluated in this HHRA, with the exception of ingestion of human breast milk. The noncancer health effects to an infant from exposure to dioxin-like PCB congeners in human breast milk were evaluated separately from the other exposure pathways as described in Section 5.3.2.4.

#### 5.3.3.3 Dermal Toxicity

Few toxicology studies have focused on the dermal exposure route; therefore, it is often necessary to use oral toxicity values for dermal toxicity values. However, most oral toxicity values are derived from critical studies that use an administered dose, while a dermal toxicity value should reflect the fact that dermal exposure is a measure of an absorbed dose. Consequently, oral toxicity values must be adjusted from administered to absorbed doses.

When appropriate, oral SFs and RfDs derived from a critical study that used an administered dose are adjusted using the gastrointestinal (GI) absorption efficiency (percent absorbed by the GI tract following oral intake). If the GI absorption of the chemical (from a medium similar to the one used in the toxicity value critical study) is less than 50%, its oral absorption efficiency (percent absorbed) is used to calculate an adjusted SF. For a chemical whose absorption is greater than 50%, a default value of 100% (complete oral absorption) is used. For 2,3,7,8-TCDD a GI absorption value of 100% was used, based on USEPA recommendations of chemicals to adjust, as well as their absorption efficiencies provided in *RAGS, Part E* (USEPA July 2004). Therefore, the oral SF was adjusted by dividing by 1.0 to derive the absorbed SF.

### 5.3.4 Risk Characterization

This section of the HHRA presents the risk estimates for human receptors under the current and hypothetical worst-case future land use scenarios adjacent to KHF. Cancer risk estimates are calculated for the COPCs at the KHF site (dioxin-like PCB congeners), the significance of the calculated risks is characterized, and the uncertainties associated with those estimates are described.

Cancer risks are estimated as the incremental upper bound probability of an individual developing cancer over a 70-year lifetime as a result of pathway-specific exposure to carcinogenic compounds. Cancer risk for the ingestion pathway is calculated by multiplying the chronic daily intake by the oral SF. Similarly, cancer risk for the inhalation pathway is calculated by multiplying the chronic daily intake by the IUR. Tables 5.3.18 through 5.3.25 present the risk calculations. The carcinogenic risk estimate is generally an upper-bound estimate because the SF and IUR are typically derived as the upper 95th percentile confidence limit of the probability of response based on experimental animal data (USEPA 1989). Thus, USEPA is reasonably confident that the “true risk” will not exceed the risk estimate derived through use of the SF or IUR and is likely to be less than that predicted (USEPA 1989). The estimation of daily intakes (averaged over a lifetime) is described in Section 5.3.2.4.

In accordance with USEPA guidelines, total cancer risk for each exposure pathway was quantified by summing chemical-specific cancer risks (USEPA 1989). In this HHRA, the concentrations of individual dioxin-like PCB congeners were converted to 2,3,7,8-TCDD TECs, based on the potency of individual congeners relative to 2,3,7,8-TCDD. The TECs then were summed to obtain a total TEC for each exposure area (soil and vegetation) or each sampling location (ambient air). This total TEC was carried through the cancer risk calculations. Risks were summarized across pathways and media for each exposure area, as presented in Table 5.3.26 (current rancher), Table 5.3.27 (future resident rancher), Table 5.3.28 (future subsistence resident rancher), and Table 5.3.29 (future resident).

Cancer risk is typically expressed in exponential form (i.e., 1 x $10^{-6}$, meaning one in one million), which describes the increased probability of an individual developing cancer from the evaluated exposure scenario. In accordance with 40 CFR §300.430, USEPA generally considers cancer risks less than one in one million (1 x $10^{-6}$) to be acceptable in all cases, and cancer risks between one in one million (1 x $10^{-6}$) and one in ten thousand (1 x $10^{-4}$) to be acceptable based on an assessment of the specific circumstances. Accordingly, USEPA’s target risk management range is 1 x $10^{-6}$ to 1 x $10^{-4}$ (USEPA December 2009). In the RCRA Part B Permit for KHF (CalEPA 2003), the CalEPA Department of Toxic Substances Control (DTSC) specified that risk estimates for air emissions (measured as part of the KHF ambient air monitoring program) are to be evaluated against a cumulative cancer risk of 1 x $10^{-6}$. In this RA, cumulative cancer risks are evaluated in relation to the USEPA and CalEPA target risk level of 1 x $10^{-6}$ and the USEPA target risk management range of 1 x $10^{-6}$ to 1 x $10^{-4}$.

Noncancer hazards generally are evaluated by comparing the estimated exposure level (intake) over a specified time period to an RfD derived for a similar exposure period. However, as described in Section 5.3.3.2, RfDs have not been developed for the PCB congeners by USEPA or CalEPA. The approach recommended by USEPA (September 2005) for evaluating noncancer hazards for dioxin-like PCBs is to compare estimated TEC exposures to national average background exposure levels. The intake route of concern for noncancer hazard is ingestion of breast milk by nursing infants. Analytical models were used to calculate the infant exposure dose by estimating uptake of the dioxin-like PCB congeners through the mother's diet and their accumulation in milk fat and subsequent transfer to the exposed infant, as described in Section 5.3.2.4. The national average background level of dioxin-like PCBs in breast milk used for this comparison, 26 pg/kg body weight-day, was obtained from USEPA (September 2005). It was derived from the average background intake for the infant of 93 pg/kg body weight-day, considering that 72 percent of this intake is from PCDDs and PCDFs and 28 percent is from dioxin-like PCBs. Accordingly, 28 percent of 93 pg/kg body weight-day equals 26 pg/kg body weight-day. Table 5.3.30 presents the comparison of infant exposure to site-related dioxin-like PCBs in breast milk to the national background exposure level.

Overall hypothetical risks for the current rancher and hypothetical worst-case future receptors (future resident rancher, subsistence resident rancher, and resident) and the seven exposure areas (southeast, south, southwest, west, northwest, north, and northeast) are summarized in Table 5.3.31.

#### 5.3.4.1 Current Land Use

Estimates of total carcinogenic risk by exposure route and medium are summarized for the hypothetical adult rancher (ranch worker) for the southeast, south, southwest, west, northwest, north, and northeast exposure areas in Table 5.3.26. Total cumulative cancer risk from incidental ingestion of soil, dermal contact with soil, inhalation of particulates from soil, and inhalation of particulates and vapors in ambient air is $6 \times 10^{-9}$ for the southeast area, west area, and north area;

7 x $10^{-9}$ for the south area and northwest area; and 1 x $10^{-8}$ for the southwest area and northeast area, all of which are 100 or more times less than the USEPA and CalEPA target risk level of 1 x $10^{-6}$. Therefore, carcinogenic risks associated with the 12 dioxin-like PCB congeners collectively are not considered to pose significant risk to the current assumed rancher receptor at the seven exposure areas evaluated.

#### 5.3.4.2 Hypothetical Worst-Case Future Land Use

Hypothetical Future Resident Rancher

Estimates of total carcinogenic risk by exposure route and medium are summarized for the adult and child hypothetical future resident rancher for the southeast, south, southwest, west, northwest, north, and northeast exposure areas in Table 5.3.27. Because effects from carcinogens may be expressed anytime over a lifespan, cancer risks were estimated for a combined exposure as a child and adult. Total cumulative cancer risk from incidental ingestion of soil, dermal contact with soil, inhalation of particulates from soil, ingestion of beef raised on-site by a resident rancher, and inhalation of particulates and vapors in ambient air is 8 x $10^{-6}$ for the southeast area; 5 x $10^{-6}$ for the south area; 2 x $10^{-6}$ for the southwest and northeast areas; and 1 x $10^{-6}$ for the west, northwest, and north areas. The risks for this receptor were due primarily to home-raised beef ingestion. Thus, for each of the exposure areas, risk from the 12 dioxin-like PCB congeners collectively was equal to or slightly greater than the USEPA and CalEPA target risk level of 1 x $10^{-6}$ and within the USEPA target risk management range of 1 x $10^{-6}$ to 1 x $10^{-4}$.

Noncancer hazards are generally estimated for a combined child and adult exposure. In addition, noncancer hazards are estimated separately for the child because the child's daily exposure is greater per unit weight than the exposure of an adult. However, as mentioned previously, RfDs have not been developed for the dioxin-like PCB congeners by USEPA or by CalEPA, and noncancer hazards cannot be calculated. Instead, noncancer hazard for the dioxin-like PCB congeners was evaluated through a comparison of estimated site-related exposures (from ingestion of breast milk by nursing infants) to national average background exposure levels. The average daily dose of dioxin-like PCB congeners estimated for the southeast, south, southwest,

west, northwest, north, and northeast exposure areas range from 0.38 to 3.24 pg/kg body weight-day, which are less than the national average background exposure level of 26 pg/kg body weight-day. Therefore, site-related dioxin-like PCB congeners are not expected to cause an increase in noncancer effects for a hypothetical future resident rancher.

Hypothetical Future Subsistence Resident Rancher

Estimates of total carcinogenic risk by exposure route and medium are summarized for the adult and child hypothetical future subsistence resident rancher for the southeast, south, southwest, west, northwest, north, and northeast exposure areas in Table 5.3.28. Cancer risks were estimated for a combined exposure as a child and adult. Total cumulative cancer risk from incidental ingestion of soil, dermal contact with soil, inhalation of particulates from soil, ingestion of homegrown produce, ingestion of beef and milk from cattle raised on-site, and inhalation of particulates and vapors in ambient air is $5 \times 10^{-5}$ for the southeast area; $3 \times 10^{-5}$ for the south area; and $1 \times 10^{-5}$ for the southwest, west, northwest, north, and northeast exposure areas. For this hypothetical future receptor, the predominant exposure pathway, accounting for roughly 40% to 70% of the total risks, was regular ingestion of unprocessed dairy milk from home-raised dairy cattle followed by regular ingestion of home-raised beef and homegrown produce over a 40-year exposure period. Thus, for each of the exposure areas, risk from the 12 dioxin-like PCB congeners collectively was greater than the USEPA and CalEPA target risk of $1 \times 10^{-6}$ and within the USEPA target risk management range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$.

Noncancer hazard for the dioxin-like PCB congeners was evaluated through a comparison of estimated site-related exposures (from ingestion of breast milk by nursing infants) to national average background exposure levels. The average daily dose of dioxin-like PCB congeners estimated for the southeast, south, southwest, west, northwest, north, and northeast exposure areas ranges from 3.22 to 17.7 pg/kg body weight-day, which are less than the national average background exposure level of 26 pg/kg body weight-day. Therefore, site-related dioxin-like PCB congeners are not expected to cause an increase in noncancer effects for a hypothetical future subsistence resident rancher.

Hypothetical Future Resident

Estimates of total carcinogenic risk by exposure route and medium are summarized for the adult and child hypothetical future resident for the southeast, south, southwest, west, northwest, north, and northeast exposure areas in Table 5.3.29. Total cumulative cancer risk from incidental ingestion of soil, dermal contact with soil, inhalation of particulates from soil, ingestion of homegrown produce raised in a residential garden, and inhalation of particulates and vapors in ambient air is $3 \times 10^{-6}$ for the southeast, south, southwest, west, northwest, north, and northeast exposure areas. The risks for this receptor were due primarily to ingestion of homegrown produce. Thus, for each of the exposure areas, risk from the 12 dioxin-like PCB congeners collectively was slightly greater than the USEPA and CalEPA target risk of $1 \times 10^{-6}$ and within the USEPA target risk management range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$.

The average daily dose of dioxin-like PCB congeners from ingestion of breast milk by nursing infants estimated for the southeast, south, southwest, west, northwest, north, and northeast exposure areas ranges from 1.12 to 1.28 pg/kg body weight-day, which are less than the national average background exposure level of 26 pg/kg body weight-day. Therefore, site-related dioxin-like PCB congeners are not expected to cause an increase in noncancer effects for a hypothetical future resident.

#### 5.3.4.3 Summary of Human Health Risks

As discussed above, cancer risk from the 12 dioxin-like PCB congeners was found to be less than the target risk level of $1 \times 10^{-6}$ for the assumed current receptor adjacent to the facility, a ranch worker. These risks were calculated using on-site data, which is expected to overestimate potential off-site concentrations. As a result, potential risks from off-site exposures farther from the facility would be even lower than those calculated in this study.

Three hypothetical worst-case future receptors also were evaluated at the request of USEPA-IX to ensure that risks would not be underestimated, even though the selected hypothetical future scenarios are unlikely to occur. These hypothetical receptors, all assumed to reside essentially at the KHF property boundary, include a hypothetical future resident rancher (farmers/residents who consume beef from cattle they raise), a hypothetical future subsistence resident rancher (farmers/residents who consume beef and milk from cattle they raise as well as homegrown produce), and hypothetical resident (nonfarm residents who consume homegrown produce). For these three hypothetical future receptors, risk in each of the exposure areas from the 12 dioxin-like PCB congeners collectively was equal to or greater than the USEPA and CalEPA target risk of $1 \times 10^{-6}$ but within the USEPA target risk management range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$. Total cumulative cancer risks were highest for the hypothetical future subsistence resident rancher ($1 \times 10^{-5}$ to $5 \times 10^{-5}$), somewhat lower for the hypothetical future resident rancher ($1 \times 10^{-6}$ to $8 \times 10^{-6}$), and lowest for the hypothetical future resident ($3 \times 10^{-6}$ to $4 \times 10^{-6}$).

#### 5.3.4.4 Uncertainty

The evaluation of chemical risks to human health is, by necessity, based on a number of assumptions. This section provides a discussion of the uncertainties associated with key site-related variables and major assumptions used in the HHRA in order to address their potential effects on the risk and hazard estimates. Uncertainty can be associated with each of the four main components of an HHRA: identification of COPCs, exposure assessment, toxicity assessment, and risk characterization. Uncertainties are addressed for each of these components in the following subsections.

General information regarding uncertainty in human health risk assessments is provided in USEPA Superfund guidance documents and USEPA risk assessment publications. USEPA risk assessment guidance states that conducting a detailed, quantitative uncertainty analysis is often not practical, or necessary, for a site-specific HHRA. Instead, a qualitative uncertainty analysis is typically sufficient. A qualitative analysis should identify the primary assessment-specific and site-specific uncertainties such that risk managers can appropriately interpret the risk assessment results (USEPA 1989).

##### 5.3.4.4.1 Identification of COPCs Uncertainty

Uncertainty is inherent in the selection of site-related COPCs. However, uncertainty in contaminant identification is considered low because the HHRA was focused on the dioxin-like PCB congeners, and all 12 of those congeners were included as COPCs in the three media sampled (soil, vegetation, and air) in all exposure areas.

##### 5.3.4.4.2 Exposure Assessment Uncertainty

Uncertainty in the exposure assessment is a function of several factors, including but not limited to the derivation of EPCs, the assumptions regarding current and/or future land use, and the identification of relevant receptor groups, activities and intake parameters.

Elements of the PCB Congeners Study were specifically designed to minimize uncertainty. A total of ten multi-increment surface soil samples and 20 multi-increment vegetation samples (ten collected in the spring [green] and 10 in the summer [dry]) were collected from each of the eight exposure areas within the KHF perimeter in order to increase spatial coverage and provide more comprehensive contaminant characterization. Air samples were collected each month for 12 months and used in the HHRA to represent ambient air concentrations for a complete year. (Air samples of acceptable quality were available for 11 months at locations MSP and UMS-1; the November 2009 sampling results were not useable.)

In order to provide a more conservative air concentration for the MSP location, the results from the ambient air sample collected at location MSP-ALT during April 2009, which had greater concentrations than the sample collected at the MSP location that month, were used in the RA instead of the MSP April results. In addition, based on a comparison of the April results, the detected concentrations of the eight detected congeners in the samples from the remaining months were adjusted (scaled up) to estimate the concentrations that potentially would have been detected at the alternate location.

Among the sources of uncertainty associated with exposure assessment is the detection of chemicals and their concentrations in environmental media. To reduce this uncertainty, all 12 of the dioxin-like PCB congeners for which soil and vegetation samples were analyzed were evaluated in all three media in all exposure areas. Even if a congener was not detected in an area or medium, it was assumed to be present and was included in the data set at a surrogate concentration of ½ the RL. This approach reduces uncertainty related to the possibility that exposures may be underestimated due to the presence of congeners that were not detected but are present at concentrations less than the EDL. This approach also increases conservatism by assuming that all congeners not detected are actually present at ½ the RL.

In order to assess the degree of conservatism associated with this approach, four alternative data set were created and used to rerun the calculations and reproduce the tables in the ERA for the four southernmost exposure areas (southeast, south, southwest, and B-18 landfill). Limiting the assessment to these four areas as examples provided a sufficient basis for comparison of the effects of the alternative data sets on risk results. The alternative data sets were composed as shown below.

1) Detects only: concentrations ≥ the RL
2) Detects only: estimated concentrations[(a)] ≥ the EDL and < the RL
3) Non-detects only: results < the EDL represented by ½ the RL
4) Non-detects assumed for all congeners: both detects and non-detects represented by ½ the RL

[(a)] Consistent with RAGS (USEPA 1989), results for detections below the RL are referred to as estimated concentrations.

The first of the alternative data sets consisted of only the concentrations of the dioxin-like PCB congeners detected at or above the RL in each medium and exposure area. No estimated concentrations were included and no surrogate concentrations were used for nondetected results. This data set of detects at or above the RL was used to rerun all of the calculations and reproduce all of the tables in the HHRA for the three southernmost exposure areas (southeast, south, and southwest). These HHRA tables are included in Appendix L (Tables L5.3.1 through L5.3.32). Comparison of the risks calculated for this data set (Table L5.3.31) with the risks for corresponding exposure areas of the primary data set on which the HHRA was based (Table 5.3.31) provides a demonstration of the effects on exposure and the resulting risk estimates from the inclusion of both estimated concentrations and surrogate concentrations for nondetects in the primary data set. Carcinogenic risks based only on detects above the RL are always less than the corresponding risks based on detects, detected concentrations below the RL, and nondetects, with the risk levels for the primary data set usually two or more orders of magnitude greater than the detects-only data set. This indicates that when nondetects are included in the data set at an assumed concentration of ½ the RL, the nondetects significantly increase the calculated risks.

In order to assess the effects on the risk estimates associated with the use of estimated concentrations for detects below the RL, a second alternative data set was created that consisted of only the estimated concentrations of the dioxin-like PCB congeners detected at or above the EDL and below the RL in each medium and exposure area. No detected concentrations at or above the RL were included and no surrogate concentrations were used for non-detected results below the EDL. This data set of detects below the RL and at or above the EDL was used to rerun all of the calculations and reproduce all of the tables in the HHRA. These HHRA tables are included in Appendix M (Tables M5.3.1 through M5.3.32). Comparison of the risks calculated for this data set (Table M5.3.31) with the risks for corresponding exposure areas of the primary data set on which the HHRA was based (Table 5.3.31) provides a demonstration of the effects on exposure and the resulting carcinogenic risk estimates from the inclusion of estimated concentrations in the primary data set. Carcinogenic risks based only on detects below the RL are in most cases slightly less than (within an order of magnitude) the corresponding values for the primary data set, which was based on detected concentrations at or above the RL, estimated concentrations for detects at or above the ESL and below the RL, and nondetects. Only the southwest area risks for the estimated-concentration-only data set are more than an order of magnitude less than the corresponding risks of the primary data set. This indicates that when detects at or above the EDL and less than the RL are included, they drive much of the calculated risks.

In order to assess the effects of using surrogate values for nondetects, a third alternative data set was created that consisted only of nondetects below the EDL, with each nondetect represented by a surrogate concentration of ½ the RL. This data set of nondetects below the EDL was used to rerun all of the calculations in the HHRA. These HHRA tables are included in Appendix N (Tables N5.3.1 through N5.3.32). Comparison of the risks calculated for this data set (Table N5.3.31) with the risks for corresponding exposure areas of the primary data set on which the HHRA was based (Table 5.3.31) provides a demonstration of the effects on exposure and risk calculations from the inclusion in the primary data set of surrogate concentrations of ½ the RL for nondetects below the EDL. For nondetects below the EDL, carcinogenic risks based entirely on ½ RL concentrations in every case are essentially equal to or less than the corresponding values for the primary data set based on both detects and nondetects. For some receptors, risks are slightly greater than one order of magnitude less than corresponding values for the primary data set. This shows that for all receptors, when nondetects are included in the data set at an assumed concentration of ½ the RL, use of the nondetects was a significant contributor to the overall calculated risk.

To further assess the effects of using surrogate values for nondetects, a fourth alternative data set was created that assumed all congeners were nondetects and represented each by a surrogate concentration of ½ the RL. As was done for the other alternative data sets, this all-nondetects data set was used to rerun all of the calculations in the HHRA. These HHRA tables are included in Appendix O (Tables O5.3.1 through O5.3.32). Comparison of the risks calculated for this data set (Table O5.3.31) with the risks for corresponding exposure areas of the primary data set on which the HHRA was based (Table 5.3.31) provides a demonstration of the effects on exposure and risk calculations from the inclusion of nondetects and surrogate concentrations in the primary data set. Carcinogenic risks based entirely on ½ the RL concentrations are in most cases equal to or slightly greater than (within an order of magnitude) the corresponding values for the primary data set. This indicates that the assumed concentrations of ½ the RL are similar to the concentrations driving the risk values in the primary data set, which are the estimated concentrations for detects below the RL and the surrogate values of ½ the RL for nondetects below the EDL. Thus, the detected concentrations at or above the RL appear to be relatively minor contributors to the estimated risks.

The results of the evaluations in Appendices L, M, N, and O indicate that uncertainty related to possible underestimation of exposures associated with congeners present but not detected (below the EDL)  is negligible due to the conservatism of exposure estimates based on surrogate concentrations (½ RL).

The TEC methodology for dioxin-like PCB congeners, which expresses the concentration of each individual congener as a TEC based on 2,3,7,8-TCDD toxicity, was used in the development of exposure point concentrations for the dioxin-like PCB congeners detected at KHF. This methodology is recommended for use by USEPA (September 2009). There is uncertainty associated with use of this methodology; however, it has been found to provide a better correlation with effects than alternative methods of effects assessment, reducing uncertainty.

The identification of potential exposure pathways and receptors under current conditions was based on site-specific, plausible, current land use. For the current rancher scenario, a site-specific receptor was assumed and relevant exposure parameters were tailored to that receptor to minimize uncertainty in the exposure assessment. The pathways and receptors under hypothetical future conditions were based on the worst-case assumption that a residence would be located immediately adjacent to the KHF property boundary. Although the hypothetical future scenarios are unlikely to occur, they were addressed to ensure that risks would not be underestimated. For the hypothetical future resident rancher, subsistence resident rancher, and resident, land use assumptions were made to ensure conservatism and to characterize potential future unrestricted use of areas adjacent to KHF, as per direction from USEPA-IX. The hypothetical future scenarios are based on the assumption that these receptors reside and raise cattle and/or produce on land immediately adjacent to the KHF property line. The recently updated Kings County General Plan (effective February 25, 2010) includes the designation of open space as an overlay zone in the area east and north of KHF as a means to prevent encroachment of urban development towards the facility (Kings County CDA 2010). When the County begins their Zoning Ordinance update to establish consistency with the new General Plan, the “Open Space” overlay zone may result in some form of additional development restrictions (Gatzka 2010). If development restrictions are adopted, the hypothetical future resident rancher, subsistence resident rancher, and resident scenarios evaluated in the HHRA would represent an even more conservative exposure scenario.

Ingestion of beef from cattle grazed near KHF was not considered a potentially complete exposure pathway for the current rancher and, therefore, was not quantitatively evaluated in the HHRA. However, this does not significantly increase the uncertainty of the estimated exposure intakes for the current land use scenario. The cattle grazed on the ranchland surrounding KHF are not kept for personal consumption by the ranch workers because of the toughness and strong flavor of the meat. The cattle are sold and sent to a feedlot, generally located out-of-state, where their meat is softened and sweetened in order to make it suitable for consumption.

The hypothetical future resident rancher and subsistence resident rancher intakes were derived using default exposure parameters from USEPA (September 2005) for a farmer exposure scenario. Many of the exposure parameters are the standard default values for the RME residential scenario. However, the adult farmer/rancher exposure duration of 40 years, as specified in USEPA (September 2005), is greater than the standard 30-year residential exposure duration used for the resident receptor. The 40-year exposure duration is based on population mobility data, which indicate that farmers are likely to have a longer residential occupancy period, i.e., they tend to remain at one location longer than do residents in general. Use of a 40-year exposure duration, which represents the highest exposure that is reasonably expected to occur at a site, increases the conservatism of the risk estimates for the hypothetical future resident rancher and subsistence resident rancher. This conservatism is further compounded by the inclusion of exposure pathways that would not be expected to occur in the area adjacent to KHF. Considering the “dry land ranching” conducted near KHF, with cattle grazed on very large parcels of land for a small portion of each year (Hewitson 2009), evaluation of the hypothetical future resident rancher living and ranching on land adjacent to KHF as the future scenario in the

HHRA is expected to overestimate potential risks. Also, although regular ingestion of unprocessed milk from homegrown dairy cattle was conservatively evaluated for the hypothetical future subsistence resident rancher, the arid climate in the KHF area is not suited to raising dairy cattle, increasing the conservatism of this exposure scenario.

Uncertainty is inherent in the use of food chain modeling to derive exposure point concentrations for the future receptors. Chemical residues in beef tissue and milk were based on ingestion of plants and soil by the cattle. The EPCs of dioxin-like PCB congeners in beef tissue and milk were also used as input to the beef and milk ingestion pathways and to maternal daily intake from beef and milk used to derive the average daily dose to an infant from exposure to dioxin-like PCB congeners in breast milk. Diet-to-beef tissue uptakes were estimated using chemical-specific transfer factors based on octanol-water partition coefficient ($K_{ow}$) values, as recommended in USEPA (September 2005). Reliance on transfer factors to estimate edible beef tissue and milk concentrations from plant tissue and soil concentrations increases uncertainty.

Estimation of EPCs of dioxin-like PCB congeners in fruits and vegetables grown in a residential garden also is inherently uncertain because of the many factors in the models for which measured, site-specific data are not available. Concentrations in belowground produce were modeled from measured surface soil concentrations, while concentrations in aboveground produce were modeled for vapor phase absorption of airborne contaminants as well as wet plus dry deposition of contaminated particulates onto plant surfaces. Measured air concentrations of the dioxin-like PCB congeners include both vapor and particulates; therefore, the fraction of contaminant in the vapor phase had to be modeled in order to derive vapor and particulate concentrations as input to the produce modeling. Some of the factors included in the equations used to model produce concentrations are chemical-specific ($K_{ow}$, vapor pressure, etc.) or site-specific (such as annual rainfall). However, many of those factors are default values developed by USEPA (December 2003 and September 2005) and they may not necessarily represent produce uptake rates for KHF. Given that the produce ingestion pathway is responsible for a high proportion of the risk calculated for the future subsistence resident and the future resident, the great amount of uncertainty associated with modeling of produce EPCs has a substantial impact on the uncertainty of the cumulative carcinogenic risk for these receptors.

The most significant uncertainties associated with derivation of the average daily dose to an infant from exposure to dioxin-like PCB congeners in breast milk are those associated with calculation of the average maternal intake of dioxin-like PCB congeners for each adult exposure scenario, including incidental ingestion of soil, ingestion of beef tissue, milk from dairy cattle, and homegrown produce, and inhalation. The uncertainty associated with the maternal intake represents the sum of all uncertainties associated with each of the potential exposure pathways. Also, the concentration of PCBs in breast milkfat is assumed to be the same as in maternal fat, which may introduce uncertainty.

There is substantial uncertainty associated with the spatial patterns of exposure in the vicinity of KHF due to the areas in which samples were collected. On-site concentrations of dioxin-like PCB congeners were used to represent off-site concentrations in areas immediately adjacent to KHF that were not sampled. However, areas more distant from potential sources of PCB congeners within the facility are expected to have lower concentrations in soil and vegetation than the on-site areas sampled along the facility boundaries and adjacent to B-18 landfill within the facility. Assuming that the source of detected dioxin-like PCB congeners originated within KHF, off-site concentrations would be expected to decrease rapidly with distance.

This expectation is supported by the results of air dispersion and deposition modeling performed in conjunction with the PCB Congeners Study. The modeling was performed to demonstrate that the monitoring locations used for ambient air sampling are properly located to measure PCB congeners potentially originating from the B-18 landfill (Wenck October 2009). The objective of the modeling analysis was to identify the areas likely to be maximally affected by aerial dispersion and deposition as a result of assumed emissions from the B-18 landfill. The model generated isocontours of predicted concentration and deposition results for particle, particle-bound, and gaseous phases of dioxin-like PCB congeners based on an assumed unit emission rate. The figures showing the isocontours indicate that: 1) monitoring station DMS-1, which is near the southeast corner of the facility, is effectively located to capture maximum impact emissions from the B-18 landfill because the dispersion and deposition patterns generally extend in a mainly southeast direction, in accordance with the predominant wind direction; 2) monitoring stations MSP and MPS-ALT are effectively located to represent concentrations when the wind is out of the southwest; and 3) monitoring station UMS-1 is effectively located to represent predominantly upwind, or less impacted, concentrations.

The figures showing the modeled isocontours indicate that the principal direction of dispersion and deposition is to the southeast of the B-18 landfill. The contours indicate modeled concentration and deposition levels decreasing rapidly with increasing distance from the source. Because concentrations are predicted to decline with distance, exposures of receptors outside the facility would be less than those calculated in this HHRA and would decline with distance from the facility. Consequently, there is a high degree of confidence that the concentrations used in this risk assessment do not underestimate potential off-site exposures and risks despite the lack of measured data from more distant areas.

Information regarding anthropogenic background levels of dioxin-like PCB congeners in soil also reduces uncertainty associated with the spatial patterns of exposure and the potential for site-related exposures and risks to be underestimated. USEPA conducted a national-scale pilot survey of the levels of dioxin-like PCB congeners in rural/remote soils from 27 sites across the United States (USEPA 2007). The study focused on sampling of undisturbed soil in rural/remote areas in order to provide a baseline for evaluating soil levels in other areas. Dioxin-like PCB congener concentrations were converted to TECs in the study using WHO TEFs from 1998, a TEF protocol which was superseded by the 2006 TEFs used in this HHRA. As a result, the soil TECs calculated in USEPA (2007) are different from, though likely are similar to, values that would result from the use of the current TEFs. Thus, the USEPA background TECs are not directly comparable to the soil TECs calculated in this study but provide a general indication of their relative magnitudes.

The USEPA background soil TEC for dioxin-like PCBs (when based on only detected concentrations) ranged from 0.004 pg/g to 0.36 pg/g, with a mean of 0.047 pg/g for the 27 sites included in the survey (USEPA 2007). The KHF-specific soil TECs from the current study (Table 5.3.32) were greater than the mean TEC from the USEPA study in all exposure areas. However, the KHF TECs were greatly affected by the surrogate concentrations used for nondetects as well as detected concentrations below the RL, as indicated by comparison of Tables 5.3.32, L5.3.32, M5.3.32, N5.3.32, and O5.3.32. When only detected concentrations above the RL (Table L5.3.32) are considered, the KHF soil TECs are less than the mean TEC from the USEPA study (0.047 pg/g) in all exposure areas. When only detected concentrations at or above the EDL and below the RL (Table M5.3.32) are considered, all but one of the KHF soil TECs are greater than the mean TEC from the USEPA study. Similarly, when only surrogate concentrations of ½ the RL were used either for nondetected results below the EDL (Table N5.3.32) or for all concentrations (Table O5.3.32), the KHF soil TECs are almost always greater than the mean TEC from the USEPA study. These comparisons increase confidence that the KHF soil TECs based on detections above the RL in the seven exposure areas are similar to anthropogenic background TECs in rural/remote soils across the United States and are not substantially elevated due to the presence of KHF.

#### 5.3.4.4.3 Toxicity Assessment Uncertainty

The toxicity assessment step in the HHRA process consists of both hazard identification and the dose-response assessment for COPCs. Defining the appropriate dose-response relationships for these chemicals is the main focus of the uncertainty analysis for toxicity.

Uncertainty is inherent in the toxicity values utilized in evaluating carcinogenic and noncarcinogenic risks. Such uncertainty is chemical-specific and is incorporated into the toxicity value during its development. For example, an uncertainty factor may be applied for interspecies and intrahuman variability, for extrapolation from subchronic to chronic exposures, or for epidemiological data limitations. Application of uncertainty factors is expected to overestimate risks.

The toxicity values used for this HHRA are the SF and IUR for 2,3,7,8-TCDD, which were used in conjunction with the TEF approach for dioxin-like PCB congeners. The IRIS database, the primary source of human health toxicity values, does not include toxicity values for 2,3,7,8-TCDD. Therefore, the toxicity values developed for 2,3,7,8-TCDD by CalEPA (2009) were used in the HHRA, including an oral SF and an IUR. The CalEPA toxicity values were derived using methodologies very similar to those used by USEPA for the IRIS toxicity values (USEPA September 2008), which reduces the uncertainty associated with using toxicity values from an alternate source.

Slope factors developed by CalEPA and/or USEPA are generally conservative and represent the 95% UCL of the probability of a cancer response. Therefore, the actual carcinogenic risk due to exposure to selected chemicals is likely to be lower than the estimated risk.

There is uncertainty in the carcinogenic potential of chemicals classified as B1, B2, or C carcinogens. Only chemicals classified as A carcinogens are proven human carcinogens. 2,3,7,8-TCDD is classified as a potential carcinogen and is assigned to a carcinogenicity weight-of-evidence group of B2 (CalEPA 2009) for both the ingestion and inhalation routes of exposure. Toxicity information was not available for dermal exposure; hence, an assumption regarding whether or not to adjust the exposure estimate from an administered to an absorbed dose (based on the GI absorption rates of PCBs) is necessary in order to calculate a dermal adjusted SF, which may overestimate or underestimate risk.

Although there are limitations and uncertainty in the TEF approach, it is the recommended method for evaluating human health risk from a mixture of dioxin-like PCB congeners (USEPA September 2009). The most recent WHO TEFs were used in this HHRA. These TEFs were developed using a refined approach, which reduces the uncertainty associated with their use.

#### 5.3.4.4.3 Risk Characterization Uncertainty

Uncertainties in the exposure and toxicity assessments are reflected in the quantitative risk estimates for the dioxin-like PCB congeners presented in the risk characterization. Some of the procedures used and uncertainties inherent in the HHRA process may tend to underestimate potential risk. However, they are moderated by numerous assumptions built into this HHRA that tend to overestimate rather than underestimate potential risks, resulting in a reasonable maximum evaluation of risk.

### 5.3.4.5 Summary

The HHRA Risk Characterization determined that the total cumulative cancer risk from dioxin-like PCB congeners collectively for the current receptor adjacent to the facility, a hypothetical ranch worker, is less than the target risk level of $1 \times 10^{-6}$. Under future conditions, three hypothetical worst-case receptors also were evaluated in order to represent more conservative potential exposure scenarios and to ensure that risks would not be underestimated: a hypothetical future resident rancher, a hypothetical future subsistence resident rancher, and a hypothetical future resident. In order to ensure conservatism when estimating risk for these hypothetical future receptors, very conservative land use assumptions were made regarding future unrestricted use of areas immediately adjacent to KHF, however unlikely. The total cumulative cancer risk for the hypothetical future resident rancher, subsistence resident rancher, and resident from the dioxin-like PCB congeners collectively, in each of the exposure areas, was equal to or greater than the USEPA and CalEPA target risk level of $1 \times 10^{-6}$ and within the USEPA target risk management range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$.

The uncertainty analysis indicated that the conservative methods and assumptions used in the HHRA provide confidence that there is minimal potential for risk to have been underestimated and that the risk estimates developed in the HHRA are protective of public health. An air dispersion and deposition modeling analysis was conducted to identify those locations subject to maximum impacts from on-site PCB disposal operations. This analysis showed that contaminant concentrations measured in the PCB Congeners Study in soil, vegetation, and air samples at the facility boundary provide conservative estimates of exposures and would not result in underestimation of off-site exposures farther from the facility. Consequently, it can be concluded that dioxin-like PCB concentrations and potential human health risks associated with the presence of dioxin-like PCB congeners at KHF were not underestimated for receptors located near the facility, and that those risks can be expected to decrease with increasing distance from the facility.

## 5.4 ECOLOGICAL RISK ASSESSMENT

### 5.4.1 Introduction and Approach

The purpose of this ERA is to evaluate the potential for adverse ecological effects from dioxin-like PCB congeners in environmental media at KHF. The ERA was performed in accordance with the current USEPA guidance for conducting ecological risk assessment, as described in the *Ecological Risk Assessment Guidance for Superfund* (ERAGS)*: Process for Designing and Conducting Ecological Risk Assessments* (USEPA June 1997), as well as the *Guidelines for Ecological Risk Assessment* (USEPA 1998) and *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments* (USEPA June 2001). The approach was also based on guidance specific to the assessment of risk from PCB congeners provided in the *Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment* (USEPA June 2008).

The eight steps of the ERA process presented in the ERAGS document are as follows:

*Screening-Level Ecological Risk Assessment* (SLERA)

Step 1. Screening-Level Problem Formulation and Effects Evaluation

Step 2. Screening-Level Exposure Estimate and Risk Calculation

*Baseline ERA*

Step 3. Problem Formulation

Selection of site-specific assessment endpoints

Refined assessment of exposure and toxicity

Risk characterization and uncertainty analysis

Step 4. Study Design and Data Quality Objectives Process

Step 5. Field Verification of Sampling Design

Step 6. Site Investigation and Data Analysis

Step 7. Risk Characterization

Step 8. Risk Management

In conjunction with these steps, the ERAGS process also requires interim decisions and deliverables following several steps in the process. These scientific/management decision points (SMDPs) are defined as points in the process at which the risk managers and the risk assessment team evaluate the work completed to a given step and either approve the work and the planned approach or redirect additional work (i.e., decide whether or not the ERA should continue to the next step in the process). Up to six SMDPs potentially may be incorporated into the eight-step ERAGS process, depending on the number of ERA steps required at a particular site and circumstances specific to the site. SMDPs typically occur after Steps 2, 3, 4, and 7 of the ERAGS process, with a possible SMDP within Step 3 and another after Step 5 if approval is required for needed changes to the sampling design.

Because the purpose of this ERA is to provide a focused evaluation of ecological risks associated with the potential presence of dioxin-like PCB congeners at the site, performance of each step in the process was not necessary. For example, the preliminary phase of the process, the SLERA, was not included because USEPA IX already has determined that the dioxin-like PCB congeners are the COPECs that warrant a detailed assessment of the risks they may pose to receptors at the site. Thus, the process followed in this ERA generally corresponds to that of a Baseline ERA (beginning at Step 3 of the process). The descriptive, introductory components of Step 3 are included below in Section 5.4.2, Problem Formulation. The site-specific analyses of exposure and effects typically included in Problem Formulation are presented in Section 5.4.3, Exposure Assessment, and Section 5.4.4, Toxicity Assessment, respectively. The results of these analyses are integrated and conclusions are discussed in Section 5.4.5, Risk Characterization. Following Risk Characterization, an SMDP (Section 5.4.6) will determine whether additional steps of the ERA process are warranted.

### 5.4.2 Problem Formulation

Problem Formulation establishes the goals, breadth, and focus of a Baseline ERA. For this ERA, it includes a description of the ecological setting at the site, the identification and evaluation of assessment endpoints, and a conceptual site model (CSM) identifying exposure pathways potentially linking contaminants to assessment endpoints.

#### 5.4.2.1 Ecological Setting

The ecological setting comprises both abiotic (nonliving) components of the natural environment and biotic components, including ecological communities and rare species.

##### 5.4.2.1.1 Physical Environment

The KHF facility covers a total of approximately 1600 acres, of which approximately 499 acres are within the Conditional Use Permit Boundary (approved for hazardous and solid waste treatment, storage and disposal activities by various agencies). KHF is located on the western slope of the Kettleman Hills, a range of low, steep hills trending northwest and bordering the western margin of the San Joaquin Valley. The surface elevation of KHF ranges from approximately 700 feet above msl to 1100 feet above msl. The highest point near the facility is Cerro Ultimo (approximate elevation 1144 feet above msl), which is adjacent to the northern property line. The topography in the vicinity of the facility generally slopes from the northwest to the southeast and includes arroyos and other erosional features, but there are no perennial surface water bodies within 1 mile of the facility (Wenck April 2009).

The climate of the San Joaquin Valley region is characterized by warm, dry summers and cool winters. The region is semiarid and characterized by extremely low rainfall. Precipitation in the valley is confined mainly to the winter months, though some rain may fall in late summer and fall. Snow, ice storms, and hail occur only infrequently. Average annual precipitation for the entire valley floor is around 9.25 inches. Precipitation recorded at KHF from 1986 through 1996 averaged only 5.8 inches annually, substantially less than the average for the San Joaquin Valley (TRC 1997). Typically, 90 percent of rainfall occurs between November and April. The estimated 100-year, 24-hour storm would result in 2.31 inches of precipitation. Mean annual evaporation is 102.94 inches (pan measurement). The mean annual temperature is 65 °F (Wenck April 2009). Average high temperatures in the southern valley range from the low 50s°F in winter to the upper 90s°F in summer, with temperatures often exceeding 100°F (TRC 1997). Winds in the area are rarely calm. The winds are predominantly from the north-northwest at a historic average speed of 13 mph. In winter, conditions may include variable winds and dense valley fog (Wenck April 2009).

#### 5.4.2.1.2 Ecological Communities

The plant communities of the entire KHF site were surveyed in the spring and early summer of 1988 and the spring of 1991 (TRC 1997). Based on these surveys, KHF was described as having highly dissected terrain with a diversity of microhabitats, including steep badlands, rocky outcrops, sand, fine-particle alkaline deposits, and ephemeral drainages and washes. The predominant vegetation community in the region is annual grassland, described as Valley Grassland community (TRC 1997). The 499 acres of KHF within the Conditional Use Permit Boundary are vegetated mainly by a typical lower Sonoran grassland community (TRC 1997). Shrublands also are common, including a transitional form of the San Joaquin salt brush scrub community (TRC 1997). The shrublands typically are dominated by saltbush, shadescale, or California sagebrush.

The plant communities of KHF support a relatively diverse and abundant community of wildlife adapted to the semiarid grasslands and shrublands of the southern San Joaquin Valley. The wildlife community of KHF was surveyed in 1988 and 1989 (TRC 1997).

The KHF site historically was used for cattle grazing, and current land use surrounding the facility continues to be for cattle grazing. Approximately 88 percent of the acreage of Kings County is used for agriculture (TRC 1997). The permanent human residences nearest to KHF are in Kettleman City, approximately 3.5 miles to the northeast, and in Avenal, approximately 6.5 miles to the northwest (TRC 1997), and one resident located 2.5 miles northeast of KHF.

#### 5.4.2.1.3 Special-Status Species

A variety of species or subspecies with a federal and/or state special status designation (such as endangered, threatened, species of special concern, or rare) potentially could occur in natural communities in the vicinity of the site. Biological surveys of KHF habitats were performed, in May-June 2002 and August 2003, to determine the potential for occurrence of such species on the facility and to map observed occurrences. Based on the findings of these surveys, as well as range maps and habitat requirements, only one federally or state-listed species is known or likely to occur at KHF: the San Joaquin kit fox (*Vulpes macrotis mutica*), which is federally listed as endangered and state listed as threatened (CH2M HILL 2008). Another wildlife species with a federal and state listing status of endangered, the blunt-nosed leopard lizard (*Gambelia sila*), potentially occurs in the region, but surveys for this species at KHF found no evidence that it occurs on the facility and determined that its potential for occurrence there was low (CH2M HILL 2008). Also, the San Joaquin antelope squirrel (*Ammospermophilus nelsoni*), which is state listed as threatened, occurs in the region and may find suitable habitat on KHF, but it has not been found in facility surveys and is considered to have a low potential to occur on the facility (CH2M HILL 2008).

Similarly, two plant species federally listed as endangered occur in the region, but surveys did not confirm their occurrence on KHF. The California jewel-flower (*Caulanthus californicus*) is federally and state listed as endangered but was not observed during surveys of KHF. California jewel-flower may have a low potential to occur on the facility based on the presence of areas of suitable habitat (CH2M HILL 2008). The San Joaquin woollythreads (*Monolopia congdonii*) is federally listed as endangered but lacks a state listing status. The California Native Plant Society (CNPS) assigns the San Joaquin woollythreads a status of 1B.2, indicating that it is rare, threatened, or endangered in California or elsewhere and is "fairly endangered" in California (20 to 80 percent of occurrences under threat). San Joaquin woollythreads may have a moderate potential to occur on the facility based on the presence of suitable habitat and its occurrence at scattered locations in the surrounding area (CH2M HILL 2008).

Based on the biological surveys, other special-status species that are not federally or state listed as endangered or threatened are known or likely to occur on KHF. Wildlife species that are designated as state species of special concern and are known or likely to occur on KHF include the American badger (*Taxidea taxus*) and loggerhead shrike (*Lanius ludovicianus*) (CH2M HILL 2008). Plant species that are known or likely to occur on KHF and have been placed by the CNPS on a watch list (List 4) because they are "fairly endangered" in California include the gypsum-loving larkspur (*Delphinium gypsophilum gypsophilum*), Hoover's woollystar (*Eriastrum hooveri*), cottony buckwheat (*Eriogonum gossypinum*), and San Joaquin blue-curls (*Trichostema ovatum*) (CH2M HILL 2008).

#### 5.4.2.2 Conceptual Site Model

An ecological CSM was developed to evaluate the potential migration and exposure pathways through which ecological receptors may be exposed to PCB congeners at the site. A complete exposure pathway consists of a source and mechanism of contaminant release, a transport mechanism for the released contaminants, a point of contact between the contaminant and the receptor (i.e., an exposure medium), and a route of contaminant entry into the receptor (i.e., an exposure route). If any of these elements are missing, the pathway is considered to be incomplete. A CSM diagram showing pathways of exposure for ecological receptors at the site is presented in Figure 7.

Dioxin-like PCB congeners could be present at KHF as a result of the historical handling and disposal of PCB wastes. Migration of PCB congeners from PCB wastes being disposed of in TSCA-approved landfills or PCB wastes being processed and stored in the TSCA-approved PCB Flushing/Storage Unit building to environmental exposure media such as soil (i.e., media to which ecological receptors may be exposed within or beyond the facility boundary) may involve multiple release mechanisms, exposure media, and exposure routes. Principle pathways for exposure of ecological receptors to PCB congeners at this site would likely be the release of PCBs from soil to the surrounding environment via suspension of contaminated soil particulates (dust) by wind, followed by deposition onto downwind soils and foliage, as well as via volatilization of PCBs followed by uptake of the airborne vapors by aerial plant parts. Subsequently, PCBs that could be deposited on plant surfaces or absorbed by plants in the vapor phase may then be taken up by the animals that consume these plants and transferred through food chains.

PCBs are hydrophobic, lipophilic compounds that tend to be taken up by organisms from their environment and through their diet (bioaccumulation). Lower-trophic-level organisms, such as plants and soil-dwelling invertebrates, that have bioaccumulated PCBs may be consumed by higher-trophic-level consumers. As these compounds are bioaccumulated by organisms at higher trophic levels, their concentrations may increase as they move up the food chain (biomagnification).

Ingestion pathways for animals may include incidental ingestion of surface soil as well as ingestion of food. Animal exposure pathways based on inhalation of soil particulates or vapors and absorption through dermal contact with contaminated soil also are potentially complete, but these pathways usually are negligible compared to ingestion pathways and are difficult to quantify (USEPA February 2005). For example, inhalation and dermal pathways were not included by USEPA in their derivation of ecological soil screening levels (Eco-SSLs) (USEPA February 2005). The Eco-SSL Task Group responsible for characterizing exposure pathways for terrestrial wildlife based this decision on the results of their focused evaluation of the relative importance of these pathways, which is described in Attachment 1-3 of USEPA (February 2005), "Evaluation of Dermal Contact and Inhalation Exposure Pathways for the Purpose of Setting Eco-SSLs." In addition to a review of relevant research, the evaluation also included example dose and risk calculations for an ecological receptor (meadow vole) using very conservative assumptions and models. The evaluation resulted in the following findings and conclusions:

Dermal Absorption. Fur, feathers, and scales covering the skin of wildlife receptors reduce dermal exposure by limiting skin contact with soil. While data are available for assessing dermal exposure for humans, such data generally are not available for wildlife. PCBs are not among the classes of chemicals known or suspected to be of concern because of their potential for dermal absorption by wildlife (i.e., volatile organic compounds [VOCs] and pesticides). The example dose calculations confirmed that the oral exposure pathways (food and soil ingestion) are the predominant contributors to exposure: the contribution to total dose from the dermal exposure pathway was 0.5 percent or less. A comparison of dermal and oral absorption factors for humans found that the absorbed dermal dose was generally much lower than the absorbed oral dose for most chemicals evaluated, resulting in the dermal exposure pathway being much less significant than the oral exposure pathway. The example risk calculations resulted in dermal risks that averaged only 2.5 percent of oral risks for the 23 chemicals evaluated, with a range from less than 1 percent to 11 percent of the oral risks (USEPA February 2005).

Inhalation. Inhalation exposures to compounds in soil may include inhalation of volatile compounds in air and/or inhalation of soil particles containing chemical compounds suspended in air. Burrowing animals could be exposed via inhalation to relatively high concentrations of VOCs in their burrows (USEPA February 2005). However, PCBs do not have the characteristics of VOCs as defined by USEPA, so inhalation of PCB vapors would not be a significant inhalation exposure pathway.

Soil particles containing adsorbed compounds could be inhaled by wildlife. However, rather than being inhaled into the lungs, respirable particles (for humans, typically those larger than 5 µm in diameter) most likely would be ingested as a result of mucociliary clearance from the respiratory tract. The fraction of suspended soil particles (dust) that is respirable differs among animals, and little data exist for estimating respirable fractions for specific receptors. Non-respirable particles potentially can be ingested and are accounted for in incidental soil ingestion values published for wildlife species (USEPA February 2005). When the soil-particle-inhalation pathway is evaluated for human receptors, it usually contributes a relatively insignificant fraction (less than 5 percent) of the total multi-pathway risk.

The example dose calculations confirmed that the contribution to total dose from the inhalation pathways was very low: less than 1 percent for volatiles and less than 0.01 percent for particulates. The example risk calculations resulted in inhalation risks that averaged only 0.017 percent of oral risks for the seven chemicals evaluated, with a range from 0.0001 percent to 0.10 percent of the oral risks (USEPA February 2005).

The evidence summarized above indicates that the contribution of dermal and inhalation exposure pathways to total exposure and risk will be negligible for most sites, contaminants, and ecological receptors (USEPA February 2005). Given their characteristics, this is expected to be true for the dioxin-like PCB congeners and receptors evaluated in this ERA. Accordingly, dermal and inhalation exposure pathways were not included among the exposure pathways quantitatively evaluated.

In order to evaluate risks to ecological receptors at multiple trophic levels within the food chain, mammalian and avian receptors were selected to be representative of risks that potentially could be posed to both primary consumers (herbivores) and secondary consumers (predators) which may be at greatest risk from biomagnification. Mammalian receptors evaluated included a herbivorous rodent, the San Joaquin pocket mouse (*Perognathus inornatus*), a carnivorous rodent, the Tulare grasshopper mouse (*Onychomys torridus tularensis*), and a higher-trophic-level predator, the San Joaquin kit fox (*Vulpes macrotis mutica*). Avian receptors evaluated included an insectivore/granivore, the western meadowlark (*Sturnella neglecta*), and a higher-trophic-level predator, the burrowing owl (*Athene cunicularia*). A predatory lizard, the blunt-nosed leopard lizard (*Gambelia sila*), also was included. These species were identified based on input from USEPA-IX and also based on factors such as life history and position in the food chain, potential occurrence in habitats in the vicinity of the study area, and status as sensitive species.

#### 5.4.2.3 Identification and Evaluation of Ecological Endpoints

An ecological endpoint is a characteristic (such as reproduction) of an ecological component (such as a population) that may be affected by exposure to a stressor (such as a chemical contaminant). Ecological endpoints are identified in order to determine whether environmental management goals for the protection of environmental resources/values in the study area are being met currently and will continue to be met in the future. Assessment endpoints are selected to reflect these management goals.

##### 5.4.2.3.1 Assessment Endpoints

Assessment endpoints are explicit expressions of the environmental value(s) to be protected at a site. According to USEPA (1998), an assessment endpoint is defined by two elements: (1) a specific, valued ecological entity and (2) characteristics of the entity that are important to protect, potentially at risk, and amenable to measurement. The minimum level of ecological concern in an ERA usually is the population; therefore, assessment endpoints generally refer to characteristics of populations or higher levels of ecological organization, such as communities. Risk to an individual usually is of concern only if the species is legally protected under the federal Endangered Species Act or state laws.

As prescribed by USEPA (1998), three principal criteria were used to identify ecological values that may be appropriate assessment endpoints: (1) ecological relevance, (2) susceptibility to known or potential stressors (contaminants), and (3) relevance to policy/management goals. ERAGS (USEPA June 1997) also describes four factors of particular importance in evaluating potential assessment endpoints: (1) the contaminants present and their concentrations; (2) the mechanisms of contaminant toxicity to potential ecological receptors; (3) the species potentially exposed to site-related contaminants; and (4) the potentially complete exposure pathways. These factors were considered in conjunction with the three criteria above in identifying assessment endpoints for the ERA.

A suite of assessment endpoints representing the values to be protected in the study area were identified for evaluation in the ERA. Values to be protected include populations of wildlife in the study area (the facility and along the property boundary buffer zone). Protection of such endpoints would maintain the existing biodiversity of the ecological community in the study area and would achieve the management goal of protecting the biological integrity of ecological communities. In addition, because a federally listed endangered species was considered likely to occur in the study area (the San Joaquin kit fox), it was identified as an assessment endpoint in conformity with federal and state management goals of protecting rare species. Another federally listed endangered species (the blunt-nosed leopard lizard) has a potential to occur in the area, so it was identified as an assessment endpoint although surveys have not found evidence that it occurs on KHF.

Generally, the values to be protected in the study area include the abundance and sustainability of wildlife populations that utilize the study area as habitat, and the survival and reproduction of individuals of the endangered species in the study area. Specifically, the assessment endpoints representing the values to be protected at the site and identified for evaluation in this ERA are presented in Table 5.4.1. Protection of these endpoints will maintain the existing biodiversity of the ecological communities at the site and will achieve the policy/management goals of protecting the environment overall and rare species in particular.

Although the plant community of the study area is a valued entity, it was not selected for evaluation as an assessment endpoint. Plants appear to be much less sensitive to adverse effects from PCBs than animals; for example, the screening benchmark concentration identified by Efroymson et al. (1997) for phytotoxicity effects from PCBs in soil was 40 mg/kg, multiple orders of magnitude higher than the detected concentrations in soil at KHF. Also, as discussed in

Section 5.4.2.1, populations of threatened or endangered plant species have not been found to occur on KHF, so rare plant species did not warrant selection. Given their relatively low susceptibility to PCBs and limited relevance to policy/management goals for protection of rare species, plants were not selected as assessment endpoints.

The assessment endpoints identified for the site are the following:

1) Sustainability (maintenance of general abundance and reproduction rate) of populations of birds that feed on invertebrates and vegetation in the study area;
2) Sustainability of populations of predatory birds that feed on the food web of the study area;
3) Sustainability of populations of herbivorous small mammals that feed on vegetation in the study area;
4) Sustainability of populations of carnivorous small mammals that feed on invertebrates in the study area;
5) Sustainability of populations of predatory mammals that feed on the food web of the study area, including survival and reproduction of individual San Joaquin kit foxes (an endangered species known to occur in the vicinity and likely to occur within the study area).
6) Survival and reproduction of individual blunt-nosed leopard lizards (an endangered species with a potential to occur in the region) should they inhabit the study area.

#### 5.4.2.3.2 Representative Receptors

In order to evaluate effects on assessment endpoints, representative receptors (also referred to as endpoint species) are selected. Receptors are selected to represent assessment endpoints based principally on the following:

- presence of the receptor at the site and its importance in the community food web;
- susceptibility of the receptor to the contaminants at the site, including bioaccumulation/biomagnification effects;
- availability of data describing the receptor's potential for exposure;

- availability of data describing toxicological effects that may result from exposure.

Additional considerations in selecting representative receptors included the following:

- the susceptibility of the receptor to the same exposure pathway(s) as the assessment endpoint being represented;
- representation by the receptor of the species, life stage, population, or community most affected by the chemicals being studied;
- possession by the receptor of physiological, behavioral, or life history characteristics that make it a sensitive representative of the assessment endpoint, including similar sensitivities to contaminants and similar spatial scales of exposure;
- a well-defined relationship between the receptor and the assessment endpoint; and
- the ability to attribute receptor responses to the chemicals being studied.

The assessment endpoints identified for this ERA are listed below with a brief explanation of the basis for selection of each representative receptor.

***1) Assessment Endpoint***: Sustainability of populations of birds that feed on invertebrates and vegetation in the study area.

*Representative receptor*: western meadowlark (*Sturnella neglecta*)

*Basis for selection*: The western meadowlark feeds mostly on insects and other invertebrates (approximately 60 percent of diet), with a smaller component of grains and other seeds (about 30 percent of diet), and a minor component of soil (10 percent of diet), which is ingested incidentally with food or deliberately as a source of grit for digestion (Cal/Ecotox 1999). The study area is within the permanent range of the western meadowlark, so it is resident in the area throughout the year. The western meadowlark forages and breeds mainly in grasslands, such as those of KHF, and it nests on the ground. Based on its habitat, feeding habits, and other life history characteristics, the western meadowlark has a relatively high potential compared to other birds likely to occur at the site for exposures to bioaccumulative contaminants such as PCBs. It could be exposed indirectly through the food chain via consumption of both animals and plants as well as directly via incidental soil ingestion. Because of its relatively high potential for exposure and predominantly insectivorous diet, the western meadowlark is expected to provide a conservative representation of risk to other small birds that may occur in the area (including the loggerhead shrike, a state species of special concern known to occur on KHF).

***2) Assessment Endpoint***: Sustainability of populations of predatory birds that feed on the food web of the study area.

*Representative receptor*: burrowing owl (*Athene cunicularia*)

*Basis for selection*: The burrowing owl may occur in the study area throughout the year, and its small size and relatively small home range are likely to result in a potential for exposure greater than that of other predatory birds. It feeds largely on rodents, though insects and other invertebrates also may compose a notable component of its diet, and it also consumes reptiles and birds. For this evaluation, the owl's diet was assumed to consist entirely of small mammals (mice) with a high potential for exposure to contaminants in soil, vegetation, and invertebrates. The burrowing owl utilizes underground burrows for shelter and nesting. As a result, it has a relatively high potential for direct exposures from incidental soil ingestion as well as indirect exposures to bioaccumulative contaminants such as PCBs through the food chain.

The burrowing owl has been designated by the state as a species of special concern. The biological surveys of KHF found potentially suitable habitat for the burrowing owl throughout the facility and substantial numbers of burrows it could use, but neither the owls nor indirect evidence of their presence were observed, so their potential to occur on the facility was considered to be moderate (CH2M HILL 2008). Because of its relatively high potential for exposure, the burrowing owl was assumed to feed on the food web of the study area and to nest in the area in order to provide a conservative representation of risk to this species as well as other predatory birds that may occur in the area (such as hawks, other owls, and the loggerhead shrike).

***3) Assessment Endpoint***: Sustainability of populations of herbivorous rodents in the study area.

*Representative receptor*: San Joaquin pocket mouse (*Perognathus inornatus*)

*Basis for selection*: The San Joaquin pocket mouse is one of many small rodents that may occur on KHF. Rodent populations are major consumers of plants as well as invertebrates, are important components of the food web and the diets of many predators, and are important in energy and nutrient cycling within the ecosystem. The diet of the San Joaquin pocket mouse consists primarily of seeds, but it also eats green vegetation and insects. For this evaluation, the mouse's diet was assumed to consist entirely of seeds or other plant parts. Plants are constantly in contact with soil and exposed to aerial deposition of soil particles, so a mouse may have a substantial potential for exposure to PCBs from consuming vegetation. Given its small home range, burrowing habits, and diet, the San Joaquin pocket mouse has a high potential for indirect exposures to bioaccumulative contaminants such as PCBs through the food chain in addition to direct exposures from incidental soil ingestion.

Because the San Joaquin pocket mouse is prey for predatory birds and mammals in the study area, it may provide an important route of exposure for these predators. The San Joaquin pocket mouse was selected to represent the many small rodents that potentially could inhabit the habitats of the study area, such as kangaroo rats, grasshopper mice, and ground squirrels. Because of its similarity to many of the other native rodents in regard to diet, life history, and relatively high potential for exposure, the San Joaquin pocket mouse was considered to provide a conservative representation of risk to rodents and other small mammals that may occur in the area.

***4) Assessment Endpoint***: Sustainability of populations of carnivorous rodents and other small mammals in the study area.

*Representative receptor*: Tulare grasshopper mouse (*Onychomys torridus tularensis*)

*Basis for selection*: The Tulare grasshopper mouse is a subspecies of the southern grasshopper mouse (*Onychomys torridus*). Occurrences of this subspecies have been reported from the central California counties surrounding Kings County (USFWS 1998), so it potentially may occur in the region. Grasshopper mouse populations are consumers of insects and other invertebrates, are important components of the food web and the diets of predators, and are important in energy and nutrient cycling within the ecosystem. The diet of the grasshopper mouse consists primarily of insects and other arthropods, but it also may include vertebrates, such as other mice, and a small component of seeds. For this evaluation, the mouse's diet was assumed to consist entirely of invertebrates. Given its small home range, burrowing habits, and diet, the Tulare grasshopper mouse has a high potential for indirect exposures to bioaccumulative contaminants such as PCBs through the food chain in addition to direct exposures from incidental soil ingestion.

Because the grasshopper mouse may be consumed as prey by predatory mammals and birds in the study area, it may provide an important route of exposure for these predators. The Tulare grasshopper mouse was selected to represent small, carnivorous mammals that potentially could inhabit the habitats of the study area and could be consumed by other predators. Because of its potential to be exposed to PCBs in its prey and to bioaccumulate PCBs, the Tulare grasshopper mouse was considered to provide a conservative representation of risk to small, carnivorous mammals that may occur in the area and an exposure pathway for higher-level predators that may feed on this mouse or other carnivorous prey. It should be noted that the Tulare grasshopper mouse has not been identified on the KHF facility.

***5) Assessment Endpoint***: Sustainability of populations of predatory mammals that feed on the food web of the study area, including survival and reproduction of individual San Joaquin kit foxes.

*Representative receptor*: San Joaquin kit fox (*Vulpes macrotis mutica*)

*Basis for selection*: As discussed above, the San Joaquin kit fox is federally listed as endangered and state listed as threatened, and it is likely to occur in the KHF study area. Although the San Joaquin kit fox was not observed during the 2002 and 2003 biological surveys of KHF, potential dens with the appropriate size and configuration for use by this fox were observed, and scat and tracks of the San Joaquin kit fox also were observed during a 2007 survey of KHF for the blunt-nosed leopard lizard (CH2M HILL 2008). As a result of its listing status and likelihood of occurrence, individuals of this subspecies warranted inclusion as an assessment endpoint in accordance with ERAGS guidance. In addition, the San Joaquin kit fox is a mammalian predator that feeds on rodents and other prey with a substantial potential for exposure to PCBs in the environment at KHF. Therefore, this fox is a suitable representative of other mammalian predators in this study area that could be exposed through the food chain, such as the badger.

The San Joaquin kit fox feeds mainly on rodents but also consumes rabbits and hares, birds, insects, and reptiles. For this evaluation, the fox's diet was assumed to consist entirely of small mammals (mice) with a high potential for exposure to contaminants in soil, vegetation, and invertebrates. The San Joaquin kit fox utilizes underground burrows for shelter and dens. As a result, it has a relatively high potential for direct exposures to PCBs from incidental soil ingestion in addition to indirect exposures through the food chain. Because of its relatively high potential for exposure, the San Joaquin kit fox was assumed to feed on the food web of the study area in order to provide a conservative representation of risk to this species as well as other predatory mammals that may occur in the area.

***6) Assessment Endpoint***: Survival and reproduction of individual blunt-nosed leopard lizards.
*Representative receptor*: blunt-nosed leopard lizard (*Gambelia sila*)
*Basis for selection*: As discussed above, the blunt-nosed leopard lizard is federally and state listed as endangered and potentially occurs in the region, but surveys at KHF found no evidence that it occurs on the facility and determined that its potential for occurrence there was low (CH2M HILL 2008). As a result of its listing status and possibility of occurrence, individuals of this species were considered to warrant inclusion as an assessment endpoint.

The blunt-nosed leopard lizard feeds mostly on insects (mainly grasshoppers, crickets, and moths) and other lizards. It appears to be an opportunistic consumer when such prey are available in a size that can be captured and swallowed (USFWS 1998). Thus, it is a predator with a diet and potential for exposure to PCBs similar to that of a small, invertivorous mammal, such as the Tulare grasshopper mouse.

#### 5.4.2.3.3 Measurement Endpoints

Measurement endpoints, also referred to as measures of exposure and measures of effect (USEPA 1998), are measurable responses or parameters that can be used to evaluate the response of an assessment endpoint to contaminant exposure. The measurement endpoints used to predict effects on each of the assessment endpoints in Step 3 generally are measured levels of dioxin-like PCB congeners in environmental media, modeled levels of dioxin-like PCB congeners in food chains, calculated exposure doses, and toxicity values from the literature. Table 5.4.1 summarizes the measurement endpoints applicable to the assessment endpoints and representative receptors for this ERA.

### 5.4.3 Exposure Assessment

Exposure assessment began with a pathway analysis based on the CSM, which identified the potentially complete exposure pathways in the study area. The study area that is the focus of the ERA includes the entire perimeter of the KHF facility, which was subdivided into seven exposure areas along the southeast, south, southwest, west, northwest, north, and northeast perimeter segments, and an area within the facility immediately southeast of the B-18 landfill. Each of these eight areas was evaluated as a separate exposure area for each receptor. Given their proximity to potential sources, these areas within the facility and along the property boundary likely provide conservative estimates of exposure. Potential environmental concentrations and ecological receptor exposures and risks are expected to decline with increasing distance from the property boundary.

The exposure pathways for all six of the representative receptors, developed with input from USEPA-IX, include ingestion of dioxin-like PCB congeners through the food chain and incidental ingestion (via feeding, grooming, and/or burrowing) of soil containing dioxin-like PCB congeners. Intakes (mass of chemical ingested per day) received by receptors via these ingestion pathways were calculated based on the measured concentrations in the multi-increment soil samples from each of the ecological exposure areas. Concentrations of dioxin-like PCB congeners detected in samples of vegetation (predominantly grasses) in each exposure area were used to estimate food chain exposures from the consumption of plant materials by herbivores in each area. Vegetation was sampled at KHF during both the spring wet season (April) and the summer dry season (August). The vegetation concentrations used in the ERA were conservatively based on the higher of the results from the two sampling events for each congener in each area.

The exposure factors identified and derived for each of the representative receptors evaluated in the ERA are provided in Table 5.4.2. The models for estimating intake and dose for the representative receptors are provided in the exposure calculation tables, Tables 5.4.3 through 5.4.20. The ecological transfer factors used in the exposure models are discussed in Section 5.4.3.1; the models for each receptor are presented in Section 5.4.3.2; exposure areas are discussed in Section 5.4.3.3; and toxicity equivalence conversions are described in Section 5.4.3.4.

#### 5.4.3.1 Ecological Transfer Factors

Ecological transfer factors are used in the exposure models to estimate the tendencies of chemicals to move between and concentrate in various ecological receptors. Transfer factors used in this ERA include bioaccumulation factors (BAFs) and biotransfer factors (BTFs). These factors are presented in Tables 5.4.3 through 5.4.20, and the footnotes of the tables document the basis/source of the transfer factors used. A BAF typically is defined as the ratio of the concentration of a chemical in the tissues of an organism to the concentration of the chemical in an environmental medium, such as soil. Given the availability of measured concentrations of dioxin-like PCB congeners in plant tissue from the study area and the uncertainty inherent in the use of soil-to-plant uptake factors, the exposure models utilized measured vegetation data from the site instead of estimated concentrations derived from soil-to-plant BAFs.

Given the lack of data on measured dioxin-like PCB concentrations in invertebrates from the study area, soil-to-invertebrate BAFs were used in calculating intakes by invertivorous receptors. Thus, for the grasshopper mouse (Tables 5.4.11 and 5.4.12) and western meadowlark (Tables 5.4.16 and 5.4.17), BAFs were used to estimate intakes from ingestion of invertebrates ($BAF_{inv}$) that have bioaccumulated PCBs from soil. The soil concentration was multiplied by the congener-specific $BAF_{inv}$ to estimate the concentration of each dioxin-like PCB congener in invertebrate tissue. The soil-to-invertebrate BAFs were calculated using a soil-to-earthworm bioaccumulation equation for nonionic organic compounds from Connell (1990): $BAF = 0.445(K_{ow})^{0.05}$, in which the BAF estimate is provided in terms of (wet weight concentration in invertebrate tissue)/(dry weight concentration in soil) and $K_{ow}$ = octanol-water partition coefficient (unitless). This model was expected to be conservative for use at the KHF study area because it was based on earthworms, which typically have the highest exposure and uptake among soil invertebrates but are unlikely to occur in the dry soils of the study area.

A BTF is defined as the ratio of a chemical concentration in animal tissue (wet weight) to the daily intake of the chemical by the animal; thus, it represents the proportional transfer of a chemical in an animal's diet to its tissues. BTFs were used in estimating tissue concentrations of dioxin-like PCBs in the prey (mice) consumed by predators (fox and owl). The concentrations of PCB congeners in the diet of a mouse were multiplied by congener-specific BTFs to estimate congener-specific concentrations in the mouse's fatty tissues, where lipophilic compounds such as PCBs tend to partition. These BTFs were calculated using an equation derived for predicting biotransfer from diet to beef fat based on chemical-specific $K_{ow}$ values:

$$\log BTF = -0.099(\log K_{ow})^2 + 1.07(\log K_{ow}) - 3.56$$

where

BTF = diet-to-fat BTF [(mg/kg fat)/(mg/day)]

This equation was developed for and has been utilized by USEPA (RTI 2005, USEPA September 2005). The BTF based on transfer to fatty tissue was multiplied by the estimated fat content of wild rodents similar to those at the site (5 percent, or 0.05 kg fat/kg body weight) to convert the BTF from a fatty tissue basis to a whole-body basis (Tables 5.4.3 through 5.4.6, 5.4.13, and 5.4.14). This fat content was based on several sources providing such data on small mammals in the wild, which have found lipid contents in small mammals of between 3 percent and 5 percent (Sovell et al. 2004, Blankenship et al. 2005). This range is based on values from a study of mice and kangaroo rats at an arid grassland/shrubland site near Pueblo, Colorado (Sovell et al. 2004), other sources cited in that study, and the Michigan study by Blankenship et al. (2005). The latter study found an average lipid content of 4.8 percent in 21 small mammals analyzed from the Michigan site (white-footed mouse, voles, and moles) and 2.9 percent in 17 shrews analyzed. In accordance with these data, a value of 5 percent, based on the upper end of the range of relevant values from these studies, was used to convert the BTF to a whole-body basis.

When evaluating exposures of the developmental stages of birds, dietary intakes by adult female birds (owl and meadowlark) were first estimated using transfer factors as described above. Then tissue concentrations in eggs (embryos) were estimated using an egg BTF based on transfer from the mother's diet to the egg. Using methodology from USEPA (September 2005), the BTF calculated for uptake into fat was multiplied by the fat content of chicken eggs to convert the transfer factor to a chicken egg BTF (Tables 5.4.18 and 5.4.19). The total intake calculated for the mother bird was multiplied by this egg BTF to estimate congener-specific concentrations within the egg.

Because uncertainty is inherent in the use of ecological transfer factors, other sources in the scientific literature of such factors for PCBs in terrestrial ecosystems were sought in order to identify the range of potential values and evaluate the conservatism of the exposure assessment. A study by Blankenship et al. (2005) of a PCB-contaminated site in a floodplain forest in Michigan provided data relevant to the estimation of food-chain transfer of PCBs in a terrestrial ecosystem. The study calculated biota-soil accumulation factors (BSAFs) by dividing total PCB concentrations (all congeners considered collectively) in soil by total PCB concentrations measured in a variety of biota, including plants, earthworms, terrestrial invertebrates other than earthworms, shrews, small mammals other than shrews, and birds and their eggs. In calculating BSAFs, the concentrations in soil typically are expressed on an organic-carbon-normalized basis, and the concentrations in tissue are expressed on a lipid-normalized basis. (This is in contrast to a BAF, in which the concentrations typically are not normalized.) The data from the Michigan study were utilized in this ERA as an alternative source of transfer factors, providing an indication of the range of values that may be employed in modeling food chain transfers and providing exposure estimates for comparison to estimates based on the BAFs and BTFs described above.

For comparison to the soil-to-invertebrate BAFs derived for individual congeners based on the equation from Connell (1990), the Michigan data (Blankenship et al. 2005) were used in this ERA to calculate BAFs for total PCBs based on non-normalized concentrations in soil and earthworms. Earthworms were found to have the highest soil-to-invertebrate BSAF for total PCBs in the Michigan study. The soil-to-earthworm BAF calculated from the Michigan data for total PCBs was 0.19 when based on non-normalized concentrations in soil and in depurated earthworms (worms that had been allowed to eliminate soil contained in their gut for 24 – 48 hours before analysis). The BAF was based on depurated earthworms because depuration, the purging of soil from the gut, reduces the effects of gut contents on results obtained when the worms are weighed and analyzed. The presence of PCBs in soil within the gut would bias estimates of PCBs accumulated in the tissues. Also, the earthworm BAF is being used to estimate bioaccumulation in the tissues of invertebrates other than earthworms (which are unlikely to occur in the arid soils of the study area), and soil ingestion by these invertebrates would be minimal compared to soil ingestion by earthworms. This soil-to-earthworm BAF was smaller than any of the congener-specific BAFs calculated using the equation from Connell (1990). Therefore, to be conservative in estimating the uptake of dioxin-like PCB congeners from soil, the food chain models for receptors that consume invertebrates used the soil-to-invertebrate BAF equation from Connell (1990) instead of the smaller soil-to-earthworm BAF calculated from the Michigan study data.

For comparison to the BTFs used in the food chain models to estimate dioxin-like PCB congener concentrations in the tissues of mice consumed by predators (fox and owl), the Michigan data also were used in this ERA to calculate BAFs for total PCBs based on non-normalized concentrations in soil and shrews. Shrews have a great potential for exposure relative to other terrestrial mammals due mainly to their relatively high food ingestion rate and relatively small home range (Blankenship et al. 2005). At the Michigan site, Blankenship et al. (2005) found that shrews tended to have concentrations of total PCBs in their tissues that were approximately 10 times higher than in other small mammals they analyzed (white-footed mice, voles, and moles). The BSAF calculated for soil-to-shrew transfer of total PCBs was 0.35, versus a BSAF of 0.018 for transfer from soil to the tissues of small mammals other than shrews (Blankenship et al. 2005). Therefore, use of the mean of total PCB concentrations in shrews at the Michigan site to calculate a soil-to-shrew BAF was expected to result in a conservative BAF, particularly when applied to small mammals other than shrews.

As discussed in Section 5.4.3.2, kit fox exposures were calculated separately based on diets assumed to consist entirely of herbivorous prey (pocket mice) and entirely of carnivorous prey (grasshopper mice) in order to ensure that risks to individual foxes based on differences in dietary composition were accounted for. Exposures of foxes assumed to feed entirely on herbivorous prey were expected to be lower based on the finding by Blankenship et al. (2005) that uptake of PCBs by plants (as indicated by BSAFs) was lower than uptake by invertebrates and shrews. Therefore, exposures of foxes assumed to feed entirely on carnivorous prey were expected to provide the most conservative exposure scenario.

Exposure estimates for this carnivorous-prey scenario potentially could vary substantially based on the transfer factors employed to estimate concentrations in carnivorous prey. In order to ensure that risks to individual foxes were not underestimated due to the transfer-factor methodology used in the food chain model, both the BTF approach and a BAF approach were used to calculate exposures for foxes consuming carnivorous prey. In the BTF approach (Tables 5.4.5 and 5.4.6), congener-specific, soil-to-invertebrate BAFs were used to calculate concentrations of dioxin-like PCB congeners in invertebrates composing the diet of grasshopper mice, then the mouse's intake was multiplied by a congener-specific BTF to calculate congener tissue concentrations in the mice consumed by the fox. In the BAF approach (Tables 5.4.7 and 5.4.8), congener-specific concentrations in soil were multiplied by the soil-to-shrew BAF (0.20), based on total PCBs from the Michigan study by Blankenship et al. (2005), to calculate congener tissue concentrations in the mice consumed by the fox.

As discussed in Section 5.4.3.1, a range of burrowing owl exposures also was evaluated based on extremes in dietary composition. As for the fox, the highest potential exposures were expected to be experienced by an owl consuming entirely carnivorous prey. To evaluate the upper limit of potential exposures for the owl, exposure was calculated for a female owl feeding on grasshopper mice. Because the highest exposures under this scenario for the fox were calculated using the BAF approach, this more-conservative approach also was used for the burrowing owl (Table 5.4.15).

For comparison to the BTF approach described above for estimating TECs in bird eggs, an alternative approach based on BAFs also was used (Table 5.4.20). The Michigan data (Blankenship et al. 2005) were used in this ERA to calculate soil-to-egg BAFs for total PCBs based on non-normalized concentrations in soil and bird eggs. Eggs from four bird species (house wren, bluebird, robin, great horned owl) were analyzed for total PCBs by Blankenship et al (2005). House wren eggs had the highest BSAF, so the arithmetic mean concentration from 21 wren eggs (8.23 mg/kg) was divided by the mean soil concentration (6.53 mg/kg) to calculate a conservative soil-to-egg BAF of 1.26. Congener-specific soil concentrations were multiplied by this BAF to estimate congener concentrations in bird eggs (Table 5.4.20). These concentrations were not affected by species-specific exposure factors and, thus, were used in comparisons based on BTF-derived egg concentrations for both the burrowing owl and meadowlark.

#### 5.4.3.2 Models for Estimating Intake and Dose

The exposures experienced by the representative receptors were estimated by calculating a daily exposure dose of each detected dioxin-like PCB congener based on each receptor's body weight and chemical intake (mass of chemical ingested per day). This is shown in the following equation, in which the mass of dioxin-like PCB congeners is expressed in nanograms (ng):

Exposure dose (ng/kg/day) = intake (ng/day) / body weight (kg)

Species-specific exposure models were used to calculate intakes by estimating the uptake and transfer of dioxin-like PCB congeners through the food chain as well as the incidental ingestion of dioxin-like PCB congeners in soil. The models utilized a variety of ecological transfer factors, as described above. To evaluate the potential exposures of some receptors, multiple exposure models utilizing different dietary assumptions and types of transfer factors were utilized.

For example, one of the assessment endpoints is the survival and reproduction of individual San Joaquin kit foxes, as this subspecies is federally listed as endangered. In order to be conservative in protecting individual foxes within the local population, several exposure scenarios were evaluated. Thus, exposures were evaluated separately for adults and juveniles. In addition, exposures were evaluated separately based on potential extremes of dietary composition. Foxes may consume prey that are either herbivorous or carnivorous. The diet of a fox's prey could have a substantial effect on the food chain exposure of the fox if the dioxin-like PCB congeners are transferred and bioaccumulated differently by herbivorous and carnivorous prey. Thus, a fox feeding predominantly on herbivorous pocket mice could have a different exposure than a fox feeding predominantly on carnivorous grasshopper mice. To ensure that risks to individual foxes based on differences in dietary composition were accounted for, kit fox exposures were calculated separately based on diets assumed to consist entirely of herbivorous prey (Tables 5.4.3 and 5.4.4) and entirely of carnivorous prey (Tables 5.4.5 through 5.4.8).

Avian predators, such as the burrowing owl, also could experience a range of exposures based on extremes of dietary composition. The most likely exposure scenario for the owl is a diet composed predominantly of herbivorous prey (Tables 5.4.13 and 5.4.14), and the exposure model for this scenario is lower in uncertainty because it is based on measured concentrations in vegetation. However, evaluation of multiple exposure scenarios for the kit fox indicated that the highest potential exposures could be experienced by a fox consuming a diet composed entirely of carnivorous prey. Therefore, to evaluate the upper limit of potential exposures for the owl, exposure also was calculated (Table 5.4.15) for a female owl feeding on carnivorous grasshopper mice (as discussed below, the female owl has a marginally greater potential for exposure than the male).

The exposure factors used in calculating intake and dose and the basis for their selection or derivation are provided in Table 5.4.2. The exposure factors generally were selected or derived to be realistic, receptor-specific estimates of such parameters as body weight, food ingestion rate, dietary composition, and soil ingestion rate. Values for receptor-specific exposure factors such as body weight, dietary composition, and feeding rate were obtained when possible from studies that measured and reported such data for the receptor species or very similar species. In the absence of such data on food ingestion rates for the receptor species, allometric equations were used to calculate food ingestion rates based on body weight, field metabolic rate, and the metabolizable energy content of foods consumed by the species (Table 5.4.2). Information on amounts of soil incidentally ingested as a percentage of diet is available for a limited number of species in USEPA (1993) and Beyer et al. (1994). This information was used to estimate for the receptor species the intake of soil contaminants via ingestion of soil in conjunction with feeding, burrowing, and grooming activities.

Exposure factors were developed based on a range of body sizes for each receptor species in order to allow intakes to be calculated that encompass a range of potential exposures. For the mammalian receptors, the ranges of body weights and associated ingestion rates were based on adult and estimated juvenile body weights. For the avian receptors, these ranges were based on adult male and adult female/juvenile body weights, as the birds are sexually dimorphic and juveniles were assumed to be similar in size to adult females.

The exposure model equations for each of the receptors are provided below and in the footnotes of the exposure calculation tables (Tables 5.4.3 through 5.4.20). The values for the exposure factors used in the models also are included below and in the table footnotes; their basis is provided in Table 5.4.2.

**<u>San Joaquin Kit Fox</u>**

Multiple exposure models were utilized for the kit fox to account for variations in exposure estimates that could result from differences in body size (adult vs. juvenile), dietary composition (herbivorous prey vs. carnivorous prey), and methods for estimating food-chain transfers of PCB congeners to prey (see Section 5.4.3.1).

<u>Exposure Model for Kit Fox Consuming Herbivorous Prey</u>

Exposure dose to fox = [(intake from food + intake from incidental soil ingestion)] / body weight

where:

intake from food = intake through the food chain from consuming small mammals that feed on plants

The equation for this calculation (used in Tables 5.4.3 and 5.4.4) is:

$$ED_{fox} = \{[((C_{plant} \text{ x } CF_{dw} \text{ x } FIR_{mouse}) + (C_{soil} \text{ x } SIR_{mouse})) \text{ x } BTF_{mouse} \text{ x } FIR_{fox}] + (C_{soil} \text{ x } SIR_{fox})\} \text{ x } (1/BW_{fox}) \text{ x } AFF$$

where:

$ED_{fox}$ = exposure dose to the kit fox (ng/kg BW-day)

$C_{plant}$ = concentration in plants (ng/kg)

$CF_{dw}$ = dry-to-wet-weight (wt) conversion factor for plants (see note below)

$C_{soil}$ = concentration in soil (ng/kg)

$FIR_{mouse}$ = food ingestion rate of mouse (0.00089 kg/day for pocket mouse)

$FIR_{fox}$ = food ingestion rate of fox (0.12 kg/day wet wt)

$BTF_{mouse}$ = biotransfer factor from mouse diet to tissue of mouse (day/kg, see note below)

$SIR_{mouse}$ = soil ingestion rate of mouse (0.000018 kg/day for pocket mouse)

$SIR_{fox}$ = soil ingestion rate of fox (0.001 kg/day dry wt)

$BW_{fox}$ = body weight of fox (2 kg for adult, 1.2 kg for juvenile)

AFF = area foraging factor (see Section 5.4.3.3) = 1 (unitless)

Notes:

The $CF_{dw}$ is a dry-to-wet-weight conversion factor (unitless) for plants, used to convert concentrations in plants from a dry-weight to a wet-weight basis. It is based on the percent moisture measured in the vegetation from each exposure area. A mean was calculated for the percent moisture in the April and August vegetation samples from each area: southeast (11.3%), south (12.4%), southwest (17.6%), west (8.3%), northwest (17.3%), north (14.3%), northeast (17.7%), and B-18 landfill (18%). The quantity (1- fraction moisture) is the $CF_{dw}$ for each area: southeast (0.887), south (0.876), southwest (0.824), west (0.917), northwest (0.827), north (0.857), northeast (0.823), and B-18 landfill (0.82).

The $BTF_{mouse}$ (biotransfer factor from diet to tissue of mouse or other small mammal eaten by a predator) was calculated using a diet-to-fat transfer equation from RTI (2005): Log BTF = $-0.099(\log Kow)^2 + 1.07(\log Kow) - 3.56$. The equation output in (mg/kg fat)/(mg/day) was multiplied by the estimated fat content of wild rodents similar to those at the site (5%, or 0.05 kg fat/kg BW) to convert the transfer factor from a fatty tissue basis to a whole body basis. As discussed in Section 5.4.3.1, the estimated fat content of rodents at the site was based on the upper end of the range of such values from a study of mice and kangaroo rats at an arid site in Colorado (Sovell et al. 2004), other sources cited by Sovell et al. (2004), and Blankenship et al. (2005). See Section 5.4.3.1 for additional information on BTFs.

Exposure Model for Kit Fox Consuming Carnivorous Prey

Exposure dose to fox = [(intake from food + intake from incidental soil ingestion)] / body weight

where:

intake from food = intake through the food chain from consuming small mammals that feed on invertebrates

The equation for this calculation using an approach based on a mouse BTF (used in Tables 5.4.5 and 5.4.6) is:

$$ED_{fox} = \{[((C_{inv} \times FIR_{mouse}) + (C_{soil} \times SIR_{mouse})) \times BTF_{mouse} \times FIR_{fox}] + (C_{soil} \times SIR_{fox})\} \times (1/BW_{fox}) \times AFF$$

where:

$ED_{fox}$ = exposure dose to the kit fox (ng/kg BW-day)

$C_{inv}$ = concentration in invertebrates consumed by grasshopper mouse (ng/kg)

= $C_{soil}$ x $BAF_{inv}$

$C_{soil}$ = concentration in soil (ng/kg)

$BAF_{inv}$ = soil-to-invertebrate bioaccumulation factor (see note below)

$FIR_{mouse}$ = food ingestion rate of mouse (0.0029 kg/day for grasshopper mouse)

$FIR_{fox}$ = food ingestion rate of fox (0.12 kg/day wet wt)

$BTF_{mouse}$ = biotransfer factor from mouse diet to tissue of mouse (day/kg, see note above)

$SIR_{mouse}$ = soil ingestion rate of mouse (0.00002 kg/day for grasshopper mouse)

$SIR_{fox}$ = soil ingestion rate of fox (0.001 kg/day dry wt)

$BW_{fox}$ = body weight of fox (2 kg for adult, 1.2 kg for juvenile)

AFF = area foraging factor (see Section 5.4.3.3) = 1 (unitless)

Note:

The $BAF_{inv}$ was calculated using a soil-to-earthworm bioaccumulation equation for nonionic organic compounds obtained from Connell (1990): $BAF = 0.445(Kow)^{0.05}$, where Kow is the octanol-water partition coefficient. Congener-specific Kow values were used. The BAF provided by the equation is in units of (invertebrate tissue wet wt concentration)/(soil dry wt concentration). See Section 5.4.3.1 for additional information on BAFs.

The equation for this calculation using an approach based on a mouse BAF (used in Tables 5.4.7 and 5.4.8) is:

$$ED_{fox} = [(C_{soil} \times BAF_{mouse} \times FIR_{fox}) + (C_{soil} \times SIR_{fox})] \times (1/BW_{fox}) \times AFF$$

where:

$ED_{fox}$ = exposure dose to the kit fox (ng/kg BW-day)

$C_{soil}$ = concentration in soil (ng/kg)

$BAF_{mouse}$ = soil-to-prey-tissue bioaccumulation factor (see note below)

$FIR_{fox}$ = food ingestion rate of fox (0.12 kg/day wet wt)

$SIR_{fox}$ = soil ingestion rate of fox (0.001 kg/day dry wt)

$BW_{fox}$ = body weight of fox (2 kg for adult, 1.2 kg for juvenile)

AFF = area foraging factor (see Section 5.4.3.3) = 1 (unitless)

Note:

The $BAF_{mouse}$ used in this model was derived from a study by Blankenship et al. (2005) in which co-located soil and wildlife tissue samples were analyzed for PCBs at a forested site in a Michigan floodplain. In the study, total PCB concentrations in tissue were divided by total PCB concentrations in soil to calculate biota-soil accumulation factors (BSAFs) for a variety of wildlife. Shrews were found to have the highest BSAF among small mammals. Using data from the study, the total PCB concentrations in shrew tissue (1.31 mg/kg) and in soil (6.53 mg/kg) were used to calculate a BAF of 0.20 that is based on total PCBs and is not congener-specific. Although based on shrews, this BAF was used to estimate tissue concentrations in the grasshopper mice assumed to be consumed by kit foxes. See Section 5.4.3.1 for additional information on BAFs and BSAFs.

**<u>San Joaquin Pocket Mouse</u>**

Two exposure models were utilized for the herbivorous pocket mouse to account for variations in exposure estimates that could result from differences in body size (adult vs. juvenile). Both models used the following equations:

Exposure dose to mouse = [(intake from food + intake from incidental soil ingestion)] / body weight

where:

intake from food = intake from consuming plants

The equation for this calculation (used in Tables 5.4.9 and 5.4.10) is:

$$ED_{mouse} = [(C_{plant} \times CF_{dw} \times FIR_{mouse}) + (C_{soil} \times SIR_{mouse})] \times (1/BW_{mouse}) \times AFF$$

where:

$ED_{mouse}$ = exposure dose to the San Joaquin pocket mouse (ng/kg BW-day)

$C_{plant}$ = concentration in plants (ng/kg)

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants (see note above for fox)

$C_{soil}$ = concentration in soil (ng/kg)

$FIR_{mouse}$ = food ingestion rate of pocket mouse (0.00089 kg/day for adult, 0.00052 kg/day for juvenile)

$SIR_{mouse}$ = soil ingestion rate of pocket mouse (0.000018 kg/day for adult, 0.000011 kg/day for juvenile)

$BW_{mouse}$ = body weight of pocket mouse (0.012 kg for adult, 0.007 kg for juvenile)

AFF = area foraging factor (see Section 5.4.3.3) = 1 (unitless)

**Tulare Grasshopper Mouse**

Two exposure models were utilized for the carnivorous grasshopper mouse to account for variations in exposure estimates that could result from differences in body size (adult vs. juvenile). Both models used the following equations:

Exposure dose to mouse = [(intake from food + intake from incidental soil ingestion)] / body weight

where:

intake from food = intake from consuming invertebrates

The equation for this calculation (used in Tables 5.4.11 and 5.4.12) is:

$$ED_{mouse} = [(C_{soil} \times BAF_{inv} \times FIR_{mouse}) + (C_{soil} \times SIR_{mouse})] \times (1/BW_{mouse}) \times AFF$$

where:

$ED_{mouse}$ = exposure dose to the grasshopper mouse (ng/kg BW-day)

$C_{soil}$ = concentration in soil (ng/kg)

$BAF_{inv}$ = bioaccumulation factor from soil to invertebrates [(ng/kg wet tissue)/(ng/kg dry soil)]

$FIR_{mouse}$ = food ingestion rate of grasshopper mouse (0.0029 kg/day for adult, 0.0015 kg/day for juvenile)

$SIR_{mouse}$ = soil ingestion rate of grasshopper mouse (0.00002 kg/day for adult, 0.00001 kg/day for juvenile)

$BW_{mouse}$ = body weight of pocket mouse (0.04 kg for adult, 0.02 kg for juvenile)

AFF = area foraging factor (see Section 5.4.3.3) = 1 (unitless)

**Burrowing Owl**

Multiple exposure models were utilized for the burrowing owl to account for variations in exposure estimates that could result from differences in body size (male vs. female), dietary composition (herbivorous prey vs. carnivorous prey), and methods for estimating food-chain transfers to prey (see Section 5.4.3.2).

Exposure Model for Burrowing Owl Consuming Herbivorous Prey

Exposure dose to owl = [(intake from food + intake from incidental soil ingestion)] / body weight

where:

intake from food = intake through the food chain from consuming small mammals that feed on plants

The equation for this calculation (used in Tables 5.4.13 and 5.4.14) is:

$$ED_{owl} = \{[((C_{plants} \times CF_{dw} \times FIR_{mouse}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{owl}] + (C_{soil} \times SIR_{owl})\} \times (1/BW_{owl}) \times AFF$$

where:

$ED_{owl}$ = exposure dose to the burrowing owl (ng/kg BW-day)

$C_{plants}$ = concentration in plants (ng/kg)

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants (see note above for fox)

$C_{soil}$ = concentration in soil (ng/kg)

$FIR_{mouse}$ = food ingestion rate of mouse (0.00089 kg/day for pocket mouse)

$FIR_{owl}$ = food ingestion rate of owl (0.066 kg/day wet wt for male, 0.052 kg/day for female/juvenile)

BTF = biotransfer factor from mouse diet to tissue of mouse (day/kg, see note above for fox)

$SIR_{mouse}$ = soil ingestion rate of mouse (0.000018 kg/day for pocket mouse)

$SIR_{owl}$ = soil ingestion rate of owl (0.0004 kg/day dry wt for male, 0.0003 kg/day for female/juvenile)

$BW_{owl}$ = body weight of owl (0.172 kg for male, 0.126 kg for female/juvenile)

AFF = area foraging factor (see Section 5.4.3.3) = 1 (unitless)

Exposure Model for Burrowing Owl Consuming Carnivorous Prey

Only the more conservative model – using the BAF approach for estimating food chain transfer from soil to prey – was used to calculate exposure for the burrowing owl assumed to feed entirely on carnivorous prey.

Exposure dose to owl = [(intake from food + intake from incidental soil ingestion)] / body weight

where:

intake from food = intake through the food chain from consuming small mammals that feed on invertebrates

The equation for this calculation using the BAF approach (used in Table 5.4.15) is:

$$ED_{fox} = [(C_{soil} \text{ x } BAF_{mouse} \text{ x } FIR_{owl}) + (C_{soil} \text{ x } SIR_{owl})] \text{ x } (1/BW_{owl}) \text{ x } AFF$$

where:

$ED_{owl}$ = exposure dose to the burrowing owl (ng/kg BW-day)

$C_{soil}$ = concentration in soil (ng/kg)

$BAF_{mouse}$ = soil-to-prey-tissue bioaccumulation factor (see note above for fox)

$FIR_{owl}$ = food ingestion rate of owl (0.066 kg/day wet wt for male, 0.052 kg/day for female/juvenile)

$SIR_{owl}$ = soil ingestion rate of owl (0.0004 kg/day dry wt for male, 0.0003 kg/day for female/juvenile)

$BW_{owl}$ = body weight of owl (0.172 kg for male, 0.126 kg for female/juvenile)

AFF = area foraging factor (see Section 5.4.3.3) = 1 (unitless)

Note:

Comparison of the TEDs calculated for male and female burrowing owls consuming herbivorous prey (Tables 5.4.13 and 5.4.14) showed that the differences between the sexes in exposure factor values ($FIR_{owl}$, $SIR_{owl}$, and $BW_{owl}$) produced only minimal differences in TEDs, with the TEDs for the female/juvenile being slightly larger than for the male. Therefore, the calculation of TEDs for a burrowing owl consuming carnivorous prey was performed only for the female/juvenile, as this is the marginally more exposed receptor and a risk estimation based on the female/juvenile would be protective of the male.

**Western Meadowlark**

Two exposure models were utilized for the omnivorous meadowlark to account for variations in exposure estimates that could result from differences in body size (adult male vs. female/juvenile). Both models used the following equations:

Exposure dose to meadowlark = [(intake from food + intake from incidental soil ingestion)] / body weight

where:

intake from food = intake from consuming plants + intake from consuming invertebrates

The equation for this calculation (used in Tables 5.4.16 and 5.4.17) is:

$$ED_{lark} = [(C_{soil} \text{ x } BAF_{inv} \text{ x } FIR_{inv}) + (C_{plant} \text{ x } CF_{dw} \text{ x } FIR_{plant}) + (C_{soil} \text{ x } SIR_{lark})] \text{ x } (1/BW_{lark}) \text{ x } AFF$$

where:

$ED_{lark}$ = exposure dose to the western meadowlark (ng/kg BW-day)

$C_{soil}$ = concentration in soil (ng/kg)

$BAF_{inv}$ = bioaccumulation factor from soil to invertebrates (see note above for fox)

$FIR_{inv}$ = food ingestion rate (invertebrates) of meadowlark (0.026 kg/day wet wt for male, 0.021 kg/day for female/juvenile)

$C_{plant}$ = concentration in plants (ng/kg)

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants (see note above for fox)

| | | |
|---|---|---|
| $FIR_{plant}$ | = | food ingestion rate (plant material) of meadowlark (0.0049 kg/day wet wt for male, 0.0040 kg/day for female/juvenile) |
| $SIR_{lark}$ | = | soil ingestion rate of meadowlark (0.0015 kg/day dry wt for male, 0.0012 kg/day for female/juvenile) |
| $BW_{lark}$ | = | body weight of meadowlark (0.112 kg for male, 0.0894 kg for female/juvenile) |
| AFF | = | area foraging factor (see Section 5.4.3.3) = 1 (unitless) |

**Eggs of Burrowing Owl and Western Meadowlark**

Evaluation of the potential exposures of avian embryos was based on the calculation of dioxin-like PCB congener concentrations within the eggs. Dietary intakes by the adult, female birds (owl and meadowlark) were estimated as described above. Then tissue concentrations in eggs were estimated using two approaches as described above in Section 5.4.3.1: an egg BTF based on transfer from the mother's diet to the egg, and a soil-to egg BAF. The total intake calculated for the mother bird was multiplied by the egg BTF to estimate congener-specific concentrations within the egg of the owl and meadowlark (Tables 5.4.18, and 5.4.19). In addition, the soil concentration of each congener was multiplied by the soil-to-egg BAF to estimate concentrations within the egg of both species (Table 5.4.20).

**Blunt-Nosed Leopard Lizard**

Exposure factors for the blunt-nosed leopard lizard that were available from the literature or could be derived are shown in Table 5.4.2. A field metabolic rate (FMR) for the southern alligator lizard (*Gerrhonotus multicarinatus*), another invertivorous lizard of similar size that occurs in California, was obtained from Nagy et al. (1999) and used in estimating the food ingestion rate of the blunt-nosed leopard lizard. The alligator lizard FMR of 2.0 kilojoules per day (kJ/day) was divided by the metabolizable energy (ME) of the diet of reptile insectivores of 18.0 kJ/g dry weight (Nagy et al. 1999) to calculate a food ingestion rate (FIR) of 0.00011 kg/day on a dry weight basis. Dividing this FIR by the dry weight fraction of invertebrates (0.35 kg dry matter/kg wet matter) yields an FIR of 0.00031 kg/day on a wet weight basis. For comparison, the invertivorous Tulare grasshopper mouse of similar body weight has an estimated FIR of 0.0015 to 0.003 kg/day wet weight (Table 5.4.2). Thus, the dietary exposure of the mouse would be approximately 5 to 10 times higher than the exposure of the lizard. Because reptile TEFs and toxicity values are not available for quantitative assessment of risk to the lizard, an exposure model could not be used to calculate exposure doses of dioxin-like PCB congeners for the blunt-nosed leopard lizard.

#### 5.4.3.3 Exposure Areas

As shown in the equations above, an AFF can be used in the exposure equation to adjust (reduce) the exposure dose based on the degree to which areas of contamination and areas of potential receptor exposure coincide. An AFF can be used to modify estimated exposures based on the expected proportional use of an area by a receptor. This factor typically is calculated by dividing the exposure area by the receptor's home range, or another metric representing the area in which the receptor mainly would forage and be exposed. The AFF cannot exceed a value of 1.0; therefore, if the exposure area is larger than the receptor's home range, the AFF is given a value of 1.0 so that it will not reduce the calculated exposure.

Acreages of the exposure areas were estimated for comparison to receptor home ranges. Acreages of the perimeter areas were estimated based on the length of each of the facility perimeter segments sampled and an assumed contaminated corridor width of about 500 ft, resulting in an exposure area of approximately 70 acres for each segment. The sampling points within the B-18 landfill area were estimated to be contained within approximately 20 acres. As shown in Table 5.4.2, the home ranges of all receptors quantitatively evaluated in the ERA except the kit fox range from approximately 1 acre to 17 acres. As a result, the AFF for each of these receptors would be 1.0 for each exposure area. Because the San Joaquin kit fox is an endangered species and each individual in the local population is of concern, its home range was estimated conservatively based on a study of this subspecies in the southern San Joaquin valley (Koopman et al. 2001). This study identified core areas of greatest activity for adults (238 acres) and juveniles (91 acres) within home ranges. However, to be very conservative and protective of all individual foxes, the AFF for the kit fox was assumed to be 1.0 for each of the exposure areas.

Thus, AFFs were not used in this ERA to reduce exposure estimates for any of the ecological receptors in any of the exposure areas.

#### 5.4.3.4 Toxicity Equivalence Conversions

As discussed in Section 5.4.4, the toxicity of dioxin-like PCBs is evaluated based on their toxicity relative to 2,3,7,8-TCDD. Therefore, as part of the exposure assessment, the exposure doses calculated using the equations provided above based on congener-specific concentrations were multiplied in Tables 5.4.3 through 5.4.17 by the appropriate avian or mammalian toxicity equivalence factors (TEFs) to convert them to toxicity equivalence doses (TEDs). The TEDs were summed to obtain a total TED for each exposure area, which subsequently could be compared to toxic effects levels based on 2,3,7,8-TCDD. These TED calculations are summarized in the following equations:

Congener-specific TED (ng/kg/day) = congener-specific exposure dose x TEF

Exposure-area total TED (ng/kg/day) = sum of congener-specific TEDs by area

In evaluating bird eggs/embryos, the calculated congener-specific concentrations in the egg were multiplied in Tables 5.4.18, 5.4.19, and 5.4.20 by the appropriate avian TEFs to convert them to toxicity equivalence concentrations (TECs) in the egg. The TECs then were summed to obtain a total TEC in the egg for each exposure area, which subsequently could be compared to toxic effects levels for avian embryos based on 2,3,7,8-TCDD concentrations.

### 5.4.4 Toxicity Assessment

Toxicity assessment identifies toxic effect levels relevant to the representative receptors for the dioxin-like PCB congeners detected at the site. Assessment of the potential for the dioxin-like PCB congeners to cause toxicity in birds and mammals was based on the toxicity equivalence methodology adopted by USEPA (USEPA June 2008). This methodology is based on the relative potency of each of the PCB congeners in comparison to the toxicity of 2,3,7,8-TCDD. It involves the use of TEFs that are numerical estimates of the potency of individual dioxin-like PCB congeners relative to 2,3,7,8-TCDD. The TEFs for the 12 dioxin-like PCB congeners for mammals and birds were obtained from Table 2 of the *Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment* (USEPA June 2008).

As described in Section 5.4.3, an exposure dose is multiplied by a congener-specific TEF to calculate a TED, or a congener concentration is multiplied by a TEF to calculate a TEC. TEDs and TECs should be based on concentrations in the tissues of organisms or in their diet (e.g., prey tissue concentrations) rather than in abiotic media, such as soil (USEPA June 2008). Therefore, food chain modeling was used as described above to estimate dioxin-like PCB congener exposure doses and egg concentrations, which then were multiplied by TEFs to calculate TEDs and egg TECs.

The TEFs for mammals were developed based on studies using administered dose (USEPA June 2008); hence, congener exposure doses in the diet of mammalian receptors were estimated prior to multiplication by mammalian TEFs to calculate mammalian TEDs, as described in Section 5.4.3. The TEDs for all the dioxin-like PCB congeners were summed for each exposure area to obtain a total congener TED for each area for each receptor. The total TEDs could then be compared to toxicity reference values (TRVs) based on administered doses of 2,3,7,8-TCDD in the diets of test animals.

In contrast to mammals, the TEFs for birds were developed based on studies of the concentrations of dioxin-like PCB congeners within the tissues of birds, principally embryo concentrations from administered doses in egg injection studies (USEPA June 2008). It would be preferable to utilize avian TRVs based on tissue concentrations so that the exposure and effects assessment are consistent. However, avian TRVs based on tissue residues of dioxin-like PCB congeners or 2,3,7,8-TCDD in adult birds were not identified. Therefore, avian TRVs based on administered doses of 2,3,7,8-TCDD in diet were used. Site-specific exposure doses of dioxin-like PCB congeners ingested in the diet were estimated for the avian receptors, these doses were multiplied by avian TEFs to calculate avian TEDs, and the total TEDs per exposure area were compared to the avian TRVs.

In addition to the evaluation of avian toxicity based on dietary exposure of adults and juveniles, tissue concentrations in eggs (embryos) were modeled because developmental and lethal effects on embryos are the most common test endpoints for effects of dioxin-like chemicals on birds and appear to be the most important and sensitive effects of such chemicals (USEPA 2003). Therefore, congener concentrations in eggs/embryos were estimated prior to multiplication by avian TEFs to calculate egg TECs (Tables 5.4.18, 5.4.19, and 5.4.20). The egg TECs could then be compared to avian TRVs based on egg concentrations of dioxin-like compounds.

The toxicity equivalence methodology requires the identification and use of TRVs for 2,3,7,8-TCDD that are as relevant as possible to the receptors being evaluated. In accordance with guidance from the USEPA-IX Biological Technical Assistance Group (BTAG), TRVs for 2,3,7,8-TCDD that are representative of both no-effect levels (TRV-Low) and mid-range adverse effect levels (TRV-High) were identified for each receptor (California DTSC 2000). TRVs based on administered dose are expressed as the amount of chemical ingested per unit body weight (BW) per day. TRVs based on body burden (for bird embryos) are expressed as the concentration of chemical in tissue. TRV concentrations were converted as necessary from the units reported in the studies on which they were based to units consistent with those used in this ERA. Thus, units of micrograms per kilogram (μg/kg) were converted to units of nanograms per kilogram (ng/kg) by multiplying by 1000. Units of ng/kg are equivalent to picograms per gram (pg/g), the units reported by the laboratory. Units based on kilograms are more convenient for performing calculations in the ERA; therefore, units of ng/kg were the standard units used in the ERA.

Toxicity effects of most concern are those that can impact populations or higher levels of ecological organization, such as effects on reproduction, development, and survival (USEPA, June 1997). Therefore, no-observed-adverse-effect levels (NOAELs) and lowest-observed-adverse-effect levels (LOAELs) from studies in which these effects were the study endpoints were preferred.

The mammalian and avian TRVs based on administered doses of 2,3,7,8-TCDD and utilized in the risk calculations are shown in Tables 5.4.21 through 5.4.25. The mammalian TRVs used in toxicity assessment were 1 ng/kg BW-day (TRV-Low) and 10 ng/kg BW-day (TRV-High), which were based on a NOAEL and a LOAEL for reproductive effects from a chronic study in the rat (USEPA 1999; Sample et al. 1996). The avian dietary TRVs used were 10 ng/kg BW-day (TRV-Low) and 100 ng/kg BW-day (TRV-High), which were based on a NOAEL and LOAEL for reproductive effects from a chronic study in the ring-necked pheasant (USEPA 1999; Sample et al. 1996). The TRVs provided in Sample et al. (1996) and used in USEPA (1999) were derived based on the critical study approach, wherein the authors reviewed and evaluated toxicity studies, identified a critical study for each chemical for both mammals and birds, and applied uncertainty factors as necessary to derive TRVs.

The avian TRVs based on concentrations of dioxin-like compounds (dioxins, furans, and PCBs) in eggs and utilized in the risk calculations are shown in Table 5.4.26. The avian embryo TRVs (μg/kg egg) were selected from the NOAELs and LOAELs for embryo developmental impairment or mortality in laboratory studies of a variety of birds provided in Tables 2-2 and 3-1, respectively, of USEPA (2003). The avian embryo TRVs used were 66 ng/kg egg (TRV-Low) and 150 ng/kg egg (TRV-High), which were based on a NOAEL and LOAEL for developmental impairment derived from the results of 28 laboratory studies of dioxin-like compounds in the chicken (USEPA 2003). The chicken was found to be the most sensitive to developmental toxicity from PCBs of the 11 avian species tested (USEPA 2003), so these TRVs are likely to be conservative and protective of avian receptors at the site.

TRVs directly applicable to lizards or other reptiles for dioxin-like PCBs or 2,3,7,8-TCDD were not available in the literature for use in evaluating toxicity to the blunt-nosed leopard lizard. Data demonstrating dioxin-like effects in reptiles (and amphibians) are extremely limited. Effects that have been observed have occurred at relatively high concentrations, indicating that reptiles and amphibians are relatively insensitive to dioxin-like compounds (USEPA June 2008). There is no indication that the blunt-nosed leopard lizard may be more sensitive to the toxic effects of these compounds than are the birds and mammals evaluated in this ERA. Therefore, the avian and mammalian TRVs discussed above are likely to be conservative when used as surrogate TRVs for evaluating the potential for toxic effects on the blunt-nosed leopard lizard.

### 5.4.5 Risk Characterization

In this section, the risks posed to the ecological assessment endpoints by the chemicals of potential ecological concern (COPECs) at the KHF site (dioxin-like PCB congeners) are characterized. The Risk Characterization, as described in ERAGS (USEPA June 1997), typically includes there three main components. The ecological risks are evaluated based principally on the results of the Risk Estimation, in which hazard quotients (HQs) are calculated for the representative receptors (i.e., the San Joaquin kit fox, San Joaquin pocket mouse, burrowing owl, and western meadowlark). The likelihood and ecological significance of any estimated risks above a threshold level of concern are discussed in the Risk Description, and determinations are made regarding the need to designate any of the preliminary COPECs as final COPECs. The Uncertainty discussion describes the sources of uncertainty associated with the ERA.

#### 5.4.5.1 Risk Estimation and Description

In Risk Estimation, the exposure doses calculated in Section 5.4.3 were used in conjunction with the conservative and alternative TRVs identified in Section 5.4.4 to calculate a range of HQs for each analyte and receptor (Tables 5.4.21 through 5.4.26). The risks posed to the assessment endpoints by the PCB congeners detected in the exposure areas at the site (the preliminary COPECs) were estimated based on the HQs calculated for the representative receptors.
As described above, the combination of two exposure dose estimates and two TRVs for each receptor (e.g., adult and juvenile, or adult male and adult female/juvenile) resulted in the calculation of four HQs that provide an estimate of the range of potential risks posed to each

receptor in each exposure area (California DTSC 2000). For example, the HQs calculated for the kit fox in each exposure area were the following:

- $HQ_{low}$ - adult = adult intake / TRV-Low
- $HQ_{low}$ -juvenile = juvenile intake / TRV-Low
- $HQ_{high}$ -adult = adult intake / TRV-High
- $HQ_{high}$ -juvenile = juvenile intake / TRV-High

For avian receptors, in addition to dietary TRVs, TRVs based on tissue concentrations in eggs/embryos were used to assess this sensitive life stage. The TECs calculated for eggs in each exposure area using both the BTF approach and the BAF approach were divided by a TRV-Low and a TRV-High based on egg concentrations of dioxin-like compounds to calculate two egg/embryo HQs for each representative avian receptor in each exposure area (Table 5.4.26).

The ecological risk assessment results were evaluated relative to an HQ threshold level of concern of 1.0. The Workplan (Wenck April 2009) described the specific decision rules to be used in interpreting the range of HQs. These rules and their rationale were the following: If none of the HQs equal or exceed 1.0, adverse ecological effects due to dioxin-like PCB congeners would not be expected to occur in the evaluated exposure areas. Potential ecological risks would be even lower beyond the facility boundary, because site-related PCB congener concentrations would be expected to decrease with increasing distance from the facility. A combination of an $HQ_{low}$ -juvenile greater than or equal to 1.0 with an $HQ_{low}$ -adult less than 1.0 or an $HQ_{low}$ -adult greater than or equal to 1.0 with an $HQ_{low}$ -juvenile less than 1.0 would indicate the need for further evaluation of the ecological significance of the potential effects. For example, additional lines of evidence available for characterizing risk would be considered in determining the potential for significant impacts on individuals of threatened or endangered species or on populations of other species. If either the $HQ_{high}$ -adult or $HQ_{high}$ -juvenile is greater than or equal to 1.0, the potential for the dioxin-like PCB congeners to pose risk would be considered of concern for that receptor in that exposure area, and these compounds would warrant further evaluation in subsequent steps of the ERA process (California DTSC 1999).

For avian receptors, in addition to the four HQs based on dietary exposures of adults and juveniles, two embryo HQs for each exposure area also were calculated: an $HQ_{high}$ and an $HQ_{low}$. The decision rules for interpreting these HQs were the following: An $HQ_{low}$ that is greater than or equal to 1.0 would indicate the need for further evaluation of the ecological significance of the potential effects. If an $HQ_{high}$ is greater than or equal to 1.0, but the HQlow is less than 1.0, the potential for the dioxin-like PCB congeners to pose risk to that receptor in that exposure area would be considered of concern, and these compounds would warrant further evaluation in subsequent steps of the ERA process.

As shown in Table 5.4.27, which summarizes the HQs from Tables 5.4.21 through 5.4.26, none of the ecological HQs exceeded a value of 1.0 for any of the representative receptors. The HQs across all evaluated receptors were more than ten times lower than the HQ threshold value of concern of 1.0. The HQs were calculated for each of the exposure areas, which were areas along the facility boundaries and adjacent to B-18 landfill from which multiple soil and vegetation samples were combined to obtain a multi-increment sample of each medium representative of the area. The risk estimates for each of the representative receptors are discussed below.

San Joaquin Kit Fox

HQs for the San Joaquin kit fox are calculated in Table 5.4.21. The highest HQs were for a juvenile fox assumed to consume a diet consisting entirely of carnivorous prey, and the highest HQs for this scenario were those based on the use of the BAF approach for calculating food-chain transfers. Under this very conservative exposure scenario and use of the TRV-Low, based on a NOAEL, the highest HQ had a value of 0.02, which is well below the threshold level of concern of 1.0. Thus, the dioxin-like PCB congeners do not pose significant risk to either adult or juvenile San Joaquin kit foxes regardless of their diet in any of the exposure areas at KHF.

The average home range of the San Joaquin kit fox has been estimated at approximately 1500 acres (Spiegel and Bradbury 1992), so an individual fox potentially could be exposed to dioxin-like PCB congeners in multiple exposure areas. If the highest HQs for the kit fox (those for a juvenile consuming carnivorous prey based on the BAF approach) for each of the eight exposure areas are summed, the resulting cumulative HQ equals only 0.06. Thus, even under this unrealistically conservative scenario in which a fox is assumed to forage in all eight exposure areas and receive additive exposures from each, the fox would not be at risk from dioxin-like PCB congeners. The home ranges for the other receptors evaluated are smaller than the individual exposure areas, so they would not experience additive exposures from more than one exposure area.

San Joaquin Pocket Mouse

HQs for the San Joaquin pocket mouse, which has a herbivorous diet, are calculated in Table 5.4.22. The HQs were essentially the same for adults and juveniles. Based on the TRV-Low, the highest HQs had a value of 0.09, which is well below the threshold level of concern of 1.0. Thus, the dioxin-like PCB congeners do not pose significant risk to either adult or juvenile San Joaquin pocket mice in any of the exposure areas at KHF.

Tulare Grasshopper Mouse

HQs for the Tulare grasshopper mouse, which has a carnivorous diet, are calculated in Table 5.4.23. The HQs were essentially the same for adults and juveniles. Based on the TRV-Low, the highest HQs had a value of 0.06, which is well below the threshold level of concern of 1.0. Thus, the dioxin-like PCB congeners do not pose significant risk to either adult or juvenile grasshopper mice in any of the exposure areas at KHF.

Burrowing Owl

HQs for the burrowing owl are calculated in Table 5.4.24. The highest HQs were for a female or juvenile owl assumed to consume a diet consisting entirely of carnivorous prey. The HQs for this scenario were conservatively based on the use of the BAF approach for calculating food-chain transfers. Under this very conservative exposure scenario and use of the TRV-Low, the highest HQs had a value of 0.01, which is well below the threshold level of concern of 1.0. For the exposure scenario based on a diet of herbivorous prey, the highest HQs had a value of only 0.0004. The HQs for eggs/embryos of the burrowing owl are calculated in Table 5.4.26. Based on the low TRV for developmental effects in eggs, the highest HQs had a value of 0.03, which was calculated using the BAF approach. Thus, the dioxin-like PCB congeners do not pose significant risk to adult or juvenile burrowing owls or their eggs regardless of their diet in any of the exposure areas at KHF.

Western Meadowlark

HQs for the western meadowlark, which has an omnivorous diet, are calculated in Table 5.4.25. The HQs were essentially the same for adult males, adult females, and juveniles. Based on the TRV-Low, the highest HQ had a value of 0.08, which is well below the threshold level of concern of 1.0. The HQs for eggs/embryos of the meadowlark are calculated in Table 5.4.26. Based on the low TRV for developmental effects in eggs, the highest HQs had a value of 0.03, which was calculated using the BAF approach. Thus, the dioxin-like PCB congeners do not pose significant risk to adult or juvenile meadowlarks or their eggs in any of the exposure areas at KHF.

Blunt-Nosed Leopard Lizard

Dietary exposure of the blunt-nosed leopard lizard to dioxin-like PCB congeners was shown in the exposure assessment in Section 5.4.3.2 to be only 1/5$^{th}$ to 1/10$^{th}$ that of the grasshopper mouse. TEFs have not been developed for reptiles. Data demonstrating dioxin-like effects in reptiles are extremely limited, but according to USEPA, reptiles appear to be relatively insensitive to dioxin-like compounds (USEPA June 2008). Thus, the blunt-nosed leopard lizard is likely to be less sensitive to the toxic effects of the dioxin-like PCB congeners than are the birds and mammals evaluated in this ERA. Given both the lower exposure and lower sensitivity of the lizard, the avian and mammalian HQs discussed above are likely to be conservative when used to evaluate the potential for toxic effects on the blunt-nosed leopard lizard. Given the lack of significant risk to birds and mammals, the blunt-nosed leopard lizard similarly would not be at significant risk.

#### 5.4.5.2 Uncertainty

Uncertainty is inherent in the risk assessment process. The principal activities performed in an ERA can be grouped into three main components, exposure assessment, toxicity assessment, and risk characterization, each of which has associated uncertainties. These uncertainties are discussed below. Throughout this assessment, uncertainties were addressed where possible by using assumptions that were conservative; thus, this assessment's results are considered more likely to overestimate risks than underestimate them.

##### 5.4.5.2.1 <u>Exposure Assessment Uncertainty</u>

Among the sources of uncertainty in exposure assessment is the detection of chemicals and their concentrations in environmental media. To reduce uncertainty in the exposure assessment, all 12 of the dioxin-like PCB congeners for which soil and vegetation samples were analyzed were evaluated in both media in all exposure areas. Even if a congener was not detected in an area or medium, it was assumed to be present and was included in the data set at a surrogate concentration of ½ the RL. This approach reduces uncertainty related to the possibility that exposures may be underestimated due to the presence of congeners that were not detected but are present at concentrations less than the EDL. This approach also increases conservatism by assuming that all congeners not detected are actually present at ½ the RL.

In order to assess the degree of conservatism associated with this approach, four alternative data sets were created and used to rerun the calculations and reproduce the tables in the ERA for the four southernmost exposure areas (southeast, south, southwest, and B-18 landfill). Limiting the assessment to these four areas as examples provided a sufficient basis for comparison of the effects of the alternative data sets on risk results. The alternative data sets were composed as shown below.

1) Detects only: concentrations ≥ the RL
2) Detects only: estimated concentrations[a] ≥ the EDL and < the RL
3) Non-detects only: results < the EDL represented by ½ the RL

4) Non-detects assumed for all congeners: both detects and non-detects represented by ½ the RL

[a] Consistent with RAGS (USEPA 1989), results for detections below the RL are referred to as estimated concentrations.

The first of the alternative data sets consisted of only the concentrations of the dioxin-like PCB congeners detected at or above the RL in each medium and exposure area. No estimated concentrations were included and no surrogate concentrations were used for nondetected results. This data set of detects at or above the RL was used to rerun all of the calculations and reproduce all of the tables in the ERA for the four southernmost exposure areas. These ERA tables are included in Appendix L (Tables L5.4.1 through L5.4.28). Comparison of the HQs calculated for this data set (Table L5.4.27) with the HQs for corresponding exposure areas of the primary data set on which the ERA was based (Table 5.4.27) provides a demonstration of the effects on exposure and the resulting risk estimates from the inclusion of both estimated concentrations and surrogate concentrations for nondetects in the primary data set. Exposures and HQs based only on detects above the RL are always less than the corresponding values based on detects, detected concentrations below the RL, and nondetects, with the values for the primary data set usually two or more orders of magnitude greater than the detects-only data set. This indicates that when nondetects are included in the data set at an assumed concentration of ½ the RL, the nondetects significantly increase the calculated exposures and risks.

In order to assess the effects on the risk estimates associated with the use of estimated concentrations for detects below the RL, a second alternative data set was created that consisted of only the estimated concentrations of the dioxin-like PCB congeners detected at or above the EDL and below the RL in each medium and exposure area. No detected concentrations at or above the RL were included and no surrogate concentrations were used for nondetected results below the EDL. This data set of detects below the RL and at or above the EDL was used to rerun all of the calculations and reproduce all of the tables in the ERA. These ERA tables are included in Appendix M (Tables M5.4.1 through M5.4.28). Comparison of the HQs calculated for this data set (Table M5.4.27) with the HQs for corresponding exposure areas of the primary data set on which the ERA was based (Table 5.4.27) provides a demonstration of the effects on exposure and the resulting risk estimates from the inclusion of estimated concentrations in the primary data set. Exposures and HQs based only on detects below the RL are in most cases equal to or slightly less than (within an order of magnitude) the corresponding values for the primary data set, which was based on detected concentrations at or above the RL, estimated concentrations for detects at or above the EDL and below the RL, and nondetects. Relatively few of the HQs for the estimated-concentration-only data set are more than an order of magnitude less than the corresponding HQ of the primary data set. This indicates that when detects at or above the EDL and less than the RL are included, these estimated concentrations drive most of the calculated exposures and risks.

In order to assess the effects of using surrogate values for nondetects, a third alternative data set was created that consisted only of nondetects below the EDL, with each nondetect represented by a surrogate concentration of ½ the RL. This data set of nondetects below the EDL was used to rerun all of the calculations in the ERA. These ERA tables are included in Appendix N (Tables N5.4.1 through N5.4.28). Comparison of the HQs calculated for this data set (Table N5.4.27) with the HQs for corresponding exposure areas of the primary data set on which the ERA was based (Table 5.4.27) provides a demonstration of the effects on exposure and HQ calculations from the inclusion in the primary data set of surrogate concentrations of ½ the RL for nondetects below the EDL. For nondetects below the EDL, exposures and HQs based entirely on ½ RL concentrations in every case are essentially equal to or less than the corresponding values for the primary data set based on both detects and nondetects. For some receptors, exposures and HQs are up to three orders of magnitude less than corresponding values for the primary data set. This shows that for some receptors, when nondetects are included in the data set at an assumed concentration of ½ the RL, use of the nondetects was a significant contributor to overall exposure and risk, while for other receptors, it was not.

To further assess the effects of using surrogate values for nondetects, a fourth alternative data set was created that assumed all congeners were nondetects and represented each by a surrogate concentration of ½ the RL. As was done for the other alternative data sets, this all-nondetects data set was used to rerun all of the calculations in the ERA. These ERA tables are included in Appendix O (Tables O5.4.1 through O5.4.28). Comparison of the HQs calculated for this data set (Table O5.4.27) with the HQs for corresponding exposure areas of the primary data set on which the ERA was based (Table 5.4.27) provides a demonstration of the effects on exposure and HQ calculations from the inclusion of nondetects and surrogate concentrations in the primary data set. Exposures and HQs based entirely on ½ the RL concentrations are in most cases equal to or slightly less than (within an order of magnitude) the corresponding values for the primary data set. Relatively few of the HQs for the all-nondetects data set are more than an order of magnitude less than the corresponding HQ of the primary data set. This indicates that the assumed concentrations of ½ the RL are similar to the concentrations driving the risk values in the primary data set, which are the estimated concentrations for detects below the RL and the surrogate values of ½ the RL for nondetects below the EDL. Thus, the detected concentrations at or above the RL appear to be relatively minor contributors to the estimated risks.

The results of the evaluations in Appendices L, M, N, and O indicate that uncertainty related to possible underestimation of exposures associated with congeners present but not detected (below the EDL) is negligible due to the conservatism of exposure estimates based on surrogate concentrations (½ RL). As was the case for the primary data set, all of the HQs calculated for these alternative data sets also were less than 1.0.

As discussed in Section 3.0, replicate sets of samples (splits) were obtained from the multi-increment soil and vegetation samples from most of the exposure areas. These split samples were submitted by USEPA to a different laboratory for analysis to validate the quality of the primary data set. Based on the results of this analysis, the primary data set used in this ERA was determined by USEPA to be of acceptable quality.

Uncertainty in exposure assessment is minimized by making reasonably conservative assumptions throughout the process. The receptors selected for evaluation as representatives of the assessment endpoints are considered to provide a conservative representation of the range of exposures that may be experienced by other species not evaluated. In calculating receptor exposure factors (e.g., dietary composition, food ingestion rates, and home range), highly conservative to average exposure factors were assumed.

In addition, all exposures were calculated based on the conservative assumption of 100 percent bioavailability. In reality, hydrophobic compounds such as PCBs may be bound to organic carbon in soil or vegetation and may not be fully absorbed from the digestive tract. For example, a study of the bioavailability of two PCB congeners (PCB 52 and PCB 118) from a variety of soils found that in rats the absolute bioavailability *in vivo* ranged from approximately 61 percent to 70 percent (Pu et al. 2006), indicating that about 30 percent to 40 percent was not absorbed from the gut.

The mammalian TRVs were based on a toxicity study in which rats were fed 2,3,7,8-TCDD in their diet (Sample et al. 1996). This study by Murray et al. (1979) was a three-generation study of rats in which the endpoints measured involved a critical lifestage, reproduction (fertility and neonatal survival). This and other studies using oral exposures in food utilize dietary formulations that provide the tested compound in a highly bioavailable form. Thus, the bioavailability of 2,3,7,8-TCDD in the rat study is likely to have been equal to or greater than that of dioxin-like PCB congeners in site soil. The avian dietary TRVs were based on a 10-week study by Nosek et al. (1992) in which pheasants were given weekly intraperitoneal injections of 2,3,7,8-TCDD. Intraperitoneal injections are likely to provide exposures comparable to oral exposure routes (Sample et al. 1996). Intraperitoneal exposures minimize the potential for matrix binding and resulting reduced intestinal absorption and bioavailability. Also, according to USEPA (1995), "it generally is acknowledged that i.p. (intraperitoneal) and oral routes of exposure are similar because in both instances the chemical is absorbed by the liver, thereby permitting first-pass metabolism." Thus, the bioavailability of 2,3,7,8-TCDD in the pheasant study is likely to have been equal to or greater than that of dioxin-like PCB congeners in site soil.

The assumption of 100 percent bioavailability in conjunction with the conservative exposure factors utilized in the exposure assessment provide confidence that the calculated exposures are reasonably conservative estimates of the range of exposures that may be experienced by receptors.

Estimation of contaminant intakes based on food chain modeling is inherently uncertain because of the transfer factors in the models for which measured, site-specific data may not be available. For this ERA, however, the collection and analysis of site-specific vegetation samples from the same locations as the soil samples provided food chain data that reduce uncertainty associated with estimating uptake by plants and the subsequent exposures of herbivores, omnivores, and predators that prey on these consumers.

Intakes from dermal and inhalation exposures were not quantified for the ecological receptors evaluated. However, as discussed in detail in Section 5.4.2.2, this does not significantly increase the uncertainty of the estimated exposures because intakes via these routes are expected to be negligible relative to intakes via ingestion.

There is substantial uncertainty associated with the spatial patterns of exposure in the vicinity of KHF due to the limited areas in which samples were collected. Extensive areas of potential habitat surrounding KHF were not sampled. However, these areas are more distant from the potential sources of PCB congeners within the facility and are expected to have lower concentrations in soil and vegetation than the areas sampled along the facility boundaries and adjacent to B-18 landfill within the facility. Assuming that the source of detected dioxin-like PCB congeners originated within KHF, offsite concentrations would be expected to decrease rapidly with distance.

The expectation of lower environmental concentrations with increasing distance from KHF is supported by the results of air dispersion and deposition modeling performed in conjunction with the PCB Congeners Study. The modeling was performed to demonstrate that the monitoring locations used for ambient air sampling are properly located to measure PCB congeners potentially originating from the B-18 landfill (Wenck October 2009). The objective of the modeling analysis was to identify the areas likely to be maximally affected by aerial dispersion and deposition as a result of assumed emissions from the B-18 landfill. The model generated isocontours of predicted concentration and deposition results for particle, particle-bound, and gaseous phases of dioxin-like PCB congeners based on an assumed unit emission rate. The figures showing the isocontours indicate that: 1) monitoring station DMS-1, which is near the southeast corner of the facility, is effectively located to capture maximum impact emissions from the B-18 landfill because the dispersion and deposition patterns generally extend in a mainly southeast direction, in accordance with the predominant wind direction; 2) monitoring station MSP is effectively located to represent concentrations when the wind is out of the southwest; and 3) monitoring station UMS-1 is effectively located to measure concentrations in a predominantly upwind, or less impacted, direction.

The figures showing the modeled isocontours indicate that the principal direction of dispersion and deposition is to the southeast of the B-18 landfill. The contours indicate that concentration and deposition levels decrease rapidly with increasing distance from the source. Because concentrations are predicted to decline with distance, exposures of ecological receptors outside the facility would be less than those calculated in this ERA and would decline with distance from the facility. Consequently, there can be a high degree of confidence that the concentrations evaluated do not underestimate potential offsite exposures and risks despite the lack of measured data from more distant areas.

Information regarding anthropogenic background levels of dioxin-like PCB congeners in soil confirms that the potential site-related exposures and risks calculated in this report are not underestimated. USEPA conducted a national-scale pilot survey of the levels of dioxin-like PCB congeners in rural/remote soils from 27 sites across the United States (USEPA 2007). The study focused on sampling of undisturbed soil in rural/remote areas in order to provide a baseline for evaluating soil levels in other areas. Dioxin-like PCB congener concentrations were converted to TECs in the study using WHO TEFs from 1998, a TEF protocol which was superseded by the 2006 TEFs used in this ERA. As a result, the soil TECs calculated in USEPA (2007) are different from, though likely are similar to, values that would result from the use of the current TEFs. Thus, the USEPA background TECs are not directly comparable to the soil TECs calculated in this study but provide a general indication of their relative magnitudes. The USEPA background soil TEC for dioxin-like PCBs (when based on only detected concentrations) ranged from 0.004 ng/kg to 0.36 ng/kg, with a mean of 0.047 ng/kg for the 27 sites included in the survey (USEPA 2007). The KHF-specific soil TECs from the current study (Table 5.4.28), based on mammalian TEFs, were greater than the mean TEC from the USEPA study in all exposure areas and upwind reference areas. However, the KHF TECs were greatly affected by the surrogate concentrations used for nondetects as well as estimated concentrations used for detections below the RL, as indicated by comparison of Tables 5.4.28, L5.4.28, M5.4.28, N5.4.28, and O5.4.28. When only detected concentrations above the RL (Table L5.4.28) are considered, the KHF soil TECs are less than the mean TEC from the USEPA study (0.047 ng/kg) in all exposure areas. When only detected concentrations at or above the EDL and below the RL (Table M5.4.28) are considered, all but one of the KHF soil TECs are greater than the mean TEC from the USEPA study. Similarly, when only surrogate concentrations of ½ the RL were used either for nondetected results below the EDL (Table N5.4.28) or for all concentrations (Table O5.4.28), the KHF soil TECs are almost always greater than the mean TEC from the USEPA study. These comparisons increase confidence that the KHF soil TECs based on detections above the RL in the eight exposure areas are similar to anthropogenic background TECs in rural/remote soils across the United States and are not substantially elevated due to the presence of KHF.

#### 5.4.5.2.2 <u>Toxicity Assessment Uncertainty</u>

Uncertainty in toxicity assessment may result from many sources. There is a moderate level of uncertainty associated with screening against TRVs from the literature. There is uncertainty associated with the performance of the toxicity tests on which the TRVs were based and with the relevance of specific toxicity values to native organisms at the site. However, conformance by laboratories with standard methods and QC procedures reduces uncertainty in the accuracy of test results, and TRVs were derived to be reasonably conservative values that were intended to be protective of sensitive receptors.

Various factors involved in the collection and handling of the media for testing, in the characteristics of the media tested, and in the testing methodologies may contribute to uncertainty in the applicability of the results to the site. For example, chemical and physical characteristics of soil can affect the toxicity of contaminants by affecting their bioavailability. Organic carbon, pH, and particle size are some of these characteristics. As discussed above with regard to the effects of bioavailability on exposure uncertainty, the bioavailability of 2,3,7,8-TCDD in the rat and pheasant studies on which the mammalian and avian dietary TRVs were based is likely to have been equal to or greater than that of dioxin-like PCB congeners in site soil. Given the relative bioavailabilities of 2,3,7,8-TCDD in these studies and dioxin-like PCB congeners in site soil, the TRVs are expected to provide a reasonably conservative approximation of the potential effects of bioavailability on toxicity, thus reducing uncertainty in the toxicity assessment.

Toxicity was evaluated based on both NOAELs (TRV-Low) and LOAELs (TRV-High). The range of HQs calculated based on this range of TRVs increases confidence that any potential risks of adverse effects on the assessment endpoints were not underestimated. However, available TRVs were not based on studies in the actual species present in the study area, so extrapolation between species was necessary. The greater the dissimilarity between the test species and the wildlife receptor, the greater may be the uncertainty in the toxicity evaluation.

#### 5.4.5.2.3 <u>Risk Characterization Uncertainty</u>

Uncertainty in risk characterization is a direct result of the methodologies employed in the preceding sections of the ERA. The conservative assumptions made and procedures followed were intended to provide conservatism in the evaluation sufficient to minimize the possibility of underestimating risk, particularly for endangered species,

To address uncertainty associated with the unlikely possibility that risk could have been underestimated for an individual of the endangered San Joaquin kit fox, an additional exposure scenario was evaluated. This was intended to be a maximally conservative scenario that would result in unreasonably high exposure estimates (Table 5.4.29). In this scenario, concentrations in soil and vegetation for all 12 dioxin-like PCB congeners in all exposure areas (including surrogate concentrations of ½ the RL for nondetects) were compared in order to identify a maximal exposure concentration for each congener in either of the two exposure media. This concentration was then assumed to be present in all food consumed by a juvenile kit fox. Accordingly, this concentration was multiplied by the food ingestion rate to calculate an intake, which was divided by the fox's body weight to obtain a maximal exposure dose. These doses were converted to congener-specific TEDs, which were summed to obtain a total TED for each exposure area. The total TEDs were divided by the TRV-Low to calculate an HQ for each exposure area. These maximally conservative HQs were 0.1 for the southeast and B-18 landfill areas, 0.09 for the south area; and 0.07 for the southwest and northeast areas; and 0.03 for the west, northwest, and north areas. If all of these HQs are summed, the resulting cumulative HQ is 0.5. Thus, even under this unrealistically conservative scenario, the exposure that would be experienced by a San Joaquin kit fox, even assuming it could be exposed to all eight exposure areas cumulatively, would be well below a no-effects level. This indicates that the possibility there could be significant risk to a fox but the risk has been underestimated by the ERA is negligible.

#### 5.4.5.3 Risk Description

This risk assessment demonstrates that none of the evaluated representative ecological receptors are at significant risk from dioxin-like PCB congeners. The uncertainty analysis indicated that the conservative methods and assumptions used in the ERA provide confidence that there is minimal potential for risk to have been underestimated. Consequently, it can be concluded that dioxin-like PCB congeners at KHF do not pose significant risk to any of the assessment endpoints evaluated in the ERA and that ecological risks are not expected in any areas beyond the facility property boundary.

### 5.4.6 Scientific/Management Decision Point

The ecological Risk Characterization determined that the dioxin-like PCB congeners do not pose significant risk to assessment endpoints in the study area at KHF. Therefore, continuation of the ERA process for dioxin-like PCBs is not recommended at this site. This risk management decision ultimately will be made by USEPA.

# 6.0 Conclusions

This PCB Congeners Study at KHF was conducted thoroughly, with collaboration and close supervision from USEPA-IX, and in accordance with USEPA approved methods and guidance. The purpose of this study was to assess the on- and off-property ecological and off-property human health (the public) risk impacts associated with the current and cumulative handling and disposing of PCB contaminated waste at KHF.

The monitoring data collected at the KHF facility shows that all 12 WHO dioxin-like PCB congeners are present in the sampled air, soil, and vegetation. However, as shown through the data collected by USEPA that summarized background levels of PCB congeners in rural soils (USEPA April 2007), PCB congeners are present everywhere in the United States, including remote wilderness areas away from industrial sources. All 12 of the dioxin-like PCB congeners were found to be present at KHF at levels consistent with these measurements elsewhere in the United States. The data collected for this study allow to some degree the discernment of differences in the levels of PCB congeners between upwind (background) and downwind (KHF impacted) areas, and those areas with the greatest potential to pose risk were evaluated in HHRA and ERA.

The results of the HHRA showed that risks at the KHF boundary are well below the level of concern for current off-site receptors and within the USEPA risk management range for hypothetical worst-case future receptors, which incorporated very conservative exposure assumptions. The conservative methods and assumptions used in the HHRA provide confidence that there is minimal potential for risk to have been underestimated and that the risk estimates developed in the HHRA are protective of public health. The uncertainty analysis showed that congener concentrations in soil, vegetation, and air samples provided conservative estimates of exposure and risk at the facility boundary and that potential risks from off-site exposures farther from the facility would be lower. Consequently, it can be concluded that concentrations and potential human health risks associated with the presence of dioxin-like PCB congeners at KHF were not underestimated for receptors who may be located near the facility, and that potential risks would decrease with increasing distance from the facility.

The results of the ERA showed that none of the representative receptors evaluated or the assessment endpoints they represent are at significant risk from dioxin-like PCB congeners in the study area. The uncertainty analysis indicated that the conservative methods and assumptions used in the ERA provide confidence that there is minimal potential for risk to have been underestimated, and air dispersion and deposition modeling confirm that potential risks would decrease with increasing distance from the facility. Consequently, it can be concluded that the dioxin-like PCB congeners do not pose significant risk to any of the assessment endpoints on the facility or in the region.

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# Tables

## Table 4.1.1
## Summary of Air Results
## (Jan 2009 - Dec 2009)

| Air Sample Name (sampling related flag) | PCB | Raw Data from Lab Result (pg) | Raw Data from Lab EDL (pg) | Presented in Lab Reports Result (pg) | Presented in Lab Reports RL (pg) | Sample Volume ($m^3$) | Raw Data Converted to $pg/m^3$ Result ($pg/m^3$) | Raw Data Converted to $pg/m^3$ EDL ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ Result ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ RL ($pg/m^3$) | EPC* ($pg/m^3$) | Analytical Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN09-UMS1-TO9A | 81 | ND* | 85.97 | ND | 1000 | 6686 | ND | 0.013 | ND | 0.15 | **0.075** | ** |
| | 77 | 142.83 | 93.82 | ND | 1000 | | 0.021 | 0.014 | ND | 0.15 | **0.021** | J |
| (*) | 123 | 85.35 | 35.52 | ND | 1000 | | 0.013 | 0.005 | ND | 0.15 | **0.013** | J |
| | 118 | 1200.00 | 35.91 | 1200 | 1000 | | 0.179 | 0.005 | 0.18 | 0.15 | **0.18** | C |
| | 114 | 33.26 | 25.79 | ND | 1000 | | 0.005 | 0.004 | ND | 0.15 | **0.005** | J |
| | 105 | 433.93 | 35.57 | ND | 1000 | | 0.065 | 0.005 | ND | 0.15 | **0.065** | J |
| | 126 | ND* | 38.74 | ND | 1000 | | ND* | 0.006 | ND | 0.15 | **0.075** | ** |
| | 167 | 37.73 | 23.03 | ND | 1000 | | 0.006 | 0.003 | ND | 0.15 | **0.006** | J |
| | 156 | 64.14 | 21.49 | ND | 1000 | | 0.010 | 0.003 | ND | 0.15 | **0.010** | J |
| | 157 | ND* | 20.18 | ND | 1000 | | ND* | 0.003 | ND | 0.15 | **0.075** | ** |
| | 169 | ND* | 31.33 | ND | 1000 | | ND* | 0.005 | ND | 0.15 | **0.075** | ** |
| | 189 | ND* | 26.66 | ND | 1000 | | ND* | 0.004 | ND | 0.15 | **0.075** | ** |
| JAN09-DMS1-TO9A | 81 | 252.94 | 89.49 | ND | 1000 | 5934 | 0.043 | 0.015 | ND | 0.17 | **0.043** | J |
| | 77 | 937.75 | 110.40 | ND | 1000 | | 0.158 | 0.019 | ND | 0.17 | **0.158** | J |
| (*) | 123 | 292.36 | 37.87 | ND | 1000 | | 0.049 | 0.006 | ND | 0.17 | **0.049** | J |
| | 118 | 6100.00 | 35.79 | 6100 | 1000 | | 1.028 | 0.006 | 1.0 | 0.17 | **1.0** | C |
| | 114 | 134.82 | 30.64 | ND | 1000 | | 0.023 | 0.005 | ND | 0.17 | **0.023** | J |
| | 105 | 2700.00 | 34.74 | 2700 | 1000 | | 0.455 | 0.006 | 0.45 | 0.17 | **0.45** | C |
| | 126 | ND* | 39.15 | ND | 1000 | | ND* | 0.007 | ND | 0.17 | **0.084** | ** |
| | 167 | 136.64 | 23.62 | ND | 1000 | | 0.023 | 0.004 | ND | 0.17 | **0.023** | J |
| | 156 | 315.14 | 22.36 | ND | 1000 | | 0.053 | 0.004 | ND | 0.17 | **0.053** | J |
| | 157 | 73.31 | 21.08 | ND | 1000 | | 0.012 | 0.004 | ND | 0.17 | **0.012** | J |
| | 169 | ND* | 31.33 | ND | 1000 | | ND* | 0.005 | ND | 0.17 | **0.084** | ** |
| | 189 | ND* | 26.08 | ND | 1000 | | ND* | 0.004 | ND | 0.17 | **0.084** | ** |
| JAN09-MSP-TO9A | 81 | ND* | 107.00 | ND | 1000 | 5413 | ND* | 0.020 | ND | 0.18 | **0.092** | ** |
| | 77 | 770.29 | 116.45 | ND | 1000 | | 0.142 | 0.022 | ND | 0.18 | **0.142** | J |
| (*) | 123 | 343.41 | 37.40 | ND | 1000 | | 0.063 | 0.007 | ND | 0.18 | **0.063** | J |
| | 118 | 5500.00 | 30.71 | 5500 | 1000 | | 1.016 | 0.006 | 1.0 | 0.18 | **1.0** | C |
| | 114 | 133.38 | 27.34 | ND | 1000 | | 0.025 | 0.005 | ND | 0.18 | **0.025** | J |
| | 105 | 2100.00 | 32.58 | 2100 | 1000 | | 0.388 | 0.006 | 0.39 | 0.18 | **0.39** | C |
| | 126 | ND* | 35.38 | ND | 1000 | | ND* | 0.007 | ND | 0.18 | **0.092** | ** |
| | 167 | ND* | 25.11 | ND | 1000 | | ND* | 0.005 | ND | 0.18 | **0.092** | ** |
| | 156 | 229.82 | 24.56 | ND | 1000 | | 0.042 | 0.005 | ND | 0.18 | **0.042** | J |
| | 157 | 37.55 | 23.06 | ND | 1000 | | 0.007 | 0.004 | ND | 0.18 | **0.0069** | J |
| | 169 | ND* | 34.59 | ND | 1000 | | ND* | 0.006 | ND | 0.18 | **0.092** | ** |
| | 189 | 39.55 | 23.87 | ND | 1000 | | 0.007 | 0.004 | ND | 0.18 | **0.0073** | J |
| JAN09-Field Blank | 81 | ND* | 3.14 | ND | 1000 | | | | | | | |
| | 77 | ND* | 3.82 | ND | 1000 | | | | | | | |
| | 123 | ND* | 3.32 | ND | 1000 | | | | | | | |
| | 118 | 11.76 | 3.24 | ND | 1000 | | | | | | | |
| | 114 | ND* | 3.11 | ND | 1000 | | | | | | | |
| | 105 | ND* | 3.33 | ND | 1000 | | | | | | | |
| | 126 | ND* | 3.84 | ND | 1000 | | | | | | | |
| | 167 | ND* | 1.54 | ND | 1000 | | | | | | | |
| | 156 | 2.83 | 1.48 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.37 | ND | 1000 | | | | | | | |
| | 169 | ND* | 2.00 | ND | 1000 | | | | | | | |
| | 189 | ND* | 2.46 | ND | 1000 | | | | | | | |
| JAN09-Method Blank | 81 | 0.85 | 0.85 | ND | 1000 | | | | | | | |
| | 77 | 1.74 | 0.99 | ND | 1000 | | | | | | | |
| | 123 | ND* | 2.45 | ND | 1000 | | | | | | | |
| | 118 | 9.10 | 2.68 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.77 | ND | 1000 | | | | | | | |
| | 105 | ND* | 2.23 | ND | 1000 | | | | | | | |
| | 126 | ND* | 2.41 | ND | 1000 | | | | | | | |
| | 167 | ND* | 1.02 | ND | 1000 | | | | | | | |
| | 156 | ND* | 0.93 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.87 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.34 | ND | 1000 | | | | | | | |
| | 189 | ND* | 4.25 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
$m^3$ Cubic meter
pg Picogram
$pg/m^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
# Summary of Air Results
# (Jan 2009 - Dec 2009)

| Air Sample Name | | Raw Data from Lab | | Presented in Lab Reports | | Sample Volume | Raw Data Converted to pg/m$^3$ | | Lab Presented Data Converted to pg/m$^3$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Result | EDL | Result | RL | | Result | EDL | Result | RL | EPC* | Analytical |
| (sampling related flag) | PCB | (pg) | (pg) | (pg) | (pg) | (m$^3$) | (pg/m$^3$) | (pg/m$^3$) | (pg/m$^3$) | (pg/m$^3$) | (pg/m$^3$) | Flag |
| FEB09-UMS1-TO9A | 81 | 42.87 | 22.24 | ND | 1000 | 5981 | 0.007 | 0.004 | ND | 0.17 | **0.007** | J |
| | 77 | 143.41 | 23.08 | ND | 1000 | | 0.024 | 0.004 | ND | 0.17 | **0.024** | J |
| | 123 | 66.42 | 15.05 | ND | 1000 | | 0.011 | 0.003 | ND | 0.17 | **0.011** | J |
| | 118 | 1100.00 | 14.98 | 1100 | 1000 | | 0.184 | 0.003 | 0.18 | 0.17 | **0.18** | C |
| | 114 | 28.09 | 14.32 | ND | 1000 | | 0.005 | 0.002 | ND | 0.17 | **0.005** | J |
| | 105 | 398.38 | 16.30 | ND | 1000 | | 0.067 | 0.003 | ND | 0.17 | **0.067** | J |
| | 126 | ND* | 18.85 | ND | 1000 | | ND* | 0.003 | ND | 0.17 | **0.084** | ** |
| | 167 | 130.77 | 7.36 | ND | 1000 | | 0.022 | 0.001 | ND | 0.17 | **0.022** | J |
| | 156 | ND* | 68.06 | ND | 1000 | | ND* | 0.011 | ND | 0.17 | **0.084** | ** |
| | 157 | ND* | 6.73 | ND | 1000 | | ND* | 0.001 | ND | 0.17 | **0.084** | ** |
| | 169 | ND* | 8.82 | ND | 1000 | | ND* | 0.001 | ND | 0.17 | **0.084** | ** |
| | 189 | ND* | 7.13 | ND | 1000 | | ND* | 0.001 | ND | 0.17 | **0.084** | ** |
| FEB09-DMS1-TO9A | 81 | 168.68 | 27.69 | ND | 1000 | 6449 | 0.026 | 0.004 | ND | 0.16 | **0.026** | J |
| | 77 | 610.33 | 31.04 | ND | 1000 | | 0.095 | 0.005 | ND | 0.16 | **0.095** | J |
| | 123 | 242.32 | 15.67 | ND | 1000 | | 0.038 | 0.002 | ND | 0.16 | **0.038** | J |
| | 118 | 3600.00 | 5.79 | 3600 | 1000 | | 0.558 | 0.001 | 0.56 | 0.16 | **0.56** | C |
| | 114 | 98.01 | 13.37 | ND | 1000 | | 0.015 | 0.002 | ND | 0.16 | **0.015** | J |
| | 105 | 1500.00 | 15.61 | 1500 | 1000 | | 0.233 | 0.002 | 0.23 | 0.16 | **0.23** | C |
| | 126 | ND* | 17.98 | ND | 1000 | | ND* | 0.003 | ND | 0.16 | **0.078** | ** |
| | 167 | 376.49 | 8.38 | ND | 1000 | | 0.058 | 0.001 | ND | 0.16 | **0.058** | J |
| | 156 | 164.13 | 8.08 | ND | 1000 | | 0.025 | 0.001 | ND | 0.16 | **0.025** | J |
| | 157 | 25.14 | 7.93 | ND | 1000 | | 0.004 | 0.001 | ND | 0.16 | **0.0039** | J |
| | 169 | ND* | 10.21 | ND | 1000 | | ND* | 0.002 | ND | 0.16 | **0.078** | ** |
| | 189 | 12.65 | 8.90 | ND | 1000 | | 0.002 | 0.001 | ND | 0.16 | **0.0020** | J |
| FEB09-MSP-TO9A | 81 | 302.22 | 74.43 | ND | 1000 | 6449 | 0.047 | 0.012 | ND | 0.16 | **0.047** | J |
| | 77 | 350.11 | 86.22 | ND | 1000 | | 0.054 | 0.013 | ND | 0.16 | **0.054** | J |
| | 123 | 590.33 | 12.67 | ND | 1000 | | 0.092 | 0.002 | ND | 0.16 | **0.092** | J |
| | 118 | 8500.00 | 12.09 | 8500 | 1000 | | 1.318 | 0.002 | 1.3 | 0.16 | **1.3** | C |
| | 114 | 305.50 | 10.57 | ND | 1000 | | 0.047 | 0.002 | ND | 0.16 | **0.047** | J |
| | 105 | 3700.00 | 11.78 | 3700 | 1000 | | 0.574 | 0.002 | 0.57 | 0.16 | **0.57** | C |
| | 126 | ND* | 10.79 | ND | 1000 | | ND* | 0.002 | ND | 0.16 | **0.078** | ** |
| | 167 | 736.48 | 7.56 | ND | 1000 | | 0.114 | 0.001 | ND | 0.16 | **0.11** | J |
| | 156 | 307.26 | 7.16 | ND | 1000 | | 0.048 | 0.001 | ND | 0.16 | **0.048** | J |
| | 157 | 51.96 | 6.67 | ND | 1000 | | 0.008 | 0.001 | ND | 0.16 | **0.0081** | J |
| | 169 | ND* | 8.93 | ND | 1000 | | ND* | 0.001 | ND | 0.16 | **0.078** | ** |
| | 189 | 22.70 | 4.38 | ND | 1000 | | 0.004 | 0.001 | ND | 0.16 | **0.0035** | J |
| FEB09-Field Blank | 81 | ND* | 4.63 | ND | 1000 | | | | | | | |
| | 77 | ND* | 5.33 | ND | 1000 | | | | | | | |
| | 123 | ND* | 4.89 | ND | 1000 | | | | | | | |
| | 118 | 12.17 | 4.44 | ND | 1000 | | | | | | | |
| | 114 | ND* | 4.40 | ND | 1000 | | | | | | | |
| | 105 | ND* | 5.06 | ND | 1000 | | | | | | | |
| | 126 | ND* | 5.31 | ND | 1000 | | | | | | | |
| | 167 | ND* | 2.71 | ND | 1000 | | | | | | | |
| | 156 | ND* | 2.62 | ND | 1000 | | | | | | | |
| | 157 | ND* | 2.52 | ND | 1000 | | | | | | | |
| | 169 | ND* | 3.20 | ND | 1000 | | | | | | | |
| | 189 | ND* | 8.64 | ND | 1000 | | | | | | | |
| FEB09-Method Blank | 81 | ND* | 0.67 | ND | 1000 | | | | | | | |
| | 77 | ND* | 0.72 | ND | 1000 | | | | | | | |
| | 123 | ND* | 0.86 | ND | 1000 | | | | | | | |
| | 118 | 9.03 | 0.84 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.80 | ND | 1000 | | | | | | | |
| | 105 | 2.99 | 0.92 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.01 | ND | 1000 | | | | | | | |
| | 167 | ND* | 0.63 | ND | 1000 | | | | | | | |
| | 156 | 0.95 | 0.63 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.58 | ND | 1000 | | | | | | | |
| | 169 | ND* | 0.75 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.41 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
m$^3$ Cubic meter
pg Picogram
pg/m$^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
# Summary of Air Results
# (Jan 2009 - Dec 2009)

| Air Sample Name | | Raw Data from Lab | | Presented in Lab Reports | | Sample Volume | Raw Data Converted to pg/m$^3$ | | Lab Presented Data Converted to pg/m$^3$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (sampling related flag) | PCB | Result (pg) | EDL (pg) | Result (pg) | RL (pg) | (m$^3$) | Result (pg/m$^3$) | EDL (pg/m$^3$) | Result (pg/m$^3$) | RL (pg/m$^3$) | EPC* (pg/m$^3$) | Analytical Flag |
| MAR09-UMS1-TO9A | 81 | ND* | 25.02 | ND | 1000 | 6478 | ND* | 0.004 | ND | 0.15 | **0.077** | ** |
| | 77 | 123.65 | 29.94 | ND | 1000 | | 0.019 | 0.005 | ND | 0.15 | **0.019** | J |
| | 123 | 53.48 | 24.65 | ND | 1000 | | 0.008 | 0.004 | ND | 0.15 | **0.0083** | J |
| | 118 | 1200.00 | 24.09 | 1200 | 1000 | | 0.185 | 0.004 | 0.19 | 0.15 | **0.19** | C |
| | 114 | 26.75 | 22.52 | ND | 1000 | | 0.004 | 0.003 | ND | 0.15 | **0.0041** | J |
| | 105 | 432.13 | 27.90 | ND | 1000 | | 0.067 | 0.004 | ND | 0.15 | **0.067** | J |
| | 126 | ND* | 43.32 | ND | 1000 | | ND* | 0.007 | ND | 0.15 | **0.077** | ** |
| | 167 | 136.95 | 11.57 | ND | 1000 | | 0.021 | 0.002 | ND | 0.15 | **0.021** | J |
| | 156 | 43.10 | 12.37 | ND | 1000 | | 0.007 | 0.002 | ND | 0.15 | **0.0067** | J |
| | 157 | ND* | 11.67 | ND | 1000 | | ND* | 0.002 | ND | 0.15 | **0.077** | ** |
| | 169 | ND* | 19.68 | ND | 1000 | | ND* | 0.003 | ND | 0.15 | **0.077** | ** |
| | 189 | ND* | 10.80 | ND | 1000 | | ND* | 0.002 | ND | 0.15 | **0.077** | ** |
| MAR09-DMS1-TO9A | 81 | 237.61 | 202.66 | ND | 1000 | 6447 | 0.037 | 0.031 | ND | 0.16 | **0.037** | J |
| | 77 | 1138.94 | 171.13 | ND | 1100 | | 0.177 | 0.027 | ND | 0.17 | **0.18** | G,J |
| | 123 | 859.20 | 129.34 | ND | 1000 | | 0.133 | 0.020 | ND | 0.16 | **0.13** | J |
| | 118 | 7300.00 | 83.39 | 7300 | 1000 | | 1.132 | 0.013 | 1.1 | 0.16 | **1.1** | C |
| | 114 | 362.11 | 84.67 | ND | 1000 | | 0.056 | 0.013 | ND | 0.16 | **0.056** | J |
| | 105 | 4000.00 | 117.72 | 4000 | 1000 | | 0.620 | 0.018 | 0.62 | 0.16 | **0.62** | C |
| | 126 | ND* | 151.51 | ND | 1000 | | ND* | 0.023 | ND | 0.16 | **0.078** | ** |
| | 167 | 169.50 | 11.48 | ND | 1000 | | 0.026 | 0.002 | ND | 0.16 | **0.026** | J |
| | 156 | 258.68 | 11.74 | ND | 1000 | | 0.040 | 0.002 | ND | 0.16 | **0.040** | J |
| | 157 | 38.78 | 10.23 | ND | 1000 | | 0.006 | 0.002 | ND | 0.16 | **0.0060** | J |
| | 169 | ND* | 18.41 | ND | 1000 | | ND* | 0.003 | ND | 0.16 | **0.078** | ** |
| | 189 | ND* | 195.53 | ND | 1000 | | ND* | 0.030 | ND | 0.16 | **0.078** | ** |
| MAR09-MSP-TO9A | 81 | 71.71 | 29.37 | ND | 1000 | 6213 | 0.012 | 0.005 | ND | 0.16 | **0.012** | J |
| | 77 | 474.75 | 34.84 | ND | 1000 | | 0.076 | 0.006 | ND | 0.16 | **0.076** | J |
| (*) | 123 | 242.41 | 24.98 | ND | 1000 | | 0.039 | 0.004 | ND | 0.16 | **0.039** | J |
| | 118 | 3200.00 | 24.23 | 3200 | 1000 | | 0.515 | 0.004 | 0.52 | 0.16 | **0.52** | C |
| | 114 | 106.10 | 22.96 | ND | 1000 | | 0.017 | 0.004 | ND | 0.16 | **0.017** | J |
| | 105 | 1300.00 | 27.77 | 1300 | 1000 | | 0.209 | 0.004 | 0.21 | 0.16 | **0.21** | C |
| | 126 | ND* | 36.47 | ND | 1000 | | ND* | 0.006 | ND | 0.16 | **0.080** | ** |
| | 167 | 330.58 | 11.98 | ND | 1000 | | 0.053 | 0.002 | ND | 0.16 | **0.053** | J |
| | 156 | 133.99 | 11.98 | ND | 1000 | | 0.022 | 0.002 | ND | 0.16 | **0.022** | J |
| | 157 | 26.61 | 11.38 | ND | 1000 | | 0.004 | 0.002 | ND | 0.16 | **0.0043** | J |
| | 169 | ND* | 17.69 | ND | 1000 | | ND* | 0.003 | ND | 0.16 | **0.080** | ** |
| | 189 | ND* | 10.97 | ND | 1000 | | ND* | 0.002 | ND | 0.16 | **0.080** | ** |
| MAR09-Field Blank | 81 | ND* | 1.86 | ND | 1000 | | | | | | | |
| | 77 | ND* | 2.04 | ND | 1000 | | | | | | | |
| | 123 | ND* | 1.48 | ND | 1000 | | | | | | | |
| | 118 | 13.31 | 1.42 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.32 | ND | 1000 | | | | | | | |
| | 105 | 4.56 | 1.51 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.67 | ND | 1000 | | | | | | | |
| | 167 | ND* | 1.94 | ND | 1000 | | | | | | | |
| | 156 | ND* | 2.04 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.88 | ND | 1000 | | | | | | | |
| | 169 | ND* | 2.98 | ND | 1000 | | | | | | | |
| | 189 | ND* | 5.11 | ND | 1000 | | | | | | | |
| MAR09-Method Blank | 81 | ND* | 2.94 | ND | 1000 | | | | | | | |
| | 77 | ND* | 3.39 | ND | 1000 | | | | | | | |
| | 123 | ND* | 2.64 | ND | 1000 | | | | | | | |
| | 118 | 12.37 | 2.57 | ND | 1000 | | | | | | | |
| | 114 | ND* | 2.36 | ND | 1000 | | | | | | | |
| | 105 | 5.80 | 2.95 | ND | 1000 | | | | | | | |
| | 126 | ND* | 3.34 | ND | 1000 | | | | | | | |
| | 167 | ND* | 3.27 | ND | 1000 | | | | | | | |
| | 156 | ND* | 3.14 | ND | 1000 | | | | | | | |
| | 157 | ND* | 3.01 | ND | 1000 | | | | | | | |
| | 169 | ND* | 3.77 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.93 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
m$^3$ Cubic meter
pg Picogram
pg/m$^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
## Summary of Air Results
## (Jan 2009 - Dec 2009)

| Air Sample Name (sampling related flag) | PCB | Raw Data from Lab Result (pg) | Raw Data from Lab EDL (pg) | Presented in Lab Reports Result (pg) | Presented in Lab Reports RL (pg) | Sample Volume ($m^3$) | Raw Data Converted to $pg/m^3$ Result ($pg/m^3$) | Raw Data Converted to $pg/m^3$ EDL ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ Result ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ RL ($pg/m^3$) | EPC* ($pg/m^3$) | Analytical Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| APR09-UMS1-TO9A | 81 | ND* | 4.06 | ND | 1000 | 6213 | ND* | 0.0007 | ND | 0.16 | **0.080** | ** |
| | 77 | 174.36 | 4.14 | ND | 1000 | | 0.028 | 0.0007 | ND | 0.16 | **0.028** | J |
| (*) | 123 | 37.30 | 2.94 | ND | 1000 | | 0.006 | 0.0005 | ND | 0.16 | **0.0060** | J |
| | 118 | 1400.00 | 2.77 | 1400 | 1000 | | 0.225 | 0.0004 | 0.23 | 0.16 | **0.23** | C |
| | 114 | ND* | 2.48 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.080** | ** |
| | 105 | 479.57 | 2.86 | ND | 1000 | | 0.077 | 0.0005 | ND | 0.16 | **0.077** | J |
| | 126 | ND* | 2.74 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.080** | ** |
| | 167 | 35.71 | 2.32 | ND | 1000 | | 0.006 | 0.0004 | ND | 0.16 | **0.0057** | J |
| | 156 | 69.88 | 2.32 | ND | 1000 | | 0.011 | 0.0004 | ND | 0.16 | **0.011** | J |
| | 157 | 14.89 | 2.05 | ND | 1000 | | 0.002 | 0.0003 | ND | 0.16 | **0.0024** | J |
| | 169 | 4.98 | 2.70 | ND | 1000 | | 0.001 | 0.0004 | ND | 0.16 | **0.0008** | J |
| | 189 | 22.14 | 2.08 | ND | 1000 | | 0.004 | 0.0003 | ND | 0.16 | **0.0036** | J |
| APR09-DMS1-TO9A | 81 | ND* | 4.03 | ND | 1000 | 5686 | ND* | 0.0007 | ND | 0.18 | **0.088** | ** |
| | 77 | 1541.52 | 4.51 | ND | 1500 | | 0.271 | 0.0008 | ND | 0.26 | **0.27** | G,J |
| (*) | 123 | 339.10 | 3.94 | ND | 1000 | | 0.060 | 0.0007 | ND | 0.18 | **0.060** | J |
| | 118 | 8000.00 | 3.79 | 8000 | 1000 | | 1.407 | 0.0007 | 1.4 | 0.18 | **1.4** | C |
| | 114 | 259.60 | 3.49 | ND | 1000 | | 0.046 | 0.0006 | ND | 0.18 | **0.046** | J |
| | 105 | 3700.00 | 3.95 | 3700 | 1000 | | 0.651 | 0.0007 | 0.65 | 0.18 | **0.65** | C |
| | 126 | ND* | 4.58 | ND | 1000 | | ND* | 0.0008 | ND | 0.18 | **0.088** | ** |
| | 167 | 173.44 | 2.81 | ND | 1000 | | 0.031 | 0.0005 | ND | 0.18 | **0.031** | J |
| | 156 | 344.77 | 2.83 | ND | 1000 | | 0.061 | 0.0005 | ND | 0.18 | **0.061** | J |
| | 157 | 69.61 | 2.72 | ND | 1000 | | 0.012 | 0.0005 | ND | 0.18 | **0.012** | J |
| | 169 | 51.60 | 5.38 | ND | 1000 | | 0.009 | 0.0009 | ND | 0.18 | **0.0091** | J |
| | 189 | ND* | 2.65 | ND | 1000 | | ND* | 0.0005 | ND | 0.18 | **0.088** | ** |
| APR09-MSP-TO9A | 81 | ND* | 3.40 | ND | 1000 | 6259 | ND* | 0.0005 | ND | 0.16 | **0.080** | ** |
| | 77 | 775.66 | 3.56 | ND | 1000 | | 0.124 | 0.0006 | ND | 0.16 | **0.12** | J |
| (*) | 123 | 172.07 | 3.12 | ND | 1000 | | 0.027 | 0.0005 | ND | 0.16 | **0.027** | J |
| | 118 | 4300.00 | 3.03 | 4300 | 1000 | | 0.687 | 0.0005 | 0.69 | 0.16 | **0.69** | C |
| | 114 | ND* | 2.83 | ND | 1000 | | ND* | 0.0005 | ND | 0.16 | **0.080** | ** |
| | 105 | 1900.00 | 3.24 | 1900 | 1000 | | 0.304 | 0.0005 | 0.30 | 0.16 | **0.30** | C |
| | 126 | ND* | 3.31 | ND | 1000 | | ND* | 0.0005 | ND | 0.16 | **0.080** | ** |
| | 167 | 88.02 | 1.64 | ND | 1000 | | 0.014 | 0.0003 | ND | 0.16 | **0.014** | J |
| | 156 | 181.63 | 1.61 | ND | 1000 | | 0.029 | 0.0003 | ND | 0.16 | **0.029** | J |
| | 157 | 37.88 | 1.54 | ND | 1000 | | 0.006 | 0.0002 | ND | 0.16 | **0.0061** | J |
| | 169 | 21.32 | 2.01 | ND | 1000 | | 0.003 | 0.0003 | ND | 0.16 | **0.0034** | J |
| | 189 | ND* | 1.32 | ND | 1000 | | ND* | 0.0002 | ND | 0.16 | **0.080** | ** |
| APR09-MSP-ALT-TO9A | 81 | ND* | 3.47 | ND | 1000 | 6254 | ND* | 0.0006 | ND | 0.16 | **0.080** | ** |
| | 77 | 1608.10 | 3.70 | ND | 1600 | | 0.257 | 0.0006 | ND | 0.26 | **0.26** | G,J |
| (*) | 123 | 307.77 | 2.88 | ND | 1000 | | 0.049 | 0.0005 | ND | 0.16 | **0.049** | J |
| | 118 | 8200.00 | 2.75 | 8200 | 1000 | | 1.311 | 0.0004 | 1.3 | 0.16 | **1.3** | C |
| | 114 | ND* | 2.46 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.080** | ** |
| | 105 | 3900.00 | 2.82 | 3900 | 1000 | | 0.624 | 0.0005 | 0.62 | 0.16 | **0.62** | C |
| | 126 | ND* | 2.86 | ND | 1000 | | ND* | 0.0005 | ND | 0.16 | **0.080** | ** |
| | 167 | 150.94 | 2.46 | ND | 1000 | | 0.024 | 0.0004 | ND | 0.16 | **0.024** | J |
| | 156 | 368.31 | 2.45 | ND | 1000 | | 0.059 | 0.0004 | ND | 0.16 | **0.059** | J |
| | 157 | 74.33 | 2.27 | ND | 1000 | | 0.012 | 0.0004 | ND | 0.16 | **0.012** | J |
| | 169 | 55.25 | 4.67 | ND | 1000 | | 0.009 | 0.0007 | ND | 0.16 | **0.0088** | J |
| | 189 | ND* | 1.45 | ND | 1000 | | ND* | 0.0002 | ND | 0.16 | **0.080** | ** |
| APR09-Field Blank | 81 | ND* | 1.53 | ND | 1000 | | | | | | | |
| | 77 | 6.72 | 1.65 | ND | 1000 | | | | | | | |
| | 123 | 2.72 | 1.40 | ND | 1000 | | | | | | | |
| | 118 | 28.79 | 1.37 | ND | 1000 | | | | | | | |
| | 114 | 2.03 | 1.30 | ND | 1000 | | | | | | | |
| | 105 | 12.56 | 1.48 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.52 | ND | 1000 | | | | | | | |
| | 167 | 1.87 | 1.17 | ND | 1000 | | | | | | | |
| | 156 | 2.49 | 1.16 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.09 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.76 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.17 | ND | 1000 | | | | | | | |
| APR09-Method Blank | 81 | ND* | 0.97 | ND | 1000 | | | | | | | |
| | 77 | ND* | 1.07 | ND | 1000 | | | | | | | |
| | 123 | 14.41 | 1.06 | ND | 1000 | | | | | | | |
| | 118 | ND* | 1.02 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.99 | ND | 1000 | | | | | | | |
| | 105 | 5.68 | 1.10 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.17 | ND | 1000 | | | | | | | |
| | 167 | 0.82 | 0.81 | ND | 1000 | | | | | | | |
| | 156 | ND* | 0.79 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.76 | ND | 1000 | | | | | | | |
| | 169 | ND* | 0.93 | ND | 1000 | | | | | | | |
| | 189 | ND* | 0.79 | ND | 1000 | | | | | | | |

| | |
|---|---|
| RL | Reporting limit |
| ND | Not detected at or above the RL |
| ND* | Not detected at or above the EDL |
| EDL | Estimated detection limit |
| $m^3$ | Cubic meter |
| pg | Picogram |
| $pg/m^3$ | Picogram per cubic meter |
| EPC* | Proposed exposure point concentration (EPC) to be used in ERA and HHRA. |

Flags:

| | |
|---|---|
| J | Detected ≥ EDL and < RL. |
| G | Elevated reporting limit. The reporting limit is elevated due to matrix interference. |
| C | Co-eluting isomer. |
| Q | Estimated maximum potential concentration. |
| B | Method blank contamination. |
| ** | ND, therefore surrogate EPC assigned as 1/2 the RL |
| (*) | Non critical sampling related issue associated with this sample. |

# Table 4.1.1
## Summary of Air Results
## (Jan 2009 - Dec 2009)

| Air Sample Name (sampling related flag) | PCB | Raw Data from Lab Result (pg) | Raw Data from Lab EDL (pg) | Presented in Lab Reports Result (pg) | Presented in Lab Reports RL (pg) | Sample Volume ($m^3$) | Raw Data Converted to $pg/m^3$ Result ($pg/m^3$) | Raw Data Converted to $pg/m^3$ EDL ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ Result ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ RL ($pg/m^3$) | EPC* ($pg/m^3$) | Analytical Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAY09-UMS1-TO9A | 81 | ND* | 6.70 | ND | 1000 | 6382 | ND* | 0.0010 | ND | 0.16 | **0.078** | ** |
| | 77 | 300.33 | 7.24 | ND | 1000 | | 0.047 | 0.0011 | ND | 0.16 | **0.047** | J |
| | 123 | 90.97 | 5.56 | ND | 1000 | | 0.014 | 0.0009 | ND | 0.16 | **0.014** | J |
| | 118 | 2400.00 | 5.22 | 2400 | 1000 | | 0.376 | 0.0008 | 0.38 | 0.16 | **0.38** | C |
| | 114 | ND* | 4.59 | ND | 1000 | | ND* | 0.0007 | ND | 0.16 | **0.078** | ** |
| | 105 | 853.64 | 5.05 | ND | 1000 | | 0.134 | 0.0008 | ND | 0.16 | **0.13** | J |
| | 126 | ND* | 4.74 | ND | 1000 | | ND* | 0.0007 | ND | 0.16 | **0.078** | ** |
| | 167 | 73.26 | 3.73 | ND | 1000 | | 0.011 | 0.0006 | ND | 0.16 | **0.011** | J |
| | 156 | 120.03 | 3.50 | ND | 1000 | | 0.019 | 0.0005 | ND | 0.16 | **0.019** | J |
| | 157 | 26.79 | 3.39 | ND | 1000 | | 0.004 | 0.0005 | ND | 0.16 | **0.0042** | J |
| | 169 | 7.52 | 4.39 | ND | 1000 | | 0.001 | 0.0007 | ND | 0.16 | **0.0012** | J |
| | 189 | ND* | 2.18 | ND | 1000 | | ND* | 0.0003 | ND | 0.16 | **0.078** | ** |
| MAY09-UMS1-TO9A-DUP | 81 | ND* | 5.41 | ND | 1000 | 6119 | ND* | 0.0009 | ND | 0.16 | **0.082** | ** |
| | 77 | 315.58 | 5.07 | ND | 1000 | | 0.052 | 0.0008 | ND | 0.16 | **0.052** | J |
| (*) | 123 | 108.48 | 3.85 | ND | 1000 | | 0.018 | 0.0006 | ND | 0.16 | **0.018** | J |
| | 118 | 2500.00 | 3.87 | 2500 | 1000 | | 0.409 | 0.0006 | 0.41 | 0.16 | **0.41** | C |
| | 114 | ND* | 3.46 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.082** | ** |
| | 105 | 927.80 | 4.00 | ND | 1000 | | 0.152 | 0.0007 | ND | 0.16 | **0.15** | J |
| | 126 | ND* | 3.95 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.082** | ** |
| | 167 | 77.75 | 2.37 | ND | 1000 | | 0.013 | 0.0004 | ND | 0.16 | **0.013** | J |
| | 156 | 125.39 | 2.34 | ND | 1000 | | 0.020 | 0.0004 | ND | 0.16 | **0.020** | J |
| | 157 | 28.18 | 2.14 | ND | 1000 | | 0.005 | 0.0003 | ND | 0.16 | **0.0046** | J |
| | 169 | ND* | 3.54 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.082** | ** |
| | 189 | ND* | 2.30 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.082** | ** |
| MAY09-DMS1-TO9A | 81 | ND* | 7.27 | ND | 1000 | 5900 | ND* | 0.0012 | ND | 0.17 | **0.085** | ** |
| | 77 | 2861.87 | 7.39 | ND | 2900 | | 0.485 | 0.0013 | ND | 0.49 | **0.49** | G,J |
| (*) | 123 | 526.79 | 5.54 | ND | 1000 | | 0.089 | 0.0009 | ND | 0.17 | **0.089** | J |
| | 118 | 14000.00 | 5.56 | 14000 | 1000 | | 2.373 | 0.0009 | 2.4 | 0.17 | **2.4** | C |
| | 114 | ND* | 5.08 | ND | 1000 | | ND* | 0.0009 | ND | 0.17 | **0.085** | ** |
| | 105 | 6100.00 | 6.00 | 6100 | 1000 | | 1.034 | 0.0010 | 1.0 | 0.17 | **1.0** | C |
| | 126 | ND* | 6.15 | ND | 1000 | | ND* | 0.0010 | ND | 0.17 | **0.085** | ** |
| | 167 | 210.27 | 2.15 | ND | 1000 | | 0.036 | 0.0004 | ND | 0.17 | **0.036** | J |
| | 156 | 431.67 | 2.20 | ND | 1000 | | 0.073 | 0.0004 | ND | 0.17 | **0.073** | J |
| | 157 | 88.01 | 2.09 | ND | 1000 | | 0.015 | 0.0004 | ND | 0.17 | **0.015** | J |
| | 169 | 27.57 | 3.36 | ND | 1000 | | 0.005 | 0.0006 | ND | 0.17 | **0.0047** | J |
| | 189 | ND* | 1.97 | ND | 1000 | | ND* | 0.0003 | ND | 0.17 | **0.085** | ** |
| MAY09-MSP-TO9A | 81 | ND* | 6.19 | ND | 1000 | 6341 | ND* | 0.0010 | ND | 0.16 | **0.079** | ** |
| | 77 | 843.96 | 6.36 | ND | 1000 | | 0.133 | 0.0010 | ND | 0.16 | **0.13** | J |
| (*) | 123 | 197.22 | 4.30 | ND | 1000 | | 0.031 | 0.0007 | ND | 0.16 | **0.031** | J |
| | 118 | 4700.00 | 4.31 | 4700 | 1000 | | 0.741 | 0.0007 | 0.74 | 0.16 | **0.74** | C |
| | 114 | ND* | 3.97 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.079** | ** |
| | 105 | 2000.00 | 4.32 | 2000 | 1000 | | 0.315 | 0.0007 | 0.32 | 0.16 | **0.32** | C |
| | 126 | ND* | 4.46 | ND | 1000 | | ND* | 0.0007 | ND | 0.16 | **0.079** | ** |
| | 167 | 117.13 | 2.99 | ND | 1000 | | 0.018 | 0.0005 | ND | 0.16 | **0.018** | J |
| | 156 | 198.11 | 2.91 | ND | 1000 | | 0.031 | 0.0005 | ND | 0.16 | **0.031** | J |
| | 157 | 43.17 | 2.71 | ND | 1000 | | 0.007 | 0.0004 | ND | 0.16 | **0.0068** | J |
| | 169 | 14.64 | 4.10 | ND | 1000 | | 0.002 | 0.0006 | ND | 0.16 | **0.0023** | J |
| | 189 | ND* | 2.21 | ND | 1000 | | ND* | 0.0003 | ND | 0.16 | **0.079** | ** |
| MAY09-Field Blank | 81 | ND* | 2.15 | ND | 1000 | | | | | | | |
| | 77 | ND* | 2.29 | ND | 1000 | | | | | | | |
| | 123 | 11.44 | 1.50 | ND | 1000 | | | | | | | |
| | 118 | ND* | 1.43 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.31 | ND | 1000 | | | | | | | |
| | 105 | ND* | 1.58 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.70 | ND | 1000 | | | | | | | |
| | 167 | ND* | 1.27 | ND | 1000 | | | | | | | |
| | 156 | ND* | 1.27 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.20 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.90 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.75 | ND | 1000 | | | | | | | |
| MAY09-Method Blank | 81 | ND* | 1.65 | ND | 1000 | | | | | | | |
| | 77 | ND* | 1.85 | ND | 1000 | | | | | | | |
| | 123 | 10.98 | 1.60 | ND | 1000 | | | | | | | |
| | 118 | 2.10 | 1.50 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.43 | ND | 1000 | | | | | | | |
| | 105 | 4.70 | 1.77 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.92 | ND | 1000 | | | | | | | |
| | 167 | 2.51 | 1.85 | ND | 1000 | | | | | | | |
| | 156 | 3.13 | 1.87 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.69 | ND | 1000 | | | | | | | |
| | 169 | 5.28 | 2.24 | ND | 1000 | | | | | | | |
| | 189 | 3.40 | 1.72 | ND | 1000 | | | | | | | |

| | | | |
|---|---|---|---|
| RL | Reporting limit | Flags: | |
| ND | Not detected at or above the RL | J | Detected ≥ EDL and < RL. |
| ND* | Not detected at or above the EDL | G | Elevated reporting limit. The reporting limit is elevated due to matrix interference. |
| EDL | Estimated detection limit | | |
| $m^3$ | Cubic meter | C | Co-eluting isomer. |
| pg | Picogram | Q | Estimated maximum potential concentration. |
| $pg/m^3$ | Picogram per cubic meter | B | Method blank contamination. |
| EPC* | Proposed exposure point concentration (EPC) to be used in ERA and HHRA. | ** | ND, therefore surrogate EPC assigned as 1/2 the RL |
| | | (*) | Non critical sampling related issue associated with this sample. |

# Table 4.1.1
## Summary of Air Results
## (Jan 2009 - Dec 2009)

| Air Sample Name (sampling related flag) | PCB | Raw Data from Lab Result (pg) | Raw Data from Lab EDL (pg) | Presented in Lab Reports Result (pg) | Presented in Lab Reports RL (pg) | Sample Volume ($m^3$) | Raw Data Converted to $pg/m^3$ Result ($pg/m^3$) | Raw Data Converted to $pg/m^3$ EDL ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ Result ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ RL ($pg/m^3$) | EPC* ($pg/m^3$) | Analytical Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JUN09-UMS1-TO9A | 81 | 140.35 | 59.62 | ND | 1000 | 6372 | 0.022 | 0.009 | ND | 0.16 | **0.022** | J |
| | 77 | 280.21 | 66.37 | ND | 1000 | | 0.044 | 0.010 | ND | 0.16 | **0.044** | J |
| (*) | 123 | 133.56 | 21.44 | ND | 1000 | | 0.021 | 0.003 | ND | 0.16 | **0.021** | J |
| | 118 | 167.33 | 21.10 | ND | 1000 | | 0.026 | 0.003 | ND | 0.16 | **0.026** | J |
| | 114 | ND* | 20.75 | ND | 1000 | | ND* | 0.003 | ND | 0.16 | **0.078** | ** |
| | 105 | ND* | 25.38 | ND | 1000 | | ND* | 0.004 | ND | 0.16 | **0.078** | ** |
| | 126 | ND* | 25.90 | ND | 1000 | | ND* | 0.004 | ND | 0.16 | **0.078** | ** |
| | 167 | 357.61 | 10.08 | ND | 1000 | | 0.056 | 0.002 | ND | 0.16 | **0.056** | J |
| | 156 | 114.89 | 8.65 | ND | 1000 | | 0.018 | 0.001 | ND | 0.16 | **0.018** | J |
| | 157 | 26.91 | 8.68 | ND | 1000 | | 0.004 | 0.001 | ND | 0.16 | **0.0042** | J |
| | 169 | ND* | 12.66 | ND | 1000 | | ND* | 0.002 | ND | 0.16 | **0.078** | ** |
| | 189 | ND* | 5.42 | ND | 1000 | | ND* | 0.001 | ND | 0.16 | **0.078** | ** |
| JUN09-DMS1-TO9A | 81 | 642.34 | 74.32 | ND | 1000 | 6369 | 0.101 | 0.012 | ND | 0.16 | **0.10** | J |
| | 77 | 2176.93 | 93.35 | ND | 2200 | | 0.342 | 0.015 | ND | 0.35 | **0.34** | G,J |
| | 123 | 503.95 | 33.33 | ND | 1000 | | 0.079 | 0.005 | ND | 0.16 | **0.079** | J |
| | 118 | 12000.00 | 35.01 | 12000 | 1000 | | 1.884 | 0.005 | 1.9 | 0.16 | **1.9** | C |
| | 114 | 454.84 | 31.25 | ND | 1000 | | 0.071 | 0.005 | ND | 0.16 | **0.071** | J |
| | 105 | 5100.00 | 42.13 | 5100 | 1000 | | 0.801 | 0.007 | 0.80 | 0.16 | **0.80** | C |
| | 126 | 79.65 | 42.22 | ND | 1000 | | 0.013 | 0.007 | ND | 0.16 | **0.013** | J |
| | 167 | 675.12 | 14.78 | ND | 1000 | | 0.106 | 0.002 | ND | 0.16 | **0.11** | J |
| | 156 | 252.85 | 13.24 | ND | 1000 | | 0.040 | 0.002 | ND | 0.16 | **0.040** | J |
| | 157 | 64.09 | 12.93 | ND | 1000 | | 0.010 | 0.002 | ND | 0.16 | **0.010** | J |
| | 169 | ND* | 17.32 | ND | 1000 | | ND* | 0.003 | ND | 0.16 | **0.079** | ** |
| | 189 | 16.51 | 2.39 | ND | 1000 | | 0.003 | 0.0004 | ND | 0.16 | **0.0026** | J |
| JUN09-DMS1-TO9A-DUP | 81 | 622.39 | 87.57 | ND | 1000 | 6354 | 0.098 | 0.014 | ND | 0.16 | **0.10** | J |
| | 77 | 2087.03 | 98.52 | ND | 2100 | | 0.328 | 0.016 | ND | 0.33 | **0.33** | G,J |
| (*) | 123 | 498.60 | 21.28 | ND | 1000 | | 0.078 | 0.003 | ND | 0.16 | **0.078** | J |
| | 118 | 10000.00 | 20.93 | 10000 | 1000 | | 1.574 | 0.003 | 1.6 | 0.16 | **1.6** | C |
| | 114 | 333.93 | 19.80 | ND | 1000 | | 0.053 | 0.003 | ND | 0.16 | **0.053** | J |
| | 105 | 4300.00 | 27.03 | 4300 | 1000 | | 0.677 | 0.004 | 0.68 | 0.16 | **0.68** | C |
| | 126 | ND* | 28.53 | ND | 1000 | | ND* | 0.004 | ND | 0.16 | **0.079** | ** |
| | 167 | 624.71 | 10.31 | ND | 1000 | | 0.098 | 0.002 | ND | 0.16 | **0.10** | J |
| | 156 | 236.36 | 9.55 | ND | 1000 | | 0.037 | 0.002 | ND | 0.16 | **0.037** | J |
| | 157 | 51.41 | 9.09 | ND | 1000 | | 0.008 | 0.001 | ND | 0.16 | **0.0081** | J |
| | 169 | ND* | 12.03 | ND | 1000 | | ND* | 0.002 | ND | 0.16 | **0.079** | ** |
| | 189 | 19.16 | 1.51 | ND | 1000 | | 0.003 | 0.000 | ND | 0.16 | **0.0030** | J |
| JUN09-MSP-TO9A | 81 | ND* | 76.09 | ND | 1000 | 6398 | ND* | 0.012 | ND | 0.16 | **0.078** | ** |
| | 77 | 194.50 | 81.58 | ND | 1000 | | 0.030 | 0.013 | ND | 0.16 | **0.030** | J |
| (*) | 123 | 353.76 | 33.60 | ND | 1000 | | 0.055 | 0.005 | ND | 0.16 | **0.06** | J |
| | 118 | 7000.00 | 33.03 | 7000 | 1000 | | 1.094 | 0.005 | 1.1 | 0.16 | **1.1** | C |
| | 114 | 241.21 | 33.62 | ND | 1000 | | 0.038 | 0.005 | ND | 0.16 | **0.04** | J |
| | 105 | 3100.00 | 40.19 | 3100 | 1000 | | 0.485 | 0.006 | 0.48 | 0.16 | **0.48** | C |
| | 126 | ND* | 47.45 | ND | 1000 | | ND* | 0.007 | ND | 0.16 | **0.08** | ** |
| | 167 | 608.28 | 16.10 | ND | 1000 | | 0.095 | 0.003 | ND | 0.16 | **0.10** | J |
| | 156 | 216.18 | 15.72 | ND | 1000 | | 0.034 | 0.002 | ND | 0.16 | **0.034** | J |
| | 157 | 64.78 | 14.30 | ND | 1000 | | 0.010 | 0.002 | ND | 0.16 | **0.010** | J |
| | 169 | ND* | 19.08 | ND | 1000 | | ND* | 0.003 | ND | 0.16 | **0.078** | ** |
| | 189 | 19.95 | 3.43 | ND | 1000 | | 0.003 | 0.001 | ND | 0.16 | **0.0031** | J |
| JUN09-Field Blank | 81 | ND* | 2.87 | ND | 1000 | | | | | | | |
| | 77 | ND* | 3.58 | ND | 1000 | | | | | | | |
| | 123 | ND* | 1.66 | ND | 1000 | | | | | | | |
| | 118 | 13.58 | 1.64 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.52 | ND | 1000 | | | | | | | |
| | 105 | 4.90 | 2.12 | ND | 1000 | | | | | | | |
| | 126 | ND* | 2.27 | ND | 1000 | | | | | | | |
| | 167 | 1.93 | 1.24 | ND | 1000 | | | | | | | |
| | 156 | ND* | 1.16 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.08 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.40 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.04 | ND | 1000 | | | | | | | |
| JUN09-Method Blank | 81 | ND* | 0.94 | ND | 1000 | | | | | | | |
| | 77 | 1.35 | 1.05 | ND | 1000 | | | | | | | |
| | 123 | ND* | 0.81 | ND | 1000 | | | | | | | |
| | 118 | 10.80 | 0.81 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.80 | ND | 1000 | | | | | | | |
| | 105 | 2.84 | 1.02 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.00 | ND | 1000 | | | | | | | |
| | 167 | ND* | 0.51 | ND | 1000 | | | | | | | |
| | 156 | ND* | 0.45 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.43 | ND | 1000 | | | | | | | |
| | 169 | ND* | 0.57 | ND | 1000 | | | | | | | |
| | 189 | ND* | 0.24 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
$m^3$ Cubic meter
pg Picogram
$pg/m^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
## Summary of Air Results
## (Jan 2009 - Dec 2009)

| Air Sample Name (sampling related flag) | PCB | Raw Data from Lab Result (pg) | Raw Data from Lab EDL (pg) | Presented in Lab Reports Result (pg) | Presented in Lab Reports RL (pg) | Sample Volume ($m^3$) | Raw Data Converted to $pg/m^3$ Result ($pg/m^3$) | Raw Data Converted to $pg/m^3$ EDL ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ Result ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ RL ($pg/m^3$) | EPC* ($pg/m^3$) | Analytical Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JUL09-UMS1-TO9A | 81 | ND* | 3.62 | ND | 1000 | 6323 | ND* | 0.0006 | ND | 0.16 | **0.079** | ** |
| | 77 | ND* | 3.92 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.079** | ** |
| (*) | 123 | 135.58 | 2.83 | ND | 1000 | | 0.021 | 0.0004 | ND | 0.16 | **0.021** | J |
| | 118 | 3800.00 | 2.78 | 3800 | 1000 | | 0.601 | 0.0004 | 0.60 | 0.16 | **0.60** | C |
| | 114 | ND* | 2.47 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.079** | ** |
| | 105 | 1400.00 | 2.77 | 1400 | 1000 | | 0.221 | 0.0004 | 0.22 | 0.16 | **0.22** | C |
| | 126 | ND* | 2.73 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.079** | ** |
| | 167 | 84.32 | 1.57 | ND | 1000 | | 0.013 | 0.0002 | ND | 0.16 | **0.013** | J |
| | 156 | 164.48 | 1.43 | ND | 1000 | | 0.026 | 0.0002 | ND | 0.16 | **0.026** | J |
| | 157 | 37.90 | 1.41 | ND | 1000 | | 0.006 | 0.0002 | ND | 0.16 | **0.0060** | J |
| | 169 | ND* | 1.81 | ND | 1000 | | ND* | 0.0003 | ND | 0.16 | **0.079** | ** |
| | 189 | ND* | 0.87 | ND | 1000 | | ND* | 0.0001 | ND | 0.16 | **0.079** | ** |
| JUL09-DMS1-TO9A | 81 | ND* | 4.19 | ND | 1000 | 6288 | ND* | 0.0007 | ND | 0.16 | **0.080** | ** |
| | 77 | 2323.14 | 4.56 | ND | 2300 | | 0.369 | 0.0007 | ND | 0.37 | **0.37** | G,J |
| (*) | 123 | 440.81 | 2.29 | ND | 1000 | | 0.070 | 0.0004 | ND | 0.16 | **0.070** | J |
| | 118 | 11000.00 | 2.15 | 11000 | 1000 | | 1.749 | 0.0003 | 1.7 | 0.16 | **1.7** | C |
| | 114 | 323.01 | 1.95 | ND | 1000 | | 0.051 | 0.0003 | ND | 0.16 | **0.051** | J |
| | 105 | 5000.00 | 2.26 | 5000 | 1000 | | 0.795 | 0.0004 | 0.80 | 0.16 | **0.80** | C |
| | 126 | ND* | 2.41 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.080** | ** |
| | 167 | 169.06 | 1.64 | ND | 1000 | | 0.027 | 0.0003 | ND | 0.16 | **0.027** | J |
| | 156 | 370.07 | 1.55 | ND | 1000 | | 0.059 | 0.0002 | ND | 0.16 | **0.059** | J |
| | 157 | 74.69 | 1.46 | ND | 1000 | | 0.012 | 0.0002 | ND | 0.16 | **0.012** | J |
| | 169 | ND* | 2.58 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.080** | ** |
| | 189 | ND* | 1.49 | ND | 1000 | | ND* | 0.0002 | ND | 0.16 | **0.080** | ** |
| JUL09-MSP-TO9A | 81 | ND* | 3.22 | ND | 1000 | 6398 | ND* | 0.0005 | ND | 0.16 | **0.078** | ** |
| | 77 | 616.44 | 3.64 | ND | 1000 | | 0.096 | 0.0006 | ND | 0.16 | **0.096** | J |
| (*) | 123 | 148.87 | 2.00 | ND | 1000 | | 0.023 | 0.0003 | ND | 0.16 | **0.023** | J |
| | 118 | 4100.00 | 1.93 | 4100 | 1000 | | 0.641 | 0.0003 | 0.64 | 0.16 | **0.64** | C |
| | 114 | ND* | 1.81 | ND | 1000 | | ND* | 0.0003 | ND | 0.16 | **0.078** | ** |
| | 105 | 1600.00 | 2.06 | 1600 | 1000 | | 0.250 | 0.0003 | 0.25 | 0.16 | **0.25** | C |
| | 126 | ND* | 2.12 | ND | 1000 | | ND* | 0.0003 | ND | 0.16 | **0.078** | ** |
| | 167 | 103.23 | 1.27 | ND | 1000 | | 0.016 | 0.0002 | ND | 0.16 | **0.016** | J |
| | 156 | 186.44 | 1.24 | ND | 1000 | | 0.029 | 0.0002 | ND | 0.16 | **0.029** | J |
| | 157 | 40.15 | 1.17 | ND | 1000 | | 0.006 | 0.0002 | ND | 0.16 | **0.0063** | J |
| | 169 | ND* | 2.10 | ND | 1000 | | ND* | 0.0003 | ND | 0.16 | **0.078** | ** |
| | 189 | ND* | 1.04 | ND | 1000 | | ND* | 0.0002 | ND | 0.16 | **0.078** | ** |
| JUL09-MSP-TO9A-DUP | 81 | ND* | 4.18 | ND | 1000 | 6354 | ND* | 0.0007 | ND | 0.16 | **0.079** | ** |
| | 77 | 835.57 | 4.47 | ND | 1000 | | 0.131 | 0.0007 | ND | 0.16 | **0.13** | J |
| (*) | 123 | 204.20 | 2.21 | ND | 1000 | | 0.032 | 0.0003 | ND | 0.16 | **0.032** | J |
| | 118 | 4700.00 | 2.11 | 4700 | 1000 | | 0.740 | 0.0003 | 0.74 | 0.16 | **0.74** | C |
| | 114 | ND* | 1.93 | ND | 1000 | | ND* | 0.0003 | ND | 0.16 | **0.079** | ** |
| | 105 | 2100.00 | 2.22 | 2100 | 1000 | | 0.330 | 0.0003 | 0.33 | 0.16 | **0.33** | C |
| | 126 | ND* | 2.41 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.079** | ** |
| | 167 | 112.38 | 1.69 | ND | 1000 | | 0.018 | 0.0003 | ND | 0.16 | **0.018** | J |
| | 156 | 217.01 | 1.63 | ND | 1000 | | 0.034 | 0.0003 | ND | 0.16 | **0.034** | J |
| | 157 | 45.31 | 1.51 | ND | 1000 | | 0.007 | 0.0002 | ND | 0.16 | **0.0071** | J |
| | 169 | ND* | 2.60 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.079** | ** |
| | 189 | ND* | 1.47 | ND | 1000 | | ND* | 0.0002 | ND | 0.16 | **0.079** | ** |
| JUL09-Field Blank | 81 | ND* | 1.07 | ND | 1000 | | | | | | | |
| | 77 | ND* | 1.23 | ND | 1000 | | | | | | | |
| | 123 | ND* | 0.89 | ND | 1000 | | | | | | | |
| | 118 | 16.08 | 0.88 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.79 | ND | 1000 | | | | | | | |
| | 105 | 6.13 | 0.95 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.05 | ND | 1000 | | | | | | | |
| | 167 | 1.22 | 1.06 | ND | 1000 | | | | | | | |
| | 156 | 1.26 | 1.07 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.02 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.81 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.08 | ND | 1000 | | | | | | | |
| JUL09-Method Blank | 81 | ND* | 0.99 | ND | 1000 | | | | | | | |
| | 77 | 1.33 | 1.13 | ND | 1000 | | | | | | | |
| | 123 | ND* | 0.93 | ND | 1000 | | | | | | | |
| | 118 | 9.34 | 0.90 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.83 | ND | 1000 | | | | | | | |
| | 105 | 4.17 | 0.99 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.16 | ND | 1000 | | | | | | | |
| | 167 | ND* | 0.86 | ND | 1000 | | | | | | | |
| | 156 | ND* | 0.83 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.81 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.16 | ND | 1000 | | | | | | | |
| | 189 | ND* | 0.82 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
$m^3$ Cubic meter
pg Picogram
$pg/m^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
# Summary of Air Results
# (Jan 2009 - Dec 2009)

| Air Sample Name | | Raw Data from Lab | | Presented in Lab Reports | | Sample Volume | Raw Data Converted to pg/m$^3$ | | Lab Presented Data Converted to pg/m$^3$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (sampling related flag) | PCB | Result (pg) | EDL (pg) | Result (pg) | RL (pg) | (m$^3$) | Result (pg/m$^3$) | EDL (pg/m$^3$) | Result (pg/m$^3$) | RL (pg/m$^3$) | EPC* (pg/m$^3$) | Analytical Flag |
| AUG09-UMS1-TO9A | 81 | ND* | 3.64 | ND | 1000 | 6177 | ND* | 0.0006 | ND | 0.16 | **0.081** | ** |
| | 77 | 449.35 | 3.84 | ND | 1000 | | 0.073 | 0.0006 | ND | 0.16 | **0.073** | J |
| (*) | 123 | 136.30 | 3.87 | ND | 1000 | | 0.022 | 0.0006 | ND | 0.16 | **0.022** | J |
| | 118 | 3400.00 | 3.65 | 3400 | 1000 | | 0.550 | 0.0006 | 0.55 | 0.16 | **0.55** | C |
| | 114 | ND* | 3.51 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.081** | ** |
| | 105 | 1300.00 | 3.71 | 1300 | 1000 | | 0.210 | 0.0006 | 0.21 | 0.16 | **0.21** | C |
| | 126 | ND* | 3.71 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.081** | ** |
| | 167 | 91.72 | 1.87 | ND | 1000 | | 0.015 | 0.0003 | ND | 0.16 | **0.015** | J |
| | 156 | 150.44 | 1.48 | ND | 1000 | | 0.024 | 0.0002 | ND | 0.16 | **0.024** | J |
| | 157 | 32.51 | 1.55 | ND | 1000 | | 0.005 | 0.0003 | ND | 0.16 | **0.0053** | J |
| | 169 | 15.28 | 2.29 | ND | 1000 | | 0.002 | 0.0004 | ND | 0.16 | **0.0025** | J |
| | 189 | 41.13 | 1.77 | ND | 1000 | | 0.007 | 0.0003 | ND | 0.16 | **0.0067** | J |
| AUG09-DMS1-TO9A | 81 | 516.58 | 4.99 | ND | 1000 | 6194 | 0.083 | 0.0008 | ND | 0.16 | **0.083** | J |
| | 77 | 3235.21 | 5.06 | ND | 3200 | | 0.522 | 0.0008 | ND | 0.52 | **0.52** | G,J |
| (*) | 123 | 563.78 | 4.04 | ND | 1000 | | 0.091 | 0.0007 | ND | 0.16 | **0.091** | J |
| | 118 | 14000.00 | 3.96 | 14000 | 1000 | | 2.260 | 0.0006 | 2.3 | 0.16 | **2.3** | C |
| | 114 | 468.39 | 3.84 | ND | 1000 | | 0.076 | 0.0006 | ND | 0.16 | **0.076** | J |
| | 105 | 7000.00 | 4.17 | 7000 | 1000 | | 1.130 | 0.0007 | 1.1 | 0.16 | **1.1** | C |
| | 126 | 87.59 | 4.11 | ND | 1000 | | 0.014 | 0.0007 | ND | 0.16 | **0.014** | J |
| | 167 | 199.25 | 1.54 | ND | 1000 | | 0.032 | 0.0002 | ND | 0.16 | **0.032** | J |
| | 156 | 413.03 | 1.25 | ND | 1000 | | 0.067 | 0.0002 | ND | 0.16 | **0.067** | J |
| | 157 | 87.81 | 1.28 | ND | 1000 | | 0.014 | 0.0002 | ND | 0.16 | **0.014** | J |
| | 169 | 33.81 | 1.90 | ND | 1000 | | 0.005 | 0.0003 | ND | 0.16 | **0.0055** | J |
| | 189 | ND* | 1.27 | ND | 1000 | | ND* | 0.0002 | ND | 0.16 | **0.081** | ** |
| AUG09-MSP-TO9A | 81 | 265.12 | 4.38 | ND | 1000 | 6175 | 0.043 | 0.0007 | ND | 0.16 | **0.043** | J |
| | 77 | 1319.61 | 4.55 | ND | 1300 | | 0.214 | 0.0007 | ND | 0.21 | **0.21** | G,J |
| (*) | 123 | 252.29 | 3.01 | ND | 1000 | | 0.041 | 0.0005 | ND | 0.16 | **0.041** | J |
| | 118 | 6600.00 | 2.83 | 6600 | 1000 | | 1.069 | 0.0005 | 1.1 | 0.16 | **1.1** | C |
| | 114 | 203.11 | 2.72 | ND | 1000 | | 0.033 | 0.0004 | ND | 0.16 | **0.033** | J |
| | 105 | 3100.00 | 2.77 | 3100 | 1000 | | 0.502 | 0.0004 | 0.50 | 0.16 | **0.50** | C |
| | 126 | 46.65 | 2.92 | ND | 1000 | | 0.008 | 0.0005 | ND | 0.16 | **0.0076** | J |
| | 167 | 138.27 | 1.80 | ND | 1000 | | 0.022 | 0.0003 | ND | 0.16 | **0.022** | J |
| | 156 | 271.90 | 1.44 | ND | 1000 | | 0.044 | 0.0002 | ND | 0.16 | **0.044** | J |
| | 157 | 53.90 | 1.52 | ND | 1000 | | 0.009 | 0.0002 | ND | 0.16 | **0.0087** | J |
| | 169 | 25.85 | 2.25 | ND | 1000 | | 0.004 | 0.0004 | ND | 0.16 | **0.0042** | J |
| | 189 | ND* | 1.72 | ND | 1000 | | ND | 0.0003 | ND | 0.16 | **0.081** | ** |
| AUG09-Field Blank | 81 | ND* | 1.30 | ND | 1000 | | | | | | | |
| | 77 | 3.32 | 1.47 | ND | 1000 | | | | | | | |
| | 123 | 17.22 | 1.14 | ND | 1000 | | | | | | | |
| | 118 | ND* | 1.08 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.09 | ND | 1000 | | | | | | | |
| | 105 | 7.42 | 1.17 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.23 | ND | 1000 | | | | | | | |
| | 167 | ND* | 1.01 | ND | 1000 | | | | | | | |
| | 156 | ND* | 0.81 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.82 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.18 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.06 | ND | 1000 | | | | | | | |
| AUG09-Method Blank | 81 | 1.15 | 0.83 | ND | 1000 | | | | | | | |
| | 77 | 2.29 | 0.98 | ND | 1000 | | | | | | | |
| | 123 | 14.34 | 0.73 | ND | 1000 | | | | | | | |
| | 118 | ND* | 0.69 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.69 | ND | 1000 | | | | | | | |
| | 105 | 4.92 | 0.74 | ND | 1000 | | | | | | | |
| | 126 | ND* | 0.90 | ND | 1000 | | | | | | | |
| | 167 | 2.41 | 0.69 | ND | 1000 | | | | | | | |
| | 156 | 0.93 | 0.55 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.59 | ND | 1000 | | | | | | | |
| | 169 | ND* | 0.89 | ND | 1000 | | | | | | | |
| | 189 | ND* | 0.64 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
m$^3$ Cubic meter
pg Picogram
pg/m$^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
# Summary of Air Results
# (Jan 2009 - Dec 2009)

| Air Sample Name | | Raw Data from Lab | | Presented in Lab Reports | | Sample Volume | Raw Data Converted to pg/m³ | | Lab Presented Data Converted to pg/m³ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (sampling related flag) | PCB | Result (pg) | EDL (pg) | Result (pg) | RL (pg) | (m³) | Result (pg/m³) | EDL (pg/m³) | Result (pg/m³) | RL (pg/m³) | EPC* (pg/m³) | Analytical Flag |
| SEP09-UMS1-TO9A | 81 | 86.86 | 3.01 | ND | 1000 | 6263 | 0.014 | 0.0005 | ND | 0.16 | **0.014** | J |
| | 77 | 400.25 | 3.23 | ND | 1000 | | 0.064 | 0.0005 | ND | 0.16 | **0.064** | J |
| (*) | 123 | 218.74 | 2.63 | ND | 1000 | | 0.035 | 0.0004 | ND | 0.16 | **0.035** | J |
| | 118 | 3500.00 | 2.38 | 3500 | 1000 | | 0.559 | 0.0004 | 0.56 | 0.16 | **0.56** | C |
| | 114 | 76.51 | 2.38 | ND | 1000 | | 0.012 | 0.0004 | ND | 0.16 | **0.012** | J |
| | 105 | 1300.00 | 2.48 | 1300 | 1000 | | 0.208 | 0.0004 | 0.21 | 0.16 | **0.21** | C |
| | 126 | ND* | 2.92 | ND | 1000 | | ND* | 0.0005 | ND | 0.16 | **0.080** | ** |
| | 167 | 108.67 | 2.46 | ND | 1000 | | 0.017 | 0.0004 | ND | 0.16 | **0.017** | J |
| | 156 | 163.82 | 2.06 | ND | 1000 | | 0.026 | 0.0003 | ND | 0.16 | **0.026** | J |
| | 157 | 36.57 | 2.12 | ND | 1000 | | 0.006 | 0.0003 | ND | 0.16 | **0.0058** | J |
| | 169 | ND* | 3.31 | ND | 1000 | | ND* | 0.0005 | ND | 0.16 | **0.080** | ** |
| | 189 | 14.93 | 1.69 | ND | 1000 | | 0.002 | 0.0003 | ND | 0.16 | **0.0024** | J |
| SEP09-DMS1-TO9A | 81 | 451.57 | 3.91 | ND | 1000 | 6154 | 0.073 | 0.0006 | ND | 0.16 | **0.073** | J |
| | 77 | 2831.79 | 4.10 | ND | 2800 | | 0.460 | 0.0007 | ND | 0.46 | **0.46** | G,J |
| (*) | 123 | 717.38 | 3.23 | ND | 1000 | | 0.117 | 0.0005 | ND | 0.16 | **0.12** | J |
| | 118 | 13000.00 | 3.03 | 13000 | 1000 | | 2.113 | 0.0005 | 2.1 | 0.16 | **2.1** | C |
| | 114 | 533.87 | 3.01 | ND | 1000 | | 0.087 | 0.0005 | ND | 0.16 | **0.087** | J |
| | 105 | 5800.00 | 3.47 | 5800 | 1000 | | 0.943 | 0.0006 | 0.94 | 0.16 | **0.94** | C |
| | 126 | 68.21 | 3.90 | ND | 1000 | | 0.011 | 0.0006 | ND | 0.16 | **0.011** | J |
| | 167 | 242.32 | 2.55 | ND | 1000 | | 0.039 | 0.0004 | ND | 0.16 | **0.039** | J |
| | 156 | 365.60 | 2.15 | ND | 1000 | | 0.059 | 0.0003 | ND | 0.16 | **0.059** | J |
| | 157 | 80.07 | 2.24 | ND | 1000 | | 0.013 | 0.0004 | ND | 0.16 | **0.013** | J |
| | 169 | ND* | 3.33 | ND | 1000 | | ND* | 0.0005 | ND | 0.16 | **0.081** | ** |
| | 189 | 33.00 | 2.52 | ND | 1000 | | 0.005 | 0.0004 | ND | 0.16 | **0.0054** | J |
| SEP09-MSP-TO9A | 81 | 333.40 | 3.99 | ND | 1000 | 5411 | 0.062 | 0.0007 | ND | 0.18 | **0.062** | J |
| | 77 | 2136.61 | 4.18 | ND | 2100 | | 0.395 | 0.0008 | ND | 0.39 | **0.39** | G,J |
| (*) | 123 | 388.05 | 2.54 | ND | 1000 | | 0.072 | 0.0005 | ND | 0.18 | **0.072** | J |
| | 118 | 9800.00 | 3.40 | 9800 | 1000 | | 1.811 | 0.0006 | 1.8 | 0.18 | **1.8** | C |
| | 114 | 370.42 | 2.42 | ND | 1000 | | 0.068 | 0.0004 | ND | 0.18 | **0.068** | J |
| | 105 | 4500.00 | 2.76 | 4500 | 1000 | | 0.832 | 0.0005 | 0.83 | 0.18 | **0.83** | C |
| | 126 | 57.91 | 3.19 | ND | 1000 | | 0.011 | 0.0006 | ND | 0.18 | **0.011** | J |
| | 167 | 169.10 | 2.39 | ND | 1000 | | 0.031 | 0.0004 | ND | 0.18 | **0.031** | J |
| | 156 | 354.39 | 1.88 | ND | 1000 | | 0.065 | 0.0003 | ND | 0.18 | **0.065** | J |
| | 157 | 72.62 | 2.02 | ND | 1000 | | 0.013 | 0.0004 | ND | 0.18 | **0.013** | J |
| | 169 | ND* | 2.93 | ND | 1000 | | ND* | 0.0005 | ND | 0.18 | **0.092** | ** |
| | 189 | 39.68 | 2.28 | ND | 1000 | | 0.007 | 0.0004 | ND | 0.18 | **0.0073** | J |
| SEP09-Field Blank | 81 | ND* | 1.59 | ND | 1000 | | | | | | | |
| | 77 | 3.15 | 1.72 | ND | 1000 | | | | | | | |
| | 123 | ND* | 1.18 | ND | 1000 | | | | | | | |
| | 118 | 12.51 | 1.12 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.11 | ND | 1000 | | | | | | | |
| | 105 | 5.52 | 1.18 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.28 | ND | 1000 | | | | | | | |
| | 167 | ND* | 1.81 | ND | 1000 | | | | | | | |
| | 156 | ND* | 1.43 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.49 | ND | 1000 | | | | | | | |
| | 169 | ND* | 2.01 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.89 | ND | 1000 | | | | | | | |
| SEP09-Method Blank | 81 | ND* | 0.90 | ND | 1000 | | | | | | | |
| | 77 | 2.05 | 0.99 | ND | 1000 | | | | | | | |
| | 123 | 14.56 | 0.86 | ND | 1000 | | | | | | | |
| | 118 | ND* | 0.80 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.79 | ND | 1000 | | | | | | | |
| | 105 | 4.57 | 0.89 | ND | 1000 | | | | | | | |
| | 126 | ND* | 0.97 | ND | 1000 | | | | | | | |
| | 167 | ND* | 0.72 | ND | 1000 | | | | | | | |
| | 156 | 0.80 | 0.58 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.59 | ND | 1000 | | | | | | | |
| | 169 | ND* | 0.87 | ND | 1000 | | | | | | | |
| | 189 | ND* | 0.80 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
$m^3$ Cubic meter
pg Picogram
$pg/m^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
## Summary of Air Results
## (Jan 2009 - Dec 2009)

| Air Sample Name (sampling related flag) | PCB | Raw Data from Lab Result (pg) | Raw Data from Lab EDL (pg) | Presented in Lab Reports Result (pg) | Presented in Lab Reports RL (pg) | Sample Volume ($m^3$) | Raw Data Converted to $pg/m^3$ Result ($pg/m^3$) | Raw Data Converted to $pg/m^3$ EDL ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ Result ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ RL ($pg/m^3$) | EPC* ($pg/m^3$) | Analytical Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OCT09-UMS1-TO9A | 81 | ND* | 3.40 | ND | 1000 | 6398 | ND* | 0.0005 | ND | 0.16 | **0.078** | ** |
| | 77 | 353.20 | 3.56 | ND | 1000 | | 0.055 | 0.0006 | ND | 0.16 | **0.055** | J |
| (*) | 123 | 209.25 | 2.69 | ND | 1000 | | 0.033 | 0.0004 | ND | 0.16 | **0.033** | J |
| | 118 | 2600.00 | 2.55 | 1600 | 1000 | | 0.406 | 0.0004 | 0.25 | 0.16 | **0.25** | C |
| | 114 | ND* | 2.42 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.078** | ** |
| | 105 | 1100.00 | 2.56 | 1100 | 1000 | | 0.172 | 0.0004 | 0.17 | 0.16 | **0.17** | C |
| | 126 | 22.38 | 2.82 | ND | 1000 | | 0.003 | 0.0004 | ND | 0.16 | **0.0035** | J |
| | 167 | 88.04 | 1.78 | ND | 1000 | | 0.014 | 0.0003 | ND | 0.16 | **0.014** | J |
| | 156 | 108.59 | 1.45 | ND | 1000 | | 0.017 | 0.0002 | ND | 0.16 | **0.017** | J |
| | 157 | 27.90 | 1.51 | ND | 1000 | | 0.004 | 0.0002 | ND | 0.16 | **0.0044** | J |
| | 169 | ND* | 2.30 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.078** | ** |
| | 189 | ND* | 1.43 | ND | 1000 | | ND* | 0.0002 | ND | 0.16 | **0.078** | ** |
| OCT09-DMS1-TO9A | 81 | 590.30 | 6.49 | ND | 1000 | 6574 | 0.090 | 0.0010 | ND | 0.15 | **0.090** | J |
| | 77 | 3133.26 | 6.64 | ND | 3100 | | 0.477 | 0.0010 | ND | 0.47 | **0.48** | G,J |
| (*) | 123 | 792.02 | 3.54 | ND | 1000 | | 0.120 | 0.0005 | ND | 0.15 | **0.12** | J |
| | 118 | 18000.00 | 3.44 | 18000 | 1000 | | 2.738 | 0.0005 | 2.7 | 0.15 | **2.7** | C |
| | 114 | 679.62 | 3.41 | ND | 1000 | | 0.103 | 0.0005 | ND | 0.15 | **0.10** | J |
| | 105 | 7500.00 | 3.49 | 7500 | 1000 | | 1.141 | 0.0005 | 1.1 | 0.15 | **1.1** | C |
| | 126 | ND* | 3.94 | ND | 1000 | | ND* | 0.0006 | ND | 0.15 | **0.076** | ** |
| | 167 | 292.25 | 2.60 | ND | 1000 | | 0.044 | 0.0004 | ND | 0.15 | **0.044** | J |
| | 156 | 453.98 | 2.27 | ND | 1000 | | 0.069 | 0.0003 | ND | 0.15 | **0.069** | J |
| | 157 | 89.44 | 2.18 | ND | 1000 | | 0.014 | 0.0003 | ND | 0.15 | **0.014** | J |
| | 169 | ND* | 5.53 | ND | 1000 | | ND* | 0.0008 | ND | 0.15 | **0.076** | ** |
| | 189 | 39.04 | 2.12 | ND | 1000 | | 0.006 | 0.0003 | ND | 0.15 | **0.006** | J |
| OCT09-MSP-TO9A | 81 | 319.72 | 49.02 | ND | 1000 | 6387 | 0.050 | 0.0077 | ND | 0.16 | **0.050** | J |
| | 77 | 1776.54 | 5.22 | ND | 1800 | | 0.278 | 0.0008 | ND | 0.28 | **0.28** | G,J |
| | 123 | 514.08 | 3.22 | ND | 1000 | | 0.080 | 0.0005 | ND | 0.16 | **0.080** | J |
| | 118 | 9900.00 | 3.04 | 9900 | 1000 | | 1.550 | 0.0005 | 1.5 | 0.16 | **1.5** | C |
| | 114 | 357.45 | 2.96 | ND | 1000 | | 0.056 | 0.0005 | ND | 0.16 | **0.056** | J |
| | 105 | 4400.00 | 3.34 | 4400 | 1000 | | 0.689 | 0.0005 | 0.69 | 0.16 | **0.69** | C |
| | 126 | ND* | 3.82 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.078** | ** |
| | 167 | 208.39 | 2.70 | ND | 1000 | | 0.033 | 0.0004 | ND | 0.16 | **0.033** | J |
| | 156 | 314.90 | 2.27 | ND | 1000 | | 0.049 | 0.0004 | ND | 0.16 | **0.049** | J |
| | 157 | 60.93 | 2.22 | ND | 1000 | | 0.010 | 0.0003 | ND | 0.16 | **0.010** | J |
| | 169 | ND* | 3.71 | ND | 1000 | | ND* | 0.0006 | ND | 0.16 | **0.078** | ** |
| | 189 | ND* | 1.81 | ND | 1000 | | ND* | 0.0003 | ND | 0.16 | **0.078** | ** |
| OCT09-Field Blank | 81 | ND* | 1.26 | ND | 1000 | | | | | | | |
| | 77 | ND* | 1.43 | ND | 1000 | | | | | | | |
| | 123 | 1.19 | 0.94 | ND | 1000 | | | | | | | |
| | 118 | 17.74 | 0.89 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.91 | ND | 1000 | | | | | | | |
| | 105 | 6.39 | 0.99 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.15 | ND | 1000 | | | | | | | |
| | 167 | 2.39 | 1.01 | ND | 1000 | | | | | | | |
| | 156 | ND* | 0.83 | ND | 1000 | | | | | | | |
| | 157 | ND* | 0.88 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.33 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.19 | ND | 1000 | | | | | | | |
| OCT09-Method Blank | 81 | ND* | 1.06 | ND | 1000 | | | | | | | |
| | 77 | ND* | 1.22 | ND | 1000 | | | | | | | |
| | 123 | ND* | 0.91 | ND | 1000 | | | | | | | |
| | 118 | 10.88 | 0.91 | ND | 1000 | | | | | | | |
| | 114 | ND* | 0.88 | ND | 1000 | | | | | | | |
| | 105 | 4.63 | 1.02 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.32 | ND | 1000 | | | | | | | |
| | 167 | ND* | 4.61 | ND | 1000 | | | | | | | |
| | 156 | ND* | 1.73 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.59 | ND | 1000 | | | | | | | |
| | 169 | ND* | 2.65 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.67 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
$m^3$ Cubic meter
pg Picogram
$pg/m^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
## Summary of Air Results
## (Jan 2009 - Dec 2009)

| Air Sample Name | | Raw Data from Lab | | Presented in Lab Reports | | Sample Volume | Raw Data Converted to pg/m$^3$ | | Lab Presented Data Converted to pg/m$^3$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (sampling related flag) | PCB | Result (pg) | EDL (pg) | Result (pg) | RL (pg) | (m$^3$) | Result (pg/m$^3$) | EDL (pg/m$^3$) | Result (pg/m$^3$) | RL (pg/m$^3$) | EPC* (pg/m$^3$) | Analytical Flag |
| NOV09-UMS1-TO9A | 81 | 26.52 | 6.47 | ND | 1000 | 4186 | 0.006 | 0.0015 | ND | 0.24 | **0.12** | |
| | 77 | 88.52 | 6.89 | ND | 1000 | | 0.021 | 0.0016 | ND | 0.24 | **0.021** | J |
| (*) | 123 | 29.69 | 4.35 | ND | 1000 | | 0.007 | 0.0010 | ND | 0.24 | **0.0071** | J |
| | 118 | 774.53 | 4.23 | ND | 1000 | | 0.185 | 0.0010 | ND | 0.24 | **0.19** | J,C |
| | 114 | 18.56 | 4.10 | ND | 1000 | | 0.004 | 0.0010 | ND | 0.24 | **0.0044** | J |
| | 105 | 280.51 | 4.57 | ND | 1000 | | 0.067 | 0.0011 | ND | 0.24 | **0.067** | J,C |
| | 126 | 7.16 | 4.93 | ND | 1000 | | 0.002 | 0.0012 | ND | 0.24 | **0.0017** | J |
| | 167 | ND* | 3.11 | ND | 1000 | | ND* | 0.0007 | ND | 0.24 | **0.12** | ** |
| | 156 | 41.57 | 2.64 | ND | 1000 | | 0.010 | 0.0006 | ND | 0.24 | **0.0099** | J |
| | 157 | 9.92 | 2.59 | ND | 1000 | | 0.002 | 0.0006 | ND | 0.24 | **0.0024** | J |
| | 169 | ND* | 3.86 | ND | 1000 | | ND* | 0.0009 | ND | 0.24 | **0.12** | ** |
| | 189 | 4.19 | 2.46 | ND | 1000 | | 0.001 | 0.0006 | ND | 0.24 | **0.0010** | J |
| NOV09-DMS1TO9A | 81 | 391.03 | 24.45 | ND | 1000 | 5973 | 0.065 | 0.0041 | ND | 0.17 | **0.065** | J |
| | 77 | 1344.66 | 26.36 | ND | 1300 | | 0.225 | 0.0044 | ND | 0.22 | **0.23** | G,J |
| (*) | 123 | 536.53 | 19.90 | ND | 1000 | | 0.090 | 0.0033 | ND | 0.17 | **0.090** | J |
| | 118 | 7984.74 | 17.06 | 8000 | 1000 | | 1.337 | 0.0029 | 1.3 | 0.17 | **1.3** | C |
| | 114 | 270.51 | 18.29 | ND | 1000 | | 0.045 | 0.0031 | ND | 0.17 | **0.045** | J |
| | 105 | 3302.68 | 20.68 | 3300 | 1000 | | 0.553 | 0.0035 | 0.55 | 0.17 | **0.55** | C |
| | 126 | ND* | 24.96 | ND | 1000 | | ND* | 0.0042 | ND | 0.17 | **0.08** | ** |
| | 167 | 919.59 | 12.44 | ND | 1000 | | 0.154 | 0.0021 | ND | 0.17 | **0.15** | J |
| | 156 | 422.03 | 10.54 | ND | 1000 | | 0.071 | 0.0018 | ND | 0.17 | **0.071** | J |
| | 157 | 75.59 | 10.90 | ND | 1000 | | 0.013 | 0.0018 | ND | 0.17 | **0.013** | J |
| | 169 | ND* | 16.71 | ND | 1000 | | ND* | 0.0028 | ND | 0.17 | **0.08** | ** |
| | 189 | 45.56 | 11.00 | ND | 1000 | | 0.008 | 0.0018 | ND | 0.17 | **0.0076** | J |
| NOV09-MSP-TO9A | 81 | 60.44 | 6.34 | ND | 1000 | 3186 | 0.019 | 0.0020 | ND | 0.31 | **0.019** | J |
| | 77 | 290.88 | 6.57 | ND | 1000 | | 0.091 | 0.0021 | ND | 0.31 | **0.091** | J |
| (*) | 123 | 95.89 | 3.60 | ND | 1000 | | 0.030 | 0.0011 | ND | 0.31 | **0.030** | J |
| | 118 | 1590.16 | 3.40 | 1600 | 1000 | | 0.499 | 0.0011 | 0.5 | 0.31 | **0.50** | C |
| | 114 | 48.87 | 3.33 | ND | 1000 | | 0.015 | 0.0010 | ND | 0.31 | **0.015** | J |
| | 105 | 726.60 | 3.81 | ND | 1000 | | 0.228 | 0.0012 | ND | 0.31 | **0.23** | J |
| | 126 | ND* | 5.11 | ND | 1000 | | ND* | 0.0016 | ND | 0.31 | **0.16** | ** |
| | 167 | 144.61 | 4.02 | ND | 1000 | | 0.045 | 0.0013 | ND | 0.31 | **0.045** | J |
| | 156 | 89.86 | 3.25 | ND | 1000 | | 0.028 | 0.0010 | ND | 0.31 | **0.028** | J |
| | 157 | 13.20 | 3.36 | ND | 1000 | | 0.004 | 0.0011 | ND | 0.31 | **0.0041** | J |
| | 169 | ND* | 4.89 | ND | 1000 | | ND* | 0.0015 | ND | 0.31 | **0.16** | ** |
| | 189 | 9.60 | 2.16 | ND | 1000 | | 0.003 | 0.0007 | ND | 0.31 | **0.0030** | J |
| NOV09-Field Blank | 81 | ND* | 1.31 | ND | 1000 | | | | | | | |
| | 77 | 2.55 | 1.54 | ND | 1000 | | | | | | | |
| | 123 | ND* | 1.24 | ND | 1000 | | | | | | | |
| | 118 | 20.13 | 1.12 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.17 | ND | 1000 | | | | | | | |
| | 105 | 9.28 | 1.23 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.42 | ND | 1000 | | | | | | | |
| | 167 | 4.50 | 1.50 | ND | 1000 | | | | | | | |
| | 156 | 4.16 | 1.22 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.23 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.85 | ND | 1000 | | | | | | | |
| | 189 | ND* | 0.86 | ND | 1000 | | | | | | | |
| NOV09-Method Blank | 81 | 1.91 | 0.87 | ND | 1000 | | | | | | | |
| | 77 | 3.26 | 0.98 | ND | 1000 | | | | | | | |
| | 123 | 1.26 | 0.98 | ND | 1000 | | | | | | | |
| | 118 | 17.86 | 0.88 | ND | 1000 | | | | | | | |
| | 114 | 0.99 | 0.90 | ND | 1000 | | | | | | | |
| | 105 | 7.47 | 1.02 | ND | 1000 | | | | | | | |
| | 126 | 1.20 | 1.10 | ND | 1000 | | | | | | | |
| | 167 | 1.65 | 1.01 | ND | 1000 | | | | | | | |
| | 156 | 2.68 | 0.83 | ND | 1000 | | | | | | | |
| | 157 | 1.29 | 0.85 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.29 | ND | 1000 | | | | | | | |
| | 189 | 1.76 | 0.56 | ND | 1000 | | | | | | | |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
m$^3$ Cubic meter
pg Picogram
pg/m$^3$ Picogram per cubic meter
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.1.1
## Summary of Air Results
## (Jan 2009 - Dec 2009)

| Air Sample Name | | Raw Data from Lab | | Presented in Lab Reports | | Sample Volume | Raw Data Converted to pg/m$^3$ | | Lab Presented Data Converted to pg/m$^3$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (sampling related flag) | PCB | Result (pg) | EDL (pg) | Result (pg) | RL (pg) | (m$^3$) | Result (pg/m$^3$) | EDL (pg/m$^3$) | Result (pg/m$^3$) | RL (pg/m$^3$) | EPC* (pg/m$^3$) | Analytical Flag |
| DEC09-UMS1-TO9A | 81 | ND* | 4.70 | ND | 1000 | 6468 | ND* | 0.0007 | ND | 0.15 | **0.077** | ** |
| | 77 | 246.47 | 5.27 | ND | 1000 | | 0.038 | 0.0008 | ND | 0.15 | **0.038** | J |
| | 123 | 100.01 | 7.37 | ND | 1000 | | 0.015 | 0.0011 | ND | 0.15 | **0.015** | J |
| | 118 | 1411.70 | 7.06 | 1400.00 | 1000 | | 0.218 | 0.0011 | 0.22 | 0.15 | **0.22** | C |
| | 114 | ND* | 7.38 | ND | 1000 | | ND* | 0.0011 | ND | 0.15 | **0.077** | ** |
| | 105 | 533.33 | 9.34 | ND | 1000 | | 0.082 | 0.0014 | ND | 0.15 | **0.082** | J |
| | 126 | ND* | 9.43 | ND | 1000 | | ND* | 0.0015 | ND | 0.15 | **0.077** | ** |
| | 167 | 71.36 | 4.42 | ND | 1000 | | 0.011 | 0.0007 | ND | 0.15 | **0.011** | J |
| | 156 | 74.20 | 3.55 | ND | 1000 | | 0.011 | 0.0005 | ND | 0.15 | **0.011** | J |
| | 157 | 16.31 | 3.56 | ND | 1000 | | 0.003 | 0.0005 | ND | 0.15 | **0.003** | J |
| | 169 | ND* | 5.66 | ND | 1000 | | ND* | 0.0009 | ND | 0.15 | **0.077** | ** |
| | 189 | ND* | 3.23 | ND | 1000 | | ND* | 0.0005 | ND | 0.15 | **0.077** | ** |
| DEC09-DMS1TO9A | 81 | ND* | 6.06 | ND | 1000 | 6443 | ND* | 0.0009 | ND | 0.16 | **0.078** | ** |
| | 77 | 912.20 | 6.13 | ND | 1000 | | 0.142 | 0.0010 | ND | 0.16 | **0.14** | J |
| | 123 | 358.53 | 3.39 | ND | 1000 | | 0.056 | 0.0005 | ND | 0.16 | **0.056** | J |
| | 118 | 5245.34 | 3.41 | 5200 | 1000 | | 0.814 | 0.0005 | 0.81 | 0.16 | **0.81** | C |
| | 114 | 166.55 | 2.99 | ND | 1000 | | 0.026 | 0.0005 | ND | 0.16 | **0.026** | J |
| | 105 | 2355.32 | 3.43 | 2400 | 1000 | | 0.366 | 0.0005 | 0.37 | 0.16 | **0.37** | C |
| | 126 | ND* | 4.30 | ND | 1000 | | ND* | 0.0007 | ND | 0.16 | **0.078** | ** |
| | 167 | 166.56 | 3.64 | ND | 1000 | | 0.026 | 0.0006 | ND | 0.16 | **0.026** | J |
| | 156 | 249.59 | 2.96 | ND | 1000 | | 0.039 | 0.0005 | ND | 0.16 | **0.039** | J |
| | 157 | 43.84 | 3.09 | ND | 1000 | | 0.007 | 0.0005 | ND | 0.16 | **0.0068** | J |
| | 169 | ND* | 4.54 | ND | 1000 | | ND* | 0.0007 | ND | 0.16 | **0.078** | ** |
| | 189 | ND* | 2.83 | ND | 1000 | | ND* | 0.0004 | ND | 0.16 | **0.078** | ** |
| DEC09-MSP-TO9A | 81 | 354.31 | 7.64 | ND | 1000 | 6451 | 0.055 | 0.0012 | ND | 0.16 | **0.055** | J |
| | 77 | 1271.93 | 7.49 | ND | 1300 | | 0.197 | 0.0012 | ND | 0.20 | **0.20** | G,J |
| | 123 | 595.34 | 3.73 | ND | 1000 | | 0.092 | 0.0006 | ND | 0.16 | **0.092** | J |
| | 118 | 7017.88 | 3.47 | 7000 | 1000 | | 1.088 | 0.0005 | 1.1 | 0.16 | **1.1** | C |
| | 114 | 229.11 | 3.49 | ND | 1000 | | 0.036 | 0.0005 | ND | 0.16 | **0.036** | J |
| | 105 | 3089.42 | 3.84 | 3100 | 1000 | | 0.479 | 0.0006 | 0.48 | 0.16 | **0.48** | C |
| | 126 | ND* | 4.65 | ND | 1000 | | ND* | 0.0007 | ND | 0.16 | **0.078** | ** |
| | 167 | 199.52 | 3.41 | ND | 1000 | | 0.031 | 0.0005 | ND | 0.16 | **0.031** | J |
| | 156 | 313.29 | 2.90 | ND | 1000 | | 0.049 | 0.0004 | ND | 0.16 | **0.049** | J |
| | 157 | 52.29 | 3.03 | ND | 1000 | | 0.008 | 0.0005 | ND | 0.16 | **0.0081** | J |
| | 169 | ND* | 4.32 | ND | 1000 | | ND* | 0.0007 | ND | 0.16 | **0.078** | ** |
| | 189 | ND* | 3.44 | ND | 1000 | | ND* | 0.0005 | ND | 0.16 | **0.078** | ** |
| DEC09-Field Blank | 81 | ND* | 1.57 | ND | 1000 | | | | | | | |
| | 77 | ND* | 1.80 | ND | 1000 | | | | | | | |
| | 123 | ND* | 1.63 | ND | 1000 | | | | | | | |
| | 118 | 7.77 | 1.68 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.26 | ND | 1000 | | | | | | | |
| | 105 | 5.33 | 1.58 | ND | 1000 | | | | | | | |
| | 126 | ND* | 2.11 | ND | 1000 | | | | | | | |
| | 167 | ND* | 1.92 | ND | 1000 | | | | | | | |
| | 156 | ND* | 1.59 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.62 | ND | 1000 | | | | | | | |
| | 169 | ND* | 2.50 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.90 | ND | 1000 | | | | | | | |
| DEC09-Method Blank | 81 | ND* | 1.16 | ND | 1000 | | | | | | | |
| | 77 | ND* | 1.44 | ND | 1000 | | | | | | | |
| | 123 | ND* | 1.27 | ND | 1000 | | | | | | | |
| | 118 | 11.73 | 1.13 | ND | 1000 | | | | | | | |
| | 114 | ND* | 1.17 | ND | 1000 | | | | | | | |
| | 105 | 4.03 | 1.33 | ND | 1000 | | | | | | | |
| | 126 | ND* | 1.62 | ND | 1000 | | | | | | | |
| | 167 | ND* | 2.69 | ND | 1000 | | | | | | | |
| | 156 | ND* | 1.07 | ND | 1000 | | | | | | | |
| | 157 | ND* | 1.13 | ND | 1000 | | | | | | | |
| | 169 | ND* | 1.66 | ND | 1000 | | | | | | | |
| | 189 | ND* | 1.36 | ND | 1000 | | | | | | | |

| | |
|---|---|
| RL | Reporting limit |
| ND | Not detected at or above the RL |
| ND* | Not detected at or above the EDL |
| EDL | Estimated detection limit |
| m$^3$ | Cubic meter |
| pg | Picogram |
| pg/m$^3$ | Picogram per cubic meter |
| EPC* | Proposed exposure point concentration (EPC) to be used in ERA and HHRA. |

Flags:

| | |
|---|---|
| J | Detected ≥ EDL and < RL. |
| G | Elevated reporting limit. The reporting limit is elevated due to matrix interference. |
| C | Co-eluting isomer. |
| Q | Estimated maximum potential concentration. |
| B | Method blank contamination. |
| ** | ND, therefore surrogate EPC assigned as 1/2 the RL |
| (*) | Non critical sampling related issue associated with this sample. |

# Table 4.1.2
# Field Duplicate Precision of Air Results

| Sample ID | Compound detected in sample analysis | Estimated Detection Limit (pg/m$^3$) | Compound concentration in sample (pg/m$^3$) | Magnitude > EDL | Estimated Detection Limit for DUP(pg/m$^3$) | Compound concentration in DUP (pg/m$^3$) | Magnitude > EDL | Relative Percent Difference (RPD) |
|---|---|---|---|---|---|---|---|---|
| APR09 MSP and APR09 MSP ALT | 81 | 0.0005 | ND* | N/A | 0.0006 | ND* | N/A | N/A |
| | 77 | 0.0006 | 0.124 | 218.0 | 0.0006 | 0.257 | 435.1 | 69.9% |
| | 123 | 0.0005 | 0.027 | 55.2 | 0.0005 | 0.049 | 107.0 | 56.6% |
| | 118 | 0.0005 | 0.687 | 1419.6 | 0.0004 | 1.311 | 2981.8 | 62.5% |
| | 114 | 0.0005 | ND* | N/A | 0.0004 | ND* | N/A | N/A |
| | 105 | 0.0005 | 0.304 | 585.6 | 0.0005 | 0.624 | 1383.0 | 69.0% |
| | 126 | 0.0005 | ND* | N/A | 0.0005 | ND* | N/A | N/A |
| | 167 | 0.0003 | 0.014 | 53.8 | 0.0004 | 0.024 | 61.3 | 52.7% |
| | 156 | 0.0003 | 0.029 | 113.1 | 0.0004 | 0.059 | 150.3 | 67.9% |
| | 157 | 0.0002 | 0.006 | 24.6 | 0.0004 | 0.012 | 32.7 | 65.0% |
| | 169 | 0.0003 | 0.003 | 10.6 | 0.0007 | 0.009 | 11.8 | 88.7% |
| | 189 | 0.0002 | ND* | N/A | 0.0002 | ND* | N/A | N/A |
| MAY09 UMS1 and MAY09 UMS1 DUP | 81 | 0.0010 | ND* | N/A | 0.0009 | ND* | N/A | N/A |
| | 77 | 0.0011 | 0.047 | 41.5 | 0.0008 | 0.052 | 62.3 | 9.1% |
| | 123 | 0.0009 | 0.014 | 16.4 | 0.0006 | 0.018 | 28.1 | 21.7% |
| | 118 | 0.0008 | 0.376 | 459.8 | 0.0006 | 0.409 | 646.0 | 8.3% |
| | 114 | 0.0007 | ND* | N/A | 0.0006 | ND* | N/A | N/A |
| | 105 | 0.0008 | 0.134 | 168.9 | 0.0007 | 0.152 | 231.8 | 12.5% |
| | 126 | 0.0007 | ND* | N/A | 0.0006 | ND* | N/A | N/A |
| | 167 | 0.0006 | 0.011 | 19.7 | 0.0004 | 0.013 | 32.8 | 10.1% |
| | 156 | 0.0005 | 0.019 | 34.3 | 0.0004 | 0.020 | 53.5 | 8.6% |
| | 157 | 0.0005 | 0.004 | 7.9 | 0.0003 | 0.005 | 13.2 | 9.3% |
| | 169 | 0.0007 | 0.001 | 1.7 | 0.0006 | ND* | N/A | N/A |
| | 189 | 0.0003 | ND* | N/A | 0.0004 | ND* | N/A | N/A |
| JUN09 DMS1 and JUN09 DMS1 DUP | 81 | 0.012 | 0.101 | 8.6 | 0.014 | 0.098 | 7.1 | 2.9% |
| | 77 | 0.015 | 0.342 | 23.3 | 0.016 | 0.328 | 21.2 | 4.0% |
| | 123 | 0.005 | 0.079 | 15.1 | 0.003 | 0.078 | 23.4 | 0.8% |
| | 118 | 0.005 | 1.884 | 342.8 | 0.003 | 1.574 | 477.8 | 18.0% |
| | 114 | 0.005 | 0.071 | 14.6 | 0.003 | 0.053 | 16.9 | 30.4% |
| | 105 | 0.007 | 0.801 | 121.1 | 0.004 | 0.677 | 159.1 | 16.8% |
| | 126 | 0.007 | 0.013 | 1.9 | 0.004 | ND* | N/A | N/A |
| | 167 | 0.002 | 0.106 | 45.7 | 0.002 | 0.098 | 60.6 | 7.5% |
| | 156 | 0.002 | 0.040 | 19.1 | 0.002 | 0.037 | 24.7 | 6.5% |
| | 157 | 0.002 | 0.010 | 5.0 | 0.001 | 0.008 | 5.7 | 21.7% |
| | 169 | 0.003 | ND* | N/A | 0.002 | ND* | N/A | N/A |
| | 189 | 0.0004 | 0.003 | 6.9 | 0.000 | 0.003 | 12.7 | 15.1% |
| JUL09 MSP and JUL09 MSP DUP | 81 | 0.0005 | ND* | N/A | 0.0007 | ND* | N/A | N/A |
| | 77 | 0.0006 | 0.096 | 169.3 | 0.0007 | 0.131 | 186.8 | 30.8% |
| | 123 | 0.0003 | 0.023 | 74.5 | 0.0003 | 0.032 | 92.4 | 32.0% |
| | 118 | 0.0003 | 0.641 | 2124.4 | 0.0003 | 0.740 | 2227.5 | 14.3% |
| | 114 | 0.0003 | ND* | N/A | 0.0003 | ND* | N/A | N/A |
| | 105 | 0.0003 | 0.250 | 776.7 | 0.0003 | 0.330 | 945.9 | 27.7% |
| | 126 | 0.0003 | ND* | N/A | 0.0004 | ND* | N/A | N/A |
| | 167 | 0.0002 | 0.016 | 81.3 | 0.0003 | 0.018 | 66.3 | 9.2% |
| | 156 | 0.0002 | 0.029 | 150.2 | 0.0003 | 0.034 | 132.8 | 15.8% |
| | 157 | 0.0002 | 0.006 | 34.3 | 0.0002 | 0.007 | 30.0 | 12.7% |
| | 169 | 0.0003 | ND* | N/A | 0.0004 | ND* | N/A | N/A |
| | 189 | 0.0002 | ND* | N/A | 0.0002 | ND* | N/A | N/A |

☐ Less than or equal to 2 times the Estimated Detection Limit; RPD will not be calculated

N/A — Not available; compound not found in both samples.
ND* — Not detected at or above the EDL
EDL — Estimated detection limit
pg/m$^3$ — Picogram per cubic meter

| Compound | Number of field | Average RPD for 2009 |
|---|---|---|
| 81 | 1 | 2.9% |
| 77 | 4 | 28.5% |
| 123 | 4 | 27.8% |
| 118 | 4 | 25.8% |
| 114 | 1 | 30.4% |
| 105 | 4 | 31.5% |
| 126 | 0 | N/A |
| 167 | 4 | 19.9% |
| 156 | 4 | 24.7% |
| 157 | 4 | 27.2% |
| 169 | 1 | 88.7% |
| 189 | 1 | 15.1% |
| **TOTAL** | **32** | **--** |
| **AVERAGE** | **--** | **29.3%** |

# Table 4.2.1
# Summary of Soil Results
# (Mar 2009 - Apr 2009)

| | | Raw Data | | | | Presented in Lab Reports | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | By Wet Weight | | By Dry Weight | | | | | | |
| **Soil Sample Name** | **PCB** | **Result pg/g** | **EDL pg/g** | **Result pg/g** | **EDL pg/g** | **Percent Moisture** | **Result pg/g** | **RL pg/g** | **EPC* pg/g** | **Flag** |
| Southwest | 81 | ND* | 0.3 | ND* | 0.3 | 2.2% | ND | 10 | **5.0** | ** |
| | 77 | 2.5 | 0.3 | 2.6 | 0.3 | | ND | 10 | **2.6** | J |
| | 123 | 1.1 | 0.4 | 1.2 | 0.4 | | ND | 10 | **1.2** | J |
| | 118 | 14.8 | 0.3 | 15.1 | 0.3 | | 15 | 10 | **15** | C, B |
| | 114 | 1.0 | 0.3 | 1.0 | 0.3 | | ND | 10 | **1.0** | J |
| | 105 | 10.6 | 0.4 | 10.9 | 0.4 | | 11 | 10 | **11** | C |
| | 126 | ND* | 0.5 | ND* | 0.6 | | ND | 10 | **5.0** | ** |
| | 167 | 1.9 | 0.2 | 1.9 | 0.2 | | ND | 10 | **1.9** | J |
| | 156 | 3.8 | 0.2 | 3.9 | 0.2 | | ND | 10 | **3.9** | J |
| | 157 | 0.9 | 0.2 | 0.9 | 0.2 | | ND | 10 | **0.9** | J |
| | 169 | ND* | 0.3 | ND* | 0.3 | | ND | 10 | **5.0** | ** |
| | 189 | 1.2 | 0.3 | 1.2 | 0.3 | | ND | 10 | **1.2** | J |
| Northeast | 81 | 1.4 | 1.2 | 1.4 | 1.3 | 2.4% | ND | 10 | **1.4** | J |
| | 77 | 14.7 | 1.5 | 15.0 | 1.5 | | ND | 15 | **15** | G, J |
| | 123 | 8.5 | 1.3 | 8.7 | 1.4 | | ND | 10 | **8.7** | J |
| | 118 | 100.0 | 1.1 | 102.4 | 1.1 | | 100 | 10 | **100** | C, B |
| | 114 | 1.9 | 1.2 | 2.0 | 1.3 | | ND | 10 | **2.0** | J |
| | 105 | 63.7 | 1.5 | 65.2 | 1.6 | | 65 | 10 | **65** | C |
| | 126 | 5.8 | 1.7 | 5.9 | 1.8 | | ND | 10 | **5.9** | J |
| | 167 | 15.4 | 1.0 | 15.8 | 1.0 | | 16 | 10 | **16** | |
| | 156 | 28.4 | 1.0 | 29.1 | 1.0 | | 29 | 10 | **29** | |
| | 157 | 6.7 | 0.9 | 6.9 | 0.9 | | ND | 10 | **6.9** | J |
| | 169 | ND* | 1.1 | ND* | 1.1 | | ND | 10 | **5.0** | ** |
| | 189 | 9.0 | 1.2 | 9.3 | 1.3 | | ND | 10 | **9.3** | J |
| North | 81 | 0.3 | 0.3 | 0.3 | 0.3 | 0.77% | ND | 10 | **0.3** | J |
| | 77 | 2.8 | 0.3 | 2.8 | 0.3 | | ND | 10 | **2.8** | J |
| | 123 | 1.5 | 0.4 | 1.5 | 0.4 | | ND | 10 | **1.5** | J |
| | 118 | 18.7 | 0.3 | 18.8 | 0.3 | | 19 | 10 | **19** | C, B |
| | 114 | ND* | 0.3 | ND* | 0.3 | | ND | 10 | **5.0** | ** |
| | 105 | 11.6 | 0.4 | 11.7 | 0.4 | | 12 | 10 | **12** | C |
| | 126 | 0.7 | 0.5 | 0.7 | 0.5 | | ND | 10 | **0.7** | J |
| | 167 | 6.5 | 0.3 | 6.6 | 0.3 | | ND | 10 | **6.6** | J |
| | 156 | 3.0 | 0.3 | 3.0 | 0.3 | | ND | 10 | **3.0** | J |
| | 157 | 1.0 | 0.2 | 1.0 | 0.2 | | ND | 10 | **1.0** | J |
| | 169 | ND* | 0.3 | ND* | 0.3 | | ND | 10 | **5.0** | ** |
| | 189 | 0.7 | 0.2 | 0.7 | 0.2 | | ND | 10 | **0.7** | J |
| South | 81 | 0.6 | 0.3 | 0.6 | 0.3 | 0.96% | ND | 10 | **0.6** | J |
| | 77 | 5.3 | 0.3 | 5.3 | 0.3 | | ND | 10 | **5.3** | J |
| | 123 | 1.9 | 0.4 | 1.9 | 0.4 | | ND | 10 | **1.9** | J |
| | 118 | 28.9 | 0.4 | 29.1 | 0.4 | | 29 | 10 | **29** | C, B |
| | 114 | ND* | 0.42 | ND* | 0.4 | | ND | 10 | **5.0** | ** |
| | 105 | 20.7 | 0.5 | 20.9 | 0.5 | | 21 | 10 | **21** | C |
| | 126 | 1.2 | 0.6 | 1.2 | 0.6 | | ND | 10 | **1.2** | J |
| | 167 | 2.9 | 0.3 | 3.0 | 0.3 | | ND | 10 | **3.0** | J |
| | 156 | 6.7 | 0.3 | 6.8 | 0.3 | | ND | 10 | **6.8** | J |
| | 157 | 1.8 | 0.3 | 1.8 | 0.3 | | ND | 10 | **1.8** | J |
| | 169 | ND* | 0.4 | ND* | 0.4 | | ND | 10 | **5.0** | ** |
| | 189 | 1.6 | 0.3 | 1.6 | 0.3 | | ND | 10 | **1.6** | J |
| Northwest | 81 | 0.5 | 0.4 | 0.5 | 0.4 | 1.6% | ND | 10 | **0.5** | J |
| | 77 | 3.0 | 0.4 | 3.0 | 0.4 | | ND | 10 | **3.0** | J |
| | 123 | 1.2 | 0.5 | 1.3 | 0.5 | | ND | 10 | **1.3** | J |
| | 118 | 18.0 | 0.4 | 18.3 | 0.4 | | 18 | 10 | **18** | C, B |
| | 114 | ND* | 0.4 | ND* | 0.4 | | ND | 10 | **5.0** | ** |
| | 105 | 9.3 | 0.5 | 9.5 | 0.5 | | ND | 10 | **9.5** | J |
| | 126 | 1.2 | 0.6 | 1.2 | 0.6 | | ND | 10 | **1.2** | J |
| | 167 | 6.2 | 0.3 | 6.3 | 0.3 | | ND | 10 | **6.3** | J |
| | 156 | 3.2 | 0.3 | 3.2 | 0.3 | | ND | 10 | **3.2** | J |
| | 157 | 1.0 | 0.3 | 1.0 | 0.3 | | ND | 10 | **1.0** | J |
| | 169 | ND* | 0.4 | ND* | 0.4 | | ND | 10 | **5.0** | ** |
| | 189 | 0.4 | 0.3 | 0.4 | 0.3 | | ND | 10 | **0.4** | J |

| | |
|---|---|
| RL | Reporting limit |
| ND | Not detected at or above the RL |
| ND* | Not detected at or above the EDL |
| EDL | Estimated detection limit |
| pg/g | Picogram per gram |
| EPC* | Proposed exposure point concentration (EPC) to be used in ERA and HHRA. |

Flags:

| | |
|---|---|
| J | Detected ≥ EDL and < RL |
| G | Elevated reporting limit. The reporting limit is elevated due to matrix interference. |
| C | Co-eluting isomer. |
| Q | Estimated maximum potential concentration. |
| B | Method blank contamination. |
| ** | ND, therefore surrogate EPC assigned as 1/2 the RL |

# Table 4.2.1
# Summary of Soil Results
# (Mar 2009 - Apr 2009)

| | | Raw Data | | | | Presented in Lab Reports | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | By Wet Weight | | By Dry Weight | | | | | | |
| Soil Sample Name | PCB | Result pg/g | EDL pg/g | Result pg/g | EDL pg/g | Percent Moisture | Result pg/g | RL pg/g | EPC* pg/g | Flag |
| B-18 | 81 | 2.4 | 0.5 | 2.4 | 0.5 | 2.1% | ND | 10 | **2.4** | J |
| | 77 | 17.9 | 0.6 | 18.3 | 0.6 | | ND | 18 | **18** | G,J |
| | 123 | 14.4 | 0.8 | 14.7 | 0.8 | | ND | 15 | **15** | G,J |
| | 118 | 83.7 | 0.5 | 85.5 | 0.6 | | 85 | 10 | **85** | C, B |
| | 114 | 2.3 | 0.7 | 2.3 | 0.7 | | ND | 10 | **2.3** | J |
| | 105 | 60.9 | 0.8 | 62.2 | 0.8 | | 62 | 10 | **62** | C |
| | 126 | 3.4 | 0.9 | 3.5 | 0.9 | | ND | 10 | **3.5** | J |
| | 167 | 13.0 | 0.5 | 13.3 | 0.6 | | 13 | 10 | **13** | |
| | 156 | 30.7 | 0.6 | 31.3 | 0.6 | | 31 | 10 | **31** | |
| | 157 | 4.7 | 0.5 | 4.8 | 0.5 | | ND | 10 | **4.8** | J |
| | 169 | ND* | 0.7 | ND* | 0.7 | | ND | 10 | **5.0** | ** |
| | 189 | 8.1 | 0.4 | 8.2 | 0.4 | | ND | 10 | **8.2** | J |
| West | 81 | 0.6 | 0.4 | 0.6 | 0.4 | 1.8% | ND | 10 | **0.6** | J |
| | 77 | 2.3 | 0.4 | 2.3 | 0.4 | | ND | 10 | **2.3** | J |
| | 123 | 1.5 | 0.5 | 1.5 | 0.5 | | ND | 10 | **1.5** | J |
| | 118 | 18.7 | 0.5 | 19.1 | 0.5 | | 19 | 10 | **19** | C, B |
| | 114 | ND* | 0.4 | ND* | 0.4 | | ND | 10 | **5.0** | ** |
| | 105 | 10.3 | 0.5 | 10.4 | 0.5 | | 10 | 10 | **10** | C |
| | 126 | 0.8 | 0.6 | 0.8 | 0.6 | | ND | 10 | **0.8** | J |
| | 167 | 2.1 | 0.3 | 2.2 | 0.3 | | ND | 10 | **2.2** | J |
| | 156 | 3.8 | 0.3 | 3.9 | 0.3 | | ND | 10 | **3.9** | J |
| | 157 | 1.0 | 0.3 | 1.0 | 0.3 | | ND | 10 | **1.0** | J |
| | 169 | ND* | 0.4 | ND* | 0.4 | | ND | 10 | **5.0** | ** |
| | 189 | 1.1 | 0.2 | 1.1 | 0.2 | | ND | 10 | **1.1** | J |
| Southeast | 81 | 1.2 | 0.2 | 1.3 | 0.2 | 8.5% | ND | 2.2 | **1.3** | J |
| | 77 | 9.3 | 0.3 | 10.2 | 0.3 | | ND | 10 | **10** | G,J |
| | 123 | 3.3 | 0.2 | 3.6 | 0.3 | | ND | 3.6 | **3.6** | G,J |
| | 118 | 41.9 | 0.2 | 45.7 | 0.3 | | 46 | 2.2 | **46** | C, B |
| | 114 | 1.5 | 0.2 | 1.6 | 0.2 | | ND | 2.2 | **1.6** | J |
| | 105 | 30.2 | 0.3 | 33.0 | 0.3 | | 33 | 2.2 | **33** | C |
| | 126 | 1.3 | 0.3 | 1.4 | 0.4 | | ND | 2.2 | **1.4** | J |
| | 167 | 2.4 | 0.2 | 2.7 | 0.3 | | 2.7 | 2.2 | **2.7** | |
| | 156 | 9.6 | 0.2 | 10.4 | 0.2 | | 10 | 2.2 | **10** | |
| | 157 | 1.9 | 0.2 | 2.0 | 0.2 | | ND | 2.2 | **2.0** | J |
| | 169 | ND* | 0.3 | ND* | 0.3 | | ND | 2.2 | **1.1** | ** |
| | 189 | 2.4 | 0.4 | 2.6 | 0.4 | | 2.6 | 2.2 | **2.6** | Q |
| Southeast Dup | 81 | 1.1 | 0.2 | 1.2 | 0.2 | 8.5% | ND | 2.2 | **1.2** | J |
| | 77 | 9.9 | 0.2 | 10.8 | 0.2 | | ND | 11 | **11** | G,J |
| | 123 | 4.9 | 0.1 | 5.4 | 0.1 | | ND | 5.4 | **5.4** | G,J |
| | 118 | 47.0 | 0.1 | 51.4 | 0.1 | | 51 | 2.2 | **51** | C, B |
| | 114 | 0.9 | 0.1 | 1.0 | 0.1 | | ND | 2.2 | **1.0** | J |
| | 105 | 25.6 | 0.1 | 28.0 | 0.2 | | 28 | 2.2 | **28** | C |
| | 126 | 1.4 | 0.2 | 1.5 | 0.2 | | ND | 2.2 | **1.5** | J |
| | 167 | 4.8 | 0.1 | 5.2 | 0.2 | | 5.2 | 2.2 | **5.2** | |
| | 156 | 12.2 | 0.1 | 13.3 | 0.2 | | 13 | 2.2 | **13** | |
| | 157 | 1.9 | 0.1 | 2.0 | 0.1 | | | 2.2 | **2.0** | J |
| | 169 | ND* | 0.17 | ND* | 0.2 | | ND | 2.2 | **1.1** | ** |
| | 189 | 3.9 | 0.2 | 4.3 | 0.2 | | 4.3 | 2.2 | **4.3** | |

RL — Reporting limit
ND — Not detected at or above the RL
ND* — Not detected at or above the EDL
EDL — Estimated detection limit
pg/g — Picogram per gram
EPC* — Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J — Detected ≥ EDL and < RL
G — Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C — Co-eluting isomer.
Q — Estimated maximum potential concentration.
B — Method blank contamination.
** — ND, therefore surrogate EPC assigned as 1/2 the RL

# Table 4.2.2
# Field Duplicate Precision of Soil Results

| Sample ID | Compound detected in sample analysis | Estimated Detection Limit (pg/g) | Compound concentration in sample (pg/g) | Magnitude > EDL | Estimated Detection Limit for DUP(pg/g) | Compound concentration in DUP (pg/g) | Magnitude > EDL | Relative Percent Difference (RPD) |
|---|---|---|---|---|---|---|---|---|
| SOUTHEAST SOIL and SOUTHEAST SOIL DUP | 81 | 0.2 | 1.2 | 5.6 | 0.2 | 1.1 | 7.0 | 9.4% |
| | 77 | 0.3 | 9.3 | 35.8 | 0.2 | 9.9 | 49.3 | 5.6% |
| | 123 | 0.2 | 3.3 | 13.7 | 0.1 | 4.9 | 40.8 | 39.3% |
| | 118 | 0.2 | 41.9 | 182.0 | 0.1 | 47.0 | 427.3 | 11.6% |
| | 114 | 0.2 | 1.5 | 6.8 | 0.1 | 0.9 | 8.4 | 47.3% |
| | 105 | 0.3 | 30.2 | 116.1 | 0.1 | 25.6 | 183.0 | 16.4% |
| | 126 | 0.3 | 1.3 | 3.9 | 0.2 | 1.4 | 8.7 | 6.7% |
| | 167 | 0.2 | 2.4 | 10.6 | 0.1 | 4.8 | 34.1 | 65.2% |
| | 156 | 0.2 | 9.6 | 45.5 | 0.1 | 12.2 | 86.9 | 23.9% |
| | 157 | 0.2 | 1.9 | 9.3 | 0.1 | 1.9 | 14.2 | 0.0% |
| | 169 | 0.27 | ND* | N/A | 0.17 | ND* | N/A | N/A |
| | 189 | 0.4 | 2.4 | 6.8 | 0.2 | 3.9 | 21.8 | 49.1% |

☐ Less than or equal to 2 times the Estimated Detection Limit; RPD will not be calculated

N/A Not available; compound not found in both samples.
ND* Not detected at or above the EDL
EDL Estimated detection limit
pg/g Picogram per gram

| Compound | Number of field | Average RPD for 2009 |
|---|---|---|
| 81 | 1 | 9.4% |
| 77 | 1 | 5.6% |
| 123 | 1 | 39.3% |
| 118 | 1 | 11.6% |
| 114 | 1 | 47.3% |
| 105 | 1 | 16.4% |
| 126 | 1 | 6.7% |
| 167 | 1 | 65.2% |
| 156 | 1 | 23.9% |
| 157 | 1 | 0.0% |
| 169 | 0 | N/A |
| 189 | 1 | 49.1% |
| **TOTAL** | **11** | **--** |
| **AVERAGE** | **--** | **25.0%** |

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# Table 4.3.1
## Summary of Vegetation Results
## (Mar 2009 - Aug 2009)

| | | Raw Data | | | | Presented in Lab Reports | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | By Wet Weight | | By Dry Weight | | | | | | |
| Vegetation Sample Name | PCB | Result pg/g | EDL pg/g | Result pg/g | EDL pg/g | Percent Moisture | Result pg/g | RL pg/g | EPC* pg/g | Flag |
| North - Spring | 81 | ND* | 1.7 | ND* | 2.1 | 21.7% | ND | 64 | **32** | ** |
| | 77 | 6.1 | 2.2 | 7.8 | 2.8 | | ND | 64 | **7.8** | J |
| | 123 | ND* | 1.1 | ND* | 1.4 | | ND | 64 | **32** | ** |
| | 118 | 22.3 | 1.1 | 28.5 | 1.4 | | ND | 64 | **29** | J |
| | 114 | ND* | 1.0 | ND* | 1.3 | | ND | 64 | **32** | ** |
| | 105 | 9.9 | 1.3 | 12.6 | 1.6 | | ND | 64 | **13** | J |
| | 126 | ND* | 1.6 | ND* | 2.0 | | ND | 64 | **32** | ** |
| | 167 | 4.0 | 1.1 | 5.1 | 1.4 | | ND | 64 | **5.1** | J |
| | 156 | 1.9 | 1.2 | 2.5 | 1.5 | | ND | 64 | **2.5** | J |
| | 157 | ND* | 1.1 | ND* | 1.5 | | ND | 64 | **32** | ** |
| | 169 | ND* | 1.5 | ND* | 1.9 | | ND | 64 | **32** | ** |
| | 189 | ND* | 2.3 | ND* | 3.0 | | ND | 64 | **32** | ** |
| Northwest - Spring | 81 | ND* | 1.6 | ND* | 2.2 | 26.6% | ND | 65 | **33** | ** |
| | 77 | 5.0 | 1.5 | 6.9 | 2.0 | | ND | 65 | **6.9** | J |
| | 123 | ND* | 1.1 | ND* | 1.5 | | ND | 65 | **33** | ** |
| | 118 | 14.5 | 1.2 | 19.7 | 1.6 | | ND | 65 | **20** | J |
| | 114 | ND* | 1.1 | ND* | 1.5 | | ND | 65 | **33** | ** |
| | 105 | 7.2 | 1.4 | 9.8 | 1.8 | | ND | 65 | **9.8** | J |
| | 126 | ND* | 1.6 | ND* | 2.1 | | ND | 65 | **33** | ** |
| | 167 | 4.4 | 1.0 | 6.0 | 1.3 | | ND | 65 | **6.0** | J |
| | 156 | 1.5 | 1.0 | 2.1 | 1.3 | | ND | 65 | **2.1** | J |
| | 157 | 1.2 | 0.9 | 1.6 | 1.2 | | ND | 65 | **1.6** | J |
| | 169 | ND* | 1.3 | ND* | 1.7 | | ND | 65 | **33** | ** |
| | 189 | ND* | 2.5 | ND* | 3.4 | | ND | 65 | **33** | ** |
| B-18 - Spring | 81 | 8.5 | 2.2 | 11.5 | 3.0 | 26.0% | ND | 65 | **12** | J |
| | 77 | 64.2 | 2.2 | 80.9 | 3.0 | | ND | 87 | **81** | G,J |
| | 123 | 10.1 | 2.0 | 13.7 | 2.6 | | ND | 65 | **14** | J |
| | 118 | 143.9 | 1.9 | 194.5 | 2.5 | | 190 | 65 | **190** | Q,C |
| | 114 | 5.0 | 1.8 | 6.7 | 2.4 | | ND | 65 | **6.7** | J |
| | 105 | 101.2 | 2.2 | 136.8 | 3.0 | | 140 | 65 | **140** | C |
| | 126 | 7.7 | 2.5 | 10.4 | 3.3 | | ND | 65 | **10** | J |
| | 167 | 34.8 | 1.1 | 47.0 | 1.4 | | ND | 65 | **47** | J |
| | 156 | 19.1 | 1.0 | 25.9 | 1.4 | | ND | 65 | **26** | J |
| | 157 | 5.1 | 1.0 | 6.9 | 1.4 | | ND | 65 | **6.9** | J |
| | 169 | ND* | 1.4 | ND* | 1.9 | | ND | 65 | **33** | ** |
| | 189 | ND* | 5.1 | ND* | 6.9 | | ND | 65 | **33** | ** |
| West - Spring | 81 | 1.5 | 1.3 | 1.7 | 1.4 | 8.5% | ND | 54 | **1.7** | J |
| | 77 | 10.6 | 1.6 | 11.6 | 1.8 | | ND | 54 | **12** | J |
| | 123 | ND* | 1.0 | ND* | 1.1 | | ND | 54 | **27** | ** |
| | 118 | 27.1 | 1.0 | 29.6 | 1.1 | | ND | 54 | **30** | J |
| | 114 | ND* | 0.9 | ND* | 0.9 | | ND | 54 | **27** | ** |
| | 105 | 17.7 | 1.2 | 19.4 | 1.3 | | ND | 54 | **19** | J |
| | 126 | ND* | 1.4 | ND* | 1.6 | | ND | 54 | **27** | ** |
| | 167 | 7.4 | 0.6 | 8.1 | 0.7 | | ND | 54 | **8.1** | J |
| | 156 | 3.3 | 0.7 | 3.6 | 0.7 | | ND | 54 | **3.6** | J |
| | 157 | 0.7 | 0.6 | 0.8 | 0.7 | | ND | 54 | **0.8** | J |
| | 169 | ND* | 0.8 | ND* | 0.9 | | ND | 54 | **27** | ** |
| | 189 | ND* | 2.9 | ND* | 3.2 | | ND | 54 | **27** | ** |

RL — Reporting limit
ND — Not detected at or above the RL
ND* — Not detected at or above the EDL
EDL — Estimated detection limit
pg/g — Picogram per gram
EPC* — Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J — Detected ≥ EDL and < RL.
G — Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C — Co-eluting isomer.
Q — Estimated maximum potential concentration.
B — Method blank contamination.
** — ND, therefore surrogate EPC assigned as 1/2 the RL

## Table 4.3.1
## Summary of Vegetation Results
## (Mar 2009 - Aug 2009)

| Vegetation Sample Name | PCB | Raw Data: By Wet Weight Result pg/g | By Wet Weight EDL pg/g | By Dry Weight Result pg/g | By Dry Weight EDL pg/g | Presented in Lab Reports: Percent Moisture | Result pg/g | RL pg/g | EPC* pg/g | Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| Southeast - Spring | 81 | 11.8 | 1.6 | 13.8 | 1.9 | 14.5% | ND | 58 | **14** | J |
| | 77 | 82.9 | 1.8 | 97.0 | 2.1 | | ND | 97 | **97** | G |
| | 123 | 14.7 | 1.1 | 17.2 | 1.3 | | ND | 58 | **17** | J |
| | 118 | 228.4 | 1.0 | 267.1 | 1.2 | | 270 | 58 | **270** | C |
| | 114 | 7.4 | 1.1 | 8.7 | 1.3 | | ND | 58 | **8.7** | J |
| | 105 | 130.8 | 1.3 | 153.0 | 1.5 | | 150 | 58 | **150** | Q,C |
| | 126 | 10.7 | 1.6 | 12.6 | 1.9 | | ND | 58 | **13** | J |
| | 167 | 14.7 | 0.8 | 17.1 | 0.9 | | ND | 58 | **17** | J |
| | 156 | 28.5 | 0.8 | 33.4 | 1.0 | | ND | 58 | **33** | J |
| | 157 | 5.8 | 0.8 | 6.8 | 0.9 | | ND | 58 | **6.8** | J |
| | 169 | ND* | 1.1 | ND* | 1.2 | | ND | 58 | **29** | ** |
| | 189 | 7.4 | 3.6 | 8.6 | 4.3 | | ND | 58 | **8.6** | J |
| Southwest - Spring | 81 | ND* | 1.2 | ND* | 1.6 | 27.6% | ND | 69 | **35** | ** |
| | 77 | 6.7 | 1.3 | 9.2 | 1.8 | | ND | 69 | **9.2** | J |
| | 123 | 1.2 | 1.1 | 1.6 | 1.5 | | ND | 69 | **1.6** | J |
| | 118 | 21.1 | 1.0 | 29.1 | 1.3 | | ND | 69 | **29.1** | J |
| | 114 | ND* | 0.9 | ND* | 1.3 | | ND | 69 | **35** | ** |
| | 105 | 13.9 | 1.2 | 19.2 | 1.6 | | ND | 69 | **19.2** | J |
| | 126 | ND* | 1.3 | ND* | 1.8 | | ND | 69 | **35** | ** |
| | 167 | 7.6 | 0.5 | 10.4 | 0.7 | | ND | 69 | **10.4** | J |
| | 156 | 3.0 | 0.5 | 4.2 | 0.7 | | ND | 69 | **4.2** | J |
| | 157 | 1.4 | 0.5 | 1.9 | 0.6 | | ND | 69 | **1.9** | J |
| | 169 | ND* | 0.6 | ND* | 0.9 | | ND | 69 | **35** | ** |
| | 189 | ND* | 4.2 | ND* | 5.8 | | ND | 69 | **35** | ** |
| Northeast - Spring | 81 | ND* | 1.5 | ND* | 2.0 | 24.5% | ND | 67 | **34** | ** |
| | 77 | 9.5 | 1.4 | 12.6 | 1.9 | | ND | 67 | **12.6** | J |
| | 123 | ND* | 0.9 | ND* | 1.2 | | ND | 67 | **34** | ** |
| | 118 | 33.2 | 0.9 | 44.0 | 1.2 | | ND | 67 | **44.0** | J |
| | 114 | ND* | 0.9 | ND* | 1.2 | | ND | 67 | **34** | ** |
| | 105 | 17.2 | 1.0 | 22.7 | 1.4 | | ND | 67 | **22.7** | J |
| | 126 | ND* | 1.3 | ND* | 1.7 | | ND | 67 | **34** | ** |
| | 167 | 9.5 | 0.5 | 12.6 | 0.7 | | ND | 67 | **12.6** | J |
| | 156 | 3.6 | 0.6 | 4.8 | 0.7 | | ND | 67 | **4.8** | J |
| | 157 | 1.3 | 0.5 | 1.8 | 0.6 | | ND | 67 | **1.8** | J |
| | 169 | ND* | 0.7 | ND* | 0.9 | | ND | 67 | **34** | ** |
| | 189 | ND* | 3.7 | ND* | 5.0 | | ND | 67 | **34** | ** |
| South - Spring | 81 | 5.7 | 1.7 | 6.5 | 1.9 | 12.5% | ND | 57 | **6.5** | J |
| | 77 | 52.2 | 2.0 | 59.6 | 2.2 | | ND | 60 | **60** | G,J |
| | 123 | 6.4 | 1.8 | 7.3 | 2.0 | | ND | 57 | **7.3** | J |
| | 118 | 152.2 | 1.8 | 174.0 | 2.0 | | 170 | 57 | **170** | C |
| | 114 | 3.4 | 1.6 | 3.9 | 1.9 | | ND | 57 | **3.9** | J |
| | 105 | 93.4 | 2.1 | 106.7 | 2.4 | | 110 | 57 | **110** | C |
| | 126 | 6.2 | 2.6 | 7.1 | 3.0 | | ND | 57 | **7.1** | J |
| | 167 | 21.1 | 0.7 | 24.1 | 0.8 | | ND | 57 | **24** | J |
| | 156 | 15.9 | 0.7 | 18.1 | 0.8 | | ND | 57 | **18** | J |
| | 157 | 3.4 | 0.7 | 3.9 | 0.8 | | ND | 57 | **3.9** | J |
| | 169 | ND* | 0.9 | ND* | 1.0 | | ND | 57 | **29** | ** |
| | 189 | ND* | 4.3 | ND* | 5.0 | | ND | 57 | **29** | ** |

RL — Reporting limit
ND — Not detected at or above the RL
ND* — Not detected at or above the EDL
EDL — Estimated detection limit
pg/g — Picogram per gram
EPC* — Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J — Detected ≥ EDL and < RL.
G — Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C — Co-eluting isomer.
Q — Estimated maximum potential concentration.
B — Method blank contamination.
** — ND, therefore surrogate EPC assigned as 1/2 the RL

# Table 4.3.1
## Summary of Vegetation Results
## (Mar 2009 - Aug 2009)

| Vegetation Sample Name | PCB | Raw Data: By Wet Weight Result pg/g | Raw Data: By Wet Weight EDL pg/g | Raw Data: By Dry Weight Result pg/g | Raw Data: By Dry Weight EDL pg/g | Presented in Lab Reports: Percent Moisture | Presented in Lab Reports: Result pg/g | Presented in Lab Reports: RL pg/g | EPC* pg/g | Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| North - Summer | 81 | 0.6 | 0.2 | 0.6 | 0.2 | 6.8% | ND | 2.1 | 0.6 | J |
| | 77 | 3.9 | 0.2 | 4.1 | 0.2 | | ND | 4.1 | 4.1 | G,J |
| | 123 | 0.5 | 0.1 | 0.6 | 0.1 | | ND | 2.1 | 0.6 | J |
| | 118 | 14.6 | 0.1 | 15.7 | 0.1 | | 16 | 2.1 | 16 | C |
| | 114 | ND* | 0.1 | ND* | 0.1 | | ND | 2.1 | 1.1 | ** |
| | 105 | 7.3 | 0.1 | 7.9 | 0.1 | | 7.9 | 2.1 | 7.9 | C |
| | 126 | ND* | 0.2 | ND* | 0.2 | | ND | 2.1 | 1.1 | ** |
| | 167 | 1.4 | 0.2 | 1.5 | 0.2 | | ND | 2.1 | 1.5 | J |
| | 156 | 1.4 | 0.1 | 1.5 | 0.1 | | ND | 2.1 | 1.5 | J |
| | 157 | 0.5 | 0.1 | 0.5 | 0.1 | | ND | 2.1 | 0.5 | J |
| | 169 | ND* | 0.2 | ND* | 0.2 | | ND | 2.1 | 1.1 | ** |
| | 189 | 0.4 | 0.1 | 0.5 | 0.1 | | ND | 2.1 | 0.5 | J |
| Southwest - Summer | 81 | ND* | 0.2 | ND* | 0.2 | 7.5% | ND | 2.1 | 1.1 | ** |
| | 77 | 6.4 | 0.2 | 6.9 | 0.2 | | ND | 6.9 | 6.9 | G,J |
| | 123 | 0.9 | 0.2 | 0.9 | 0.2 | | ND | 2.1 | 0.9 | J |
| | 118 | 19.7 | 0.2 | 21.3 | 0.2 | | 21 | 2.1 | 21 | C |
| | 114 | ND* | 0.2 | ND* | 0.2 | | ND | 2.1 | 1.1 | ** |
| | 105 | 12.5 | 0.2 | 13.5 | 0.2 | | 13 | 2.1 | 13 | C |
| | 126 | ND* | 0.3 | ND* | 0.3 | | ND | 2.1 | 1.1 | ** |
| | 167 | 1.7 | 0.2 | 1.9 | 0.2 | | ND | 2.1 | 1.9 | J |
| | 156 | 2.2 | 0.1 | 2.3 | 0.1 | | 2.3 | 2.1 | 2.3 | |
| | 157 | 0.7 | 0.1 | 0.7 | 0.1 | | ND | 2.1 | 0.7 | J |
| | 169 | ND* | 0.2 | ND* | 0.2 | | ND | 2.1 | 1.1 | ** |
| | 189 | ND* | 0.6 | ND* | 0.6 | | ND | 2.1 | 1.1 | ** |
| Northeast - Summer | 81 | 0.6 | 0.1 | 0.6 | 0.1 | 10.8% | ND | 2.2 | 0.6 | J |
| | 77 | 4.6 | 0.1 | 5.1 | 0.1 | | ND | 5.1 | 5.1 | G,J |
| | 123 | 0.7 | 0.1 | 0.8 | 0.1 | | ND | 2.2 | 0.8 | J |
| | 118 | 16.3 | 0.1 | 18.2 | 0.1 | | 18 | 2.2 | 18 | C |
| | 114 | ND* | 0.1 | ND* | 0.1 | | ND | 2.2 | 1.1 | ** |
| | 105 | 9.0 | 0.1 | 10.0 | 0.1 | | 10 | 2.2 | 10 | C |
| | 126 | ND* | 0.2 | ND* | 0.2 | | ND | 2.2 | 1.1 | ** |
| | 167 | 1.8 | 0.1 | 2.0 | 0.1 | | ND | 2.2 | 2.0 | J |
| | 156 | 2.0 | 0.1 | 2.2 | 0.1 | | 2.2 | 2.2 | 2.2 | |
| | 157 | 0.7 | 0.1 | 0.8 | 0.1 | | ND | 2.2 | 0.8 | J |
| | 169 | 0.3 | 0.1 | 0.3 | 0.1 | | ND | 2.2 | 0.3 | J |
| | 189 | ND* | 0.4 | ND* | 0.5 | | ND | 2.2 | 1.1 | ** |
| West - Summer | 81 | 0.6 | 0.1 | 0.7 | 0.1 | 8.1% | ND | 2.2 | 0.7 | J |
| | 77 | 5.7 | 0.1 | 6.3 | 0.1 | | ND | 6.3 | 6.3 | G,J |
| | 123 | 1.7 | 0.1 | 1.9 | 0.1 | | ND | 2.2 | 1.9 | J |
| | 118 | 17.7 | 0.1 | 19.3 | 0.1 | | 19 | 2.2 | 19 | C |
| | 114 | ND* | 0.1 | ND* | 0.1 | | ND | 2.2 | 1.1 | ** |
| | 105 | 10.9 | 0.1 | 11.8 | 0.1 | | 12 | 2.2 | 12 | C |
| | 126 | ND* | 0.2 | ND* | 0.2 | | ND | 2.2 | 1.1 | ** |
| | 167 | 1.7 | 0.2 | 1.9 | 0.2 | | ND | 2.2 | 1.9 | J |
| | 156 | 2.0 | 0.1 | 2.2 | 0.1 | | 2.2 | 2.2 | 2.2 | |
| | 157 | 0.7 | 0.1 | 0.7 | 0.1 | | ND | 2.2 | 0.7 | J |
| | 169 | 0.4 | 0.2 | 0.5 | 0.2 | | ND | 2.2 | 0.5 | J |
| | 189 | ND* | 0.5 | ND* | 0.5 | | ND | 2.2 | 1.1 | ** |

RL — Reporting limit
ND — Not detected at or above the RL
ND* — Not detected at or above the EDL
EDL — Estimated detection limit
pg/g — Picogram per gram
EPC* — Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J — Detected ≥ EDL and < RL.
G — Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C — Co-eluting isomer.
Q — Estimated maximum potential concentration.
B — Method blank contamination.
** — ND, therefore surrogate EPC assigned as 1/2 the RL

# Table 4.3.1
# Summary of Vegetation Results
# (Mar 2009 - Aug 2009)

| Vegetation Sample Name | PCB | Raw Data: By Wet Weight Result pg/g | Raw Data: By Wet Weight EDL pg/g | Raw Data: By Dry Weight Result pg/g | Raw Data: By Dry Weight EDL pg/g | Presented in Lab Reports: Percent Moisture | Presented in Lab Reports: Result pg/g | Presented in Lab Reports: RL pg/g | EPC* pg/g | Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| Northwest - Summer | 81 | ND* | 0.1 | ND* | 0.1 | 8.0% | ND | 2.1 | **1.1** | ** |
| | 77 | 4.7 | 0.1 | 5.2 | 0.1 | | ND | 5.2 | **5.2** | G,J |
| | 123 | 0.6 | 0.1 | 0.7 | 0.1 | | ND | 2.1 | **0.7** | J |
| | 118 | 14.8 | 0.1 | 16.1 | 0.1 | | 16 | 2.1 | **16** | C |
| | 114 | ND* | 0.1 | ND* | 0.1 | | ND | 2.1 | **1.1** | ** |
| | 105 | 7.9 | 0.1 | 8.6 | 0.1 | | 8.6 | 2.1 | **8.6** | C |
| | 126 | ND* | 0.2 | ND* | 0.2 | | ND | 2.1 | **1.1** | ** |
| | 167 | 1.6 | 0.1 | 1.8 | 0.1 | | ND | 2.1 | **1.8** | J |
| | 156 | 1.7 | 0.1 | 1.9 | 0.1 | | ND | 2.1 | **1.9** | J |
| | 157 | 0.3 | 0.1 | 0.4 | 0.1 | | ND | 2.1 | **0.4** | J |
| | 169 | ND* | 0.1 | ND* | 0.2 | | ND | 2.1 | **1.1** | ** |
| | 189 | ND* | 0.5 | ND* | 0.6 | | ND | 2.1 | **1.1** | ** |
| South - Summer | 81 | ND* | 0.1 | ND* | 0.2 | 12.2% | ND | 2.3 | **1.2** | ** |
| | 77 | 61.7 | 0.2 | 70.3 | 0.2 | | ND | 70 | **70.3** | G,J |
| | 123 | 5.7 | 0.1 | 6.5 | 0.1 | | ND | 6.5 | **6.5** | G,J |
| | 118 | 156.0 | 0.1 | 177.6 | 0.1 | | 180 | 2.3 | **180** | C |
| | 114 | 4.7 | 0.1 | 5.4 | 0.1 | | 5.4 | 2.3 | **5.4** | |
| | 105 | 112.5 | 0.1 | 128.1 | 0.1 | | 130 | 2.3 | **130** | C |
| | 126 | ND* | 0.2 | ND* | 0.2 | | ND | 2.3 | **1.2** | ** |
| | 167 | 10.9 | 0.1 | 12.4 | 0.1 | | 12 | 2.3 | **12** | |
| | 156 | 18.3 | 0.1 | 20.8 | 0.1 | | 21 | 2.3 | **21** | |
| | 157 | 4.2 | 0.1 | 4.8 | 0.1 | | 4.8 | 2.3 | **4.8** | |
| | 169 | 0.6 | 0.1 | 0.7 | 0.2 | | ND | 2.3 | **0.7** | J |
| | 189 | ND* | 0.5 | ND* | 0.6 | | ND | 2.3 | **1.2** | ** |
| B-18 - Summer | 81 | ND* | 0.3 | ND* | 0.3 | 10.0% | ND | 2.2 | **1.1** | ** |
| | 77 | 155.8 | 0.3 | 173.1 | 0.3 | | ND | 170 | **170** | G,J |
| | 123 | 27.8 | 0.2 | 30.9 | 0.2 | | ND | 31 | **31** | G,J |
| | 118 | 471.6 | 0.2 | 524.0 | 0.2 | | 520 | 2.2 | **520** | C |
| | 114 | 18.9 | 0.2 | 21.0 | 0.2 | | 21 | 2.2 | **21** | |
| | 105 | 278.3 | 0.2 | 309.3 | 0.2 | | 310 | 2.2 | **310** | C |
| | 126 | ND* | 0.2 | ND* | 0.2 | | ND | 2.2 | **1.1** | ** |
| | 167 | 57.0 | 0.3 | 63.4 | 0.3 | | 63 | 2.2 | **63** | |
| | 156 | 89.5 | 0.2 | 99.4 | 0.2 | | 99 | 2.2 | **99** | |
| | 157 | 14.3 | 0.2 | 15.9 | 0.2 | | 16 | 2.2 | **16** | |
| | 169 | 2.9 | 0.3 | 3.2 | 0.4 | | 3.2 | 2.2 | **3.2** | |
| | 189 | ND* | 0.4 | ND* | 0.4 | | ND | 2.2 | **1.1** | ** |
| Southeast - Summer | 81 | ND* | 0.2 | ND* | 0.2 | 8.1% | ND | 2.1 | **1.1** | ** |
| | 77 | 39.3 | 0.2 | 42.8 | 0.2 | | ND | 43 | **43** | G,J |
| | 123 | 4.9 | 0.2 | 5.4 | 0.2 | | ND | 5.4 | **5.4** | G,J |
| | 118 | 108.8 | 0.2 | 118.4 | 0.2 | | 120 | 2.1 | **120** | C |
| | 114 | 3.2 | 0.2 | 3.5 | 0.2 | | 3.5 | 2.1 | **3.5** | |
| | 105 | 72.0 | 0.2 | 78.4 | 0.2 | | 78 | 2.1 | **78** | C |
| | 126 | ND* | 0.2 | ND* | 0.2 | | ND | 2.1 | **1.1** | ** |
| | 167 | 8.2 | 0.1 | 9.0 | 0.1 | | 9.0 | 2.1 | **9.0** | |
| | 156 | 13.5 | 0.1 | 14.7 | 0.1 | | 15 | 2.1 | **15** | |
| | 157 | 2.9 | 0.1 | 3.2 | 0.1 | | 3.2 | 2.1 | **3.2** | |
| | 169 | 0.7 | 0.1 | 0.7 | 0.2 | | ND | 2.1 | **0.7** | J |
| | 189 | ND* | 0.4 | ND* | 0.5 | | ND | 2.1 | **1.1** | ** |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
pg/g Picogram per gram
EPC* Proposed exposure point concentration (EPC) to be used in ERA and HHRA.

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL

# Table 4.3.2
## Comparison of the Spring and Summer Vegetation Samples

| Sample ID | Compound detected in sample analysis | Estimated Detection Limit (pg/g) | Compound concentration in sample (pg/g) | Magnitude > EDL | Estimated Detection Limit for DUP(pg/g) | Compound concentration in DUP (pg/g) | Magnitude > EDL | Relative Percent Difference (RPD) |
|---|---|---|---|---|---|---|---|---|
| North - Spring and North - Summer | 81 | 1.67 | ND* | N/A | 0.16 | 0.56 | 3.6 | N/A |
| | 77 | 2.23 | 6.09 | 2.7 | 0.17 | 3.86 | 22.5 | 44.8% |
| | 123 | 1.07 | ND* | N/A | 0.11 | 0.52 | 4.7 | N/A |
| | 118 | 1.13 | 22.32 | 19.8 | 0.10 | 14.65 | 144.8 | 41.5% |
| | 114 | 1.01 | ND* | N/A | 0.10 | ND* | N/A | N/A |
| | 105 | 1.27 | 9.89 | 7.8 | 0.11 | 7.35 | 68.6 | 29.5% |
| | 126 | 1.56 | ND* | N/A | 0.16 | ND* | N/A | N/A |
| | 167 | 1.13 | 3.96 | 3.5 | 0.16 | 1.44 | 9.1 | 93.2% |
| | 156 | 1.21 | 1.93 | **1.6** | 0.13 | 1.37 | 10.8 | N/A* |
| | 157 | 1.14 | ND* | N/A | 0.13 | 0.50 | 4.0 | N/A |
| | 169 | 1.52 | ND* | N/A | 0.21 | ND* | N/A | N/A |
| | 189 | 2.32 | ND* | N/A | 0.11 | 0.43 | 4.0 | N/A |
| Northwest - Spring and Northwest - Summer | 81 | 1.64 | ND* | N/A | 0.11 | ND* | N/A | N/A |
| | 77 | 1.46 | 5.03 | 3.4 | 0.12 | 4.75 | 38.0 | 5.8% |
| | 123 | 1.11 | ND* | N/A | 0.12 | 0.64 | 5.3 | N/A |
| | 118 | 1.15 | 14.47 | 12.6 | 0.11 | 14.85 | 131.0 | 2.6% |
| | 114 | 1.11 | ND* | N/A | 0.12 | ND* | N/A | N/A |
| | 105 | 1.35 | 7.19 | 5.3 | 0.13 | 7.91 | 63.2 | 9.6% |
| | 126 | 1.56 | ND* | N/A | 0.20 | ND* | N/A | N/A |
| | 167 | 0.96 | 4.40 | 4.6 | 0.13 | 1.65 | 12.5 | 91.1% |
| | 156 | 0.97 | 1.53 | **1.6** | 0.09 | 1.72 | 19.7 | N/A* |
| | 157 | 0.91 | 1.18 | **1.3** | 0.09 | 0.33 | 3.8 | N/A* |
| | 169 | 1.25 | ND* | N/A | 0.14 | ND* | N/A | N/A |
| | 189 | 2.52 | ND* | N/A | 0.53 | ND* | N/A | N/A |
| B-18 - Spring and B-18 - Summer | 81 | 2.22 | 8.52 | 3.8 | 0.28 | ND* | N/A | N/A |
| | 77 | 2.21 | 64.24 | 29.1 | 0.31 | 155.80 | 505.6 | 83.2% |
| | 123 | 1.95 | 10.11 | 5.2 | 0.17 | 27.81 | 164.3 | 93.3% |
| | 118 | 1.87 | 143.91 | 77.0 | 0.15 | 471.57 | 3138.6 | 106.5% |
| | 114 | 1.77 | 4.96 | 2.8 | 0.16 | 18.90 | 118.8 | 116.9% |
| | 105 | 2.23 | 101.21 | 45.4 | 0.18 | 278.34 | 1566.7 | 93.3% |
| | 126 | 2.45 | 7.73 | 3.2 | 0.22 | ND* | N/A | N/A |
| | 167 | 1.05 | 34.78 | 33.1 | 0.26 | 57.04 | 222.7 | 48.5% |
| | 156 | 1.04 | 19.14 | 18.4 | 0.21 | 89.47 | 418.1 | 129.5% |
| | 157 | 1.01 | 5.10 | 5.0 | 0.22 | 14.28 | 65.1 | 94.7% |
| | 169 | 1.40 | ND* | N/A | 0.34 | 2.86 | 8.5 | N/A |
| | 189 | 5.13 | ND* | N/A | 0.37 | ND* | N/A | N/A |
| West - Spring and West - Summer | 81 | 1.25 | 1.54 | **1.2** | 0.11 | 0.64 | 5.9 | N/A* |
| | 77 | 1.64 | 10.60 | 6.5 | 0.13 | 5.75 | 45.8 | 59.3% |
| | 123 | 0.99 | ND* | N/A | 0.12 | 1.72 | 14.4 | N/A |
| | 118 | 0.97 | 27.08 | 27.9 | 0.11 | 17.70 | 155.2 | 41.9% |
| | 114 | 0.86 | ND* | N/A | 0.11 | ND* | N/A | N/A |
| | 105 | 1.19 | 17.72 | 14.9 | 0.13 | 10.89 | 83.3 | 47.8% |
| | 126 | 1.42 | ND* | N/A | 0.20 | ND* | N/A | N/A |
| | 167 | 0.62 | 7.38 | 11.9 | 0.17 | 1.72 | 10.2 | 124.5% |
| | 156 | 0.66 | 3.29 | 5.0 | 0.13 | 2.03 | 15.8 | 47.4% |
| | 157 | 0.62 | 0.73 | **1.2** | 0.12 | 0.68 | 5.6 | N/A* |
| | 169 | 0.83 | ND* | N/A | 0.17 | 0.44 | 2.5 | N/A |
| | 189 | 2.91 | ND* | N/A | 0.50 | ND* | N/A | N/A |
| Southeast - Spring and Southeast - Summer | 81 | 1.60 | 11.79 | 7.4 | 0.15 | ND* | N/A | N/A |
| | 77 | 1.78 | 82.94 | 46.6 | 0.18 | 39.33 | 221.7 | 71.3% |
| | 123 | 1.12 | 14.72 | 13.1 | 0.16 | 4.93 | 30.5 | 99.6% |
| | 118 | 1.03 | 228.35 | 221.7 | 0.15 | 108.83 | 703.1 | 70.9% |
| | 114 | 1.10 | 7.43 | 6.8 | 0.16 | 3.17 | 20.3 | 80.3% |
| | 105 | 1.28 | 130.79 | 102.2 | 0.17 | 72.03 | 418.8 | 57.9% |
| | 126 | 1.59 | 10.74 | 6.8 | 0.23 | ND* | N/A | N/A |
| | 167 | 0.78 | 14.66 | 18.8 | 0.11 | 8.24 | 72.2 | 56.1% |
| | 156 | 0.82 | 28.53 | 34.8 | 0.09 | 13.54 | 149.6 | 71.2% |
| | 157 | 0.80 | 5.81 | 7.3 | 0.09 | 2.94 | 32.0 | 65.5% |
| | 169 | 1.05 | ND* | N/A | 0.15 | 0.69 | 4.7 | N/A |
| | 189 | 3.64 | 7.39 | 2.0 | 0.44 | ND* | N/A | N/A |

Bold values are ess than or equal to 2 times the Estimated Detection Limit; RPD will not be calculated

| | |
|---|---|
| N/A* | RPD not calculated because one or more values < that 2 times the Estimated Detection Limit |
| N/A | Not available; compound not found in both samples. |
| ND* | Not detected at or above the EDL |
| EDL | Estimated detection limit |
| pg/g | Picogram per gram |

## Table 4.3.2
## Comparison of the Spring and Summer Vegetation Samples

| Sample ID | Compound detected in sample analysis | Estimated Detection Limit (pg/g) | Compound concentration in sample (pg/g) | Magnitude > EDL | Estimated Detection Limit for DUP(pg/g) | Compound concentration in DUP (pg/g) | Magnitude > EDL | Relative Percent Difference (RPD) |
|---|---|---|---|---|---|---|---|---|
| Southwest - Spring and Southwest - Summer | 81 | 1.2 | ND* | N/A | 0.15 | ND* | N/A | N/A |
| | 77 | 1.3 | 6.68 | 5.3 | 0.18 | 6.41 | 36.1 | 4.1% |
| | 123 | 1.1 | 1.17 | **1.1** | 0.20 | 0.87 | 4.2 | N/A* |
| | 118 | 1.0 | 21.09 | 21.7 | 0.19 | 19.67 | 101.7 | 6.9% |
| | 114 | 0.9 | ND* | N/A | 0.20 | ND* | N/A | N/A |
| | 105 | 1.2 | 13.92 | 11.7 | 0.22 | 12.46 | 55.4 | 11.1% |
| | 126 | 1.3 | ND* | N/A | 0.30 | ND* | N/A | N/A |
| | 167 | 0.5 | 7.55 | 15.4 | 0.15 | 1.72 | 11.2 | 125.8% |
| | 156 | 0.5 | 3.02 | 5.9 | 0.12 | 2.17 | 17.6 | 32.7% |
| | 157 | 0.5 | 1.41 | 3.0 | 0.13 | 0.66 | 5.3 | 71.8% |
| | 169 | 0.6 | ND* | N/A | 0.19 | ND* | N/A | N/A |
| | 189 | 4.2 | ND* | N/A | 0.57 | ND* | N/A | N/A |
| Northeast - Spring and Northeast - Summer | 81 | 1.51 | ND* | N/A | 0.09 | 0.57 | 6.5 | N/A |
| | 77 | 1.44 | 9.48 | 6.6 | 0.10 | 4.57 | 45.0 | 69.8% |
| | 123 | 0.90 | ND* | N/A | 0.11 | 0.68 | 6.3 | N/A |
| | 118 | 0.92 | 33.23 | 36.1 | 0.10 | 16.27 | 160.3 | 68.5% |
| | 114 | 0.89 | ND* | N/A | 0.10 | ND* | N/A | N/A |
| | 105 | 1.04 | 17.15 | 16.5 | 0.12 | 8.96 | 73.7 | 62.8% |
| | 126 | 1.25 | ND* | N/A | 0.17 | ND* | N/A | N/A |
| | 167 | 0.51 | 9.48 | 18.6 | 0.08 | 1.76 | 22.0 | 137.5% |
| | 156 | 0.55 | 3.60 | 6.5 | 0.07 | 1.99 | 28.5 | 57.6% |
| | 157 | 0.48 | 1.33 | 2.8 | 0.06 | 0.75 | 12.0 | 56.3% |
| | 169 | 0.70 | ND* | N/A | 0.09 | 0.30 | N/A | N/A |
| | 189 | 3.74 | ND* | N/A | 0.44 | ND* | N/A | N/A |
| South - Spring and South - Summer | 81 | 1.66 | 5.68 | 3.4 | 0.15 | ND* | N/A | N/A |
| | 77 | 1.95 | 52.16 | 26.7 | 0.17 | 61.72 | 360.2 | 16.8% |
| | 123 | 1.79 | 6.42 | 3.6 | 0.12 | 5.70 | 46.9 | 11.8% |
| | 118 | 1.78 | 152.23 | 85.5 | 0.11 | 155.98 | 1380.1 | 2.4% |
| | 114 | 1.62 | 3.38 | 2.1 | 0.12 | 4.71 | 40.4 | 32.9% |
| | 105 | 2.12 | 93.40 | 44.1 | 0.13 | 112.47 | 855.7 | 18.5% |
| | 126 | 2.63 | 6.21 | 2.4 | 0.19 | ND* | N/A | N/A |
| | 167 | 0.68 | 21.05 | 31.0 | 0.12 | 10.88 | 90.4 | 63.7% |
| | 156 | 0.70 | 15.86 | 22.7 | 0.10 | 18.30 | 174.6 | 14.3% |
| | 157 | 0.68 | 3.37 | 5.0 | 0.09 | 4.18 | 45.5 | 21.4% |
| | 169 | 0.89 | ND* | N/A | 0.14 | 0.58 | 4.2 | N/A |
| | 189 | 4.34 | ND* | N/A | 0.52 | ND* | N/A | N/A |

Bold values are ess than or equal to 2 times the Estimated Detection Limit; RPD will not be calculated

N/A* RPD not calculated because one or more values < that 2 times the Estimated Detection Limit
N/A Not available; compound not found in both samples
ND* Not detected at or above the EDL
EDL Estimated detection limit
pg/g Picogram per gram

| Compound | Number of field | Average RPD for 2009 |
|---|---|---|
| 81 | 0 | N/A |
| 77 | 8 | 44.4% |
| 123 | 3 | 68.3% |
| 118 | 8 | 42.7% |
| 114 | 3 | 76.7% |
| 105 | 8 | 41.3% |
| 126 | 0 | N/A |
| 167 | 8 | 92.6% |
| 156 | 6 | 58.8% |
| 157 | 5 | 62.0% |
| 169 | 0 | N/A |
| 189 | 0 | N/A |
| **TOTAL** | **49** | **--** |
| **AVERAGE** | **--** | **60.8%** |

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# Table 4.10.1
# Summary of Fresno, Hanford, and Coalinga Air Sampling Results

| Air Sample Name (sampling related flag) | PCB | Raw Data from Lab Result (pg) | Raw Data from Lab EDL (pg) | Presented in Lab Reports Result (pg) | Presented in Lab Reports RL (pg) | Sample Volume ($m^3$) | Raw Data Converted to $pg/m^3$ Result ($pg/m^3$) | Raw Data Converted to $pg/m^3$ EDL ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ Result ($pg/m^3$) | Lab Presented Data Converted to $pg/m^3$ RL ($pg/m^3$) | Analytical Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AUG09-FRESNO-TO9A | 81 | ND* | 7.19 | ND | 1000 | 3449 | ND | 0.002 | ND | 0.29 | ** |
| | 77 | 880.42 | 7.69 | ND | 1000 | | 0.255 | 0.002 | ND | 0.29 | J |
| R | 123 | 273.05 | 3.53 | ND | 1000 | | 0.079 | 0.001 | ND | 0.29 | J |
| | 118 | 7764.62 | 3.25 | 7800 | 1000 | | 2.251 | 0.001 | 2.3 | 0.29 | C |
| | 114 | ND* | 2.99 | ND | 1000 | | ND | 0.001 | ND | 0.29 | ** |
| | 105 | 2926.09 | 3.36 | 2900 | 1000 | | 0.848 | 0.001 | 2900 | 0.29 | C |
| | 126 | ND* | 3.29 | ND | 1000 | | ND* | 0.001 | ND | 0.29 | ** |
| | 167 | 257.19 | 4.37 | ND | 1000 | | 0.075 | 0.001 | ND | 0.29 | J |
| | 156 | 425.56 | 3.73 | ND | 1000 | | 0.123 | 0.001 | ND | 0.29 | J |
| | 157 | 102.94 | 3.81 | ND | 1000 | | ND* | 0.001 | ND | 0.29 | J |
| | 169 | ND* | 5.08 | ND | 1000 | | ND* | 0.001 | ND | 0.29 | ** |
| | 189 | ND* | 3.17 | ND | 1000 | | ND* | 0.001 | ND | 0.29 | ** |
| SEP09-HANFORD-TO9A | 81 | 157.97 | 7.50 | ND | 1000 | 5845 | 0.027 | 0.001 | ND | 0.17 | J |
| | 77 | 781.42 | 8.18 | ND | 1000 | | 0.134 | 0.001 | ND | 0.17 | J |
| (*) | 123 | 296.22 | 4.45 | ND | 1000 | | 0.051 | 0.001 | ND | 0.17 | J |
| | 118 | 7042.01 | 4.20 | 7000 | 1000 | | 1.205 | 0.001 | 1.2 | 0.17 | C |
| | 114 | 142.12 | 4.22 | ND | 1000 | | 0.024 | 0.001 | ND | 0.17 | J |
| | 105 | 2359.34 | 4.46 | 2400 | 1000 | | 0.404 | 0.001 | 0.41 | 0.17 | C |
| | 126 | 111.47 | 5.05 | ND | 1000 | | ND* | 0.001 | ND | 0.17 | J |
| | 167 | 382.75 | 5.35 | ND | 1000 | | 0.065 | 0.001 | ND | 0.17 | J |
| | 156 | 619.10 | 4.32 | ND | 1000 | | 0.106 | 0.001 | ND | 0.17 | J |
| | 157 | 104.94 | 4.64 | ND | 1000 | | 0.018 | 0.001 | ND | 0.17 | J |
| | 169 | ND* | 8.22 | ND | 1000 | | ND* | 0.001 | ND | 0.17 | ** |
| | 189 | 94.26 | 2.82 | ND | 1000 | | ND* | 0.000 | ND | 0.17 | J |
| OCT09-COALINGA-TO9A | 81 | ND* | 3.07 | ND | 1000 | 4803 | ND* | 0.001 | ND | 0.21 | ** |
| | 77 | 156.90 | 3.29 | ND | 1000 | | 0.033 | 0.001 | ND | 0.21 | J |
| (*) | 123 | 74.34 | 2.84 | ND | 1000 | | 0.015 | 0.001 | ND | 0.21 | J |
| | 118 | 1643.39 | 2.64 | 5500 | 1000 | | 0.342 | 0.001 | 1.1 | 0.21 | C |
| | 114 | ND* | 2.59 | ND | 1000 | | ND | 0.001 | ND | 0.21 | J |
| | 105 | 572.12 | 2.74 | 2100 | 1000 | | 0.119 | 0.001 | 0.44 | 0.21 | C |
| | 126 | ND* | 3.06 | ND | 1000 | | ND* | 0.001 | ND | 0.21 | ** |
| | 167 | 65.70 | 1.58 | ND | 1000 | | ND* | 0.000 | ND | 0.21 | ** |
| | 156 | 75.66 | 1.34 | ND | 1000 | | 0.016 | 0.000 | ND | 0.21 | J |
| | 157 | 18.05 | 1.35 | ND | 1000 | | 0.004 | 0.000 | ND | 0.21 | J |
| | 169 | ND* | 2.36 | ND | 1000 | | ND* | 0.000 | ND | 0.21 | ** |
| | 189 | ND* | 1.53 | ND | 1000 | | ND | 0.000 | ND | 0.21 | J |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
$m^3$ Cubic meter
pg Picogram
$pg/m^3$ Picogram per cubic meter

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
R Rejected due to lack of sufficient sample volume
** ND, therefore surrogate EPC assigned as 1/2 the RL
(*) Non critical sampling related issue associated with this sample.

# Table 4.10.2
## Summary of Fresno, Hanford, and Coalinga Soil Sampling Results

| | | Raw Data | | | | Presented in Lab Reports | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | By Wet Weight | | By Dry Weight | | | | | |
| Soil Sample Name | PCB | Result pg/g | EDL pg/g | Result pg/g | EDL pg/g | Percent Moisture | Result pg/g | RL pg/g | Flag |
| AUG09-FRESNO | 81 | ND* | 0.8 | ND* | 0.8 | 0.2% | ND | 3.5 | ** |
| | 77 | 3.5 | 1.0 | 3.5 | 1.0 | | ND | 1.9 | G, J |
| | 123 | 1.2 | 0.4 | 1.2 | 0.4 | | ND | 1.9 | J |
| | 118 | 22.1 | 0.4 | 22.1 | 0.4 | | 22 | 1.9 | C |
| | 114 | 0.8 | 0.4 | 0.8 | 0.4 | | ND | 1.9 | J |
| | 105 | 13.6 | 0.4 | 13.6 | 0.4 | | 14 | 1.9 | C |
| | 126 | 1.1 | 0.6 | 1.1 | 0.6 | | ND | 1.9 | J |
| | 167 | 3.1 | 0.6 | 3.1 | 0.6 | | ND | 1.9 | J |
| | 156 | 4.4 | 0.5 | 4.4 | 0.5 | | 4.4 | 1.9 | J |
| | 157 | 1.1 | 0.5 | 1.1 | 0.5 | | 3.1 | 1.9 | J |
| | 169 | ND* | 1.0 | ND* | 1.0 | | ND | 1.9 | ** |
| | 189 | ND* | 1.5 | ND* | 1.5 | | ND | 1.9 | ** |
| SEP09- HANFORD | 81 | 0.4 | 0.1 | 0.4 | 0.1 | 0.6% | ND | 2.0 | J |
| | 77 | 0.9 | 0.1 | 0.9 | 0.1 | | ND | 2.0 | J |
| | 123 | 0.5 | 0.1 | 0.5 | 0.1 | | ND | 2.0 | J |
| | 118 | 4.9 | 0.1 | 5.0 | 0.1 | | 5.0 | 2.0 | C |
| | 114 | 0.2 | 0.1 | 0.2 | 0.1 | | ND | 2.0 | J |
| | 105 | 2.5 | 0.1 | 2.5 | 0.1 | | 2.5 | 2.0 | C |
| | 126 | 0.5 | 0.1 | 0.5 | 0.1 | | ND | 2.0 | J |
| | 167 | 1.0 | 0.3 | 1.0 | 0.3 | | ND | 2.0 | J |
| | 156 | 1.7 | 0.2 | 1.8 | 0.2 | | ND | 2.0 | J |
| | 157 | 0.6 | 0.2 | 0.6 | 0.2 | | ND | 2.0 | J |
| | 169 | ND* | 0.3 | ND* | 0.3 | | ND | 2.0 | ** |
| | 189 | 0.7 | 0.2 | 0.7 | 0.2 | | ND | 2.0 | J |
| OCT09-COALINGA | 81 | 1.0 | 0.1 | 1.0 | 0.1 | 1.40% | ND | 19 | J |
| | 77 | 3.7 | 0.1 | 3.7 | 0.1 | | ND | 3.7 | G, J |
| | 123 | 2.5 | 0.2 | 2.5 | 0.2 | | ND | 2.1 | G, J |
| | 118 | 72.5 | 0.2 | 73.5 | 0.2 | | 73 | 1.9 | C |
| | 114 | 1.1 | 0.2 | 1.2 | 0.2 | | ND | 1.9 | J |
| | 105 | 38.1 | 0.2 | 38.6 | 0.2 | | 39 | 1.9 | C |
| | 126 | 1.3 | 0.2 | 1.3 | 0.2 | | ND | 1.9 | J |
| | 167 | 7.3 | 0.2 | 7.4 | 0.3 | | 7.4 | 1.9 | J |
| | 156 | 15.1 | 0.2 | 15.3 | 0.2 | | 15 | 1.9 | J |
| | 157 | 4.1 | 0.2 | 4.2 | 0.2 | | 4.2 | 1.9 | J |
| | 169 | ND* | 0.4 | ND* | 0.4 | | ND | 1.9 | ** |
| | 189 | 1.2 | 0.2 | 1.2 | 0.2 | | ND | 1.9 | J |

RL — Reporting limit
ND — Not detected at or above the RL
ND* — Not detected at or above the EDL
EDL — Estimated detection limit
pg/g — Picogram per gram

Flags:
J — Detected ≥ EDL and < RL
G — Elevated reporting limit. The reporting limit is elevated due to matrix interference
C — Co-eluting isomer.
Q — Estimated maximum potential concentration.
B — Method blank contamination.
** — ND, therefore surrogate EPC assigned as 1/2 the RL

# Table 4.10.3
## Summary of Fresno, Hanford, and Coalings Vegetation Sampling Results

| Vegetation Sample Name | PCB | Raw Data By Wet Weight Result pg/g | By Wet Weight EDL pg/g | By Dry Weight Result pg/g | By Dry Weight EDL pg/g | Presented in Lab Reports Percent Moisture | Result pg/g | RL pg/g | Flag |
|---|---|---|---|---|---|---|---|---|---|
| AUG09-FRESNO | 81 | 0.4 | 0.2 | 0.4 | 0.2 | 1.7% | ND | 2.3 | J |
| | 77 | 1.8 | 0.3 | 1.8 | 0.3 | | ND | 2.3 | J |
| | 123 | 0.8 | 0.2 | 0.8 | 0.2 | | ND | 2.3 | J |
| | 118 | 12.0 | 0.2 | 12.2 | 0.2 | | 12 | 2.3 | C |
| | 114 | 0.2 | 0.1 | 0.2 | 0.1 | | ND | 2.3 | J |
| | 105 | 7.3 | 0.2 | 7.5 | 0.2 | | 7.5 | 2.3 | C |
| | 126 | 0.46 | 0.2 | 0.47 | 0.2 | | ND | 2.3 | J |
| | 167 | 1.7 | 0.2 | 1.7 | 0.2 | | ND | 2.3 | J |
| | 156 | 2.9 | 0.2 | 3.0 | 0.2 | | 3.0 | 2.3 | |
| | 157 | 0.9 | 0.2 | 1.0 | 0.2 | | ND | 2.3 | J |
| | 169 | ND* | 0.3 | ND* | 0.3 | | ND | 2.3 | ** |
| | 189 | 0.5 | 0.2 | 0.5 | 0.2 | | ND | 2.3 | J |
| SEP09- HANFORD | 81 | 1.1 | 0.3 | 1.3 | 0.4 | 13.0% | ND | 6.9 | J |
| | 77 | 5.2 | 0.3 | 6.0 | 0.4 | | ND | 6.9 | J |
| | 123 | 2.6 | 0.6 | 3.0 | 0.6 | | ND | 6.9 | J |
| | 118 | 18.7 | 0.5 | 21.5 | 0.6 | | 21 | 6.9 | C |
| | 114 | 0.5 | 0.6 | 0.6 | 0.6 | | ND | 6.9 | J |
| | 105 | 9.9 | 0.6 | 11.4 | 0.7 | | 11 | 6.9 | C |
| | 126 | 2.3 | 0.9 | 2.7 | 1.0 | | ND | 6.9 | J |
| | 167 | 5.1 | 1.3 | 5.9 | 1.5 | | ND | 6.9 | J |
| | 156 | 6.2 | 1.1 | 7.1 | 1.3 | | 7.1 | 6.9 | |
| | 157 | 1.3 | 1.2 | 1.5 | 1.3 | | ND | 6.9 | J |
| | 169 | ND* | 2.0 | ND* | 2.3 | | ND | 6.9 | ** |
| | 189 | 3.1 | 1.5 | 3.6 | 1.7 | | ND | 6.9 | J |
| OCT09-COALINGA | 81 | 0.7 | 0.1 | 0.8 | 0.2 | 8.8% | ND | 3.9 | J |
| | 77 | 3.5 | 0.2 | 3.8 | 0.2 | | ND | 3.7 | G,J |
| | 123 | 1.1 | 0.2 | 1.2 | 0.3 | | ND | 3.7 | J |
| | 118 | 18.4 | 0.2 | 20.2 | 0.2 | | 20 | 3.7 | c |
| | 114 | 0.5 | 0.2 | 0.6 | 0.2 | | ND | 3.7 | J |
| | 105 | 9.1 | 0.2 | 9.9 | 0.3 | | 9.9 | 3.7 | C |
| | 126 | ND* | 0.3 | ND* | 0.3 | | ND | 3.7 | ** |
| | 167 | 1.9 | 0.4 | 2.1 | 0.5 | | ND | 3.7 | J |
| | 156 | 2.5 | 0.3 | 2.7 | 0.4 | | ND | 3.7 | J |
| | 157 | 0.7 | 0.3 | 0.7 | 0.4 | | ND | 3.7 | J |
| | 169 | ND* | 0.7 | ND* | 0.7 | | ND | 3.7 | ** |
| | 189 | ND* | 1.6 | ND* | 1.8 | | ND | 3.7 | ** |

RL Reporting limit
ND Not detected at or above the RL
ND* Not detected at or above the EDL
EDL Estimated detection limit
pg/g Picogram per gram

Flags:
J Detected ≥ EDL and < RL.
G Elevated reporting limit. The reporting limit is elevated due to matrix interference.
C Co-eluting isomer.
Q Estimated maximum potential concentration.
B Method blank contamination.
** ND, therefore surrogate EPC assigned as 1/2 the RL

**Table 5.2.1**
**Summary of Analytical Samples and Chemical Analyses**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Sample ID | Sample Type | Date Collected | USEPA Method 1668A |
|---|---|---|---|
| **SURFACE SOIL** | | | |
| Southeast | Normal | 04/01/09 | X |
| Southeast Dup | Duplicate | 04/01/09 | X |
| South | Normal | 03/31/09 | X |
| Southwest | Normal | 03/31/09 | X |
| West | Normal | 04/01/09 | X |
| Northwest | Normal | 04/01/09 | X |
| North | Normal | 03/31/09 | X |
| Northeast | Normal | 03/31/09 | X |
| B-18 | Normal | 04/01/09 | X |
| **VEGETATION** | | | |
| Southeast | Normal | 04/01/09 | X |
| Southeast | Normal | 08/04/09 | X |
| South | Normal | 03/31/09 | X |
| South | Normal | 08/04/09 | X |
| Southwest | Normal | 03/31/09 | X |
| Southwest | Normal | 08/03/09 | X |
| West | Normal | 04/01/09 | X |
| West | Normal | 08/03/09 | X |
| Northwest | Normal | 04/01/09 | X |
| Northwest | Normal | 08/03/09 | X |
| North | Normal | 03/31/09 | X |
| North | Normal | 08/03/09 | X |
| Northeast | Normal | 03/31/09 | X |
| Northeast | Normal | 08/03/09 | X |
| B-18 | Normal | 04/01/09 | X |
| B-18 | Normal | 08/04/09 | X |

**Table 5.2.1**
**Summary of Analytical Samples and Chemical Analyses**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Sample ID | Sample Type | Date Collected | USEPA Method 1668A |
|---|---|---|---|
| **AIR** | | | |
| DMS1 | Normal | January 2009 | X |
| DMS1 | Normal | February 2009 | X |
| DMS1 | Normal | March 2009 | X |
| DMS1 | Normal | April 2009 | X |
| DMS1 | Normal | May 2009 | X |
| DMS1 | Normal | June 2009 | X |
| DMS1 - Dup | Duplicate | June 2009 | X |
| DMS1 | Normal | July 2009 | X |
| DMS1 | Normal | August 2009 | X |
| DMS1 | Normal | September 2009 | X |
| DMS1 | Normal | October 2009 | X |
| DMS1 | Normal | November 2009 | X |
| DMS1 | Normal | December 2009 | X |
| MSP | Normal | January 2009 | X |
| MSP | Normal | February 2009 | X |
| MSP | Normal | March 2009 | X |
| MSP | Normal | April 2009 | X |
| MSP-ALT (1) | Normal | April 2009 | X |
| MSP | Normal | May 2009 | X |
| MSP | Normal | June 2009 | X |
| MSP | Normal | July 2009 | X |
| MSP - Dup | Duplicate | July 2009 | X |
| MSP | Normal | August 2009 | X |
| MSP | Normal | September 2009 | X |
| MSP | Normal | October 2009 | X |
| MSP (2) | Normal | November 2009 | X |
| MSP | Normal | December 2009 | X |
| UMS1 | Normal | January 2009 | X |
| UMS1 | Normal | February 2009 | X |
| UMS1 | Normal | March 2009 | X |
| UMS1 | Normal | April 2009 | X |
| UMS1 | Normal | May 2009 | X |
| UMS1 - Dup | Duplicate | May 2009 | X |
| UMS1 | Normal | June 2009 | X |
| UMS1 | Normal | July 2009 | X |
| UMS1 | Normal | August 2009 | X |
| UMS1 | Normal | September 2009 | X |
| UMS1 | Normal | October 2009 | X |
| UMS1 (2) | Normal | November 2009 | X |
| UMS1 | Normal | December 2009 | X |

Notes:
(1) The MSP-ALT sample, collected in April 2009 near the parking lot, had higher concentrations than the MSP sample collected in April; therefore, it was used instead of the MSP sample in the risk assessment.
(2) November data from this sample were not used due to malfunction of sampling equipment.

**Table 5.2.2**
**Exposure Point Concentrations for the Risk Assessment - Soil**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Chemical | EPC (pg/g) | Basis for EPC | Reporting Limit (pg/g) |
|---|---|---|---|---|
| Southeast | PCB 77 | 1.1E+01 | E | 1.1E+01 |
| | PCB 81 | 1.3E+00 | E | 2.2E+00 |
| | PCB 105 | 3.3E+01 | D | 2.2E+00 |
| | PCB 114 | 1.6E+00 | E | 2.2E+00 |
| | PCB 118 | 5.1E+01 | D | 2.2E+00 |
| | PCB 123 | 5.4E+00 | E | 5.4E+00 |
| | PCB 126 | 1.5E+00 | E | 2.2E+00 |
| | PCB 156 | 1.3E+01 | D | 2.2E+00 |
| | PCB 157 | 2.0E+00 | E | 2.2E+00 |
| | PCB 167 | 5.2E+00 | D | 2.2E+00 |
| | PCB 169 | 1.1E+00 | N | 2.2E+00 |
| | PCB 189 | 4.3E+00 | D | 2.2E+00 |
| South | PCB 77 | 5.3E+00 | E | 1.0E+01 |
| | PCB 81 | 6.0E-01 | E | 1.0E+01 |
| | PCB 105 | 2.1E+01 | D | 1.0E+01 |
| | PCB 114 | 5.0E+00 | N | 1.0E+01 |
| | PCB 118 | 2.9E+01 | D | 1.0E+01 |
| | PCB 123 | 1.9E+00 | E | 1.0E+01 |
| | PCB 126 | 1.2E+00 | E | 1.0E+01 |
| | PCB 156 | 6.8E+00 | E | 1.0E+01 |
| | PCB 157 | 1.8E+00 | E | 1.0E+01 |
| | PCB 167 | 3.0E+00 | E | 1.0E+01 |
| | PCB 169 | 5.0E+00 | N | 1.0E+01 |
| | PCB 189 | 1.6E+00 | E | 1.0E+01 |
| Southwest | PCB 77 | 2.6E+00 | E | 1.0E+01 |
| | PCB 81 | 5.0E+00 | N | 1.0E+01 |
| | PCB 105 | 1.1E+01 | D | 1.0E+01 |
| | PCB 114 | 1.0E+00 | E | 1.0E+01 |
| | PCB 118 | 1.5E+01 | D | 1.0E+01 |
| | PCB 123 | 1.2E+00 | E | 1.0E+01 |
| | PCB 126 | 5.0E+00 | N | 1.0E+01 |
| | PCB 156 | 3.9E+00 | E | 1.0E+01 |
| | PCB 157 | 9.2E-01 | E | 1.0E+01 |
| | PCB 167 | 1.9E+00 | E | 1.0E+01 |
| | PCB 169 | 5.0E+00 | N | 1.0E+01 |
| | PCB 189 | 1.2E+00 | E | 1.0E+01 |
| West | PCB 77 | 2.3E+00 | E | 1.0E+01 |
| | PCB 81 | 6.0E-01 | E | 1.0E+01 |
| | PCB 105 | 1.0E+01 | D | 1.0E+01 |
| | PCB 114 | 5.0E+00 | N | 1.0E+01 |
| | PCB 118 | 1.9E+01 | D | 1.0E+01 |
| | PCB 123 | 1.5E+00 | E | 1.0E+01 |
| | PCB 126 | 8.0E-01 | E | 1.0E+01 |
| | PCB 156 | 3.9E+00 | E | 1.0E+01 |
| | PCB 157 | 1.0E+00 | E | 1.0E+01 |
| | PCB 167 | 2.2E+00 | E | 1.0E+01 |
| | PCB 169 | 5.0E+00 | N | 1.0E+01 |
| | PCB 189 | 1.1E+00 | E | 1.0E+01 |

**Table 5.2.2**
**Exposure Point Concentrations for the Risk Assessment - Soil**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Chemical | EPC (pg/g) | Basis for EPC | Reporting Limit (pg/g) |
|---|---|---|---|---|
| Northwest | PCB 77 | 3.0E+00 | E | 1.0E+01 |
| | PCB 81 | 5.0E-01 | E | 1.0E+01 |
| | PCB 105 | 9.5E+00 | E | 1.0E+01 |
| | PCB 114 | 5.0E+00 | N | 1.0E+01 |
| | PCB 118 | 1.8E+01 | D | 1.0E+01 |
| | PCB 123 | 1.3E+00 | E | 1.0E+01 |
| | PCB 126 | 1.2E+00 | E | 1.0E+01 |
| | PCB 156 | 3.2E+00 | E | 1.0E+01 |
| | PCB 157 | 1.0E+00 | E | 1.0E+01 |
| | PCB 167 | 6.3E+00 | E | 1.0E+01 |
| | PCB 169 | 5.0E+00 | N | 1.0E+01 |
| | PCB 189 | 4.0E-01 | E | 1.0E+01 |
| North | PCB 77 | 2.8E+00 | E | 1.0E+01 |
| | PCB 81 | 3.0E-01 | E | 1.0E+01 |
| | PCB 105 | 1.2E+01 | D | 1.0E+01 |
| | PCB 114 | 5.0E+00 | N | 1.0E+01 |
| | PCB 118 | 1.9E+01 | D | 1.0E+01 |
| | PCB 123 | 1.5E+00 | E | 1.0E+01 |
| | PCB 126 | 7.0E-01 | E | 1.0E+01 |
| | PCB 156 | 3.0E+00 | E | 1.0E+01 |
| | PCB 157 | 1.0E+00 | E | 1.0E+01 |
| | PCB 167 | 6.6E+00 | E | 1.0E+01 |
| | PCB 169 | 5.0E+00 | N | 1.0E+01 |
| | PCB 189 | 7.0E-01 | E | 1.0E+01 |
| Northeast | PCB 77 | 1.5E+01 | E | 1.5E+01 |
| | PCB 81 | 1.4E+00 | E | 1.0E+01 |
| | PCB 105 | 6.5E+01 | D | 1.0E+01 |
| | PCB 114 | 2.0E+00 | E | 1.0E+01 |
| | PCB 118 | 1.0E+02 | D | 1.0E+01 |
| | PCB 123 | 8.7E+00 | E | 1.0E+01 |
| | PCB 126 | 5.9E+00 | E | 1.0E+01 |
| | PCB 156 | 2.9E+01 | D | 1.0E+01 |
| | PCB 157 | 6.9E+00 | E | 1.0E+01 |
| | PCB 167 | 1.6E+01 | D | 1.0E+01 |
| | PCB 169 | 5.0E+00 | N | 1.0E+01 |
| | PCB 189 | 9.3E+00 | E | 1.0E+01 |
| B-18 Landfill | PCB 77 | 1.8E+01 | E | 1.8E+01 |
| | PCB 81 | 2.4E+00 | E | 1.0E+01 |
| | PCB 105 | 6.2E+01 | D | 1.0E+01 |
| | PCB 114 | 2.3E+00 | E | 1.0E+01 |
| | PCB 118 | 8.5E+01 | D | 1.0E+01 |
| | PCB 123 | 1.5E+01 | E | 1.5E+01 |
| | PCB 126 | 3.5E+00 | E | 1.0E+01 |
| | PCB 156 | 3.1E+01 | D | 1.0E+01 |
| | PCB 157 | 4.8E+00 | E | 1.0E+01 |
| | PCB 167 | 1.3E+01 | D | 1.0E+01 |
| | PCB 169 | 5.0E+00 | N | 1.0E+01 |
| | PCB 189 | 8.2E+00 | E | 1.0E+01 |

Notes:
Analytical data and qualifiers are presented and discussed in Section 4.
Basis for EPC:
D indicates a detection at a concentration above the reporting limit.
E indicates a detection at a concentration between the estimated detection limit and the reporting limit.
N indicates the chemical was not detected above the estimated detection limit. One-half the reporting limit is used as a surrogate EPC.
EPC - exposure point concentration
PCB - polychlorinated biphenyl
pg/g - picograms per gram (parts per trillion)

**Table 5.2.3**
**Exposure Point Concentrations for the Risk Assessment - Vegetation**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Chemical | EPC (pg/g) | Basis for EPC | Reporting Limit (pg/g) |
|---|---|---|---|---|
| Southeast | PCB 77 | 9.7E+01 | E | 9.7E+01 |
| | PCB 81 | 1.4E+01 | E | 5.8E+01 |
| | PCB 105 | 1.5E+02 | D | 5.8E+01 |
| | PCB 114 | 8.7E+00 | E | 5.8E+01 |
| | PCB 118 | 2.7E+02 | D | 5.8E+01 |
| | PCB 123 | 1.7E+01 | E | 5.8E+01 |
| | PCB 126 | 1.3E+01 | E | 5.8E+01 |
| | PCB 156 | 3.3E+01 | E | 5.8E+01 |
| | PCB 157 | 6.8E+00 | E | 5.8E+01 |
| | PCB 167 | 1.7E+01 | E | 5.8E+01 |
| | PCB 169 | 7.5E-01 | E | 2.1E+00 |
| | PCB 189 | 8.6E+00 | E | 5.8E+01 |
| South | PCB 77 | 7.0E+01 | E | 7.0E+01 |
| | PCB 81 | 6.5E+00 | E | 5.7E+01 |
| | PCB 105 | 1.3E+02 | D | 2.3E+00 |
| | PCB 114 | 5.4E+00 | D | 2.3E+00 |
| | PCB 118 | 1.8E+02 | D | 2.3E+00 |
| | PCB 123 | 7.3E+00 | E | 5.7E+01 |
| | PCB 126 | 7.1E+00 | E | 5.7E+01 |
| | PCB 156 | 2.1E+01 | D | 2.3E+00 |
| | PCB 157 | 4.8E+00 | D | 2.3E+00 |
| | PCB 167 | 2.4E+01 | E | 5.7E+01 |
| | PCB 169 | 6.6E-01 | E | 2.3E+00 |
| | PCB 189 | 1.2E+00 | N | 2.3E+00 |
| Southwest | PCB 77 | 9.2E+00 | E | 6.9E+01 |
| | PCB 81 | 1.1E+00 | N | 2.1E+00 |
| | PCB 105 | 1.9E+01 | E | 6.9E+01 |
| | PCB 114 | 1.1E+00 | N | 2.1E+00 |
| | PCB 118 | 2.9E+01 | E | 6.9E+01 |
| | PCB 123 | 1.6E+00 | E | 6.9E+01 |
| | PCB 126 | 1.1E+00 | N | 2.1E+00 |
| | PCB 156 | 4.2E+00 | E | 6.9E+01 |
| | PCB 157 | 1.9E+00 | E | 6.9E+01 |
| | PCB 167 | 1.0E+01 | E | 6.9E+01 |
| | PCB 169 | 1.1E+00 | N | 2.1E+00 |
| | PCB 189 | 1.1E+00 | N | 2.1E+00 |
| West | PCB 77 | 1.2E+01 | E | 5.4E+01 |
| | PCB 81 | 1.7E+00 | E | 5.4E+01 |
| | PCB 105 | 1.9E+01 | E | 5.4E+01 |
| | PCB 114 | 1.1E+00 | N | 2.2E+00 |
| | PCB 118 | 3.0E+01 | E | 5.4E+01 |
| | PCB 123 | 1.9E+00 | E | 2.2E+00 |
| | PCB 126 | 1.1E+00 | N | 2.2E+00 |
| | PCB 156 | 3.6E+00 | E | 5.4E+01 |
| | PCB 157 | 8.0E-01 | E | 5.4E+01 |
| | PCB 167 | 8.1E+00 | E | 5.4E+01 |
| | PCB 169 | 4.8E-01 | E | 2.2E+00 |
| | PCB 189 | 1.1E+00 | N | 2.2E+00 |

**Table 5.2.3**
**Exposure Point Concentrations for the Risk Assessment - Vegetation**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Chemical | EPC (pg/g) | Basis for EPC | Reporting Limit (pg/g) |
|---|---|---|---|---|
| Northwest | PCB 77 | 6.9E+00 | E | 6.5E+01 |
| | PCB 81 | 1.1E+00 | N | 2.1E+00 |
| | PCB 105 | 9.8E+00 | E | 6.5E+01 |
| | PCB 114 | 1.1E+00 | N | 2.1E+00 |
| | PCB 118 | 2.0E+01 | E | 6.5E+01 |
| | PCB 123 | 7.0E-01 | E | 2.1E+00 |
| | PCB 126 | 1.1E+00 | N | 2.1E+00 |
| | PCB 156 | 2.1E+00 | E | 6.5E+01 |
| | PCB 157 | 1.6E+00 | E | 6.5E+01 |
| | PCB 167 | 6.0E+00 | E | 6.5E+01 |
| | PCB 169 | 1.1E+00 | N | 2.1E+00 |
| | PCB 189 | 1.1E+00 | N | 2.1E+00 |
| North | PCB 77 | 7.8E+00 | E | 6.4E+01 |
| | PCB 81 | 6.0E-01 | E | 2.1E+00 |
| | PCB 105 | 1.3E+01 | E | 6.4E+01 |
| | PCB 114 | 1.1E+00 | N | 2.1E+00 |
| | PCB 118 | 2.9E+01 | E | 6.4E+01 |
| | PCB 123 | 5.6E-01 | E | 2.1E+00 |
| | PCB 126 | 1.1E+00 | N | 2.1E+00 |
| | PCB 156 | 2.5E+00 | E | 6.4E+01 |
| | PCB 157 | 5.4E-01 | E | 2.1E+00 |
| | PCB 167 | 5.1E+00 | E | 6.4E+01 |
| | PCB 169 | 1.1E+00 | N | 2.1E+00 |
| | PCB 189 | 4.7E-01 | E | 2.1E+00 |
| Northeast | PCB 77 | 1.3E+01 | E | 6.7E+01 |
| | PCB 81 | 6.4E-01 | E | 2.2E+00 |
| | PCB 105 | 2.3E+01 | E | 6.7E+01 |
| | PCB 114 | 1.1E+00 | N | 2.2E+00 |
| | PCB 118 | 4.4E+01 | E | 6.7E+01 |
| | PCB 123 | 7.6E-01 | E | 2.2E+00 |
| | PCB 126 | 1.1E+00 | N | 2.2E+00 |
| | PCB 156 | 4.8E+00 | E | 6.7E+01 |
| | PCB 157 | 1.8E+00 | E | 6.7E+01 |
| | PCB 167 | 1.3E+01 | E | 6.7E+01 |
| | PCB 169 | 3.3E-01 | E | 2.2E+00 |
| | PCB 189 | 1.1E+00 | N | 2.2E+00 |
| B-18 Landfill | PCB 77 | 1.7E+02 | E | 1.7E+02 |
| | PCB 81 | 1.2E+01 | E | 6.5E+01 |
| | PCB 105 | 3.1E+02 | D | 2.2E+00 |
| | PCB 114 | 2.1E+01 | D | 2.2E+00 |
| | PCB 118 | 5.2E+02 | D | 2.2E+00 |
| | PCB 123 | 3.1E+01 | E | 3.1E+01 |
| | PCB 126 | 1.0E+01 | E | 6.5E+01 |
| | PCB 156 | 9.9E+01 | D | 2.2E+00 |
| | PCB 157 | 1.6E+01 | D | 2.2E+00 |
| | PCB 167 | 6.3E+01 | D | 2.2E+00 |
| | PCB 169 | 3.2E+00 | D | 2.2E+00 |
| | PCB 189 | 1.1E+00 | N | 2.2E+00 |

Notes:
Analytical data and qualifiers are presented and discussed in Section 4.
Basis for EPC:
D indicates a detection at a concentration above the reporting limit.
E indicates a detection at a concentration between the estimated detection limit and the reporting limit.
N indicates the chemical was not detected above the estimated detection limit. One-half the reporting limit is used as a surrogate EPC.
EPC - exposure point concentration
PCB - polychlorinated biphenyl
pg/g - picograms per gram (parts per trillion)

**Table 5.2.4**
**Exposure Point Concentrations for the Risk Assessment - Air**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | EPC (mg/m3) | Basis for EPC | Reporting Limit (mg/m$^3$) | Scaling Factor [(1)] | Scaled EPC [(2)] (mg/m$^3$) |
|---|---|---|---|---|---|---|---|
| DMS1 | January | PCB 77 | 1.6E-10 | E | 1.7E-10 | — | 1.58E-10 |
| | | PCB 81 | 4.3E-11 | E | 1.7E-10 | — | 4.26E-11 |
| | | PCB 105 | 4.5E-10 | D | 1.7E-10 | — | 4.55E-10 |
| | | PCB 114 | 2.3E-11 | E | 1.7E-10 | — | 2.27E-11 |
| | | PCB 118 | 1.0E-09 | D | 1.7E-10 | — | 1.03E-09 |
| | | PCB 123 | 4.9E-11 | E | 1.7E-10 | — | 4.93E-11 |
| | | PCB 126 | 8.4E-11 | N | 1.7E-10 | — | 8.43E-11 |
| | | PCB 156 | 5.3E-11 | E | 1.7E-10 | — | 5.31E-11 |
| | | PCB 157 | 1.2E-11 | E | 1.7E-10 | — | 1.24E-11 |
| | | PCB 167 | 2.3E-11 | E | 1.7E-10 | — | 2.30E-11 |
| | | PCB 169 | 8.4E-11 | N | 1.7E-10 | — | 8.43E-11 |
| | | PCB 189 | 8.4E-11 | N | 1.7E-10 | — | 8.43E-11 |
| | February | PCB 77 | 9.5E-11 | E | 1.6E-10 | — | 9.46E-11 |
| | | PCB 81 | 2.6E-11 | E | 1.6E-10 | — | 2.62E-11 |
| | | PCB 105 | 2.3E-10 | D | 1.6E-10 | — | 2.33E-10 |
| | | PCB 114 | 1.5E-11 | E | 1.6E-10 | — | 1.52E-11 |
| | | PCB 118 | 5.6E-10 | D | 1.6E-10 | — | 5.58E-10 |
| | | PCB 123 | 3.8E-11 | E | 1.6E-10 | — | 3.76E-11 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.75E-11 |
| | | PCB 156 | 2.5E-11 | E | 1.6E-10 | — | 2.55E-11 |
| | | PCB 157 | 3.9E-12 | E | 1.6E-10 | — | 3.90E-12 |
| | | PCB 167 | 5.8E-11 | E | 1.6E-10 | — | 5.84E-11 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | — | 7.75E-11 |
| | | PCB 189 | 2.0E-12 | E | 1.6E-10 | — | 1.96E-12 |
| | March | PCB 77 | 1.8E-10 | E* | 1.7E-10 | — | 1.77E-10 |
| | | PCB 81 | 3.7E-11 | E | 1.6E-10 | — | 3.69E-11 |
| | | PCB 105 | 6.2E-10 | D | 1.6E-10 | — | 6.20E-10 |
| | | PCB 114 | 5.6E-11 | E | 1.6E-10 | — | 5.62E-11 |
| | | PCB 118 | 1.1E-09 | D | 1.6E-10 | — | 1.13E-09 |
| | | PCB 123 | 1.3E-10 | E | 1.6E-10 | — | 1.33E-10 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.76E-11 |
| | | PCB 156 | 4.0E-11 | E | 1.6E-10 | — | 4.01E-11 |
| | | PCB 157 | 6.0E-12 | E | 1.6E-10 | — | 6.01E-12 |
| | | PCB 167 | 2.6E-11 | E | 1.6E-10 | — | 2.63E-11 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | — | 7.76E-11 |
| | | PCB 189 | 7.8E-11 | N | 1.6E-10 | — | 7.76E-11 |
| | April | PCB 77 | 2.7E-10 | E* | 2.6E-10 | — | 2.71E-10 |
| | | PCB 81 | 8.8E-11 | N | 1.8E-10 | — | 8.79E-11 |
| | | PCB 105 | 6.5E-10 | D | 1.8E-10 | — | 6.51E-10 |
| | | PCB 114 | 4.6E-11 | E | 1.8E-10 | — | 4.57E-11 |
| | | PCB 118 | 1.4E-09 | D | 1.8E-10 | — | 1.41E-09 |
| | | PCB 123 | 6.0E-11 | E | 1.8E-10 | — | 5.96E-11 |
| | | PCB 126 | 8.8E-11 | N | 1.8E-10 | — | 8.79E-11 |
| | | PCB 156 | 6.1E-11 | E | 1.8E-10 | — | 6.06E-11 |
| | | PCB 157 | 1.2E-11 | E | 1.8E-10 | — | 1.22E-11 |
| | | PCB 167 | 3.1E-11 | E | 1.8E-10 | — | 3.05E-11 |
| | | PCB 169 | 9.1E-12 | E | 1.8E-10 | — | 9.08E-12 |
| | | PCB 189 | 8.8E-11 | N | 1.8E-10 | — | 8.79E-11 |
| | May | PCB 77 | 4.9E-10 | E | 4.9E-10 | — | 4.85E-10 |
| | | PCB 81 | 8.5E-11 | N | 1.7E-10 | — | 8.48E-11 |
| | | PCB 105 | 1.0E-09 | D | 1.7E-10 | — | 1.03E-09 |
| | | PCB 114 | 8.5E-11 | N | 1.7E-10 | — | 8.48E-11 |
| | | PCB 118 | 2.4E-09 | D | 1.7E-10 | — | 2.37E-09 |
| | | PCB 123 | 8.9E-11 | E | 1.7E-10 | — | 8.93E-11 |
| | | PCB 126 | 8.5E-11 | N | 1.7E-10 | — | 8.48E-11 |
| | | PCB 156 | 7.3E-11 | E | 1.7E-10 | — | 7.32E-11 |
| | | PCB 157 | 1.5E-11 | E | 1.7E-10 | — | 1.49E-11 |
| | | PCB 167 | 3.6E-11 | E | 1.7E-10 | — | 3.56E-11 |
| | | PCB 169 | 4.7E-12 | E | 1.7E-10 | — | 4.67E-12 |
| | | PCB 189 | 8.5E-11 | N | 1.7E-10 | — | 8.48E-11 |
| | June | PCB 77 | 3.4E-10 | E | 3.5E-10 | — | 3.42E-10 |
| | | PCB 81 | 1.0E-10 | E | 1.6E-10 | — | 1.01E-10 |
| | | PCB 105 | 8.0E-10 | D | 1.6E-10 | — | 8.01E-10 |
| | | PCB 114 | 7.1E-11 | E | 1.6E-10 | — | 7.14E-11 |
| | | PCB 118 | 1.9E-09 | D | 1.6E-10 | — | 1.88E-09 |
| | | PCB 123 | 7.9E-11 | E | 1.6E-10 | — | 7.91E-11 |
| | | PCB 126 | 1.3E-11 | E | 1.6E-10 | — | 1.25E-11 |
| | | PCB 156 | 4.0E-11 | E | 1.6E-10 | — | 3.97E-11 |
| | | PCB 157 | 1.0E-11 | E | 1.6E-10 | — | 1.01E-11 |
| | | PCB 167 | 1.1E-10 | E | 1.6E-10 | — | 1.06E-10 |
| | | PCB 169 | 7.9E-11 | N | 1.6E-10 | — | 7.85E-11 |
| | | PCB 189 | 3.0E-12 | E | 1.6E-10 | — | 3.02E-12 |

**Table 5.2.4**
**Exposure Point Concentrations for the Risk Assessment - Air**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | EPC (mg/m3) | Basis for EPC | Reporting Limit ($mg/m^3$) | Scaling Factor (1) | Scaled EPC (2) ($mg/m^3$) |
|---|---|---|---|---|---|---|---|
| DMS1 | July | PCB 77 | 3.7E-10 | E* | 3.7E-10 | — | 3.69E-10 |
| | | PCB 81 | 8.0E-11 | N | 1.6E-10 | — | 7.95E-11 |
| | | PCB 105 | 8.0E-10 | D | 1.6E-10 | — | 7.95E-10 |
| | | PCB 114 | 5.1E-11 | E | 1.6E-10 | — | 5.14E-11 |
| | | PCB 118 | 1.7E-09 | D | 1.6E-10 | — | 1.75E-09 |
| | | PCB 123 | 7.0E-11 | E | 1.6E-10 | — | 7.01E-11 |
| | | PCB 126 | 8.0E-11 | N | 1.6E-10 | — | 7.95E-11 |
| | | PCB 156 | 5.9E-11 | E | 1.6E-10 | — | 5.89E-11 |
| | | PCB 157 | 1.2E-11 | E | 1.6E-10 | — | 1.19E-11 |
| | | PCB 167 | 2.7E-11 | E | 1.6E-10 | — | 2.69E-11 |
| | | PCB 169 | 8.0E-11 | N | 1.6E-10 | — | 7.95E-11 |
| | | PCB 189 | 8.0E-11 | N | 1.6E-10 | — | 7.95E-11 |
| | August | PCB 77 | 5.2E-10 | E* | 5.2E-10 | — | 5.22E-10 |
| | | PCB 81 | 8.3E-11 | E | 1.6E-10 | — | 8.34E-11 |
| | | PCB 105 | 1.1E-09 | D | 1.6E-10 | — | 1.13E-09 |
| | | PCB 114 | 7.6E-11 | E | 1.6E-10 | — | 7.56E-11 |
| | | PCB 118 | 2.3E-09 | D | 1.6E-10 | — | 2.26E-09 |
| | | PCB 123 | 9.1E-11 | E | 1.6E-10 | — | 9.10E-11 |
| | | PCB 126 | 1.4E-11 | E | 1.6E-10 | — | 1.41E-11 |
| | | PCB 156 | 6.7E-11 | E | 1.6E-10 | — | 6.67E-11 |
| | | PCB 157 | 1.4E-11 | E | 1.6E-10 | — | 1.42E-11 |
| | | PCB 167 | 3.2E-11 | E | 1.6E-10 | — | 3.22E-11 |
| | | PCB 169 | 5.5E-12 | E | 1.6E-10 | — | 5.46E-12 |
| | | PCB 189 | 8.1E-11 | N | 1.6E-10 | — | 8.07E-11 |
| | September | PCB 77 | 4.6E-10 | E* | 4.6E-10 | — | 4.60E-10 |
| | | PCB 81 | 7.3E-11 | E | 1.6E-10 | — | 7.34E-11 |
| | | PCB 105 | 9.4E-10 | D | 1.6E-10 | — | 9.43E-10 |
| | | PCB 114 | 8.7E-11 | E | 1.6E-10 | — | 8.68E-11 |
| | | PCB 118 | 2.1E-09 | D | 1.6E-10 | — | 2.11E-09 |
| | | PCB 123 | 1.2E-10 | E | 1.6E-10 | — | 1.17E-10 |
| | | PCB 126 | 1.1E-11 | E | 1.6E-10 | — | 1.11E-11 |
| | | PCB 156 | 5.9E-11 | E | 1.6E-10 | — | 5.94E-11 |
| | | PCB 157 | 1.3E-11 | E | 1.6E-10 | — | 1.30E-11 |
| | | PCB 167 | 3.9E-11 | E | 1.6E-10 | — | 3.94E-11 |
| | | PCB 169 | 8.1E-11 | N | 1.6E-10 | — | 8.13E-11 |
| | | PCB 189 | 5.4E-12 | E | 1.6E-10 | — | 5.36E-12 |
| | October | PCB 77 | 4.8E-10 | E* | 4.7E-10 | — | 4.77E-10 |
| | | PCB 81 | 9.0E-11 | E | 1.5E-10 | — | 8.98E-11 |
| | | PCB 105 | 1.1E-09 | D | 1.5E-10 | — | 1.14E-09 |
| | | PCB 114 | 1.0E-10 | E | 1.5E-10 | — | 1.03E-10 |
| | | PCB 118 | 2.7E-09 | D | 1.5E-10 | — | 2.74E-09 |
| | | PCB 123 | 1.2E-10 | E | 1.5E-10 | — | 1.20E-10 |
| | | PCB 126 | 7.6E-11 | N | 1.5E-10 | — | 7.61E-11 |
| | | PCB 156 | 6.9E-11 | E | 1.5E-10 | — | 6.91E-11 |
| | | PCB 157 | 1.4E-11 | E | 1.5E-10 | — | 1.36E-11 |
| | | PCB 167 | 4.4E-11 | E | 1.5E-10 | — | 4.45E-11 |
| | | PCB 169 | 7.6E-11 | N | 1.5E-10 | — | 7.61E-11 |
| | | PCB 189 | 5.9E-12 | E | 1.5E-10 | — | 5.94E-12 |
| | November | PCB 77 | 2.3E-10 | E* | 2.2E-10 | — | 2.25E-10 |
| | | PCB 81 | 6.5E-11 | E | 1.7E-10 | — | 6.55E-11 |
| | | PCB 105 | 5.5E-10 | D | 1.7E-10 | — | 5.53E-10 |
| | | PCB 114 | 4.5E-11 | E | 1.7E-10 | — | 4.53E-11 |
| | | PCB 118 | 1.3E-09 | D | 1.7E-10 | — | 1.34E-09 |
| | | PCB 123 | 9.0E-11 | E | 1.7E-10 | — | 8.98E-11 |
| | | PCB 126 | 8.4E-11 | N | 1.7E-10 | — | 8.37E-11 |
| | | PCB 156 | 7.1E-11 | E | 1.7E-10 | — | 7.07E-11 |
| | | PCB 157 | 1.3E-11 | E | 1.7E-10 | — | 1.27E-11 |
| | | PCB 167 | 1.5E-10 | E | 1.7E-10 | — | 1.54E-10 |
| | | PCB 169 | 8.4E-11 | N | 1.7E-10 | — | 8.37E-11 |
| | | PCB 189 | 7.6E-12 | E | 1.7E-10 | — | 7.63E-12 |
| | December | PCB 77 | 1.4E-10 | E | 1.6E-10 | — | 1.42E-10 |
| | | PCB 81 | 7.8E-11 | N | 1.6E-10 | — | 7.76E-11 |
| | | PCB 105 | 3.7E-10 | D | 1.6E-10 | — | 3.72E-10 |
| | | PCB 114 | 2.6E-11 | E | 1.6E-10 | — | 2.58E-11 |
| | | PCB 118 | 8.1E-10 | D | 1.6E-10 | — | 8.07E-10 |
| | | PCB 123 | 5.6E-11 | E | 1.6E-10 | — | 5.56E-11 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.76E-11 |
| | | PCB 156 | 3.9E-11 | E | 1.6E-10 | — | 3.87E-11 |
| | | PCB 157 | 6.8E-12 | E | 1.6E-10 | — | 6.80E-12 |
| | | PCB 167 | 2.6E-11 | E | 1.6E-10 | — | 2.59E-11 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | — | 7.76E-11 |
| | | PCB 189 | 7.8E-11 | N | 1.6E-10 | — | 7.76E-11 |

**Table 5.2.4**
**Exposure Point Concentrations for the Risk Assessment - Air**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | EPC (mg/m3) | Basis for EPC | Reporting Limit ($mg/m^3$) | Scaling Factor (1) | Scaled EPC (2) ($mg/m^3$) |
|---|---|---|---|---|---|---|---|
| MSP | January | PCB 77 | 1.4E-10 | E | 1.8E-10 | 2.07 | 2.95E-10 |
| | | PCB 81 | 9.2E-11 | N | 1.8E-10 | — | 9.24E-11 |
| | | PCB 105 | 3.9E-10 | D | 1.8E-10 | 2.05 | 7.95E-10 |
| | | PCB 114 | 2.5E-11 | E | 1.8E-10 | — | 2.46E-11 |
| | | PCB 118 | 1.0E-09 | D | 1.8E-10 | 1.91 | 1.94E-09 |
| | | PCB 123 | 6.3E-11 | E | 1.8E-10 | 1.79 | 1.14E-10 |
| | | PCB 126 | 9.2E-11 | N | 1.8E-10 | — | 9.24E-11 |
| | | PCB 156 | 4.2E-11 | E | 1.8E-10 | 2.03 | 8.62E-11 |
| | | PCB 157 | 6.9E-12 | E | 1.8E-10 | 1.96 | 1.36E-11 |
| | | PCB 167 | 9.2E-11 | N | 1.8E-10 | 1.72 | 1.59E-10 |
| | | PCB 169 | 9.2E-11 | N | 1.8E-10 | 2.59 | 2.39E-10 |
| | | PCB 189 | 7.3E-12 | E | 1.8E-10 | — | 7.31E-12 |
| | February | PCB 77 | 5.4E-11 | E | 1.6E-10 | 2.07 | 1.12E-10 |
| | | PCB 81 | 4.7E-11 | E | 1.6E-10 | — | 4.69E-11 |
| | | PCB 105 | 5.7E-10 | D | 1.6E-10 | 2.05 | 1.18E-09 |
| | | PCB 114 | 4.7E-11 | E | 1.6E-10 | — | 4.74E-11 |
| | | PCB 118 | 1.3E-09 | D | 1.6E-10 | 1.91 | 2.52E-09 |
| | | PCB 123 | 9.2E-11 | E | 1.6E-10 | 1.79 | 1.64E-10 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.75E-11 |
| | | PCB 156 | 4.8E-11 | E | 1.6E-10 | 2.03 | 9.67E-11 |
| | | PCB 157 | 8.1E-12 | E | 1.6E-10 | 1.96 | 1.58E-11 |
| | | PCB 167 | 1.1E-10 | E | 1.6E-10 | 1.72 | 1.96E-10 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | 2.59 | 2.01E-10 |
| | | PCB 189 | 3.5E-12 | E | 1.6E-10 | — | 3.52E-12 |
| | March | PCB 77 | 7.6E-11 | E | 1.6E-10 | 2.07 | 1.58E-10 |
| | | PCB 81 | 1.2E-11 | E | 1.6E-10 | — | 1.15E-11 |
| | | PCB 105 | 2.1E-10 | D | 1.6E-10 | 2.05 | 4.29E-10 |
| | | PCB 114 | 1.7E-11 | E | 1.6E-10 | — | 1.71E-11 |
| | | PCB 118 | 5.2E-10 | D | 1.6E-10 | 1.91 | 9.84E-10 |
| | | PCB 123 | 3.9E-11 | E | 1.6E-10 | 1.79 | 6.98E-11 |
| | | PCB 126 | 8.0E-11 | N | 1.6E-10 | — | 8.05E-11 |
| | | PCB 156 | 2.2E-11 | E | 1.6E-10 | 2.03 | 4.38E-11 |
| | | PCB 157 | 4.3E-12 | E | 1.6E-10 | 1.96 | 8.40E-12 |
| | | PCB 167 | 5.3E-11 | E | 1.6E-10 | 1.72 | 9.15E-11 |
| | | PCB 169 | 8.0E-11 | N | 1.6E-10 | 2.59 | 2.08E-10 |
| | | PCB 189 | 8.0E-11 | N | 1.6E-10 | — | 8.05E-11 |
| | April (2) | PCB 77 | 2.6E-10 | E* | 2.6E-10 | — | 2.57E-10 |
| | | PCB 81 | 8.0E-11 | N | 1.6E-10 | — | 7.99E-11 |
| | | PCB 105 | 6.2E-10 | D | 1.6E-10 | — | 6.24E-10 |
| | | PCB 114 | 8.0E-11 | N | 1.6E-10 | — | 7.99E-11 |
| | | PCB 118 | 1.3E-09 | D | 1.6E-10 | — | 1.31E-09 |
| | | PCB 123 | 4.9E-11 | E | 1.6E-10 | — | 4.92E-11 |
| | | PCB 126 | 8.0E-11 | N | 1.6E-10 | — | 7.99E-11 |
| | | PCB 156 | 5.9E-11 | E | 1.6E-10 | — | 5.89E-11 |
| | | PCB 157 | 1.2E-11 | E | 1.6E-10 | — | 1.19E-11 |
| | | PCB 167 | 2.4E-11 | E | 1.6E-10 | — | 2.41E-11 |
| | | PCB 169 | 8.8E-12 | E | 1.6E-10 | — | 8.83E-12 |
| | | PCB 189 | 8.0E-11 | N | 1.6E-10 | — | 7.99E-11 |
| | May | PCB 77 | 1.3E-10 | E | 1.6E-10 | 2.07 | 2.76E-10 |
| | | PCB 81 | 7.9E-11 | N | 1.6E-10 | — | 7.89E-11 |
| | | PCB 105 | 3.2E-10 | D | 1.6E-10 | 2.05 | 6.47E-10 |
| | | PCB 114 | 7.9E-11 | N | 1.6E-10 | — | 7.89E-11 |
| | | PCB 118 | 7.4E-10 | D | 1.6E-10 | 1.91 | 1.42E-09 |
| | | PCB 123 | 3.1E-11 | E | 1.6E-10 | 1.79 | 5.57E-11 |
| | | PCB 126 | 7.9E-11 | N | 1.6E-10 | — | 7.89E-11 |
| | | PCB 156 | 3.1E-11 | E | 1.6E-10 | 2.03 | 6.34E-11 |
| | | PCB 157 | 6.8E-12 | E | 1.6E-10 | 1.96 | 1.33E-11 |
| | | PCB 167 | 1.8E-11 | E | 1.6E-10 | 1.72 | 3.18E-11 |
| | | PCB 169 | 2.3E-12 | E | 1.6E-10 | 2.59 | 5.98E-12 |
| | | PCB 189 | 7.9E-11 | N | 1.6E-10 | — | 7.89E-11 |
| | June | PCB 77 | 3.0E-11 | E | 1.6E-10 | 2.07 | 6.29E-11 |
| | | PCB 81 | 7.8E-11 | N | 1.6E-10 | — | 7.82E-11 |
| | | PCB 105 | 4.8E-10 | D | 1.6E-10 | 2.05 | 9.93E-10 |
| | | PCB 114 | 3.8E-11 | E | 1.6E-10 | — | 3.77E-11 |
| | | PCB 118 | 1.1E-09 | D | 1.6E-10 | 1.91 | 2.09E-09 |
| | | PCB 123 | 5.5E-11 | E | 1.6E-10 | 1.79 | 9.90E-11 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.82E-11 |
| | | PCB 156 | 3.4E-11 | E | 1.6E-10 | 2.03 | 6.86E-11 |
| | | PCB 157 | 1.0E-11 | E | 1.6E-10 | 1.96 | 1.98E-11 |
| | | PCB 167 | 9.5E-11 | E | 1.6E-10 | 1.72 | 1.64E-10 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | 2.59 | 2.02E-10 |
| | | PCB 189 | 3.1E-12 | E | 1.6E-10 | — | 3.12E-12 |

**Table 5.2.4**
**Exposure Point Concentrations for the Risk Assessment - Air**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | EPC (mg/m3) | Basis for EPC | Reporting Limit ($mg/m^3$) | Scaling Factor [1] | Scaled EPC [2] ($mg/m^3$) |
|---|---|---|---|---|---|---|---|
| MSP | July | PCB 77 | 1.3E-10 | E | 1.6E-10 | 2.07 | 2.72E-10 |
| | | PCB 81 | 7.8E-11 | N | 1.6E-10 | — | 7.82E-11 |
| | | PCB 105 | 3.3E-10 | D | 1.6E-10 | 2.05 | 6.78E-10 |
| | | PCB 114 | 7.8E-11 | N | 1.6E-10 | — | 7.82E-11 |
| | | PCB 118 | 7.4E-10 | D | 1.6E-10 | 1.91 | 1.41E-09 |
| | | PCB 123 | 3.2E-11 | E | 1.6E-10 | 1.79 | 5.75E-11 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.82E-11 |
| | | PCB 156 | 3.4E-11 | E | 1.6E-10 | 2.03 | 6.93E-11 |
| | | PCB 157 | 7.1E-12 | E | 1.6E-10 | 1.96 | 1.40E-11 |
| | | PCB 167 | 1.8E-11 | E | 1.6E-10 | 1.72 | 3.04E-11 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | 2.59 | 2.02E-10 |
| | | PCB 189 | 7.8E-11 | N | 1.6E-10 | — | 7.82E-11 |
| | August | PCB 77 | 2.1E-10 | E* | 2.1E-10 | 2.07 | 4.42E-10 |
| | | PCB 81 | 4.3E-11 | E | 1.6E-10 | — | 4.29E-11 |
| | | PCB 105 | 5.0E-10 | D | 1.6E-10 | 2.05 | 1.03E-09 |
| | | PCB 114 | 3.3E-11 | E | 1.6E-10 | — | 3.29E-11 |
| | | PCB 118 | 1.1E-09 | D | 1.6E-10 | 1.91 | 2.04E-09 |
| | | PCB 123 | 4.1E-11 | E | 1.6E-10 | 1.79 | 7.31E-11 |
| | | PCB 126 | 7.6E-12 | E | 1.6E-10 | — | 7.55E-12 |
| | | PCB 156 | 4.4E-11 | E | 1.6E-10 | 2.03 | 8.94E-11 |
| | | PCB 157 | 8.7E-12 | E | 1.6E-10 | 1.96 | 1.71E-11 |
| | | PCB 167 | 2.2E-11 | E | 1.6E-10 | 1.72 | 3.85E-11 |
| | | PCB 169 | 4.2E-12 | E | 1.6E-10 | 2.59 | 1.08E-11 |
| | | PCB 189 | 8.1E-11 | N | 1.6E-10 | — | 8.10E-11 |
| | September | PCB 77 | 3.9E-10 | E* | 3.9E-10 | 2.07 | 8.17E-10 |
| | | PCB 81 | 6.2E-11 | E | 1.8E-10 | — | 6.16E-11 |
| | | PCB 105 | 8.3E-10 | D | 1.8E-10 | 2.05 | 1.70E-09 |
| | | PCB 114 | 6.8E-11 | E | 1.8E-10 | — | 6.85E-11 |
| | | PCB 118 | 1.8E-09 | D | 1.8E-10 | 1.91 | 3.46E-09 |
| | | PCB 123 | 7.2E-11 | E | 1.8E-10 | 1.79 | 1.28E-10 |
| | | PCB 126 | 1.1E-11 | E | 1.8E-10 | — | 1.07E-11 |
| | | PCB 156 | 6.5E-11 | E | 1.8E-10 | 2.03 | 1.33E-10 |
| | | PCB 157 | 1.3E-11 | E | 1.8E-10 | 1.96 | 2.63E-11 |
| | | PCB 167 | 3.1E-11 | E | 1.8E-10 | 1.72 | 5.38E-11 |
| | | PCB 169 | 9.2E-11 | N | 1.8E-10 | 2.59 | 2.39E-10 |
| | | PCB 189 | 7.3E-12 | E | 1.8E-10 | — | 7.33E-12 |
| | October | PCB 77 | 2.8E-10 | E | 2.8E-10 | 2.07 | 5.76E-10 |
| | | PCB 81 | 5.0E-11 | E | 1.6E-10 | — | 5.01E-11 |
| | | PCB 105 | 6.9E-10 | D | 1.6E-10 | 2.05 | 1.41E-09 |
| | | PCB 114 | 5.6E-11 | E | 1.6E-10 | — | 5.60E-11 |
| | | PCB 118 | 1.5E-09 | D | 1.6E-10 | 1.91 | 2.96E-09 |
| | | PCB 123 | 8.0E-11 | E | 1.6E-10 | 1.79 | 1.44E-10 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.83E-11 |
| | | PCB 156 | 4.9E-11 | E | 1.6E-10 | 2.03 | 1.00E-10 |
| | | PCB 157 | 9.5E-12 | E | 1.6E-10 | 1.96 | 1.87E-11 |
| | | PCB 167 | 3.3E-11 | E | 1.6E-10 | 1.72 | 5.61E-11 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | 2.59 | 2.03E-10 |
| | | PCB 189 | 7.8E-11 | N | 1.6E-10 | — | 7.83E-11 |
| | November [4] | | | | | | |
| | December | PCB 77 | 2.0E-10 | E | 2.0E-10 | 2.07 | 4.08E-10 |
| | | PCB 81 | 5.5E-11 | E | 1.6E-10 | — | 5.49E-11 |
| | | PCB 105 | 4.8E-10 | D | 1.6E-10 | 2.05 | 9.85E-10 |
| | | PCB 114 | 3.6E-11 | E | 1.6E-10 | — | 3.55E-11 |
| | | PCB 118 | 1.1E-09 | D | 1.6E-10 | 1.91 | 2.07E-09 |
| | | PCB 123 | 9.2E-11 | E | 1.6E-10 | 1.79 | 1.65E-10 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.75E-11 |
| | | PCB 156 | 4.9E-11 | E | 1.6E-10 | 2.03 | 9.86E-11 |
| | | PCB 157 | 8.1E-12 | E | 1.6E-10 | 1.96 | 1.59E-11 |
| | | PCB 167 | 3.1E-11 | E | 1.6E-10 | 1.72 | 5.32E-11 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | 2.59 | 2.01E-10 |
| | | PCB 189 | 7.8E-11 | N | 1.6E-10 | — | 7.75E-11 |

**Table 5.2.4**
**Exposure Point Concentrations for the Risk Assessment - Air**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | EPC (mg/m3) | Basis for EPC | Reporting Limit ($mg/m^3$) | Scaling Factor [(1)] | Scaled EPC [(2)] ($mg/m^3$) |
|---|---|---|---|---|---|---|---|
| UMS1 | January | PCB 77 | 2.1E-11 | E | 1.5E-10 | — | 2.14E-11 |
| | | PCB 81 | 7.5E-11 | N | 1.5E-10 | — | 7.48E-11 |
| | | PCB 105 | 6.5E-11 | E | 1.5E-10 | — | 6.49E-11 |
| | | PCB 114 | 5.0E-12 | E | 1.5E-10 | — | 4.97E-12 |
| | | PCB 118 | 1.8E-10 | D | 1.5E-10 | — | 1.79E-10 |
| | | PCB 123 | 1.3E-11 | E | 1.5E-10 | — | 1.28E-11 |
| | | PCB 126 | 7.5E-11 | N | 1.5E-10 | — | 7.48E-11 |
| | | PCB 156 | 9.6E-12 | E | 1.5E-10 | — | 9.59E-12 |
| | | PCB 157 | 7.5E-11 | N | 1.5E-10 | — | 7.48E-11 |
| | | PCB 167 | 5.6E-12 | E | 1.5E-10 | — | 5.64E-12 |
| | | PCB 169 | 7.5E-11 | N | 1.5E-10 | — | 7.48E-11 |
| | | PCB 189 | 7.5E-11 | N | 1.5E-10 | — | 7.48E-11 |
| | February | PCB 77 | 2.4E-11 | E | 1.7E-10 | — | 2.40E-11 |
| | | PCB 81 | 7.2E-12 | E | 1.7E-10 | — | 7.17E-12 |
| | | PCB 105 | 6.7E-11 | E | 1.7E-10 | — | 6.66E-11 |
| | | PCB 114 | 4.7E-12 | E | 1.7E-10 | — | 4.70E-12 |
| | | PCB 118 | 1.8E-10 | D | 1.7E-10 | — | 1.84E-10 |
| | | PCB 123 | 1.1E-11 | E | 1.7E-10 | — | 1.11E-11 |
| | | PCB 126 | 8.4E-11 | N | 1.7E-10 | — | 8.36E-11 |
| | | PCB 156 | 8.4E-11 | N | 1.7E-10 | — | 8.36E-11 |
| | | PCB 157 | 8.4E-11 | N | 1.7E-10 | — | 8.36E-11 |
| | | PCB 167 | 2.2E-11 | E | 1.7E-10 | — | 2.19E-11 |
| | | PCB 169 | 8.4E-11 | N | 1.7E-10 | — | 8.36E-11 |
| | | PCB 189 | 8.4E-11 | N | 1.7E-10 | — | 8.36E-11 |
| | March | PCB 77 | 1.9E-11 | E | 1.5E-10 | — | 1.91E-11 |
| | | PCB 81 | 7.7E-11 | N | 1.5E-10 | — | 7.72E-11 |
| | | PCB 105 | 6.7E-11 | E | 1.5E-10 | — | 6.67E-11 |
| | | PCB 114 | 4.1E-12 | E | 1.5E-10 | — | 4.13E-12 |
| | | PCB 118 | 1.9E-10 | D | 1.5E-10 | — | 1.85E-10 |
| | | PCB 123 | 8.3E-12 | E | 1.5E-10 | — | 8.26E-12 |
| | | PCB 126 | 7.7E-11 | N | 1.5E-10 | — | 7.72E-11 |
| | | PCB 156 | 6.7E-12 | E | 1.5E-10 | — | 6.65E-12 |
| | | PCB 157 | 7.7E-11 | N | 1.5E-10 | — | 7.72E-11 |
| | | PCB 167 | 2.1E-11 | E | 1.5E-10 | — | 2.11E-11 |
| | | PCB 169 | 7.7E-11 | N | 1.5E-10 | — | 7.72E-11 |
| | | PCB 189 | 7.7E-11 | N | 1.5E-10 | — | 7.72E-11 |
| | April | PCB 77 | 2.8E-11 | E | 1.6E-10 | — | 2.81E-11 |
| | | PCB 81 | 8.0E-11 | N | 1.6E-10 | — | 8.05E-11 |
| | | PCB 105 | 7.7E-11 | E | 1.6E-10 | — | 7.72E-11 |
| | | PCB 114 | 8.0E-11 | N | 1.6E-10 | — | 8.05E-11 |
| | | PCB 118 | 2.3E-10 | D | 1.6E-10 | — | 2.25E-10 |
| | | PCB 123 | 6.0E-12 | E | 1.6E-10 | — | 6.00E-12 |
| | | PCB 126 | 8.0E-11 | N | 1.6E-10 | — | 8.05E-11 |
| | | PCB 156 | 1.1E-11 | E | 1.6E-10 | — | 1.12E-11 |
| | | PCB 157 | 2.4E-12 | E | 1.6E-10 | — | 2.40E-12 |
| | | PCB 167 | 5.7E-12 | E | 1.6E-10 | — | 5.75E-12 |
| | | PCB 169 | 8.0E-13 | E | 1.6E-10 | — | 8.02E-13 |
| | | PCB 189 | 3.6E-12 | E | 1.6E-10 | — | 3.56E-12 |
| | May | PCB 77 | 5.2E-11 | E | 1.6E-10 | — | 5.16E-11 |
| | | PCB 81 | 7.8E-11 | N | 1.6E-10 | — | 7.83E-11 |
| | | PCB 105 | 1.5E-10 | E | 1.6E-10 | — | 1.52E-10 |
| | | PCB 114 | 7.8E-11 | N | 1.6E-10 | — | 7.83E-11 |
| | | PCB 118 | 4.1E-10 | D | 1.6E-10 | — | 4.09E-10 |
| | | PCB 123 | 1.8E-11 | E | 1.6E-10 | — | 1.77E-11 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.83E-11 |
| | | PCB 156 | 2.0E-11 | E | 1.6E-10 | — | 2.05E-11 |
| | | PCB 157 | 4.6E-12 | E | 1.6E-10 | — | 4.61E-12 |
| | | PCB 167 | 1.3E-11 | E | 1.6E-10 | — | 1.27E-11 |
| | | PCB 169 | 1.2E-12 | E | 1.6E-10 | — | 1.18E-12 |
| | | PCB 189 | 7.8E-11 | N | 1.6E-10 | — | 7.83E-11 |
| | June | PCB 77 | 4.4E-11 | E | 1.6E-10 | — | 4.40E-11 |
| | | PCB 81 | 2.2E-11 | E | 1.6E-10 | — | 2.20E-11 |
| | | PCB 105 | 7.8E-11 | N | 1.6E-10 | — | 7.85E-11 |
| | | PCB 114 | 7.8E-11 | N | 1.6E-10 | — | 7.85E-11 |
| | | PCB 118 | 2.6E-11 | E | 1.6E-10 | — | 2.63E-11 |
| | | PCB 123 | 2.1E-11 | E | 1.6E-10 | — | 2.10E-11 |
| | | PCB 126 | 7.8E-11 | N | 1.6E-10 | — | 7.85E-11 |
| | | PCB 156 | 1.8E-11 | E | 1.6E-10 | — | 1.80E-11 |
| | | PCB 157 | 4.2E-12 | E | 1.6E-10 | — | 4.22E-12 |
| | | PCB 167 | 5.6E-11 | E | 1.6E-10 | — | 5.61E-11 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | — | 7.85E-11 |
| | | PCB 189 | 7.8E-11 | N | 1.6E-10 | — | 7.85E-11 |

**Table 5.2.4**
**Exposure Point Concentrations for the Risk Assessment - Air**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | EPC (mg/m3) | Basis for EPC | Reporting Limit ($mg/m^3$) | Scaling Factor (1) | Scaled EPC (2) ($mg/m^3$) |
|---|---|---|---|---|---|---|---|
| UMS1 | July | PCB 77 | 7.9E-11 | N | 1.6E-10 | — | 7.91E-11 |
| | | PCB 81 | 7.9E-11 | N | 1.6E-10 | — | 7.91E-11 |
| | | PCB 105 | 2.2E-10 | D | 1.6E-10 | — | 2.21E-10 |
| | | PCB 114 | 7.9E-11 | N | 1.6E-10 | — | 7.91E-11 |
| | | PCB 118 | 6.0E-10 | D | 1.6E-10 | — | 6.01E-10 |
| | | PCB 123 | 2.1E-11 | E | 1.6E-10 | — | 2.14E-11 |
| | | PCB 126 | 7.9E-11 | N | 1.6E-10 | — | 7.91E-11 |
| | | PCB 156 | 2.6E-11 | E | 1.6E-10 | — | 2.60E-11 |
| | | PCB 157 | 6.0E-12 | E | 1.6E-10 | — | 5.99E-12 |
| | | PCB 167 | 1.3E-11 | E | 1.6E-10 | — | 1.33E-11 |
| | | PCB 169 | 7.9E-11 | N | 1.6E-10 | — | 7.91E-11 |
| | | PCB 189 | 7.9E-11 | N | 1.6E-10 | — | 7.91E-11 |
| | August | PCB 77 | 7.3E-11 | E | 1.6E-10 | — | 7.28E-11 |
| | | PCB 81 | 8.1E-11 | N | 1.6E-10 | — | 8.10E-11 |
| | | PCB 105 | 2.1E-10 | D | 1.6E-10 | — | 2.10E-10 |
| | | PCB 114 | 8.1E-11 | N | 1.6E-10 | — | 8.10E-11 |
| | | PCB 118 | 5.5E-10 | D | 1.6E-10 | — | 5.50E-10 |
| | | PCB 123 | 2.2E-11 | E | 1.6E-10 | — | 2.21E-11 |
| | | PCB 126 | 8.1E-11 | N | 1.6E-10 | — | 8.10E-11 |
| | | PCB 156 | 2.4E-11 | E | 1.6E-10 | — | 2.44E-11 |
| | | PCB 157 | 5.3E-12 | E | 1.6E-10 | — | 5.26E-12 |
| | | PCB 167 | 1.5E-11 | E | 1.6E-10 | — | 1.48E-11 |
| | | PCB 169 | 2.5E-12 | E | 1.6E-10 | — | 2.47E-12 |
| | | PCB 189 | 6.7E-12 | E | 1.6E-10 | — | 6.66E-12 |
| | September | PCB 77 | 6.4E-11 | E | 1.6E-10 | — | 6.39E-11 |
| | | PCB 81 | 1.4E-11 | E | 1.6E-10 | — | 1.39E-11 |
| | | PCB 105 | 2.1E-10 | D | 1.6E-10 | — | 2.08E-10 |
| | | PCB 114 | 1.2E-11 | E | 1.6E-10 | — | 1.22E-11 |
| | | PCB 118 | 5.6E-10 | D | 1.6E-10 | — | 5.59E-10 |
| | | PCB 123 | 3.5E-11 | E | 1.6E-10 | — | 3.49E-11 |
| | | PCB 126 | 8.0E-11 | N | 1.6E-10 | — | 7.98E-11 |
| | | PCB 156 | 2.6E-11 | E | 1.6E-10 | — | 2.62E-11 |
| | | PCB 157 | 5.8E-12 | E | 1.6E-10 | — | 5.84E-12 |
| | | PCB 167 | 1.7E-11 | E | 1.6E-10 | — | 1.73E-11 |
| | | PCB 169 | 8.0E-11 | N | 1.6E-10 | — | 7.98E-11 |
| | | PCB 189 | 2.4E-12 | E | 1.6E-10 | — | 2.38E-12 |
| | October | PCB 77 | 5.5E-11 | E | 1.6E-10 | — | 5.52E-11 |
| | | PCB 81 | 7.8E-11 | N | 1.6E-10 | — | 7.81E-11 |
| | | PCB 105 | 1.7E-10 | D | 1.6E-10 | — | 1.72E-10 |
| | | PCB 114 | 7.8E-11 | N | 1.6E-10 | — | 7.81E-11 |
| | | PCB 118 | 4.1E-10 | D | 1.6E-10 | — | 4.06E-10 |
| | | PCB 123 | 3.3E-11 | E | 1.6E-10 | — | 3.27E-11 |
| | | PCB 126 | 3.5E-12 | E | 1.6E-10 | — | 3.50E-12 |
| | | PCB 156 | 1.7E-11 | E | 1.6E-10 | — | 1.70E-11 |
| | | PCB 157 | 4.4E-12 | E | 1.6E-10 | — | 4.36E-12 |
| | | PCB 167 | 1.4E-11 | E | 1.6E-10 | — | 1.38E-11 |
| | | PCB 169 | 7.8E-11 | N | 1.6E-10 | — | 7.81E-11 |
| | | PCB 189 | 7.8E-11 | N | 1.6E-10 | — | 7.81E-11 |
| | November (4) | | | | | | |
| | December | PCB 77 | 3.8E-11 | E | 1.5E-10 | — | 3.81E-11 |
| | | PCB 81 | 7.7E-11 | N | 1.5E-10 | — | 7.73E-11 |
| | | PCB 105 | 8.2E-11 | E | 1.5E-10 | — | 8.25E-11 |
| | | PCB 114 | 7.7E-11 | N | 1.5E-10 | — | 7.73E-11 |
| | | PCB 118 | 2.2E-10 | D | 1.5E-10 | — | 2.16E-10 |
| | | PCB 123 | 1.5E-11 | E | 1.5E-10 | — | 1.55E-11 |
| | | PCB 126 | 7.7E-11 | N | 1.5E-10 | — | 7.73E-11 |
| | | PCB 156 | 1.1E-11 | E | 1.5E-10 | — | 1.15E-11 |
| | | PCB 157 | 2.5E-12 | E | 1.5E-10 | — | 2.52E-12 |
| | | PCB 167 | 1.1E-11 | E | 1.5E-10 | — | 1.10E-11 |
| | | PCB 169 | 7.7E-11 | N | 1.5E-10 | — | 7.73E-11 |
| | | PCB 189 | 7.7E-11 | N | 1.5E-10 | — | 7.73E-11 |

**Table 5.2.4**
**Exposure Point Concentrations for the Risk Assessment - Air**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

Analytical data and qualifiers are presented and discussed in Section 4.

Basis for EPC:

D indicates a detection at a concentration above the reporting limit.

E indicates a detection at a concentration between the estimated detection limit (EDL) and the reporting limit (RL).

E* indicates a detection at a concentration between the EDL and the RL. However, in this case it is equal to or slightly greater than the RL because the laboratory rounded reported concentrations to two significant figures.

N indicates the chemical is not detected above the EDL. One-half the RL is used as a surrogate EPC.

(1) Scaling factor is the ratio of the PCB congener concentration measured at the alternate sampling location (MSP-Alt) divided by the congener concentration measured at the regular sampling location (MSP) during April 2009. (During the April sampling event, a one-month sample was collected at an alternate location near the MSP as suggested by USEPA-IX, as well as at the regular MSP location.)

(2) Scaled EPC = EPC x Scaling Factor.

(3) April concentrations are the data collected from location MSP-Alt (See Section 5.2.1).

(4) November data from this sample were not used due to malfunction of sampling equipment.

EPC - exposure point concentration

$mg/m^3$ - milligrams per cubic meter (parts per million)

PCB - polychlorinated biphenyl

**Table 5.3.1**
**Toxicity Equivalence Concentrations - Soil**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Chemical | Concentration (pg/g) | TEF | TEC (pg/g) |
|---|---|---|---|---|
| Southeast | PCB 77 | 1.1E+01 | 1.00E-04 | 1.10E-03 |
| | PCB 81 | 1.3E+00 | 3.00E-04 | 3.90E-04 |
| | PCB 105 | 3.3E+01 | 3.00E-05 | 9.90E-04 |
| | PCB 114 | 1.6E+00 | 3.00E-05 | 4.80E-05 |
| | PCB 118 | 5.1E+01 | 3.00E-05 | 1.53E-03 |
| | PCB 123 | 5.4E+00 | 3.00E-05 | 1.62E-04 |
| | PCB 126 | 1.5E+00 | 1.00E-01 | 1.50E-01 |
| | PCB 156 | 1.3E+01 | 3.00E-05 | 3.90E-04 |
| | PCB 157 | 2.0E+00 | 3.00E-05 | 6.00E-05 |
| | PCB 167 | 5.2E+00 | 3.00E-05 | 1.56E-04 |
| | PCB 169 | 1.1E+00 | 3.00E-02 | 3.30E-02 |
| | PCB 189 | 4.3E+00 | 3.00E-05 | 1.29E-04 |
| | **PCB Total TEC** | — | — | **1.88E-01** |
| South | PCB 77 | 5.3E+00 | 1.00E-04 | 5.30E-04 |
| | PCB 81 | 6.0E-01 | 3.00E-04 | 1.80E-04 |
| | PCB 105 | 2.1E+01 | 3.00E-05 | 6.30E-04 |
| | PCB 114 | 5.0E+00 | 3.00E-05 | 1.50E-04 |
| | PCB 118 | 2.9E+01 | 3.00E-05 | 8.70E-04 |
| | PCB 123 | 1.9E+00 | 3.00E-05 | 5.70E-05 |
| | PCB 126 | 1.2E+00 | 1.00E-01 | 1.20E-01 |
| | PCB 156 | 6.8E+00 | 3.00E-05 | 2.04E-04 |
| | PCB 157 | 1.8E+00 | 3.00E-05 | 5.40E-05 |
| | PCB 167 | 3.0E+00 | 3.00E-05 | 9.00E-05 |
| | PCB 169 | 5.0E+00 | 3.00E-02 | 1.50E-01 |
| | PCB 189 | 1.6E+00 | 3.00E-05 | 4.80E-05 |
| | **PCB Total TEC** | — | — | **2.73E-01** |
| Southwest | PCB 77 | 2.6E+00 | 1.00E-04 | 2.60E-04 |
| | PCB 81 | 5.0E+00 | 3.00E-04 | 1.50E-03 |
| | PCB 105 | 1.1E+01 | 3.00E-05 | 3.30E-04 |
| | PCB 114 | 1.0E+00 | 3.00E-05 | 3.00E-05 |
| | PCB 118 | 1.5E+01 | 3.00E-05 | 4.50E-04 |
| | PCB 123 | 1.2E+00 | 3.00E-05 | 3.60E-05 |
| | PCB 126 | 5.0E+00 | 1.00E-01 | 5.00E-01 |
| | PCB 156 | 3.9E+00 | 3.00E-05 | 1.17E-04 |
| | PCB 157 | 9.2E-01 | 3.00E-05 | 2.76E-05 |
| | PCB 167 | 1.9E+00 | 3.00E-05 | 5.70E-05 |
| | PCB 169 | 5.0E+00 | 3.00E-02 | 1.50E-01 |
| | PCB 189 | 1.2E+00 | 3.00E-05 | 3.60E-05 |
| | **PCB Total TEC** | — | — | **6.53E-01** |
| West | PCB 77 | 2.3E+00 | 1.00E-04 | 2.30E-04 |
| | PCB 81 | 6.0E-01 | 3.00E-04 | 1.80E-04 |
| | PCB 105 | 1.0E+01 | 3.00E-05 | 3.00E-04 |
| | PCB 114 | 5.0E+00 | 3.00E-05 | 1.50E-04 |
| | PCB 118 | 1.9E+01 | 3.00E-05 | 5.70E-04 |
| | PCB 123 | 1.5E+00 | 3.00E-05 | 4.50E-05 |
| | PCB 126 | 8.0E-01 | 1.00E-01 | 8.00E-02 |
| | PCB 156 | 3.9E+00 | 3.00E-05 | 1.17E-04 |
| | PCB 157 | 1.0E+00 | 3.00E-05 | 3.00E-05 |
| | PCB 167 | 2.2E+00 | 3.00E-05 | 6.60E-05 |
| | PCB 169 | 5.0E+00 | 3.00E-02 | 1.50E-01 |
| | PCB 189 | 1.1E+00 | 3.00E-05 | 3.30E-05 |
| | **PCB Total TEC** | — | — | **2.32E-01** |

**Table 5.3.1**
**Toxicity Equivalence Concentrations - Soil**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Chemical | Concentration (pg/g) | TEF | TEC (pg/g) |
|---|---|---|---|---|
| Northwest | PCB 77 | 3.0E+00 | 1.00E-04 | 3.00E-04 |
| | PCB 81 | 5.0E-01 | 3.00E-04 | 1.50E-04 |
| | PCB 105 | 9.5E+00 | 3.00E-05 | 2.85E-04 |
| | PCB 114 | 5.0E+00 | 3.00E-05 | 1.50E-04 |
| | PCB 118 | 1.8E+01 | 3.00E-05 | 5.40E-04 |
| | PCB 123 | 1.3E+00 | 3.00E-05 | 3.90E-05 |
| | PCB 126 | 1.2E+00 | 1.00E-01 | 1.20E-01 |
| | PCB 156 | 3.2E+00 | 3.00E-05 | 9.60E-05 |
| | PCB 157 | 1.0E+00 | 3.00E-05 | 3.00E-05 |
| | PCB 167 | 6.3E+00 | 3.00E-05 | 1.89E-04 |
| | PCB 169 | 5.0E+00 | 3.00E-02 | 1.50E-01 |
| | PCB 189 | 4.0E-01 | 3.00E-05 | 1.20E-05 |
| | **PCB Total TEC** | — | — | **2.72E-01** |
| North | PCB 77 | 2.8E+00 | 1.00E-04 | 2.80E-04 |
| | PCB 81 | 3.0E-01 | 3.00E-04 | 9.00E-05 |
| | PCB 105 | 1.2E+01 | 3.00E-05 | 3.60E-04 |
| | PCB 114 | 5.0E+00 | 3.00E-05 | 1.50E-04 |
| | PCB 118 | 1.9E+01 | 3.00E-05 | 5.70E-04 |
| | PCB 123 | 1.5E+00 | 3.00E-05 | 4.50E-05 |
| | PCB 126 | 7.0E-01 | 1.00E-01 | 7.00E-02 |
| | PCB 156 | 3.0E+00 | 3.00E-05 | 9.00E-05 |
| | PCB 157 | 1.0E+00 | 3.00E-05 | 3.00E-05 |
| | PCB 167 | 6.6E+00 | 3.00E-05 | 1.98E-04 |
| | PCB 169 | 5.0E+00 | 3.00E-02 | 1.50E-01 |
| | PCB 189 | 7.0E-01 | 3.00E-05 | 2.10E-05 |
| | **PCB Total TEC** | — | — | **2.22E-01** |
| Northeast | PCB 77 | 1.5E+01 | 1.00E-04 | 1.50E-03 |
| | PCB 81 | 1.4E+00 | 3.00E-04 | 4.20E-04 |
| | PCB 105 | 6.5E+01 | 3.00E-05 | 1.95E-03 |
| | PCB 114 | 2.0E+00 | 3.00E-05 | 6.00E-05 |
| | PCB 118 | 1.0E+02 | 3.00E-05 | 3.00E-03 |
| | PCB 123 | 8.7E+00 | 3.00E-05 | 2.61E-04 |
| | PCB 126 | 5.9E+00 | 1.00E-01 | 5.90E-01 |
| | PCB 156 | 2.9E+01 | 3.00E-05 | 8.70E-04 |
| | PCB 157 | 6.9E+00 | 3.00E-05 | 2.07E-04 |
| | PCB 167 | 1.6E+01 | 3.00E-05 | 4.80E-04 |
| | PCB 169 | 5.0E+00 | 3.00E-02 | 1.50E-01 |
| | PCB 189 | 9.3E+00 | 3.00E-05 | 2.79E-04 |
| | **PCB Total TEC** | — | — | **7.49E-01** |

Notes:

The concentrations of the twelve dioxin-like PCB congeners were multiplied by their individual TEFs to express each concentration as a 2,3,7,8-TCDD TEC. For each exposure area, the TECs of the individual congeners were summed to obtain a PCB Total TEC. See Section 5.2.2 of the text for additional discussion.

PCB - polychlorinated biphenyl
pg/g - picograms per gram (parts per trillion)
TEC - toxicity equivalence concentration
TEF - toxicity equivalence factor

**Table 5.3.2**
**Toxicity Equivalence Concentrations - Vegetation**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Chemical | Concentration (pg/g) | TEF | TEC (pg/g) |
|---|---|---|---|---|
| Southeast | PCB 77 | 9.7E+01 | 1.00E-04 | 9.70E-03 |
| | PCB 81 | 1.4E+01 | 3.00E-04 | 4.14E-03 |
| | PCB 105 | 1.5E+02 | 3.00E-05 | 4.50E-03 |
| | PCB 114 | 8.7E+00 | 3.00E-05 | 2.61E-04 |
| | PCB 118 | 2.7E+02 | 3.00E-05 | 8.10E-03 |
| | PCB 123 | 1.7E+01 | 3.00E-05 | 5.16E-04 |
| | PCB 126 | 1.3E+01 | 1.00E-01 | 1.26E+00 |
| | PCB 156 | 3.3E+01 | 3.00E-05 | 1.00E-03 |
| | PCB 157 | 6.8E+00 | 3.00E-05 | 2.04E-04 |
| | PCB 167 | 1.7E+01 | 3.00E-05 | 5.14E-04 |
| | PCB 169 | 7.5E-01 | 3.00E-02 | 2.24E-02 |
| | PCB 189 | 8.6E+00 | 3.00E-05 | 2.59E-04 |
| | **PCB Total TEC** | — | — | **1.31E+00** |
| South | PCB 77 | 7.0E+01 | 1.00E-04 | 7.03E-03 |
| | PCB 81 | 6.5E+00 | 3.00E-04 | 1.95E-03 |
| | PCB 105 | 1.3E+02 | 3.00E-05 | 3.90E-03 |
| | PCB 114 | 5.4E+00 | 3.00E-05 | 1.62E-04 |
| | PCB 118 | 1.8E+02 | 3.00E-05 | 5.40E-03 |
| | PCB 123 | 7.3E+00 | 3.00E-05 | 2.20E-04 |
| | PCB 126 | 7.1E+00 | 1.00E-01 | 7.10E-01 |
| | PCB 156 | 2.1E+01 | 3.00E-05 | 6.30E-04 |
| | PCB 157 | 4.8E+00 | 3.00E-05 | 1.44E-04 |
| | PCB 167 | 2.4E+01 | 3.00E-05 | 7.22E-04 |
| | PCB 169 | 6.6E-01 | 3.00E-02 | 1.98E-02 |
| | PCB 189 | 1.2E+00 | 3.00E-05 | 3.45E-05 |
| | **PCB Total TEC** | — | — | **7.50E-01** |
| Southwest | PCB 77 | 9.2E+00 | 1.00E-04 | 9.23E-04 |
| | PCB 81 | 1.1E+00 | 3.00E-04 | 3.15E-04 |
| | PCB 105 | 1.9E+01 | 3.00E-05 | 5.77E-04 |
| | PCB 114 | 1.1E+00 | 3.00E-05 | 3.15E-05 |
| | PCB 118 | 2.9E+01 | 3.00E-05 | 8.74E-04 |
| | PCB 123 | 1.6E+00 | 3.00E-05 | 4.85E-05 |
| | PCB 126 | 1.1E+00 | 1.00E-01 | 1.05E-01 |
| | PCB 156 | 4.2E+00 | 3.00E-05 | 1.25E-04 |
| | PCB 157 | 1.9E+00 | 3.00E-05 | 5.84E-05 |
| | PCB 167 | 1.0E+01 | 3.00E-05 | 3.13E-04 |
| | PCB 169 | 1.1E+00 | 3.00E-02 | 3.15E-02 |
| | PCB 189 | 1.1E+00 | 3.00E-05 | 3.15E-05 |
| | **PCB Total TEC** | — | — | **1.40E-01** |
| West | PCB 77 | 1.2E+01 | 1.00E-04 | 1.16E-03 |
| | PCB 81 | 1.7E+00 | 3.00E-04 | 5.05E-04 |
| | PCB 105 | 1.9E+01 | 3.00E-05 | 5.81E-04 |
| | PCB 114 | 1.1E+00 | 3.00E-05 | 3.30E-05 |
| | PCB 118 | 3.0E+01 | 3.00E-05 | 8.88E-04 |
| | PCB 123 | 1.9E+00 | 3.00E-05 | 5.61E-05 |
| | PCB 126 | 1.1E+00 | 1.00E-01 | 1.10E-01 |
| | PCB 156 | 3.6E+00 | 3.00E-05 | 1.08E-04 |
| | PCB 157 | 8.0E-01 | 3.00E-05 | 2.39E-05 |
| | PCB 167 | 8.1E+00 | 3.00E-05 | 2.42E-04 |
| | PCB 169 | 4.8E-01 | 3.00E-02 | 1.45E-02 |
| | PCB 189 | 1.1E+00 | 3.00E-05 | 3.30E-05 |
| | **PCB Total TEC** | — | — | **1.28E-01** |

**Table 5.3.2**
**Toxicity Equivalence Concentrations - Vegetation**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Chemical | Concentration (pg/g) | TEF | TEC (pg/g) |
|---|---|---|---|---|
| Northwest | PCB 77 | 6.9E+00 | 1.00E-04 | 6.85E-04 |
| | PCB 81 | 1.1E+00 | 3.00E-04 | 3.15E-04 |
| | PCB 105 | 9.8E+00 | 3.00E-05 | 2.94E-04 |
| | PCB 114 | 1.1E+00 | 3.00E-05 | 3.15E-05 |
| | PCB 118 | 2.0E+01 | 3.00E-05 | 5.91E-04 |
| | PCB 123 | 7.0E-01 | 3.00E-05 | 2.10E-05 |
| | PCB 126 | 1.1E+00 | 1.00E-01 | 1.05E-01 |
| | PCB 156 | 2.1E+00 | 3.00E-05 | 6.25E-05 |
| | PCB 157 | 1.6E+00 | 3.00E-05 | 4.82E-05 |
| | PCB 167 | 6.0E+00 | 3.00E-05 | 1.80E-04 |
| | PCB 169 | 1.1E+00 | 3.00E-02 | 3.15E-02 |
| | PCB 189 | 1.1E+00 | 3.00E-05 | 3.15E-05 |
| | **PCB Total TEC** | — | — | **1.39E-01** |
| North | PCB 77 | 7.8E+00 | 1.00E-04 | 7.78E-04 |
| | PCB 81 | 6.0E-01 | 3.00E-04 | 1.81E-04 |
| | PCB 105 | 1.3E+01 | 3.00E-05 | 3.79E-04 |
| | PCB 114 | 1.1E+00 | 3.00E-05 | 3.15E-05 |
| | PCB 118 | 2.9E+01 | 3.00E-05 | 8.55E-04 |
| | PCB 123 | 5.6E-01 | 3.00E-05 | 1.67E-05 |
| | PCB 126 | 1.1E+00 | 1.00E-01 | 1.05E-01 |
| | PCB 156 | 2.5E+00 | 3.00E-05 | 7.39E-05 |
| | PCB 157 | 5.4E-01 | 3.00E-05 | 1.62E-05 |
| | PCB 167 | 5.1E+00 | 3.00E-05 | 1.52E-04 |
| | PCB 169 | 1.1E+00 | 3.00E-02 | 3.15E-02 |
| | PCB 189 | 4.7E-01 | 3.00E-05 | 1.40E-05 |
| | **PCB Total TEC** | — | — | **1.39E-01** |
| Northeast | PCB 77 | 1.3E+01 | 1.00E-04 | 1.26E-03 |
| | PCB 81 | 6.4E-01 | 3.00E-04 | 1.91E-04 |
| | PCB 105 | 2.3E+01 | 3.00E-05 | 6.81E-04 |
| | PCB 114 | 1.1E+00 | 3.00E-05 | 3.30E-05 |
| | PCB 118 | 4.4E+01 | 3.00E-05 | 1.32E-03 |
| | PCB 123 | 7.6E-01 | 3.00E-05 | 2.28E-05 |
| | PCB 126 | 1.1E+00 | 1.00E-01 | 1.10E-01 |
| | PCB 156 | 4.8E+00 | 3.00E-05 | 1.43E-04 |
| | PCB 157 | 1.8E+00 | 3.00E-05 | 5.28E-05 |
| | PCB 167 | 1.3E+01 | 3.00E-05 | 3.77E-04 |
| | PCB 169 | 3.3E-01 | 3.00E-02 | 9.96E-03 |
| | PCB 189 | 1.1E+00 | 3.00E-05 | 3.30E-05 |
| | **PCB Total TEC** | — | — | **1.24E-01** |

Notes:

The concentrations of the twelve dioxin-like PCB congeners were multiplied by their individual TEFs to express each concentration as a 2,3,7,8-TCDD TEC. For each exposure area, the TECs of the individual congeners were summed to obtain a PCB Total TEC. See Section 5.2.2 of the text for additional discussion.

PCB - polychlorinated biphenyl

pg/g - picograms per gram (parts per trillion)

TEF - toxicity equivalence factor

TEC - toxicity equivalence concentration

**Table 5.3.3**
**Toxicity Equivalence Concentrations - Air**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | Concentration ($mg/m^3$) | Scaling Factor [1] | TEF | TEC ($mg/m^3$) |
|---|---|---|---|---|---|---|
| DMS1 | January | PCB 77 | 1.6E-10 | — | 1.00E-04 | 1.58E-14 |
| | | PCB 81 | 4.3E-11 | — | 3.00E-04 | 1.28E-14 |
| | | PCB 105 | 4.5E-10 | — | 3.00E-05 | 1.36E-14 |
| | | PCB 114 | 2.3E-11 | — | 3.00E-05 | 6.82E-16 |
| | | PCB 118 | 1.0E-09 | — | 3.00E-05 | 3.08E-14 |
| | | PCB 123 | 4.9E-11 | — | 3.00E-05 | 1.48E-15 |
| | | PCB 126 | 8.4E-11 | — | 1.00E-01 | 8.43E-12 |
| | | PCB 156 | 5.3E-11 | — | 3.00E-05 | 1.59E-15 |
| | | PCB 157 | 1.2E-11 | — | 3.00E-05 | 3.71E-16 |
| | | PCB 167 | 2.3E-11 | — | 3.00E-05 | 6.91E-16 |
| | | PCB 169 | 8.4E-11 | — | 3.00E-02 | 2.53E-12 |
| | | PCB 189 | 8.4E-11 | — | 3.00E-05 | 2.53E-15 |
| | February | PCB 77 | 9.5E-11 | — | 1.00E-04 | 9.46E-15 |
| | | PCB 81 | 2.6E-11 | — | 3.00E-04 | 7.85E-15 |
| | | PCB 105 | 2.3E-10 | — | 3.00E-05 | 6.98E-15 |
| | | PCB 114 | 1.5E-11 | — | 3.00E-05 | 4.56E-16 |
| | | PCB 118 | 5.6E-10 | — | 3.00E-05 | 1.67E-14 |
| | | PCB 123 | 3.8E-11 | — | 3.00E-05 | 1.13E-15 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.75E-12 |
| | | PCB 156 | 2.5E-11 | — | 3.00E-05 | 7.64E-16 |
| | | PCB 157 | 3.9E-12 | — | 3.00E-05 | 1.17E-16 |
| | | PCB 167 | 5.8E-11 | — | 3.00E-05 | 1.75E-15 |
| | | PCB 169 | 7.8E-11 | — | 3.00E-02 | 2.33E-12 |
| | | PCB 189 | 2.0E-12 | — | 3.00E-05 | 5.88E-17 |
| | March | PCB 77 | 1.8E-10 | — | 1.00E-04 | 1.77E-14 |
| | | PCB 81 | 3.7E-11 | — | 3.00E-04 | 1.11E-14 |
| | | PCB 105 | 6.2E-10 | — | 3.00E-05 | 1.86E-14 |
| | | PCB 114 | 5.6E-11 | — | 3.00E-05 | 1.68E-15 |
| | | PCB 118 | 1.1E-09 | — | 3.00E-05 | 3.40E-14 |
| | | PCB 123 | 1.3E-10 | — | 3.00E-05 | 4.00E-15 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.76E-12 |
| | | PCB 156 | 4.0E-11 | — | 3.00E-05 | 1.20E-15 |
| | | PCB 157 | 6.0E-12 | — | 3.00E-05 | 1.80E-16 |
| | | PCB 167 | 2.6E-11 | — | 3.00E-05 | 7.89E-16 |
| | | PCB 169 | 7.8E-11 | — | 3.00E-02 | 2.33E-12 |
| | | PCB 189 | 7.8E-11 | — | 3.00E-05 | 2.33E-15 |
| | April | PCB 77 | 2.7E-10 | — | 1.00E-04 | 2.71E-14 |
| | | PCB 81 | 8.8E-11 | — | 3.00E-04 | 2.64E-14 |
| | | PCB 105 | 6.5E-10 | — | 3.00E-05 | 1.95E-14 |
| | | PCB 114 | 4.6E-11 | — | 3.00E-05 | 1.37E-15 |
| | | PCB 118 | 1.4E-09 | — | 3.00E-05 | 4.22E-14 |
| | | PCB 123 | 6.0E-11 | — | 3.00E-05 | 1.79E-15 |
| | | PCB 126 | 8.8E-11 | — | 1.00E-01 | 8.79E-12 |
| | | PCB 156 | 6.1E-11 | — | 3.00E-05 | 1.82E-15 |
| | | PCB 157 | 1.2E-11 | — | 3.00E-05 | 3.67E-16 |
| | | PCB 167 | 3.1E-11 | — | 3.00E-05 | 9.15E-16 |
| | | PCB 169 | 9.1E-12 | — | 3.00E-02 | 2.72E-13 |
| | | PCB 189 | 8.8E-11 | — | 3.00E-05 | 2.64E-15 |
| | May | PCB 77 | 4.9E-10 | — | 1.00E-04 | 4.85E-14 |
| | | PCB 81 | 8.5E-11 | — | 3.00E-04 | 2.54E-14 |
| | | PCB 105 | 1.0E-09 | — | 3.00E-05 | 3.10E-14 |
| | | PCB 114 | 8.5E-11 | — | 3.00E-05 | 2.54E-15 |
| | | PCB 118 | 2.4E-09 | — | 3.00E-05 | 7.12E-14 |
| | | PCB 123 | 8.9E-11 | — | 3.00E-05 | 2.68E-15 |
| | | PCB 126 | 8.5E-11 | — | 1.00E-01 | 8.48E-12 |
| | | PCB 156 | 7.3E-11 | — | 3.00E-05 | 2.20E-15 |
| | | PCB 157 | 1.5E-11 | — | 3.00E-05 | 4.48E-16 |
| | | PCB 167 | 3.6E-11 | — | 3.00E-05 | 1.07E-15 |
| | | PCB 169 | 4.7E-12 | — | 3.00E-02 | 1.40E-13 |
| | | PCB 189 | 8.5E-11 | — | 3.00E-05 | 2.54E-15 |
| | June | PCB 77 | 3.4E-10 | — | 1.00E-04 | 3.42E-14 |
| | | PCB 81 | 1.0E-10 | — | 3.00E-04 | 3.03E-14 |
| | | PCB 105 | 8.0E-10 | — | 3.00E-05 | 2.40E-14 |
| | | PCB 114 | 7.1E-11 | — | 3.00E-05 | 2.14E-15 |
| | | PCB 118 | 1.9E-09 | — | 3.00E-05 | 5.65E-14 |
| | | PCB 123 | 7.9E-11 | — | 3.00E-05 | 2.37E-15 |
| | | PCB 126 | 1.3E-11 | — | 1.00E-01 | 1.25E-12 |
| | | PCB 156 | 4.0E-11 | — | 3.00E-05 | 1.19E-15 |
| | | PCB 157 | 1.0E-11 | — | 3.00E-05 | 3.02E-16 |
| | | PCB 167 | 1.1E-10 | — | 3.00E-05 | 3.18E-15 |
| | | PCB 169 | 7.9E-11 | — | 3.00E-02 | 2.36E-12 |
| | | PCB 189 | 3.0E-12 | — | 3.00E-05 | 9.05E-17 |

**Table 5.3.3**
**Toxicity Equivalence Concentrations - Air**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | Concentration ($mg/m^3$) | Scaling Factor (1) | TEF | TEC ($mg/m^3$) |
|---|---|---|---|---|---|---|
| DMS1 | July | PCB 77 | 3.7E-10 | — | 1.00E-04 | 3.69E-14 |
| | | PCB 81 | 8.0E-11 | — | 3.00E-04 | 2.39E-14 |
| | | PCB 105 | 8.0E-10 | — | 3.00E-05 | 2.39E-14 |
| | | PCB 114 | 5.1E-11 | — | 3.00E-05 | 1.54E-15 |
| | | PCB 118 | 1.7E-09 | — | 3.00E-05 | 5.25E-14 |
| | | PCB 123 | 7.0E-11 | — | 3.00E-05 | 2.10E-15 |
| | | PCB 126 | 8.0E-11 | — | 1.00E-01 | 7.95E-12 |
| | | PCB 156 | 5.9E-11 | — | 3.00E-05 | 1.77E-15 |
| | | PCB 157 | 1.2E-11 | — | 3.00E-05 | 3.56E-16 |
| | | PCB 167 | 2.7E-11 | — | 3.00E-05 | 8.07E-16 |
| | | PCB 169 | 8.0E-11 | — | 3.00E-02 | 2.39E-12 |
| | | PCB 189 | 8.0E-11 | — | 3.00E-05 | 2.39E-15 |
| | August | PCB 77 | 5.2E-10 | — | 1.00E-04 | 5.22E-14 |
| | | PCB 81 | 8.3E-11 | — | 3.00E-04 | 2.50E-14 |
| | | PCB 105 | 1.1E-09 | — | 3.00E-05 | 3.39E-14 |
| | | PCB 114 | 7.6E-11 | — | 3.00E-05 | 2.27E-15 |
| | | PCB 118 | 2.3E-09 | — | 3.00E-05 | 6.78E-14 |
| | | PCB 123 | 9.1E-11 | — | 3.00E-05 | 2.73E-15 |
| | | PCB 126 | 1.4E-11 | — | 1.00E-01 | 1.41E-12 |
| | | PCB 156 | 6.7E-11 | — | 3.00E-05 | 2.00E-15 |
| | | PCB 157 | 1.4E-11 | — | 3.00E-05 | 4.25E-16 |
| | | PCB 167 | 3.2E-11 | — | 3.00E-05 | 9.65E-16 |
| | | PCB 169 | 5.5E-12 | — | 3.00E-02 | 1.64E-13 |
| | | PCB 189 | 8.1E-11 | — | 3.00E-05 | 2.42E-15 |
| | September | PCB 77 | 4.6E-10 | — | 1.00E-04 | 4.60E-14 |
| | | PCB 81 | 7.3E-11 | — | 3.00E-04 | 2.20E-14 |
| | | PCB 105 | 9.4E-10 | — | 3.00E-05 | 2.83E-14 |
| | | PCB 114 | 8.7E-11 | — | 3.00E-05 | 2.60E-15 |
| | | PCB 118 | 2.1E-09 | — | 3.00E-05 | 6.34E-14 |
| | | PCB 123 | 1.2E-10 | — | 3.00E-05 | 3.50E-15 |
| | | PCB 126 | 1.1E-11 | — | 1.00E-01 | 1.11E-12 |
| | | PCB 156 | 5.9E-11 | — | 3.00E-05 | 1.78E-15 |
| | | PCB 157 | 1.3E-11 | — | 3.00E-05 | 3.90E-16 |
| | | PCB 167 | 3.9E-11 | — | 3.00E-05 | 1.18E-15 |
| | | PCB 169 | 8.1E-11 | — | 3.00E-02 | 2.44E-12 |
| | | PCB 189 | 5.4E-12 | — | 3.00E-05 | 1.61E-16 |
| | October | PCB 77 | 4.8E-10 | — | 1.00E-04 | 4.77E-14 |
| | | PCB 81 | 9.0E-11 | — | 3.00E-04 | 2.69E-14 |
| | | PCB 105 | 1.1E-09 | — | 3.00E-05 | 3.42E-14 |
| | | PCB 114 | 1.0E-10 | — | 3.00E-05 | 3.10E-15 |
| | | PCB 118 | 2.7E-09 | — | 3.00E-05 | 8.21E-14 |
| | | PCB 123 | 1.2E-10 | — | 3.00E-05 | 3.61E-15 |
| | | PCB 126 | 7.6E-11 | — | 1.00E-01 | 7.61E-12 |
| | | PCB 156 | 6.9E-11 | — | 3.00E-05 | 2.07E-15 |
| | | PCB 157 | 1.4E-11 | — | 3.00E-05 | 4.08E-16 |
| | | PCB 167 | 4.4E-11 | — | 3.00E-05 | 1.33E-15 |
| | | PCB 169 | 7.6E-11 | — | 3.00E-02 | 2.28E-12 |
| | | PCB 189 | 5.9E-12 | — | 3.00E-05 | 1.78E-16 |
| | November | PCB 77 | 2.3E-10 | — | 1.00E-04 | 2.25E-14 |
| | | PCB 81 | 6.5E-11 | — | 3.00E-04 | 1.96E-14 |
| | | PCB 105 | 5.5E-10 | — | 3.00E-05 | 1.66E-14 |
| | | PCB 114 | 4.5E-11 | — | 3.00E-05 | 1.36E-15 |
| | | PCB 118 | 1.3E-09 | — | 3.00E-05 | 4.01E-14 |
| | | PCB 123 | 9.0E-11 | — | 3.00E-05 | 2.69E-15 |
| | | PCB 126 | 8.4E-11 | — | 1.00E-01 | 8.37E-12 |
| | | PCB 156 | 7.1E-11 | — | 3.00E-05 | 2.12E-15 |
| | | PCB 157 | 1.3E-11 | — | 3.00E-05 | 3.80E-16 |
| | | PCB 167 | 1.5E-10 | — | 3.00E-05 | 4.62E-15 |
| | | PCB 169 | 8.4E-11 | — | 3.00E-02 | 2.51E-12 |
| | | PCB 189 | 7.6E-12 | — | 3.00E-05 | 2.29E-16 |
| | December | PCB 77 | 1.4E-10 | — | 1.00E-04 | 1.42E-14 |
| | | PCB 81 | 7.8E-11 | — | 3.00E-04 | 2.33E-14 |
| | | PCB 105 | 3.7E-10 | — | 3.00E-05 | 1.12E-14 |
| | | PCB 114 | 2.6E-11 | — | 3.00E-05 | 7.75E-16 |
| | | PCB 118 | 8.1E-10 | — | 3.00E-05 | 2.42E-14 |
| | | PCB 123 | 5.6E-11 | — | 3.00E-05 | 1.67E-15 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.76E-12 |
| | | PCB 156 | 3.9E-11 | — | 3.00E-05 | 1.16E-15 |
| | | PCB 157 | 6.8E-12 | — | 3.00E-05 | 2.04E-16 |
| | | PCB 167 | 2.6E-11 | — | 3.00E-05 | 7.76E-16 |
| | | PCB 169 | 7.8E-11 | — | 3.00E-02 | 2.33E-12 |
| | | PCB 189 | 7.8E-11 | — | 3.00E-05 | 2.33E-15 |
| | | **PCB Total TEC** | — | — | — | **8.36E-12** |

**Table 5.3.3**
**Toxicity Equivalence Concentrations - Air**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | Concentration ($mg/m^3$) | Scaling Factor [(1)] | TEF | TEC ($mg/m^3$) |
|---|---|---|---|---|---|---|
| MSP | January | PCB 77 | 1.4E-10 | 2.07 | 1.00E-04 | 2.95E-14 |
| | | PCB 81 | 9.2E-11 | — | 3.00E-04 | 2.77E-14 |
| | | PCB 105 | 3.9E-10 | 2.05 | 3.00E-05 | 2.39E-14 |
| | | PCB 114 | 2.5E-11 | — | 3.00E-05 | 7.39E-16 |
| | | PCB 118 | 1.0E-09 | 1.91 | 3.00E-05 | 5.82E-14 |
| | | PCB 123 | 6.3E-11 | 1.79 | 3.00E-05 | 3.41E-15 |
| | | PCB 126 | 9.2E-11 | — | 1.00E-01 | 9.24E-12 |
| | | PCB 156 | 4.2E-11 | 2.03 | 3.00E-05 | 2.59E-15 |
| | | PCB 157 | 6.9E-12 | 1.96 | 3.00E-05 | 4.08E-16 |
| | | PCB 167 | 9.2E-11 | 1.72 | 3.00E-05 | 4.77E-15 |
| | | PCB 169 | 9.2E-11 | 2.59 | 3.00E-02 | 7.18E-12 |
| | | PCB 189 | 7.3E-12 | — | 3.00E-05 | 2.19E-16 |
| | February | PCB 77 | 5.4E-11 | 2.07 | 1.00E-04 | 1.12E-14 |
| | | PCB 81 | 4.7E-11 | — | 3.00E-04 | 1.41E-14 |
| | | PCB 105 | 5.7E-10 | 2.05 | 3.00E-05 | 3.53E-14 |
| | | PCB 114 | 4.7E-11 | — | 3.00E-05 | 1.42E-15 |
| | | PCB 118 | 1.3E-09 | 1.91 | 3.00E-05 | 7.55E-14 |
| | | PCB 123 | 9.2E-11 | 1.79 | 3.00E-05 | 4.92E-15 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.75E-12 |
| | | PCB 156 | 4.8E-11 | 2.03 | 3.00E-05 | 2.90E-15 |
| | | PCB 157 | 8.1E-12 | 1.96 | 3.00E-05 | 4.74E-16 |
| | | PCB 167 | 1.1E-10 | 1.72 | 3.00E-05 | 5.89E-15 |
| | | PCB 169 | 7.8E-11 | 2.59 | 3.00E-02 | 6.02E-12 |
| | | PCB 189 | 3.5E-12 | — | 3.00E-05 | 1.06E-16 |
| | March | PCB 77 | 7.6E-11 | 2.07 | 1.00E-04 | 1.58E-14 |
| | | PCB 81 | 1.2E-11 | — | 3.00E-04 | 3.46E-15 |
| | | PCB 105 | 2.1E-10 | 2.05 | 3.00E-05 | 1.29E-14 |
| | | PCB 114 | 1.7E-11 | — | 3.00E-05 | 5.12E-16 |
| | | PCB 118 | 5.2E-10 | 1.91 | 3.00E-05 | 2.95E-14 |
| | | PCB 123 | 3.9E-11 | 1.79 | 3.00E-05 | 2.10E-15 |
| | | PCB 126 | 8.0E-11 | — | 1.00E-01 | 8.05E-12 |
| | | PCB 156 | 2.2E-11 | 2.03 | 3.00E-05 | 1.31E-15 |
| | | PCB 157 | 4.3E-12 | 1.96 | 3.00E-05 | 2.52E-16 |
| | | PCB 167 | 5.3E-11 | 1.72 | 3.00E-05 | 2.75E-15 |
| | | PCB 169 | 8.0E-11 | 2.59 | 3.00E-02 | 6.25E-12 |
| | | PCB 189 | 8.0E-11 | — | 3.00E-05 | 2.41E-15 |
| | April [(2)] | PCB 77 | 2.6E-10 | — | 1.00E-04 | 2.57E-14 |
| | | PCB 81 | 8.0E-11 | — | 3.00E-04 | 2.40E-14 |
| | | PCB 105 | 6.2E-10 | — | 3.00E-05 | 1.87E-14 |
| | | PCB 114 | 8.0E-11 | — | 3.00E-05 | 2.40E-15 |
| | | PCB 118 | 1.3E-09 | — | 3.00E-05 | 3.93E-14 |
| | | PCB 123 | 4.9E-11 | — | 3.00E-05 | 1.48E-15 |
| | | PCB 126 | 8.0E-11 | — | 1.00E-01 | 7.99E-12 |
| | | PCB 156 | 5.9E-11 | — | 3.00E-05 | 1.77E-15 |
| | | PCB 157 | 1.2E-11 | — | 3.00E-05 | 3.57E-16 |
| | | PCB 167 | 2.4E-11 | — | 3.00E-05 | 7.24E-16 |
| | | PCB 169 | 8.8E-12 | — | 3.00E-02 | 2.65E-13 |
| | | PCB 189 | 8.0E-11 | — | 3.00E-05 | 2.40E-15 |
| | May | PCB 77 | 1.3E-10 | 2.07 | 1.00E-04 | 2.76E-14 |
| | | PCB 81 | 7.9E-11 | — | 3.00E-04 | 2.37E-14 |
| | | PCB 105 | 3.2E-10 | 2.05 | 3.00E-05 | 1.94E-14 |
| | | PCB 114 | 7.9E-11 | — | 3.00E-05 | 2.37E-15 |
| | | PCB 118 | 7.4E-10 | 1.91 | 3.00E-05 | 4.25E-14 |
| | | PCB 123 | 3.1E-11 | 1.79 | 3.00E-05 | 1.67E-15 |
| | | PCB 126 | 7.9E-11 | — | 1.00E-01 | 7.89E-12 |
| | | PCB 156 | 3.1E-11 | 2.03 | 3.00E-05 | 1.90E-15 |
| | | PCB 157 | 6.8E-12 | 1.96 | 3.00E-05 | 4.00E-16 |
| | | PCB 167 | 1.8E-11 | 1.72 | 3.00E-05 | 9.53E-16 |
| | | PCB 169 | 2.3E-12 | 2.59 | 3.00E-02 | 1.79E-13 |
| | | PCB 189 | 7.9E-11 | — | 3.00E-05 | 2.37E-15 |
| | June | PCB 77 | 3.0E-11 | 2.07 | 1.00E-04 | 6.29E-15 |
| | | PCB 81 | 7.8E-11 | — | 3.00E-04 | 2.34E-14 |
| | | PCB 105 | 4.8E-10 | 2.05 | 3.00E-05 | 2.98E-14 |
| | | PCB 114 | 3.8E-11 | — | 3.00E-05 | 1.13E-15 |
| | | PCB 118 | 1.1E-09 | 1.91 | 3.00E-05 | 6.27E-14 |
| | | PCB 123 | 5.5E-11 | 1.79 | 3.00E-05 | 2.97E-15 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.82E-12 |
| | | PCB 156 | 3.4E-11 | 2.03 | 3.00E-05 | 2.06E-15 |
| | | PCB 157 | 1.0E-11 | 1.96 | 3.00E-05 | 5.95E-16 |
| | | PCB 167 | 9.5E-11 | 1.72 | 3.00E-05 | 4.91E-15 |
| | | PCB 169 | 7.8E-11 | 2.59 | 3.00E-02 | 6.07E-12 |
| | | PCB 189 | 3.1E-12 | — | 3.00E-05 | 9.36E-17 |

**Table 5.3.3**
**Toxicity Equivalence Concentrations - Air**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | Concentration (mg/m$^3$) | Scaling Factor [(1)] | TEF | TEC (mg/m$^3$) |
|---|---|---|---|---|---|---|
| MSP | July | PCB 77 | 1.3E-10 | 2.07 | 1.00E-04 | 2.72E-14 |
| | | PCB 81 | 7.8E-11 | — | 3.00E-04 | 2.34E-14 |
| | | PCB 105 | 3.3E-10 | 2.05 | 3.00E-05 | 2.03E-14 |
| | | PCB 114 | 7.8E-11 | — | 3.00E-05 | 2.34E-15 |
| | | PCB 118 | 7.4E-10 | 1.91 | 3.00E-05 | 4.24E-14 |
| | | PCB 123 | 3.2E-11 | 1.79 | 3.00E-05 | 1.73E-15 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.82E-12 |
| | | PCB 156 | 3.4E-11 | 2.03 | 3.00E-05 | 2.08E-15 |
| | | PCB 157 | 7.1E-12 | 1.96 | 3.00E-05 | 4.19E-16 |
| | | PCB 167 | 1.8E-11 | 1.72 | 3.00E-05 | 9.13E-16 |
| | | PCB 169 | 7.8E-11 | 2.59 | 3.00E-02 | 6.07E-12 |
| | | PCB 189 | 7.8E-11 | — | 3.00E-05 | 2.34E-15 |
| | August | PCB 77 | 2.1E-10 | 2.07 | 1.00E-04 | 4.42E-14 |
| | | PCB 81 | 4.3E-11 | — | 3.00E-04 | 1.29E-14 |
| | | PCB 105 | 5.0E-10 | 2.05 | 3.00E-05 | 3.09E-14 |
| | | PCB 114 | 3.3E-11 | — | 3.00E-05 | 9.87E-16 |
| | | PCB 118 | 1.1E-09 | 1.91 | 3.00E-05 | 6.12E-14 |
| | | PCB 123 | 4.1E-11 | 1.79 | 3.00E-05 | 2.19E-15 |
| | | PCB 126 | 7.6E-12 | — | 1.00E-01 | 7.55E-13 |
| | | PCB 156 | 4.4E-11 | 2.03 | 3.00E-05 | 2.68E-15 |
| | | PCB 157 | 8.7E-12 | 1.96 | 3.00E-05 | 5.13E-16 |
| | | PCB 167 | 2.2E-11 | 1.72 | 3.00E-05 | 1.16E-15 |
| | | PCB 169 | 4.2E-12 | 2.59 | 3.00E-02 | 3.25E-13 |
| | | PCB 189 | 8.1E-11 | — | 3.00E-05 | 2.43E-15 |
| | September | PCB 77 | 3.9E-10 | 2.07 | 1.00E-04 | 8.17E-14 |
| | | PCB 81 | 6.2E-11 | — | 3.00E-04 | 1.85E-14 |
| | | PCB 105 | 8.3E-10 | 2.05 | 3.00E-05 | 5.11E-14 |
| | | PCB 114 | 6.8E-11 | — | 3.00E-05 | 2.05E-15 |
| | | PCB 118 | 1.8E-09 | 1.91 | 3.00E-05 | 1.04E-13 |
| | | PCB 123 | 7.2E-11 | 1.79 | 3.00E-05 | 3.85E-15 |
| | | PCB 126 | 1.1E-11 | — | 1.00E-01 | 1.07E-12 |
| | | PCB 156 | 6.5E-11 | 2.03 | 3.00E-05 | 3.99E-15 |
| | | PCB 157 | 1.3E-11 | 1.96 | 3.00E-05 | 7.89E-16 |
| | | PCB 167 | 3.1E-11 | 1.72 | 3.00E-05 | 1.61E-15 |
| | | PCB 169 | 9.2E-11 | 2.59 | 3.00E-02 | 7.18E-12 |
| | | PCB 189 | 7.3E-12 | — | 3.00E-05 | 2.20E-16 |
| | October | PCB 77 | 2.8E-10 | 2.07 | 1.00E-04 | 5.76E-14 |
| | | PCB 81 | 5.0E-11 | — | 3.00E-04 | 1.50E-14 |
| | | PCB 105 | 6.9E-10 | 2.05 | 3.00E-05 | 4.24E-14 |
| | | PCB 114 | 5.6E-11 | — | 3.00E-05 | 1.68E-15 |
| | | PCB 118 | 1.5E-09 | 1.91 | 3.00E-05 | 8.88E-14 |
| | | PCB 123 | 8.0E-11 | 1.79 | 3.00E-05 | 4.32E-15 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.83E-12 |
| | | PCB 156 | 4.9E-11 | 2.03 | 3.00E-05 | 3.00E-15 |
| | | PCB 157 | 9.5E-12 | 1.96 | 3.00E-05 | 5.61E-16 |
| | | PCB 167 | 3.3E-11 | 1.72 | 3.00E-05 | 1.68E-15 |
| | | PCB 169 | 7.8E-11 | 2.59 | 3.00E-02 | 6.08E-12 |
| | | PCB 189 | 7.8E-11 | — | 3.00E-05 | 2.35E-15 |
| | November [(3)] | | | | | |
| | December | PCB 77 | 2.0E-10 | 2.07 | 1.00E-04 | 4.08E-14 |
| | | PCB 81 | 5.5E-11 | — | 3.00E-04 | 1.65E-14 |
| | | PCB 105 | 4.8E-10 | 2.05 | 3.00E-05 | 2.96E-14 |
| | | PCB 114 | 3.6E-11 | — | 3.00E-05 | 1.07E-15 |
| | | PCB 118 | 1.1E-09 | 1.91 | 3.00E-05 | 6.22E-14 |
| | | PCB 123 | 9.2E-11 | 1.79 | 3.00E-05 | 4.96E-15 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.75E-12 |
| | | PCB 156 | 4.9E-11 | 2.03 | 3.00E-05 | 2.96E-15 |
| | | PCB 157 | 8.1E-12 | 1.96 | 3.00E-05 | 4.77E-16 |
| | | PCB 167 | 3.1E-11 | 1.72 | 3.00E-05 | 1.60E-15 |
| | | PCB 169 | 7.8E-11 | 2.59 | 3.00E-02 | 6.02E-12 |
| | | PCB 189 | 7.8E-11 | — | 3.00E-05 | 2.33E-15 |
| | | **PCB Total TEC** | — | — | — | **1.16E-11** |

**Table 5.3.3**
**Toxicity Equivalence Concentrations - Air**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | Concentration ($mg/m^3$) | Scaling Factor (1) | TEF | TEC ($mg/m^3$) |
|---|---|---|---|---|---|---|
| UMS1 | January | PCB 77 | 2.1E-11 | — | 1.00E-04 | 2.14E-15 |
| | | PCB 81 | 7.5E-11 | — | 3.00E-04 | 2.24E-14 |
| | | PCB 105 | 6.5E-11 | — | 3.00E-05 | 1.95E-15 |
| | | PCB 114 | 5.0E-12 | — | 3.00E-05 | 1.49E-16 |
| | | PCB 118 | 1.8E-10 | — | 3.00E-05 | 5.38E-15 |
| | | PCB 123 | 1.3E-11 | — | 3.00E-05 | 3.83E-16 |
| | | PCB 126 | 7.5E-11 | — | 1.00E-01 | 7.48E-12 |
| | | PCB 156 | 9.6E-12 | — | 3.00E-05 | 2.88E-16 |
| | | PCB 157 | 7.5E-11 | — | 3.00E-05 | 2.24E-15 |
| | | PCB 167 | 5.6E-12 | — | 3.00E-05 | 1.69E-16 |
| | | PCB 169 | 7.5E-11 | — | 3.00E-02 | 2.24E-12 |
| | | PCB 189 | 7.5E-11 | — | 3.00E-05 | 2.24E-15 |
| | February | PCB 77 | 2.4E-11 | — | 1.00E-04 | 2.40E-15 |
| | | PCB 81 | 7.2E-12 | — | 3.00E-04 | 2.15E-15 |
| | | PCB 105 | 6.7E-11 | — | 3.00E-05 | 2.00E-15 |
| | | PCB 114 | 4.7E-12 | — | 3.00E-05 | 1.41E-16 |
| | | PCB 118 | 1.8E-10 | — | 3.00E-05 | 5.52E-15 |
| | | PCB 123 | 1.1E-11 | — | 3.00E-05 | 3.33E-16 |
| | | PCB 126 | 8.4E-11 | — | 1.00E-01 | 8.36E-12 |
| | | PCB 156 | 8.4E-11 | — | 3.00E-05 | 2.51E-15 |
| | | PCB 157 | 8.4E-11 | — | 3.00E-05 | 2.51E-15 |
| | | PCB 167 | 2.2E-11 | — | 3.00E-05 | 6.56E-16 |
| | | PCB 169 | 8.4E-11 | — | 3.00E-02 | 2.51E-12 |
| | | PCB 189 | 8.4E-11 | — | 3.00E-05 | 2.51E-15 |
| | March | PCB 77 | 1.9E-11 | — | 1.00E-04 | 1.91E-15 |
| | | PCB 81 | 7.7E-11 | — | 3.00E-04 | 2.32E-14 |
| | | PCB 105 | 6.7E-11 | — | 3.00E-05 | 2.00E-15 |
| | | PCB 114 | 4.1E-12 | — | 3.00E-05 | 1.24E-16 |
| | | PCB 118 | 1.9E-10 | — | 3.00E-05 | 5.56E-15 |
| | | PCB 123 | 8.3E-12 | — | 3.00E-05 | 2.48E-16 |
| | | PCB 126 | 7.7E-11 | — | 1.00E-01 | 7.72E-12 |
| | | PCB 156 | 6.7E-12 | — | 3.00E-05 | 2.00E-16 |
| | | PCB 157 | 7.7E-11 | — | 3.00E-05 | 2.32E-15 |
| | | PCB 167 | 2.1E-11 | — | 3.00E-05 | 6.34E-16 |
| | | PCB 169 | 7.7E-11 | — | 3.00E-02 | 2.32E-12 |
| | | PCB 189 | 7.7E-11 | — | 3.00E-05 | 2.32E-15 |
| | April | PCB 77 | 2.8E-11 | — | 1.00E-04 | 2.81E-15 |
| | | PCB 81 | 8.0E-11 | — | 3.00E-04 | 2.41E-14 |
| | | PCB 105 | 7.7E-11 | — | 3.00E-05 | 2.32E-15 |
| | | PCB 114 | 8.0E-11 | — | 3.00E-05 | 2.41E-15 |
| | | PCB 118 | 2.3E-10 | — | 3.00E-05 | 6.76E-15 |
| | | PCB 123 | 6.0E-12 | — | 3.00E-05 | 1.80E-16 |
| | | PCB 126 | 8.0E-11 | — | 1.00E-01 | 8.05E-12 |
| | | PCB 156 | 1.1E-11 | — | 3.00E-05 | 3.37E-16 |
| | | PCB 157 | 2.4E-12 | — | 3.00E-05 | 7.19E-17 |
| | | PCB 167 | 5.7E-12 | — | 3.00E-05 | 1.72E-16 |
| | | PCB 169 | 8.0E-13 | — | 3.00E-02 | 2.40E-14 |
| | | PCB 189 | 3.6E-12 | — | 3.00E-05 | 1.07E-16 |
| | May | PCB 77 | 5.2E-11 | — | 1.00E-04 | 5.16E-15 |
| | | PCB 81 | 7.8E-11 | — | 3.00E-04 | 2.35E-14 |
| | | PCB 105 | 1.5E-10 | — | 3.00E-05 | 4.55E-15 |
| | | PCB 114 | 7.8E-11 | — | 3.00E-05 | 2.35E-15 |
| | | PCB 118 | 4.1E-10 | — | 3.00E-05 | 1.23E-14 |
| | | PCB 123 | 1.8E-11 | — | 3.00E-05 | 5.32E-16 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.83E-12 |
| | | PCB 156 | 2.0E-11 | — | 3.00E-05 | 6.15E-16 |
| | | PCB 157 | 4.6E-12 | — | 3.00E-05 | 1.38E-16 |
| | | PCB 167 | 1.3E-11 | — | 3.00E-05 | 3.81E-16 |
| | | PCB 169 | 1.2E-12 | — | 3.00E-02 | 3.54E-14 |
| | | PCB 189 | 7.8E-11 | — | 3.00E-05 | 2.35E-15 |
| | June | PCB 77 | 4.4E-11 | — | 1.00E-04 | 4.40E-15 |
| | | PCB 81 | 2.2E-11 | — | 3.00E-04 | 6.61E-15 |
| | | PCB 105 | 7.8E-11 | — | 3.00E-05 | 2.35E-15 |
| | | PCB 114 | 7.8E-11 | — | 3.00E-05 | 2.35E-15 |
| | | PCB 118 | 2.6E-11 | — | 3.00E-05 | 7.88E-16 |
| | | PCB 123 | 2.1E-11 | — | 3.00E-05 | 6.29E-16 |
| | | PCB 126 | 7.8E-11 | — | 1.00E-01 | 7.85E-12 |
| | | PCB 156 | 1.8E-11 | — | 3.00E-05 | 5.41E-16 |
| | | PCB 157 | 4.2E-12 | — | 3.00E-05 | 1.27E-16 |
| | | PCB 167 | 5.6E-11 | — | 3.00E-05 | 1.68E-15 |
| | | PCB 169 | 7.8E-11 | — | 3.00E-02 | 2.35E-12 |
| | | PCB 189 | 7.8E-11 | — | 3.00E-05 | 2.35E-15 |

**Table 5.3.3**
**Toxicity Equivalence Concentrations - Air**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | Sample Date | Chemical | Concentration ($mg/m^3$) | Scaling Factor [1] | TEF | TEC ($mg/m^3$) |
|---|---|---|---|---|---|---|
| UMS1 | July | PCB 77 | 7.9E-11 | — | 1.00E-04 | 7.91E-15 |
| | | PCB 81 | 7.9E-11 | — | 3.00E-04 | 2.37E-14 |
| | | PCB 105 | 2.2E-10 | — | 3.00E-05 | 6.64E-15 |
| | | PCB 114 | 7.9E-11 | — | 3.00E-05 | 2.37E-15 |
| | | PCB 118 | 6.0E-10 | — | 3.00E-05 | 1.80E-14 |
| | | PCB 123 | 2.1E-11 | — | 3.00E-05 | 6.43E-16 |
| | | PCB 126 | 7.9E-11 | — | 1.00E-01 | 7.91E-12 |
| | | PCB 156 | 2.6E-11 | — | 3.00E-05 | 7.80E-16 |
| | | PCB 157 | 6.0E-12 | — | 3.00E-05 | 1.80E-16 |
| | | PCB 167 | 1.3E-11 | — | 3.00E-05 | 4.00E-16 |
| | | PCB 169 | 7.9E-11 | — | 3.00E-02 | 2.37E-12 |
| | | PCB 189 | 7.9E-11 | — | 3.00E-05 | 2.37E-15 |
| | August | PCB 77 | 7.3E-11 | — | 1.00E-04 | 7.28E-15 |
| | | PCB 81 | 8.1E-11 | — | 3.00E-04 | 2.43E-14 |
| | | PCB 105 | 2.1E-10 | — | 3.00E-05 | 6.31E-15 |
| | | PCB 114 | 8.1E-11 | — | 3.00E-05 | 2.43E-15 |
| | | PCB 118 | 5.5E-10 | — | 3.00E-05 | 1.65E-14 |
| | | PCB 123 | 2.2E-11 | — | 3.00E-05 | 6.62E-16 |
| | | PCB 126 | 8.1E-11 | — | 1.00E-01 | 8.10E-12 |
| | | PCB 156 | 2.4E-11 | — | 3.00E-05 | 7.31E-16 |
| | | PCB 157 | 5.3E-12 | — | 3.00E-05 | 1.58E-16 |
| | | PCB 167 | 1.5E-11 | — | 3.00E-05 | 4.45E-16 |
| | | PCB 169 | 2.5E-12 | — | 3.00E-02 | 7.42E-14 |
| | | PCB 189 | 6.7E-12 | — | 3.00E-05 | 2.00E-16 |
| | September | PCB 77 | 6.4E-11 | — | 1.00E-04 | 6.39E-15 |
| | | PCB 81 | 1.4E-11 | — | 3.00E-04 | 4.16E-15 |
| | | PCB 105 | 2.1E-10 | — | 3.00E-05 | 6.23E-15 |
| | | PCB 114 | 1.2E-11 | — | 3.00E-05 | 3.66E-16 |
| | | PCB 118 | 5.6E-10 | — | 3.00E-05 | 1.68E-14 |
| | | PCB 123 | 3.5E-11 | — | 3.00E-05 | 1.05E-15 |
| | | PCB 126 | 8.0E-11 | — | 1.00E-01 | 7.98E-12 |
| | | PCB 156 | 2.6E-11 | — | 3.00E-05 | 7.85E-16 |
| | | PCB 157 | 5.8E-12 | — | 3.00E-05 | 1.75E-16 |
| | | PCB 167 | 1.7E-11 | — | 3.00E-05 | 5.20E-16 |
| | | PCB 169 | 8.0E-11 | — | 3.00E-02 | 2.39E-12 |
| | | PCB 189 | 2.4E-12 | — | 3.00E-05 | 7.15E-17 |
| | October | PCB 77 | 5.5E-11 | — | 1.00E-04 | 5.52E-15 |
| | | PCB 81 | 7.8E-11 | — | 3.00E-04 | 2.34E-14 |
| | | PCB 105 | 1.7E-10 | — | 3.00E-05 | 5.16E-15 |
| | | PCB 114 | 7.8E-11 | — | 3.00E-05 | 2.34E-15 |
| | | PCB 118 | 4.1E-10 | — | 3.00E-05 | 1.22E-14 |
| | | PCB 123 | 3.3E-11 | — | 3.00E-05 | 9.81E-16 |
| | | PCB 126 | 3.5E-12 | — | 1.00E-01 | 3.50E-13 |
| | | PCB 156 | 1.7E-11 | — | 3.00E-05 | 5.09E-16 |
| | | PCB 157 | 4.4E-12 | — | 3.00E-05 | 1.31E-16 |
| | | PCB 167 | 1.4E-11 | — | 3.00E-05 | 4.13E-16 |
| | | PCB 169 | 7.8E-11 | — | 3.00E-02 | 2.34E-12 |
| | | PCB 189 | 7.8E-11 | — | 3.00E-05 | 2.34E-15 |
| | November [3] | | | | | |
| | December | PCB 77 | 3.8E-11 | — | 1.00E-04 | 3.81E-15 |
| | | PCB 81 | 7.7E-11 | — | 3.00E-04 | 2.32E-14 |
| | | PCB 105 | 8.2E-11 | — | 3.00E-05 | 2.47E-15 |
| | | PCB 114 | 7.7E-11 | — | 3.00E-05 | 2.32E-15 |
| | | PCB 118 | 2.2E-10 | — | 3.00E-05 | 6.49E-15 |
| | | PCB 123 | 1.5E-11 | — | 3.00E-05 | 4.64E-16 |
| | | PCB 126 | 7.7E-11 | — | 1.00E-01 | 7.73E-12 |
| | | PCB 156 | 1.1E-11 | — | 3.00E-05 | 3.44E-16 |
| | | PCB 157 | 2.5E-12 | — | 3.00E-05 | 7.57E-17 |
| | | PCB 167 | 1.1E-11 | — | 3.00E-05 | 3.31E-16 |
| | | PCB 169 | 7.7E-11 | — | 3.00E-02 | 2.32E-12 |
| | | PCB 189 | 7.7E-11 | — | 3.00E-05 | 2.32E-15 |
| | | **PCB Total TEC** | — | — | — | **8.98E-12** |

**Table 5.3.3**
**Toxicity Equivalence Concentrations - Air**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

The concentrations of the twelve dioxin-like PCB congeners were multiplied by their individual TEFs to express each concentration as a 2,3,7,8-TCDD TEC. For each sampling location, the TECs of the individual congeners were summed for each month to obtain a PCB Total TEC for that month. Then the monthly PCB Total TECs were averaged to obtain a PCB Total TEC for the sampling location. See Section 5.2.2 of the text for additional discussion.

(1) Scaling factor is the ratio of the PCB congener concentration measured at the alternate sampling location (MSP-Alt) divided by the congener concentration measured at the regular sampling location (MSP) during April 2009. (During the April sampling event, a one-month sample was collected at an alternate location near the MSP as suggested by USEPA-IX, as well as at the regular MSP location.) For congeners with a Scaling Factor, TEC = Concentration x Scaling Factor x TEF.

(2) April concentrations were collected from location MSP-Alt (See Section 5.2.1).

(3) November data from this sample were not used due to malfunction of sampling equipment.

$mg/m^3$ - milligrams per cubic meter (parts per million)

PCB - polychlorinated biphenyl

TEF - toxicity equivalence factor

TEC - toxicity equivalence concentration

**Table 5.3.4**
**Derivation of Exposure Point Concentrations in Aboveground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 1: MASS-BASED AIR-TO-LEAF BIOTRANSFER FACTOR**

| Congener | Concentration in Air ( $Conc_{air}$ ) (1) pg/m3 | Log $K_{ow}$ (2) unitless | Henry's Law Constant (H) (3) atm-m3/mol | Ideal Gas Constant ($R_i$) (4) atm-m3/mol-K | Temperature (T) (4) degrees K | Empirical Constant (EC) (4) unitless | Bacci Volumetric Air-to-Leaf BTF ($B_{vol}$) (5) unitless | Mass-Based Air-to-Plant BTF ($Bv_{ag}$) (6) unitless |
|---|---|---|---|---|---|---|---|---|
| ***DMS1*** | | | | | | | | |
| PCB 77 | 3.10E-01 | 6.63 | 9.40E-06 | 8.205E-05 | 298.1 | -1.654 | 6.64E+08 | 6.84E+06 |
| PCB 81 | 7.07E-02 | 6.34 | 2.23E-04 | 8.205E-05 | 298.1 | -1.654 | 1.37E+07 | 1.42E+05 |
| PCB 105 | 7.27E-01 | 6.79 | 2.83E-04 | 8.205E-05 | 298.1 | -1.654 | 3.27E+07 | 3.36E+05 |
| PCB 114 | 5.70E-02 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 118 | 1.62E+00 | 7.12 | 2.88E-04 | 8.205E-05 | 298.1 | -1.654 | 7.21E+07 | 7.43E+05 |
| PCB 123 | 8.27E-02 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 126 | 6.39E-02 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 156 | 5.46E-02 | 7.60 | 1.43E-04 | 8.205E-05 | 298.1 | -1.654 | 4.71E+08 | 4.85E+06 |
| PCB 157 | 1.10E-02 | 7.62 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 4.37E+08 | 4.50E+06 |
| PCB 167 | 5.02E-02 | 7.50 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 3.25E+08 | 3.35E+06 |
| PCB 169 | 6.13E-02 | 7.41 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 2.61E+08 | 2.69E+06 |
| PCB 189 | 4.97E-02 | 8.27 | 1.38E-04 | 8.205E-05 | 298.1 | -1.654 | 2.52E+09 | 2.60E+07 |
| ***MSP*** | | | | | | | | |
| PCB 77 | 3.34E-01 | 6.63 | 9.40E-06 | 8.205E-05 | 298.1 | -1.654 | 6.64E+08 | 6.84E+06 |
| PCB 81 | 6.14E-02 | 6.34 | 2.23E-04 | 8.205E-05 | 298.1 | -1.654 | 1.37E+07 | 1.42E+05 |
| PCB 105 | 9.52E-01 | 6.79 | 2.83E-04 | 8.205E-05 | 298.1 | -1.654 | 3.27E+07 | 3.36E+05 |
| PCB 114 | 5.06E-02 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 118 | 2.02E+00 | 7.12 | 2.88E-04 | 8.205E-05 | 298.1 | -1.654 | 7.21E+07 | 7.43E+05 |
| PCB 123 | 1.02E-01 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 126 | 6.72E-02 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 156 | 8.25E-02 | 7.60 | 1.43E-04 | 8.205E-05 | 298.1 | -1.654 | 4.71E+08 | 4.85E+06 |
| PCB 157 | 1.59E-02 | 7.62 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 4.37E+08 | 4.50E+06 |
| PCB 167 | 8.17E-02 | 7.50 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 3.25E+08 | 3.35E+06 |
| PCB 169 | 1.57E-01 | 7.41 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 2.61E+08 | 2.69E+06 |
| PCB 189 | 5.23E-02 | 8.27 | 1.38E-04 | 8.205E-05 | 298.1 | -1.654 | 2.52E+09 | 2.60E+07 |
| ***UMS1*** | | | | | | | | |
| PCB 77 | 4.52E-02 | 6.63 | 9.40E-06 | 8.205E-05 | 298.1 | -1.654 | 6.64E+08 | 6.84E+06 |
| PCB 81 | 6.08E-02 | 6.34 | 2.23E-04 | 8.205E-05 | 298.1 | -1.654 | 1.37E+07 | 1.42E+05 |
| PCB 105 | 1.27E-01 | 6.79 | 2.83E-04 | 8.205E-05 | 298.1 | -1.654 | 3.27E+07 | 3.36E+05 |
| PCB 114 | 5.26E-02 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 118 | 3.22E-01 | 7.12 | 2.88E-04 | 8.205E-05 | 298.1 | -1.654 | 7.21E+07 | 7.43E+05 |
| PCB 123 | 1.85E-02 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 126 | 7.21E-02 | 6.98 | 1.90E-04 | 8.205E-05 | 298.1 | -1.654 | 7.75E+07 | 7.99E+05 |
| PCB 156 | 2.31E-02 | 7.60 | 1.43E-04 | 8.205E-05 | 298.1 | -1.654 | 4.71E+08 | 4.85E+06 |
| PCB 157 | 2.46E-02 | 7.62 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 4.37E+08 | 4.50E+06 |
| PCB 167 | 1.76E-02 | 7.50 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 3.25E+08 | 3.35E+06 |
| PCB 169 | 5.75E-02 | 7.41 | 1.62E-04 | 8.205E-05 | 298.1 | -1.654 | 2.61E+08 | 2.69E+06 |
| PCB 189 | 5.81E-02 | 8.27 | 1.38E-04 | 8.205E-05 | 298.1 | -1.654 | 2.52E+09 | 2.60E+07 |

**Table 5.3.4**
**Derivation of Exposure Point Concentrations in Aboveground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 1: MASS-BASED AIR-TO-LEAF BIOTRANSFER FACTOR**

Notes:
(1) Exposure Point Concentration. Average air concentration over the 12-month sampling period (See Table 5.3.3 for monthly air concentrations).
(2) Value from Oak Ridge National Laboratory Risk Assessment Information System accessed online at http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem.
(3) Value from Regional Screening Level (RSL) Chemical-Specific Parameters Table (USEPA, December 2009).
(4) Default value from USEPA 2003.
(5) Bacci volumetric air-to-leaf BTF from Equation A-2-19 in USEPA 2005: $\log B_{vol} = 1.065 \times \log K_{ow} - \log ( H / [ R_i \times T ] ) - EC$

where:

$B_{vol}$ - Bacci volumetric air-to-leaf BTF ( unitless; [ ug contaminant / L of wet leaf ] / [ ug contaminant / L air ] ) (fresh-weight basis)
$K_{ow}$ - contaminant octanol water partition coefficient (unitless)
H - contaminant Henry's Law constant (atm-$m^3$/mol)
Ri - ideal gas constant (atm-$m^3$/mol-K)
T - temperature (K)
EC - empirical constant

(6) Mass-based air-to-plant BTF from Equation A-2-20 in USEPA 2005: $B_{vpa} = ( \rho_{air} \times B_{vol} ) / ( [ 1 - f_{water} ] \times \rho_{forage} )$

where:

$Bv_{ag}$ - mass-based air-to-plant biotransfer factor ( unitless; [ pg contaminant / g plant dry weight ] / [ pg contaminant / g air ] )
$\rho_{air}$ - density of air (1.19 g/L)
$\rho_{forage}$ - 770 g/L
$f_{water}$ - 0.85 (fraction of forage that is water)

BTF - Biotransfer factor

**Table 5.3.4**
**Derivation of Exposure Point Concentrations in Aboveground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 2: PLANT CONCENTRATION DUE TO VAPOR-PHASE ABSORPTION OF AIR-BORNE CONTAMINANTS**

| Congener | Junge Constant (c) (1) atm-cm | Vapor Pressure (VP) (2) mm Hg | Vapor Pressure ($p^o_L$) (3) atm | Whitby's Average Surface Area ($S_T$) (1) $cm^2/cm^3$ | Fraction of Contaminant (Fv) (4) unitless | Vapor Phase Concentration ($C_v$) (5) $pg/m^3$ | Correction Factor ($VG_{ag}$) (1) | Density of Air ($d_a$) (1) $g/m^3$ | Plant Concentration ($C_{vpa}$) (6) pg/g |
|---|---|---|---|---|---|---|---|---|---|
| ***DMS1*** | | | | | | | | | |
| PCB 77 | 1.7E-04 | 1.64E-05 | 2.16E-08 | 3.50E-06 | 0.97 | 3.02E-01 | 0.01 | 1190 | 1.74E+01 |
| PCB 81 | 1.7E-04 | 8.45E-06 | 1.12E-08 | 3.50E-06 | 0.95 | 6.71E-02 | 0.01 | 1190 | 7.99E-02 |
| PCB 105 | 1.7E-04 | 6.53E-06 | 8.62E-09 | 3.50E-06 | 0.94 | 6.80E-01 | 0.01 | 1190 | 1.92E+00 |
| PCB 114 | 1.7E-04 | 5.47E-06 | 7.22E-09 | 3.50E-06 | 0.92 | 5.27E-02 | 0.01 | 1190 | 3.54E-01 |
| PCB 118 | 1.7E-04 | 8.97E-06 | 1.18E-08 | 3.50E-06 | 0.95 | 1.54E+00 | 0.01 | 1190 | 9.60E+00 |
| PCB 123 | 1.7E-04 | 5.47E-06 | 7.22E-09 | 3.50E-06 | 0.92 | 7.64E-02 | 0.01 | 1190 | 5.12E-01 |
| PCB 126 | 1.7E-04 | 2.22E-06 | 2.93E-09 | 3.50E-06 | 0.83 | 5.31E-02 | 0.01 | 1190 | 3.56E-01 |
| PCB 156 | 1.7E-04 | 1.61E-06 | 2.13E-09 | 3.50E-06 | 0.78 | 4.27E-02 | 0.01 | 1190 | 1.74E+00 |
| PCB 157 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 6.18E-03 | 0.01 | 1190 | 2.34E-01 |
| PCB 167 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 2.83E-02 | 0.01 | 1190 | 7.97E-01 |
| PCB 169 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 3.45E-02 | 0.01 | 1190 | 7.79E-01 |
| PCB 189 | 1.7E-04 | 1.30E-07 | 1.72E-10 | 3.50E-06 | 0.22 | 1.11E-02 | 0.01 | 1190 | 2.43E+00 |
| ***MSP*** | | | | | | | | | |
| PCB 77 | 1.7E-04 | 1.64E-05 | 2.16E-08 | 3.50E-06 | 0.97 | 3.25E-01 | 0.01 | 1190 | 1.87E+01 |
| PCB 81 | 1.7E-04 | 8.45E-06 | 1.12E-08 | 3.50E-06 | 0.95 | 5.83E-02 | 0.01 | 1190 | 6.94E-02 |
| PCB 105 | 1.7E-04 | 6.53E-06 | 8.62E-09 | 3.50E-06 | 0.94 | 8.91E-01 | 0.01 | 1190 | 2.52E+00 |
| PCB 114 | 1.7E-04 | 5.47E-06 | 7.22E-09 | 3.50E-06 | 0.92 | 4.67E-02 | 0.01 | 1190 | 3.14E-01 |
| PCB 118 | 1.7E-04 | 8.97E-06 | 1.18E-08 | 3.50E-06 | 0.95 | 1.92E+00 | 0.01 | 1190 | 1.20E+01 |
| PCB 123 | 1.7E-04 | 5.47E-06 | 7.22E-09 | 3.50E-06 | 0.92 | 9.40E-02 | 0.01 | 1190 | 6.31E-01 |
| PCB 126 | 1.7E-04 | 2.22E-06 | 2.93E-09 | 3.50E-06 | 0.83 | 5.59E-02 | 0.01 | 1190 | 3.75E-01 |
| PCB 156 | 1.7E-04 | 1.61E-06 | 2.13E-09 | 3.50E-06 | 0.78 | 6.45E-02 | 0.01 | 1190 | 2.63E+00 |
| PCB 157 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 8.95E-03 | 0.01 | 1190 | 3.38E-01 |
| PCB 167 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 4.60E-02 | 0.01 | 1190 | 1.30E+00 |
| PCB 169 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 8.81E-02 | 0.01 | 1190 | 1.99E+00 |
| PCB 189 | 1.7E-04 | 1.30E-07 | 1.72E-10 | 3.50E-06 | 0.22 | 1.17E-02 | 0.01 | 1190 | 2.56E+00 |
| ***UMS1*** | | | | | | | | | |
| PCB 77 | 1.7E-04 | 1.64E-05 | 2.16E-08 | 3.50E-06 | 0.97 | 4.40E-02 | 0.01 | 1190 | 2.53E+00 |
| PCB 81 | 1.7E-04 | 8.45E-06 | 1.12E-08 | 3.50E-06 | 0.95 | 5.78E-02 | 0.01 | 1190 | 6.88E-02 |
| PCB 105 | 1.7E-04 | 6.53E-06 | 8.62E-09 | 3.50E-06 | 0.94 | 1.19E-01 | 0.01 | 1190 | 3.36E-01 |
| PCB 114 | 1.7E-04 | 5.47E-06 | 7.22E-09 | 3.50E-06 | 0.92 | 4.86E-02 | 0.01 | 1190 | 3.26E-01 |
| PCB 118 | 1.7E-04 | 8.97E-06 | 1.18E-08 | 3.50E-06 | 0.95 | 3.07E-01 | 0.01 | 1190 | 1.91E+00 |
| PCB 123 | 1.7E-04 | 5.47E-06 | 7.22E-09 | 3.50E-06 | 0.92 | 1.71E-02 | 0.01 | 1190 | 1.15E-01 |
| PCB 126 | 1.7E-04 | 2.22E-06 | 2.93E-09 | 3.50E-06 | 0.83 | 6.00E-02 | 0.01 | 1190 | 4.02E-01 |
| PCB 156 | 1.7E-04 | 1.61E-06 | 2.13E-09 | 3.50E-06 | 0.78 | 1.81E-02 | 0.01 | 1190 | 7.37E-01 |
| PCB 157 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 1.39E-02 | 0.01 | 1190 | 5.24E-01 |
| PCB 167 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 9.91E-03 | 0.01 | 1190 | 2.79E-01 |
| PCB 169 | 1.7E-04 | 5.81E-07 | 7.67E-10 | 3.50E-06 | 0.56 | 3.24E-02 | 0.01 | 1190 | 7.32E-01 |
| PCB 189 | 1.7E-04 | 1.30E-07 | 1.72E-10 | 3.50E-06 | 0.22 | 1.30E-02 | 0.01 | 1190 | 2.84E+00 |

**Table 5.3.4**
**Derivation of Exposure Point Concentrations in Aboveground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 2: PLANT CONCENTRATION DUE TO VAPOR-PHASE ABSORPTION OF AIR-BORNE CONTAMINANTS**

Notes:

(1) Default value from USEPA 2005.

(2) Value from Oak Ridge National Laboratory Risk Assessment Information System accessed online at http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem.

(3) VP x 0.00132 (Convert vapor pressure in mm Hg to vapor pressure in atm, using the following relationship: 1 mm Hg = 0.00132 atm)

(4) Fraction of Contaminant in the vapor phase from Equation A-2-1 in USEPA 2005: $Fv = 1 - ( [ c \times S_T ] / [ p^o_L + c \times S_T ] )$

where:

Fv - Fraction of Contaminant Air Concentration in the Vapor Phase (unitless)

c - Junge constant (atm-cm)

$S_T$ - Whitby's average surface area of particulates (aerosols) ($cm^2/cm^3$)

$p^o_L$ - Liquid phase vapor pressure of compound (atm)

(5) $C_v$ = concentration of contaminant in the Air x Fv.

(6) Plant concentration from Equation 4-37 in USEPA 2003 and Table B-2-8 in USEPA 2005: $C_{vpa} = ( Bv_{ag} \times C_v \times VGag ) / d_a$

where:

$C_{vpa}$ - plant concentration due to vapor-phase absorption of air-borne contaminants (pg/g, dry weight basis)

$Bv_{ag}$ - mass-based air-to-plant biotransfer factor (unitless)

$C_v$ - vapor-phase concentration of contaminant in air ($pg/m^3$)

$VG_{ag}$ - empirical correction factor which reduces vegetative concentrations considering that $Bv_{ag}$ was developed for transfer of air-borne contaminants into leaves rather than into bulky aboveground vegetation.

$d_a$ - density of air ($g/m^3$)

atm - atmospheric pressure

**Table 5.3.4**
**Derivation of Exposure Point Concentrations in Aboveground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 3: PLANT CONCENTRATION DUE TO WET PLUS DRY DEPOSITION OF CONTAMINATED PARTICULATES ONTO PLANT MATTER**

| Congener | Contaminant Concentration ($C_p$) (1) pg/m$^3$ | Deposition Velocity ($V_d$) (2) m/yr | Fraction of Particulates Intercepted ($I_j$) (3) unitless | Annual Rainfall (RN) (4) m/yr | Fraction of Particles Retained ($R_w$) (2) unitless | Volumetric Washout Factor ($W_p$) (2) unitless | Deposition Rate ($F_p$) (5) pg/m$^2$-yr | Weathering Constant ($k_w$) (3) 1/yr | Crop Yield ($Y_j$) (3) kg/m$^2$ | Plant Concentration ($C_{ppa}$) (6) pg/g |
|---|---|---|---|---|---|---|---|---|---|---|
| ***DMS1*** | | | | | | | | | | |
| PCB 77 | 8.30E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.03E+03 | 18 | 2.24 | 2.55E-02 |
| PCB 81 | 3.58E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 4.43E+02 | 18 | 2.24 | 1.10E-02 |
| PCB 105 | 4.70E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 5.82E+03 | 18 | 2.24 | 1.44E-01 |
| PCB 114 | 4.34E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 5.38E+02 | 18 | 2.24 | 1.33E-02 |
| PCB 118 | 7.73E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 9.57E+03 | 18 | 2.24 | 2.37E-01 |
| PCB 123 | 6.29E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 7.79E+02 | 18 | 2.24 | 1.93E-02 |
| PCB 126 | 1.08E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.34E+03 | 18 | 2.24 | 3.31E-02 |
| PCB 156 | 1.20E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.48E+03 | 18 | 2.24 | 3.67E-02 |
| PCB 157 | 4.79E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 5.93E+02 | 18 | 2.24 | 1.47E-02 |
| PCB 167 | 2.19E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 2.72E+03 | 18 | 2.24 | 6.74E-02 |
| PCB 169 | 2.68E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 3.32E+03 | 18 | 2.24 | 8.22E-02 |
| PCB 189 | 3.86E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 4.78E+03 | 18 | 2.24 | 1.18E-01 |
| ***MSP*** | | | | | | | | | | |
| PCB 77 | 8.94E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.11E+03 | 18 | 2.24 | 2.75E-02 |
| PCB 81 | 3.11E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 3.85E+02 | 18 | 2.24 | 9.55E-03 |
| PCB 105 | 6.15E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 7.61E+03 | 18 | 2.24 | 1.89E-01 |
| PCB 114 | 3.85E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 4.77E+02 | 18 | 2.24 | 1.18E-02 |
| PCB 118 | 9.66E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.20E+04 | 18 | 2.24 | 2.97E-01 |
| PCB 123 | 7.75E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 9.60E+02 | 18 | 2.24 | 2.38E-02 |
| PCB 126 | 1.13E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.41E+03 | 18 | 2.24 | 3.49E-02 |
| PCB 156 | 1.81E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 2.24E+03 | 18 | 2.24 | 5.55E-02 |
| PCB 157 | 6.94E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 8.60E+02 | 18 | 2.24 | 2.13E-02 |
| PCB 167 | 3.57E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 4.42E+03 | 18 | 2.24 | 1.10E-01 |
| PCB 169 | 6.84E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 8.47E+03 | 18 | 2.24 | 2.10E-01 |
| PCB 189 | 4.06E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 5.03E+03 | 18 | 2.24 | 1.25E-01 |
| ***UMS1*** | | | | | | | | | | |
| PCB 77 | 1.21E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.50E+02 | 18 | 2.24 | 3.71E-03 |
| PCB 81 | 3.08E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 3.82E+02 | 18 | 2.24 | 9.47E-03 |
| PCB 105 | 8.21E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.02E+03 | 18 | 2.24 | 2.52E-02 |
| PCB 114 | 4.01E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 4.96E+02 | 18 | 2.24 | 1.23E-02 |
| PCB 118 | 1.54E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.91E+03 | 18 | 2.24 | 4.73E-02 |
| PCB 123 | 1.41E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.74E+02 | 18 | 2.24 | 4.32E-03 |
| PCB 126 | 1.22E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.51E+03 | 18 | 2.24 | 3.74E-02 |
| PCB 156 | 5.06E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 6.27E+02 | 18 | 2.24 | 1.56E-02 |
| PCB 157 | 1.08E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 1.33E+03 | 18 | 2.24 | 3.30E-02 |
| PCB 167 | 7.69E-03 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 9.52E+02 | 18 | 2.24 | 2.36E-02 |
| PCB 169 | 2.51E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 3.11E+03 | 18 | 2.24 | 7.72E-02 |
| PCB 189 | 4.51E-02 | 315,360 | 0.39 | 0.147 | 0.3 | 5.00E+04 | 5.59E+03 | 18 | 2.24 | 1.39E-01 |

**Table 5.3.4**
**Derivation of Exposure Point Concentrations in Aboveground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 3: PLANT CONCENTRATION DUE TO WET PLUS DRY DEPOSITION OF CONTAMINATED PARTICULATES ONTO PLANT MATTER**

Notes:

(1) Cp = concentration of contaminant in the air x (1 - $F_V$).

(2) Default value from USEPA 2003.

(3) Default value from Table B-2-7 in USEPA 2005.

(4) Site specific value from TRC 1997.

(5) Deposition rate from Equation 4-39 in USEPA 2003: $Fp = C_p \times ( V_d \times I_j + RN \times R_w \times W_p \times I_j )$

where:

Fp - Unit contaminant wet plus dry deposition rate onto plant surfaces (pg/$m^2$-yr)

$C_p$ - air-borne particulate phase contaminant concentration (pg/$m^3$)

$V_d$ - deposition velocity (m/yr)

$I_j$ - fraction of particulates intercepted by crop j during deposition (unitless)

RN - annual rainfall (m/yr)

$R_w$ - fraction of particles retained on vegetation after rainfall (unitless)

$W_p$ - volumetric washout factor for particulates (unitless)

(6) Plant concentration from Equation 4-38 from USEPA 2003: $Cppa = F_p / ( 1000 \times k_w \times Y_j )$

where:

Cppa - plant concentration due to settling of contaminated particulates onto plant matter (pg/g, dry weight basis)

Fp - Unit contaminant wet plus dry deposition rate onto plant surfaces (pg/m2-yr)

$k_w$ - first-order weathering dissipation constant (1/yr)

$Y_j$ - dry matter yield of crop j (kg/$m^2$)

1/1000 - converts pg/kg to pg/g

**Table 5.3.4**
**Derivation of Exposure Point Concentrations in Aboveground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 4: TEC CONCENTRATION IN ABOVEGROUND PRODUCE**

| Congener | Concentration in Aboveground Produce ($C_{abv}$) (1) pg/g | TEF (2) | TEC Concentration (3) pg/g |
|---|---|---|---|
| ***DMS1*** | | | |
| PCB 77 | 1.74E+01 | 0.0001 | 1.74E-03 |
| PCB 81 | 9.09E-02 | 0.0003 | 2.73E-05 |
| PCB 105 | 2.07E+00 | 0.00003 | 6.20E-05 |
| PCB 114 | 3.67E-01 | 0.00003 | 1.10E-05 |
| PCB 118 | 9.84E+00 | 0.00003 | 2.95E-04 |
| PCB 123 | 5.32E-01 | 0.00003 | 1.60E-05 |
| PCB 126 | 3.90E-01 | 0.1 | 3.90E-02 |
| PCB 156 | 1.78E+00 | 0.00003 | 5.33E-05 |
| PCB 157 | 2.48E-01 | 0.00003 | 7.45E-06 |
| PCB 167 | 8.64E-01 | 0.00003 | 2.59E-05 |
| PCB 169 | 8.62E-01 | 0.03 | 2.59E-02 |
| PCB 189 | 2.55E+00 | 0.00003 | 7.65E-05 |
| *Total Congeners:* (4) | | | **6.71E-02** |
| ***MSP*** | | | |
| PCB 77 | 1.87E+01 | 0.0001 | 1.87E-03 |
| PCB 81 | 7.89E-02 | 0.0003 | 2.37E-05 |
| PCB 105 | 2.71E+00 | 0.00003 | 8.12E-05 |
| PCB 114 | 3.26E-01 | 0.00003 | 9.77E-06 |
| PCB 118 | 1.23E+01 | 0.00003 | 3.69E-04 |
| PCB 123 | 6.55E-01 | 0.00003 | 1.96E-05 |
| PCB 126 | 4.10E-01 | 0.1 | 4.10E-02 |
| PCB 156 | 2.69E+00 | 0.00003 | 8.06E-05 |
| PCB 157 | 3.60E-01 | 0.00003 | 1.08E-05 |
| PCB 167 | 1.41E+00 | 0.00003 | 4.22E-05 |
| PCB 169 | 2.20E+00 | 0.03 | 6.60E-02 |
| PCB 189 | 2.68E+00 | 0.00003 | 8.05E-05 |
| *Total Congeners:* (4) | | | **1.10E-01** |
| ***UMS1*** | | | |
| PCB 77 | 2.53E+00 | 0.0001 | 2.53E-04 |
| PCB 81 | 7.82E-02 | 0.0003 | 2.35E-05 |
| PCB 105 | 3.62E-01 | 0.00003 | 1.09E-05 |
| PCB 114 | 3.39E-01 | 0.00003 | 1.02E-05 |
| PCB 118 | 1.96E+00 | 0.00003 | 5.88E-05 |
| PCB 123 | 1.19E-01 | 0.00003 | 3.57E-06 |
| PCB 126 | 4.40E-01 | 0.1 | 4.40E-02 |
| PCB 156 | 7.53E-01 | 0.00003 | 2.26E-05 |
| PCB 157 | 5.57E-01 | 0.00003 | 1.67E-05 |
| PCB 167 | 3.03E-01 | 0.00003 | 9.08E-06 |
| PCB 169 | 8.09E-01 | 0.03 | 2.43E-02 |
| PCB 189 | 2.98E+00 | 0.00003 | 8.95E-05 |
| *Total Congeners:* (4) | | | **6.88E-02** |

**Table 5.3.4**
**Derivation of Exposure Point Concentrations in Aboveground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Concentration in aboveground produce from Equation 4-36 in USEPA 2003: $C_{abv} = C_{vpa} + C_{ppa}$

(2) Human TEFs from USEPA, September 2009.

(3) $C_{abv}$ is multiplied by its TEF to obtain the TEC in aboveground produce (pg/g, dry weight)

(4) Total Congeners represents the sum of TECs in aboveground produce for the exposure area.

**Table 5.3.5**
**Derivation of Exposure Point Concentration in Belowground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener [1] | Log $K_{ow}$ [2] | Fraction Organic Carbon ($f_{oc}$) [3] unitless | Soil Organic Carbon-Water Partition Coefficient ($K_{oc}$) [4] L/kg | Soil-Water Partition Coefficient ($Kd_s$) [5] L/kg | Root Concentration Factor (RCF) [6] (mg/kg DW plant)/ (mg/L soil water) | Bioconcentration Factor ($Br_{rootveg}$) [7] (mg/kg DW plant)/ (mg/kg soil) | Concentration in Soil (Cs) [8] mg/kg | Correction Factor ($VG_{rootveg}$) [9] | Concentration in Belowground Produce ($Pr_{bg}$) [10] mg/kg DW | TEF [11] | EPC (TEC in Belowground Produce) [12] mg/kg DW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | | | |
| PCB 77 | 6.63 | 0.01 | 7.81E+04 | 7.81E+02 | 3.85E+03 | 4.93E+00 | 1.1E-05 | 0.01 | 5.42E-07 | 0.0001 | 5.42E-11 |
| PCB 81 | 6.34 | 0.01 | 7.81E+04 | 7.81E+02 | 2.30E+03 | 2.95E+00 | 1.3E-06 | 0.01 | 3.83E-08 | 0.0003 | 1.15E-11 |
| PCB 105 | 6.79 | 0.01 | 1.31E+05 | 1.31E+03 | 5.11E+03 | 3.90E+00 | 3.3E-05 | 0.01 | 1.29E-06 | 0.00003 | 3.86E-11 |
| PCB 114 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 1.6E-06 | 0.01 | 8.74E-08 | 0.00003 | 2.62E-12 |
| PCB 118 | 7.12 | 0.01 | 1.28E+05 | 1.28E+03 | 9.17E+03 | 7.16E+00 | 5.1E-05 | 0.01 | 3.65E-06 | 0.00003 | 1.10E-10 |
| PCB 123 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 5.4E-06 | 0.01 | 2.95E-07 | 0.00003 | 8.85E-12 |
| PCB 126 | 6.98 | 0.01 | 1.28E+05 | 1.28E+03 | 7.15E+03 | 5.59E+00 | 1.5E-06 | 0.01 | 8.38E-08 | 0.1 | 8.38E-09 |
| PCB 156 | 7.60 | 0.01 | 2.14E+05 | 2.14E+03 | 2.15E+04 | 1.00E+01 | 1.3E-05 | 0.01 | 1.30E-06 | 0.00003 | 3.91E-11 |
| PCB 157 | 7.62 | 0.01 | 2.14E+05 | 2.14E+03 | 2.23E+04 | 1.04E+01 | 2.0E-06 | 0.01 | 2.08E-07 | 0.00003 | 6.24E-12 |
| PCB 167 | 7.50 | 0.01 | 2.09E+05 | 2.09E+03 | 1.80E+04 | 8.61E+00 | 5.2E-06 | 0.01 | 4.48E-07 | 0.00003 | 1.34E-11 |
| PCB 169 | 7.41 | 0.01 | 2.09E+05 | 2.09E+03 | 1.53E+04 | 7.34E+00 | 1.1E-06 | 0.01 | 8.07E-08 | 0.03 | 2.42E-09 |
| PCB 189 | 8.27 | 0.01 | 3.50E+05 | 3.50E+03 | 7.05E+04 | 2.01E+01 | 4.3E-06 | 0.01 | 8.66E-07 | 0.00003 | 2.60E-11 |
| *Total Congeners:* [13] | | | | | | | | | | | 1.11E-08 |
| ***South*** | | | | | | | | | | | |
| PCB 77 | 6.63 | 0.01 | 7.81E+04 | 7.81E+02 | 3.85E+03 | 4.93E+00 | 5.3E-06 | 0.01 | 2.61E-07 | 0.0001 | 2.61E-11 |
| PCB 81 | 6.34 | 0.01 | 7.81E+04 | 7.81E+02 | 2.30E+03 | 2.95E+00 | 6.0E-07 | 0.01 | 1.77E-08 | 0.0003 | 5.30E-12 |
| PCB 105 | 6.79 | 0.01 | 1.31E+05 | 1.31E+03 | 5.11E+03 | 3.90E+00 | 2.1E-05 | 0.01 | 8.19E-07 | 0.00003 | 2.46E-11 |
| PCB 114 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 5.0E-06 | 0.01 | 2.73E-07 | 0.00003 | 8.19E-12 |
| PCB 118 | 7.12 | 0.01 | 1.28E+05 | 1.28E+03 | 9.17E+03 | 7.16E+00 | 2.9E-05 | 0.01 | 2.08E-06 | 0.00003 | 6.23E-11 |
| PCB 123 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 1.9E-06 | 0.01 | 1.04E-07 | 0.00003 | 3.11E-12 |
| PCB 126 | 6.98 | 0.01 | 1.28E+05 | 1.28E+03 | 7.15E+03 | 5.59E+00 | 1.2E-06 | 0.01 | 6.71E-08 | 0.1 | 6.71E-09 |
| PCB 156 | 7.60 | 0.01 | 2.14E+05 | 2.14E+03 | 2.15E+04 | 1.00E+01 | 6.8E-06 | 0.01 | 6.82E-07 | 0.00003 | 2.05E-11 |
| PCB 157 | 7.62 | 0.01 | 2.14E+05 | 2.14E+03 | 2.23E+04 | 1.04E+01 | 1.8E-06 | 0.01 | 1.87E-07 | 0.00003 | 5.62E-12 |
| PCB 167 | 7.50 | 0.01 | 2.09E+05 | 2.09E+03 | 1.80E+04 | 8.61E+00 | 3.0E-06 | 0.01 | 2.58E-07 | 0.00003 | 7.75E-12 |
| PCB 169 | 7.41 | 0.01 | 2.09E+05 | 2.09E+03 | 1.53E+04 | 7.34E+00 | 5.0E-06 | 0.01 | 3.67E-07 | 0.03 | 1.10E-08 |
| PCB 189 | 8.27 | 0.01 | 3.50E+05 | 3.50E+03 | 7.05E+04 | 2.01E+01 | 1.6E-06 | 0.01 | 3.22E-07 | 0.00003 | 9.66E-12 |
| *Total Congeners:* [13] | | | | | | | | | | | 1.79E-08 |

**Table 5.3.5**
**Derivation of Exposure Point Concentration in Belowground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener (1) | Log $K_{ow}$ (2) | Fraction Organic Carbon ($f_{oc}$) (3) unitless | Soil Organic Carbon-Water Partition Coefficient ($K_{oc}$) (4) L/kg | Soil-Water Partition Coefficient ($Kd_s$) (5) L/kg | Root Concentration Factor (RCF) (6) (mg/kg DW plant)/ (mg/L soil water) | Bioconcentration Factor ($Br_{rootveg}$) (7) (mg/kg DW plant)/ (mg/kg soil) | Concentration in Soil (Cs) (8) mg/kg | Correction Factor ($VG_{rootveg}$) (9) | Concentration in Belowground Produce ($Pr_{bg}$) (10) mg/kg DW | TEF (11) | EPC (TEC in Belowground Produce) (12) mg/kg DW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Southwest*** | | | | | | | | | | | |
| PCB 77 | 6.63 | 0.01 | 7.81E+04 | 7.81E+02 | 3.85E+03 | 4.93E+00 | 2.6E-06 | 0.01 | 1.28E-07 | 0.0001 | 1.28E-11 |
| PCB 81 | 6.34 | 0.01 | 7.81E+04 | 7.81E+02 | 2.30E+03 | 2.95E+00 | 5.0E-06 | 0.01 | 1.47E-07 | 0.0003 | 4.42E-11 |
| PCB 105 | 6.79 | 0.01 | 1.31E+05 | 1.31E+03 | 5.11E+03 | 3.90E+00 | 1.1E-05 | 0.01 | 4.29E-07 | 0.00003 | 1.29E-11 |
| PCB 114 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 1.0E-06 | 0.01 | 5.46E-08 | 0.00003 | 1.64E-12 |
| PCB 118 | 7.12 | 0.01 | 1.28E+05 | 1.28E+03 | 9.17E+03 | 7.16E+00 | 1.5E-05 | 0.01 | 1.07E-06 | 0.00003 | 3.22E-11 |
| PCB 123 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 1.2E-06 | 0.01 | 6.55E-08 | 0.00003 | 1.97E-12 |
| PCB 126 | 6.98 | 0.01 | 1.28E+05 | 1.28E+03 | 7.15E+03 | 5.59E+00 | 5.0E-06 | 0.01 | 2.79E-07 | 0.1 | 2.79E-08 |
| PCB 156 | 7.60 | 0.01 | 2.14E+05 | 2.14E+03 | 2.15E+04 | 1.00E+01 | 3.9E-06 | 0.01 | 3.91E-07 | 0.00003 | 1.17E-11 |
| PCB 157 | 7.62 | 0.01 | 2.14E+05 | 2.14E+03 | 2.23E+04 | 1.04E+01 | 9.2E-07 | 0.01 | 9.57E-08 | 0.00003 | 2.87E-12 |
| PCB 167 | 7.50 | 0.01 | 2.09E+05 | 2.09E+03 | 1.80E+04 | 8.61E+00 | 1.9E-06 | 0.01 | 1.64E-07 | 0.00003 | 4.91E-12 |
| PCB 169 | 7.41 | 0.01 | 2.09E+05 | 2.09E+03 | 1.53E+04 | 7.34E+00 | 5.0E-06 | 0.01 | 3.67E-07 | 0.03 | 1.10E-08 |
| PCB 189 | 8.27 | 0.01 | 3.50E+05 | 3.50E+03 | 7.05E+04 | 2.01E+01 | 1.2E-06 | 0.01 | 2.42E-07 | 0.00003 | 7.25E-12 |
| *Total Congeners:* (13) | | | | | | | | | | | 3.91E-08 |
| ***West*** | | | | | | | | | | | |
| PCB 77 | 6.63 | 0.01 | 7.81E+04 | 7.81E+02 | 3.85E+03 | 4.93E+00 | 2.3E-06 | 0.01 | 1.13E-07 | 0.0001 | 1.13E-11 |
| PCB 81 | 6.34 | 0.01 | 7.81E+04 | 7.81E+02 | 2.30E+03 | 2.95E+00 | 6.0E-07 | 0.01 | 1.77E-08 | 0.0003 | 5.30E-12 |
| PCB 105 | 6.79 | 0.01 | 1.31E+05 | 1.31E+03 | 5.11E+03 | 3.90E+00 | 1.0E-05 | 0.01 | 3.90E-07 | 0.00003 | 1.17E-11 |
| PCB 114 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 5.0E-06 | 0.01 | 2.73E-07 | 0.00003 | 8.19E-12 |
| PCB 118 | 7.12 | 0.01 | 1.28E+05 | 1.28E+03 | 9.17E+03 | 7.16E+00 | 1.9E-05 | 0.01 | 1.36E-06 | 0.00003 | 4.08E-11 |
| PCB 123 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 1.5E-06 | 0.01 | 8.19E-08 | 0.00003 | 2.46E-12 |
| PCB 126 | 6.98 | 0.01 | 1.28E+05 | 1.28E+03 | 7.15E+03 | 5.59E+00 | 8.0E-07 | 0.01 | 4.47E-08 | 0.1 | 4.47E-09 |
| PCB 156 | 7.60 | 0.01 | 2.14E+05 | 2.14E+03 | 2.15E+04 | 1.00E+01 | 3.9E-06 | 0.01 | 3.91E-07 | 0.00003 | 1.17E-11 |
| PCB 157 | 7.62 | 0.01 | 2.14E+05 | 2.14E+03 | 2.23E+04 | 1.04E+01 | 1.0E-06 | 0.01 | 1.04E-07 | 0.00003 | 3.12E-12 |
| PCB 167 | 7.50 | 0.01 | 2.09E+05 | 2.09E+03 | 1.80E+04 | 8.61E+00 | 2.2E-06 | 0.01 | 1.89E-07 | 0.00003 | 5.68E-12 |
| PCB 169 | 7.41 | 0.01 | 2.09E+05 | 2.09E+03 | 1.53E+04 | 7.34E+00 | 5.0E-06 | 0.01 | 3.67E-07 | 0.03 | 1.10E-08 |
| PCB 189 | 8.27 | 0.01 | 3.50E+05 | 3.50E+03 | 7.05E+04 | 2.01E+01 | 1.1E-06 | 0.01 | 2.21E-07 | 0.00003 | 6.64E-12 |
| *Total Congeners:* (13) | | | | | | | | | | | 1.56E-08 |

**Table 5.3.5**
**Derivation of Exposure Point Concentration in Belowground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener [1] | Log $K_{ow}$ [2] | Fraction Organic Carbon ($f_{oc}$) [3] unitless | Soil Organic Carbon-Water Partition Coefficient ($K_{oc}$) [4] L/kg | Soil-Water Partition Coefficient ($Kd_s$) [5] L/kg | Root Concentration Factor (RCF) [6] (mg/kg DW plant)/ (mg/L soil water) | Bioconcentration Factor ($Br_{rootveg}$) [7] (mg/kg DW plant)/ (mg/kg soil) | Concentration in Soil (Cs) [8] mg/kg | Correction Factor ($VG_{rootveg}$) [9] | Concentration in Belowground Produce ($Pr_{bg}$) [10] mg/kg DW | TEF [11] | EPC (TEC in Belowground Produce) [12] mg/kg DW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | | | |
| PCB 77 | 6.63 | 0.01 | 7.81E+04 | 7.81E+02 | 3.85E+03 | 4.93E+00 | 3.0E-06 | 0.01 | 1.48E-07 | 0.0001 | 1.48E-11 |
| PCB 81 | 6.34 | 0.01 | 7.81E+04 | 7.81E+02 | 2.30E+03 | 2.95E+00 | 5.0E-07 | 0.01 | 1.47E-08 | 0.0003 | 4.42E-12 |
| PCB 105 | 6.79 | 0.01 | 1.31E+05 | 1.31E+03 | 5.11E+03 | 3.90E+00 | 9.5E-06 | 0.01 | 3.70E-07 | 0.00003 | 1.11E-11 |
| PCB 114 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 5.0E-06 | 0.01 | 2.73E-07 | 0.00003 | 8.19E-12 |
| PCB 118 | 7.12 | 0.01 | 1.28E+05 | 1.28E+03 | 9.17E+03 | 7.16E+00 | 1.8E-05 | 0.01 | 1.29E-06 | 0.00003 | 3.87E-11 |
| PCB 123 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 1.3E-06 | 0.01 | 7.10E-08 | 0.00003 | 2.13E-12 |
| PCB 126 | 6.98 | 0.01 | 1.28E+05 | 1.28E+03 | 7.15E+03 | 5.59E+00 | 1.2E-06 | 0.01 | 6.71E-08 | 0.1 | 6.71E-09 |
| PCB 156 | 7.60 | 0.01 | 2.14E+05 | 2.14E+03 | 2.15E+04 | 1.00E+01 | 3.2E-06 | 0.01 | 3.21E-07 | 0.00003 | 9.64E-12 |
| PCB 157 | 7.62 | 0.01 | 2.14E+05 | 2.14E+03 | 2.23E+04 | 1.04E+01 | 1.0E-06 | 0.01 | 1.04E-07 | 0.00003 | 3.12E-12 |
| PCB 167 | 7.50 | 0.01 | 2.09E+05 | 2.09E+03 | 1.80E+04 | 8.61E+00 | 6.3E-06 | 0.01 | 5.42E-07 | 0.00003 | 1.63E-11 |
| PCB 169 | 7.41 | 0.01 | 2.09E+05 | 2.09E+03 | 1.53E+04 | 7.34E+00 | 5.0E-06 | 0.01 | 3.67E-07 | 0.03 | 1.10E-08 |
| PCB 189 | 8.27 | 0.01 | 3.50E+05 | 3.50E+03 | 7.05E+04 | 2.01E+01 | 4.0E-07 | 0.01 | 8.05E-08 | 0.00003 | 2.42E-12 |
| *Total Congeners:* [13] | | | | | | | | | | | 1.78E-08 |
| ***North*** | | | | | | | | | | | |
| PCB 77 | 6.63 | 0.01 | 7.81E+04 | 7.81E+02 | 3.85E+03 | 4.93E+00 | 2.8E-06 | 0.01 | 1.38E-07 | 0.0001 | 1.38E-11 |
| PCB 81 | 6.34 | 0.01 | 7.81E+04 | 7.81E+02 | 2.30E+03 | 2.95E+00 | 3.0E-07 | 0.01 | 8.84E-09 | 0.0003 | 2.65E-12 |
| PCB 105 | 6.79 | 0.01 | 1.31E+05 | 1.31E+03 | 5.11E+03 | 3.90E+00 | 1.2E-05 | 0.01 | 4.68E-07 | 0.00003 | 1.40E-11 |
| PCB 114 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 5.0E-06 | 0.01 | 2.73E-07 | 0.00003 | 8.19E-12 |
| PCB 118 | 7.12 | 0.01 | 1.28E+05 | 1.28E+03 | 9.17E+03 | 7.16E+00 | 1.9E-05 | 0.01 | 1.36E-06 | 0.00003 | 4.08E-11 |
| PCB 123 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 1.5E-06 | 0.01 | 8.19E-08 | 0.00003 | 2.46E-12 |
| PCB 126 | 6.98 | 0.01 | 1.28E+05 | 1.28E+03 | 7.15E+03 | 5.59E+00 | 7.0E-07 | 0.01 | 3.91E-08 | 0.1 | 3.91E-09 |
| PCB 156 | 7.60 | 0.01 | 2.14E+05 | 2.14E+03 | 2.15E+04 | 1.00E+01 | 3.0E-06 | 0.01 | 3.01E-07 | 0.00003 | 9.03E-12 |
| PCB 157 | 7.62 | 0.01 | 2.14E+05 | 2.14E+03 | 2.23E+04 | 1.04E+01 | 1.0E-06 | 0.01 | 1.04E-07 | 0.00003 | 3.12E-12 |
| PCB 167 | 7.50 | 0.01 | 2.09E+05 | 2.09E+03 | 1.80E+04 | 8.61E+00 | 6.6E-06 | 0.01 | 5.68E-07 | 0.00003 | 1.70E-11 |
| PCB 169 | 7.41 | 0.01 | 2.09E+05 | 2.09E+03 | 1.53E+04 | 7.34E+00 | 5.0E-06 | 0.01 | 3.67E-07 | 0.03 | 1.10E-08 |
| PCB 189 | 8.27 | 0.01 | 3.50E+05 | 3.50E+03 | 7.05E+04 | 2.01E+01 | 7.0E-07 | 0.01 | 1.41E-07 | 0.00003 | 4.23E-12 |
| *Total Congeners:* [13] | | | | | | | | | | | 1.50E-08 |

**Table 5.3.5**
**Derivation of Exposure Point Concentration in Belowground Produce**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener (1) | Log $K_{ow}$ (2) | Fraction Organic Carbon ($f_{oc}$) (3) unitless | Soil Organic Carbon-Water Partition Coefficient ($K_{oc}$) (4) L/kg | Soil-Water Partition Coefficient ($Kd_s$) (5) L/kg | Root Concentration Factor (RCF) (6) (mg/kg DW plant)/(mg/L soil water) | Bioconcentration Factor ($Br_{rootveg}$) (7) (mg/kg DW plant)/(mg/kg soil) | Concentration in Soil (Cs) (8) mg/kg | Correction Factor ($VG_{rootveg}$) (9) | Concentration in Belowground Produce ($Pr_{bg}$) (10) mg/kg DW | TEF (11) | EPC (TEC in Belowground Produce) (12) mg/kg DW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Northeast*** | | | | | | | | | | | |
| PCB 77 | 6.63 | 0.01 | 7.81E+04 | 7.81E+02 | 3.85E+03 | 4.93E+00 | 1.5E-05 | 0.01 | 7.39E-07 | 0.0001 | 7.39E-11 |
| PCB 81 | 6.34 | 0.01 | 7.81E+04 | 7.81E+02 | 2.30E+03 | 2.95E+00 | 1.4E-06 | 0.01 | 4.12E-08 | 0.0003 | 1.24E-11 |
| PCB 105 | 6.79 | 0.01 | 1.31E+05 | 1.31E+03 | 5.11E+03 | 3.90E+00 | 6.5E-05 | 0.01 | 2.53E-06 | 0.00003 | 7.60E-11 |
| PCB 114 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 2.0E-06 | 0.01 | 1.09E-07 | 0.00003 | 3.28E-12 |
| PCB 118 | 7.12 | 0.01 | 1.28E+05 | 1.28E+03 | 9.17E+03 | 7.16E+00 | 1.0E-04 | 0.01 | 7.16E-06 | 0.00003 | 2.15E-10 |
| PCB 123 | 6.98 | 0.01 | 1.31E+05 | 1.31E+03 | 7.15E+03 | 5.46E+00 | 8.7E-06 | 0.01 | 4.75E-07 | 0.00003 | 1.43E-11 |
| PCB 126 | 6.98 | 0.01 | 1.28E+05 | 1.28E+03 | 7.15E+03 | 5.59E+00 | 5.9E-06 | 0.01 | 3.30E-07 | 0.1 | 3.30E-08 |
| PCB 156 | 7.60 | 0.01 | 2.14E+05 | 2.14E+03 | 2.15E+04 | 1.00E+01 | 2.9E-05 | 0.01 | 2.91E-06 | 0.00003 | 8.73E-11 |
| PCB 157 | 7.62 | 0.01 | 2.14E+05 | 2.14E+03 | 2.23E+04 | 1.04E+01 | 6.9E-06 | 0.01 | 7.18E-07 | 0.00003 | 2.15E-11 |
| PCB 167 | 7.50 | 0.01 | 2.09E+05 | 2.09E+03 | 1.80E+04 | 8.61E+00 | 1.6E-05 | 0.01 | 1.38E-06 | 0.00003 | 4.13E-11 |
| PCB 169 | 7.41 | 0.01 | 2.09E+05 | 2.09E+03 | 1.53E+04 | 7.34E+00 | 5.0E-06 | 0.01 | 3.67E-07 | 0.03 | 1.10E-08 |
| PCB 189 | 8.27 | 0.01 | 3.50E+05 | 3.50E+03 | 7.05E+04 | 2.01E+01 | 9.3E-06 | 0.01 | 1.87E-06 | 0.00003 | 5.62E-11 |
| *Total Congeners:* (13) | | | | | | | | | | | 4.46E-08 |

Notes:
(1) Congeners in surface soil.
(2) Log $K_{ow}$ (octanol-water partition coefficient) source: ORNL 2009.
(3) Default value from USEPA 2005.
(4) Value from Oak Ridge National Laboratory Risk Assessment Information System accessed online at http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem.
(5) Calculated: $Kd_s = f_{oc} \times K_{oc}$
(6) Basis for RCF : Equation from USEPA 2005: log RCF = 0.77 (log $K_{ow}$) - 1.52.
(7) Soil to plant bioconcentration factor for belowground produce calculated: $Br_{rootveg} = RCF/Kd_s$
(8) Concentration in composite of ten samples from each exposure area.
(9) Correction factor for belowground produce ($VGroot_{veg}$) is from USEPA 2005.
(10) Concentration in belowground produce calculated using equation from USEPA 2005: $Pr_{bg} = Cs \times Br_{rootveg} \times VG_{rootveg}$
(11) Human TEFs from USEPA September 2009.
(12) $Pr_{bg}$ is multiplied by the congener-specific TEF to obtain the TEC in belowground produce (mg/kg DW).
(13) Total congeners represents the sum of TECs in belowground produce for an exposure area.

DW - dry weight
EPC - exposure point concentration
PCB - polychlorinated biphenyl
TEC - toxicity equivalence concentration
TEF - toxicity equivalence factor

**Table 5.3.6**
**Derivation of Exposure Point Concentrations in Beef Tissue**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener (1) | Fraction of Plant and Soil ( F ) (2) | Quantity of Plant ( Qp ) (3) kg DW/day | Concentration in Plant ( P (4) ) mg/kg DW | Quantity of Soil ( Qs ) (5) kg/day | Concentration in Soil ( Cs (4) ) mg/kg | Soil Bioavailability Factor ( Bs ) (5) | Log Kow (6) | Biotransfer Factor ( $Ba_{beef}$ ) (7) day/kg FW | MF (5) | Concentration in Beef ( $A_{beef}$ ) (8) mg/kg FW | TEF (9) | EPC (TEC Conc. in Beef) (10) mg/kg FW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 11.77 | 9.7E-05 | 0.5 | 1.1E-05 | 1 | 6.63 | 0.0289 | 1 | 8.29E-06 | 0.0001 | 8.29E-10 |
| PCB 81 | 0.25 | 11.77 | 1.4E-05 | 0.5 | 1.3E-06 | 1 | 6.34 | 0.0334 | 1 | 1.36E-06 | 0.0003 | 4.08E-10 |
| PCB 105 | 0.25 | 11.77 | 1.5E-04 | 0.5 | 3.3E-05 | 1 | 6.79 | 0.0263 | 1 | 1.17E-05 | 0.00003 | 3.51E-10 |
| PCB 114 | 0.25 | 11.77 | 8.7E-06 | 0.5 | 1.6E-06 | 1 | 6.98 | 0.0231 | 1 | 5.96E-07 | 0.00003 | 1.79E-11 |
| PCB 118 | 0.25 | 11.77 | 2.7E-04 | 0.5 | 5.1E-05 | 1 | 7.12 | 0.0208 | 1 | 1.67E-05 | 0.00003 | 5.00E-10 |
| PCB 123 | 0.25 | 11.77 | 1.7E-05 | 0.5 | 5.4E-06 | 1 | 6.98 | 0.0231 | 1 | 1.19E-06 | 0.00003 | 3.56E-11 |
| PCB 126 | 0.25 | 11.77 | 1.3E-05 | 0.5 | 1.5E-06 | 1 | 6.98 | 0.0231 | 1 | 8.59E-07 | 0.1 | 8.59E-08 |
| PCB 156 | 0.25 | 11.77 | 3.3E-05 | 0.5 | 1.3E-05 | 1 | 7.6 | 0.0136 | 1 | 1.35E-06 | 0.00003 | 4.06E-11 |
| PCB 157 | 0.25 | 11.77 | 6.8E-06 | 0.5 | 2.0E-06 | 1 | 7.62 | 0.0133 | 1 | 2.69E-07 | 0.00003 | 8.08E-12 |
| PCB 167 | 0.25 | 11.77 | 1.7E-05 | 0.5 | 5.2E-06 | 1 | 7.5 | 0.0150 | 1 | 7.65E-07 | 0.00003 | 2.29E-11 |
| PCB 169 | 0.25 | 11.77 | 7.5E-07 | 0.5 | 1.1E-06 | 1 | 7.41 | 0.0163 | 1 | 3.80E-08 | 0.03 | 1.14E-09 |
| PCB 189 | 0.25 | 11.77 | 8.6E-06 | 0.5 | 4.3E-06 | 1 | 8.27 | 0.0063 | 1 | 1.63E-07 | 0.00003 | 4.88E-12 |
| *Total Congeners:* (11) | | | | | | | | | | | | 8.93E-08 |
| ***South*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 11.77 | 7.0E-05 | 0.5 | 5.3E-06 | 1 | 6.63 | 0.0289 | 1 | 6.00E-06 | 0.0001 | 6.00E-10 |
| PCB 81 | 0.25 | 11.77 | 6.5E-06 | 0.5 | 6.0E-07 | 1 | 6.34 | 0.0334 | 1 | 6.40E-07 | 0.0003 | 1.92E-10 |
| PCB 105 | 0.25 | 11.77 | 1.3E-04 | 0.5 | 2.1E-05 | 1 | 6.79 | 0.0263 | 1 | 1.01E-05 | 0.00003 | 3.04E-10 |
| PCB 114 | 0.25 | 11.77 | 5.4E-06 | 0.5 | 5.0E-06 | 1 | 6.98 | 0.0231 | 1 | 3.82E-07 | 0.00003 | 1.15E-11 |
| PCB 118 | 0.25 | 11.77 | 1.8E-04 | 0.5 | 2.9E-05 | 1 | 7.12 | 0.0208 | 1 | 1.11E-05 | 0.00003 | 3.33E-10 |
| PCB 123 | 0.25 | 11.77 | 7.3E-06 | 0.5 | 1.9E-06 | 1 | 6.98 | 0.0231 | 1 | 5.05E-07 | 0.00003 | 1.51E-11 |
| PCB 126 | 0.25 | 11.77 | 7.1E-06 | 0.5 | 1.2E-06 | 1 | 6.98 | 0.0231 | 1 | 4.86E-07 | 0.1 | 4.86E-08 |
| PCB 156 | 0.25 | 11.77 | 2.1E-05 | 0.5 | 6.8E-06 | 1 | 7.6 | 0.0136 | 1 | 8.50E-07 | 0.00003 | 2.55E-11 |
| PCB 157 | 0.25 | 11.77 | 4.8E-06 | 0.5 | 1.8E-06 | 1 | 7.62 | 0.0133 | 1 | 1.91E-07 | 0.00003 | 5.72E-12 |
| PCB 167 | 0.25 | 11.77 | 2.4E-05 | 0.5 | 3.0E-06 | 1 | 7.5 | 0.0150 | 1 | 1.06E-06 | 0.00003 | 3.19E-11 |
| PCB 169 | 0.25 | 11.77 | 6.6E-07 | 0.5 | 5.0E-06 | 1 | 7.41 | 0.0163 | 1 | 4.17E-08 | 0.03 | 1.25E-09 |
| PCB 189 | 0.25 | 11.77 | 1.2E-06 | 0.5 | 1.6E-06 | 1 | 8.27 | 0.0063 | 1 | 2.24E-08 | 0.00003 | 6.73E-13 |
| *Total Congeners:* (11) | | | | | | | | | | | | 5.14E-08 |
| ***Southwest*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 11.77 | 9.2E-06 | 0.5 | 2.6E-06 | 1 | 6.63 | 0.0289 | 1 | 7.94E-07 | 0.0001 | 7.94E-11 |
| PCB 81 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-06 | 1 | 6.34 | 0.0334 | 1 | 1.24E-07 | 0.0003 | 3.72E-11 |
| PCB 105 | 0.25 | 11.77 | 1.9E-05 | 0.5 | 1.1E-05 | 1 | 6.79 | 0.0263 | 1 | 1.52E-06 | 0.00003 | 4.57E-11 |
| PCB 114 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 1.0E-06 | 1 | 6.98 | 0.0231 | 1 | 7.43E-08 | 0.00003 | 2.23E-12 |
| PCB 118 | 0.25 | 11.77 | 2.9E-05 | 0.5 | 1.5E-05 | 1 | 7.12 | 0.0208 | 1 | 1.82E-06 | 0.00003 | 5.47E-11 |
| PCB 123 | 0.25 | 11.77 | 1.6E-06 | 0.5 | 1.2E-06 | 1 | 6.98 | 0.0231 | 1 | 1.13E-07 | 0.00003 | 3.40E-12 |
| PCB 126 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-06 | 1 | 6.98 | 0.0231 | 1 | 8.59E-08 | 0.1 | 8.59E-09 |
| PCB 156 | 0.25 | 11.77 | 4.2E-06 | 0.5 | 3.9E-06 | 1 | 7.6 | 0.0136 | 1 | 1.73E-07 | 0.00003 | 5.19E-12 |
| PCB 157 | 0.25 | 11.77 | 1.9E-06 | 0.5 | 9.2E-07 | 1 | 7.62 | 0.0133 | 1 | 7.77E-08 | 0.00003 | 2.33E-12 |
| PCB 167 | 0.25 | 11.77 | 1.0E-05 | 0.5 | 1.9E-06 | 1 | 7.5 | 0.0150 | 1 | 4.63E-07 | 0.00003 | 1.39E-11 |
| PCB 169 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-06 | 1 | 7.41 | 0.0163 | 1 | 6.05E-08 | 0.03 | 1.81E-09 |
| PCB 189 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 1.2E-06 | 1 | 8.27 | 0.0063 | 1 | 2.03E-08 | 0.00003 | 6.09E-13 |
| *Total Congeners:* (11) | | | | | | | | | | | | 1.06E-08 |

**Table 5.3.6**
**Derivation of Exposure Point Concentrations in Beef Tissue**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener [1] | Fraction of Plant and Soil ( F ) [2] | Quantity of Plant ( Qp ) [3] kg DW/day | Concentration in Plant ( P [4] ) mg/kg DW | Quantity of Soil ( Qs ) [5] kg/day | Concentration in Soil ( Cs [4] ) mg/kg | Soil Bioavailability Factor ( Bs ) [5] | Log Kow [6] | Biotransfer Factor ( $Ba_{beef}$ ) [7] day/kg FW | MF [5] | Concentration in Beef ( $A_{beef}$ ) [8] mg/kg FW | TEF [9] | EPC (TEC Conc. in Beef) [10] mg/kg FW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***West*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 11.77 | 1.2E-05 | 0.5 | 2.3E-06 | 1 | 6.63 | 0.0289 | 1 | 9.94E-07 | 0.0001 | 9.94E-11 |
| PCB 81 | 0.25 | 11.77 | 1.7E-06 | 0.5 | 6.0E-07 | 1 | 6.34 | 0.0334 | 1 | 1.68E-07 | 0.0003 | 5.03E-11 |
| PCB 105 | 0.25 | 11.77 | 1.9E-05 | 0.5 | 1.0E-05 | 1 | 6.79 | 0.0263 | 1 | 1.53E-06 | 0.00003 | 4.59E-11 |
| PCB 114 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-06 | 1 | 6.98 | 0.0231 | 1 | 8.93E-08 | 0.00003 | 2.68E-12 |
| PCB 118 | 0.25 | 11.77 | 3.0E-05 | 0.5 | 1.9E-05 | 1 | 7.12 | 0.0208 | 1 | 1.86E-06 | 0.00003 | 5.59E-11 |
| PCB 123 | 0.25 | 11.77 | 1.9E-06 | 0.5 | 1.5E-06 | 1 | 6.98 | 0.0231 | 1 | 1.32E-07 | 0.00003 | 3.95E-12 |
| PCB 126 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 8.0E-07 | 1 | 6.98 | 0.0231 | 1 | 7.72E-08 | 0.1 | 7.72E-09 |
| PCB 156 | 0.25 | 11.77 | 3.6E-06 | 0.5 | 3.9E-06 | 1 | 7.6 | 0.0136 | 1 | 1.50E-07 | 0.00003 | 4.50E-12 |
| PCB 157 | 0.25 | 11.77 | 8.0E-07 | 0.5 | 1.0E-06 | 1 | 7.62 | 0.0133 | 1 | 3.29E-08 | 0.00003 | 9.86E-13 |
| PCB 167 | 0.25 | 11.77 | 8.1E-06 | 0.5 | 2.2E-06 | 1 | 7.5 | 0.0150 | 1 | 3.59E-07 | 0.00003 | 1.08E-11 |
| PCB 169 | 0.25 | 11.77 | 4.8E-07 | 0.5 | 5.0E-06 | 1 | 7.41 | 0.0163 | 1 | 3.33E-08 | 0.03 | 9.98E-10 |
| PCB 189 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 1.1E-06 | 1 | 8.27 | 0.0063 | 1 | 2.11E-08 | 0.00003 | 6.34E-13 |
| *Total Congeners:* [11] | | | | | | | | | | | | 8.99E-09 |
| ***Northwest*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 11.77 | 6.9E-06 | 0.5 | 3.0E-06 | 1 | 6.63 | 0.0289 | 1 | 5.94E-07 | 0.0001 | 5.94E-11 |
| PCB 81 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-07 | 1 | 6.34 | 0.0334 | 1 | 1.05E-07 | 0.0003 | 3.15E-11 |
| PCB 105 | 0.25 | 11.77 | 9.8E-06 | 0.5 | 9.5E-06 | 1 | 6.79 | 0.0263 | 1 | 7.89E-07 | 0.00003 | 2.37E-11 |
| PCB 114 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-06 | 1 | 6.98 | 0.0231 | 1 | 8.59E-08 | 0.00003 | 2.58E-12 |
| PCB 118 | 0.25 | 11.77 | 2.0E-05 | 0.5 | 1.8E-05 | 1 | 7.12 | 0.0208 | 1 | 1.25E-06 | 0.00003 | 3.76E-11 |
| PCB 123 | 0.25 | 11.77 | 7.0E-07 | 0.5 | 1.3E-06 | 1 | 6.98 | 0.0231 | 1 | 5.14E-08 | 0.00003 | 1.54E-12 |
| PCB 126 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 1.2E-06 | 1 | 6.98 | 0.0231 | 1 | 7.49E-08 | 0.1 | 7.49E-09 |
| PCB 156 | 0.25 | 11.77 | 2.1E-06 | 0.5 | 3.2E-06 | 1 | 7.6 | 0.0136 | 1 | 8.86E-08 | 0.00003 | 2.66E-12 |
| PCB 157 | 0.25 | 11.77 | 1.6E-06 | 0.5 | 1.0E-06 | 1 | 7.62 | 0.0133 | 1 | 6.46E-08 | 0.00003 | 1.94E-12 |
| PCB 167 | 0.25 | 11.77 | 6.0E-06 | 0.5 | 6.3E-06 | 1 | 7.5 | 0.0150 | 1 | 2.76E-07 | 0.00003 | 8.27E-12 |
| PCB 169 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-06 | 1 | 7.41 | 0.0163 | 1 | 6.05E-08 | 0.03 | 1.81E-09 |
| PCB 189 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 4.0E-07 | 1 | 8.27 | 0.0063 | 1 | 1.97E-08 | 0.00003 | 5.90E-13 |
| *Total Congeners:* [11] | | | | | | | | | | | | 9.47E-09 |
| ***North*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 11.77 | 7.8E-06 | 0.5 | 2.8E-06 | 1 | 6.63 | 0.0289 | 1 | 6.72E-07 | 0.0001 | 6.72E-11 |
| PCB 81 | 0.25 | 11.77 | 6.0E-07 | 0.5 | 3.0E-07 | 1 | 6.34 | 0.0334 | 1 | 6.04E-08 | 0.0003 | 1.81E-11 |
| PCB 105 | 0.25 | 11.77 | 1.3E-05 | 0.5 | 1.2E-05 | 1 | 6.79 | 0.0263 | 1 | 1.02E-06 | 0.00003 | 3.05E-11 |
| PCB 114 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-06 | 1 | 6.98 | 0.0231 | 1 | 8.59E-08 | 0.00003 | 2.58E-12 |
| PCB 118 | 0.25 | 11.77 | 2.9E-05 | 0.5 | 1.9E-05 | 1 | 7.12 | 0.0208 | 1 | 1.80E-06 | 0.00003 | 5.39E-11 |
| PCB 123 | 0.25 | 11.77 | 5.6E-07 | 0.5 | 1.5E-06 | 1 | 6.98 | 0.0231 | 1 | 4.21E-08 | 0.00003 | 1.26E-12 |
| PCB 126 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 7.0E-07 | 1 | 6.98 | 0.0231 | 1 | 7.35E-08 | 0.1 | 7.35E-09 |
| PCB 156 | 0.25 | 11.77 | 2.5E-06 | 0.5 | 3.0E-06 | 1 | 7.6 | 0.0136 | 1 | 1.03E-07 | 0.00003 | 3.10E-12 |
| PCB 157 | 0.25 | 11.77 | 5.4E-07 | 0.5 | 1.0E-06 | 1 | 7.62 | 0.0133 | 1 | 2.28E-08 | 0.00003 | 6.84E-13 |
| PCB 167 | 0.25 | 11.77 | 5.1E-06 | 0.5 | 6.6E-06 | 1 | 7.5 | 0.0150 | 1 | 2.35E-07 | 0.00003 | 7.05E-12 |
| PCB 169 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.0E-06 | 1 | 7.41 | 0.0163 | 1 | 6.05E-08 | 0.03 | 1.81E-09 |
| PCB 189 | 0.25 | 11.77 | 4.7E-07 | 0.5 | 7.0E-07 | 1 | 8.27 | 0.0063 | 1 | 9.14E-09 | 0.00003 | 2.74E-13 |
| *Total Congeners:* [11] | | | | | | | | | | | | 9.34E-09 |

**Table 5.3.6**
**Derivation of Exposure Point Concentrations in Beef Tissue**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener [1] | Fraction of Plant and Soil ( F ) [2] | Quantity of Plant ( Qp ) [3] kg DW/day | Concentration in Plant ( P [4] ) mg/kg DW | Quantity of Soil ( Qs ) [5] kg/day | Concentration in Soil ( Cs [4] ) mg/kg | Soil Bioavailability Factor ( Bs ) [5] | Log Kow [6] | Biotransfer Factor ( $Ba_{beef}$ ) [7] day/kg FW | MF [5] | Concentration in Beef ( $A_{beef}$ ) [8] mg/kg FW | TEF [9] | EPC (TEC Conc. in Beef) [10] mg/kg FW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Northeast*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 11.77 | 1.3E-05 | 0.5 | 1.5E-05 | 1 | 6.63 | 0.0289 | 1 | 1.12E-06 | 0.0001 | 1.12E-10 |
| PCB 81 | 0.25 | 11.77 | 6.4E-07 | 0.5 | 1.4E-06 | 1 | 6.34 | 0.0334 | 1 | 6.83E-08 | 0.0003 | 2.05E-11 |
| PCB 105 | 0.25 | 11.77 | 2.3E-05 | 0.5 | 6.5E-05 | 1 | 6.79 | 0.0263 | 1 | 1.97E-06 | 0.00003 | 5.91E-11 |
| PCB 114 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 2.0E-06 | 1 | 6.98 | 0.0231 | 1 | 8.06E-08 | 0.00003 | 2.42E-12 |
| PCB 118 | 0.25 | 11.77 | 4.4E-05 | 0.5 | 1.0E-04 | 1 | 7.12 | 0.0208 | 1 | 2.96E-06 | 0.00003 | 8.87E-11 |
| PCB 123 | 0.25 | 11.77 | 7.6E-07 | 0.5 | 8.7E-06 | 1 | 6.98 | 0.0231 | 1 | 7.69E-08 | 0.00003 | 2.31E-12 |
| PCB 126 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 5.9E-06 | 1 | 6.98 | 0.0231 | 1 | 9.19E-08 | 0.1 | 9.19E-09 |
| PCB 156 | 0.25 | 11.77 | 4.8E-06 | 0.5 | 2.9E-05 | 1 | 7.6 | 0.0136 | 1 | 2.40E-07 | 0.00003 | 7.19E-12 |
| PCB 157 | 0.25 | 11.77 | 1.8E-06 | 0.5 | 6.9E-06 | 1 | 7.62 | 0.0133 | 1 | 8.04E-08 | 0.00003 | 2.41E-12 |
| PCB 167 | 0.25 | 11.77 | 1.3E-05 | 0.5 | 1.6E-05 | 1 | 7.5 | 0.0150 | 1 | 5.83E-07 | 0.00003 | 1.75E-11 |
| PCB 169 | 0.25 | 11.77 | 3.3E-07 | 0.5 | 5.0E-06 | 1 | 7.41 | 0.0163 | 1 | 2.61E-08 | 0.03 | 7.82E-10 |
| PCB 189 | 0.25 | 11.77 | 1.1E-06 | 0.5 | 9.3E-06 | 1 | 8.27 | 0.0063 | 1 | 2.76E-08 | 0.00003 | 8.27E-13 |
| *Total Congeners:* [11] | | | | | | | | | | | | 1.03E-08 |

Notes:
(1) Congeners in surface soil and vegetation.
(2) Assumes 25% of vegetation and 25% of soil consumed by beef cattle is on-site vegetation and on-site soil, respectively (see Section 5.3.2.3).
(3) Assumes total daily intake of forage plants by beef cattle consists of on-site vegetation. Default value from USEPA 2005.
(4) Concentration in composite of ten samples from each exposure area. 1/2 the RL is used for non-detects.
(5) Default value from USEPA 2005.
(6) Value from Oak Ridge National Laboratory Risk Assessment Information System accessed online at http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem.
(7) Basis for $Ba_{beef}$ (biotransfer factor from diet to beef tissue): diet-to-beef transfer equation from RTI 2005: Log BTF = -0.099(log Kow)$^2$ + 1.07(log Kow) - 3.56
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of beef (0.19 kg fat/kg BW) to convert transfer factor to whole body basis.
(8) Concentration in beef equation from USEPA 2005: $A_{beef}$ = [ (Fp x Qp x P) + (Fs x Qs x Cs x Bs) ] x $Ba_{beef}$ x MF
where:
$A_{beef}$ - Concentration in beef (mg/kg FW tissue)
Fp - Fraction of plant type grown on contaminated soil and ingested by cattle (unitless)
Fs - Fraction of contaminated soil ingested by cattle (unitless)
Qp - Quantity of plant type eaten by cattle per day (kg DW plant/day)
P - Concentration in plant type eaten by cattle (mg/kg DW)
Qs - Quantity of soil eaten by cattle each day (kg/day)
Cs - Average soil concentration over exposure duration (mg/kg soil)
Bs - Soil bioavailability factor (unitless)
$Ba_{beef}$ - Biotransfer factor for beef (day/kg FW tissue)
MF - Metabolism factor (unitless)
(9) Human TEFs from USEPA September 2009.
(10) $A_{beef}$ is multiplied by the congener-specific TEF to obtain the TEC in beef (mg/kg FW tissue).
(11) Total congeners represents the sum of TECs in beef for an exposure area.

BW - body weight
DW - dry weight
EPC - exposure point concentration
FW - fresh weight
PCB - polychlorinated biphenyl
TEF - toxicity equivalence factor
TEC - toxicity equivalence concentration

**Table 5.3.7**
**Derivation of Exposure Point Concentrations in Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener [1] | Fraction of Plant and Soil ( F ) [2] | Quantity of Plant ( Qp ) [3] kg DW/day | Concentration in Plant ( P [4] ) mg/kg DW | Quantity of Soil ( Qs ) [5] kg/day | Concentration in Soil ( Cs [4] ) mg/kg | Soil Bioavailability Factor ( Bs ) [5] | Log Kow [6] | Biotransfer Factor ( $Ba_{milk}$ ) [7] day/kg WW | MF [5] | Concentration in Milk ( $A_{milk}$ ) [8] mg/kg WW | TEF [9] | EPC (TEC Conc. in Milk) [10] mg/kg WW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 20.3 | 9.7E-05 | 0.4 | 1.1E-05 | 1 | 6.63 | 0.0061 | 1 | 3.00E-06 | 0.0001 | 3.00E-10 |
| PCB 81 | 0.25 | 20.3 | 1.4E-05 | 0.4 | 1.3E-06 | 1 | 6.34 | 0.0070 | 1 | 4.92E-07 | 0.0003 | 1.48E-10 |
| PCB 105 | 0.25 | 20.3 | 1.5E-04 | 0.4 | 3.3E-05 | 1 | 6.79 | 0.0055 | 1 | 4.23E-06 | 0.00003 | 1.27E-10 |
| PCB 114 | 0.25 | 20.3 | 8.7E-06 | 0.4 | 1.6E-06 | 1 | 6.98 | 0.0049 | 1 | 2.15E-07 | 0.00003 | 6.46E-12 |
| PCB 118 | 0.25 | 20.3 | 2.7E-04 | 0.4 | 5.1E-05 | 1 | 7.12 | 0.0044 | 1 | 6.03E-06 | 0.00003 | 1.81E-10 |
| PCB 123 | 0.25 | 20.3 | 1.7E-05 | 0.4 | 5.4E-06 | 1 | 6.98 | 0.0049 | 1 | 4.28E-07 | 0.00003 | 1.28E-11 |
| PCB 126 | 0.25 | 20.3 | 1.3E-05 | 0.4 | 1.5E-06 | 1 | 6.98 | 0.0049 | 1 | 3.11E-07 | 0.1 | 3.11E-08 |
| PCB 156 | 0.25 | 20.3 | 3.3E-05 | 0.4 | 1.3E-05 | 1 | 7.6 | 0.0029 | 1 | 4.87E-07 | 0.00003 | 1.46E-11 |
| PCB 157 | 0.25 | 20.3 | 6.8E-06 | 0.4 | 2.0E-06 | 1 | 7.62 | 0.0028 | 1 | 9.71E-08 | 0.00003 | 2.91E-12 |
| PCB 167 | 0.25 | 20.3 | 1.7E-05 | 0.4 | 5.2E-06 | 1 | 7.5 | 0.0031 | 1 | 2.76E-07 | 0.00003 | 8.27E-12 |
| PCB 169 | 0.25 | 20.3 | 7.5E-07 | 0.4 | 1.1E-06 | 1 | 7.41 | 0.0034 | 1 | 1.34E-08 | 0.03 | 4.01E-10 |
| PCB 189 | 0.25 | 20.3 | 8.6E-06 | 0.4 | 4.3E-06 | 1 | 8.27 | 0.0013 | 1 | 5.84E-08 | 0.00003 | 1.75E-12 |
| *Total Congeners:* [11] | | | | | | | | | | | | 3.23E-08 |
| ***South*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 20.3 | 7.0E-05 | 0.4 | 5.3E-06 | 1 | 6.63 | 0.0061 | 1 | 2.17E-06 | 0.0001 | 2.17E-10 |
| PCB 81 | 0.25 | 20.3 | 6.5E-06 | 0.4 | 6.0E-07 | 1 | 6.34 | 0.0070 | 1 | 2.32E-07 | 0.0003 | 6.95E-11 |
| PCB 105 | 0.25 | 20.3 | 1.3E-04 | 0.4 | 2.1E-05 | 1 | 6.79 | 0.0055 | 1 | 3.66E-06 | 0.00003 | 1.10E-10 |
| PCB 114 | 0.25 | 20.3 | 5.4E-06 | 0.4 | 5.0E-06 | 1 | 6.98 | 0.0049 | 1 | 1.36E-07 | 0.00003 | 4.08E-12 |
| PCB 118 | 0.25 | 20.3 | 1.8E-04 | 0.4 | 2.9E-05 | 1 | 7.12 | 0.0044 | 1 | 4.02E-06 | 0.00003 | 1.20E-10 |
| PCB 123 | 0.25 | 20.3 | 7.3E-06 | 0.4 | 1.9E-06 | 1 | 6.98 | 0.0049 | 1 | 1.82E-07 | 0.00003 | 5.47E-12 |
| PCB 126 | 0.25 | 20.3 | 7.1E-06 | 0.4 | 1.2E-06 | 1 | 6.98 | 0.0049 | 1 | 1.76E-07 | 0.1 | 1.76E-08 |
| PCB 156 | 0.25 | 20.3 | 2.1E-05 | 0.4 | 6.8E-06 | 1 | 7.6 | 0.0029 | 1 | 3.06E-07 | 0.00003 | 9.19E-12 |
| PCB 157 | 0.25 | 20.3 | 4.8E-06 | 0.4 | 1.8E-06 | 1 | 7.62 | 0.0028 | 1 | 6.87E-08 | 0.00003 | 2.06E-12 |
| PCB 167 | 0.25 | 20.3 | 2.4E-05 | 0.4 | 3.0E-06 | 1 | 7.5 | 0.0031 | 1 | 3.86E-07 | 0.00003 | 1.16E-11 |
| PCB 169 | 0.25 | 20.3 | 6.6E-07 | 0.4 | 5.0E-06 | 1 | 7.41 | 0.0034 | 1 | 1.32E-08 | 0.03 | 3.95E-10 |
| PCB 189 | 0.25 | 20.3 | 1.2E-06 | 0.4 | 1.6E-06 | 1 | 8.27 | 0.0013 | 1 | 7.91E-09 | 0.00003 | 2.37E-13 |
| *Total Congeners:* [11] | | | | | | | | | | | | 1.85E-08 |
| ***Southwest*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 20.3 | 9.2E-06 | 0.4 | 2.6E-06 | 1 | 6.63 | 0.0061 | 1 | 2.87E-07 | 0.0001 | 2.87E-11 |
| PCB 81 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-06 | 1 | 6.34 | 0.0070 | 1 | 4.09E-08 | 0.0003 | 1.23E-11 |
| PCB 105 | 0.25 | 20.3 | 1.9E-05 | 0.4 | 1.1E-05 | 1 | 6.79 | 0.0055 | 1 | 5.46E-07 | 0.00003 | 1.64E-11 |
| PCB 114 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 1.0E-06 | 1 | 6.98 | 0.0049 | 1 | 2.64E-08 | 0.00003 | 7.93E-13 |
| PCB 118 | 0.25 | 20.3 | 2.9E-05 | 0.4 | 1.5E-05 | 1 | 7.12 | 0.0044 | 1 | 6.54E-07 | 0.00003 | 1.96E-11 |
| PCB 123 | 0.25 | 20.3 | 1.6E-06 | 0.4 | 1.2E-06 | 1 | 6.98 | 0.0049 | 1 | 4.05E-08 | 0.00003 | 1.22E-12 |
| PCB 126 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-06 | 1 | 6.98 | 0.0049 | 1 | 2.84E-08 | 0.1 | 2.84E-09 |
| PCB 156 | 0.25 | 20.3 | 4.2E-06 | 0.4 | 3.9E-06 | 1 | 7.6 | 0.0029 | 1 | 6.16E-08 | 0.00003 | 1.85E-12 |
| PCB 157 | 0.25 | 20.3 | 1.9E-06 | 0.4 | 9.2E-07 | 1 | 7.62 | 0.0028 | 1 | 2.79E-08 | 0.00003 | 8.38E-13 |
| PCB 167 | 0.25 | 20.3 | 1.0E-05 | 0.4 | 1.9E-06 | 1 | 7.5 | 0.0031 | 1 | 1.67E-07 | 0.00003 | 5.02E-12 |
| PCB 169 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-06 | 1 | 7.41 | 0.0034 | 1 | 2.00E-08 | 0.03 | 5.99E-10 |
| PCB 189 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 1.2E-06 | 1 | 8.27 | 0.0013 | 1 | 7.18E-09 | 0.00003 | 2.16E-13 |
| *Total Congeners:* [11] | | | | | | | | | | | | 3.52E-09 |

**Table 5.3.7**
**Derivation of Exposure Point Concentrations in Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener [1] | Fraction of Plant and Soil ( F ) [2] | Quantity of Plant ( Qp ) [3] kg DW/day | Concentration in Plant ( P [4] ) mg/kg DW | Quantity of Soil ( Qs ) [5] kg/day | Concentration in Soil ( Cs [4] ) mg/kg | Soil Bioavailability Factor ( Bs ) [5] | Log Kow [6] | Biotransfer Factor ( $Ba_{milk}$ ) [7] day/kg WW | MF [5] | Concentration in Milk ( $A_{milk}$ ) [8] mg/kg WW | TEF [9] | EPC (TEC Conc. in Milk) [10] mg/kg WW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***West*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 20.3 | 1.2E-05 | 0.4 | 2.3E-06 | 1 | 6.63 | 0.0061 | 1 | 3.59E-07 | 0.0001 | 3.59E-11 |
| PCB 81 | 0.25 | 20.3 | 1.7E-06 | 0.4 | 6.0E-07 | 1 | 6.34 | 0.0070 | 1 | 6.04E-08 | 0.0003 | 1.81E-11 |
| PCB 105 | 0.25 | 20.3 | 1.9E-05 | 0.4 | 1.0E-05 | 1 | 6.79 | 0.0055 | 1 | 5.49E-07 | 0.00003 | 1.65E-11 |
| PCB 114 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-06 | 1 | 6.98 | 0.0049 | 1 | 2.96E-08 | 0.00003 | 8.88E-13 |
| PCB 118 | 0.25 | 20.3 | 3.0E-05 | 0.4 | 1.9E-05 | 1 | 7.12 | 0.0044 | 1 | 6.67E-07 | 0.00003 | 2.00E-11 |
| PCB 123 | 0.25 | 20.3 | 1.9E-06 | 0.4 | 1.5E-06 | 1 | 6.98 | 0.0049 | 1 | 4.69E-08 | 0.00003 | 1.41E-12 |
| PCB 126 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 8.0E-07 | 1 | 6.98 | 0.0049 | 1 | 2.76E-08 | 0.1 | 2.76E-09 |
| PCB 156 | 0.25 | 20.3 | 3.6E-06 | 0.4 | 3.9E-06 | 1 | 7.6 | 0.0029 | 1 | 5.32E-08 | 0.00003 | 1.60E-12 |
| PCB 157 | 0.25 | 20.3 | 8.0E-07 | 0.4 | 1.0E-06 | 1 | 7.62 | 0.0028 | 1 | 1.16E-08 | 0.00003 | 3.48E-13 |
| PCB 167 | 0.25 | 20.3 | 8.1E-06 | 0.4 | 2.2E-06 | 1 | 7.5 | 0.0031 | 1 | 1.30E-07 | 0.00003 | 3.89E-12 |
| PCB 169 | 0.25 | 20.3 | 4.8E-07 | 0.4 | 5.0E-06 | 1 | 7.41 | 0.0034 | 1 | 1.01E-08 | 0.03 | 3.03E-10 |
| PCB 189 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 1.1E-06 | 1 | 8.27 | 0.0013 | 1 | 7.51E-09 | 0.00003 | 2.25E-13 |
| *Total Congeners:* [11] | | | | | | | | | | | | 3.16E-09 |
| ***Northwest*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 20.3 | 6.9E-06 | 0.4 | 3.0E-06 | 1 | 6.63 | 0.0061 | 1 | 2.14E-07 | 0.0001 | 2.14E-11 |
| PCB 81 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-07 | 1 | 6.34 | 0.0070 | 1 | 3.78E-08 | 0.0003 | 1.13E-11 |
| PCB 105 | 0.25 | 20.3 | 9.8E-06 | 0.4 | 9.5E-06 | 1 | 6.79 | 0.0055 | 1 | 2.80E-07 | 0.00003 | 8.41E-12 |
| PCB 114 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-06 | 1 | 6.98 | 0.0049 | 1 | 2.84E-08 | 0.00003 | 8.51E-13 |
| PCB 118 | 0.25 | 20.3 | 2.0E-05 | 0.4 | 1.8E-05 | 1 | 7.12 | 0.0044 | 1 | 4.46E-07 | 0.00003 | 1.34E-11 |
| PCB 123 | 0.25 | 20.3 | 7.0E-07 | 0.4 | 1.3E-06 | 1 | 6.98 | 0.0049 | 1 | 1.79E-08 | 0.00003 | 5.38E-13 |
| PCB 126 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 1.2E-06 | 1 | 6.98 | 0.0049 | 1 | 2.65E-08 | 0.1 | 2.65E-09 |
| PCB 156 | 0.25 | 20.3 | 2.1E-06 | 0.4 | 3.2E-06 | 1 | 7.6 | 0.0029 | 1 | 3.11E-08 | 0.00003 | 9.34E-13 |
| PCB 157 | 0.25 | 20.3 | 1.6E-06 | 0.4 | 1.0E-06 | 1 | 7.62 | 0.0028 | 1 | 2.31E-08 | 0.00003 | 6.94E-13 |
| PCB 167 | 0.25 | 20.3 | 6.0E-06 | 0.4 | 6.3E-06 | 1 | 7.5 | 0.0031 | 1 | 9.78E-08 | 0.00003 | 2.93E-12 |
| PCB 169 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-06 | 1 | 7.41 | 0.0034 | 1 | 2.00E-08 | 0.03 | 5.99E-10 |
| PCB 189 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 4.0E-07 | 1 | 8.27 | 0.0013 | 1 | 7.08E-09 | 0.00003 | 2.12E-13 |
| *Total Congeners:* [11] | | | | | | | | | | | | 3.31E-09 |
| ***North*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 20.3 | 7.8E-06 | 0.4 | 2.8E-06 | 1 | 6.63 | 0.0061 | 1 | 2.42E-07 | 0.0001 | 2.42E-11 |
| PCB 81 | 0.25 | 20.3 | 6.0E-07 | 0.4 | 3.0E-07 | 1 | 6.34 | 0.0070 | 1 | 2.17E-08 | 0.0003 | 6.50E-12 |
| PCB 105 | 0.25 | 20.3 | 1.3E-05 | 0.4 | 1.2E-05 | 1 | 6.79 | 0.0055 | 1 | 3.61E-07 | 0.00003 | 1.08E-11 |
| PCB 114 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-06 | 1 | 6.98 | 0.0049 | 1 | 2.84E-08 | 0.00003 | 8.51E-13 |
| PCB 118 | 0.25 | 20.3 | 2.9E-05 | 0.4 | 1.9E-05 | 1 | 7.12 | 0.0044 | 1 | 6.42E-07 | 0.00003 | 1.93E-11 |
| PCB 123 | 0.25 | 20.3 | 5.6E-07 | 0.4 | 1.5E-06 | 1 | 6.98 | 0.0049 | 1 | 1.45E-08 | 0.00003 | 4.34E-13 |
| PCB 126 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 7.0E-07 | 1 | 6.98 | 0.0049 | 1 | 2.63E-08 | 0.1 | 2.63E-09 |
| PCB 156 | 0.25 | 20.3 | 2.5E-06 | 0.4 | 3.0E-06 | 1 | 7.6 | 0.0029 | 1 | 3.66E-08 | 0.00003 | 1.10E-12 |
| PCB 157 | 0.25 | 20.3 | 5.4E-07 | 0.4 | 1.0E-06 | 1 | 7.62 | 0.0028 | 1 | 7.95E-09 | 0.00003 | 2.38E-13 |
| PCB 167 | 0.25 | 20.3 | 5.1E-06 | 0.4 | 6.6E-06 | 1 | 7.5 | 0.0031 | 1 | 8.29E-08 | 0.00003 | 2.49E-12 |
| PCB 169 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.0E-06 | 1 | 7.41 | 0.0034 | 1 | 2.00E-08 | 0.03 | 5.99E-10 |
| PCB 189 | 0.25 | 20.3 | 4.7E-07 | 0.4 | 7.0E-07 | 1 | 8.27 | 0.0013 | 1 | 3.21E-09 | 0.00003 | 9.63E-14 |
| *Total Congeners:* [11] | | | | | | | | | | | | 3.29E-09 |

**Table 5.3.7**
**Derivation of Exposure Point Concentrations in Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congener (1) | Fraction of Plant and Soil ( F ) (2) | Quantity of Plant ( Qp ) (3) kg DW/day | Concentration in Plant ( P (4) ) mg/kg DW | Quantity of Soil ( Qs ) (5) kg/day | Concentration in Soil ( Cs (4) ) mg/kg | Soil Bioavailability Factor ( Bs ) (5) | Log Kow (6) | Biotransfer Factor ( $Ba_{milk}$ ) (7) day/kg WW | MF (5) | Concentration in Milk ( $A_{milk}$ ) (8) mg/kg WW | TEF (9) | EPC (TEC Conc. in Milk) (10) mg/kg WW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Northeast*** | | | | | | | | | | | | |
| PCB 77 | 0.25 | 20.3 | 1.3E-05 | 0.4 | 1.5E-05 | 1 | 6.63 | 0.0061 | 1 | 3.97E-07 | 0.0001 | 3.97E-11 |
| PCB 81 | 0.25 | 20.3 | 6.4E-07 | 0.4 | 1.4E-06 | 1 | 6.34 | 0.0070 | 1 | 2.37E-08 | 0.0003 | 7.10E-12 |
| PCB 105 | 0.25 | 20.3 | 2.3E-05 | 0.4 | 6.5E-05 | 1 | 6.79 | 0.0055 | 1 | 6.74E-07 | 0.00003 | 2.02E-11 |
| PCB 114 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 2.0E-06 | 1 | 6.98 | 0.0049 | 1 | 2.81E-08 | 0.00003 | 8.44E-13 |
| PCB 118 | 0.25 | 20.3 | 4.4E-05 | 0.4 | 1.0E-04 | 1 | 7.12 | 0.0044 | 1 | 1.02E-06 | 0.00003 | 3.07E-11 |
| PCB 123 | 0.25 | 20.3 | 7.6E-07 | 0.4 | 8.7E-06 | 1 | 6.98 | 0.0049 | 1 | 2.30E-08 | 0.00003 | 6.91E-13 |
| PCB 126 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 5.9E-06 | 1 | 6.98 | 0.0049 | 1 | 3.00E-08 | 0.1 | 3.00E-09 |
| PCB 156 | 0.25 | 20.3 | 4.8E-06 | 0.4 | 2.9E-05 | 1 | 7.6 | 0.0029 | 1 | 7.74E-08 | 0.00003 | 2.32E-12 |
| PCB 157 | 0.25 | 20.3 | 1.8E-06 | 0.4 | 6.9E-06 | 1 | 7.62 | 0.0028 | 1 | 2.70E-08 | 0.00003 | 8.09E-13 |
| PCB 167 | 0.25 | 20.3 | 1.3E-05 | 0.4 | 1.6E-05 | 1 | 7.5 | 0.0031 | 1 | 2.06E-07 | 0.00003 | 6.17E-12 |
| PCB 169 | 0.25 | 20.3 | 3.3E-07 | 0.4 | 5.0E-06 | 1 | 7.41 | 0.0034 | 1 | 7.49E-09 | 0.03 | 2.25E-10 |
| PCB 189 | 0.25 | 20.3 | 1.1E-06 | 0.4 | 9.3E-06 | 1 | 8.27 | 0.0013 | 1 | 8.59E-09 | 0.00003 | 2.58E-13 |
| *Total Congeners:* (11) | | | | | | | | | | | | 3.34E-09 |

Notes:

(1) Congeners in surface soil and vegetation.

(2) Assumes 25% of vegetation and 25% of soil consumed by dairy cattle is on-site vegetation and on-site soil, respectively (see Section 5.3.2.3).

(3) Assumes total daily intake of plants by dairy cattle consists of on-site vegetation. Default value from USEPA 2005.

(4) Concentration in composite of ten samples from each exposure area. 1/2 the RL is used for non-detects.

(5) Default value from USEPA 2005.

(6) Value from Oak Ridge National Laboratory Risk Assessment Information System accessed online at http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem.

(7) Basis for $Ba_{milk}$ (biotransfer factor from diet to milk): diet-to-milk transfer equation from RTI 2005: $\text{Log BTF} = -0.099(\log Kow)^2 + 1.07(\log Kow) - 3.56$
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of milk (0.04 kg fat/kg WW) to convert transfer factor to whole body basis.

(8) Concentration in milk equation from USEPA 2005: $A_{milk} = [ (Fp \times Qp \times P) + (Fs \times Qs \times Cs \times Bs) ] \times Ba_{milk} \times MF$

where:

$A_{milk}$ - Concentration in milk (mg/kg milk)
Fp - Fraction of plant type grown on contaminated soil and ingested by dairy cattle (unitless)
Fs - Fraction of contaminated soil ingested by dairy cattle (unitless)
Qp - Quantity of plant type eaten by dairy cattle per day (kg DW plant/day)
P - Concentration in plant type eaten by dairy cattle (mg/kg DW)
Qs - Quantity of soil eaten by dairy cattle each day (kg/day)
Cs - Average soil concentration over exposure duration (mg/kg soil)
Bs - Soil bioavailability factor (unitless)
$Ba_{milk}$ - Biotransfer factor for milk (day/kg WW tissue)
MF - Metabolism factor (unitless)

(9) Human TEFs from USEPA September 2009.

(10) $A_{milk}$ is multiplied by the congener-specific TEF to obtain the TEC in milk (mg/kg WW).

(11) Total congeners represents the sum of TECs in milk for an exposure area.

DW - dry weight
EPC - exposure point concentration
PCB - polychlorinated biphenyl
TEF - toxicity equivalence factor
TEC - toxicity equivalence concentration
WW - Wet weight

**Table 5.3.8**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Soil (Current)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Rancher | Adult | Surface Soil | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CSOIL | Soil Exposure Point Concentration | From Sampling Data | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | IRSOIL | Ingestion Rate, Soil | 100 | mg/day | USEPA August 1997 | CSOIL x IRSOIL x FI x EF x ED x CF x 1/BW x 1/ATC |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | |
| | | | | EF | Exposure Frequency | 19 | days/year | Site-Specific | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | ED | Exposure Duration | 25 | years | USEPA 1991 | CSOIL x IRSOIL x FI x EF x ED x CF x 1/BW x 1/ATN |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | -- | |
| | | | | BW | Body Weight | 70 | kg | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 9125 | days | ED x 365 d/y | |
| Dermal | Rancher | Adult | Surface Soil | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CSOIL | Soil Exposure Point Concentration | From Sampling Data | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | SA | Skin surface area for contact - Adult | 5700 | cm$^2$/day | USEPA 2004 (Head, Hands, Forearms, Lower Legs) | (DA-event x EV x EF x ED x SA x 1/BW x 1/ATC) |
| | | | | AF | Soil-to-skin adherence factor - Adult | 0.4 | mg/cm$^2$ | USEPA 2004 (95th percentile for farmers) | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | ABS | Soil Absorption Factor | 0.14 | unitless | USEPA 2004 | (DA-event x EV x EF x ED x SA x 1/BW x 1/ATN) |
| | | | | EV | Event Frequency | 1 | events/day | USEPA 2004 | |
| | | | | EF | Exposure Frequency - Adult | 19 | days/year | Site-Specific | Where: |
| | | | | ED | Exposure Duration - Adult | 25 | years | USEPA 2005 | Absorbed Dose per Event (DA-event) (mg/cm2-event) = |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | -- | CSOIL x AF x ABS x CF |
| | | | | BW | Body Weight - Adult | 70 | kg | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 9125 | days | ED x 365 d/y | |

**Table 5.3.9**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Air-Particulates (Current)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Rancher | Adult | Particulates from Soil | EC | Exposure Concentration | Calculated | mg/m3 | -- | |
| | | | | CAIR | Air Exposure Point Concentration | Modeled from Soil | mg/m3 | CSOIL/PEF | Exposure Concentration (ug/m3) for carcinogens = |
| | | | | CSOIL | Soil Exposure Point Concentration | See Table 5.3.1 | mg/kg | -- | CAIR x ET x EF x ED x 1/ATC |
| | | | | PEF | Particulate Emission Factor | 6.11E+05 | m3/kg | Site-Specific | |
| | | | | ET | Exposure Time | 8 | hr/day | USEPA 1991 | Exposure Concentration (ug/m3) for noncarcinogens = |
| | | | | EF | Exposure Frequency | 19 | days/year | Site-Specific | CAIR x ET x EF x ED x 1/ATN |
| | | | | ED | Exposure Duration | 25 | years | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 613,200 | hours | 70 y x 365 d/y x 24 hr/d | where: |
| | | | | ATN | Averaging Time, noncarcinogens | 219,000 | hours | ED x 365 d/y x 24 hr/d | CAIR = CSOIL/PEF |

**Table 5.3.10**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Ambient Air (Current)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Medium: Ambient Air
Exposure Medium: Ambient Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Rancher | Adult | Particulates and Vapors in Air | EC | Exposure Concentration | Calculated | ug/m3 | -- | |
| | | | | CAIR | Air Exposure Point Concentration | From Monitoring Data | ug/m3 | -- | Exposure Concentration (ug/m3) for carcinogens = |
| | | | | ET | Exposure Time | 8 | hr/day | USEPA 1991 | CAIR x ET x EF x ED x 1/ATC |
| | | | | EF | Exposure Frequency | 19 | days/year | Site-Specific | |
| | | | | ED | Exposure Duration | 25 | years | USEPA 1991 | Exposure Concentration (ug/m3) for noncarcinogens = |
| | | | | ATC | Averaging Time, carcinogens | 613,200 | hours | 70 y x 365 d/y x 24 hr/d | CAIR x ET x EF x ED x 1/ATN |
| | | | | ATN | Averaging Time, noncarcinogens | 219,000 | hours | ED x 365 d/y x 24 hr/d | |

# Table 5.3.11
## Values Used For Daily Intake Calculations
## Reasonable Maximum Exposure - Soil (Future)
## Human Health Risk Assessment
## PCB Congener Study for Kettleman Hills Facility
## Kings County, California

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident Rancher | Adult | Surface Soil | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CSOIL | Soil Exposure Point Concentration | From Sampling Data | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | IRSOILa | Ingestion Rate, Soil - Adult | 100 | mg/day | USEPA August 1997; 2005 | CSOIL x IRSOILa x FI x EFa x EDa x CF x 1/BWa x 1/ATC + |
| | | | | IRSOILc | Ingestion Rate, Soil - Child | 200 | mg/day | USEPA August 1997; 2005 | CSOIL x IRSOILc x FI x EFc x EDc x CF x 1/BWc x 1/ATC |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 1991 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 1991 | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | EDa | Exposure Duration - Adult | 34 | years | USEPA 2005 | CSOIL x IRSOILa x FI x EFa x EDa x CF x 1/BWa x 1/ATN + |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | CSOIL x IRSOILc x FI x EFc x EDc x CF x 1/BWc x 1/ATN |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | -- | |
| | | | | BWa | Body Weight - Adult | 70 | kg | USEPA 1991 | |
| | | | | BWc | Body Weight - Child | 15 | kg | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 14,600 | days | ED x 365 d/y | |
| | Subsistence Resident Rancher | Adult | Surface Soil | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CSOIL | Soil Exposure Point Concentration | From Sampling Data | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | IRSOILa | Ingestion Rate, Soil - Adult | 100 | mg/day | USEPA August 1997; 2005 | CSOIL x IRSOILa x FI x EFa x EDa x CF x 1/BWa x 1/ATC + |
| | | | | IRSOILc | Ingestion Rate, Soil - Child | 200 | mg/day | USEPA August 1997; 2005 | CSOIL x IRSOILc x FI x EFc x EDc x CF x 1/BWc x 1/ATC |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 1991 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 1991 | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | EDa | Exposure Duration - Adult | 34 | years | USEPA 2005 | CSOIL x IRSOILa x FI x EFa x EDa x CF x 1/BWa x 1/ATN + |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | CSOIL x IRSOILc x FI x EFc x EDc x CF x 1/BWc x 1/ATN |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | -- | |
| | | | | BWa | Body Weight - Adult | 70 | kg | USEPA 1991 | |
| | | | | BWc | Body Weight - Child | 15 | kg | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 14,600 | days | ED x 365 d/y | |
| | Resident | Adult | Surface Soil | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CSOIL | Soil Exposure Point Concentration | From Sampling Data | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | IRSOILa | Ingestion Rate, Soil - Adult | 100 | mg/day | USEPA August 1997; 2005 | CSOIL x IRSOILa x FI x EFa x EDa x CF x 1/BWa x 1/ATC + |
| | | | | IRSOILc | Ingestion Rate, Soil - Child | 200 | mg/day | USEPA August 1997; 2005 | CSOIL x IRSOILc x FI x EFc x EDc x CF x 1/BWc x 1/ATC |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 1991 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 1991 | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | EDa | Exposure Duration - Adult | 24 | years | USEPA 2005 | CSOIL x IRSOILa x FI x EFa x EDa x CF x 1/BWa x 1/ATN + |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | CSOIL x IRSOILc x FI x EFc x EDc x CF x 1/BWc x 1/ATN |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | -- | |
| | | | | BWa | Body Weight - Adult | 70 | kg | USEPA 1991 | |
| | | | | BWc | Body Weight - Child | 15 | kg | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 10,950 | days | ED x 365 d/y | |

**Table 5.3.11**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Soil (Future)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal | Resident Rancher | Adult | Surface Soil | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CSOIL | Soil Exposure Point Concentration | From Sampling Data | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | SAa | Skin surface area for contact - Adult | 5700 | cm$^2$/day | USEPA 2004 (Head, Hands, Forearms, Lower Legs) | (DA-event x EV x EFa x EDa x SAa x 1/BWa x 1/ATC) + (DA-event x EV x EFc x EDc x SAc x 1/BWc x 1/ATC) |
| | | | | SCc | Skin surface area for contact - Child | 2800 | cm$^2$/day | USEPA 2004 (Head, Hands, Forearms, Lower Legs, Feet) | |
| | | | | AFa | Soil-to-skin adherence factor - Adult | 0.4 | mg/cm$^2$ | USEPA 2004 (95th percentile for farmers) | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | AFc | Soil-to-skin adherence factor - Child | 0.2 | mg/cm$^2$ | USEPA 2004 (95th percentile) | (DA-event x EV x EFa x EDa x SAa x 1/BWa x 1/ATN) + |
| | | | | ABS | Soil Absorption Factor | 0.14 | unitless | USEPA 2004 | (DA-event x EV x EFc x EDc x SAc x 1/BWc x 1/ATN) |
| | | | | EV | Event Frequency | 1 | events/day | USEPA 2004 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 2004 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 2004 | |
| | | | | EDa | Exposure Duration - Adult | 34 | years | USEPA 2005 | Where: |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | Absorbed Dose per Event (DA-event) (mg/cm2-event) = |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | -- | CSOIL x AF x ABS x CF |
| | | | | BWa | Body Weight - Adult | 70 | kg | USEPA 1991 | |
| | | | | BWc | Body Weight - Child | 15 | kg | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 14,600 | days | ED x 365 d/y | |
| | Subsistence Resident | Adult | Surface Soil | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | Rancher | | | CSOIL | Soil Exposure Point Concentration | From Sampling Data | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | SAa | Skin surface area for contact - Adult | 5700 | cm$^2$/day | USEPA 2004 (Head, Hands, Forearms, Lower Legs) | (DA-event x EV x EFa x EDa x SAa x 1/BWa x 1/ATC) + (DA-event x EV x EFc x EDc x SAc x 1/BWc x 1/ATC) |
| | | | | SCc | Skin surface area for contact - Child | 2800 | cm$^2$/day | USEPA 2004 (Head, Hands, Forearms, Lower Legs, Feet) | |
| | | | | AFa | Soil-to-skin adherence factor - Adult | 0.4 | mg/cm$^2$ | USEPA 2004 (95th percentile for farmers) | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | AFc | Soil-to-skin adherence factor - Child | 0.2 | mg/cm$^2$ | USEPA 2004 (95th percentile) | (DA-event x EV x EFa x EDa x SAa x 1/BWa x 1/ATN) + |
| | | | | ABS | Soil Absorption Factor | 0.14 | unitless | USEPA 2004 | (DA-event x EV x EFc x EDc x SAc x 1/BWc x 1/ATN) |
| | | | | EV | Event Frequency | 1 | events/day | USEPA 2004 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 2004 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 2004 | |
| | | | | EDa | Exposure Duration - Adult | 34 | years | USEPA 2005 | Where: |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | Absorbed Dose per Event (DA-event) (mg/cm2-event) = |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | -- | CSOIL x AF x ABS x CF |
| | | | | BWa | Body Weight - Adult | 70 | kg | USEPA 1991 | |
| | | | | BWc | Body Weight - Child | 15 | kg | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 14,600 | days | ED x 365 d/y | |

**Table 5.3.11**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Soil (Future)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal | Resident | Adult | Surface Soil | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CSOIL | Soil Exposure Point Concentration | From Sampling Data | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | SAa | Skin surface area for contact - Adult | 5700 | $cm^2$/day | USEPA 2004 (Head, Hands, Forearms, Lower Legs) | (DA-event x EV x EFa x EDa x SAa x 1/BWa x 1/ATC) + (DA-event x EV x EFc x EDc x SAc x 1/BWc x 1/ATC) |
| | | | | SCc | Skin surface area for contact - Child | 2800 | $cm^2$/day | USEPA 2004 (Head, Hands, Forearms, Lower Legs, Feet) | |
| | | | | AFa | Soil-to-skin adherence factor - Adult | 0.07 | mg/$cm^2$ | USEPA 2004 (RME scenario, residential) | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | AFc | Soil-to-skin adherence factor - Child | 0.2 | mg/$cm^2$ | USEPA 2004 (RME scenario, residential) | (DA-event x EV x EFa x EDa x SAa x 1/BWa x 1/ATN) + |
| | | | | ABS | Soil Absorption Factor | 0.14 | unitless | USEPA 2004 | (DA-event x EV x EFc x EDc x SAc x 1/BWc x 1/ATN) |
| | | | | EV | Event Frequency | 1 | events/day | USEPA 2004 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 2004 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 2004 | |
| | | | | EDa | Exposure Duration - Adult | 24 | years | USEPA 2005 | Where: |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | Absorbed Dose per Event (DA-event) (mg/cm2-event) = |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | -- | CSOIL x AF x ABS x CF |
| | | | | BWa | Body Weight - Adult | 70 | kg | USEPA 1991 | |
| | | | | BWc | Body Weight - Child | 15 | kg | USEPA 1991 | |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 10,950 | days | ED x 365 d/y | |

**Table 5.3.12**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Soil Particulates (Future)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident Rancher | Adult | Particulates from Soil | EC | Exposure Concentration | Calculated | mg/m3 | -- | |
| | | | | CAIR | Air Exposure Point Concentration | Modeled from Soil | mg/m3 | CSOIL/PEF | Exposure Concentration (ug/m3) for carcinogens = |
| | | | | CSOIL | Soil Exposure Point Concentration | See Table 5.3.1 | mg/kg | -- | CAIR x ET x EF x ED x 1/ATC |
| | | | | PEF | Particulate Emission Factor | 6.11E+05 | m3/kg | Site-Specific | |
| | | | | ET | Exposure Time | 24 | hr/day | USEPA 1991 | Exposure Concentration (ug/m3) for noncarcinogens = |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA 1991 | CAIR x ET x EF x ED x 1/ATN |
| | | | | ED | Exposure Duration | 40 | years | USEPA 2005 | |
| | | | | ATC | Averaging Time, carcinogens | 613,200 | hours | 70 y x 365 d/y x 24 hr/d | where: |
| | | | | ATN | Averaging Time, noncarcinogens | 350,400 | hours | ED x 365 d/y x 24 hr/d | CAIR = CSOIL/PEF |
| | Subsistence Resident Rancher | Adult | Particulates from Soil | EC | Exposure Concentration | Calculated | mg/m3 | -- | |
| | | | | CAIR | Air Exposure Point Concentration | Modeled from Soil | mg/m3 | CSOIL/PEF | Exposure Concentration (ug/m3) for carcinogens = |
| | | | | CSOIL | Soil Exposure Point Concentration | See Table 5.3.1 | mg/kg | -- | CAIR x ET x EF x ED x 1/ATC |
| | | | | PEF | Particulate Emission Factor | 6.11E+05 | m3/kg | Site-Specific | |
| | | | | ET | Exposure Time | 24 | hr/day | USEPA 1991 | Exposure Concentration (ug/m3) for noncarcinogens = |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA 1991 | CAIR x ET x EF x ED x 1/ATN |
| | | | | ED | Exposure Duration | 40 | years | USEPA 2005 | |
| | | | | ATC | Averaging Time, carcinogens | 613,200 | hours | 70 y x 365 d/y x 24 hr/d | where: |
| | | | | ATN | Averaging Time, noncarcinogens | 350,400 | hours | ED x 365 d/y x 24 hr/d | CAIR = CSOIL/PEF |
| | Resident | Adult | Particulates from Soil | EC | Exposure Concentration | Calculated | mg/m3 | -- | |
| | | | | CAIR | Air Exposure Point Concentration | Modeled from Soil | mg/m3 | CSOIL/PEF | Exposure Concentration (ug/m3) for carcinogens = |
| | | | | CSOIL | Soil Exposure Point Concentration | See Table 5.3.1 | mg/kg | -- | CAIR x ET x EF x ED x 1/ATC |
| | | | | PEF | Particulate Emission Factor | 6.11E+05 | m3/kg | Site-Specific | |
| | | | | ET | Exposure Time | 24 | hr/day | USEPA 1991 | Exposure Concentration (ug/m3) for noncarcinogens = |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA 1991 | CAIR x ET x EF x ED x 1/ATN |
| | | | | ED | Exposure Duration | 30 | years | USEPA 2005 | |
| | | | | ATC | Averaging Time, carcinogens | 613,200 | hours | 70 y x 365 d/y x 24 hr/d | where: |
| | | | | ATN | Averaging Time, noncarcinogens | 262,800 | hours | ED x 365 d/y x 24 hr/d | CAIR = CSOIL/PEF |

**Table 5.3.13**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Ambient Air (Future)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Medium: Ambient Air
Exposure Medium: Ambient Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident Rancher | Adult | Particulates and Vapors in Air | EC | Exposure Concentration | Calculated | ug/m3 | -- | |
| | | | | CAIR | Air Exposure Point Concentration | From Monitoring Data | ug/m3 | -- | Exposure Concentration (ug/m3) for carcinogens = |
| | | | | ET | Exposure Time | 24 | hr/day | USEPA 2005 | CAIR x ET x EF x ED x 1/ATC |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA 1991 | |
| | | | | ED | Exposure Duration | 40 | years | USEPA 2005 | Chronic Daily Intake (ug/m3) for noncarcinogens = |
| | | | | ATC | Averaging Time, carcinogens | 613,200 | hours | 70 y x 365 d/y x 24 hr/d | CAIR x ET x EF x ED x 1/ATN |
| | | | | ATN | Averaging Time, noncarcinogens | 350,400 | hours | ED x 365 d/y x 24 hr/d | |
| | Subsistence Resident Rancher | Adult | Particulates and Vapors in Air | EC | Exposure Concentration | Calculated | ug/m3 | -- | |
| | | | | CAIR | Air Exposure Point Concentration | From Monitoring Data | ug/m3 | -- | Exposure Concentration (ug/m3) for carcinogens = |
| | | | | ET | Exposure Time | 24 | hr/day | USEPA 2005 | CAIR x ET x EF x ED x 1/ATC |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA 1991 | |
| | | | | ED | Exposure Duration | 40 | years | USEPA 2005 | Chronic Daily Intake (ug/m3) for noncarcinogens = |
| | | | | ATC | Averaging Time, carcinogens | 613,200 | hours | 70 y x 365 d/y x 24 hr/d | CAIR x ET x EF x ED x 1/ATN |
| | | | | ATN | Averaging Time, noncarcinogens | 350,400 | hours | ED x 365 d/y x 24 hr/d | |
| | Resident | Adult | Particulates and Vapors in Air | EC | Exposure Concentration | Calculated | ug/m3 | -- | |
| | | | | CAIR | Air Exposure Point Concentration | From Monitoring Data | ug/m3 | -- | Exposure Concentration (ug/m3) for carcinogens = |
| | | | | ET | Exposure Time | 24 | hr/day | USEPA 2005 | CAIR x ET x EF x ED x 1/ATC |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA 1991 | |
| | | | | ED | Exposure Duration | 30 | years | USEPA 2005 | Chronic Daily Intake (ug/m3) for noncarcinogens = |
| | | | | ATC | Averaging Time, carcinogens | 613,200 | hours | 70 y x 365 d/y x 24 hr/d | CAIR x ET x EF x ED x 1/ATN |
| | | | | ATN | Averaging Time, noncarcinogens | 262,800 | hours | ED x 365 d/y x 24 hr/d | |

**Table 5.3.14**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Produce (Future)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Produce

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Subsistence Resident Rancher | Adult | Plant Tissue (Homegrown Produce) | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CPRODag | Aboveground Produce (Exposed) Exposure Point Concentration | Modeled From Sampling Data (See Table 5.3.4) | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | CPRODbg | Belowground Produce Exposure Point Concentration | Modeled From Sampling Data (See Table 5.3.5) | mg/kg | -- | [(CPRODag x CRag-a) + (CPRODbg x CRbg-a)] x |
| | | | | CRag-a | Consumption Rate of Exposed Aboveground Produce - Adult | 0.00047 | kg/kg-day DW | USEPA August 1997; 2005 | FI x EFa x EDa x 1/ATC + |
| | | | | CRag-c | Consumption Rate of Exposed Aboveground Produce - Child | 0.00113 | kg/kg-day DW | USEPA August 1997; 2005 | [(CPRODag x CRag-c) + (CPRODbg x CRbg-c)] x |
| | | | | CRbg-a | Consumption Rate of Belowground Produce - Adult | 0.00017 | kg/kg-day DW | USEPA August 1997; 2005 | FI x EFc x EDc x 1/ATC |
| | | | | CRbg-c | Consumption Rate of Belowground Produce - Child | 0.00028 | kg/kg-day DW | USEPA August 1997; 2005 | |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 1991 | [(CPRODag x CRag-a) + (CPRODbg x CRbg-a)] x |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 1991 | FI x EFa x EDa x 1/ATN + |
| | | | | EDa | Exposure Duration - Adult | 34 | years | USEPA 2005 | [(CPRODag x CRag-c) + (CPRODbg x CRbg-c)] x |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | FI x EFc x EDc x 1/ATN |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 14,600 | days | ED x 365 d/y | |
| | Resident | Adult | Plant Tissue (Homegrown Produce) | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CPRODag | Aboveground Produce (Exposed) Exposure Point Concentration | Modeled From Sampling Data (See Table 5.3.4) | mg/kg | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | CPRODbg | Belowground Produce Exposure Point Concentration | Modeled From Sampling Data (See Table 5.3.5) | mg/kg | -- | [(CPRODag x CRag-a) + (CPRODbg x CRbg-a)] x |
| | | | | CRag-a | Consumption Rate of Exposed Aboveground Produce - Adult | 0.00032 | kg/kg-day DW | USEPA August 1997; 2005 | FI x EFa x EDa x 1/ATC + |
| | | | | CRag-c | Consumption Rate of Exposed Aboveground Produce - Child | 0.00077 | kg/kg-day DW | USEPA August 1997; 2005 | [(CPRODag x CRag-c) + (CPRODbg x CRbg-c)] x |
| | | | | CRbg-a | Consumption Rate of Belowground Produce - Adult | 0.00014 | kg/kg-day DW | USEPA August 1997; 2005 | FI x EFc x EDc x 1/ATC |
| | | | | CRbg-c | Consumption Rate of Belowground Produce - Child | 0.00023 | kg/kg-day DW | USEPA August 1997; 2005 | |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 1991 | [(CPRODag x CRag-a) + (CPRODbg x CRbg-a)] x |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 1991 | FI x EFa x EDa x 1/ATN + |
| | | | | EDa | Exposure Duration - Adult | 24 | years | USEPA 2005 | [(CPRODag x CRag-c) + (CPRODbg x CRbg-c)] x |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | FI x EFc x EDc x 1/ATN |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 10,950 | days | ED x 365 d/y | |

**Table 5.3.15**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Beef Tissue (Future)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Beef Tissue

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident Rancher | Adult | Beef Tissue | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CBEEF | Beef Exposure Point Concentration | Modeled From Sampling Data (See Table 5.3.6) | mg/kg FW | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | IRBEEFa | Ingestion Rate, Beef - Adult | 0.00122 | kg/kg-day FW | USEPA August 1997; 2005 | CBEEF x IRBEEFa x FI x EFa x EDa x 1/ATC + |
| | | | | IRBEEFc | Ingestion Rate, Beef - Child | 0.00075 | kg/kg-day FW | USEPA August 1997; 2005 | CBEEF x IRBEEFc x FI x EFc x EDc x 1/ATC |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 2005 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 2005 | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | EDa | Exposure Duration - Adult | 34 | years | USEPA 2005 | CBEEF x IRBEEFa x FI x EFa x EDa x 1/ATN + |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | CBEEF x IRBEEFc x FI x EFc x EDc x 1/ATN |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 14,600 | days | ED x 365 d/y | |
| | Subsistence Resident Rancher | Adult | Beef Tissue | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CBEEF | Beef Exposure Point Concentration | Modeled From Sampling Data (See Table 5.3.6) | mg/kg FW | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | IRBEEFa | Ingestion Rate, Beef - Adult | 0.00122 | kg/kg-day FW | USEPA August 1997; 2005 | CBEEF x IRBEEFa x FI x EFa x EDa x 1/ATC + |
| | | | | IRBEEFc | Ingestion Rate, Beef - Child | 0.00075 | kg/kg-day FW | USEPA August 1997; 2005 | CBEEF x IRBEEFc x FI x EFc x EDc x 1/ATC |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 2005 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 2005 | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | EDa | Exposure Duration - Adult | 34 | years | USEPA 2005 | CBEEF x IRBEEFa x FI x EFa x EDa x 1/ATN + |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | CBEEF x IRBEEFc x FI x EFc x EDc x 1/ATN |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 14,600 | days | ED x 365 d/y | |

**Table 5.3.16**
**Values Used For Daily Intake Calculations**
**Reasonable Maximum Exposure - Milk (Future)**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Milk

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Subsistence Resident Rancher | Adult | Milk | CDI | Chronic Daily Intake | Calculated | mg/kg-day | -- | |
| | | | | CMILK | Milk Exposure Point Concentration | Modeled From Sampling Data (See Table 5.3.7) | mg/kg FW | -- | Chronic Daily Intake (mg/kg-day) for carcinogens = |
| | | | | IRMILKa | Ingestion Rate, MIlk - Adult | 0.01367 | kg/kg-day FW | USEPA August 1997; 2005 | CMILK x IRMILKa x FI x EFa x EDa x 1/ATC + |
| | | | | IRMILKc | Ingestion Rate, Milk - Child | 0.02268 | kg/kg-day FW | USEPA August 1997; 2005 | CMILK x IRMILKc x FI x EFc x EDc x 1/ATC |
| | | | | FI | Fraction Ingested from Source | 1 | unitless | USEPA 2005 | |
| | | | | EFa | Exposure Frequency - Adult | 350 | days/year | USEPA 2005 | |
| | | | | EFc | Exposure Frequency - Child | 350 | days/year | USEPA 2005 | Chronic Daily Intake (mg/kg-day) for noncarcinogens = |
| | | | | EDa | Exposure Duration - Adult | 34 | years | USEPA 2005 | CMILK x IRMILKa x FI x EFa x EDa x 1/ATN + |
| | | | | EDc | Exposure Duration - Child | 6 | years | USEPA 2005 | CMILK x IRMILKc x FI x EFc x EDc x 1/ATN |
| | | | | ATC | Averaging Time, carcinogens | 25,550 | days | 70 y x 365 d/y | |
| | | | | ATN | Averaging Time, noncarcinogens | 14,600 | days | ED x 365 d/y | |

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 1: MATERNAL DAILY INTAKE FROM SOIL**

**FUTURE RESIDENT RANCHER**

| Exposure Area | Concentration in Soil ( Cs ) (1) mg/kg | Consumption Rate of Soil ( $CR_{soil}$ ) (2) kg/day | Fraction of Contaminated Soil ( $F_{soil}$ ) (3) | Body Weight ( BW ) (2) kg | Daily Intake from Soil ( $I_{soil}$ ) (4) mg/kg-day |
|---|---|---|---|---|---|
| Southeast | 1.88E-07 | 0.0001 | 1 | 70 | 2.69E-13 |
| South | 2.73E-07 | 0.0001 | 1 | 70 | 3.90E-13 |
| Southwest | 6.53E-07 | 0.0001 | 1 | 70 | 9.33E-13 |
| West | 2.32E-07 | 0.0001 | 1 | 70 | 3.31E-13 |
| Northwest | 2.72E-07 | 0.0001 | 1 | 70 | 3.88E-13 |
| North | 2.22E-07 | 0.0001 | 1 | 70 | 3.17E-13 |
| Northeast | 7.49E-07 | 0.0001 | 1 | 70 | 1.07E-12 |

**FUTURE SUBSISTENCE RESIDENT RANCHER**

| Exposure Area | Concentration in Soil ( Cs ) (1) mg/kg | Consumption Rate of Soil ( $CR_{soil}$ ) (2) kg/day | Fraction of Contaminated Soil ( $F_{soil}$ ) (3) | Body Weight ( BW ) (2) kg | Daily Intake from Soil ( $I_{soil}$ ) (4) mg/kg-day |
|---|---|---|---|---|---|
| Southeast | 1.88E-07 | 0.0001 | 1 | 70 | 2.69E-13 |
| South | 2.73E-07 | 0.0001 | 1 | 70 | 3.90E-13 |
| Southwest | 6.53E-07 | 0.0001 | 1 | 70 | 9.33E-13 |
| West | 2.32E-07 | 0.0001 | 1 | 70 | 3.31E-13 |
| Northwest | 2.72E-07 | 0.0001 | 1 | 70 | 3.88E-13 |
| North | 2.22E-07 | 0.0001 | 1 | 70 | 3.17E-13 |
| Northeast | 7.49E-07 | 0.0001 | 1 | 70 | 1.07E-12 |

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 1: MATERNAL DAILY INTAKE FROM SOIL (CONTINUED)**

**FUTURE RESIDENT**

| Exposure Area | Concentration in Soil ( Cs ) (1) mg/kg | Consumption Rate of Soil ( $CR_{soil}$ ) (2) kg/day | Fraction of Contaminated Soil ( $F_{soil}$ ) (3) | Body Weight ( BW ) (2) kg | Daily Intake from Soil ( $I_{soil}$ ) (4) mg/kg-day |
|---|---|---|---|---|---|
| Southeast | 1.88E-07 | 0.0001 | 1 | 70 | 2.69E-13 |
| South | 2.73E-07 | 0.0001 | 1 | 70 | 3.90E-13 |
| Southwest | 6.53E-07 | 0.0001 | 1 | 70 | 9.33E-13 |
| West | 2.32E-07 | 0.0001 | 1 | 70 | 3.31E-13 |
| Northwest | 2.72E-07 | 0.0001 | 1 | 70 | 3.88E-13 |
| North | 2.22E-07 | 0.0001 | 1 | 70 | 3.17E-13 |
| Northeast | 7.49E-07 | 0.0001 | 1 | 70 | 1.07E-12 |

Notes (Step 1):

(1) Exposure Point Concentration (See Table 5.3.1 for soil concentrations).

(2) Default value (adult) from USEPA 2005.

(3) Default value from USEPA 2005.

(4) Daily Intake from Soil from Table C-1-1 in USEPA 2005: $I_{soil} = [\ Cs \times CR_{soil} \times F_{soil}\ ] / BW$

where:

$I_{soil}$ - daily intake from soil (mg/kg-day)

Cs - average soil concentration over exposure duration (mg/kg)

$CR_{soil}$ - consumption rate of soil (kg/day)

$F_{soil}$ - fraction of soil that is contaminated (unitless)

BW - body weight of mother (kg)

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 2: MATERNAL DAILY INTAKE FROM HOMEGROWN PRODUCE, BEEF, AND MILK**

**FUTURE RESIDENT RANCHER**

| Exposure Area | Concentration in Beef Tissue ( $A_{beef}$ ) (1) mg/kg FW | Consumption Rate of Beef Tissue ( $CR_{beef}$ ) (2) kg/kg-day FW | Fraction of Contaminated Beef Tissue ( $F_{beef}$ ) (3) | Daily Intake from Beef Tissue ( $I_{beef}$ ) (4) mg/kg-day |
|---|---|---|---|---|
| Southeast | 8.93E-08 | 0.00122 | 1 | 1.09E-10 |
| South | 5.14E-08 | 0.00122 | 1 | 6.27E-11 |
| Southwest | 1.06E-08 | 0.00122 | 1 | 1.30E-11 |
| West | 8.99E-09 | 0.00122 | 1 | 1.10E-11 |
| Northwest | 9.47E-09 | 0.00122 | 1 | 1.16E-11 |
| North | 9.34E-09 | 0.00122 | 1 | 1.14E-11 |
| Northeast | 1.03E-08 | 0.00122 | 1 | 1.25E-11 |

**FUTURE SUBSISTENCE RESIDENT RANCHER**

| Exposure Area | Concentration in Beef Tissue ( $A_{beef}$ ) (1) mg/kg FW | Consumption Rate of Beef Tissue ( $CR_{beef}$ ) (2) kg/kg-day FW | Fraction of Contaminated Beef Tissue ( $F_{beef}$ ) (3) | Daily Intake from Beef Tissue ( $I_{beef}$ ) (4) mg/kg-day | Concentration in Exposed Aboveground Produce ( $A_{prod-ag}$ ) (1) mg/kg | Consumption Rate of Exposed Aboveground Produce ( $CR_{prod-ag}$ ) (2) kg/kg-day DW | Concentration in Belowground Produce ( $A_{prod-bg}$ ) (1) mg/kg | Consumption Rate of Belowground Produce ( $CR_{prod-bg}$ ) (2) kg/kg-day DW | Fraction of Contaminated Produce ( $F_{prod}$ ) (3) | Daily Intake from Produce ( $I_{prod}$ ) (5) mg/kg-day | Concentration in Milk ( $A_{milk}$ ) (1) mg/kg FW | Consumption Rate of Milk ( $CR_{milk}$ ) (2) kg/kg-day FW | Fraction of Contaminated Milk ( $F_{milk}$ ) (3) | Daily Intake from Milk ( $I_{milk}$ ) (6) mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Southeast | 8.93E-08 | 0.00122 | 1 | 1.09E-10 | 1.10E-07 | 0.00047 | 1.11E-08 | 0.00017 | 1 | 5.34E-11 | 3.23E-08 | 0.01367 | 1 | 4.42E-10 |
| South | 5.14E-08 | 0.00122 | 1 | 6.27E-11 | 1.10E-07 | 0.00047 | 1.79E-08 | 0.00017 | 1 | 5.46E-11 | 1.85E-08 | 0.01367 | 1 | 2.53E-10 |
| Southwest | 1.06E-08 | 0.00122 | 1 | 1.30E-11 | 1.10E-07 | 0.00047 | 3.91E-08 | 0.00017 | 1 | 5.82E-11 | 3.52E-09 | 0.01367 | 1 | 4.82E-11 |
| West | 8.99E-09 | 0.00122 | 1 | 1.10E-11 | 1.10E-07 | 0.00047 | 1.56E-08 | 0.00017 | 1 | 5.42E-11 | 3.16E-09 | 0.01367 | 1 | 4.32E-11 |
| Northwest | 9.47E-09 | 0.00122 | 1 | 1.16E-11 | 1.10E-07 | 0.00047 | 1.78E-08 | 0.00017 | 1 | 5.46E-11 | 3.31E-09 | 0.01367 | 1 | 4.53E-11 |
| North | 9.34E-09 | 0.00122 | 1 | 1.14E-11 | 1.10E-07 | 0.00047 | 1.50E-08 | 0.00017 | 1 | 5.41E-11 | 3.29E-09 | 0.01367 | 1 | 4.50E-11 |
| Northeast | 1.03E-08 | 0.00122 | 1 | 1.25E-11 | 1.10E-07 | 0.00047 | 4.46E-08 | 0.00017 | 1 | 5.91E-11 | 3.34E-09 | 0.01367 | 1 | 4.56E-11 |

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 2: MATERNAL DAILY INTAKE FROM HOMEGROWN PRODUCE, BEEF, AND MILK (CONTINUED)**

**FUTURE RESIDENT**

| Exposure Area | Concentration in Exposed Aboveground Produce ( $A_{prod-ag}$ ) (1) mg/kg | Consumption Rate of Exposed Aboveground Produce ( $CR_{prod-ag}$ ) (2) kg/kg-day DW | Concentration in Belowground Produce ( $A_{prod-bg}$ ) (1) mg/kg | Consumption Rate of Belowground Produce ( $CR_{prod-bg}$ ) (2) kg/kg-day DW | Fraction of Contaminated Produce ( $F_{prod}$ ) (3) | Daily Intake from Produce ( $I_{prod}$ ) (5) mg/kg-day |
|---|---|---|---|---|---|---|
| Southeast | 1.10E-07 | 0.00032 | 1.11E-08 | 0.00014 | 1 | 3.66E-11 |
| South | 1.10E-07 | 0.00032 | 1.79E-08 | 0.00014 | 1 | 3.76E-11 |
| Southwest | 1.10E-07 | 0.00032 | 3.91E-08 | 0.00014 | 1 | 4.06E-11 |
| West | 1.10E-07 | 0.00032 | 1.56E-08 | 0.00014 | 1 | 3.73E-11 |
| Northwest | 1.10E-07 | 0.00032 | 1.78E-08 | 0.00014 | 1 | 3.76E-11 |
| North | 1.10E-07 | 0.00032 | 1.50E-08 | 0.00014 | 1 | 3.72E-11 |
| Northeast | 1.10E-07 | 0.00032 | 4.46E-08 | 0.00014 | 1 | 4.13E-11 |

Notes (Step 2):

(1) Exposure Point Concentration (See Tables 5.3.4, 5.3.5, 5.3.6, and 5.3.7 for aboveground produce, belowground produce, beef, and milk concentrations, respectively).

Aboveground produce concentration is from sampling location MSP, the location with the highest produce concentration.

(2) Default value (homegrown produce, beef, milk - farmer) from USEPA 1997, 2005.

(3) Default value from USEPA 2005.

(4) Daily Intake from Beef Tissue from Table C-1-3 in USEPA 2005: $I_{beef} = A_{beef} \times CR_{beef} \times F_{beef}$

where:

$I_{beef}$ - daily intake from beef tissue (mg/kg-day)

$A_{beef}$ - concentration in beef tissue (mg/kg FW)

$CR_{beef}$ - consumption rate of beef tissue (kg/kg-day FW)

$F_{beef}$ - fraction of beef tissue that is contaminated (unitless)

(5) Daily Intake from Produce from Table C-1-2 in USEPA 2005: $I_{prod} = ( A_{prod-ag} \times CR_{prod-ag} + A_{prod-bg} \times CR_{prod-bg} ) \times F_{prod}$

where:

$I_{prod}$ - daily intake from produce (mg/kg-day)

$A_{prod-ag}$ - concentration in exposed aboveground produce (mg/kg)

$A_{prod-bg}$ - concentration in belowground produce (mg/kg)

$CR_{prod-ag}$ - consumption rate of exposed aboveground produce (kg/kg-day DW)

$CR_{prod-bg}$ - consumption rate of belowground produce (kg/kg-day DW)

$F_{prod}$ - fraction of produce that is contaminated (unitless)

(6) Daily Intake from Milk from Table C-1-3 in USEPA 2005: $I_{milk} = A_{milk} \times CR_{milk} \times F_{milk}$

where:

$I_{milk}$ - daily intake from milk (mg/kg-day)

$A_{milk}$ - average milk concentration over exposure duration (mg/kg FW)

$CR_{milk}$ - consumption rate of milk (kg/kg-day FW)

$F_{milk}$ - fraction of milk that is contaminated (unitless)

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 3: MATERNAL DAILY INTAKE VIA INHALATION**

**FUTURE RESIDENT RANCHER**

| Exposure Area | Concentration in Air ( $C_a$ ) (1) ug/m$^3$ | Inhalation Rate ( IR ) (2) m$^3$/hr | Exposure Time ( ET ) (2) hrs/day | Exposure Frequency ( EF ) (2) days/yr | Exposure Duration ( ED ) (3) yr | Body Weight ( BW ) (2) kg | Averaging Time ( AT ) (2) yr | Conversion Factor ( CF1 ) (2) mg/ug | Conversion Factor ( CF2 ) (2) days/yr | Daily Intake via Inhalation ( ADI ) (4) mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|
| Southeast | 1.19E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.85E-12 |
| South | 1.20E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.87E-12 |
| Southwest | 1.26E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.97E-12 |
| West | 1.20E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.86E-12 |
| Northwest | 1.20E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.87E-12 |
| North | 1.19E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.86E-12 |
| Northeast | 1.28E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 2.00E-12 |

**FUTURE SUBSISTENCE RESIDENT RANCHER**

| Exposure Area | Concentration in Air ( $C_a$ ) (1) ug/m$^3$ | Inhalation Rate ( IR ) (2) m$^3$/hr | Exposure Time ( ET ) (2) hrs/day | Exposure Frequency ( EF ) (2) days/yr | Exposure Duration ( ED ) (3) yr | Body Weight ( BW ) (2) kg | Averaging Time ( AT ) (2) yr | Conversion Factor ( CF1 ) (2) mg/ug | Conversion Factor ( CF2 ) (2) days/yr | Daily Intake via Inhalation ( ADI ) (4) mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|
| Southeast | 1.19E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.85E-12 |
| South | 1.20E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.87E-12 |
| Southwest | 1.26E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.97E-12 |
| West | 1.20E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.86E-12 |
| Northwest | 1.20E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.87E-12 |
| North | 1.19E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 1.86E-12 |
| Northeast | 1.28E-08 | 0.83 | 24 | 350 | 40 | 70 | 70 | 0.001 | 365 | 2.00E-12 |

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 3: MATERNAL DAILY INTAKE VIA INHALATION (CONTINUED)**

**FUTURE RESIDENT**

| Exposure Area | Concentration in Air ( $C_a$ ) (1) $ug/m^3$ | Inhalation Rate ( IR ) (2) $m^3/hr$ | Exposure Time ( ET ) (2) hrs/day | Exposure Frequency ( EF ) (2) days/yr | Exposure Duration ( ED ) (3) yr | Body Weight ( BW ) (2) kg | Averaging Time ( AT ) (2) yr | Conversion Factor ( CF1 ) (2) mg/ug | Conversion Factor ( CF2 ) (2) days/yr | Daily Intake via Inhalation ( ADI ) (4) mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|
| Southeast | 1.19E-08 | 0.83 | 24 | 350 | 30 | 70 | 70 | 0.001 | 365 | 1.39E-12 |
| South | 1.20E-08 | 0.83 | 24 | 350 | 30 | 70 | 70 | 0.001 | 365 | 1.41E-12 |
| Southwest | 1.26E-08 | 0.83 | 24 | 350 | 30 | 70 | 70 | 0.001 | 365 | 1.48E-12 |
| West | 1.20E-08 | 0.83 | 24 | 350 | 30 | 70 | 70 | 0.001 | 365 | 1.40E-12 |
| Northwest | 1.20E-08 | 0.83 | 24 | 350 | 30 | 70 | 70 | 0.001 | 365 | 1.41E-12 |
| North | 1.19E-08 | 0.83 | 24 | 350 | 30 | 70 | 70 | 0.001 | 365 | 1.40E-12 |
| Northeast | 1.28E-08 | 0.83 | 24 | 350 | 30 | 70 | 70 | 0.001 | 365 | 1.50E-12 |

Notes (Step 3):

(1) Concentration in air is the sum of measured air concentration and modeled particulate concentration.

where:

Measured air concentration for each exposure area is from sampling location MSP, the sampling location containing the highest concentration (see Table 5.3.3).

Modeled particulate concentration for each exposure area is the concentration in soil at that exposure area (see Table 5.3.1) divided by the site-specific particulate emission factor (PEF) of 6.11E+5 $m^3/kg$ (see Section 5.3.2.3 of the text for PEF derivation).

(2) Default value from USEPA 2005.

(3) Default value (farmer) from USEPA 2005.

(4) Daily Intake via Inhalation from Table C-2-1 in USEPA 2005: ADI = [ $C_a$ x IR x ET x EF x ED x 0.001 mg/ug ] / [ BW x AT x 365 day/yr ]

where:

ADI - average daily intake via inhalation (mg/kg-day)

$C_a$ - total air concentration ($ug/m^3$)

IR - inhalation rate ($m^3/hr$)

ET - exposure time (hrs/day)

EF - exposure frequency (days/yr)

ED - exposure duration (yr)

BW - body weight (kg)

AT - averaging time (yr)

CF1 (0.001) - units conversion factor (mg/ug)

CF2 (365) -units conversion factor (days/yr)

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 4: CONCENTRATION IN MILK FAT**

**FUTURE RESIDENT RANCHER**

| Exposure Area | Daily Intake via Inhalation ( ADI ) (1) mg/kg-day | Daily Intake from Soil ( I ) (1) mg/kg-day | Daily Intake from Beef Tissue ( I ) (1) mg/kg-day | Average Maternal Intake ( m ) (2) mg/kg-day | Conversion Factor ( CF ) (3) pg/mg | Half-Life ( h ) (3) days | Fraction Stored in Fat ( $f_1$ ) (3) | Fraction of Mother's Weight ( $f_2$ ) (3) | Constant (Const ) (3) | Concentration ( $C_{milkfat}$ ) (4) pg/kg |
|---|---|---|---|---|---|---|---|---|---|---|
| Southeast | 1.85E-12 | 2.69E-13 | 1.09E-10 | 1.11E-10 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.23E+03 |
| South | 1.87E-12 | 3.90E-13 | 6.27E-11 | 6.50E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 7.19E+02 |
| Southwest | 1.97E-12 | 9.33E-13 | 1.30E-11 | 1.59E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.76E+02 |
| West | 1.86E-12 | 3.31E-13 | 1.10E-11 | 1.32E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.46E+02 |
| Northwest | 1.87E-12 | 3.88E-13 | 1.16E-11 | 1.38E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.53E+02 |
| North | 1.86E-12 | 3.17E-13 | 1.14E-11 | 1.36E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.50E+02 |
| Northeast | 2.00E-12 | 1.07E-12 | 1.25E-11 | 1.56E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.73E+02 |

**FUTURE SUBSISTENCE RESIDENT RANCHER**

| Exposure Area | Daily Intake via Inhalation ( ADI ) (1) mg/kg-day | Daily Intake from Soil ( I ) (1) mg/kg-day | Daily Intake from Beef Tissue ( I ) (1) mg/kg-day | Daily Intake from Produce ( $I_{prod}$ ) (1) mg/kg-day | Daily Intake from Milk ( $I_{milk}$ ) (1) mg/kg-day | Average Maternal Intake ( m ) (2) mg/kg-day | Conversion Factor ( CF ) (3) pg/mg | Half-Life ( h ) (3) days | Fraction Stored in Fat ( $f_1$ ) (3) | Fraction of Mother's Weight ( $f_2$ ) (3) | Constant (Const ) (3) | Concentration ( $C_{milkfat}$ ) (4) pg/kg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Southeast | 1.85E-12 | 2.69E-13 | 1.09E-10 | 5.34E-11 | 4.42E-10 | 6.06E-10 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 6.70E+03 |
| South | 1.87E-12 | 3.90E-13 | 6.27E-11 | 5.46E-11 | 2.53E-10 | 3.73E-10 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 4.12E+03 |
| Southwest | 1.97E-12 | 9.33E-13 | 1.30E-11 | 5.82E-11 | 4.82E-11 | 1.22E-10 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.35E+03 |
| West | 1.86E-12 | 3.31E-13 | 1.10E-11 | 5.42E-11 | 4.32E-11 | 1.11E-10 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.22E+03 |
| Northwest | 1.87E-12 | 3.88E-13 | 1.16E-11 | 5.46E-11 | 4.53E-11 | 1.14E-10 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.26E+03 |
| North | 1.86E-12 | 3.17E-13 | 1.14E-11 | 5.41E-11 | 4.50E-11 | 1.13E-10 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.25E+03 |
| Northeast | 2.00E-12 | 1.07E-12 | 1.25E-11 | 5.91E-11 | 4.56E-11 | 1.20E-10 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 1.33E+03 |

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 4: CONCENTRATION IN MILK FAT (CONTINUED)**

**FUTURE RESIDENT**

| Exposure Area | Daily Intake via Inhalation ( ADI ) (1) mg/kg-day | Daily Intake from Soil ( I ) (1) mg/kg-day | Daily Intake from Produce ( $I_{prod}$ ) (1) mg/kg-day | Average Maternal Intake ( m ) (2) mg/kg-day | Conversion Factor ( CF ) (3) pg/mg | Half-Life ( h ) (3) days | Fraction Stored in Fat ( $f_1$ ) (3) | Fraction of Mother's Weight ( $f_2$ ) (3) | Constant (Const ) (3) | Concentration ( $C_{milkfat}$ ) (4) pg/kg |
|---|---|---|---|---|---|---|---|---|---|---|
| Southeast | 1.39E-12 | 2.69E-13 | 3.66E-11 | 3.83E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 4.24E+02 |
| South | 1.41E-12 | 3.90E-13 | 3.76E-11 | 3.94E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 4.36E+02 |
| Southwest | 1.48E-12 | 9.33E-13 | 4.06E-11 | 4.30E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 4.75E+02 |
| West | 1.40E-12 | 3.31E-13 | 3.73E-11 | 3.90E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 4.31E+02 |
| Northwest | 1.41E-12 | 3.88E-13 | 3.76E-11 | 3.94E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 4.35E+02 |
| North | 1.40E-12 | 3.17E-13 | 3.72E-11 | 3.89E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 4.30E+02 |
| Northeast | 1.50E-12 | 1.07E-12 | 4.13E-11 | 4.39E-11 | 1.00E+09 | 2555 | 0.9 | 0.3 | 0.693 | 4.85E+02 |

Notes (Step 4):

(1) Daily intake calculations are shown in Steps 1, 2, and 3 above.

(2) Sum of Daily Intakes.

(3) Default value from USEPA 2005.

(4) Concentration in Milk Fat from Table C-3-1 in USEPA 2005: $C_{milkfat} = [ m \times ( 1 \times (10)^9 ) \times h \times f_1 ] / [ 0.693 \times f_2 ]$

where:

$C_{milkfat}$ - Concentration in milk fat of breast milk (pg/kg milk fat)

m - average maternal intake for each adult exposure scenario (mg/kg BW-day) (Calculated in preceding tables for inhalation (ADI), and soil and beef ingestion (I)).

CF ($1 \times 10^9$) - unit conversion factor (pg/mg)

h - half-life of dioxin in adults (days)

$f_1$ - fraction of ingested dioxin-like PCBs stored in fat (unitless)

$f_2$ - fraction of mother's weight that is fat (unitless)

Const (0.693) - constant (unitless)

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 5: AVERAGE DAILY DOSE TO THE EXPOSED INFANT**

**FUTURE RESIDENT RANCHER**

| Exposure Area | Concentration ( $C_{milkfat}$ ) (1) pg/kg | Fraction of Breast Milk That is Fat ( $f_3$ ) (2) | Fraction Absorbed ( $f_4$ ) (2) | Ingestion Rate ( $IR_{milk}$ ) (2) kg/day | Exposure Duration ( ED ) (2) yr | Body Weight ( BW ) (2) kg | Averaging Time ( AT ) (2) yr | Average Daily Dose ( $ADD_{infant}$ ) (3) pg/kg BW-day |
|---|---|---|---|---|---|---|---|---|
| Southeast | 1.23E+03 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 3.24E+00 |
| South | 7.19E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.89E+00 |
| Southwest | 1.76E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 4.63E-01 |
| West | 1.46E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 3.84E-01 |
| Northwest | 1.53E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 4.03E-01 |
| North | 1.50E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 3.96E-01 |
| Northeast | 1.73E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 4.55E-01 |

**FUTURE SUBSISTENCE RESIDENT RANCHER**

| Exposure Area | Concentration ( $C_{milkfat}$ ) (1) pg/kg | Fraction of Breast Milk That is Fat ( $f_3$ ) (2) | Fraction Absorbed ( $f_4$ ) (2) | Ingestion Rate ( $IR_{milk}$ ) (2) kg/day | Exposure Duration ( ED ) (2) yr | Body Weight ( BW ) (2) kg | Averaging Time ( AT ) (2) yr | Average Daily Dose ( $ADD_{infant}$ ) (3) pg/kg BW-day |
|---|---|---|---|---|---|---|---|---|
| Southeast | 6.70E+03 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.77E+01 |
| South | 4.12E+03 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.09E+01 |
| Southwest | 1.35E+03 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 3.56E+00 |
| West | 1.22E+03 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 3.22E+00 |
| Northwest | 1.26E+03 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 3.31E+00 |
| North | 1.25E+03 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 3.28E+00 |
| Northeast | 1.33E+03 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 3.51E+00 |

**Table 5.3.17**
**Average Daily Dose to Infant from Exposure to Total PCB TEC in Breast Milk**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**STEP 5: AVERAGE DAILY DOSE TO THE EXPOSED INFANT (CONTINUED)**

**FUTURE RESIDENT**

| Exposure Area | Concentration ( $C_{milkfat}$ ) (1) pg/kg | Fraction of Breast Milk That is Fat ( $f_3$ ) (2) | Fraction Absorbed ( $f_4$ ) (2) | Ingestion Rate ( $IR_{milk}$ ) (2) kg/day | Exposure Duration ( ED ) (2) yr | Body Weight ( BW ) (2) kg | Averaging Time ( AT ) (2) yr | Average Daily Dose ( $ADD_{infant}$ ) (3) pg/kg BW-day |
|---|---|---|---|---|---|---|---|---|
| Southeast | 4.24E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.12E+00 |
| South | 4.36E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.15E+00 |
| Southwest | 4.75E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.25E+00 |
| West | 4.31E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.14E+00 |
| Northwest | 4.35E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.15E+00 |
| North | 4.30E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.13E+00 |
| Northeast | 4.85E+02 | 0.04 | 0.9 | 0.688 | 1 | 9.4 | 1 | 1.28E+00 |

Notes (Step 5):

(1) Concentration of Milk Fat calculation is shown in Step 4 above.

(2) Default value from USEPA 2005.

(3) Average Daily Dose from Table C-3-2 in USEPA 2005: $ADD_{infant} = [ C_{milkfat} \times f_3 \times f_4 \times IR_{milk} \times ED ] / [ BW_{infant} \times AT ]$

where:

ADD - average daily intake for infant exposed to contaminated breast milk (pg/kg BW-day)

$C_{milkfat}$ - concentration in milk fat of breast milk (pg/kg milk fat)

$f_3$ - fraction of mother's breast milk that is fat (unitless)

$f_4$ - fraction ingested that is absorbed (unitless)

$IR_{milk}$ - ingestion rate of breast milk by the infant (kg/day)

ED - exposure duration (yr)

$BW_{infant}$ - body weight of infant (kg)

AT - averaging time (yr)

**Table 5.3.18**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Current Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Receptor Population: Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | Value | Units | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Southeast | Ingestion | PCB Total TEC | 1.88E-07 | mg/kg | 5.0E-15 | mg/kg-day | 1.3E+05 | kg-day/mg | 6.5E-10 | 1.4E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 6.5E-10 | | | | | NA |
| | | | Dermal | PCB Total TEC | 1.88E-07 | mg/kg | 1.6E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.1E-09 | 4.5E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.1E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.7E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.7E-09 | | | | | NA |
| | Ambient Air | Particulates Southeast | Inhalation | PCB Total TEC | 3.08E-10 | ug/m3 | 1.9E-12 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 7.2E-11 | 5.3E-12 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 7.2E-11 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.2E-11 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.2E-11 | | | | | NA |
| Soil Total (Southeast) | | | | | | | | | | | 2.8E-09 | | | | | NA |
| Soil | Soil | South | Ingestion | PCB Total TEC | 2.73E-07 | mg/kg | 7.2E-15 | mg/kg-day | 1.3E+05 | kg-day/mg | 9.4E-10 | 2.0E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 9.4E-10 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.73E-07 | mg/kg | 2.3E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.0E-09 | 6.5E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.0E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.9E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.9E-09 | | | | | NA |
| | Ambient Air | Particulates South | Inhalation | PCB Total TEC | 4.47E-10 | ug/m3 | 2.8E-12 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.1E-10 | 7.7E-12 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.1E-10 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.1E-10 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.1E-10 | | | | | NA |
| Soil Total (South) | | | | | | | | | | | 4.1E-09 | | | | | NA |
| Soil | Soil | Southwest | Ingestion | PCB Total TEC | 6.53E-07 | mg/kg | 1.7E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.3E-09 | 4.9E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.3E-09 | | | | | NA |
| | | | Dermal | PCB Total TEC | 6.53E-07 | mg/kg | 5.5E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.2E-09 | 1.5E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.2E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 9.4E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 9.4E-09 | | | | | NA |
| | Ambient Air | Particulates Southwest | Inhalation | PCB Total TEC | 1.07E-09 | ug/m3 | 6.6E-12 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.5E-10 | 1.9E-11 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.5E-10 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.5E-10 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.5E-10 | | | | | NA |
| Soil Total (Southwest) | | | | | | | | | | | 9.7E-09 | | | | | NA |

**Table 5.3.18**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Current Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Receptor Population: Rancher
Receptor Age: Adult

| | | | | | | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exposure | Exposure | Exposure | Chemical of | EPC | | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer | Intake/Exposure Concentration | | RfD/RfC | | Hazard |
| Medium | Medium | Point | Route | Potential Concern | Value | Units | Value | Units | Value | Units | Risk | Value | Units | Value | Units | Quotient |
| Soil | Soil | West | Ingestion | PCB Total TEC | 2.32E-07 | mg/kg | 6.2E-15 | mg/kg-day | 1.3E+05 | kg-day/mg | 8.0E-10 | 1.7E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 8.0E-10 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.32E-07 | mg/kg | 2.0E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.6E-09 | 5.5E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.6E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.4E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.4E-09 | | | | | NA |
| | Ambient Air | Particulates West | Inhalation | PCB Total TEC | 3.79E-10 | ug/m3 | 2.4E-12 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 8.9E-11 | 6.6E-12 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 8.9E-11 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 8.9E-11 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 8.9E-11 | | | | | NA |
| Soil Total (West) | | | | | | | | | | | 3.4E-09 | | | | | NA |
| Soil | Soil | Northwest | Ingestion | PCB Total TEC | 2.72E-07 | mg/kg | 7.2E-15 | mg/kg-day | 1.3E+05 | kg-day/mg | 9.4E-10 | 2.0E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 9.4E-10 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.72E-07 | mg/kg | 2.3E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.0E-09 | 6.5E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.0E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.9E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.9E-09 | | | | | NA |
| | Ambient Air | Particulates Northwest | Inhalation | PCB Total TEC | 4.45E-10 | ug/m3 | 2.8E-12 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.0E-10 | 7.7E-12 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.0E-10 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.0E-10 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.0E-10 | | | | | NA |
| Soil Total (Northwest) | | | | | | | | | | | 4.0E-09 | | | | | NA |

**Table 5.3.18**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Current Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Receptor Population: Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations: Intake/Exposure Concentration | | Cancer Risk Calculations: CSF/Unit Risk | | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration | | Non-Cancer Hazard Calculations: RfD/RfC | | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | North | Ingestion | PCB Total TEC | 2.22E-07 | mg/kg | 5.9E-15 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.7E-10 | 1.6E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.7E-10 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.22E-07 | mg/kg | 1.9E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.4E-09 | 5.3E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.4E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.2E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.2E-09 | | | | | NA |
| | Ambient Air | Particulates North | Inhalation | PCB Total TEC | 3.63E-10 | ug/m3 | 2.2E-12 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 8.5E-11 | 6.3E-12 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 8.5E-11 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 8.5E-11 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 8.5E-11 | | | | | NA |
| Soil Total (North) | | | | | | | | | | | 3.3E-09 | | | | | NA |
| Soil | Soil | Northeast | Ingestion | PCB Total TEC | 7.49E-07 | mg/kg | 2.0E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.6E-09 | 5.6E-14 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.6E-09 | | | | | NA |
| | | | Dermal | PCB Total TEC | 7.49E-07 | mg/kg | 6.3E-14 | mg/kg-day | 1.3E+05 | kg-day/mg | 8.3E-09 | 1.8E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 8.3E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.1E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.1E-08 | | | | | NA |
| | Ambient Air | Particulates Northeast | Inhalation | PCB Total TEC | 1.23E-09 | ug/m3 | 7.6E-12 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.9E-10 | 2.1E-11 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.9E-10 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.9E-10 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.9E-10 | | | | | NA |
| Soil Total (Northeast) | | | | | | | | | | | 1.1E-08 | | | | | NA |

**Table 5.3.19**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Current Rancher (Adult) - Ambient Air**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Receptor Population: Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Noncancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Intake/Exposure Concentration | | Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfC | | Hazard Quotient |
| | | | | | Value | Units | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Ambient Air | Ambient Air | Particulates and Vapors at DMS1 | Inhalation | PCB Total TEC | 8.36E-09 | ug/m3 | 5.2E-11 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.0E-09 | 1.5E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.0E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.0E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.0E-09 | | | | | NA |
| Medium Total | | | | | | | | | | | 2.0E-09 | | | | | NA |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP | Inhalation | PCB Total TEC | 1.16E-08 | ug/m3 | 7.2E-11 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.7E-09 | 2.0E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.7E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.7E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.7E-09 | | | | | NA |
| Medium Total | | | | | | | | | | | 2.7E-09 | | | | | NA |
| Ambient Air | Ambient Air | Particulates and Vapors at UMS1 | Inhalation | PCB Total TEC | 8.98E-09 | ug/m3 | 5.6E-11 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.1E-09 | 1.6E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.1E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.1E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.1E-09 | | | | | NA |
| Medium Total | | | | | | | | | | | 2.1E-09 | | | | | NA |

**Table 5.3.20**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | Soil | Southeast | Ingestion | PCB Total TEC | 1.88E-07 | mg/kg | 3.3E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 4.3E-08 | 5.8E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 4.3E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 1.88E-07 | mg/kg | 4.8E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 6.2E-08 | 8.4E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 6.2E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.1E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.1E-07 | | | | | NA |
| | Beef Tissue | Southeast | Ingestion | PCB Total TEC | 8.93E-08 | mg/kg | 5.6E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.3E-06 | 9.8E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.3E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.3E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.3E-06 | | | | | NA |
| | Ambient Air | Particulates Southeast | Inhalation | PCB Total TEC | 3.08E-10 | ug/m3 | 1.7E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 6.4E-09 | 2.9E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 6.4E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 6.4E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 6.4E-09 | | | | | NA |
| Soil Total (Southeast) | | | | | | | | | | | 7.4E-06 | | | | | NA |
| Soil | Soil | South | Ingestion | PCB Total TEC | 2.73E-07 | mg/kg | 4.8E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 6.2E-08 | 8.4E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 6.2E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.73E-07 | mg/kg | 7.0E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 9.1E-08 | 1.2E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 9.1E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.5E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.5E-07 | | | | | NA |
| | Beef Tissue | South | Ingestion | PCB Total TEC | 5.14E-08 | mg/kg | 3.2E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 4.2E-06 | 5.7E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 4.2E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 4.2E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 4.2E-06 | | | | | NA |
| | Ambient Air | Particulates South | Inhalation | PCB Total TEC | 4.47E-10 | ug/m3 | 2.4E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 9.3E-09 | 4.3E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 9.3E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 9.3E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 9.3E-09 | | | | | NA |
| Soil Total (South) | | | | | | | | | | | 4.4E-06 | | | | | NA |

**Table 5.3.20**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | Soil | Southwest | Ingestion | PCB Total TEC | 6.53E-07 | mg/kg | 1.1E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 1.5E-07 | 2.0E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 1.5E-07 | | | | | NA |
| | | | Dermal | PCB Total TEC | 6.53E-07 | mg/kg | 1.7E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.2E-07 | 2.9E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.2E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.7E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.7E-07 | | | | | NA |
| | Beef Tissue | Southwest | Ingestion | PCB Total TEC | 1.06E-08 | mg/kg | 6.7E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 8.7E-07 | 1.2E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 8.7E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 8.7E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 8.7E-07 | | | | | NA |
| | Ambient Air | Particulates Southwest | Inhalation | PCB Total TEC | 1.07E-09 | ug/m3 | 5.9E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.2E-08 | 1.0E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.2E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.2E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.2E-08 | | | | | NA |
| Soil Total (Southwest) | | | | | | | | | | | 1.3E-06 | | | | | NA |
| Soil | Soil | West | Ingestion | PCB Total TEC | 2.32E-07 | mg/kg | 4.1E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.3E-08 | 7.1E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 5.3E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.32E-07 | mg/kg | 5.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.7E-08 | 1.0E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.7E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.3E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.3E-07 | | | | | NA |
| | Beef Tissue | West | Ingestion | PCB Total TEC | 8.99E-09 | mg/kg | 5.7E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.4E-07 | 9.9E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.4E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.4E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.4E-07 | | | | | NA |
| | Ambient Air | Particulates West | Inhalation | PCB Total TEC | 3.79E-10 | ug/m3 | 2.1E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 7.9E-09 | 3.6E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 7.9E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.9E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.9E-09 | | | | | NA |
| Soil Total (West) | | | | | | | | | | | 8.7E-07 | | | | | NA |

**Table 5.3.20**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| | | | | | | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
| Soil | Soil | Northwest | Ingestion | PCB Total TEC | 2.72E-07 | mg/kg | 4.8E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 6.2E-08 | 8.4E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 6.2E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.72E-07 | mg/kg | 6.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 9.0E-08 | 1.2E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 9.0E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.5E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.5E-07 | | | | | NA |
| | Beef Tissue | Northwest | Ingestion | PCB Total TEC | 9.47E-09 | mg/kg | 6.0E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.8E-07 | 1.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.8E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.8E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.8E-07 | | | | | NA |
| | Ambient Air | Particulates Northwest | Inhalation | PCB Total TEC | 4.45E-10 | ug/m3 | 2.4E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 9.3E-09 | 4.3E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 9.3E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 9.3E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 9.3E-09 | | | | | NA |
| Soil Total (Northwest) | | | | | | | | | | | 9.4E-07 | | | | | NA |
| Soil | Soil | North | Ingestion | PCB Total TEC | 2.22E-07 | mg/kg | 3.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.1E-08 | 6.8E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 5.1E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.22E-07 | mg/kg | 5.7E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.4E-08 | 9.9E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.4E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.2E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.2E-07 | | | | | NA |
| | Beef Tissue | North | Ingestion | PCB Total TEC | 9.34E-09 | mg/kg | 5.9E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.7E-07 | 1.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.7E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.7E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.7E-07 | | | | | NA |
| | Ambient Air | Particulates North | Inhalation | PCB Total TEC | 3.63E-10 | ug/m3 | 2.0E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 7.6E-09 | 3.5E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 7.6E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.6E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.6E-09 | | | | | NA |
| Soil Total (North) | | | | | | | | | | | 9.0E-07 | | | | | NA |

**Table 5.3.20**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | Value | Units | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Northeast | Ingestion | PCB Total TEC | 7.49E-07 | mg/kg | 1.3E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 1.7E-07 | 2.3E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 1.7E-07 | | | | | NA |
| | | | Dermal | PCB Total TEC | 7.49E-07 | mg/kg | 1.9E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.5E-07 | 3.3E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.5E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 4.2E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 4.2E-07 | | | | | NA |
| | Beef Tissue | Northeast | Ingestion | PCB Total TEC | 1.03E-08 | mg/kg | 6.5E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 8.4E-07 | 1.1E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 8.4E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 8.4E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 8.4E-07 | | | | | NA |
| | Ambient Air | Particulates Northeast | Inhalation | PCB Total TEC | 1.23E-09 | ug/m3 | 6.7E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.6E-08 | 1.2E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.6E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.6E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.6E-08 | | | | | NA |
| Soil Total (Northeast) | | | | | | | | | | | 1.3E-06 | | | | | NA |

**Table 5.3.21**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident Rancher (Adult) - Ambient Air**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | Unit Risk Value | Unit Risk Units | Cancer Risk | Noncancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfC Value | RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ambient Air | Ambient Air | Particulates and Vapors at DMS1 | Inhalation | PCB Total TEC | 8.36E-09 | ug/m3 | 4.6E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.7E-07 | 8.0E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.7E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.7E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.7E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 1.7E-07 | | | | | NA |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP | Inhalation | PCB Total TEC | 1.16E-08 | ug/m3 | 6.3E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.4E-07 | 1.1E-08 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.4E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.4E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.4E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 2.4E-07 | | | | | NA |
| Ambient Air | Ambient Air | Particulates and Vapors at UMS1 | Inhalation | PCB Total TEC | 8.98E-09 | ug/m3 | 4.9E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.9E-07 | 8.6E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.9E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.9E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.9E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 1.9E-07 | | | | | NA |

**Table 5.3.22**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Subsistence Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | Soil | Southeast | Ingestion | PCB Total TEC | 1.88E-07 | mg/kg | 3.3E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 4.3E-08 | 5.8E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 4.3E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 1.88E-07 | mg/kg | 4.8E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 6.2E-08 | 8.4E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 6.2E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.1E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.1E-07 | | | | | NA |
| | Plant Tissue | Southeast | Ingestion | PCB Total TEC | | | 3.9E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.1E-06 | 6.9E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.11E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 5.1E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.1E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.1E-06 | | | | | NA |
| | Beef Tissue | Southeast | Ingestion | PCB Total TEC | 8.93E-08 | mg/kg | 5.6E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.3E-06 | 9.8E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.3E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.3E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.3E-06 | | | | | NA |
| | Milk | Southeast | Ingestion | PCB Total TEC | 3.23E-08 | mg/kg | 2.7E-10 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.5E-05 | 4.7E-10 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.5E-05 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.5E-05 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.5E-05 | | | | | NA |
| | Ambient Air | Particulates Southeast | Inhalation | PCB Total TEC | 3.08E-10 | ug/m3 | 1.7E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 6.4E-09 | 2.9E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 6.4E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 6.4E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 6.4E-09 | | | | | NA |
| Soil Total (Southeast) | | | | | | | | | | | 4.7E-05 | | | | | NA |

**Table 5.3.22**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Subsistence Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | Value | Units | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | South | Ingestion | PCB Total TEC | 2.73E-07 | mg/kg | 4.8E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 6.2E-08 | 8.4E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 6.2E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.73E-07 | mg/kg | 7.0E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 9.1E-08 | 1.2E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 9.1E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.5E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.5E-07 | | | | | NA |
| | Plant Tissue | South | Ingestion | PCB Total TEC | | | 4.0E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.2E-06 | 7.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.79E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 5.2E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.2E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.2E-06 | | | | | NA |
| | Beef Tissue | South | Ingestion | PCB Total TEC | 5.14E-08 | mg/kg | 3.2E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 4.2E-06 | 5.7E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 4.2E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 4.2E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 4.2E-06 | | | | | NA |
| | Milk | South | Ingestion | PCB Total TEC | 1.85E-08 | mg/kg | 1.5E-10 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.0E-05 | 2.7E-10 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.0E-05 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.0E-05 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.0E-05 | | | | | NA |
| | Ambient Air | Particulates South | Inhalation | PCB Total TEC | 4.47E-10 | ug/m3 | 2.4E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 9.3E-09 | 4.3E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 9.3E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 9.3E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 9.3E-09 | | | | | NA |
| Soil Total (South) | | | | | | | | | | | 2.9E-05 | | | | | NA |

**Table 5.3.22**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Subsistence Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | Soil | Southwest | Ingestion | PCB Total TEC | 6.53E-07 | mg/kg | 1.1E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 1.5E-07 | 2.0E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 1.5E-07 | | | | | NA |
| | | | Dermal | PCB Total TEC | 6.53E-07 | mg/kg | 1.7E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.2E-07 | 2.9E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.2E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.7E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.7E-07 | | | | | NA |
| | Plant Tissue | Southwest | Ingestion | PCB Total TEC | | | 4.2E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.5E-06 | 7.4E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 3.91E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 5.5E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.5E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.5E-06 | | | | | NA |
| | Beef Tissue | Southwest | Ingestion | PCB Total TEC | 1.06E-08 | mg/kg | 6.7E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 8.7E-07 | 1.2E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 8.7E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 8.7E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 8.7E-07 | | | | | NA |
| | Milk | Southwest | Ingestion | PCB Total TEC | 3.52E-09 | mg/kg | 2.9E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.8E-06 | 5.1E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.8E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.8E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.8E-06 | | | | | NA |
| | Ambient Air | Particulates Southwest | Inhalation | PCB Total TEC | 1.07E-09 | ug/m3 | 5.9E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.2E-08 | 1.0E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.2E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.2E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.2E-08 | | | | | NA |
| Soil Total (Southwest) | | | | | | | | | | | 1.1E-05 | | | | | NA |

**Table 5.3.22**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Subsistence Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | Soil | West | Ingestion | PCB Total TEC | 2.32E-07 | mg/kg | 4.1E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.3E-08 | 7.1E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 5.3E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.32E-07 | mg/kg | 5.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.7E-08 | 1.0E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.7E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.3E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.3E-07 | | | | | NA |
| | Plant Tissue | West | Ingestion | PCB Total TEC | | | 4.0E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.2E-06 | 7.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.56E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 5.2E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.2E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.2E-06 | | | | | NA |
| | Beef Tissue | West | Ingestion | PCB Total TEC | 8.99E-09 | mg/kg | 5.7E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.4E-07 | 9.9E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.4E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.4E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.4E-07 | | | | | NA |
| | Milk | West | Ingestion | PCB Total TEC | 3.16E-09 | mg/kg | 2.6E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.4E-06 | 4.5E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.4E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.4E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.4E-06 | | | | | NA |
| | Ambient Air | Particulates West | Inhalation | PCB Total TEC | 3.79E-10 | ug/m3 | 2.1E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 7.9E-09 | 3.6E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 7.9E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.9E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.9E-09 | | | | | NA |
| Soil Total (West) | | | | | | | | | | | 9.4E-06 | | | | | NA |

**Table 5.3.22**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Subsistence Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | Value | Units | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Northwest | Ingestion | PCB Total TEC | 2.72E-07 | mg/kg | 4.8E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 6.2E-08 | 8.4E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 6.2E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.72E-07 | mg/kg | 6.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 9.0E-08 | 1.2E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 9.0E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.5E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.5E-07 | | | | | NA |
| | Plant Tissue | Northwest | Ingestion | PCB Total TEC | | | 4.0E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.2E-06 | 7.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.78E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 5.2E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.2E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.2E-06 | | | | | NA |
| | Beef Tissue | Northwest | Ingestion | PCB Total TEC | 9.47E-09 | mg/kg | 6.0E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.8E-07 | 1.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.8E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.8E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.8E-07 | | | | | NA |
| | Milk | Northwest | Ingestion | PCB Total TEC | 3.31E-09 | mg/kg | 2.7E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.5E-06 | 4.8E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.5E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.5E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.5E-06 | | | | | NA |
| | Ambient Air | Particulates Northwest | Inhalation | PCB Total TEC | 4.45E-10 | ug/m3 | 2.4E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 9.3E-09 | 4.3E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 9.3E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 9.3E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 9.3E-09 | | | | | NA |
| Soil Total (Northwest) | | | | | | | | | | | 9.7E-06 | | | | | NA |

# Table 5.3.22
## Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Subsistence Resident Rancher (Adult) - Soil
## Reasonable Maximum Exposure
## Human Health Risk Assessment
## PCB Congener Study for Kettleman Hills Facility
## Kings County, California

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations: Intake/Exposure Concentration | | Cancer Risk Calculations: CSF/Unit Risk | | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration | | Non-Cancer Hazard Calculations: RfD/RfC | | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | North | Ingestion | PCB Total TEC | 2.22E-07 | mg/kg | 3.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.1E-08 | 6.8E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 5.1E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.22E-07 | mg/kg | 5.7E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.4E-08 | 9.9E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.4E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.2E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.2E-07 | | | | | NA |
| | Plant Tissue | North | Ingestion | PCB Total TEC | | | 4.0E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.2E-06 | 7.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.50E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 5.2E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.2E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.2E-06 | | | | | NA |
| | Beef Tissue | North | Ingestion | PCB Total TEC | 9.34E-09 | mg/kg | 5.9E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 7.7E-07 | 1.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 7.7E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.7E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.7E-07 | | | | | NA |
| | Milk | North | Ingestion | PCB Total TEC | 3.29E-09 | mg/kg | 2.7E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.5E-06 | 4.7E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.5E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.5E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.5E-06 | | | | | NA |
| | Ambient Air | Particulates North | Inhalation | PCB Total TEC | 3.63E-10 | ug/m3 | 2.0E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 7.6E-09 | 3.5E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 7.6E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.6E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.6E-09 | | | | | NA |
| Soil Total (North) | | | | | | | | | | | 9.6E-06 | | | | | NA |

**Table 5.3.22**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Subsistence Resident Rancher (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| | | | | | | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | EPC | | Intake/Exposure Concentration | | CSF/Unit Risk | | | Intake/Exposure Concentration | | RfD/RfC | | |
| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | Value | Units | Value | Units | Value | Units | Cancer Risk | Value | Units | Value | Units | Hazard Quotient |
| Soil | Soil | Northeast | Ingestion | PCB Total TEC | 7.49E-07 | mg/kg | 1.3E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 1.7E-07 | 2.3E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 1.7E-07 | | | | | NA |
| | | | Dermal | PCB Total TEC | 7.49E-07 | mg/kg | 1.9E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.5E-07 | 3.3E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.5E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 4.2E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 4.2E-07 | | | | | NA |
| | Plant Tissue | Northeast | Ingestion | PCB Total TEC | | | 4.3E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.6E-06 | 7.5E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 4.46E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 5.6E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.6E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.6E-06 | | | | | NA |
| | Beef Tissue | Northeast | Ingestion | PCB Total TEC | 1.03E-08 | mg/kg | 6.5E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 8.4E-07 | 1.1E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 8.4E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 8.4E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 8.4E-07 | | | | | NA |
| | Milk | Northeast | Ingestion | PCB Total TEC | 3.34E-09 | mg/kg | 2.7E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.6E-06 | 4.8E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.6E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.6E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.6E-06 | | | | | NA |
| | Ambient Air | Particulates Northeast | Inhalation | PCB Total TEC | 1.23E-09 | ug/m3 | 6.7E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.6E-08 | 1.2E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.6E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.6E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.6E-08 | | | | | NA |
| Soil Total (Northeast) | | | | | | | | | | | 1.0E-05 | | | | | NA |

**Table 5.3.23**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Subsistence Resident Rancher (Adult) - Ambient Air**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | Unit Risk Value | Unit Risk Units | Cancer Risk | Noncancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfC Value | RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ambient Air | Ambient Air | Particulates and Vapors at DMS1 | Inhalation | PCB Total TEC | 8.36E-09 | ug/m3 | 4.6E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.7E-07 | 8.0E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.7E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.7E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.7E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 1.7E-07 | | | | | NA |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP | Inhalation | PCB Total TEC | 1.16E-08 | ug/m3 | 6.3E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 2.4E-07 | 1.1E-08 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 2.4E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.4E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.4E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 2.4E-07 | | | | | NA |
| Ambient Air | Ambient Air | Particulates and Vapors at UMS1 | Inhalation | PCB Total TEC | 8.98E-09 | ug/m3 | 4.9E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.9E-07 | 8.6E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.9E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.9E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.9E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 1.9E-07 | | | | | NA |

**Table 5.3.24**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| | | | | | | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exposure | Exposure | Exposure | Chemical of | EPC | | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer | Intake/Exposure Concentration | | RfD/RfC | | Hazard |
| Medium | Medium | Point | Route | Potential Concern | Value | Units | Value | Units | Value | Units | Risk | Value | Units | Value | Units | Quotient |
| Soil | Soil | Southeast | Ingestion | PCB Total TEC | 1.88E-07 | mg/kg | 2.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.8E-08 | 6.9E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 3.8E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 1.88E-07 | mg/kg | 1.3E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 1.7E-08 | 3.0E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 1.7E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.5E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.5E-08 | | | | | NA |
| | Plant Tissue | Southeast | Ingestion | PCB Total TEC | | | 2.1E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.8E-06 | 5.0E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.11E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 2.8E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.8E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.8E-06 | | | | | NA |
| | Ambient Air | Particulates Southeast | Inhalation | PCB Total TEC | 3.08E-10 | ug/m3 | 1.3E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 4.8E-09 | 2.9E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 4.8E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 4.8E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 4.8E-09 | | | | | NA |
| Soil Total (Southeast) | | | | | | | | | | | 2.8E-06 | | | | | NA |

**Table 5.3.24**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | Soil | South | Ingestion | PCB Total TEC | 2.73E-07 | mg/kg | 4.3E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.6E-08 | 1.0E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 5.6E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.73E-07 | mg/kg | 1.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.5E-08 | 4.4E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.5E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 8.0E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 8.0E-08 | | | | | NA |
| | Plant Tissue | South | Ingestion | PCB Total TEC | | | 2.2E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.8E-06 | 5.1E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.79E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 2.8E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.8E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.8E-06 | | | | | NA |
| | Ambient Air | Particulates South | Inhalation | PCB Total TEC | 4.47E-10 | ug/m3 | 1.8E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 7.0E-09 | 4.3E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 7.0E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 7.0E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 7.0E-09 | | | | | NA |
| Soil Total (South) | | | | | | | | | | | 2.9E-06 | | | | | NA |

**Table 5.3.24**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| | | | | | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exposure | Exposure | Exposure | Chemical of | | | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer | Intake/Exposure Concentration | | RfD/RfC | | Hazard |
| Medium | Medium | Point | Route | Potential Concern | Value | Units | Value | Units | Value | Units | Risk | Value | Units | Value | Units | Quotient |
| Soil | Soil | Southwest | Ingestion | PCB Total TEC | 6.53E-07 | mg/kg | 1.0E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 1.3E-07 | 2.4E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 1.3E-07 | | | | | NA |
| | | | Dermal | PCB Total TEC | 6.53E-07 | mg/kg | 4.5E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.9E-08 | 1.1E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 5.9E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.9E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.9E-07 | | | | | NA |
| | Plant Tissue | Southwest | Ingestion | PCB Total TEC | | | 2.3E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.0E-06 | 5.4E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 3.91E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 3.0E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.0E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.0E-06 | | | | | NA |
| | Ambient Air | Particulates Southwest | Inhalation | PCB Total TEC | 1.07E-09 | ug/m3 | 4.4E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.7E-08 | 1.0E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.7E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.7E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.7E-08 | | | | | NA |
| Soil Total (Southwest) | | | | | | | | | | | 3.2E-06 | | | | | NA |

**Table 5.3.24**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations: Intake/Exposure Concentration | | Cancer Risk Calculations: CSF/Unit Risk | | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration | | Non-Cancer Hazard Calculations: RfD/RfC | | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | West | Ingestion | PCB Total TEC | 2.32E-07 | mg/kg | 3.6E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 4.7E-08 | 8.5E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 4.7E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.32E-07 | mg/kg | 1.6E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.1E-08 | 3.7E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.1E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 6.8E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 6.8E-08 | | | | | NA |
| | Plant Tissue | West | Ingestion | PCB Total TEC | | | 2.2E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.8E-06 | 5.1E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.56E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 2.8E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.8E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.8E-06 | | | | | NA |
| | Ambient Air | Particulates West | Inhalation | PCB Total TEC | 3.79E-10 | ug/m3 | 1.6E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 5.9E-09 | 3.6E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 5.9E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.9E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.9E-09 | | | | | NA |
| Soil Total (West) | | | | | | | | | | | 2.9E-06 | | | | | NA |

**Table 5.3.24**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| | | | | | | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exposure | Exposure | Exposure | Chemical of | EPC | | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer | Intake/Exposure Concentration | | RfD/RfC | | Hazard |
| Medium | Medium | Point | Route | Potential Concern | Value | Units | Value | Units | Value | Units | Risk | Value | Units | Value | Units | Quotient |
| Soil | Soil | Northwest | Ingestion | PCB Total TEC | 2.72E-07 | mg/kg | 4.3E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 5.5E-08 | 9.9E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 5.5E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.72E-07 | mg/kg | 1.9E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.4E-08 | 4.4E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.4E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 8.0E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 8.0E-08 | | | | | NA |
| | Plant Tissue | Northwest | Ingestion | PCB Total TEC | | | 2.2E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.8E-06 | 5.1E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.78E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 2.8E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.8E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.8E-06 | | | | | NA |
| | Ambient Air | Particulates Northwest | Inhalation | PCB Total TEC | 4.45E-10 | ug/m3 | 1.8E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 6.9E-09 | 4.3E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 6.9E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 6.9E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 6.9E-09 | | | | | NA |
| Soil Total (Northwest) | | | | | | | | | | | 2.9E-06 | | | | | NA |

**Table 5.3.24**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | Soil | North | Ingestion | PCB Total TEC | 2.22E-07 | mg/kg | 3.5E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 4.5E-08 | 8.1E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 4.5E-08 | | | | | NA |
| | | | Dermal | PCB Total TEC | 2.22E-07 | mg/kg | 1.5E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.0E-08 | 3.6E-13 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 2.0E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 6.5E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 6.5E-08 | | | | | NA |
| | Plant Tissue | North | Ingestion | PCB Total TEC | | | 2.2E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 2.8E-06 | 5.1E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 1.50E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 2.8E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.8E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.8E-06 | | | | | NA |
| | Ambient Air | Particulates North | Inhalation | PCB Total TEC | 3.63E-10 | ug/m3 | 1.5E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 5.7E-09 | 3.5E-10 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 5.7E-09 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 5.7E-09 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 5.7E-09 | | | | | NA |
| Soil Total (North) | | | | | | | | | | | 2.9E-06 | | | | | NA |

**Table 5.3.24**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident (Adult) - Soil**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC Value | EPC Units | Cancer Risk Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | CSF/Unit Risk Value | CSF/Unit Risk Units | Cancer Risk | Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value | Intake/Exposure Concentration Units | RfD/RfC Value | RfD/RfC Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | Soil | Northeast | Ingestion | PCB Total TEC | 7.49E-07 | mg/kg | 1.2E-12 | mg/kg-day | 1.3E+05 | kg-day/mg | 1.5E-07 | 2.7E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 1.5E-07 | | | | | NA |
| | | | Dermal | PCB Total TEC | 7.49E-07 | mg/kg | 5.2E-13 | mg/kg-day | 1.3E+05 | kg-day/mg | 6.7E-08 | 1.2E-12 | mg/kg-day | NA | mg/kg-day | NA |
| | | | Exp. Route Total | | | | | | | | 6.7E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 2.2E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 2.2E-07 | | | | | NA |
| | Plant Tissue | Northeast | Ingestion | PCB Total TEC | | | 2.4E-11 | mg/kg-day | 1.3E+05 | kg-day/mg | 3.1E-06 | 5.5E-11 | mg/kg-day | NA | mg/kg-day | NA |
| | | | | Aboveground | 1.23E-07 | mg/kg | | | | | | | | | | |
| | | | | Belowground | 4.46E-08 | mg/kg | | | | | | | | | | |
| | | | Exp. Route Total | | | | | | | | 3.1E-06 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 3.1E-06 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 3.1E-06 | | | | | NA |
| | Ambient Air | Particulates Northeast | Inhalation | PCB Total TEC | 1.23E-09 | ug/m3 | 5.0E-10 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.9E-08 | 1.2E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.9E-08 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.9E-08 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.9E-08 | | | | | NA |
| Soil Total (Northeast) | | | | | | | | | | | 3.3E-06 | | | | | NA |

**Table 5.3.25**
**Calculation Of Chemical Cancer Risks And Noncancer Hazards - Future Resident (Adult) - Ambient Air**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Noncancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Intake/Exposure Concentration | | Unit Risk | | Cancer | Intake/Exposure Concentration | | RfC | | Hazard |
| | | | | | Value | Units | Value | Units | Value | Units | Risk | Value | Units | Value | Units | Quotient |
| Ambient Air | Ambient Air | Particulates and Vapors at DMS1 | Inhalation | PCB Total TEC | 8.36E-09 | ug/m3 | 3.4E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.3E-07 | 8.0E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.3E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.3E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.3E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 1.3E-07 | | | | | NA |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP | Inhalation | PCB Total TEC | 1.16E-08 | ug/m3 | 4.8E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.8E-07 | 1.1E-08 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.8E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.8E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.8E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 1.8E-07 | | | | | NA |
| Ambient Air | Ambient Air | Particulates and Vapors at UMS1 | Inhalation | PCB Total TEC | 8.98E-09 | ug/m3 | 3.7E-09 | ug/m3 | 3.8E+01 | (ug/m3)-1 | 1.4E-07 | 8.6E-09 | ug/m3 | NA | ug/m3 | NA |
| | | | Exp. Route Total | | | | | | | | 1.4E-07 | | | | | NA |
| | | Exposure Point Total | | | | | | | | | 1.4E-07 | | | | | NA |
| | Exposure Medium Total | | | | | | | | | | 1.4E-07 | | | | | NA |
| Medium Total | | | | | | | | | | | 1.4E-07 | | | | | NA |

**Table 5.3.26**
**Summary of Receptor Risks and Hazards for COPCs - Current Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Receptor Population: Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Southeast | PCB Total TEC | 6E-10 | -- | 2E-09 | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 6E-10 | -- | 2E-09 | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| | Ambient Air | Particulates Southeast | PCB Total TEC | -- | 7E-11 | -- | -- | 7E-11 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 7E-11 | -- | -- | 7E-11 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-11 | | | | | -- |
| Soil Total (Southeast) | | | | | | | | 3E-09 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 3E-09 | -- | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| Ambient Air Total (Southeast) | | | | | | | | 3E-09 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Southeast) | | | | | | | | 6E-09 | | | | | -- |
| Soil | Soil | South | PCB Total TEC | 9E-10 | -- | 3E-09 | -- | 4E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 9E-10 | -- | 3E-09 | -- | 4E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-09 | | | | | -- |
| | Ambient Air | Particulates South | PCB Total TEC | -- | 1E-10 | -- | -- | 1E-10 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-10 | -- | -- | 1E-10 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-10 | | | | | -- |
| Soil Total (South) | | | | | | | | 4E-09 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 3E-09 | -- | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| Ambient Air Total (South) | | | | | | | | 3E-09 | | | | | -- |
| Receptor Total (Soil and Ambient Air - South) | | | | | | | | 7E-09 | | | | | -- |

**Table 5.3.26**
**Summary of Receptor Risks and Hazards for COPCs - Current Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Receptor Population: Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Southwest | PCB Total TEC | 2E-09 | -- | 7E-09 | -- | 9E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 2E-09 | -- | 7E-09 | -- | 9E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-09 | | | | | -- |
| | Ambient Air | Particulates Southwest | PCB Total TEC | -- | 3E-10 | -- | -- | 3E-10 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-10 | -- | -- | 3E-10 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-10 | | | | | -- |
| Soil Total (Southwest) | | | | | | | | 1E-08 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 3E-09 | -- | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| Ambient Air Total (Southwest) | | | | | | | | 3E-09 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Southwest) | | | | | | | | 1E-08 | | | | | -- |
| Soil | Soil | West | PCB Total TEC | 8E-10 | -- | 3E-09 | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 8E-10 | -- | 3E-09 | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| | Ambient Air | Particulates West | PCB Total TEC | -- | 9E-11 | -- | -- | 9E-11 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 9E-11 | -- | -- | 9E-11 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-11 | | | | | -- |
| Soil Total (West) | | | | | | | | 3E-09 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 3E-09 | -- | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| Ambient Air Total (West) | | | | | | | | 3E-09 | | | | | -- |
| Receptor Total (Soil and Ambient Air - West) | | | | | | | | 6E-09 | | | | | -- |

**Table 5.3.26**
**Summary of Receptor Risks and Hazards for COPCs - Current Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Receptor Population: Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Northwest | PCB Total TEC | 9E-10 | -- | 3E-09 | -- | 4E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 9E-10 | -- | 3E-09 | -- | 4E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-09 | | | | | -- |
| | Ambient Air | Particulates Northwest | PCB Total TEC | -- | 1E-10 | -- | -- | 1E-10 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-10 | -- | -- | 1E-10 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-10 | | | | | -- |
| Soil Total (Northwest) | | | | | | | | 4E-09 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 3E-09 | -- | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| Ambient Air Total (Northwest) | | | | | | | | 3E-09 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Northwest) | | | | | | | | 7E-09 | | | | | -- |
| Soil | Soil | North | PCB Total TEC | 8E-10 | -- | 2E-09 | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 8E-10 | -- | 2E-09 | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| | Ambient Air | Particulates North | PCB Total TEC | -- | 9E-11 | -- | -- | 9E-11 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 9E-11 | -- | -- | 9E-11 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-11 | | | | | -- |
| Soil Total (North) | | | | | | | | 3E-09 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 3E-09 | -- | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| Ambient Air Total (North) | | | | | | | | 3E-09 | | | | | -- |
| Receptor Total (Soil and Ambient Air - North) | | | | | | | | 6E-09 | | | | | -- |

**Table 5.3.26**
**Summary of Receptor Risks and Hazards for COPCs - Current Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Current
Receptor Population: Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Northeast | PCB Total TEC | 3E-09 | -- | 8E-09 | -- | 1E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-09 | -- | 8E-09 | -- | 1E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-08 | | | | | -- |
| | Ambient Air | Particulates Northeast | PCB Total TEC | -- | 3E-10 | -- | -- | 3E-10 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-10 | -- | -- | 3E-10 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-10 | | | | | -- |
| Soil Total (Northeast) | | | | | | | | 1E-08 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 3E-09 | -- | -- | 3E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | -- |
| Ambient Air Total (Northeast) | | | | | | | | 3E-09 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Northeast) | | | | | | | | 1E-08 | | | | | -- |

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the highest calculated inhalation risk (see Table 5.3.19).

**Table 5.3.27**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Southeast | PCB Total TEC | 4E-08 | -- | 6E-08 | -- | 1E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-08 | -- | 6E-08 | -- | 1E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | -- |
| | Beef Tissue | Southeast | PCB Total TEC | 7E-06 | -- | -- | -- | 7E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 7E-06 | -- | -- | -- | 7E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-06 | | | | | -- |
| | Ambient Air | Particulates Southeast | PCB Total TEC | -- | 6E-09 | -- | -- | 6E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-09 | -- | -- | 6E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 6E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-09 | | | | | -- |
| Soil Total (Southeast) | | | | | | | | 7E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Southeast) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Southeast) | | | | | | | | 8E-06 | | | | | -- |
| Soil | Soil | South | PCB Total TEC | 6E-08 | -- | 9E-08 | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 6E-08 | -- | 9E-08 | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| | Beef Tissue | South | PCB Total TEC | 4E-06 | -- | -- | -- | 4E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-06 | -- | -- | -- | 4E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | -- |
| | Ambient Air | Particulates South | PCB Total TEC | -- | 9E-09 | -- | -- | 9E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 9E-09 | -- | -- | 9E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-09 | | | | | -- |
| Soil Total (South) | | | | | | | | 4E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (South) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - South) | | | | | | | | 5E-06 | | | | | -- |

**Table 5.3.27**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Southwest | PCB Total TEC | 1E-07 | -- | 2E-07 | -- | 4E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 1E-07 | -- | 2E-07 | -- | 4E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-07 | | | | | -- |
| | Beef Tissue | Southwest | PCB Total TEC | 9E-07 | -- | -- | -- | 9E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 9E-07 | -- | -- | -- | 9E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-07 | | | | | -- |
| | Ambient Air | Particulates Southwest | PCB Total TEC | -- | 2E-08 | -- | -- | 2E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-08 | -- | -- | 2E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | -- |
| Soil Total (Southwest) | | | | | | | | 1E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Southwest) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Southwest) | | | | | | | | 2E-06 | | | | | -- |
| Soil | Soil | West | PCB Total TEC | 5E-08 | -- | 8E-08 | -- | 1E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-08 | -- | 8E-08 | -- | 1E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | -- |
| | Beef Tissue | West | PCB Total TEC | 7E-07 | -- | -- | -- | 7E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 7E-07 | -- | -- | -- | 7E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-07 | | | | | -- |
| | Ambient Air | Particulates West | PCB Total TEC | -- | 8E-09 | -- | -- | 8E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 8E-09 | -- | -- | 8E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-09 | | | | | -- |
| Soil Total (West) | | | | | | | | 9E-07 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (West) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - West) | | | | | | | | 1E-06 | | | | | -- |

**Table 5.3.27**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Northwest | PCB Total TEC | 6E-08 | -- | 9E-08 | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 6E-08 | -- | 9E-08 | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| | Beef Tissue | Northwest | PCB Total TEC | 8E-07 | -- | -- | -- | 8E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 8E-07 | -- | -- | -- | 8E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | -- |
| | Ambient Air | Particulates Northwest | PCB Total TEC | -- | 9E-09 | -- | -- | 9E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 9E-09 | -- | -- | 9E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-09 | | | | | -- |
| Soil Total (Northwest) | | | | | | | | 9E-07 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Northwest) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Northwest) | | | | | | | | 1E-06 | | | | | -- |
| Soil | Soil | North | PCB Total TEC | 5E-08 | -- | 7E-08 | -- | 1E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-08 | -- | 7E-08 | -- | 1E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | -- |
| | Beef Tissue | North | PCB Total TEC | 8E-07 | -- | -- | -- | 8E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 8E-07 | -- | -- | -- | 8E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | -- |
| | Ambient Air | Particulates North | PCB Total TEC | -- | 8E-09 | -- | -- | 8E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 8E-09 | -- | -- | 8E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-09 | | | | | -- |
| Soil Total (North) | | | | | | | | 9E-07 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (North) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - North) | | | | | | | | 1E-06 | | | | | -- |

**Table 5.3.27**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Northeast | PCB Total TEC | 2E-07 | -- | 2E-07 | -- | 4E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 2E-07 | -- | 2E-07 | -- | 4E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-07 | | | | | -- |
| | Beef Tissue | Northeast | PCB Total TEC | 8E-07 | -- | -- | -- | 8E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 8E-07 | -- | -- | -- | 8E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | -- |
| | Ambient Air | Particulates Northeast | PCB Total TEC | -- | 3E-08 | -- | -- | 3E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | -- |
| Soil Total (Northeast) | | | | | | | | 1E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Northeast) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Northeast) | | | | | | | | 2E-06 | | | | | -- |

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the highest calculated inhalation risk (see Table 5.3.21).

**Table 5.3.28**
**Summary of Receptor Risks and Hazards for COPCs - Future Subsistence Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Southeast | PCB Total TEC | 4E-08 | -- | 6E-08 | -- | 1E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-08 | -- | 6E-08 | -- | 1E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | -- |
| | Plant Tissue | Southeast | PCB Total TEC | 5E-06 | -- | -- | -- | 5E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-06 | -- | -- | -- | 5E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | -- |
| | Beef Tissue | Southeast | PCB Total TEC | 7E-06 | -- | -- | -- | 7E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 7E-06 | -- | -- | -- | 7E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-06 | | | | | -- |
| | Milk | Southeast | PCB Total TEC | 3E-05 | -- | -- | -- | 3E-05 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-05 | -- | -- | -- | 3E-05 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-05 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-05 | | | | | -- |
| | Ambient Air | Particulates Southeast | PCB Total TEC | -- | 6E-09 | -- | -- | 6E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-09 | -- | -- | 6E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 6E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-09 | | | | | -- |
| Soil Total (Southeast) | | | | | | | | 5E-05 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Southeast) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Southeast) | | | | | | | | 5E-05 | | | | | -- |

**Table 5.3.28**
**Summary of Receptor Risks and Hazards for COPCs - Future Subsistence Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | South | PCB Total TEC | 6E-08 | -- | 9E-08 | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 6E-08 | -- | 9E-08 | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| | Plant Tissue | South | PCB Total TEC | 5E-06 | -- | -- | -- | 5E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-06 | -- | -- | -- | 5E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | -- |
| | Beef Tissue | South | PCB Total TEC | 4E-06 | -- | -- | -- | 4E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-06 | -- | -- | -- | 4E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | -- |
| | Milk | South | PCB Total TEC | 2E-05 | -- | -- | -- | 2E-05 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 2E-05 | -- | -- | -- | 2E-05 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-05 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-05 | | | | | -- |
| | Ambient Air | Particulates South | PCB Total TEC | -- | 9E-09 | -- | -- | 9E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 9E-09 | -- | -- | 9E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-09 | | | | | -- |
| Soil Total (South) | | | | | | | | 3E-05 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP [1] | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (South) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - South) | | | | | | | | 3E-05 | | | | | -- |

**Table 5.3.28**
**Summary of Receptor Risks and Hazards for COPCs - Future Subsistence Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Southwest | PCB Total TEC | 1E-07 | -- | 2E-07 | -- | 4E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 1E-07 | -- | 2E-07 | -- | 4E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-07 | | | | | -- |
| | Plant Tissue | Southwest | PCB Total TEC | 5E-06 | -- | -- | -- | 5E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-06 | -- | -- | -- | 5E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | -- |
| | Beef Tissue | Southwest | PCB Total TEC | 9E-07 | -- | -- | -- | 9E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 9E-07 | -- | -- | -- | 9E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-07 | | | | | -- |
| | Milk | Southwest | PCB Total TEC | 4E-06 | -- | -- | -- | 4E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-06 | -- | -- | -- | 4E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | -- |
| | Ambient Air | Particulates Southwest | PCB Total TEC | -- | 2E-08 | -- | -- | 2E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-08 | -- | -- | 2E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | -- |
| Soil Total (Southwest) | | | | | | | | 1E-05 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP [(1)] | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Southwest) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Southwest) | | | | | | | | 1E-05 | | | | | -- |

**Table 5.3.28**
**Summary of Receptor Risks and Hazards for COPCs - Future Subsistence Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | West | PCB Total TEC | 5E-08 | -- | 8E-08 | -- | 1E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-08 | -- | 8E-08 | -- | 1E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | -- |
| | Plant Tissue | West | PCB Total TEC | 5E-06 | -- | -- | -- | 5E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-06 | -- | -- | -- | 5E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | -- |
| | Beef Tissue | West | PCB Total TEC | 7E-07 | -- | -- | -- | 7E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 7E-07 | -- | -- | -- | 7E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-07 | | | | | -- |
| | Milk | West | PCB Total TEC | 3E-06 | -- | -- | -- | 3E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Ambient Air | Particulates West | PCB Total TEC | -- | 8E-09 | -- | -- | 8E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 8E-09 | -- | -- | 8E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-09 | | | | | -- |
| Soil Total (West) | | | | | | | | 9E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP [(1)] | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (West) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - West) | | | | | | | | 1E-05 | | | | | -- |

**Table 5.3.28**
**Summary of Receptor Risks and Hazards for COPCs - Future Subsistence Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Northwest | PCB Total TEC | 6E-08 | -- | 9E-08 | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 6E-08 | -- | 9E-08 | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| | Plant Tissue | Northwest | PCB Total TEC | 5E-06 | -- | -- | -- | 5E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-06 | -- | -- | -- | 5E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | -- |
| | Beef Tissue | Northwest | PCB Total TEC | 8E-07 | -- | -- | -- | 8E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 8E-07 | -- | -- | -- | 8E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | -- |
| | Milk | Northwest | PCB Total TEC | 4E-06 | -- | -- | -- | 4E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-06 | -- | -- | -- | 4E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | -- |
| | Ambient Air | Particulates Northwest | PCB Total TEC | -- | 9E-09 | -- | -- | 9E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 9E-09 | -- | -- | 9E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-09 | | | | | -- |
| Soil Total (Northwest) | | | | | | | | 1E-05 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Northwest) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Northwest) | | | | | | | | 1E-05 | | | | | -- |

**Table 5.3.28**
**Summary of Receptor Risks and Hazards for COPCs - Future Subsistence Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | North | PCB Total TEC | 5E-08 | -- | 7E-08 | -- | 1E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-08 | -- | 7E-08 | -- | 1E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | -- |
| | Plant Tissue | North | PCB Total TEC | 5E-06 | -- | -- | -- | 5E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-06 | -- | -- | -- | 5E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | -- |
| | Beef Tissue | North | PCB Total TEC | 8E-07 | -- | -- | -- | 8E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 8E-07 | -- | -- | -- | 8E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | -- |
| | Milk | North | PCB Total TEC | 4E-06 | -- | -- | -- | 4E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-06 | -- | -- | -- | 4E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | -- |
| | Ambient Air | Particulates North | PCB Total TEC | -- | 8E-09 | -- | -- | 8E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 8E-09 | -- | -- | 8E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-09 | | | | | -- |
| Soil Total (North) | | | | | | | | 1E-05 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP [1] | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (North) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - North) | | | | | | | | 1E-05 | | | | | -- |

**Table 5.3.28**
**Summary of Receptor Risks and Hazards for COPCs - Future Subsistence Resident Rancher (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Subsistence Resident Rancher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Northeast | PCB Total TEC | 2E-07 | -- | 2E-07 | -- | 4E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 2E-07 | -- | 2E-07 | -- | 4E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-07 | | | | | -- |
| | Plant Tissue | Northeast | PCB Total TEC | 6E-06 | -- | -- | -- | 6E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 6E-06 | -- | -- | -- | 6E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 6E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-06 | | | | | -- |
| | Beef Tissue | Northeast | PCB Total TEC | 8E-07 | -- | -- | -- | 8E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 8E-07 | -- | -- | -- | 8E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | -- |
| | Milk | Northeast | PCB Total TEC | 4E-06 | -- | -- | -- | 4E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-06 | -- | -- | -- | 4E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | -- |
| | Ambient Air | Particulates Northeast | PCB Total TEC | -- | 3E-08 | -- | -- | 3E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | -- |
| Soil Total (Northeast) | | | | | | | | 1E-05 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Northeast) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Northeast) | | | | | | | | 1E-05 | | | | | -- |

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the highest calculated inhalation risk (see Table 5.3.23).

**Table 5.3.29**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Southeast | PCB Total TEC | 4E-08 | -- | 2E-08 | -- | 6E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 4E-08 | -- | 2E-08 | -- | 6E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 6E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-08 | | | | | -- |
| | Plant Tissue | Southeast | PCB Total TEC | 3E-06 | -- | -- | -- | 3E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Ambient Air | Particulates Southeast | PCB Total TEC | -- | 5E-09 | -- | -- | 5E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 5E-09 | -- | -- | 5E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 5E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 5E-09 | | | | | -- |
| Soil Total (Southeast) | | | | | | | | 3E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP [(1)] | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Southeast) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Southeast) | | | | | | | | 3E-06 | | | | | -- |

**Table 5.3.29**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | South | PCB Total TEC | 6E-08 | -- | 2E-08 | -- | 8E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 6E-08 | -- | 2E-08 | -- | 8E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-08 | | | | | -- |
| | Plant Tissue | South | PCB Total TEC | 3E-06 | -- | -- | -- | 3E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Ambient Air | Particulates South | PCB Total TEC | -- | 7E-09 | -- | -- | 7E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 7E-09 | -- | -- | 7E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-09 | | | | | -- |
| Soil Total (South) | | | | | | | | 3E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (South) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - South) | | | | | | | | 3E-06 | | | | | -- |

**Table 5.3.29**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Southwest | PCB Total TEC | 1E-07 | -- | 6E-08 | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 1E-07 | -- | 6E-08 | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| | Plant Tissue | Southwest | PCB Total TEC | 3E-06 | -- | -- | -- | 3E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Ambient Air | Particulates Southwest | PCB Total TEC | -- | 2E-08 | -- | -- | 2E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-08 | -- | -- | 2E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | -- |
| Soil Total (Southwest) | | | | | | | | 3E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP [(1)] | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Southwest) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Southwest) | | | | | | | | 3E-06 | | | | | -- |

**Table 5.3.29**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | West | PCB Total TEC | 5E-08 | -- | 2E-08 | -- | 7E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-08 | -- | 2E-08 | -- | 7E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-08 | | | | | -- |
| | Plant Tissue | West | PCB Total TEC | 3E-06 | -- | -- | -- | 3E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Ambient Air | Particulates West | PCB Total TEC | -- | 6E-09 | -- | -- | 6E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-09 | -- | -- | 6E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 6E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-09 | | | | | -- |
| Soil Total (West) | | | | | | | | 3E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (West) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - West) | | | | | | | | 3E-06 | | | | | -- |

**Table 5.3.29**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Northwest | PCB Total TEC | 6E-08 | -- | 2E-08 | -- | 8E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 6E-08 | -- | 2E-08 | -- | 8E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-08 | | | | | -- |
| | Plant Tissue | Northwest | PCB Total TEC | 3E-06 | -- | -- | -- | 3E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Ambient Air | Particulates Northwest | PCB Total TEC | -- | 7E-09 | -- | -- | 7E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 7E-09 | -- | -- | 7E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-09 | | | | | -- |
| Soil Total (Northwest) | | | | | | | | 3E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Northwest) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Northwest) | | | | | | | | 3E-06 | | | | | -- |

**Table 5.3.29**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | North | PCB Total TEC | 5E-08 | -- | 2E-08 | -- | 7E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 5E-08 | -- | 2E-08 | -- | 7E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 7E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-08 | | | | | -- |
| | Plant Tissue | North | PCB Total TEC | 3E-06 | -- | -- | -- | 3E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Ambient Air | Particulates North | PCB Total TEC | -- | 6E-09 | -- | -- | 6E-09 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-09 | -- | -- | 6E-09 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 6E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-09 | | | | | -- |
| Soil Total (North) | | | | | | | | 3E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (North) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - North) | | | | | | | | 3E-06 | | | | | -- |

**Table 5.3.29**
**Summary of Receptor Risks and Hazards for COPCs - Future Resident (Adult)**
**Reasonable Maximum Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Soil | Northeast | PCB Total TEC | 2E-07 | -- | 7E-08 | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 2E-07 | -- | 7E-08 | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| | Plant Tissue | Northeast | PCB Total TEC | 3E-06 | -- | -- | -- | 3E-06 | -- | -- | -- | -- | -- |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Ambient Air | Particulates Northeast | PCB Total TEC | -- | 2E-08 | -- | -- | 2E-08 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-08 | -- | -- | 2E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | -- |
| Soil Total (Northeast) | | | | | | | | 3E-06 | | | | | -- |
| Ambient Air | Ambient Air | Particulates and Vapors at MSP (1) | PCB Total TEC | -- | 2E-07 | -- | -- | 2E-07 | -- | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| Ambient Air Total (Northeast) | | | | | | | | 2E-07 | | | | | -- |
| Receptor Total (Soil and Ambient Air - Northeast) | | | | | | | | 3E-06 | | | | | -- |

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the highest calculated inhalation risk (see Table 5.3.25).

**Table 5.3.30**
**Comparison of Infant Exposure to PCB Congeners in Breast Milk**
**to National Average Background Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**FUTURE RESIDENT RANCHER**

| Exposure Area | Average Daily Dose [(1)] (pg/kg BW-day) | National Average Background Intake [(2)] (pg/kg BW-day) | Average Daily Dose Above Background? |
|---|---|---|---|
| Southeast | 3.24E+00 | 2.60E+01 | No |
| South | 1.89E+00 | 2.60E+01 | No |
| Southwest | 4.63E-01 | 2.60E+01 | No |
| West | 3.84E-01 | 2.60E+01 | No |
| Northwest | 4.03E-01 | 2.60E+01 | No |
| North | 3.96E-01 | 2.60E+01 | No |
| Northeast | 4.55E-01 | 2.60E+01 | No |

**FUTURE SUBSISTENCE RESIDENT RANCHER**

| Exposure Area | Average Daily Dose [(1)] (pg/kg BW-day) | National Average Background Intake [(2)] (pg/kg BW-day) | Average Daily Dose Above Background? |
|---|---|---|---|
| Southeast | 1.77E+01 | 2.60E+01 | No |
| South | 1.09E+01 | 2.60E+01 | No |
| Southwest | 3.56E+00 | 2.60E+01 | No |
| West | 3.22E+00 | 2.60E+01 | No |
| Northwest | 3.31E+00 | 2.60E+01 | No |
| North | 3.28E+00 | 2.60E+01 | No |
| Northeast | 3.51E+00 | 2.60E+01 | No |

**Table 5.3.30**
**Comparison of Infant Exposure to PCB Congeners in Breast Milk**
**to National Average Background Exposure**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**FUTURE RESIDENT**

| Exposure Area | Average Daily Dose (1) (pg/kg BW-day) | National Average Background Intake (2) (pg/kg BW-day) | Average Daily Dose Above Background? |
|---|---|---|---|
| Southeast | 1.12E+00 | 2.60E+01 | No |
| South | 1.15E+00 | 2.60E+01 | No |
| Southwest | 1.25E+00 | 2.60E+01 | No |
| West | 1.14E+00 | 2.60E+01 | No |
| Northwest | 1.15E+00 | 2.60E+01 | No |
| North | 1.13E+00 | 2.60E+01 | No |
| Northeast | 1.28E+00 | 2.60E+01 | No |

Notes:

(1) Average daily intake for infant exposed to contaminated breast milk (See Table 5.3.17).

(2) Basis for national average background intake for infant exposed to contaminated breast milk (from USEPA 2005):

Average background intake of 2,3,7,8-TCDD TEC is 93 pg/kg BW-day.

72% of this intake is from PCDDs/PCDFs and 28% is from dioxin-like PCBs.

28% of 93 pg/kg- BWday yields 26 pg/kg BW-day average background intake.

BW - body weight

PCB - polychlorinated biphenyl

PCDD - polychlorinated dibenzodioxin

PCDF - polychlorinated dibenzofuran

pg/kg - picograms per kilogram (parts per quadrillion)

TCDD - tetrachlorodibenzo-p-dioxin

TEC - toxicity equivalence concentration

**Table 5.3.31**
**Overall Summary of Risks and Hazards for COPCs**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| **Receptor**<br>Exposure Medium | **Carcinogenic Risk** | **Noncarcinogenic Hazard Index** |
|---|---|---|
| **Current Rancher (Adult)** | | |
| **Southeast Area** | | |
| Soil (Ingestion and Dermal) | 3E-09 | — |
| Ambient Air (Particulates from Soil) | 7E-11 | — |
| Ambient Air (Particulates and Vapors) | 3E-09 | — |
| Total | 6E-09 | |
| **South Area** | | |
| Soil (Ingestion and Dermal) | 4E-09 | — |
| Ambient Air (Particulates from Soil) | 1E-10 | — |
| Ambient Air (Particulates and Vapors) | 3E-09 | — |
| Total | 7E-09 | |
| **Southwest Area** | | |
| Soil (Ingestion and Dermal) | 9E-09 | — |
| Ambient Air (Particulates from Soil) | 3E-10 | — |
| Ambient Air (Particulates and Vapors) | 3E-09 | — |
| Total | 1E-08 | |
| **West Area** | | |
| Soil (Ingestion and Dermal) | 3E-09 | — |
| Ambient Air (Particulates from Soil) | 9E-11 | — |
| Ambient Air (Particulates and Vapors) | 3E-09 | — |
| Total | 6E-09 | |
| **Northwest Area** | | |
| Soil (Ingestion and Dermal) | 4E-09 | — |
| Ambient Air (Particulates from Soil) | 1E-10 | — |
| Ambient Air (Particulates and Vapors) | 3E-09 | — |
| Total | 7E-09 | |
| **North Area** | | |
| Soil (Ingestion and Dermal) | 3E-09 | — |
| Ambient Air (Particulates from Soil) | 9E-11 | — |
| Ambient Air (Particulates and Vapors) | 3E-09 | — |
| Total | 6E-09 | |
| **Northeast Area** | | |
| Soil (Ingestion and Dermal) | 1E-08 | — |
| Ambient Air (Particulates from Soil) | 3E-10 | — |
| Ambient Air (Particulates and Vapors) | 3E-09 | — |
| Total | 1E-08 | |

**Table 5.3.31**
**Overall Summary of Risks and Hazards for COPCs**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| **Receptor**<br>Exposure Medium | **Carcinogenic Risk** | **Noncarcinogenic Hazard Index** |
|---|---|---|
| **Future Resident Rancher (Adult and Child)** | | |
| **Southeast Area** | | |
| Soil (Ingestion and Dermal) | 1E-07 | — |
| Beef Tissue | 7E-06 | — |
| Ambient Air (Particulates from Soil) | 6E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 8E-06 | |
| **South Area** | | |
| Soil (Ingestion and Dermal) | 2E-07 | — |
| Beef Tissue | 4E-06 | — |
| Ambient Air (Particulates from Soil) | 9E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 5E-06 | |
| **Southwest Area** | | |
| Soil (Ingestion and Dermal) | 4E-07 | — |
| Beef Tissue | 9E-07 | — |
| Ambient Air (Particulates from Soil) | 2E-08 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 2E-06 | |
| **West Area** | | |
| Soil (Ingestion and Dermal) | 1E-07 | — |
| Beef Tissue | 7E-07 | — |
| Ambient Air (Particulates from Soil) | 8E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 1E-06 | |
| **Northwest Area** | | |
| Soil (Ingestion and Dermal) | 2E-07 | — |
| Beef Tissue | 8E-07 | — |
| Ambient Air (Particulates from Soil) | 9E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 1E-06 | |
| **North Area** | | |
| Soil (Ingestion and Dermal) | 1E-07 | — |
| Beef Tissue | 8E-07 | — |
| Ambient Air (Particulates from Soil) | 8E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 1E-06 | |
| **Northeast Area** | | |
| Soil (Ingestion and Dermal) | 4E-07 | — |
| Beef Tissue | 8E-07 | — |
| Ambient Air (Particulates from Soil) | 3E-08 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 2E-06 | |

**Table 5.3.31**
**Overall Summary of Risks and Hazards for COPCs**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| **Receptor**<br>Exposure Medium | **Carcinogenic Risk** | **Noncarcinogenic Hazard Index** |
|---|---|---|
| **Future Subsistence Resident Rancher (Adult and Child)** | | |
| **Southeast Area** | | |
| Soil (Ingestion and Dermal) | 1E-07 | — |
| Plant Tissue (Homegrown Produce) | 5E-06 | — |
| Beef Tissue | 7E-06 | — |
| Milk | 3E-05 | — |
| Ambient Air (Particulates from Soil) | 6E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 5E-05 | |
| **South Area** | | |
| Soil (Ingestion and Dermal) | 2E-07 | — |
| Plant Tissue (Homegrown Produce) | 5E-06 | — |
| Beef Tissue | 4E-06 | — |
| Milk | 2E-05 | — |
| Ambient Air (Particulates from Soil) | 9E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 3E-05 | |
| **Southwest Area** | | |
| Soil (Ingestion and Dermal) | 4E-07 | — |
| Plant Tissue (Homegrown Produce) | 5E-06 | — |
| Beef Tissue | 9E-07 | — |
| Milk | 4E-06 | — |
| Ambient Air (Particulates from Soil) | 2E-08 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 1E-05 | |
| **West Area** | | |
| Soil (Ingestion and Dermal) | 1E-07 | — |
| Plant Tissue (Homegrown Produce) | 5E-06 | — |
| Beef Tissue | 7E-07 | — |
| Milk | 3E-06 | — |
| Ambient Air (Particulates from Soil) | 8E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 1E-05 | |
| **Northwest Area** | | |
| Soil (Ingestion and Dermal) | 2E-07 | — |
| Plant Tissue (Homegrown Produce) | 5E-06 | — |
| Beef Tissue | 8E-07 | — |
| Milk | 4E-06 | — |
| Ambient Air (Particulates from Soil) | 9E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 1E-05 | |

**Table 5.3.31**

**Overall Summary of Risks and Hazards for COPCs**

**Human Health Risk Assessment**

**PCB Congener Study for Kettleman Hills Facility**

**Kings County, California**

| **Receptor**<br>Exposure Medium | **Carcinogenic Risk** | **Noncarcinogenic Hazard Index** |
|---|---|---|
| **Future Subsistence Resident Rancher (Adult and Child Continued)** | | |
| **North Area** | | |
| Soil (Ingestion and Dermal) | 1E-07 | — |
| Plant Tissue (Homegrown Produce) | 5E-06 | — |
| Beef Tissue | 8E-07 | — |
| Milk | 4E-06 | — |
| Ambient Air (Particulates from Soil) | 8E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 1E-05 | |
| **Northeast Area** | | |
| Soil (Ingestion and Dermal) | 4E-07 | — |
| Plant Tissue (Homegrown Produce) | 6E-06 | — |
| Beef Tissue | 8E-07 | — |
| Milk | 4E-06 | — |
| Ambient Air (Particulates from Soil) | 3E-08 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 1E-05 | |

**Table 5.3.31**
**Overall Summary of Risks and Hazards for COPCs**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| **Receptor**<br>Exposure Medium | **Carcinogenic Risk** | **Noncarcinogenic Hazard Index** |
|---|---|---|
| **Future Resident (Adult and Child)** | | |
| **Southeast Area** | | |
| Soil (Ingestion and Dermal) | 6E-08 | — |
| Plant Tissue (Homegrown Produce) | 3E-06 | — |
| Ambient Air (Particulates from Soil) | 5E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 3E-06 | |
| **South Area** | | |
| Soil (Ingestion and Dermal) | 8E-08 | — |
| Plant Tissue (Homegrown Produce) | 3E-06 | — |
| Ambient Air (Particulates from Soil) | 7E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 3E-06 | |
| **Southwest Area** | | |
| Soil (Ingestion and Dermal) | 2E-07 | — |
| Plant Tissue (Homegrown Produce) | 3E-06 | — |
| Ambient Air (Particulates from Soil) | 2E-08 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 3E-06 | |
| **West Area** | | |
| Soil (Ingestion and Dermal) | 7E-08 | — |
| Plant Tissue (Homegrown Produce) | 3E-06 | — |
| Ambient Air (Particulates from Soil) | 6E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 3E-06 | |
| **Northwest Area** | | |
| Soil (Ingestion and Dermal) | 8E-08 | — |
| Plant Tissue (Homegrown Produce) | 3E-06 | — |
| Ambient Air (Particulates from Soil) | 7E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 3E-06 | |
| **North Area** | | |
| Soil (Ingestion and Dermal) | 7E-08 | — |
| Plant Tissue (Homegrown Produce) | 3E-06 | — |
| Ambient Air (Particulates from Soil) | 6E-09 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 3E-06 | |
| **Northeast Area** | | |
| Soil (Ingestion and Dermal) | 2E-07 | — |
| Plant Tissue (Homegrown Produce) | 3E-06 | — |
| Ambient Air (Particulates from Soil) | 2E-08 | — |
| Ambient Air (Particulates and Vapors) | 2E-07 | — |
| Total | 3E-06 | |

**Table 5.3.31**

**Overall Summary of Risks and Hazards for COPCs**

**Human Health Risk Assessment**

**PCB Congener Study for Kettleman Hills Facility**

**Kings County, California**

Notes:

Carcinogenic risk from ambient air (particulates and vapors) is from sampling location MSP, the sampling location with the highest calculated ambient air risk (see Tables 5.3.19, 5.3.21, 5.3.23, and 5.3.25.

— - Hazard indices were not calculated (toxicity data were not available).

Risk values are taken from Tables 5.3.26 through 5.3.29.

Risk calculations are shown on Tables 5.3.18 through 5.3.25.

A total cancer risk of 1E-6 to 1E-4 is generally considered to represent an acceptable exposure level (RAGS Part B; USEPA 1991b). A total cancer risk of 1E-6 or less is considered to represent an exposure level with no potential for unacceptable risk.

**Table 5.3.32**
**Summary of KHF Exposure Area TECs in Soil**
**Human Health Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**SOIL**

| KHF Exposure Area Total TECs [1] (pg/g) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Southeast** | **South** | **Southwest** | **West** | **Northwest** | **North** | **Northeast** | **Mean** |
| 0.19 | 0.27 | 0.65 | 0.23 | 0.27 | 0.22 | 0.75 | 0.37 |

Notes:
(1) TECs were derived by summing congener-specific TECs calculated by multiplying concentrations of the dioxin-like congeners by TEFs for humans from USEPA (September 2009). See Table 5.3.1.
pg/g - picograms per gram (parts per trillion)
KHF - Kettleman Hills Facility
TEC - toxicity equivalence concentration
TEF - toxicity equivalence factor

**Table 5.4.1**
**Ecological Assessment Endpoints, Representative Receptors, and Measurement Endpoints**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Assessment Endpoint | Representative Receptor | Measurement Endpoints (Measures of Exposure and Effect) |
|---|---|---|
| 1) Sustainability of populations of birds that feed on invertebrates and vegetation in the study area. | western meadowlark *(Sturnella neglecta)* | -- Measured PCB levels in soil<br>-- Measured PCB levels in vegetation<br>-- Modeled PCB levels in invertebrates<br>-- Calculated exposure doses and egg concentrations<br>-- Avian toxicity reference values |
| 2) Sustainability of populations of predatory birds that feed on the food web of the study area. | burrowing owl *(Athene cunicularia)*<br><br>-- State species of special concern | -- Measured PCB levels in soil<br>-- Measured PCB levels in vegetation<br>-- Modeled PCB levels in rodents<br>-- Calculated exposure doses and egg concentrations<br>-- Avian toxicity reference values |
| 3) Sustainability of populations of herbivorous small mammals that feed on vegetation in the study area. | San Joaquin pocket mouse *(Perognathus inornatus)* | -- Measured PCB levels in soil<br>-- Measured PCB levels in vegetation<br>-- Calculated pocket mouse exposure doses<br>-- Mammalian toxicity reference values |
| 4) Sustainability of populations of carnivorous small mammals that feed on invertebrates in the study area. | Tulare grasshopper mouse *(Onychomys torridus tularensis)*<br><br>--State species of special concern | -- Measured PCB levels in soil<br>-- Modeled PCB levels in invertebrates<br>-- Calculated grasshopper mouse exposure doses<br>-- Mammalian toxicity reference values |
| 5) Sustainability of populations of predatory mammals that feed on the food web of the study area, including survival and reproduction of individual kit foxes (an endangered species). | San Joaquin kit fox *(Vulpes macrotis mutica)*<br><br>-- Federally endangered<br>-- State threatened | -- Measured PCB levels in soil<br>-- Measured PCB levels in vegetation<br>-- Modeled PCB levels in rodents<br>-- Calculated kit fox exposure doses<br>-- Mammalian toxicity reference values |
| 6) Survival and reproduction of individual blunt-nosed leopard lizards (an endangered species) should they inhabit the study area. | blunt-nosed leopard lizard (*Gambelia sila* )<br><br>-- Federally endangered<br>-- State endangered | -- Measured PCB levels in soil<br>-- Modeled PCB levels in invertebrates<br>-- Calculated risks to carnivorous mammals and birds |

**Table 5.4.2**
**Exposure Factors for Ecological Receptors**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Receptor | Exposure Factor | Estimated Value | Units | Basis | Source |
|---|---|---|---|---|---|
| **western meadowlark** *(Sturnella neglecta)* | body weight (BW) | 0.112 (male) | kg | Mean of adult male body weights from South Dakota, Texas, Washington, and Nevada. | Dunning (1993) |
| | | 0.0894 (female/ juvenile) | kg | Mean of adult female body weights from South Dakota, Texas, Washington, and Nevada. Assumed to be representative of a fledgling (juvenile). | Dunning (1993) |
| | dietary composition: | | | | |
| | invertebrates | 60 | % | Approx. composition (percent by volume) from studies throughout range and in CA. | Sample et al. (1997), Cal/Ecotox (1999) |
| | plants | 30 | % | Approx. composition (percent by volume) from studies throughout range and in CA. | Sample et al. (1997), Cal/Ecotox (1999) |
| | soil | 10 | % | Conservative estimate of incidentally ingested soil as a proportion of food consumed (based on data for other species and professional judgment), on a dry-weight basis. | Beyer et al. (1994), USEPA (1993) |
| | food ingestion rate (FIR) | 0.015 (male) | kg/day (dry weight) | Based on meadowlark body weight and allometric equation for food ingestion rate of passerine birds: FIR = (FMR/ME) = (257 kJ/day) / (17.5 kJ/g) = 14.7 g/day = 0.015 kg/day (dry weight) where: FMR = Field Metabolic Rate = 10.4 x (BW in g)^0.68 = 257 kJ/day (based on BW of 112 g) ME = Metabolic Energy of Food = 17.5 kJ/g dry matter [estimate for diet of insects and seeds based on estimated MEs for avian insectivore (18.0 kJ/g dry matter) and avian granivore (16.3 kJ/g dry matter)] | Nagy et al. (1999) |
| | | 0.012 (female/ juvenile) | kg/day (dry weight) | Same as for male, but used body weight of 0.0894 kg. | |
| | food ingestion rate - invertebrates ($FIR_{inv}$) | 0.026 (male) | kg/day (wet weight) | $FIR_{inv}$ = (FIR, 0.015 kg/day) x (fraction of invertebrates in diet, 0.60) = 0.0090 kg/day (dry-weight basis). On a wet-weight basis: $FIR_{inv}$ = [0.0090 kg dry matter/day] / [dry weight fraction of invertebrates (grasshoppers, crickets, and beetles), 0.35 kg dry matter/kg wet matter] = 0.026 kg/day (wet-weight basis). | Nagy et al. (1999), USEPA (1993) |
| | | 0.021 (female/ juvenile) | kg/day (wet weight) | Same as for male, but used FIR of 0.012 kg/day. | |
| | food ingestion rate - plants ($FIR_{plant}$) | 0.0049 (male) | kg/day (wet weight) | $FIR_{plant}$ = (FIR, 0.015 kg/day) x (fraction of plants, primarily seeds, in diet, 0.30) = 0.0045 kg/day (dry-weight basis). On a wet-weight basis, $FIR_{plant}$ = [0.0045 kg dry matter/day] / [dry-weight fraction of plants (primarily seeds), 0.91 kg dry matter/kg wet matter] = 0.0049 kg/day (wet-weight basis). | Nagy et al. (1999), USEPA (1993) |
| | | 0.0040 (female/ juvenile) | kg/day (wet weight) | Same as for male, but used $IR_f$ of 0.012 kg/day. | |
| | soil ingestion rate ($SIR_{lark}$) | 0.0015 (male) | kg/day (dry weight) | SIR = (FIR, 0.015 kg/day) x (fraction of dietary intake that is soil, 0.10) = 0.0015 kg/day (dry-weight basis). | Beyer et al. (1994), USEPA (1993) |
| | | 0.0012 (female/ juvenile) | kg/day (dry weight) | Same as for male, but used FIR of 0.012 kg/day. | |
| | home range | 17 | acres | Mean territory size from study in Manitoba, Canada. | Sample et al. (1997) |

**Table 5.4.2**
**Exposure Factors for Ecological Receptors**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Receptor | Exposure Factor | Estimated Value | Units | Basis | Source |
|---|---|---|---|---|---|
| **burrowing owl** *(Athene cunicularia)* | body weight (BW) | 0.172 (male) | kg | Mean of 12 males captured in study at Oakland airport, CA. | Cal/Ecotox (1999) |
| | | 0.126 (female/ juvenile) | kg | Mean of 10 females captured in study at Oakland airport, CA. Assumed this body weight applicable to a juvenile. | Cal/Ecotox (1999) |
| | dietary composition: | | | | |
| | small mammals | 98 | % | Conservatively assumed that prey consisted entirely of small mammals, particularly rodents. (Diet also can include significant components of insects and birds.) | USEPA (1993) |
| | soil | 2 | % | Estimated (based on professional judgment and data for other species) quantity of soil ingested (on a dry-weight basis). | Beyer et al. (1994), USEPA (1993) |
| | food ingestion rate (FIR) | 0.021 (male) | kg/day (dry weight) | Based on burrowing owl body weight and allometric equation for food ingestion rate of all birds: FIR = (FMR/ME) = (350 kJ/day) / (16.8 kJ/g) = 20.8 g/day = 0.021 kg/day (dry weight) where: FMR = Field Metabolic Rate = 10.5 x (BW in g)^0.681 = 350 kJ/day (based on BW of 172 g) ME = Metabolic Energy of Food = 16.8 kJ/g dry matter [estimate for diet of rodents based on estimated ME for mammalian carnivores] | Nagy et al. (1999) |
| | | 0.017 (female/ juvenile) | kg/day (dry weight) | Same as for male, but used body weight of 0.126 kg. | |
| | food ingestion rate - owl preying on mammals ($FIR_{owl}$) | 0.066 (male) | kg/day (wet weight) | $FIR_{mam}$ = (FIR, 0.021 kg/day) x (fraction of mammals in diet, 0.98) = 0.021 kg/day (dry-weight basis). On a wet-weight basis: $FIR_{mam}$ = [0.021 kg dry matter/day] / [dry weight fraction of rodents, 0.32 kg dry matter/kg wet matter] = 0.066 kg/day (wet-weight basis). | Nagy et al. (1999), USEPA (1993) |
| | | 0.052 (female/ juvenile) | kg/day (wet weight) | Same as for male, but used FIR of 0.017 kg/day. | |
| | soil ingestion rate ($SIR_{owl}$) | 0.0004 (male) | kg/day (dry weight) | $IR_{soil}$ = (FIR, 0.021 kg/day) x (fraction of dietary intake that is soil, 0.02) = 0.0004 kg/day (dry-weight basis). | Beyer et al. (1994), USEPA (1993) |
| | | 0.0003 (female/ juvenile) | kg/day (dry weight) | Same as for male, but used FIR of 0.017 kg/day. | |
| | home range | 2 | acres | Mean territory size from a study at Oakland airport, CA. | Cal/Ecotox (1999) |

**Table 5.4.2**
**Exposure Factors for Ecological Receptors**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Receptor | Exposure Factor | Estimated Value | Units | Basis | Source |
|---|---|---|---|---|---|
| **San Joaquin pocket mouse** *(Perognathus inornatus inornatus)* | body weight (BW) | 0.012 (adult) | kg | Upper end of range of body weights for the species. | Smithsonian (2009a) |
| | | 0.007 (juvenile) | kg | Lower end of range of body weights for the species. Assumed to represent juveniles. | Smithsonian (2009a) |
| | dietary composition: | | | | |
| | plants | 98 | % | Estimate based on descriptions of dietary composition of this and similar species. Seeds predominate in diet, will eat some green vegetation and insects. | Smithsonian (2009), Cal/Ecotox (1999) |
| | soil | 2.0 | % | Estimated based on percent soil in diet (on a dry-weight basis) of other mice and rodents. | Beyer et al. (1994), USEPA (1993) |
| | food ingestion rate (FIR) | 0.00091 (adult) | kg/day (wet weight) | Based on data from study of the Great Basin pocket mouse (*Perognathus parvus* ): Mean food consumption rate per unit body weight for eight mice (four male, four female) = 0.076 g/g-day. Source estimated rate using daily maintenance energy requirements and caloric content of food. Assuming same rate and using body weight of San Joaquin pocket mouse: (0.076 g/g-day) x (12 g BW) = 0.912 g/day = 0.00091 kg/day | Sample et al. (1997) |
| | | 0.00053 (juvenile) | kg/day (wet weight) | Same as for adult, but used juvenile body weight of 7 g: (0.076 g/g-day) x (7 g BW) = 0.53 g/day = 0.00053 kg/day | |
| | food ingestion rate - plants ($FIR_{plant}$) | 0.00089 (adult) | kg/day (wet weight) | For adult, $FIR_{plant}$ = (FIR, 0.00091 kg/day) x (fraction of plants in diet, 0.98) = 0.00089 kg/day (on a wet-weight basis). | |
| | | 0.00052 (juvenile) | kg/day (wet weight) | Same as for adult, but used juvenile FIR of 0.00053 kg/day (on a wet-weight basis). | |
| | soil ingestion rate (SIR) | 0.000018 (adult) | kg/day (dry weight) | For adult, SIR = (FIR, 0.00091 kg/day) x (fraction of soil in diet, 0.02) = 0.000018 kg/day on a dry-weight basis. | Beyer et al. (1994), USEPA (1993) |
| | | 0.000011 (juvenile) | kg/day (dry weight) | Same as for adult, but used juvenile FIR of 0.00053 kg/day (on a dry-weight basis). | |
| | home range | 1 | acre | Estimated from home range estimate (0.82 acre) for little pocket mouse (*Perognathus longimembris* ) from study in Nevada. | Cal/Ecotox (1999) |

**Table 5.4.2**
**Exposure Factors for Ecological Receptors**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Receptor | Exposure Factor | Estimated Value | Units | Basis | Source |
|---|---|---|---|---|---|
| **Tulare grasshopper mouse** *(Onychomys torridus)* | body weight (BW) | 0.04 (adult) | kg | Upper end of range of body weights for the species (not sexually dimorphic). | Smithsonian (2009b) |
| | | 0.02 (juvenile) | kg | Lower end of range of body weights for the species. Assumed to represent juveniles. | Smithsonian (2009b) |
| | dietary composition: | | | | |
| | invertebrates | 98 | % | Estimate based on descriptions of dietary composition of this species. Diet is mainly insects (grasshoppers, crickets, beetles, etc.) and other invertebrates (scorpions, spiders); also may include small vertebrates such as mice and lizards. | USFWS (1998) |
| | soil | 2.0 | % | Estimated based on percent soil in diet (on a dry-weight basis) of other mice and rodents. | Beyer et al. (1994), USEPA (1993) |
| | food ingestion rate (FIR) | 0.003 (adult) | kg/day (wet weight) | Based on data from study of the Great Basin pocket mouse (*Perognathus parvus* ):<br>Mean food consumption rate per unit body weight for eight mice (four male, four female) = 0.076 g/g-day.<br>Assuming same rate and using body weight of southern grasshopper mouse:<br>(0.076 g/g-day) x (40 g BW) = 3.04 g/day = 0.003 kg/day | Sample et al. (1997) |
| | | 0.0015 (juvenile) | kg/day (wet weight) | Same as for adult, but used juvenile body weight of 20 g:<br>(0.076 g/g-day) x (20 g BW) = 1.52 g/day = 0.0015 kg/day | |
| | food ingestion rate - invertebrates ($FIR_{inv}$) | 0.0029 (adult) | kg/day (wet weight) | $FIR_{inv}$ = (FIR, 0.003 kg/day) x (fraction of invertebrates in diet, 0.98) = 0.0029 kg/day (wet-weight basis). | |
| | | 0.0015 (juvenile) | kg/day (wet weight) | Same as for adult, but used FIR of 0.0015 kg/day. | |
| | soil ingestion rate (SIR) | 0.00002 (adult) | kg/day (dry weight) | For adult, SIR (dry weight basis) = (FIR on a dry weight basis, 0.001 kg/day) x (fraction of soil in diet, 0.02) = 0.00002 kg/day dry weight. FIR on a dry-weight basis = [FIR on a wet-weight basis (0.003 kg wet matter/day)] x [dry weight fraction of predominant dietary component (grasshoppers, crickets, and beetles), 0.35 kg dry matter/kg wet matter] = 0.001 kg/day (dry-weight basis). | Beyer et al. (1994), USEPA (1993) |
| | | 0.00001 (juvenile) | kg/day (dry weight) | Same as for adult, but used juvenile FIR of 0.0015 kg/day (on a wet-weight basis). | |
| | home range | 6 | acre | Low end of range of home range sizes (6 - 8 acres) from study of this species in New Mexico. | USFWS (1998) |

**Table 5.4.2**
**Exposure Factors for Ecological Receptors**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Receptor | Exposure Factor | Estimated Value | Units | Basis | Source |
|---|---|---|---|---|---|
| **San Joaquin kit fox** *(Vulpes macrotis mutica)* | body weight (BW) | 2 (adult) | kg | Mean of body weights for male and female adults from study of the desert kit fox (*V. m. arsipus*) in Kern County, CA. | Cal/Ecotox (1999) |
| | | 1.2 (juvenile) | kg | Estimated juvenile body weight based on a growth rate of about 0.4 kg/month, adult weight being reached at about 5 months, and a juvenile age of about 3 months (2 kg - 0.4 kg - 0.4 kg = 1.2 kg). | Cal/Ecotox (1999) |
| | dietary composition: | | | | |
| | small mammals | 97 | % | Estimate based on multiple studies in CA. Predominant dietary component is rodents (approx. 85%), followed by rabbits/hares, birds, insects, and reptiles in widely varying percentages. For simplicity, assumed all prey are small mammals. | Cal/Ecotox (1999) |
| | soil | 3 | % | Estimated incidental soil ingestion based on the percent soil (2.8 %) in diet (on a dry-weight basis) for the red fox (*Vulpes vulpes*). | Beyer et al. (1994) and USEPA (1993) |
| | food ingestion rate - fox preying on mammals ($FIR_{fox}$) | 0.12 | kg/day (wet weight) | Based on study of adult kit foxes, which ate on average 108 g food/day in the lab (115 g/d in summer, 101 g/d in winter). Food ingestion rate for a rapidly growing juvenile assumed to be similar to that of an adult. | Cal/Ecotox (1999) |
| | soil ingestion rate ($SIR_{fox}$) | 0.001 | kg/day (dry weight) | SIR = [food ingestion rate for adult kit fox, 0.12 kg wet matter/day] x [dry weight fraction of small mammals (mice, voles, and rabbits), 0.32 kg dry matter/kg wet matter] x [fraction of soil in fox diet, 0.03] = 0.001 kg/day (dry-weight basis). | Beyer et al. (1994) and USEPA (1993) |
| | home range | 238 (adult) | acres | Low end of range of home range core areas (238 ac) from a study of the San Joaquin kit fox in the southern San Joaquin Valley. | Koopman et al. (2001) |
| | | 91 (juvenile) | acres | Low end of range of home range core areas (91 ac) from a study of the San Joaquin kit fox in the southern San Joaquin Valley. | Koopman et al. (2001) |
| **blunt-nosed leopard lizard** *(Gambelia sila)* | body weight (BW) | 0.037 (male) | kg | Upper end of range of adult male body weights (31.8 - 37.4 g). | Sandoval et al. (2006) |
| | | 0.021 (female) | kg | Lower end of range of adult female body weights (20.6 - 29.3 g). | Sandoval et al. (2006) |
| | dietary composition: | | | | |
| | invertebrates | 100 | % | Approx. composition (percent by volume) from studies throughout range and in CA. | Sandoval et al. (2006) |
| | soil | 5 | % | Conservative estimate of incidentally ingested soil as a proportion of food consumed (based on data for other species and professional judgment), on a dry-weight basis. | Beyer et al. (1994), USEPA (1993) |
| | food ingestion rate (FIR) | 0.00011 | kg/day (dry weight) | Based on FMR data for lizard of similar size and diet (southern alligator lizard) and allometric equation for food ingestion rate:<br>FIR = (FMR/ME) = (2.0 kJ/day) / (18 kJ/g) = 0.11 g/day = 0.00011 kg/day (dry weight)<br>where: FMR = Field Metabolic Rate = 2.0 kJ/day (based on alligator lizard)<br>ME = Metabolic Energy of Food = 18 kJ/g dry matter (reptile diet of insects) | Nagy et al. (1999) |
| | | 0.00031 | kg/day (wet weight) | On a wet-weight basis: FIR = [0.00011 kg dry matter/day] / [dry weight fraction of invertebrates (grasshoppers, crickets, and beetles), 0.35 kg dry matter/kg wet matter] = 0.00031 kg/day (wet-weight basis). | Nagy et al. (1999), USEPA (1993) |
| | home range | 1.4 (adult) | acres | Calculated from reported data for this species on foraging distance from burrow (42 m). Assumed foraging distance equaled radius of a circular range surrounding the burrow. | Cal/Ecotox (1999) |

**Table 5.4.2**
**Exposure Factors for Ecological Receptors**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

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**Table 5.4.3**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area (1) | Log Kow (2) | Soil Concentration (ng/kg) (3) | Plant Concentration (ng/kg) (3) | BTF (day/kg) (4) | Intake from Herbivorous Prey (ng/day) (5) | Intake from Incidental Soil Ingestion (ng/day) (5) | Exposure Dose (ng/kg BW-day) (5) | TEF (mammal) (6) | TED (ng/kg BW-day) (7) |
|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 9.7E+01 | 0.0076 | 7.01E-05 | 1.10E-02 | 5.54E-03 | 0.0001 | 5.54E-07 |
| PCB 81 | 6.34 | 1.3E+00 | 1.4E+01 | 0.0088 | 1.15E-05 | 1.30E-03 | 6.56E-04 | 0.0003 | 1.97E-07 |
| PCB 105 | 6.79 | 3.3E+01 | 1.5E+02 | 0.0069 | 9.88E-05 | 3.30E-02 | 1.65E-02 | 0.00003 | 4.96E-07 |
| PCB 114 | 6.98 | 1.6E+00 | 8.7E+00 | 0.0061 | 5.03E-06 | 1.60E-03 | 8.03E-04 | 0.00003 | 2.41E-08 |
| PCB 118 | 7.12 | 5.1E+01 | 2.7E+02 | 0.0055 | 1.41E-04 | 5.10E-02 | 2.56E-02 | 0.00003 | 7.67E-07 |
| PCB 123 | 6.98 | 5.4E+00 | 1.7E+01 | 0.0061 | 9.99E-06 | 5.40E-03 | 2.70E-03 | 0.00003 | 8.11E-08 |
| PCB 126 | 6.98 | 1.5E+00 | 1.3E+01 | 0.0061 | 7.26E-06 | 1.50E-03 | 7.54E-04 | 0.1 | 7.54E-05 |
| PCB 156 | 7.60 | 1.3E+01 | 3.3E+01 | 0.0036 | 1.14E-05 | 1.30E-02 | 6.51E-03 | 0.00003 | 1.95E-07 |
| PCB 157 | 7.62 | 2.0E+00 | 6.8E+00 | 0.0035 | 2.27E-06 | 2.00E-03 | 1.00E-03 | 0.00003 | 3.00E-08 |
| PCB 167 | 7.50 | 5.2E+00 | 1.7E+01 | 0.0039 | 6.44E-06 | 5.20E-03 | 2.60E-03 | 0.00003 | 7.81E-08 |
| PCB 169 | 7.41 | 1.1E+00 | 7.5E-01 | 0.0043 | 3.14E-07 | 1.10E-03 | 5.50E-04 | 0.03 | 1.65E-05 |
| PCB 189 | 8.27 | 4.3E+00 | 8.6E+00 | 0.0016 | 1.36E-06 | 4.30E-03 | 2.15E-03 | 0.00003 | 6.45E-08 |
| *Congener total: (8)* | | | | | | | | | 9.44E-05 |
| ***South*** | | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 7.0E+01 | 0.0076 | 5.01E-05 | 5.30E-03 | 2.68E-03 | 0.0001 | 2.68E-07 |
| PCB 81 | 6.34 | 6.0E-01 | 6.5E+00 | 0.0088 | 5.34E-06 | 6.00E-04 | 3.03E-04 | 0.0003 | 9.08E-08 |
| PCB 105 | 6.79 | 2.1E+01 | 1.3E+02 | 0.0069 | 8.44E-05 | 2.10E-02 | 1.05E-02 | 0.00003 | 3.16E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 5.4E+00 | 0.0061 | 3.14E-06 | 5.00E-03 | 2.50E-03 | 0.00003 | 7.50E-08 |
| PCB 118 | 7.12 | 2.9E+01 | 1.8E+02 | 0.0055 | 9.26E-05 | 2.90E-02 | 1.45E-02 | 0.00003 | 4.36E-07 |
| PCB 123 | 6.98 | 1.9E+00 | 7.3E+00 | 0.0061 | 4.20E-06 | 1.90E-03 | 9.52E-04 | 0.00003 | 2.86E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 7.1E+00 | 0.0061 | 4.06E-06 | 1.20E-03 | 6.02E-04 | 0.1 | 6.02E-05 |
| PCB 156 | 7.60 | 6.8E+00 | 2.1E+01 | 0.0036 | 7.07E-06 | 6.80E-03 | 3.40E-03 | 0.00003 | 1.02E-07 |
| PCB 157 | 7.62 | 1.8E+00 | 4.8E+00 | 0.0035 | 1.59E-06 | 1.80E-03 | 9.01E-04 | 0.00003 | 2.70E-08 |
| PCB 167 | 7.50 | 3.0E+00 | 2.4E+01 | 0.0039 | 8.89E-06 | 3.00E-03 | 1.50E-03 | 0.00003 | 4.51E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 6.6E-01 | 0.0043 | 3.10E-07 | 5.00E-03 | 2.50E-03 | 0.03 | 7.50E-05 |
| PCB 189 | 8.27 | 1.6E+00 | 1.2E+00 | 0.0016 | 1.83E-07 | 1.60E-03 | 8.00E-04 | 0.00003 | 2.40E-08 |
| *Congener total: (8)* | | | | | | | | | 1.37E-04 |
| ***Southwest*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 9.2E+00 | 0.0076 | 6.22E-06 | 2.60E-03 | 1.30E-03 | 0.0001 | 1.30E-07 |
| PCB 81 | 6.34 | 5.0E+00 | 1.1E+00 | 0.0088 | 9.06E-07 | 5.00E-03 | 2.50E-03 | 0.0003 | 7.50E-07 |
| PCB 105 | 6.79 | 1.1E+01 | 1.9E+01 | 0.0069 | 1.19E-05 | 1.10E-02 | 5.51E-03 | 0.00003 | 1.65E-07 |
| PCB 114 | 6.98 | 1.0E+00 | 1.1E+00 | 0.0061 | 5.75E-07 | 1.00E-03 | 5.00E-04 | 0.00003 | 1.50E-08 |
| PCB 118 | 7.12 | 1.5E+01 | 2.9E+01 | 0.0055 | 1.42E-05 | 1.50E-02 | 7.51E-03 | 0.00003 | 2.25E-07 |
| PCB 123 | 6.98 | 1.2E+00 | 1.6E+00 | 0.0061 | 8.81E-07 | 1.20E-03 | 6.00E-04 | 0.00003 | 1.80E-08 |
| PCB 126 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 6.28E-07 | 5.00E-03 | 2.50E-03 | 0.1 | 2.50E-04 |
| PCB 156 | 7.60 | 3.9E+00 | 4.2E+00 | 0.0036 | 1.34E-06 | 3.90E-03 | 1.95E-03 | 0.00003 | 5.85E-08 |
| PCB 157 | 7.62 | 9.2E-01 | 1.9E+00 | 0.0035 | 6.07E-07 | 9.20E-04 | 4.60E-04 | 0.00003 | 1.38E-08 |
| PCB 167 | 7.50 | 1.9E+00 | 1.0E+01 | 0.0039 | 3.63E-06 | 1.90E-03 | 9.52E-04 | 0.00003 | 2.86E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 4.42E-07 | 5.00E-03 | 2.50E-03 | 0.03 | 7.50E-05 |
| PCB 189 | 8.27 | 1.2E+00 | 1.1E+00 | 0.0016 | 1.57E-07 | 1.20E-03 | 6.00E-04 | 0.00003 | 1.80E-08 |
| *Congener total: (8)* | | | | | | | | | 3.26E-04 |
| ***West*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 1.2E+01 | 0.0076 | 8.67E-06 | 2.30E-03 | 1.15E-03 | 0.0001 | 1.15E-07 |
| PCB 81 | 6.34 | 6.0E-01 | 1.7E+00 | 0.0088 | 1.46E-06 | 6.00E-04 | 3.01E-04 | 0.0003 | 9.02E-08 |
| PCB 105 | 6.79 | 1.0E+01 | 1.9E+01 | 0.0069 | 1.33E-05 | 1.00E-02 | 5.01E-03 | 0.00003 | 1.50E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 7.21E-07 | 5.00E-03 | 2.50E-03 | 0.00003 | 7.50E-08 |
| PCB 118 | 7.12 | 1.9E+01 | 3.0E+01 | 0.0055 | 1.61E-05 | 1.90E-02 | 9.51E-03 | 0.00003 | 2.85E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 1.9E+00 | 0.0061 | 1.13E-06 | 1.50E-03 | 7.51E-04 | 0.00003 | 2.25E-08 |
| PCB 126 | 6.98 | 8.0E-01 | 1.1E+00 | 0.0061 | 6.66E-07 | 8.00E-04 | 4.00E-04 | 0.1 | 4.00E-05 |
| PCB 156 | 7.60 | 3.9E+00 | 3.6E+00 | 0.0036 | 1.29E-06 | 3.90E-03 | 1.95E-03 | 0.00003 | 5.85E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 8.0E-01 | 0.0035 | 2.81E-07 | 1.00E-03 | 5.00E-04 | 0.00003 | 1.50E-08 |
| PCB 167 | 7.50 | 2.2E+00 | 8.1E+00 | 0.0039 | 3.13E-06 | 2.20E-03 | 1.10E-03 | 0.00003 | 3.30E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 4.8E-01 | 0.0043 | 2.48E-07 | 5.00E-03 | 2.50E-03 | 0.03 | 7.50E-05 |
| PCB 189 | 8.27 | 1.1E+00 | 1.1E+00 | 0.0016 | 1.81E-07 | 1.10E-03 | 5.50E-04 | 0.00003 | 1.65E-08 |
| *Congener total: (8)* | | | | | | | | | 1.16E-04 |

**Table 5.4.3**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area [1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | Plant Concentration (ng/kg) [3] | BTF (day/kg) [4] | Intake from Herbivorous Prey (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (mammal) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 6.9E+00 | 0.0076 | 4.65E-06 | 3.00E-03 | 1.50E-03 | 0.0001 | 1.50E-07 |
| PCB 81 | 6.34 | 5.0E-01 | 1.1E+00 | 0.0088 | 8.24E-07 | 5.00E-04 | 2.50E-04 | 0.0003 | 7.51E-08 |
| PCB 105 | 6.79 | 9.5E+00 | 9.8E+00 | 0.0069 | 6.13E-06 | 9.50E-03 | 4.75E-03 | 0.00003 | 1.43E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 6.30E-07 | 5.00E-03 | 2.50E-03 | 0.00003 | 7.50E-08 |
| PCB 118 | 7.12 | 1.8E+01 | 2.0E+01 | 0.0055 | 9.75E-06 | 1.80E-02 | 9.00E-03 | 0.00003 | 2.70E-07 |
| PCB 123 | 6.98 | 1.3E+00 | 7.0E-01 | 0.0061 | 3.94E-07 | 1.30E-03 | 6.50E-04 | 0.00003 | 1.95E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 1.1E+00 | 0.0061 | 5.80E-07 | 1.20E-03 | 6.00E-04 | 0.1 | 6.00E-05 |
| PCB 156 | 7.60 | 3.2E+00 | 2.1E+00 | 0.0036 | 6.82E-07 | 3.20E-03 | 1.60E-03 | 0.00003 | 4.80E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 1.6E+00 | 0.0035 | 5.04E-07 | 1.00E-03 | 5.00E-04 | 0.00003 | 1.50E-08 |
| PCB 167 | 7.50 | 6.3E+00 | 6.0E+00 | 0.0039 | 2.14E-06 | 6.30E-03 | 3.15E-03 | 0.00003 | 9.45E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 4.43E-07 | 5.00E-03 | 2.50E-03 | 0.03 | 7.50E-05 |
| PCB 189 | 8.27 | 4.0E-01 | 1.1E+00 | 0.0016 | 1.54E-07 | 4.00E-04 | 2.00E-04 | 0.00003 | 6.00E-09 |
| *Congener total:* [8] | | | | | | | | | 1.36E-04 |
| ***North*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 7.8E+00 | 0.0076 | 5.46E-06 | 2.80E-03 | 1.40E-03 | 0.0001 | 1.40E-07 |
| PCB 81 | 6.34 | 3.0E-01 | 6.0E-01 | 0.0088 | 4.89E-07 | 3.00E-04 | 1.50E-04 | 0.0003 | 4.51E-08 |
| PCB 105 | 6.79 | 1.2E+01 | 1.3E+01 | 0.0069 | 8.18E-06 | 1.20E-02 | 6.00E-03 | 0.00003 | 1.80E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 6.50E-07 | 5.00E-03 | 2.50E-03 | 0.00003 | 7.50E-08 |
| PCB 118 | 7.12 | 1.9E+01 | 2.9E+01 | 0.0055 | 1.45E-05 | 1.90E-02 | 9.51E-03 | 0.00003 | 2.85E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 5.6E-01 | 0.0061 | 3.29E-07 | 1.50E-03 | 7.50E-04 | 0.00003 | 2.25E-08 |
| PCB 126 | 6.98 | 7.0E-01 | 1.1E+00 | 0.0061 | 5.94E-07 | 7.00E-04 | 3.50E-04 | 0.1 | 3.50E-05 |
| PCB 156 | 7.60 | 3.0E+00 | 2.5E+00 | 0.0036 | 8.29E-07 | 3.00E-03 | 1.50E-03 | 0.00003 | 4.50E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 5.4E-01 | 0.0035 | 1.80E-07 | 1.00E-03 | 5.00E-04 | 0.00003 | 1.50E-08 |
| PCB 167 | 7.50 | 6.6E+00 | 5.1E+00 | 0.0039 | 1.88E-06 | 6.60E-03 | 3.30E-03 | 0.00003 | 9.90E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 4.58E-07 | 5.00E-03 | 2.50E-03 | 0.03 | 7.50E-05 |
| PCB 189 | 8.27 | 7.0E-01 | 4.7E-01 | 0.0016 | 7.28E-08 | 7.00E-04 | 3.50E-04 | 0.00003 | 1.05E-08 |
| *Congener total:* [8] | | | | | | | | | 1.11E-04 |
| ***Northeast*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 1.3E+01 | 0.0076 | 8.64E-06 | 1.50E-02 | 7.50E-03 | 0.0001 | 7.50E-07 |
| PCB 81 | 6.34 | 1.4E+00 | 6.4E-01 | 0.0088 | 5.17E-07 | 1.40E-03 | 7.00E-04 | 0.0003 | 2.10E-07 |
| PCB 105 | 6.79 | 6.5E+01 | 2.3E+01 | 0.0069 | 1.48E-05 | 6.50E-02 | 3.25E-02 | 0.00003 | 9.75E-07 |
| PCB 114 | 6.98 | 2.0E+00 | 1.1E+00 | 0.0061 | 6.15E-07 | 2.00E-03 | 1.00E-03 | 0.00003 | 3.00E-08 |
| PCB 118 | 7.12 | 1.0E+02 | 4.4E+01 | 0.0055 | 2.24E-05 | 1.00E-01 | 5.00E-02 | 0.00003 | 1.50E-06 |
| PCB 123 | 6.98 | 8.7E+00 | 7.6E-01 | 0.0061 | 5.21E-07 | 8.70E-03 | 4.35E-03 | 0.00003 | 1.31E-07 |
| PCB 126 | 6.98 | 5.9E+00 | 1.1E+00 | 0.0061 | 6.66E-07 | 5.90E-03 | 2.95E-03 | 0.1 | 2.95E-04 |
| PCB 156 | 7.60 | 2.9E+01 | 4.8E+00 | 0.0036 | 1.72E-06 | 2.90E-02 | 1.45E-02 | 0.00003 | 4.35E-07 |
| PCB 157 | 7.62 | 6.9E+00 | 1.8E+00 | 0.0035 | 5.94E-07 | 6.90E-03 | 3.45E-03 | 0.00003 | 1.04E-07 |
| PCB 167 | 7.50 | 1.6E+01 | 1.3E+01 | 0.0039 | 4.48E-06 | 1.60E-02 | 8.00E-03 | 0.00003 | 2.40E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 3.3E-01 | 0.0043 | 1.71E-07 | 5.00E-03 | 2.50E-03 | 0.03 | 7.50E-05 |
| PCB 189 | 8.27 | 9.3E+00 | 1.1E+00 | 0.0016 | 1.92E-07 | 9.30E-03 | 4.65E-03 | 0.00003 | 1.40E-07 |
| *Congener total:* [8] | | | | | | | | | 3.75E-04 |
| ***B-18 Landfill*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 1.7E+02 | 0.0076 | 1.14E-04 | 1.80E-02 | 9.06E-03 | 0.0001 | 9.06E-07 |
| PCB 81 | 6.34 | 2.4E+00 | 1.2E+01 | 0.0088 | 8.90E-06 | 2.40E-03 | 1.20E-03 | 0.0003 | 3.61E-07 |
| PCB 105 | 6.79 | 6.2E+01 | 3.1E+02 | 0.0069 | 1.89E-04 | 6.20E-02 | 3.11E-02 | 0.00003 | 9.33E-07 |
| PCB 114 | 6.98 | 2.3E+00 | 2.1E+01 | 0.0061 | 1.12E-05 | 2.30E-03 | 1.16E-03 | 0.00003 | 3.47E-08 |
| PCB 118 | 7.12 | 8.5E+01 | 5.2E+02 | 0.0055 | 2.50E-04 | 8.50E-02 | 4.26E-02 | 0.00003 | 1.28E-06 |
| PCB 123 | 6.98 | 1.5E+01 | 3.1E+01 | 0.0061 | 1.67E-05 | 1.50E-02 | 7.51E-03 | 0.00003 | 2.25E-07 |
| PCB 126 | 6.98 | 3.5E+00 | 1.0E+01 | 0.0061 | 5.61E-06 | 3.50E-03 | 1.75E-03 | 0.1 | 1.75E-04 |
| PCB 156 | 7.60 | 3.1E+01 | 9.9E+01 | 0.0036 | 3.12E-05 | 3.10E-02 | 1.55E-02 | 0.00003 | 4.65E-07 |
| PCB 157 | 7.62 | 4.8E+00 | 1.6E+01 | 0.0035 | 4.94E-06 | 4.80E-03 | 2.40E-03 | 0.00003 | 7.21E-08 |
| PCB 167 | 7.50 | 1.3E+01 | 6.3E+01 | 0.0039 | 2.18E-05 | 1.30E-02 | 6.51E-03 | 0.00003 | 1.95E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 3.2E+00 | 0.0043 | 1.25E-06 | 5.00E-03 | 2.50E-03 | 0.03 | 7.50E-05 |
| PCB 189 | 8.27 | 8.2E+00 | 1.1E+00 | 0.0016 | 1.88E-07 | 8.20E-03 | 4.10E-03 | 0.00003 | 1.23E-07 |
| *Congener total:* [8] | | | | | | | | | 2.55E-04 |

**Table 5.4.3**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for BTF (biotransfer factor from diet to small mammal tissue): diet-to-fat transfer equation from RTI (2005): Log BTF = $-0.099(\log Kow)^2 + 1.07(\log Kow) - 3.56$
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of wild rodents of 5 % (0.05 kg fat/kg BW) to convert transfer factor to whole body basis.
Fat composition based on upper end of range from study of mice and kangaroo rats at arid prairie site in Pueblo, Colorado (Sovell et al. 2004).

(5) Exposure dose (ED) calculation:

ED = [(intake from herbivorous prey) + (intake from soil ingestion)] / body weight.

ED = $\{[((C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{fox}] + (C_{soil} \times SIR_{fox})\} \times \{AFF/BW\}$.

where:

ED = total exposure dose (ng/kg BW-day).

$C_{plants}$ = concentration in plants (ng/kg).

$C_{soil}$ = concentration in soil (ng/kg).

$FIR_{mouse}$ = food ingestion rate (plants) for herbivorous mouse = 0.00089 kg/day (based on San Joaquin pocket mouse).

$FIR_{fox}$ = food ingestion rate (mice) for fox (kg/day) = 0.12. See Table 5.4.2 for basis/source.

$SIR_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table 5.4.2 for basis/source.

$SIR_{fox}$ = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table 5.4.2 for basis/source.

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants, based on % moisture in vegetation (mean of April and August samples) from each exposure area (southeast 11.3%, south 12.4%, southwest 17.6%, west 8.3%, northwest 17.3%, north 14.3%, northeast 17.7%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.917 for west, 0.827 for northwest, 0.857 for north, 0.823 for northeast, 0.82 for B-18 landfill

BTF = biotransfer factor from diet to small mammal (day/kg).

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table 5.4.2 for basis/source of home range.

BW = body weight (kg) = 2 kg. See Table 5.4.2 for basis/source.

(6) Mammal TEFs are from USEPA (June 2008).

(7) TED = (exposure dose based on PCB congener concentration) x (TEF).

(8) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

**Table 5.4.4**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | Plant Concentration (ng/kg) [3] | BTF (day/kg) [4] | Intake from Herbivorous Prey (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (mammal) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|---|
| **Southeast** | | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 9.7E+01 | 0.0076 | 7.01E-05 | 1.10E-02 | 9.23E-03 | 0.0001 | 9.23E-07 |
| PCB 81 | 6.34 | 1.3E+00 | 1.4E+01 | 0.0088 | 1.15E-05 | 1.30E-03 | 1.09E-03 | 0.0003 | 3.28E-07 |
| PCB 105 | 6.79 | 3.3E+01 | 1.5E+02 | 0.0069 | 9.88E-05 | 3.30E-02 | 2.76E-02 | 0.00003 | 8.27E-07 |
| PCB 114 | 6.98 | 1.6E+00 | 8.7E+00 | 0.0061 | 5.03E-06 | 1.60E-03 | 1.34E-03 | 0.00003 | 4.01E-08 |
| PCB 118 | 7.12 | 5.1E+01 | 2.7E+02 | 0.0055 | 1.41E-04 | 5.10E-02 | 4.26E-02 | 0.00003 | 1.28E-06 |
| PCB 123 | 6.98 | 5.4E+00 | 1.7E+01 | 0.0061 | 9.99E-06 | 5.40E-03 | 4.51E-03 | 0.00003 | 1.35E-07 |
| PCB 126 | 6.98 | 1.5E+00 | 1.3E+01 | 0.0061 | 7.26E-06 | 1.50E-03 | 1.26E-03 | 0.1 | 1.26E-04 |
| PCB 156 | 7.60 | 1.3E+01 | 3.3E+01 | 0.0036 | 1.14E-05 | 1.30E-02 | 1.08E-02 | 0.00003 | 3.25E-07 |
| PCB 157 | 7.62 | 2.0E+00 | 6.8E+00 | 0.0035 | 2.27E-06 | 2.00E-03 | 1.67E-03 | 0.00003 | 5.01E-08 |
| PCB 167 | 7.50 | 5.2E+00 | 1.7E+01 | 0.0039 | 6.44E-06 | 5.20E-03 | 4.34E-03 | 0.00003 | 1.30E-07 |
| PCB 169 | 7.41 | 1.1E+00 | 7.5E-01 | 0.0043 | 3.14E-07 | 1.10E-03 | 9.17E-04 | 0.03 | 2.75E-05 |
| PCB 189 | 8.27 | 4.3E+00 | 8.6E+00 | 0.0016 | 1.36E-06 | 4.30E-03 | 3.58E-03 | 0.00003 | 1.08E-07 |
| *Congener total:* [8] | | | | | | | | | 1.57E-04 |
| **South** | | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 7.0E+01 | 0.0076 | 5.01E-05 | 5.30E-03 | 4.46E-03 | 0.0001 | 4.46E-07 |
| PCB 81 | 6.34 | 6.0E-01 | 6.5E+00 | 0.0088 | 5.34E-06 | 6.00E-04 | 5.04E-04 | 0.0003 | 1.51E-07 |
| PCB 105 | 6.79 | 2.1E+01 | 1.3E+02 | 0.0069 | 8.44E-05 | 2.10E-02 | 1.76E-02 | 0.00003 | 5.27E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 5.4E+00 | 0.0061 | 3.14E-06 | 5.00E-03 | 4.17E-03 | 0.00003 | 1.25E-07 |
| PCB 118 | 7.12 | 2.9E+01 | 1.8E+02 | 0.0055 | 9.26E-05 | 2.90E-02 | 2.42E-02 | 0.00003 | 7.27E-07 |
| PCB 123 | 6.98 | 1.9E+00 | 7.3E+00 | 0.0061 | 4.20E-06 | 1.90E-03 | 1.59E-03 | 0.00003 | 4.76E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 7.1E+00 | 0.0061 | 4.06E-06 | 1.20E-03 | 1.00E-03 | 0.1 | 1.00E-04 |
| PCB 156 | 7.60 | 6.8E+00 | 2.1E+01 | 0.0036 | 7.07E-06 | 6.80E-03 | 5.67E-03 | 0.00003 | 1.70E-07 |
| PCB 157 | 7.62 | 1.8E+00 | 4.8E+00 | 0.0035 | 1.59E-06 | 1.80E-03 | 1.50E-03 | 0.00003 | 4.50E-08 |
| PCB 167 | 7.50 | 3.0E+00 | 2.4E+01 | 0.0039 | 8.89E-06 | 3.00E-03 | 2.51E-03 | 0.00003 | 7.52E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 6.6E-01 | 0.0043 | 3.10E-07 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 1.6E+00 | 1.2E+00 | 0.0016 | 1.83E-07 | 1.60E-03 | 1.33E-03 | 0.00003 | 4.00E-08 |
| *Congener total:* [8] | | | | | | | | | 2.28E-04 |
| **Southwest** | | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 9.2E+00 | 0.0076 | 6.22E-06 | 2.60E-03 | 2.17E-03 | 0.0001 | 2.17E-07 |
| PCB 81 | 6.34 | 5.0E+00 | 1.1E+00 | 0.0088 | 9.06E-07 | 5.00E-03 | 4.17E-03 | 0.0003 | 1.25E-06 |
| PCB 105 | 6.79 | 1.1E+01 | 1.9E+01 | 0.0069 | 1.19E-05 | 1.10E-02 | 9.18E-03 | 0.00003 | 2.75E-07 |
| PCB 114 | 6.98 | 1.0E+00 | 1.1E+00 | 0.0061 | 5.75E-07 | 1.00E-03 | 8.34E-04 | 0.00003 | 2.50E-08 |
| PCB 118 | 7.12 | 1.5E+01 | 2.9E+01 | 0.0055 | 1.42E-05 | 1.50E-02 | 1.25E-02 | 0.00003 | 3.75E-07 |
| PCB 123 | 6.98 | 1.2E+00 | 1.6E+00 | 0.0061 | 8.81E-07 | 1.20E-03 | 1.00E-03 | 0.00003 | 3.00E-08 |
| PCB 126 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 6.28E-07 | 5.00E-03 | 4.17E-03 | 0.1 | 4.17E-04 |
| PCB 156 | 7.60 | 3.9E+00 | 4.2E+00 | 0.0036 | 1.34E-06 | 3.90E-03 | 3.25E-03 | 0.00003 | 9.75E-08 |
| PCB 157 | 7.62 | 9.2E-01 | 1.9E+00 | 0.0035 | 6.07E-07 | 9.20E-04 | 7.67E-04 | 0.00003 | 2.30E-08 |
| PCB 167 | 7.50 | 1.9E+00 | 1.0E+01 | 0.0039 | 3.63E-06 | 1.90E-03 | 1.59E-03 | 0.00003 | 4.76E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 4.42E-07 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 1.2E+00 | 1.1E+00 | 0.0016 | 1.57E-07 | 1.20E-03 | 1.00E-03 | 0.00003 | 3.00E-08 |
| *Congener total:* [8] | | | | | | | | | 5.44E-04 |
| **West** | | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 1.2E+01 | 0.0076 | 8.67E-06 | 2.30E-03 | 1.92E-03 | 0.0001 | 1.92E-07 |
| PCB 81 | 6.34 | 6.0E-01 | 1.7E+00 | 0.0088 | 1.46E-06 | 6.00E-04 | 5.01E-04 | 0.0003 | 1.50E-07 |
| PCB 105 | 6.79 | 1.0E+01 | 1.9E+01 | 0.0069 | 1.33E-05 | 1.00E-02 | 8.34E-03 | 0.00003 | 2.50E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 7.21E-07 | 5.00E-03 | 4.17E-03 | 0.00003 | 1.25E-07 |
| PCB 118 | 7.12 | 1.9E+01 | 3.0E+01 | 0.0055 | 1.61E-05 | 1.90E-02 | 1.58E-02 | 0.00003 | 4.75E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 1.9E+00 | 0.0061 | 1.13E-06 | 1.50E-03 | 1.25E-03 | 0.00003 | 3.75E-08 |
| PCB 126 | 6.98 | 8.0E-01 | 1.1E+00 | 0.0061 | 6.66E-07 | 8.00E-04 | 6.67E-04 | 0.1 | 6.67E-05 |
| PCB 156 | 7.60 | 3.9E+00 | 3.6E+00 | 0.0036 | 1.29E-06 | 3.90E-03 | 3.25E-03 | 0.00003 | 9.75E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 8.0E-01 | 0.0035 | 2.81E-07 | 1.00E-03 | 8.34E-04 | 0.00003 | 2.50E-08 |
| PCB 167 | 7.50 | 2.2E+00 | 8.1E+00 | 0.0039 | 3.13E-06 | 2.20E-03 | 1.84E-03 | 0.00003 | 5.51E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 4.8E-01 | 0.0043 | 2.48E-07 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 1.1E+00 | 1.1E+00 | 0.0016 | 1.81E-07 | 1.10E-03 | 9.17E-04 | 0.00003 | 2.75E-08 |
| *Congener total:* [8] | | | | | | | | | 1.93E-04 |

**Table 5.4.4**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | Plant Concentration (ng/kg) [3] | BTF (day/kg) [4] | Intake from Herbivorous Prey (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (mammal) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 6.9E+00 | 0.0076 | 4.65E-06 | 3.00E-03 | 2.50E-03 | 0.0001 | 2.50E-07 |
| PCB 81 | 6.34 | 5.0E-01 | 1.1E+00 | 0.0088 | 8.24E-07 | 5.00E-04 | 4.17E-04 | 0.0003 | 1.25E-07 |
| PCB 105 | 6.79 | 9.5E+00 | 9.8E+00 | 0.0069 | 6.13E-06 | 9.50E-03 | 7.92E-03 | 0.00003 | 2.38E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 6.30E-07 | 5.00E-03 | 4.17E-03 | 0.00003 | 1.25E-07 |
| PCB 118 | 7.12 | 1.8E+01 | 2.0E+01 | 0.0055 | 9.75E-06 | 1.80E-02 | 1.50E-02 | 0.00003 | 4.50E-07 |
| PCB 123 | 6.98 | 1.3E+00 | 7.0E-01 | 0.0061 | 3.94E-07 | 1.30E-03 | 1.08E-03 | 0.00003 | 3.25E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 1.1E+00 | 0.0061 | 5.80E-07 | 1.20E-03 | 1.00E-03 | 0.1 | 1.00E-04 |
| PCB 156 | 7.60 | 3.2E+00 | 2.1E+00 | 0.0036 | 6.82E-07 | 3.20E-03 | 2.67E-03 | 0.00003 | 8.00E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 1.6E+00 | 0.0035 | 5.04E-07 | 1.00E-03 | 8.34E-04 | 0.00003 | 2.50E-08 |
| PCB 167 | 7.50 | 6.3E+00 | 6.0E+00 | 0.0039 | 2.14E-06 | 6.30E-03 | 5.25E-03 | 0.00003 | 1.58E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 4.43E-07 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 4.0E-01 | 1.1E+00 | 0.0016 | 1.54E-07 | 4.00E-04 | 3.33E-04 | 0.00003 | 1.00E-08 |
| *Congener total:* [8] | | | | | | | | | 2.27E-04 |
| ***North*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 7.8E+00 | 0.0076 | 5.46E-06 | 2.80E-03 | 2.34E-03 | 0.0001 | 2.34E-07 |
| PCB 81 | 6.34 | 3.0E-01 | 6.0E-01 | 0.0088 | 4.89E-07 | 3.00E-04 | 2.50E-04 | 0.0003 | 7.51E-08 |
| PCB 105 | 6.79 | 1.2E+01 | 1.3E+01 | 0.0069 | 8.18E-06 | 1.20E-02 | 1.00E-02 | 0.00003 | 3.00E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 6.50E-07 | 5.00E-03 | 4.17E-03 | 0.00003 | 1.25E-07 |
| PCB 118 | 7.12 | 1.9E+01 | 2.9E+01 | 0.0055 | 1.45E-05 | 1.90E-02 | 1.58E-02 | 0.00003 | 4.75E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 5.6E-01 | 0.0061 | 3.29E-07 | 1.50E-03 | 1.25E-03 | 0.00003 | 3.75E-08 |
| PCB 126 | 6.98 | 7.0E-01 | 1.1E+00 | 0.0061 | 5.94E-07 | 7.00E-04 | 5.84E-04 | 0.1 | 5.84E-05 |
| PCB 156 | 7.60 | 3.0E+00 | 2.5E+00 | 0.0036 | 8.29E-07 | 3.00E-03 | 2.50E-03 | 0.00003 | 7.50E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 5.4E-01 | 0.0035 | 1.80E-07 | 1.00E-03 | 8.33E-04 | 0.00003 | 2.50E-08 |
| PCB 167 | 7.50 | 6.6E+00 | 5.1E+00 | 0.0039 | 1.88E-06 | 6.60E-03 | 5.50E-03 | 0.00003 | 1.65E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 4.58E-07 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 7.0E-01 | 4.7E-01 | 0.0016 | 7.28E-08 | 7.00E-04 | 5.83E-04 | 0.00003 | 1.75E-08 |
| *Congener total:* [8] | | | | | | | | | 1.85E-04 |
| ***Northeast*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 1.3E+01 | 0.0076 | 8.64E-06 | 1.50E-02 | 1.25E-02 | 0.0001 | 1.25E-06 |
| PCB 81 | 6.34 | 1.4E+00 | 6.4E-01 | 0.0088 | 5.17E-07 | 1.40E-03 | 1.17E-03 | 0.0003 | 3.50E-07 |
| PCB 105 | 6.79 | 6.5E+01 | 2.3E+01 | 0.0069 | 1.48E-05 | 6.50E-02 | 5.42E-02 | 0.00003 | 1.63E-06 |
| PCB 114 | 6.98 | 2.0E+00 | 1.1E+00 | 0.0061 | 6.15E-07 | 2.00E-03 | 1.67E-03 | 0.00003 | 5.00E-08 |
| PCB 118 | 7.12 | 1.0E+02 | 4.4E+01 | 0.0055 | 2.24E-05 | 1.00E-01 | 8.34E-02 | 0.00003 | 2.50E-06 |
| PCB 123 | 6.98 | 8.7E+00 | 7.6E-01 | 0.0061 | 5.21E-07 | 8.70E-03 | 7.25E-03 | 0.00003 | 2.18E-07 |
| PCB 126 | 6.98 | 5.9E+00 | 1.1E+00 | 0.0061 | 6.66E-07 | 5.90E-03 | 4.92E-03 | 0.1 | 4.92E-04 |
| PCB 156 | 7.60 | 2.9E+01 | 4.8E+00 | 0.0036 | 1.72E-06 | 2.90E-02 | 2.42E-02 | 0.00003 | 7.25E-07 |
| PCB 157 | 7.62 | 6.9E+00 | 1.8E+00 | 0.0035 | 5.94E-07 | 6.90E-03 | 5.75E-03 | 0.00003 | 1.73E-07 |
| PCB 167 | 7.50 | 1.6E+01 | 1.3E+01 | 0.0039 | 4.48E-06 | 1.60E-02 | 1.33E-02 | 0.00003 | 4.00E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 3.3E-01 | 0.0043 | 1.71E-07 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 9.3E+00 | 1.1E+00 | 0.0016 | 1.92E-07 | 9.30E-03 | 7.75E-03 | 0.00003 | 2.33E-07 |
| *Congener total:* [8] | | | | | | | | | 6.24E-04 |
| ***B-18 Landfill*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 1.7E+02 | 0.0076 | 1.14E-04 | 1.80E-02 | 1.51E-02 | 0.0001 | 1.51E-06 |
| PCB 81 | 6.34 | 2.4E+00 | 1.2E+01 | 0.0088 | 8.90E-06 | 2.40E-03 | 2.01E-03 | 0.0003 | 6.02E-07 |
| PCB 105 | 6.79 | 6.2E+01 | 3.1E+02 | 0.0069 | 1.89E-04 | 6.20E-02 | 5.18E-02 | 0.00003 | 1.55E-06 |
| PCB 114 | 6.98 | 2.3E+00 | 2.1E+01 | 0.0061 | 1.12E-05 | 2.30E-03 | 1.93E-03 | 0.00003 | 5.78E-08 |
| PCB 118 | 7.12 | 8.5E+01 | 5.2E+02 | 0.0055 | 2.50E-04 | 8.50E-02 | 7.10E-02 | 0.00003 | 2.13E-06 |
| PCB 123 | 6.98 | 1.5E+01 | 3.1E+01 | 0.0061 | 1.67E-05 | 1.50E-02 | 1.25E-02 | 0.00003 | 3.75E-07 |
| PCB 126 | 6.98 | 3.5E+00 | 1.0E+01 | 0.0061 | 5.61E-06 | 3.50E-03 | 2.92E-03 | 0.1 | 2.92E-04 |
| PCB 156 | 7.60 | 3.1E+01 | 9.9E+01 | 0.0036 | 3.12E-05 | 3.10E-02 | 2.59E-02 | 0.00003 | 7.76E-07 |
| PCB 157 | 7.62 | 4.8E+00 | 1.6E+01 | 0.0035 | 4.94E-06 | 4.80E-03 | 4.00E-03 | 0.00003 | 1.20E-07 |
| PCB 167 | 7.50 | 1.3E+01 | 6.3E+01 | 0.0039 | 2.18E-05 | 1.30E-02 | 1.09E-02 | 0.00003 | 3.26E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 3.2E+00 | 0.0043 | 1.25E-06 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 8.2E+00 | 1.1E+00 | 0.0016 | 1.88E-07 | 8.20E-03 | 6.83E-03 | 0.00003 | 2.05E-07 |
| *Congener total:* [8] | | | | | | | | | 4.25E-04 |

**Table 5.4.4**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for BTF (biotransfer factor from diet to small mammal tissue): diet-to-fat transfer equation from RTI (2005): Log BTF = $-0.099(\log Kow)^2 + 1.07(\log Kow) - 3.56$
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of wild rodents of 5% (0.05 kg fat/kg BW) to convert transfer factor to whole body basis.
Fat composition based on upper end of range from study of mice and kangaroo rats at arid prairie site in Pueblo, Colorado (Sovell et al. 2004).

(5) Exposure dose (ED) calculation:

ED = [(intake from herbivorous prey) + (intake from soil ingestion)] x (area foraging factor / body weight).

$ED = \{[((C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{fox}] + (C_{soil} \times SIR_{fox})\} \times \{AFF/BW\}$.

where:

ED = total exposure dose (ng/kg BW-day).

$C_{plants}$ = concentration in plants (ng/kg).

$C_{soil}$ = concentration in soil (ng/kg).

$FIR_{mouse}$ = food ingestion rate (plants) for herbivorous mouse = 0.00089 kg/day (based on San Joaquin pocket mouse).

$FIR_{fox}$ = food ingestion rate (mice) for fox (kg/day) = 0.12 See Table 5.4.2 for basis/source.

$SIR_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table 5.4.2 for basis/source.

$SIR_{fox}$ = soil ingestion rate for fox (kg/day) = 0.001 kg/day See Table 5.4.2 for basis/source.

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants, based on % moisture in vegetation (mean of April and August samples) from each exposure area
(southeast 11.3%, south 12.4%, southwest 17.6%, west 8.3%, northwest 17.3%, north 14.3%, northeast 17.7%, B-18 18%) = 1- fraction moisture =
0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.917 for west, 0.827 for northwest, 0.857 for north, 0.823 for northeast, 0.82 for B-18 landfill

BTF = biotransfer factor from diet to small mammal (day/kg).

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table 5.4.2 for basis/source of home range.

BW = body weight (kg) = 1.2 kg. See Table 5.4.2 for basis/source.

(6) Mammal TEFs are from USEPA (June 2008).

(7) TED = (exposure dose based on PCB congener concentration) x (TEF).

(8) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram
TED = toxicity equivalence dose
TEF = toxicity equivalence factor

**Table 5.4.5**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area (1) | Log Kow (2) | Soil Concentration (ng/kg) (3) | $BAF_{inv}$ (ng/kg)/ (ng/kg) (4) | Invertebrate Tissue Concentration (ng/kg) (5) | BTF (day/kg) (6) | Intake from Carnivorous Prey (ng/day) (7) | Intake from Incidental Soil Ingestion (ng/day) (7) | Exposure Dose (ng/kg BW-day) (7) | TEF (mammal) (8) | TED (ng/kg BW-day) (9) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Southeast** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 0.95 | 1.05E+1 | 0.0076 | 2.80E-05 | 1.10E-02 | 5.51E-03 | 0.0001 | 5.51E-07 |
| PCB 81 | 6.34 | 1.3E+00 | 0.92 | 1.20E+0 | 0.0088 | 3.69E-06 | 1.30E-03 | 6.52E-04 | 0.0003 | 1.96E-07 |
| PCB 105 | 6.79 | 3.3E+01 | 0.97 | 3.21E+1 | 0.0069 | 7.78E-05 | 3.30E-02 | 1.65E-02 | 0.00003 | 4.96E-07 |
| PCB 114 | 6.98 | 1.6E+00 | 0.99 | 1.59E+0 | 0.0061 | 3.39E-06 | 1.60E-03 | 8.02E-04 | 0.00003 | 2.41E-08 |
| PCB 118 | 7.12 | 5.1E+01 | 1.01 | 5.15E+1 | 0.0055 | 9.89E-05 | 5.10E-02 | 2.55E-02 | 0.00003 | 7.66E-07 |
| PCB 123 | 6.98 | 5.4E+00 | 0.99 | 5.37E+0 | 0.0061 | 1.14E-05 | 5.40E-03 | 2.71E-03 | 0.00003 | 8.12E-08 |
| PCB 126 | 6.98 | 1.5E+00 | 0.99 | 1.49E+0 | 0.0061 | 3.18E-06 | 1.50E-03 | 7.52E-04 | 0.1 | 7.52E-05 |
| PCB 156 | 7.60 | 1.3E+01 | 1.07 | 1.39E+1 | 0.0036 | 1.74E-05 | 1.30E-02 | 6.51E-03 | 0.00003 | 1.95E-07 |
| PCB 157 | 7.62 | 2.0E+00 | 1.07 | 2.14E+0 | 0.0035 | 2.62E-06 | 2.00E-03 | 1.00E-03 | 0.00003 | 3.00E-08 |
| PCB 167 | 7.50 | 5.2E+00 | 1.06 | 5.49E+0 | 0.0039 | 7.57E-06 | 5.20E-03 | 2.60E-03 | 0.00003 | 7.81E-08 |
| PCB 169 | 7.41 | 1.1E+00 | 1.04 | 1.15E+0 | 0.0043 | 1.72E-06 | 1.10E-03 | 5.51E-04 | 0.03 | 1.65E-05 |
| PCB 189 | 8.27 | 4.3E+00 | 1.15 | 4.96E+0 | 0.0016 | 2.86E-06 | 4.30E-03 | 2.15E-03 | 0.00003 | 6.45E-08 |
| *Congener total:* (10) | | | | | | | | | | 9.42E-05 |
| **South** | | | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 0.95 | 5.06E+0 | 0.0076 | 1.35E-05 | 5.30E-03 | 2.66E-03 | 0.0001 | 2.66E-07 |
| PCB 81 | 6.34 | 6.0E-01 | 0.92 | 5.54E-1 | 0.0088 | 1.71E-06 | 6.00E-04 | 3.01E-04 | 0.0003 | 9.03E-08 |
| PCB 105 | 6.79 | 2.1E+01 | 0.97 | 2.04E+1 | 0.0069 | 4.95E-05 | 2.10E-02 | 1.05E-02 | 0.00003 | 3.16E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 4.97E+0 | 0.0061 | 1.06E-05 | 5.00E-03 | 2.51E-03 | 0.00003 | 7.52E-08 |
| PCB 118 | 7.12 | 2.9E+01 | 1.01 | 2.93E+1 | 0.0055 | 5.62E-05 | 2.90E-02 | 1.45E-02 | 0.00003 | 4.36E-07 |
| PCB 123 | 6.98 | 1.9E+00 | 0.99 | 1.89E+0 | 0.0061 | 4.03E-06 | 1.90E-03 | 9.52E-04 | 0.00003 | 2.86E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 0.99 | 1.19E+0 | 0.0061 | 2.54E-06 | 1.20E-03 | 6.01E-04 | 0.1 | 6.01E-05 |
| PCB 156 | 7.60 | 6.8E+00 | 1.07 | 7.26E+0 | 0.0036 | 9.08E-06 | 6.80E-03 | 3.40E-03 | 0.00003 | 1.02E-07 |
| PCB 157 | 7.62 | 1.8E+00 | 1.07 | 1.93E+0 | 0.0035 | 2.36E-06 | 1.80E-03 | 9.01E-04 | 0.00003 | 2.70E-08 |
| PCB 167 | 7.50 | 3.0E+00 | 1.06 | 3.17E+0 | 0.0039 | 4.37E-06 | 3.00E-03 | 1.50E-03 | 0.00003 | 4.51E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+0 | 0.0043 | 7.83E-06 | 5.00E-03 | 2.50E-03 | 0.03 | 7.51E-05 |
| PCB 189 | 8.27 | 1.6E+00 | 1.15 | 1.84E+0 | 0.0016 | 1.06E-06 | 1.60E-03 | 8.01E-04 | 0.00003 | 2.40E-08 |
| *Congener total:* (10) | | | | | | | | | | 1.37E-04 |
| **Southwest** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 0.95 | 2.48E+0 | 0.0076 | 6.62E-06 | 2.60E-03 | 1.30E-03 | 0.0001 | 1.30E-07 |
| PCB 81 | 6.34 | 5.0E+00 | 0.92 | 4.62E+0 | 0.0088 | 1.42E-05 | 5.00E-03 | 2.51E-03 | 0.0003 | 7.52E-07 |
| PCB 105 | 6.79 | 1.1E+01 | 0.97 | 1.07E+1 | 0.0069 | 2.59E-05 | 1.10E-02 | 5.51E-03 | 0.00003 | 1.65E-07 |
| PCB 114 | 6.98 | 1.0E+00 | 0.99 | 9.94E-1 | 0.0061 | 2.12E-06 | 1.00E-03 | 5.01E-04 | 0.00003 | 1.50E-08 |
| PCB 118 | 7.12 | 1.5E+01 | 1.01 | 1.52E+1 | 0.0055 | 2.91E-05 | 1.50E-02 | 7.51E-03 | 0.00003 | 2.25E-07 |
| PCB 123 | 6.98 | 1.2E+00 | 0.99 | 1.19E+0 | 0.0061 | 2.54E-06 | 1.20E-03 | 6.01E-04 | 0.00003 | 1.80E-08 |
| PCB 126 | 6.98 | 5.0E+00 | 0.99 | 4.97E+0 | 0.0061 | 1.06E-05 | 5.00E-03 | 2.51E-03 | 0.1 | 2.51E-04 |
| PCB 156 | 7.60 | 3.9E+00 | 1.07 | 4.16E+0 | 0.0036 | 5.21E-06 | 3.90E-03 | 1.95E-03 | 0.00003 | 5.86E-08 |
| PCB 157 | 7.62 | 9.2E-01 | 1.07 | 9.84E-1 | 0.0035 | 1.21E-06 | 9.20E-04 | 4.61E-04 | 0.00003 | 1.38E-08 |
| PCB 167 | 7.50 | 1.9E+00 | 1.06 | 2.00E+0 | 0.0039 | 2.77E-06 | 1.90E-03 | 9.51E-04 | 0.00003 | 2.85E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+0 | 0.0043 | 7.83E-06 | 5.00E-03 | 2.50E-03 | 0.03 | 7.51E-05 |
| PCB 189 | 8.27 | 1.2E+00 | 1.15 | 1.38E+0 | 0.0016 | 7.98E-07 | 1.20E-03 | 6.00E-04 | 0.00003 | 1.80E-08 |
| *Congener total:* (10) | | | | | | | | | | 3.27E-04 |
| **West** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 0.95 | 2.20E+0 | 0.0076 | 5.86E-06 | 2.30E-03 | 1.15E-03 | 0.0001 | 1.15E-07 |
| PCB 81 | 6.34 | 6.0E-01 | 0.92 | 5.54E-1 | 0.0088 | 1.71E-06 | 6.00E-04 | 3.01E-04 | 0.0003 | 9.03E-08 |
| PCB 105 | 6.79 | 1.0E+01 | 0.97 | 9.72E+0 | 0.0069 | 2.36E-05 | 1.00E-02 | 5.01E-03 | 0.00003 | 1.50E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 4.97E+0 | 0.0061 | 1.06E-05 | 5.00E-03 | 2.51E-03 | 0.00003 | 7.52E-08 |
| PCB 118 | 7.12 | 1.9E+01 | 1.01 | 1.92E+1 | 0.0055 | 3.68E-05 | 1.90E-02 | 9.52E-03 | 0.00003 | 2.86E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 0.99 | 1.49E+0 | 0.0061 | 3.18E-06 | 1.50E-03 | 7.52E-04 | 0.00003 | 2.25E-08 |
| PCB 126 | 6.98 | 8.0E-01 | 0.99 | 7.95E-1 | 0.0061 | 1.70E-06 | 8.00E-04 | 4.01E-04 | 0.1 | 4.01E-05 |
| PCB 156 | 7.60 | 3.9E+00 | 1.07 | 4.16E+0 | 0.0036 | 5.21E-06 | 3.90E-03 | 1.95E-03 | 0.00003 | 5.86E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.07E+0 | 0.0035 | 1.31E-06 | 1.00E-03 | 5.01E-04 | 0.00003 | 1.50E-08 |
| PCB 167 | 7.50 | 2.2E+00 | 1.06 | 2.32E+0 | 0.0039 | 3.20E-06 | 2.20E-03 | 1.10E-03 | 0.00003 | 3.30E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+0 | 0.0043 | 7.83E-06 | 5.00E-03 | 2.50E-03 | 0.03 | 7.51E-05 |
| PCB 189 | 8.27 | 1.1E+00 | 1.15 | 1.27E+0 | 0.0016 | 7.32E-07 | 1.10E-03 | 5.50E-04 | 0.00003 | 1.65E-08 |
| *Congener total:* (10) | | | | | | | | | | 1.16E-04 |

**Table 5.4.5**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[(1)] | Log Kow [(2)] | Soil Concentration (ng/kg) [(3)] | $BAF_{inv}$ (ng/kg)/(ng/kg) [(4)] | Invertebrate Tissue Concentration (ng/kg)[(5)] | BTF (day/kg) [(6)] | Intake from Carnivorous Prey (ng/day) [(7)] | Intake from Incidental Soil Ingestion (ng/day) [(7)] | Exposure Dose (ng/kg BW-day) [(7)] | TEF (mammal) [(8)] | TED (ng/kg BW-day) [(9)] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 0.95 | 2.86E+0 | 0.0076 | 7.64E-06 | 3.00E-03 | 1.50E-03 | 0.0001 | 1.50E-07 |
| PCB 81 | 6.34 | 5.0E-01 | 0.92 | 4.62E-1 | 0.0088 | 1.42E-06 | 5.00E-04 | 2.51E-04 | 0.0003 | 7.52E-08 |
| PCB 105 | 6.79 | 9.5E+00 | 0.97 | 9.24E+0 | 0.0069 | 2.24E-05 | 9.50E-03 | 4.76E-03 | 0.00003 | 1.43E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 4.97E+0 | 0.0061 | 1.06E-05 | 5.00E-03 | 2.51E-03 | 0.00003 | 7.52E-08 |
| PCB 118 | 7.12 | 1.8E+01 | 1.01 | 1.82E+1 | 0.0055 | 3.49E-05 | 1.80E-02 | 9.02E-03 | 0.00003 | 2.71E-07 |
| PCB 123 | 6.98 | 1.3E+00 | 0.99 | 1.29E+0 | 0.0061 | 2.76E-06 | 1.30E-03 | 6.51E-04 | 0.00003 | 1.95E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 0.99 | 1.19E+0 | 0.0061 | 2.54E-06 | 1.20E-03 | 6.01E-04 | 0.1 | 6.01E-05 |
| PCB 156 | 7.60 | 3.2E+00 | 1.07 | 3.42E+0 | 0.0036 | 4.27E-06 | 3.20E-03 | 1.60E-03 | 0.00003 | 4.81E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.07E+0 | 0.0035 | 1.31E-06 | 1.00E-03 | 5.01E-04 | 0.00003 | 1.50E-08 |
| PCB 167 | 7.50 | 6.3E+00 | 1.06 | 6.65E+0 | 0.0039 | 9.17E-06 | 6.30E-03 | 3.15E-03 | 0.00003 | 9.46E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+0 | 0.0043 | 7.83E-06 | 5.00E-03 | 2.50E-03 | 0.03 | 7.51E-05 |
| PCB 189 | 8.27 | 4.0E-01 | 1.15 | 4.61E-1 | 0.0016 | 2.66E-07 | 4.00E-04 | 2.00E-04 | 0.00003 | 6.00E-09 |
| *Congener total:* [(10)] | | | | | | | | | | 1.36E-04 |
| ***North*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 0.95 | 2.67E+0 | 0.0076 | 7.13E-06 | 2.80E-03 | 1.40E-03 | 0.0001 | 1.40E-07 |
| PCB 81 | 6.34 | 3.0E-01 | 0.92 | 2.77E-1 | 0.0088 | 8.53E-07 | 3.00E-04 | 1.50E-04 | 0.0003 | 4.51E-08 |
| PCB 105 | 6.79 | 1.2E+01 | 0.97 | 1.17E+1 | 0.0069 | 2.83E-05 | 1.20E-02 | 6.01E-03 | 0.00003 | 1.80E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 4.97E+0 | 0.0061 | 1.06E-05 | 5.00E-03 | 2.51E-03 | 0.00003 | 7.52E-08 |
| PCB 118 | 7.12 | 1.9E+01 | 1.01 | 1.92E+1 | 0.0055 | 3.68E-05 | 1.90E-02 | 9.52E-03 | 0.00003 | 2.86E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 0.99 | 1.49E+0 | 0.0061 | 3.18E-06 | 1.50E-03 | 7.52E-04 | 0.00003 | 2.25E-08 |
| PCB 126 | 6.98 | 7.0E-01 | 0.99 | 6.96E-1 | 0.0061 | 1.48E-06 | 7.00E-04 | 3.51E-04 | 0.1 | 3.51E-05 |
| PCB 156 | 7.60 | 3.0E+00 | 1.07 | 3.20E+0 | 0.0036 | 4.00E-06 | 3.00E-03 | 1.50E-03 | 0.00003 | 4.51E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.07E+0 | 0.0035 | 1.31E-06 | 1.00E-03 | 5.01E-04 | 0.00003 | 1.50E-08 |
| PCB 167 | 7.50 | 6.6E+00 | 1.06 | 6.96E+0 | 0.0039 | 9.61E-06 | 6.60E-03 | 3.30E-03 | 0.00003 | 9.91E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+0 | 0.0043 | 7.83E-06 | 5.00E-03 | 2.50E-03 | 0.03 | 7.51E-05 |
| PCB 189 | 8.27 | 7.0E-01 | 1.15 | 8.07E-1 | 0.0016 | 4.66E-07 | 7.00E-04 | 3.50E-04 | 0.00003 | 1.05E-08 |
| *Congener total:* [(10)] | | | | | | | | | | 1.11E-04 |
| ***Northeast*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 0.95 | 1.43E+1 | 0.0076 | 3.82E-05 | 1.50E-02 | 7.52E-03 | 0.0001 | 7.52E-07 |
| PCB 81 | 6.34 | 1.4E+00 | 0.92 | 1.29E+0 | 0.0088 | 3.98E-06 | 1.40E-03 | 7.02E-04 | 0.0003 | 2.11E-07 |
| PCB 105 | 6.79 | 6.5E+01 | 0.97 | 6.32E+1 | 0.0069 | 1.53E-04 | 6.50E-02 | 3.26E-02 | 0.00003 | 9.77E-07 |
| PCB 114 | 6.98 | 2.0E+00 | 0.99 | 1.99E+0 | 0.0061 | 4.24E-06 | 2.00E-03 | 1.00E-03 | 0.00003 | 3.01E-08 |
| PCB 118 | 7.12 | 1.0E+02 | 1.01 | 1.01E+2 | 0.0055 | 1.94E-04 | 1.00E-01 | 5.01E-02 | 0.00003 | 1.50E-06 |
| PCB 123 | 6.98 | 8.7E+00 | 0.99 | 8.65E+0 | 0.0061 | 1.84E-05 | 8.70E-03 | 4.36E-03 | 0.00003 | 1.31E-07 |
| PCB 126 | 6.98 | 5.9E+00 | 0.99 | 5.86E+0 | 0.0061 | 1.25E-05 | 5.90E-03 | 2.96E-03 | 0.1 | 2.96E-04 |
| PCB 156 | 7.60 | 2.9E+01 | 1.07 | 3.10E+1 | 0.0036 | 3.87E-05 | 2.90E-02 | 1.45E-02 | 0.00003 | 4.36E-07 |
| PCB 157 | 7.62 | 6.9E+00 | 1.07 | 7.38E+0 | 0.0035 | 9.05E-06 | 6.90E-03 | 3.45E-03 | 0.00003 | 1.04E-07 |
| PCB 167 | 7.50 | 1.6E+01 | 1.06 | 1.69E+1 | 0.0039 | 2.33E-05 | 1.60E-02 | 8.01E-03 | 0.00003 | 2.40E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+0 | 0.0043 | 7.83E-06 | 5.00E-03 | 2.50E-03 | 0.03 | 7.51E-05 |
| PCB 189 | 8.27 | 9.3E+00 | 1.15 | 1.07E+1 | 0.0016 | 6.19E-06 | 9.30E-03 | 4.65E-03 | 0.00003 | 1.40E-07 |
| *Congener total:* [(10)] | | | | | | | | | | 3.75E-04 |
| ***B-18 Landfill*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 0.95 | 1.72E+1 | 0.0076 | 4.58E-05 | 1.80E-02 | 9.02E-03 | 0.0001 | 9.02E-07 |
| PCB 81 | 6.34 | 2.4E+00 | 0.92 | 2.22E+0 | 0.0088 | 6.82E-06 | 2.40E-03 | 1.20E-03 | 0.0003 | 3.61E-07 |
| PCB 105 | 6.79 | 6.2E+01 | 0.97 | 6.03E+1 | 0.0069 | 1.46E-04 | 6.20E-02 | 3.11E-02 | 0.00003 | 9.32E-07 |
| PCB 114 | 6.98 | 2.3E+00 | 0.99 | 2.29E+0 | 0.0061 | 4.87E-06 | 2.30E-03 | 1.15E-03 | 0.00003 | 3.46E-08 |
| PCB 118 | 7.12 | 8.5E+01 | 1.01 | 8.59E+1 | 0.0055 | 1.65E-04 | 8.50E-02 | 4.26E-02 | 0.00003 | 1.28E-06 |
| PCB 123 | 6.98 | 1.5E+01 | 0.99 | 1.49E+1 | 0.0061 | 3.18E-05 | 1.50E-02 | 7.52E-03 | 0.00003 | 2.25E-07 |
| PCB 126 | 6.98 | 3.5E+00 | 0.99 | 3.48E+0 | 0.0061 | 7.42E-06 | 3.50E-03 | 1.75E-03 | 0.1 | 1.75E-04 |
| PCB 156 | 7.60 | 3.1E+01 | 1.07 | 3.31E+1 | 0.0036 | 4.14E-05 | 3.10E-02 | 1.55E-02 | 0.00003 | 4.66E-07 |
| PCB 157 | 7.62 | 4.8E+00 | 1.07 | 5.14E+0 | 0.0035 | 6.29E-06 | 4.80E-03 | 2.40E-03 | 0.00003 | 7.21E-08 |
| PCB 167 | 7.50 | 1.3E+01 | 1.06 | 1.37E+1 | 0.0039 | 1.89E-05 | 1.30E-02 | 6.51E-03 | 0.00003 | 1.95E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+0 | 0.0043 | 7.83E-06 | 5.00E-03 | 2.50E-03 | 0.03 | 7.51E-05 |
| PCB 189 | 8.27 | 8.2E+00 | 1.15 | 9.46E+0 | 0.0016 | 5.46E-06 | 8.20E-03 | 4.10E-03 | 0.00003 | 1.23E-07 |
| *Congener total:* [(10)] | | | | | | | | | | 2.55E-04 |

**Table 5.4.5**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for soil-to-invertebrate BAF ($BAF_{inv}$): soil-to-earthworm bioaccumulation equation for nonionic organic compounds from Connell (1990): $BAF = 0.445(Kow)^{0.05}$
BAF is in units of (invertebrate tissue wet weight concentration) / (soil dry weight concentration).

(5) Invertebrate tissue concentration (ng/kg wet wt) = soil concentration (ng/kg dry wt) x $BAF_{inv}$

(6) Basis for BTF (biotransfer factor from diet to small mammal tissue): diet-to-fat transfer equation from RTI (2005): $\text{Log BTF} = -0.099(\text{log Kow})^2 + 1.07(\text{log Kow}) - 3.56$
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of wild rodents of 5 % (0.05 kg fat/kg BW) to convert transfer factor to whole body basis.
Fat composition based on upper end of range from study of mice and kangaroo rats at arid prairie site in Pueblo, Colorado (Sovell et al. 2004).

(7) Exposure dose (ED) calculation:
ED = [(intake from carnivorous prey) + (intake from soil ingestion)] x [area foraging factor / body weight].
$ED = \{[((C_{inv} \times FIR_{mouse}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{fox}] + (C_{soil} \times SIR_{fox})\} \times \{AFF/BW\}$.
where:
ED = total exposure dose (ng/kg BW-day).
$C_{inv}$ = concentration in invertebrates consumed by grasshopper mouse (ng/kg) = $C_{soil} \times BAF_{inv}$
$C_{soil}$ = concentration in soil (ng/kg).
$FIR_{mouse}$ = food ingestion rate (invertebrates) for grasshopper mouse = 0.0029 kg/day.
$FIR_{fox}$ = food ingestion rate (mice) for fox (kg/day) = 0.12. See Table 5.4.2 for basis/source.
$SIR_{mouse}$ = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table 5.4.2 for basis/source.
$SIR_{fox}$ = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table 5.4.2 for basis/source.
BTF = biotransfer factor from diet to small mammal (day/kg).
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table 5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table 5.4.2 for basis/source.

(8) Mammal TEFs are from USEPA (June 2008).

(9) TED = (exposure dose based on PCB congener concentration) x (TEF).

(10) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram
TED = toxicity equivalence dose
TEF = toxicity equivalence factor

**Table 5.4.6**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area(1) | Log Kow (2) | Soil Concentration (ng/kg) (3) | $BAF_{inv}$ (ng/kg)/(ng/kg) (4) | Invertebrate Tissue Concentration (ng/kg)(5) | BTF (day/kg) (6) | Intake from Carnivorous Prey (ng/day) (7) | Intake from Incidental Soil Ingestion (ng/day) (7) | Exposure Dose (ng/kg BW-day) (7) | TEF (mammal) (8) | TED (ng/kg BW-day) (9) |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 0.95 | 1.05E+01 | 0.0076 | 2.80E-05 | 1.10E-02 | 9.19E-03 | 0.0001 | 9.19E-07 |
| PCB 81 | 6.34 | 1.3E+00 | 0.92 | 1.20E+00 | 0.0088 | 3.69E-06 | 1.30E-03 | 1.09E-03 | 0.0003 | 3.26E-07 |
| PCB 105 | 6.79 | 3.3E+01 | 0.97 | 3.21E+01 | 0.0069 | 7.78E-05 | 3.30E-02 | 2.76E-02 | 0.00003 | 8.27E-07 |
| PCB 114 | 6.98 | 1.6E+00 | 0.99 | 1.59E+00 | 0.0061 | 3.39E-06 | 1.60E-03 | 1.34E-03 | 0.00003 | 4.01E-08 |
| PCB 118 | 7.12 | 5.1E+01 | 1.01 | 5.15E+01 | 0.0055 | 9.89E-05 | 5.10E-02 | 4.26E-02 | 0.00003 | 1.28E-06 |
| PCB 123 | 6.98 | 5.4E+00 | 0.99 | 5.37E+00 | 0.0061 | 1.14E-05 | 5.40E-03 | 4.51E-03 | 0.00003 | 1.35E-07 |
| PCB 126 | 6.98 | 1.5E+00 | 0.99 | 1.49E+00 | 0.0061 | 3.18E-06 | 1.50E-03 | 1.25E-03 | 0.1 | 1.25E-04 |
| PCB 156 | 7.60 | 1.3E+01 | 1.07 | 1.39E+01 | 0.0036 | 1.74E-05 | 1.30E-02 | 1.08E-02 | 0.00003 | 3.25E-07 |
| PCB 157 | 7.62 | 2.0E+00 | 1.07 | 2.14E+00 | 0.0035 | 2.62E-06 | 2.00E-03 | 1.67E-03 | 0.00003 | 5.01E-08 |
| PCB 167 | 7.50 | 5.2E+00 | 1.06 | 5.49E+00 | 0.0039 | 7.57E-06 | 5.20E-03 | 4.34E-03 | 0.00003 | 1.30E-07 |
| PCB 169 | 7.41 | 1.1E+00 | 1.04 | 1.15E+00 | 0.0043 | 1.72E-06 | 1.10E-03 | 9.18E-04 | 0.03 | 2.75E-05 |
| PCB 189 | 8.27 | 4.3E+00 | 1.15 | 4.96E+00 | 0.0016 | 2.86E-06 | 4.30E-03 | 3.59E-03 | 0.00003 | 1.08E-07 |
| *Congener total:* (10) | | | | | | | | | | 1.57E-04 |
| ***South*** | | | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 0.95 | 5.06E+00 | 0.0076 | 1.35E-05 | 5.30E-03 | 4.43E-03 | 0.0001 | 4.43E-07 |
| PCB 81 | 6.34 | 6.0E-01 | 0.92 | 5.54E-01 | 0.0088 | 1.71E-06 | 6.00E-04 | 5.01E-04 | 0.0003 | 1.50E-07 |
| PCB 105 | 6.79 | 2.1E+01 | 0.97 | 2.04E+01 | 0.0069 | 4.95E-05 | 2.10E-02 | 1.75E-02 | 0.00003 | 5.26E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 4.97E+00 | 0.0061 | 1.06E-05 | 5.00E-03 | 4.18E-03 | 0.00003 | 1.25E-07 |
| PCB 118 | 7.12 | 2.9E+01 | 1.01 | 2.93E+01 | 0.0055 | 5.62E-05 | 2.90E-02 | 2.42E-02 | 0.00003 | 7.26E-07 |
| PCB 123 | 6.98 | 1.9E+00 | 0.99 | 1.89E+00 | 0.0061 | 4.03E-06 | 1.90E-03 | 1.59E-03 | 0.00003 | 4.76E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 0.99 | 1.19E+00 | 0.0061 | 2.54E-06 | 1.20E-03 | 1.00E-03 | 0.1 | 1.00E-04 |
| PCB 156 | 7.60 | 6.8E+00 | 1.07 | 7.26E+00 | 0.0036 | 9.08E-06 | 6.80E-03 | 5.67E-03 | 0.00003 | 1.70E-07 |
| PCB 157 | 7.62 | 1.8E+00 | 1.07 | 1.93E+00 | 0.0035 | 2.36E-06 | 1.80E-03 | 1.50E-03 | 0.00003 | 4.51E-08 |
| PCB 167 | 7.50 | 3.0E+00 | 1.06 | 3.17E+00 | 0.0039 | 4.37E-06 | 3.00E-03 | 2.50E-03 | 0.00003 | 7.51E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+00 | 0.0043 | 7.83E-06 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 1.6E+00 | 1.15 | 1.84E+00 | 0.0016 | 1.06E-06 | 1.60E-03 | 1.33E-03 | 0.00003 | 4.00E-08 |
| *Congener total:* (10) | | | | | | | | | | 2.28E-04 |
| ***Southwest*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 0.95 | 2.48E+00 | 0.0076 | 6.62E-06 | 2.60E-03 | 2.17E-03 | 0.0001 | 2.17E-07 |
| PCB 81 | 6.34 | 5.0E+00 | 0.92 | 4.62E+00 | 0.0088 | 1.42E-05 | 5.00E-03 | 4.18E-03 | 0.0003 | 1.25E-06 |
| PCB 105 | 6.79 | 1.1E+01 | 0.97 | 1.07E+01 | 0.0069 | 2.59E-05 | 1.10E-02 | 9.19E-03 | 0.00003 | 2.76E-07 |
| PCB 114 | 6.98 | 1.0E+00 | 0.99 | 9.94E-01 | 0.0061 | 2.12E-06 | 1.00E-03 | 8.35E-04 | 0.00003 | 2.51E-08 |
| PCB 118 | 7.12 | 1.5E+01 | 1.01 | 1.52E+01 | 0.0055 | 2.91E-05 | 1.50E-02 | 1.25E-02 | 0.00003 | 3.76E-07 |
| PCB 123 | 6.98 | 1.2E+00 | 0.99 | 1.19E+00 | 0.0061 | 2.54E-06 | 1.20E-03 | 1.00E-03 | 0.00003 | 3.01E-08 |
| PCB 126 | 6.98 | 5.0E+00 | 0.99 | 4.97E+00 | 0.0061 | 1.06E-05 | 5.00E-03 | 4.18E-03 | 0.1 | 4.18E-04 |
| PCB 156 | 7.60 | 3.9E+00 | 1.07 | 4.16E+00 | 0.0036 | 5.21E-06 | 3.90E-03 | 3.25E-03 | 0.00003 | 9.76E-08 |
| PCB 157 | 7.62 | 9.2E-01 | 1.07 | 9.84E-01 | 0.0035 | 1.21E-06 | 9.20E-04 | 7.68E-04 | 0.00003 | 2.30E-08 |
| PCB 167 | 7.50 | 1.9E+00 | 1.06 | 2.00E+00 | 0.0039 | 2.77E-06 | 1.90E-03 | 1.59E-03 | 0.00003 | 4.76E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+00 | 0.0043 | 7.83E-06 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 1.2E+00 | 1.15 | 1.38E+00 | 0.0016 | 7.98E-07 | 1.20E-03 | 1.00E-03 | 0.00003 | 3.00E-08 |
| *Congener total:* (10) | | | | | | | | | | 5.45E-04 |
| ***West*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 0.95 | 2.20E+00 | 0.0076 | 5.86E-06 | 2.30E-03 | 1.92E-03 | 0.0001 | 1.92E-07 |
| PCB 81 | 6.34 | 6.0E-01 | 0.92 | 5.54E-01 | 0.0088 | 1.71E-06 | 6.00E-04 | 5.01E-04 | 0.0003 | 1.50E-07 |
| PCB 105 | 6.79 | 1.0E+01 | 0.97 | 9.72E+00 | 0.0069 | 2.36E-05 | 1.00E-02 | 8.35E-03 | 0.00003 | 2.51E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 4.97E+00 | 0.0061 | 1.06E-05 | 5.00E-03 | 4.18E-03 | 0.00003 | 1.25E-07 |
| PCB 118 | 7.12 | 1.9E+01 | 1.01 | 1.92E+01 | 0.0055 | 3.68E-05 | 1.90E-02 | 1.59E-02 | 0.00003 | 4.76E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 0.99 | 1.49E+00 | 0.0061 | 3.18E-06 | 1.50E-03 | 1.25E-03 | 0.00003 | 3.76E-08 |
| PCB 126 | 6.98 | 8.0E-01 | 0.99 | 7.95E-01 | 0.0061 | 1.70E-06 | 8.00E-04 | 6.68E-04 | 0.1 | 6.68E-05 |
| PCB 156 | 7.60 | 3.9E+00 | 1.07 | 4.16E+00 | 0.0036 | 5.21E-06 | 3.90E-03 | 3.25E-03 | 0.00003 | 9.76E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.07E+00 | 0.0035 | 1.31E-06 | 1.00E-03 | 8.34E-04 | 0.00003 | 2.50E-08 |
| PCB 167 | 7.50 | 2.2E+00 | 1.06 | 2.32E+00 | 0.0039 | 3.20E-06 | 2.20E-03 | 1.84E-03 | 0.00003 | 5.51E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+00 | 0.0043 | 7.83E-06 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 1.1E+00 | 1.15 | 1.27E+00 | 0.0016 | 7.32E-07 | 1.10E-03 | 9.17E-04 | 0.00003 | 2.75E-08 |
| *Congener total:* (10) | | | | | | | | | | 1.93E-04 |

**Table 5.4.6**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area(1) | Log Kow (2) | Soil Concentration (ng/kg) (3) | $BAF_{inv}$ (ng/kg)/(ng/kg) (4) | Invertebrate Tissue Concentration (ng/kg)(5) | BTF (day/kg) (6) | Intake from Carnivorous Prey (ng/day) (7) | Intake from Incidental Soil Ingestion (ng/day) (7) | Exposure Dose (ng/kg BW-day) (7) | TEF (mammal) (8) | TED (ng/kg BW-day) (9) |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 0.95 | 2.86E+00 | 0.0076 | 7.64E-06 | 3.00E-03 | 2.51E-03 | 0.0001 | 2.51E-07 |
| PCB 81 | 6.34 | 5.0E-01 | 0.92 | 4.62E-01 | 0.0088 | 1.42E-06 | 5.00E-04 | 4.18E-04 | 0.0003 | 1.25E-07 |
| PCB 105 | 6.79 | 9.5E+00 | 0.97 | 9.24E+00 | 0.0069 | 2.24E-05 | 9.50E-03 | 7.94E-03 | 0.00003 | 2.38E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 4.97E+00 | 0.0061 | 1.06E-05 | 5.00E-03 | 4.18E-03 | 0.00003 | 1.25E-07 |
| PCB 118 | 7.12 | 1.8E+01 | 1.01 | 1.82E+01 | 0.0055 | 3.49E-05 | 1.80E-02 | 1.50E-02 | 0.00003 | 4.51E-07 |
| PCB 123 | 6.98 | 1.3E+00 | 0.99 | 1.29E+00 | 0.0061 | 2.76E-06 | 1.30E-03 | 1.09E-03 | 0.00003 | 3.26E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 0.99 | 1.19E+00 | 0.0061 | 2.54E-06 | 1.20E-03 | 1.00E-03 | 0.1 | 1.00E-04 |
| PCB 156 | 7.60 | 3.2E+00 | 1.07 | 3.42E+00 | 0.0036 | 4.27E-06 | 3.20E-03 | 2.67E-03 | 0.00003 | 8.01E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.07E+00 | 0.0035 | 1.31E-06 | 1.00E-03 | 8.34E-04 | 0.00003 | 2.50E-08 |
| PCB 167 | 7.50 | 6.3E+00 | 1.06 | 6.65E+00 | 0.0039 | 9.17E-06 | 6.30E-03 | 5.26E-03 | 0.00003 | 1.58E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+00 | 0.0043 | 7.83E-06 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 4.0E-01 | 1.15 | 4.61E-01 | 0.0016 | 2.66E-07 | 4.00E-04 | 3.34E-04 | 0.00003 | 1.00E-08 |
| *Congener total:* (10) | | | | | | | | | | 2.27E-04 |
| ***North*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 0.95 | 2.67E+00 | 0.0076 | 7.13E-06 | 2.80E-03 | 2.34E-03 | 0.0001 | 2.34E-07 |
| PCB 81 | 6.34 | 3.0E-01 | 0.92 | 2.77E-01 | 0.0088 | 8.53E-07 | 3.00E-04 | 2.51E-04 | 0.0003 | 7.52E-08 |
| PCB 105 | 6.79 | 1.2E+01 | 0.97 | 1.17E+01 | 0.0069 | 2.83E-05 | 1.20E-02 | 1.00E-02 | 0.00003 | 3.01E-07 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 4.97E+00 | 0.0061 | 1.06E-05 | 5.00E-03 | 4.18E-03 | 0.00003 | 1.25E-07 |
| PCB 118 | 7.12 | 1.9E+01 | 1.01 | 1.92E+01 | 0.0055 | 3.68E-05 | 1.90E-02 | 1.59E-02 | 0.00003 | 4.76E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 0.99 | 1.49E+00 | 0.0061 | 3.18E-06 | 1.50E-03 | 1.25E-03 | 0.00003 | 3.76E-08 |
| PCB 126 | 6.98 | 7.0E-01 | 0.99 | 6.96E-01 | 0.0061 | 1.48E-06 | 7.00E-04 | 5.85E-04 | 0.1 | 5.85E-05 |
| PCB 156 | 7.60 | 3.0E+00 | 1.07 | 3.20E+00 | 0.0036 | 4.00E-06 | 3.00E-03 | 2.50E-03 | 0.00003 | 7.51E-08 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.07E+00 | 0.0035 | 1.31E-06 | 1.00E-03 | 8.34E-04 | 0.00003 | 2.50E-08 |
| PCB 167 | 7.50 | 6.6E+00 | 1.06 | 6.96E+00 | 0.0039 | 9.61E-06 | 6.60E-03 | 5.51E-03 | 0.00003 | 1.65E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+00 | 0.0043 | 7.83E-06 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 7.0E-01 | 1.15 | 8.07E-01 | 0.0016 | 4.66E-07 | 7.00E-04 | 5.84E-04 | 0.00003 | 1.75E-08 |
| *Congener total:* (10) | | | | | | | | | | 1.85E-04 |
| ***Northeast*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 0.95 | 1.43E+01 | 0.0076 | 3.82E-05 | 1.50E-02 | 1.25E-02 | 0.0001 | 1.25E-06 |
| PCB 81 | 6.34 | 1.4E+00 | 0.92 | 1.29E+00 | 0.0088 | 3.98E-06 | 1.40E-03 | 1.17E-03 | 0.0003 | 3.51E-07 |
| PCB 105 | 6.79 | 6.5E+01 | 0.97 | 6.32E+01 | 0.0069 | 1.53E-04 | 6.50E-02 | 5.43E-02 | 0.00003 | 1.63E-06 |
| PCB 114 | 6.98 | 2.0E+00 | 0.99 | 1.99E+00 | 0.0061 | 4.24E-06 | 2.00E-03 | 1.67E-03 | 0.00003 | 5.01E-08 |
| PCB 118 | 7.12 | 1.0E+02 | 1.01 | 1.01E+02 | 0.0055 | 1.94E-04 | 1.00E-01 | 8.35E-02 | 0.00003 | 2.50E-06 |
| PCB 123 | 6.98 | 8.7E+00 | 0.99 | 8.65E+00 | 0.0061 | 1.84E-05 | 8.70E-03 | 7.27E-03 | 0.00003 | 2.18E-07 |
| PCB 126 | 6.98 | 5.9E+00 | 0.99 | 5.86E+00 | 0.0061 | 1.25E-05 | 5.90E-03 | 4.93E-03 | 0.1 | 4.93E-04 |
| PCB 156 | 7.60 | 2.9E+01 | 1.07 | 3.10E+01 | 0.0036 | 3.87E-05 | 2.90E-02 | 2.42E-02 | 0.00003 | 7.26E-07 |
| PCB 157 | 7.62 | 6.9E+00 | 1.07 | 7.38E+00 | 0.0035 | 9.05E-06 | 6.90E-03 | 5.76E-03 | 0.00003 | 1.73E-07 |
| PCB 167 | 7.50 | 1.6E+01 | 1.06 | 1.69E+01 | 0.0039 | 2.33E-05 | 1.60E-02 | 1.34E-02 | 0.00003 | 4.01E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+00 | 0.0043 | 7.83E-06 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 9.3E+00 | 1.15 | 1.07E+01 | 0.0016 | 6.19E-06 | 9.30E-03 | 7.76E-03 | 0.00003 | 2.33E-07 |
| *Congener total:* (10) | | | | | | | | | | 6.25E-04 |
| ***B-18 Landfill*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 0.95 | 1.72E+01 | 0.0076 | 4.58E-05 | 1.80E-02 | 1.50E-02 | 0.0001 | 1.50E-06 |
| PCB 81 | 6.34 | 2.4E+00 | 0.92 | 2.22E+00 | 0.0088 | 6.82E-06 | 2.40E-03 | 2.01E-03 | 0.0003 | 6.02E-07 |
| PCB 105 | 6.79 | 6.2E+01 | 0.97 | 6.03E+01 | 0.0069 | 1.46E-04 | 6.20E-02 | 5.18E-02 | 0.00003 | 1.55E-06 |
| PCB 114 | 6.98 | 2.3E+00 | 0.99 | 2.29E+00 | 0.0061 | 4.87E-06 | 2.30E-03 | 1.92E-03 | 0.00003 | 5.76E-08 |
| PCB 118 | 7.12 | 8.5E+01 | 1.01 | 8.59E+01 | 0.0055 | 1.65E-04 | 8.50E-02 | 7.10E-02 | 0.00003 | 2.13E-06 |
| PCB 123 | 6.98 | 1.5E+01 | 0.99 | 1.49E+01 | 0.0061 | 3.18E-05 | 1.50E-02 | 1.25E-02 | 0.00003 | 3.76E-07 |
| PCB 126 | 6.98 | 3.5E+00 | 0.99 | 3.48E+00 | 0.0061 | 7.42E-06 | 3.50E-03 | 2.92E-03 | 0.1 | 2.92E-04 |
| PCB 156 | 7.60 | 3.1E+01 | 1.07 | 3.31E+01 | 0.0036 | 4.14E-05 | 3.10E-02 | 2.59E-02 | 0.00003 | 7.76E-07 |
| PCB 157 | 7.62 | 4.8E+00 | 1.07 | 5.14E+00 | 0.0035 | 6.29E-06 | 4.80E-03 | 4.01E-03 | 0.00003 | 1.20E-07 |
| PCB 167 | 7.50 | 1.3E+01 | 1.06 | 1.37E+01 | 0.0039 | 1.89E-05 | 1.30E-02 | 1.08E-02 | 0.00003 | 3.25E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 5.22E+00 | 0.0043 | 7.83E-06 | 5.00E-03 | 4.17E-03 | 0.03 | 1.25E-04 |
| PCB 189 | 8.27 | 8.2E+00 | 1.15 | 9.46E+00 | 0.0016 | 5.46E-06 | 8.20E-03 | 6.84E-03 | 0.00003 | 2.05E-07 |
| *Congener total:* (10) | | | | | | | | | | 4.25E-04 |

**Table 5.4.6**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for soil-to-invertebrate BAF ($BAF_{inv}$): soil-to-earthworm bioaccumulation equation for nonionic organic compounds from Connell (1990): $BAF = 0.445(Kow)^{0.05}$
BAF is in units of (invertebrate tissue wet weight concentration) / (soil dry weight concentration).

(5) Invertebrate tissue concentration (ng/kg wet wt) = soil concentration (ng/kg dry wt) x $BAF_{inv}$

(6) Basis for BTF (biotransfer factor from diet to small mammal tissue): diet-to-fat transfer equation from RTI (2005): $\text{Log BTF} = -0.099(\log Kow)^2 + 1.07(\log Kow) - 3.56$
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of wild rodents of 5 % (0.05 kg fat/kg BW) to convert transfer factor to whole body basis.
Fat composition based on upper end of range from study of mice and kangaroo rats at arid prairie site in Pueblo, Colorado (Sovell et al. 2004).

(7) Exposure dose (ED) calculation:
ED = [(intake from carnivorous prey) + (intake from soil ingestion)] x [area foraging factor / body weight].
$ED = \{[((C_{inv} \times FIR_{mouse}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{fox}] + (C_{soil} \times SIR_{fox})\} \times \{AFF/BW\}$.
where:
ED = total exposure dose (ng/kg BW-day).
$C_{inv}$ = concentration in invertebrates consumed by grasshopper mouse (ng/kg) = $C_{soil}$ x $BAF_{inv}$
$C_{soil}$ = concentration in soil (ng/kg).
$FIR_{mouse}$ = food ingestion rate (invertebrates) for grasshopper mouse = 0.0029 kg/day .
$FIR_{fox}$ = food ingestion rate (mice) for fox (kg/day) = 0.12. See Table 5.4.2 for basis/source.
$SIR_{mouse}$ = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table 5.4.2 for basis/source.
$SIR_{fox}$ = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table 5.4.2 for basis/source.
BTF = biotransfer factor from diet to small mammal (day/kg).
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table 5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table 5.4.2 for basis/source.

(8) Mammal TEFs are from USEPA (June 2008).

(9) TED = (exposure dose based on PCB congener concentration) x (TEF).

(10) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram
TED = toxicity equivalence dose
TEF = toxicity equivalence factor

**Table 5.4.7**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | BAF (unitless) [3] | Intake from Carnivorous Prey (ng/day) [4] | Intake from Incidental Soil Ingestion (ng/day) [4] | Exposure Dose (ng/kg BW-day) [4] | TEF (mammal) [5] | TED (ng/kg BW-day) [6] |
|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | |
| PCB 77 | 1.1E+01 | 0.20 | 2.64E-01 | 1.10E-02 | 1.38E-01 | 0.0001 | 1.38E-05 |
| PCB 81 | 1.3E+00 | 0.20 | 3.12E-02 | 1.30E-03 | 1.63E-02 | 0.0003 | 4.88E-06 |
| PCB 105 | 3.3E+01 | 0.20 | 7.92E-01 | 3.30E-02 | 4.13E-01 | 0.00003 | 1.24E-05 |
| PCB 114 | 1.6E+00 | 0.20 | 3.84E-02 | 1.60E-03 | 2.00E-02 | 0.00003 | 6.00E-07 |
| PCB 118 | 5.1E+01 | 0.20 | 1.22E+00 | 5.10E-02 | 6.38E-01 | 0.00003 | 1.91E-05 |
| PCB 123 | 5.4E+00 | 0.20 | 1.30E-01 | 5.40E-03 | 6.75E-02 | 0.00003 | 2.03E-06 |
| PCB 126 | 1.5E+00 | 0.20 | 3.60E-02 | 1.50E-03 | 1.88E-02 | 0.1 | 1.88E-03 |
| PCB 156 | 1.3E+01 | 0.20 | 3.12E-01 | 1.30E-02 | 1.63E-01 | 0.00003 | 4.88E-06 |
| PCB 157 | 2.0E+00 | 0.20 | 4.80E-02 | 2.00E-03 | 2.50E-02 | 0.00003 | 7.50E-07 |
| PCB 167 | 5.2E+00 | 0.20 | 1.25E-01 | 5.20E-03 | 6.50E-02 | 0.00003 | 1.95E-06 |
| PCB 169 | 1.1E+00 | 0.20 | 2.64E-02 | 1.10E-03 | 1.38E-02 | 0.03 | 4.13E-04 |
| PCB 189 | 4.3E+00 | 0.20 | 1.03E-01 | 4.30E-03 | 5.38E-02 | 0.00003 | 1.61E-06 |
| *Congener total:* [7] | | | | | | | 2.35E-03 |
| ***South*** | | | | | | | |
| PCB 77 | 5.3E+00 | 0.20 | 1.27E-01 | 5.30E-03 | 6.63E-02 | 0.0001 | 6.63E-06 |
| PCB 81 | 6.0E-01 | 0.20 | 1.44E-02 | 6.00E-04 | 7.50E-03 | 0.0003 | 2.25E-06 |
| PCB 105 | 2.1E+01 | 0.20 | 5.04E-01 | 2.10E-02 | 2.63E-01 | 0.00003 | 7.88E-06 |
| PCB 114 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.00003 | 1.88E-06 |
| PCB 118 | 2.9E+01 | 0.20 | 6.96E-01 | 2.90E-02 | 3.63E-01 | 0.00003 | 1.09E-05 |
| PCB 123 | 1.9E+00 | 0.20 | 4.56E-02 | 1.90E-03 | 2.38E-02 | 0.00003 | 7.13E-07 |
| PCB 126 | 1.2E+00 | 0.20 | 2.88E-02 | 1.20E-03 | 1.50E-02 | 0.1 | 1.50E-03 |
| PCB 156 | 6.8E+00 | 0.20 | 1.63E-01 | 6.80E-03 | 8.50E-02 | 0.00003 | 2.55E-06 |
| PCB 157 | 1.8E+00 | 0.20 | 4.32E-02 | 1.80E-03 | 2.25E-02 | 0.00003 | 6.75E-07 |
| PCB 167 | 3.0E+00 | 0.20 | 7.20E-02 | 3.00E-03 | 3.75E-02 | 0.00003 | 1.13E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.03 | 1.88E-03 |
| PCB 189 | 1.6E+00 | 0.20 | 3.84E-02 | 1.60E-03 | 2.00E-02 | 0.00003 | 6.00E-07 |
| *Congener total:* [7] | | | | | | | 3.41E-03 |
| ***Southwest*** | | | | | | | |
| PCB 77 | 2.6E+00 | 0.20 | 6.24E-02 | 2.60E-03 | 3.25E-02 | 0.0001 | 3.25E-06 |
| PCB 81 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.0003 | 1.88E-05 |
| PCB 105 | 1.1E+01 | 0.20 | 2.64E-01 | 1.10E-02 | 1.38E-01 | 0.00003 | 4.13E-06 |
| PCB 114 | 1.0E+00 | 0.20 | 2.40E-02 | 1.00E-03 | 1.25E-02 | 0.00003 | 3.75E-07 |
| PCB 118 | 1.5E+01 | 0.20 | 3.60E-01 | 1.50E-02 | 1.88E-01 | 0.00003 | 5.63E-06 |
| PCB 123 | 1.2E+00 | 0.20 | 2.88E-02 | 1.20E-03 | 1.50E-02 | 0.00003 | 4.50E-07 |
| PCB 126 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.1 | 6.25E-03 |
| PCB 156 | 3.9E+00 | 0.20 | 9.36E-02 | 3.90E-03 | 4.88E-02 | 0.00003 | 1.46E-06 |
| PCB 157 | 9.2E-01 | 0.20 | 2.21E-02 | 9.20E-04 | 1.15E-02 | 0.00003 | 3.45E-07 |
| PCB 167 | 1.9E+00 | 0.20 | 4.56E-02 | 1.90E-03 | 2.38E-02 | 0.00003 | 7.13E-07 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.03 | 1.88E-03 |
| PCB 189 | 1.2E+00 | 0.20 | 2.88E-02 | 1.20E-03 | 1.50E-02 | 0.00003 | 4.50E-07 |
| *Congener total:* [7] | | | | | | | 8.16E-03 |
| ***West*** | | | | | | | |
| PCB 77 | 2.3E+00 | 0.20 | 5.52E-02 | 2.30E-03 | 2.88E-02 | 0.0001 | 2.88E-06 |
| PCB 81 | 6.0E-01 | 0.20 | 1.44E-02 | 6.00E-04 | 7.50E-03 | 0.0003 | 2.25E-06 |
| PCB 105 | 1.0E+01 | 0.20 | 2.40E-01 | 1.00E-02 | 1.25E-01 | 0.00003 | 3.75E-06 |
| PCB 114 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.00003 | 1.88E-06 |
| PCB 118 | 1.9E+01 | 0.20 | 4.56E-01 | 1.90E-02 | 2.38E-01 | 0.00003 | 7.13E-06 |
| PCB 123 | 1.5E+00 | 0.20 | 3.60E-02 | 1.50E-03 | 1.88E-02 | 0.00003 | 5.63E-07 |
| PCB 126 | 8.0E-01 | 0.20 | 1.92E-02 | 8.00E-04 | 1.00E-02 | 0.1 | 1.00E-03 |
| PCB 156 | 3.9E+00 | 0.20 | 9.36E-02 | 3.90E-03 | 4.88E-02 | 0.00003 | 1.46E-06 |
| PCB 157 | 1.0E+00 | 0.20 | 2.40E-02 | 1.00E-03 | 1.25E-02 | 0.00003 | 3.75E-07 |
| PCB 167 | 2.2E+00 | 0.20 | 5.28E-02 | 2.20E-03 | 2.75E-02 | 0.00003 | 8.25E-07 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.03 | 1.88E-03 |
| PCB 189 | 1.1E+00 | 0.20 | 2.64E-02 | 1.10E-03 | 1.38E-02 | 0.00003 | 4.13E-07 |
| *Congener total:* [7] | | | | | | | 2.90E-03 |

**Table 5.4.7**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | BAF (unitless) [3] | Intake from Carnivorous Prey (ng/day) [4] | Intake from Incidental Soil Ingestion (ng/day) [4] | Exposure Dose (ng/kg BW-day) [4] | TEF (mammal) [5] | TED (ng/kg BW-day) [6] |
|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | |
| PCB 77 | 3.0E+00 | 0.20 | 7.20E-02 | 3.00E-03 | 3.75E-02 | 0.0001 | 3.75E-06 |
| PCB 81 | 5.0E-01 | 0.20 | 1.20E-02 | 5.00E-04 | 6.25E-03 | 0.0003 | 1.88E-06 |
| PCB 105 | 9.5E+00 | 0.20 | 2.28E-01 | 9.50E-03 | 1.19E-01 | 0.00003 | 3.56E-06 |
| PCB 114 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.00003 | 1.88E-06 |
| PCB 118 | 1.8E+01 | 0.20 | 4.32E-01 | 1.80E-02 | 2.25E-01 | 0.00003 | 6.75E-06 |
| PCB 123 | 1.3E+00 | 0.20 | 3.12E-02 | 1.30E-03 | 1.63E-02 | 0.00003 | 4.88E-07 |
| PCB 126 | 1.2E+00 | 0.20 | 2.88E-02 | 1.20E-03 | 1.50E-02 | 0.1 | 1.50E-03 |
| PCB 156 | 3.2E+00 | 0.20 | 7.68E-02 | 3.20E-03 | 4.00E-02 | 0.00003 | 1.20E-06 |
| PCB 157 | 1.0E+00 | 0.20 | 2.40E-02 | 1.00E-03 | 1.25E-02 | 0.00003 | 3.75E-07 |
| PCB 167 | 6.3E+00 | 0.20 | 1.51E-01 | 6.30E-03 | 7.88E-02 | 0.00003 | 2.36E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.03 | 1.88E-03 |
| PCB 189 | 4.0E-01 | 0.20 | 9.60E-03 | 4.00E-04 | 5.00E-03 | 0.00003 | 1.50E-07 |
| *Congener total:* [7] | | | | | | | 3.40E-03 |
| ***North*** | | | | | | | |
| PCB 77 | 2.8E+00 | 0.20 | 6.72E-02 | 2.80E-03 | 3.50E-02 | 0.0001 | 3.50E-06 |
| PCB 81 | 3.0E-01 | 0.20 | 7.20E-03 | 3.00E-04 | 3.75E-03 | 0.0003 | 1.13E-06 |
| PCB 105 | 1.2E+01 | 0.20 | 2.88E-01 | 1.20E-02 | 1.50E-01 | 0.00003 | 4.50E-06 |
| PCB 114 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.00003 | 1.88E-06 |
| PCB 118 | 1.9E+01 | 0.20 | 4.56E-01 | 1.90E-02 | 2.38E-01 | 0.00003 | 7.13E-06 |
| PCB 123 | 1.5E+00 | 0.20 | 3.60E-02 | 1.50E-03 | 1.88E-02 | 0.00003 | 5.63E-07 |
| PCB 126 | 7.0E-01 | 0.20 | 1.68E-02 | 7.00E-04 | 8.75E-03 | 0.1 | 8.75E-04 |
| PCB 156 | 3.0E+00 | 0.20 | 7.20E-02 | 3.00E-03 | 3.75E-02 | 0.00003 | 1.13E-06 |
| PCB 157 | 1.0E+00 | 0.20 | 2.40E-02 | 1.00E-03 | 1.25E-02 | 0.00003 | 3.75E-07 |
| PCB 167 | 6.6E+00 | 0.20 | 1.58E-01 | 6.60E-03 | 8.25E-02 | 0.00003 | 2.48E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.03 | 1.88E-03 |
| PCB 189 | 7.0E-01 | 0.20 | 1.68E-02 | 7.00E-04 | 8.75E-03 | 0.00003 | 2.63E-07 |
| *Congener total:* [7] | | | | | | | 2.77E-03 |
| ***Northeast*** | | | | | | | |
| PCB 77 | 1.5E+01 | 0.20 | 3.60E-01 | 1.50E-02 | 1.88E-01 | 0.0001 | 1.88E-05 |
| PCB 81 | 1.4E+00 | 0.20 | 3.36E-02 | 1.40E-03 | 1.75E-02 | 0.0003 | 5.25E-06 |
| PCB 105 | 6.5E+01 | 0.20 | 1.56E+00 | 6.50E-02 | 8.13E-01 | 0.00003 | 2.44E-05 |
| PCB 114 | 2.0E+00 | 0.20 | 4.80E-02 | 2.00E-03 | 2.50E-02 | 0.00003 | 7.50E-07 |
| PCB 118 | 1.0E+02 | 0.20 | 2.40E+00 | 1.00E-01 | 1.25E+00 | 0.00003 | 3.75E-05 |
| PCB 123 | 8.7E+00 | 0.20 | 2.09E-01 | 8.70E-03 | 1.09E-01 | 0.00003 | 3.26E-06 |
| PCB 126 | 5.9E+00 | 0.20 | 1.42E-01 | 5.90E-03 | 7.38E-02 | 0.1 | 7.38E-03 |
| PCB 156 | 2.9E+01 | 0.20 | 6.96E-01 | 2.90E-02 | 3.63E-01 | 0.00003 | 1.09E-05 |
| PCB 157 | 6.9E+00 | 0.20 | 1.66E-01 | 6.90E-03 | 8.63E-02 | 0.00003 | 2.59E-06 |
| PCB 167 | 1.6E+01 | 0.20 | 3.84E-01 | 1.60E-02 | 2.00E-01 | 0.00003 | 6.00E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.03 | 1.88E-03 |
| PCB 189 | 9.3E+00 | 0.20 | 2.23E-01 | 9.30E-03 | 1.16E-01 | 0.00003 | 3.49E-06 |
| *Congener total:* [7] | | | | | | | 9.36E-03 |
| ***B-18 Landfill*** | | | | | | | |
| PCB 77 | 1.8E+01 | 0.20 | 4.32E-01 | 1.80E-02 | 2.25E-01 | 0.0001 | 2.25E-05 |
| PCB 81 | 2.4E+00 | 0.20 | 5.76E-02 | 2.40E-03 | 3.00E-02 | 0.0003 | 9.00E-06 |
| PCB 105 | 6.2E+01 | 0.20 | 1.49E+00 | 6.20E-02 | 7.75E-01 | 0.00003 | 2.33E-05 |
| PCB 114 | 2.3E+00 | 0.20 | 5.52E-02 | 2.30E-03 | 2.88E-02 | 0.00003 | 8.63E-07 |
| PCB 118 | 8.5E+01 | 0.20 | 2.04E+00 | 8.50E-02 | 1.06E+00 | 0.00003 | 3.19E-05 |
| PCB 123 | 1.5E+01 | 0.20 | 3.60E-01 | 1.50E-02 | 1.88E-01 | 0.00003 | 5.63E-06 |
| PCB 126 | 3.5E+00 | 0.20 | 8.40E-02 | 3.50E-03 | 4.38E-02 | 0.1 | 4.38E-03 |
| PCB 156 | 3.1E+01 | 0.20 | 7.44E-01 | 3.10E-02 | 3.88E-01 | 0.00003 | 1.16E-05 |
| PCB 157 | 4.8E+00 | 0.20 | 1.15E-01 | 4.80E-03 | 6.00E-02 | 0.00003 | 1.80E-06 |
| PCB 167 | 1.3E+01 | 0.20 | 3.12E-01 | 1.30E-02 | 1.63E-01 | 0.00003 | 4.88E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 6.25E-02 | 0.03 | 1.88E-03 |
| PCB 189 | 8.2E+00 | 0.20 | 1.97E-01 | 8.20E-03 | 1.03E-01 | 0.00003 | 3.08E-06 |
| *Congener total:* [7] | | | | | | | 6.36E-03 |

**Table 5.4.7**
**Exposure Calculation for the San Joaquin Kit Fox - Adult Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(3) Basis for BAF: A study by Blankenship et al. (2005) in which co-located soil and wildlife tissue samples were analyzed for PCBs at a forested site in a Michigan flood plain. Total PCB concentrations in tissue were divided by total PCB concentrations in soil to calculate BSAFs for a variety of wildlife. Shrews were found to have the highest BSAF among small mammals. Using data from the study, the total PCB concentration in shrew tissue (1.31 mg/kg) and in soil (6.53 mg/kg) were used to calculate a BAF of 0.20.

(4) Exposure dose (ED) calculation:

ED = [(intake from carnivorous prey) + (intake from soil ingestion)] x [area foraging factor / body weight].

ED = [($C_{soil}$ x BAF x $FIR_{fox}$) + ($C_{soil}$ x $SIR_{fox}$)] x AFF/BW.

where:

ED = total exposure dose (ng/kg BW-day).

$C_{soil}$ = concentration in soil (ng/kg).

BAF = bioaccumulation factor (unitless) for carnivorous prey (factor based on shrew used for grasshopper mouse) = 0.20.

$FIR_{fox}$ = food ingestion rate (mice) for fox (kg/day) = 0.12. See Table 5.4.2 for basis/source.

$SIR_{fox}$ = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table 5.4.2 for basis/source.

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table 5.4.2 for basis/source of home range.

BW = body weight (kg) = 2 kg. See Table 5.4.2 for basis/source.

(5) Mammal TEFs are from USEPA (June 2008).

(6) TED = (exposure dose based on PCB congener concentration) x (TEF).

(7) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

BAF = bioaccumulation factor

BSAF = biota-soil accumulation factor

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

**Table 5.4.8**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | BAF (unitless) [3] | Intake from Carnivorous Prey (ng/day) [4] | Intake from Incidental Soil Ingestion (ng/day) [4] | Exposure Dose (ng/kg BW-day) [4] | TEF (mammal) [5] | TED (ng/kg BW-day) [6] |
|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | |
| PCB 77 | 1.1E+01 | 0.20 | 2.64E-01 | 1.10E-02 | 2.29E-01 | 0.0001 | 2.29E-05 |
| PCB 81 | 1.3E+00 | 0.20 | 3.12E-02 | 1.30E-03 | 2.71E-02 | 0.0003 | 8.13E-06 |
| PCB 105 | 3.3E+01 | 0.20 | 7.92E-01 | 3.30E-02 | 6.88E-01 | 0.00003 | 2.06E-05 |
| PCB 114 | 1.6E+00 | 0.20 | 3.84E-02 | 1.60E-03 | 3.33E-02 | 0.00003 | 1.00E-06 |
| PCB 118 | 5.1E+01 | 0.20 | 1.22E+00 | 5.10E-02 | 1.06E+00 | 0.00003 | 3.19E-05 |
| PCB 123 | 5.4E+00 | 0.20 | 1.30E-01 | 5.40E-03 | 1.13E-01 | 0.00003 | 3.38E-06 |
| PCB 126 | 1.5E+00 | 0.20 | 3.60E-02 | 1.50E-03 | 3.13E-02 | 0.1 | 3.13E-03 |
| PCB 156 | 1.3E+01 | 0.20 | 3.12E-01 | 1.30E-02 | 2.71E-01 | 0.00003 | 8.13E-06 |
| PCB 157 | 2.0E+00 | 0.20 | 4.80E-02 | 2.00E-03 | 4.17E-02 | 0.00003 | 1.25E-06 |
| PCB 167 | 5.2E+00 | 0.20 | 1.25E-01 | 5.20E-03 | 1.08E-01 | 0.00003 | 3.25E-06 |
| PCB 169 | 1.1E+00 | 0.20 | 2.64E-02 | 1.10E-03 | 2.29E-02 | 0.03 | 6.88E-04 |
| PCB 189 | 4.3E+00 | 0.20 | 1.03E-01 | 4.30E-03 | 8.96E-02 | 0.00003 | 2.69E-06 |
| *Congener total:* [7] | | | | | | | 3.92E-03 |
| ***South*** | | | | | | | |
| PCB 77 | 5.3E+00 | 0.20 | 1.27E-01 | 5.30E-03 | 1.10E-01 | 0.0001 | 1.10E-05 |
| PCB 81 | 6.0E-01 | 0.20 | 1.44E-02 | 6.00E-04 | 1.25E-02 | 0.0003 | 3.75E-06 |
| PCB 105 | 2.1E+01 | 0.20 | 5.04E-01 | 2.10E-02 | 4.38E-01 | 0.00003 | 1.31E-05 |
| PCB 114 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.00003 | 3.13E-06 |
| PCB 118 | 2.9E+01 | 0.20 | 6.96E-01 | 2.90E-02 | 6.04E-01 | 0.00003 | 1.81E-05 |
| PCB 123 | 1.9E+00 | 0.20 | 4.56E-02 | 1.90E-03 | 3.96E-02 | 0.00003 | 1.19E-06 |
| PCB 126 | 1.2E+00 | 0.20 | 2.88E-02 | 1.20E-03 | 2.50E-02 | 0.1 | 2.50E-03 |
| PCB 156 | 6.8E+00 | 0.20 | 1.63E-01 | 6.80E-03 | 1.42E-01 | 0.00003 | 4.25E-06 |
| PCB 157 | 1.8E+00 | 0.20 | 4.32E-02 | 1.80E-03 | 3.75E-02 | 0.00003 | 1.13E-06 |
| PCB 167 | 3.0E+00 | 0.20 | 7.20E-02 | 3.00E-03 | 6.25E-02 | 0.00003 | 1.88E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.03 | 3.13E-03 |
| PCB 189 | 1.6E+00 | 0.20 | 3.84E-02 | 1.60E-03 | 3.33E-02 | 0.00003 | 1.00E-06 |
| *Congener total:* [7] | | | | | | | 5.68E-03 |
| ***Southwest*** | | | | | | | |
| PCB 77 | 2.6E+00 | 0.20 | 6.24E-02 | 2.60E-03 | 5.42E-02 | 0.0001 | 5.42E-06 |
| PCB 81 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.0003 | 3.13E-05 |
| PCB 105 | 1.1E+01 | 0.20 | 2.64E-01 | 1.10E-02 | 2.29E-01 | 0.00003 | 6.88E-06 |
| PCB 114 | 1.0E+00 | 0.20 | 2.40E-02 | 1.00E-03 | 2.08E-02 | 0.00003 | 6.25E-07 |
| PCB 118 | 1.5E+01 | 0.20 | 3.60E-01 | 1.50E-02 | 3.13E-01 | 0.00003 | 9.38E-06 |
| PCB 123 | 1.2E+00 | 0.20 | 2.88E-02 | 1.20E-03 | 2.50E-02 | 0.00003 | 7.50E-07 |
| PCB 126 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.1 | 1.04E-02 |
| PCB 156 | 3.9E+00 | 0.20 | 9.36E-02 | 3.90E-03 | 8.13E-02 | 0.00003 | 2.44E-06 |
| PCB 157 | 9.2E-01 | 0.20 | 2.21E-02 | 9.20E-04 | 1.92E-02 | 0.00003 | 5.75E-07 |
| PCB 167 | 1.9E+00 | 0.20 | 4.56E-02 | 1.90E-03 | 3.96E-02 | 0.00003 | 1.19E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.03 | 3.13E-03 |
| PCB 189 | 1.2E+00 | 0.20 | 2.88E-02 | 1.20E-03 | 2.50E-02 | 0.00003 | 7.50E-07 |
| *Congener total:* [7] | | | | | | | 1.36E-02 |
| ***West*** | | | | | | | |
| PCB 77 | 2.3E+00 | 0.20 | 5.52E-02 | 2.30E-03 | 4.79E-02 | 0.0001 | 4.79E-06 |
| PCB 81 | 6.0E-01 | 0.20 | 1.44E-02 | 6.00E-04 | 1.25E-02 | 0.0003 | 3.75E-06 |
| PCB 105 | 1.0E+01 | 0.20 | 2.40E-01 | 1.00E-02 | 2.08E-01 | 0.00003 | 6.25E-06 |
| PCB 114 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.00003 | 3.13E-06 |
| PCB 118 | 1.9E+01 | 0.20 | 4.56E-01 | 1.90E-02 | 3.96E-01 | 0.00003 | 1.19E-05 |
| PCB 123 | 1.5E+00 | 0.20 | 3.60E-02 | 1.50E-03 | 3.13E-02 | 0.00003 | 9.38E-07 |
| PCB 126 | 8.0E-01 | 0.20 | 1.92E-02 | 8.00E-04 | 1.67E-02 | 0.1 | 1.67E-03 |
| PCB 156 | 3.9E+00 | 0.20 | 9.36E-02 | 3.90E-03 | 8.13E-02 | 0.00003 | 2.44E-06 |
| PCB 157 | 1.0E+00 | 0.20 | 2.40E-02 | 1.00E-03 | 2.08E-02 | 0.00003 | 6.25E-07 |
| PCB 167 | 2.2E+00 | 0.20 | 5.28E-02 | 2.20E-03 | 4.58E-02 | 0.00003 | 1.38E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.03 | 3.13E-03 |
| PCB 189 | 1.1E+00 | 0.20 | 2.64E-02 | 1.10E-03 | 2.29E-02 | 0.00003 | 6.88E-07 |
| *Congener total:* [7] | | | | | | | 4.83E-03 |

**Table 5.4.8**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | BAF (unitless) [3] | Intake from Carnivorous Prey (ng/day) [4] | Intake from Incidental Soil Ingestion (ng/day) [4] | Exposure Dose (ng/kg BW-day) [4] | TEF (mammal) [5] | TED (ng/kg BW-day) [6] |
|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | |
| PCB 77 | 3.0E+00 | 0.20 | 7.20E-02 | 3.00E-03 | 6.25E-02 | 0.0001 | 6.25E-06 |
| PCB 81 | 5.0E-01 | 0.20 | 1.20E-02 | 5.00E-04 | 1.04E-02 | 0.0003 | 3.13E-06 |
| PCB 105 | 9.5E+00 | 0.20 | 2.28E-01 | 9.50E-03 | 1.98E-01 | 0.00003 | 5.94E-06 |
| PCB 114 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.00003 | 3.13E-06 |
| PCB 118 | 1.8E+01 | 0.20 | 4.32E-01 | 1.80E-02 | 3.75E-01 | 0.00003 | 1.13E-05 |
| PCB 123 | 1.3E+00 | 0.20 | 3.12E-02 | 1.30E-03 | 2.71E-02 | 0.00003 | 8.13E-07 |
| PCB 126 | 1.2E+00 | 0.20 | 2.88E-02 | 1.20E-03 | 2.50E-02 | 0.1 | 2.50E-03 |
| PCB 156 | 3.2E+00 | 0.20 | 7.68E-02 | 3.20E-03 | 6.67E-02 | 0.00003 | 2.00E-06 |
| PCB 157 | 1.0E+00 | 0.20 | 2.40E-02 | 1.00E-03 | 2.08E-02 | 0.00003 | 6.25E-07 |
| PCB 167 | 6.3E+00 | 0.20 | 1.51E-01 | 6.30E-03 | 1.31E-01 | 0.00003 | 3.94E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.03 | 3.13E-03 |
| PCB 189 | 4.0E-01 | 0.20 | 9.60E-03 | 4.00E-04 | 8.33E-03 | 0.00003 | 2.50E-07 |
| *Congener total:* [7] | | | | | | | 5.66E-03 |
| ***North*** | | | | | | | |
| PCB 77 | 2.8E+00 | 0.20 | 6.72E-02 | 2.80E-03 | 5.83E-02 | 0.0001 | 5.83E-06 |
| PCB 81 | 3.0E-01 | 0.20 | 7.20E-03 | 3.00E-04 | 6.25E-03 | 0.0003 | 1.88E-06 |
| PCB 105 | 1.2E+01 | 0.20 | 2.88E-01 | 1.20E-02 | 2.50E-01 | 0.00003 | 7.50E-06 |
| PCB 114 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.00003 | 3.13E-06 |
| PCB 118 | 1.9E+01 | 0.20 | 4.56E-01 | 1.90E-02 | 3.96E-01 | 0.00003 | 1.19E-05 |
| PCB 123 | 1.5E+00 | 0.20 | 3.60E-02 | 1.50E-03 | 3.13E-02 | 0.00003 | 9.38E-07 |
| PCB 126 | 7.0E-01 | 0.20 | 1.68E-02 | 7.00E-04 | 1.46E-02 | 0.1 | 1.46E-03 |
| PCB 156 | 3.0E+00 | 0.20 | 7.20E-02 | 3.00E-03 | 6.25E-02 | 0.00003 | 1.88E-06 |
| PCB 157 | 1.0E+00 | 0.20 | 2.40E-02 | 1.00E-03 | 2.08E-02 | 0.00003 | 6.25E-07 |
| PCB 167 | 6.6E+00 | 0.20 | 1.58E-01 | 6.60E-03 | 1.38E-01 | 0.00003 | 4.13E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.03 | 3.13E-03 |
| PCB 189 | 7.0E-01 | 0.20 | 1.68E-02 | 7.00E-04 | 1.46E-02 | 0.00003 | 4.38E-07 |
| *Congener total:* [7] | | | | | | | 4.62E-03 |
| ***Northeast*** | | | | | | | |
| PCB 77 | 1.5E+01 | 0.20 | 3.60E-01 | 1.50E-02 | 3.13E-01 | 0.0001 | 3.13E-05 |
| PCB 81 | 1.4E+00 | 0.20 | 3.36E-02 | 1.40E-03 | 2.92E-02 | 0.0003 | 8.75E-06 |
| PCB 105 | 6.5E+01 | 0.20 | 1.56E+00 | 6.50E-02 | 1.35E+00 | 0.00003 | 4.06E-05 |
| PCB 114 | 2.0E+00 | 0.20 | 4.80E-02 | 2.00E-03 | 4.17E-02 | 0.00003 | 1.25E-06 |
| PCB 118 | 1.0E+02 | 0.20 | 2.40E+00 | 1.00E-01 | 2.08E+00 | 0.00003 | 6.25E-05 |
| PCB 123 | 8.7E+00 | 0.20 | 2.09E-01 | 8.70E-03 | 1.81E-01 | 0.00003 | 5.44E-06 |
| PCB 126 | 5.9E+00 | 0.20 | 1.42E-01 | 5.90E-03 | 1.23E-01 | 0.1 | 1.23E-02 |
| PCB 156 | 2.9E+01 | 0.20 | 6.96E-01 | 2.90E-02 | 6.04E-01 | 0.00003 | 1.81E-05 |
| PCB 157 | 6.9E+00 | 0.20 | 1.66E-01 | 6.90E-03 | 1.44E-01 | 0.00003 | 4.31E-06 |
| PCB 167 | 1.6E+01 | 0.20 | 3.84E-01 | 1.60E-02 | 3.33E-01 | 0.00003 | 1.00E-05 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.03 | 3.13E-03 |
| PCB 189 | 9.3E+00 | 0.20 | 2.23E-01 | 9.30E-03 | 1.94E-01 | 0.00003 | 5.81E-06 |
| *Congener total:* [7] | | | | | | | 1.56E-02 |
| ***B-18 Landfill*** | | | | | | | |
| PCB 77 | 1.8E+01 | 0.20 | 4.32E-01 | 1.80E-02 | 3.75E-01 | 0.0001 | 3.75E-05 |
| PCB 81 | 2.4E+00 | 0.20 | 5.76E-02 | 2.40E-03 | 5.00E-02 | 0.0003 | 1.50E-05 |
| PCB 105 | 6.2E+01 | 0.20 | 1.49E+00 | 6.20E-02 | 1.29E+00 | 0.00003 | 3.88E-05 |
| PCB 114 | 2.3E+00 | 0.20 | 5.52E-02 | 2.30E-03 | 4.79E-02 | 0.00003 | 1.44E-06 |
| PCB 118 | 8.5E+01 | 0.20 | 2.04E+00 | 8.50E-02 | 1.77E+00 | 0.00003 | 5.31E-05 |
| PCB 123 | 1.5E+01 | 0.20 | 3.60E-01 | 1.50E-02 | 3.13E-01 | 0.00003 | 9.38E-06 |
| PCB 126 | 3.5E+00 | 0.20 | 8.40E-02 | 3.50E-03 | 7.29E-02 | 0.1 | 7.29E-03 |
| PCB 156 | 3.1E+01 | 0.20 | 7.44E-01 | 3.10E-02 | 6.46E-01 | 0.00003 | 1.94E-05 |
| PCB 157 | 4.8E+00 | 0.20 | 1.15E-01 | 4.80E-03 | 1.00E-01 | 0.00003 | 3.00E-06 |
| PCB 167 | 1.3E+01 | 0.20 | 3.12E-01 | 1.30E-02 | 2.71E-01 | 0.00003 | 8.13E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 1.20E-01 | 5.00E-03 | 1.04E-01 | 0.03 | 3.13E-03 |
| PCB 189 | 8.2E+00 | 0.20 | 1.97E-01 | 8.20E-03 | 1.71E-01 | 0.00003 | 5.13E-06 |
| *Congener total:* [7] | | | | | | | 1.06E-02 |

**Table 5.4.8**
**Exposure Calculation for the San Joaquin Kit Fox - Juvenile Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(3) Basis for BAF: A study by Blankenship et al. (2005) in which co-located soil and wildlife tissue samples were analyzed for PCBs at a forested site in a Michigan flood plain. Total PCB concentrations in tissue were divided by total PCB concentrations in soil to calculate BSAFs for a variety of wildlife. Shrews were found to have the highest BSAF among small mammals. Using data from the study, the total PCB concentration in shrew tissue (1.31 mg/kg) and in soil (6.53 mg/kg) were used to calculate a BAF of 0.20.

(4) Exposure dose (ED) calculation:

ED = [(intake from carnivorous prey) + (intake from soil ingestion)] x [area foraging factor / body weight].

ED = $[(C_{soil} \times BAF \times FIR_{fox}) + (C_{soil} \times SIR_{fox})] \times AFF/BW$.

where:

ED = total exposure dose (ng/kg BW-day).

$C_{soil}$ = concentration in soil (ng/kg).

BAF = bioaccumulation factor (unitless) for carnivorous prey (factor based on shrew used for grasshopper mouse) = 0.20.

$FIR_{fox}$ = food ingestion rate (mice) for fox (kg/day) = 0.12. See Table 5.4.2 for basis/source.

$SIR_{fox}$ = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table 5.4.2 for basis/source.

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table 5.4.2 for basis/source of home range.

BW = body weight (kg) = 1.2 kg. See Table 5.4.2 for basis/source.

(5) Mammal TEFs are from USEPA (June 2008).

(6) TED = (exposure dose based on PCB congener concentration) x (TEF).

(7) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

BAF = bioaccumulation factor

BSAF = biota-soil accumulation factor

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

**Table 5.4.9**
**Exposure Calculation for the San Joaquin Pocket Mouse - Adult**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | Plant Concentration (ng/kg) [2] | Intake from Plant Ingestion (ng/day) [3] | Intake from Incidental Soil Ingestion (ng/day) [3] | Exposure Dose (ng/kg BW-day) [3] | TEF (mammal) [4] | TED (ng/kg BW-day) [5] |
|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | |
| PCB 77 | 1.1E+01 | 9.7E+01 | 7.66E-02 | 1.98E-04 | 6.40E+00 | 0.0001 | 6.40E-04 |
| PCB 81 | 1.3E+00 | 1.4E+01 | 1.09E-02 | 2.34E-05 | 9.09E-01 | 0.0003 | 2.73E-04 |
| PCB 105 | 3.3E+01 | 1.5E+02 | 1.18E-01 | 5.94E-04 | 9.92E+00 | 0.00003 | 2.98E-04 |
| PCB 114 | 1.6E+00 | 8.7E+00 | 6.86E-03 | 2.88E-05 | 5.74E-01 | 0.00003 | 1.72E-05 |
| PCB 118 | 5.1E+01 | 2.7E+02 | 2.13E-01 | 9.18E-04 | 1.78E+01 | 0.00003 | 5.35E-04 |
| PCB 123 | 5.4E+00 | 1.7E+01 | 1.36E-02 | 9.72E-05 | 1.14E+00 | 0.00003 | 3.42E-05 |
| PCB 126 | 1.5E+00 | 1.3E+01 | 9.92E-03 | 2.70E-05 | 8.29E-01 | 0.1 | 8.29E-02 |
| PCB 156 | 1.3E+01 | 3.3E+01 | 2.63E-02 | 2.34E-04 | 2.21E+00 | 0.00003 | 6.64E-05 |
| PCB 157 | 2.0E+00 | 6.8E+00 | 5.36E-03 | 3.60E-05 | 4.50E-01 | 0.00003 | 1.35E-05 |
| PCB 167 | 5.2E+00 | 1.7E+01 | 1.35E-02 | 9.36E-05 | 1.14E+00 | 0.00003 | 3.41E-05 |
| PCB 169 | 1.1E+00 | 7.5E-01 | 5.90E-04 | 1.98E-05 | 5.08E-02 | 0.03 | 1.53E-03 |
| PCB 189 | 4.3E+00 | 8.6E+00 | 6.82E-03 | 7.74E-05 | 5.75E-01 | 0.00003 | 1.73E-05 |
| *Congener total:* [6] | | | | | | | 8.63E-02 |
| ***South*** | | | | | | | |
| PCB 77 | 5.3E+00 | 7.0E+01 | 5.48E-02 | 9.54E-05 | 4.57E+00 | 0.0001 | 4.57E-04 |
| PCB 81 | 6.0E-01 | 6.5E+00 | 5.06E-03 | 1.08E-05 | 4.23E-01 | 0.0003 | 1.27E-04 |
| PCB 105 | 2.1E+01 | 1.3E+02 | 1.01E-01 | 3.78E-04 | 8.48E+00 | 0.00003 | 2.54E-04 |
| PCB 114 | 5.0E+00 | 5.4E+00 | 4.21E-03 | 9.00E-05 | 3.58E-01 | 0.00003 | 1.08E-05 |
| PCB 118 | 2.9E+01 | 1.8E+02 | 1.40E-01 | 5.22E-04 | 1.17E+01 | 0.00003 | 3.52E-04 |
| PCB 123 | 1.9E+00 | 7.3E+00 | 5.72E-03 | 3.42E-05 | 4.80E-01 | 0.00003 | 1.44E-05 |
| PCB 126 | 1.2E+00 | 7.1E+00 | 5.53E-03 | 2.16E-05 | 4.63E-01 | 0.1 | 4.63E-02 |
| PCB 156 | 6.8E+00 | 2.1E+01 | 1.64E-02 | 1.22E-04 | 1.37E+00 | 0.00003 | 4.12E-05 |
| PCB 157 | 1.8E+00 | 4.8E+00 | 3.74E-03 | 3.24E-05 | 3.15E-01 | 0.00003 | 9.44E-06 |
| PCB 167 | 3.0E+00 | 2.4E+01 | 1.88E-02 | 5.40E-05 | 1.57E+00 | 0.00003 | 4.70E-05 |
| PCB 169 | 5.0E+00 | 6.6E-01 | 5.14E-04 | 9.00E-05 | 5.03E-02 | 0.03 | 1.51E-03 |
| PCB 189 | 1.6E+00 | 1.2E+00 | 8.97E-04 | 2.88E-05 | 7.71E-02 | 0.00003 | 2.31E-06 |
| *Congener total:* [6] | | | | | | | 4.91E-02 |
| ***Southwest*** | | | | | | | |
| PCB 77 | 2.6E+00 | 9.2E+00 | 6.77E-03 | 4.68E-05 | 5.68E-01 | 0.0001 | 5.68E-05 |
| PCB 81 | 5.0E+00 | 1.1E+00 | 7.70E-04 | 9.00E-05 | 7.17E-02 | 0.0003 | 2.15E-05 |
| PCB 105 | 1.1E+01 | 1.9E+01 | 1.41E-02 | 1.98E-04 | 1.19E+00 | 0.00003 | 3.57E-05 |
| PCB 114 | 1.0E+00 | 1.1E+00 | 7.70E-04 | 1.80E-05 | 6.57E-02 | 0.00003 | 1.97E-06 |
| PCB 118 | 1.5E+01 | 2.9E+01 | 2.14E-02 | 2.70E-04 | 1.80E+00 | 0.00003 | 5.41E-05 |
| PCB 123 | 1.2E+00 | 1.6E+00 | 1.19E-03 | 2.16E-05 | 1.01E-01 | 0.00003 | 3.02E-06 |
| PCB 126 | 5.0E+00 | 1.1E+00 | 7.70E-04 | 9.00E-05 | 7.17E-02 | 0.1 | 7.17E-03 |
| PCB 156 | 3.9E+00 | 4.2E+00 | 3.06E-03 | 7.02E-05 | 2.61E-01 | 0.00003 | 7.82E-06 |
| PCB 157 | 9.2E-01 | 1.9E+00 | 1.43E-03 | 1.66E-05 | 1.20E-01 | 0.00003 | 3.61E-06 |
| PCB 167 | 1.9E+00 | 1.0E+01 | 7.65E-03 | 3.42E-05 | 6.40E-01 | 0.00003 | 1.92E-05 |
| PCB 169 | 5.0E+00 | 1.1E+00 | 7.70E-04 | 9.00E-05 | 7.17E-02 | 0.03 | 2.15E-03 |
| PCB 189 | 1.2E+00 | 1.1E+00 | 7.70E-04 | 2.16E-05 | 6.60E-02 | 0.00003 | 1.98E-06 |
| *Congener total:* [6] | | | | | | | 9.52E-03 |
| ***West*** | | | | | | | |
| PCB 77 | 2.3E+00 | 1.2E+01 | 9.45E-03 | 4.14E-05 | 7.91E-01 | 0.0001 | 7.91E-05 |
| PCB 81 | 6.0E-01 | 1.7E+00 | 1.37E-03 | 1.08E-05 | 1.15E-01 | 0.0003 | 3.46E-05 |
| PCB 105 | 1.0E+01 | 1.9E+01 | 1.58E-02 | 1.80E-04 | 1.33E+00 | 0.00003 | 4.00E-05 |
| PCB 114 | 5.0E+00 | 1.1E+00 | 8.98E-04 | 9.00E-05 | 8.23E-02 | 0.00003 | 2.47E-06 |
| PCB 118 | 1.9E+01 | 3.0E+01 | 2.42E-02 | 3.42E-04 | 2.04E+00 | 0.00003 | 6.12E-05 |
| PCB 123 | 1.5E+00 | 1.9E+00 | 1.53E-03 | 2.70E-05 | 1.29E-01 | 0.00003 | 3.88E-06 |
| PCB 126 | 8.0E-01 | 1.1E+00 | 8.98E-04 | 1.44E-05 | 7.60E-02 | 0.1 | 7.60E-03 |
| PCB 156 | 3.9E+00 | 3.6E+00 | 2.93E-03 | 7.02E-05 | 2.50E-01 | 0.00003 | 7.51E-06 |
| PCB 157 | 1.0E+00 | 8.0E-01 | 6.51E-04 | 1.80E-05 | 5.58E-02 | 0.00003 | 1.67E-06 |
| PCB 167 | 2.2E+00 | 8.1E+00 | 6.58E-03 | 3.96E-05 | 5.52E-01 | 0.00003 | 1.66E-05 |
| PCB 169 | 5.0E+00 | 4.8E-01 | 3.93E-04 | 9.00E-05 | 4.03E-02 | 0.03 | 1.21E-03 |
| PCB 189 | 1.1E+00 | 1.1E+00 | 8.98E-04 | 1.98E-05 | 7.65E-02 | 0.00003 | 2.29E-06 |
| *Congener total:* [6] | | | | | | | 9.06E-03 |

**Table 5.4.9**
**Exposure Calculation for the San Joaquin Pocket Mouse - Adult**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | Plant Concentration (ng/kg) [2] | Intake from Plant Ingestion (ng/day) [3] | Intake from Incidental Soil Ingestion (ng/day) [3] | Exposure Dose (ng/kg BW-day) [3] | TEF (mammal) [4] | TED (ng/kg BW-day) [5] |
|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | |
| PCB 77 | 3.0E+00 | 6.9E+00 | 5.04E-03 | 5.40E-05 | 4.25E-01 | 0.0001 | 4.25E-05 |
| PCB 81 | 5.0E-01 | 1.1E+00 | 7.73E-04 | 9.00E-06 | 6.52E-02 | 0.0003 | 1.95E-05 |
| PCB 105 | 9.5E+00 | 9.8E+00 | 7.21E-03 | 1.71E-04 | 6.15E-01 | 0.00003 | 1.85E-05 |
| PCB 114 | 5.0E+00 | 1.1E+00 | 7.73E-04 | 9.00E-05 | 7.19E-02 | 0.00003 | 2.16E-06 |
| PCB 118 | 1.8E+01 | 2.0E+01 | 1.45E-02 | 3.24E-04 | 1.24E+00 | 0.00003 | 3.71E-05 |
| PCB 123 | 1.3E+00 | 7.0E-01 | 5.16E-04 | 2.34E-05 | 4.49E-02 | 0.00003 | 1.35E-06 |
| PCB 126 | 1.2E+00 | 1.1E+00 | 7.73E-04 | 2.16E-05 | 6.62E-02 | 0.1 | 6.62E-03 |
| PCB 156 | 3.2E+00 | 2.1E+00 | 1.53E-03 | 5.76E-05 | 1.33E-01 | 0.00003 | 3.98E-06 |
| PCB 157 | 1.0E+00 | 1.6E+00 | 1.18E-03 | 1.80E-05 | 1.00E-01 | 0.00003 | 3.00E-06 |
| PCB 167 | 6.3E+00 | 6.0E+00 | 4.41E-03 | 1.13E-04 | 3.77E-01 | 0.00003 | 1.13E-05 |
| PCB 169 | 5.0E+00 | 1.1E+00 | 7.73E-04 | 9.00E-05 | 7.19E-02 | 0.03 | 2.16E-03 |
| PCB 189 | 4.0E-01 | 1.1E+00 | 7.73E-04 | 7.20E-06 | 6.50E-02 | 0.00003 | 1.95E-06 |
| *Congener total:* [6] | | | | | | | 8.92E-03 |
| ***North*** | | | | | | | |
| PCB 77 | 2.8E+00 | 7.8E+00 | 5.93E-03 | 5.04E-05 | 4.99E-01 | 0.0001 | 4.99E-05 |
| PCB 81 | 3.0E-01 | 6.0E-01 | 4.59E-04 | 5.40E-06 | 3.87E-02 | 0.0003 | 1.16E-05 |
| PCB 105 | 1.2E+01 | 1.3E+01 | 9.63E-03 | 2.16E-04 | 8.21E-01 | 0.00003 | 2.46E-05 |
| PCB 114 | 5.0E+00 | 1.1E+00 | 8.01E-04 | 9.00E-05 | 7.42E-02 | 0.00003 | 2.23E-06 |
| PCB 118 | 1.9E+01 | 2.9E+01 | 2.17E-02 | 3.42E-04 | 1.84E+00 | 0.00003 | 5.52E-05 |
| PCB 123 | 1.5E+00 | 5.6E-01 | 4.24E-04 | 2.70E-05 | 3.76E-02 | 0.00003 | 1.13E-06 |
| PCB 126 | 7.0E-01 | 1.1E+00 | 8.01E-04 | 1.26E-05 | 6.78E-02 | 0.1 | 6.78E-03 |
| PCB 156 | 3.0E+00 | 2.5E+00 | 1.88E-03 | 5.40E-05 | 1.61E-01 | 0.00003 | 4.84E-06 |
| PCB 157 | 1.0E+00 | 5.4E-01 | 4.12E-04 | 1.80E-05 | 3.58E-02 | 0.00003 | 1.07E-06 |
| PCB 167 | 6.6E+00 | 5.1E+00 | 3.86E-03 | 1.19E-04 | 3.31E-01 | 0.00003 | 9.94E-06 |
| PCB 169 | 5.0E+00 | 1.1E+00 | 8.01E-04 | 9.00E-05 | 7.42E-02 | 0.03 | 2.23E-03 |
| PCB 189 | 7.0E-01 | 4.7E-01 | 3.56E-04 | 1.26E-05 | 3.07E-02 | 0.00003 | 9.20E-07 |
| *Congener total:* [6] | | | | | | | 9.17E-03 |
| ***Northeast*** | | | | | | | |
| PCB 77 | 1.5E+01 | 1.3E+01 | 9.20E-03 | 2.70E-04 | 7.89E-01 | 0.0001 | 7.89E-05 |
| PCB 81 | 1.4E+00 | 6.4E-01 | 4.66E-04 | 2.52E-05 | 4.09E-02 | 0.0003 | 1.23E-05 |
| PCB 105 | 6.5E+01 | 2.3E+01 | 1.66E-02 | 1.17E-03 | 1.48E+00 | 0.00003 | 4.45E-05 |
| PCB 114 | 2.0E+00 | 1.1E+00 | 8.06E-04 | 3.60E-05 | 7.01E-02 | 0.00003 | 2.10E-06 |
| PCB 118 | 1.0E+02 | 4.4E+01 | 3.22E-02 | 1.80E-03 | 2.84E+00 | 0.00003 | 8.51E-05 |
| PCB 123 | 8.7E+00 | 7.6E-01 | 5.58E-04 | 1.57E-04 | 5.95E-02 | 0.00003 | 1.79E-06 |
| PCB 126 | 5.9E+00 | 1.1E+00 | 8.06E-04 | 1.06E-04 | 7.60E-02 | 0.1 | 7.60E-03 |
| PCB 156 | 2.9E+01 | 4.8E+00 | 3.49E-03 | 5.22E-04 | 3.35E-01 | 0.00003 | 1.00E-05 |
| PCB 157 | 6.9E+00 | 1.8E+00 | 1.29E-03 | 1.24E-04 | 1.18E-01 | 0.00003 | 3.54E-06 |
| PCB 167 | 1.6E+01 | 1.3E+01 | 9.20E-03 | 2.88E-04 | 7.90E-01 | 0.00003 | 2.37E-05 |
| PCB 169 | 5.0E+00 | 3.3E-01 | 2.43E-04 | 9.00E-05 | 2.78E-02 | 0.03 | 8.33E-04 |
| PCB 189 | 9.3E+00 | 1.1E+00 | 8.06E-04 | 1.67E-04 | 8.11E-02 | 0.00003 | 2.43E-06 |
| *Congener total:* [6] | | | | | | | 8.70E-03 |
| ***B-18 Landfill*** | | | | | | | |
| PCB 77 | 1.8E+01 | 1.7E+02 | 1.24E-01 | 3.24E-04 | 1.04E+01 | 0.0001 | 1.04E-03 |
| PCB 81 | 2.4E+00 | 1.2E+01 | 8.40E-03 | 4.32E-05 | 7.04E-01 | 0.0003 | 2.11E-04 |
| PCB 105 | 6.2E+01 | 3.1E+02 | 2.26E-01 | 1.12E-03 | 1.89E+01 | 0.00003 | 5.68E-04 |
| PCB 114 | 2.3E+00 | 2.1E+01 | 1.53E-02 | 4.14E-05 | 1.28E+00 | 0.00003 | 3.84E-05 |
| PCB 118 | 8.5E+01 | 5.2E+02 | 3.79E-01 | 1.53E-03 | 3.18E+01 | 0.00003 | 9.53E-04 |
| PCB 123 | 1.5E+01 | 3.1E+01 | 2.26E-02 | 2.70E-04 | 1.91E+00 | 0.00003 | 5.72E-05 |
| PCB 126 | 3.5E+00 | 1.0E+01 | 7.62E-03 | 6.30E-05 | 6.41E-01 | 0.1 | 6.41E-02 |
| PCB 156 | 3.1E+01 | 9.9E+01 | 7.23E-02 | 5.58E-04 | 6.07E+00 | 0.00003 | 1.82E-04 |
| PCB 157 | 4.8E+00 | 1.6E+01 | 1.17E-02 | 8.64E-05 | 9.80E-01 | 0.00003 | 2.94E-05 |
| PCB 167 | 1.3E+01 | 6.3E+01 | 4.60E-02 | 2.34E-04 | 3.85E+00 | 0.00003 | 1.16E-04 |
| PCB 169 | 5.0E+00 | 3.2E+00 | 2.34E-03 | 9.00E-05 | 2.02E-01 | 0.03 | 6.06E-03 |
| PCB 189 | 8.2E+00 | 1.1E+00 | 8.03E-04 | 1.48E-04 | 7.92E-02 | 0.00003 | 2.38E-06 |
| *Congener total:* [6] | | | | | | | 7.33E-02 |

**Table 5.4.9**
**Exposure Calculation for the San Joaquin Pocket Mouse - Adult**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(3) Exposure dose (ED) calculation:

ED = [(intake from plant ingestion) + (intake from soil ingestion)] / body weight.

ED = [($C_{plants}$ x $FIR_{mouse}$ x $CF_{dw}$) + ($C_{soil}$ x $SIR_{mouse}$)] x (AFF/BW).

where:

ED = total exposure dose (ng/kg BW-day).

$C_{plants}$ = concentration in plants (ng/kg).

$C_{soil}$ = concentration in soil (ng/kg).

$FIR_{mouse}$ = food ingestion rate (plants) for mouse = 0.00089 kg/day. See Table 5.4.2 for basis/source.

$SIR_{mouse}$ = soil ingestion rate for mouse (kg/day) = 0.000018 kg/day. See Table 5.4.2 for basis/source.

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants, based on % moisture in vegetation (mean of April and August samples) from each exposure area (southeast 11.3%, south 12.4%, southwest 17.6%, west 8.3%, northwest 17.3%, north 14.3%, northeast 17.7%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.917 for west, 0.827 for northwest, 0.857 for north, 0.823 for northeast, 0.82 for B-18 landfill

AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table 5.4.2 for home range.

BW = body weight (kg) = 0.012 kg. See Table 5.4.2 for basis/source.

(4) Mammal TEFs are from USEPA (June 2008).

(5) TED = (exposure dose based on PCB congener concentration) x (TEF).

(6) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

**Table 5.4.10**
**Exposure Calculation for the San Joaquin Pocket Mouse - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area (1) | Soil Concentration (ng/kg) (2) | Plant Concentration (ng/kg) (2) | Intake from Plant Ingestion (ng/day) (3) | Intake from Incidental Soil Ingestion (ng/day) (3) | Exposure Dose (ng/kg BW-day) (3) | TEF (mammal) (4) | TED (ng/kg BW-day) (5) |
|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | |
| PCB 77 | 1.1E+01 | 9.7E+01 | 4.47E-02 | 1.21E-04 | 6.41E+00 | 0.0001 | 6.41E-04 |
| PCB 81 | 1.3E+00 | 1.4E+01 | 6.36E-03 | 1.43E-05 | 9.11E-01 | 0.0003 | 2.73E-04 |
| PCB 105 | 3.3E+01 | 1.5E+02 | 6.92E-02 | 3.63E-04 | 9.94E+00 | 0.00003 | 2.98E-04 |
| PCB 114 | 1.6E+00 | 8.7E+00 | 4.01E-03 | 1.76E-05 | 5.75E-01 | 0.00003 | 1.73E-05 |
| PCB 118 | 5.1E+01 | 2.7E+02 | 1.25E-01 | 5.61E-04 | 1.79E+01 | 0.00003 | 5.36E-04 |
| PCB 123 | 5.4E+00 | 1.7E+01 | 7.94E-03 | 5.94E-05 | 1.14E+00 | 0.00003 | 3.43E-05 |
| PCB 126 | 1.5E+00 | 1.3E+01 | 5.79E-03 | 1.65E-05 | 8.30E-01 | 0.1 | 8.30E-02 |
| PCB 156 | 1.3E+01 | 3.3E+01 | 1.54E-02 | 1.43E-04 | 2.22E+00 | 0.00003 | 6.66E-05 |
| PCB 157 | 2.0E+00 | 6.8E+00 | 3.13E-03 | 2.20E-05 | 4.51E-01 | 0.00003 | 1.35E-05 |
| PCB 167 | 5.2E+00 | 1.7E+01 | 7.91E-03 | 5.72E-05 | 1.14E+00 | 0.00003 | 3.41E-05 |
| PCB 169 | 1.1E+00 | 7.5E-01 | 3.45E-04 | 1.21E-05 | 5.10E-02 | 0.03 | 1.53E-03 |
| PCB 189 | 4.3E+00 | 8.6E+00 | 3.99E-03 | 4.73E-05 | 5.76E-01 | 0.00003 | 1.73E-05 |
| *Congener total:* (6) | | | | | | | 8.65E-02 |
| ***South*** | | | | | | | |
| PCB 77 | 5.3E+00 | 7.0E+01 | 3.20E-02 | 5.83E-05 | 4.58E+00 | 0.0001 | 4.58E-04 |
| PCB 81 | 6.0E-01 | 6.5E+00 | 2.96E-03 | 6.60E-06 | 4.23E-01 | 0.0003 | 1.27E-04 |
| PCB 105 | 2.1E+01 | 1.3E+02 | 5.92E-02 | 2.31E-04 | 8.49E+00 | 0.00003 | 2.55E-04 |
| PCB 114 | 5.0E+00 | 5.4E+00 | 2.46E-03 | 5.50E-05 | 3.59E-01 | 0.00003 | 1.08E-05 |
| PCB 118 | 2.9E+01 | 1.8E+02 | 8.20E-02 | 3.19E-04 | 1.18E+01 | 0.00003 | 3.53E-04 |
| PCB 123 | 1.9E+00 | 7.3E+00 | 3.34E-03 | 2.09E-05 | 4.80E-01 | 0.00003 | 1.44E-05 |
| PCB 126 | 1.2E+00 | 7.1E+00 | 3.23E-03 | 1.32E-05 | 4.64E-01 | 0.1 | 4.64E-02 |
| PCB 156 | 6.8E+00 | 2.1E+01 | 9.57E-03 | 7.48E-05 | 1.38E+00 | 0.00003 | 4.13E-05 |
| PCB 157 | 1.8E+00 | 4.8E+00 | 2.19E-03 | 1.98E-05 | 3.15E-01 | 0.00003 | 9.46E-06 |
| PCB 167 | 3.0E+00 | 2.4E+01 | 1.10E-02 | 3.30E-05 | 1.57E+00 | 0.00003 | 4.71E-05 |
| PCB 169 | 5.0E+00 | 6.6E-01 | 3.00E-04 | 5.50E-05 | 5.07E-02 | 0.03 | 1.52E-03 |
| PCB 189 | 1.6E+00 | 1.2E+00 | 5.24E-04 | 1.76E-05 | 7.73E-02 | 0.00003 | 2.32E-06 |
| *Congener total:* (6) | | | | | | | 4.92E-02 |
| ***Southwest*** | | | | | | | |
| PCB 77 | 2.6E+00 | 9.2E+00 | 3.95E-03 | 2.86E-05 | 5.69E-01 | 0.0001 | 5.69E-05 |
| PCB 81 | 5.0E+00 | 1.1E+00 | 4.50E-04 | 5.50E-05 | 7.21E-02 | 0.0003 | 2.16E-05 |
| PCB 105 | 1.1E+01 | 1.9E+01 | 8.24E-03 | 1.21E-04 | 1.19E+00 | 0.00003 | 3.58E-05 |
| PCB 114 | 1.0E+00 | 1.1E+00 | 4.50E-04 | 1.10E-05 | 6.58E-02 | 0.00003 | 1.98E-06 |
| PCB 118 | 1.5E+01 | 2.9E+01 | 1.25E-02 | 1.65E-04 | 1.81E+00 | 0.00003 | 5.42E-05 |
| PCB 123 | 1.2E+00 | 1.6E+00 | 6.92E-04 | 1.32E-05 | 1.01E-01 | 0.00003 | 3.02E-06 |
| PCB 126 | 5.0E+00 | 1.1E+00 | 4.50E-04 | 5.50E-05 | 7.21E-02 | 0.1 | 7.21E-03 |
| PCB 156 | 3.9E+00 | 4.2E+00 | 1.79E-03 | 4.29E-05 | 2.61E-01 | 0.00003 | 7.84E-06 |
| PCB 157 | 9.2E-01 | 1.9E+00 | 8.34E-04 | 1.01E-05 | 1.21E-01 | 0.00003 | 3.62E-06 |
| PCB 167 | 1.9E+00 | 1.0E+01 | 4.47E-03 | 2.09E-05 | 6.41E-01 | 0.00003 | 1.92E-05 |
| PCB 169 | 5.0E+00 | 1.1E+00 | 4.50E-04 | 5.50E-05 | 7.21E-02 | 0.03 | 2.16E-03 |
| PCB 189 | 1.2E+00 | 1.1E+00 | 4.50E-04 | 1.32E-05 | 6.62E-02 | 0.00003 | 1.98E-06 |
| *Congener total:* (6) | | | | | | | 9.58E-03 |
| ***West*** | | | | | | | |
| PCB 77 | 2.3E+00 | 1.2E+01 | 5.52E-03 | 2.53E-05 | 7.93E-01 | 0.0001 | 7.93E-05 |
| PCB 81 | 6.0E-01 | 1.7E+00 | 8.03E-04 | 6.60E-06 | 1.16E-01 | 0.0003 | 3.47E-05 |
| PCB 105 | 1.0E+01 | 1.9E+01 | 9.23E-03 | 1.10E-04 | 1.33E+00 | 0.00003 | 4.00E-05 |
| PCB 114 | 5.0E+00 | 1.1E+00 | 5.25E-04 | 5.50E-05 | 8.28E-02 | 0.00003 | 2.48E-06 |
| PCB 118 | 1.9E+01 | 3.0E+01 | 1.41E-02 | 2.09E-04 | 2.05E+00 | 0.00003 | 6.14E-05 |
| PCB 123 | 1.5E+00 | 1.9E+00 | 8.92E-04 | 1.65E-05 | 1.30E-01 | 0.00003 | 3.89E-06 |
| PCB 126 | 8.0E-01 | 1.1E+00 | 5.25E-04 | 8.80E-06 | 7.62E-02 | 0.1 | 7.62E-03 |
| PCB 156 | 3.9E+00 | 3.6E+00 | 1.71E-03 | 4.29E-05 | 2.51E-01 | 0.00003 | 7.53E-06 |
| PCB 157 | 1.0E+00 | 8.0E-01 | 3.80E-04 | 1.10E-05 | 5.59E-02 | 0.00003 | 1.68E-06 |
| PCB 167 | 2.2E+00 | 8.1E+00 | 3.85E-03 | 2.42E-05 | 5.53E-01 | 0.00003 | 1.66E-05 |
| PCB 169 | 5.0E+00 | 4.8E-01 | 2.30E-04 | 5.50E-05 | 4.07E-02 | 0.03 | 1.22E-03 |
| PCB 189 | 1.1E+00 | 1.1E+00 | 5.25E-04 | 1.21E-05 | 7.67E-02 | 0.00003 | 2.30E-06 |
| *Congener total:* (6) | | | | | | | 9.09E-03 |

**Table 5.4.10**
**Exposure Calculation for the San Joaquin Pocket Mouse - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | Plant Concentration (ng/kg) [2] | Intake from Plant Ingestion (ng/day) [3] | Intake from Incidental Soil Ingestion (ng/day) [3] | Exposure Dose (ng/kg BW-day) [3] | TEF (mammal) [4] | TED (ng/kg BW-day) [5] |
|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | |
| PCB 77 | 3.0E+00 | 6.9E+00 | 2.95E-03 | 3.30E-05 | 4.26E-01 | 0.0001 | 4.26E-05 |
| PCB 81 | 5.0E-01 | 1.1E+00 | 4.52E-04 | 5.50E-06 | 6.53E-02 | 0.0003 | 1.96E-05 |
| PCB 105 | 9.5E+00 | 9.8E+00 | 4.21E-03 | 1.05E-04 | 6.17E-01 | 0.00003 | 1.85E-05 |
| PCB 114 | 5.0E+00 | 1.1E+00 | 4.52E-04 | 5.50E-05 | 7.24E-02 | 0.00003 | 2.17E-06 |
| PCB 118 | 1.8E+01 | 2.0E+01 | 8.48E-03 | 1.98E-04 | 1.24E+00 | 0.00003 | 3.72E-05 |
| PCB 123 | 1.3E+00 | 7.0E-01 | 3.01E-04 | 1.43E-05 | 4.51E-02 | 0.00003 | 1.35E-06 |
| PCB 126 | 1.2E+00 | 1.1E+00 | 4.52E-04 | 1.32E-05 | 6.64E-02 | 0.1 | 6.64E-03 |
| PCB 156 | 3.2E+00 | 2.1E+00 | 8.96E-04 | 3.52E-05 | 1.33E-01 | 0.00003 | 3.99E-06 |
| PCB 157 | 1.0E+00 | 1.6E+00 | 6.91E-04 | 1.10E-05 | 1.00E-01 | 0.00003 | 3.01E-06 |
| PCB 167 | 6.3E+00 | 6.0E+00 | 2.58E-03 | 6.93E-05 | 3.78E-01 | 0.00003 | 1.13E-05 |
| PCB 169 | 5.0E+00 | 1.1E+00 | 4.52E-04 | 5.50E-05 | 7.24E-02 | 0.03 | 2.17E-03 |
| PCB 189 | 4.0E-01 | 1.1E+00 | 4.52E-04 | 4.40E-06 | 6.51E-02 | 0.00003 | 1.95E-06 |
| *Congener total:* [6] | | | | | | | 8.95E-03 |
| ***North*** | | | | | | | |
| PCB 77 | 2.8E+00 | 7.8E+00 | 3.47E-03 | 3.08E-05 | 5.00E-01 | 0.0001 | 5.00E-05 |
| PCB 81 | 3.0E-01 | 6.0E-01 | 2.68E-04 | 3.30E-06 | 3.88E-02 | 0.0003 | 1.16E-05 |
| PCB 105 | 1.2E+01 | 1.3E+01 | 5.63E-03 | 1.32E-04 | 8.23E-01 | 0.00003 | 2.47E-05 |
| PCB 114 | 5.0E+00 | 1.1E+00 | 4.68E-04 | 5.50E-05 | 7.47E-02 | 0.00003 | 2.24E-06 |
| PCB 118 | 1.9E+01 | 2.9E+01 | 1.27E-02 | 2.09E-04 | 1.84E+00 | 0.00003 | 5.53E-05 |
| PCB 123 | 1.5E+00 | 5.6E-01 | 2.48E-04 | 1.65E-05 | 3.77E-02 | 0.00003 | 1.13E-06 |
| PCB 126 | 7.0E-01 | 1.1E+00 | 4.68E-04 | 7.70E-06 | 6.79E-02 | 0.1 | 6.79E-03 |
| PCB 156 | 3.0E+00 | 2.5E+00 | 1.10E-03 | 3.30E-05 | 1.62E-01 | 0.00003 | 4.85E-06 |
| PCB 157 | 1.0E+00 | 5.4E-01 | 2.41E-04 | 1.10E-05 | 3.59E-02 | 0.00003 | 1.08E-06 |
| PCB 167 | 6.6E+00 | 5.1E+00 | 2.25E-03 | 7.26E-05 | 3.32E-01 | 0.00003 | 9.97E-06 |
| PCB 169 | 5.0E+00 | 1.1E+00 | 4.68E-04 | 5.50E-05 | 7.47E-02 | 0.03 | 2.24E-03 |
| PCB 189 | 7.0E-01 | 4.7E-01 | 2.08E-04 | 7.70E-06 | 3.08E-02 | 0.00003 | 9.23E-07 |
| *Congener total:* [6] | | | | | | | 9.20E-03 |
| ***Northeast*** | | | | | | | |
| PCB 77 | 1.5E+01 | 1.3E+01 | 5.37E-03 | 1.65E-04 | 7.91E-01 | 0.0001 | 7.91E-05 |
| PCB 81 | 1.4E+00 | 6.4E-01 | 2.72E-04 | 1.54E-05 | 4.11E-02 | 0.0003 | 1.23E-05 |
| PCB 105 | 6.5E+01 | 2.3E+01 | 9.72E-03 | 7.15E-04 | 1.49E+00 | 0.00003 | 4.47E-05 |
| PCB 114 | 2.0E+00 | 1.1E+00 | 4.71E-04 | 2.20E-05 | 7.04E-02 | 0.00003 | 2.11E-06 |
| PCB 118 | 1.0E+02 | 4.4E+01 | 1.88E-02 | 1.10E-03 | 2.85E+00 | 0.00003 | 8.54E-05 |
| PCB 123 | 8.7E+00 | 7.6E-01 | 3.26E-04 | 9.57E-05 | 6.02E-02 | 0.00003 | 1.81E-06 |
| PCB 126 | 5.9E+00 | 1.1E+00 | 4.71E-04 | 6.49E-05 | 7.65E-02 | 0.1 | 7.65E-03 |
| PCB 156 | 2.9E+01 | 4.8E+00 | 2.04E-03 | 3.19E-04 | 3.37E-01 | 0.00003 | 1.01E-05 |
| PCB 157 | 6.9E+00 | 1.8E+00 | 7.54E-04 | 7.59E-05 | 1.19E-01 | 0.00003 | 3.56E-06 |
| PCB 167 | 1.6E+01 | 1.3E+01 | 5.37E-03 | 1.76E-04 | 7.93E-01 | 0.00003 | 2.38E-05 |
| PCB 169 | 5.0E+00 | 3.3E-01 | 1.42E-04 | 5.50E-05 | 2.82E-02 | 0.03 | 8.45E-04 |
| PCB 189 | 9.3E+00 | 1.1E+00 | 4.71E-04 | 1.02E-04 | 8.19E-02 | 0.00003 | 2.46E-06 |
| *Congener total:* [6] | | | | | | | 8.76E-03 |
| ***B-18 Landfill*** | | | | | | | |
| PCB 77 | 1.8E+01 | 1.7E+02 | 7.25E-02 | 1.98E-04 | 1.04E+01 | 0.0001 | 1.04E-03 |
| PCB 81 | 2.4E+00 | 1.2E+01 | 4.91E-03 | 2.64E-05 | 7.05E-01 | 0.0003 | 2.12E-04 |
| PCB 105 | 6.2E+01 | 3.1E+02 | 1.32E-01 | 6.82E-04 | 1.90E+01 | 0.00003 | 5.69E-04 |
| PCB 114 | 2.3E+00 | 2.1E+01 | 8.95E-03 | 2.53E-05 | 1.28E+00 | 0.00003 | 3.85E-05 |
| PCB 118 | 8.5E+01 | 5.2E+02 | 2.22E-01 | 9.35E-04 | 3.18E+01 | 0.00003 | 9.54E-04 |
| PCB 123 | 1.5E+01 | 3.1E+01 | 1.32E-02 | 1.65E-04 | 1.91E+00 | 0.00003 | 5.74E-05 |
| PCB 126 | 3.5E+00 | 1.0E+01 | 4.45E-03 | 3.85E-05 | 6.42E-01 | 0.1 | 6.42E-02 |
| PCB 156 | 3.1E+01 | 9.9E+01 | 4.22E-02 | 3.41E-04 | 6.08E+00 | 0.00003 | 1.82E-04 |
| PCB 157 | 4.8E+00 | 1.6E+01 | 6.82E-03 | 5.28E-05 | 9.82E-01 | 0.00003 | 2.95E-05 |
| PCB 167 | 1.3E+01 | 6.3E+01 | 2.69E-02 | 1.43E-04 | 3.86E+00 | 0.00003 | 1.16E-04 |
| PCB 169 | 5.0E+00 | 3.2E+00 | 1.36E-03 | 5.50E-05 | 2.03E-01 | 0.03 | 6.08E-03 |
| PCB 189 | 8.2E+00 | 1.1E+00 | 4.69E-04 | 9.02E-05 | 7.99E-02 | 0.00003 | 2.40E-06 |
| *Congener total:* [6] | | | | | | | 7.35E-02 |

**Table 5.4.10**
**Exposure Calculation for the San Joaquin Pocket Mouse - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(3) Exposure dose (ED) calculation:

ED = [(intake from plant ingestion) + (intake from soil ingestion)] / body weight.

ED = [($C_{plants}$ x $FIR_{mouse}$ x $CF_{dw}$) + ($C_{soil}$ x $SIR_{mouse}$)] x (AFF/BW).

where:

ED = total exposure dose (ng/kg BW-day).

$C_{plants}$ = concentration in plants (ng/kg).

$C_{soil}$ = concentration in soil (ng/kg).

$FIR_{mouse}$ = food ingestion rate (plants) for mouse = 0.00052 kg/day. See Table 5.4.2 for basis/source.

$SIR_{mouse}$ = soil ingestion rate for mouse (kg/day) = 0.000011 kg/day. See Table 5.4.2 for basis/source.

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants, based on % moisture in vegetation (mean of April and August samples) from each exposure area (southeast 11.3%, south 12.4%, southwest 17.6%, west 8.3%, northwest 17.3%, north 14.3%, northeast 17.7%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.917 for west, 0.827 for northwest, 0.857 for north, 0.823 for northeast, 0.82 for B-18 landfill

AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table 5.4.2 for home range.

BW = body weight (kg) = 0.007 kg. See Table 5.4.2 for basis/source.

(4) Mammal TEFs are from USEPA (June 2008).

(5) TED = (exposure dose based on PCB congener concentration) x (TEF).

(6) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

**Table 5.4.11**
**Exposure Calculation for the Tulare Grasshopper Mouse - Adult**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | $BAF_{inv}$ (ng/kg)/ (ng/kg) [4] | Intake from Invertebrate Ingestion (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (mammal) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|
| **_Southeast_** | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 0.95 | 3.05E-02 | 2.20E-04 | 7.67E-01 | 0.0001 | 7.67E-05 |
| PCB 81 | 6.34 | 1.3E+00 | 0.92 | 3.48E-03 | 2.60E-05 | 8.77E-02 | 0.0003 | 2.63E-05 |
| PCB 105 | 6.79 | 3.3E+01 | 0.97 | 9.31E-02 | 6.60E-04 | 2.34E+00 | 0.00003 | 7.03E-05 |
| PCB 114 | 6.98 | 1.6E+00 | 0.99 | 4.61E-03 | 3.20E-05 | 1.16E-01 | 0.00003 | 3.48E-06 |
| PCB 118 | 7.12 | 5.1E+01 | 1.01 | 1.49E-01 | 1.02E-03 | 3.76E+00 | 0.00003 | 1.13E-04 |
| PCB 123 | 6.98 | 5.4E+00 | 0.99 | 1.56E-02 | 1.08E-04 | 3.92E-01 | 0.00003 | 1.18E-05 |
| PCB 126 | 6.98 | 1.5E+00 | 0.99 | 4.32E-03 | 3.00E-05 | 1.09E-01 | 0.1 | 1.09E-02 |
| PCB 156 | 7.60 | 1.3E+01 | 1.07 | 4.02E-02 | 2.60E-04 | 1.01E+00 | 0.00003 | 3.04E-05 |
| PCB 157 | 7.62 | 2.0E+00 | 1.07 | 6.21E-03 | 4.00E-05 | 1.56E-01 | 0.00003 | 4.68E-06 |
| PCB 167 | 7.50 | 5.2E+00 | 1.06 | 1.59E-02 | 1.04E-04 | 4.00E-01 | 0.00003 | 1.20E-05 |
| PCB 169 | 7.41 | 1.1E+00 | 1.04 | 3.33E-03 | 2.20E-05 | 8.38E-02 | 0.03 | 2.52E-03 |
| PCB 189 | 8.27 | 4.3E+00 | 1.15 | 1.44E-02 | 8.60E-05 | 3.62E-01 | 0.00003 | 1.08E-05 |
| *Congener total:* [8] | | | | | | | | 1.38E-02 |
| **_South_** | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 0.95 | 1.47E-02 | 1.06E-04 | 3.69E-01 | 0.0001 | 3.69E-05 |
| PCB 81 | 6.34 | 6.0E-01 | 0.92 | 1.61E-03 | 1.20E-05 | 4.05E-02 | 0.0003 | 1.21E-05 |
| PCB 105 | 6.79 | 2.1E+01 | 0.97 | 5.92E-02 | 4.20E-04 | 1.49E+00 | 0.00003 | 4.47E-05 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 1.44E-02 | 1.00E-04 | 3.63E-01 | 0.00003 | 1.09E-05 |
| PCB 118 | 7.12 | 2.9E+01 | 1.01 | 8.49E-02 | 5.80E-04 | 2.14E+00 | 0.00003 | 6.41E-05 |
| PCB 123 | 6.98 | 1.9E+00 | 0.99 | 5.48E-03 | 3.80E-05 | 1.38E-01 | 0.00003 | 4.14E-06 |
| PCB 126 | 6.98 | 1.2E+00 | 0.99 | 3.46E-03 | 2.40E-05 | 8.71E-02 | 0.1 | 8.71E-03 |
| PCB 156 | 7.60 | 6.8E+00 | 1.07 | 2.11E-02 | 1.36E-04 | 5.30E-01 | 0.00003 | 1.59E-05 |
| PCB 157 | 7.62 | 1.8E+00 | 1.07 | 5.59E-03 | 3.60E-05 | 1.41E-01 | 0.00003 | 4.22E-06 |
| PCB 167 | 7.50 | 3.0E+00 | 1.06 | 9.18E-03 | 6.00E-05 | 2.31E-01 | 0.00003 | 6.93E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 1.51E-02 | 1.00E-04 | 3.81E-01 | 0.03 | 1.14E-02 |
| PCB 189 | 8.27 | 1.6E+00 | 1.15 | 5.35E-03 | 3.20E-05 | 1.35E-01 | 0.00003 | 4.04E-06 |
| *Congener total:* [8] | | | | | | | | 2.03E-02 |
| **_Southwest_** | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 0.95 | 7.20E-03 | 5.20E-05 | 1.81E-01 | 0.0001 | 1.81E-05 |
| PCB 81 | 6.34 | 5.0E+00 | 0.92 | 1.34E-02 | 1.00E-04 | 3.37E-01 | 0.0003 | 1.01E-04 |
| PCB 105 | 6.79 | 1.1E+01 | 0.97 | 3.10E-02 | 2.20E-04 | 7.81E-01 | 0.00003 | 2.34E-05 |
| PCB 114 | 6.98 | 1.0E+00 | 0.99 | 2.88E-03 | 2.00E-05 | 7.26E-02 | 0.00003 | 2.18E-06 |
| PCB 118 | 7.12 | 1.5E+01 | 1.01 | 4.39E-02 | 3.00E-04 | 1.11E+00 | 0.00003 | 3.32E-05 |
| PCB 123 | 6.98 | 1.2E+00 | 0.99 | 3.46E-03 | 2.40E-05 | 8.71E-02 | 0.00003 | 2.61E-06 |
| PCB 126 | 6.98 | 5.0E+00 | 0.99 | 1.44E-02 | 1.00E-04 | 3.63E-01 | 0.1 | 3.63E-02 |
| PCB 156 | 7.60 | 3.9E+00 | 1.07 | 1.21E-02 | 7.80E-05 | 3.04E-01 | 0.00003 | 9.11E-06 |
| PCB 157 | 7.62 | 9.2E-01 | 1.07 | 2.85E-03 | 1.84E-05 | 7.18E-02 | 0.00003 | 2.15E-06 |
| PCB 167 | 7.50 | 1.9E+00 | 1.06 | 5.81E-03 | 3.80E-05 | 1.46E-01 | 0.00003 | 4.39E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 1.51E-02 | 1.00E-04 | 3.81E-01 | 0.03 | 1.14E-02 |
| PCB 189 | 8.27 | 1.2E+00 | 1.15 | 4.01E-03 | 2.40E-05 | 1.01E-01 | 0.00003 | 3.03E-06 |
| *Congener total:* [8] | | | | | | | | 4.79E-02 |
| **_West_** | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 0.95 | 6.37E-03 | 4.60E-05 | 1.60E-01 | 0.0001 | 1.60E-05 |
| PCB 81 | 6.34 | 6.0E-01 | 0.92 | 1.61E-03 | 1.20E-05 | 4.05E-02 | 0.0003 | 1.21E-05 |
| PCB 105 | 6.79 | 1.0E+01 | 0.97 | 2.82E-02 | 2.00E-04 | 7.10E-01 | 0.00003 | 2.13E-05 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 1.44E-02 | 1.00E-04 | 3.63E-01 | 0.00003 | 1.09E-05 |
| PCB 118 | 7.12 | 1.9E+01 | 1.01 | 5.57E-02 | 3.80E-04 | 1.40E+00 | 0.00003 | 4.20E-05 |
| PCB 123 | 6.98 | 1.5E+00 | 0.99 | 4.32E-03 | 3.00E-05 | 1.09E-01 | 0.00003 | 3.27E-06 |
| PCB 126 | 6.98 | 8.0E-01 | 0.99 | 2.31E-03 | 1.60E-05 | 5.80E-02 | 0.1 | 5.80E-03 |
| PCB 156 | 7.60 | 3.9E+00 | 1.07 | 1.21E-02 | 7.80E-05 | 3.04E-01 | 0.00003 | 9.11E-06 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 3.10E-03 | 2.00E-05 | 7.81E-02 | 0.00003 | 2.34E-06 |
| PCB 167 | 7.50 | 2.2E+00 | 1.06 | 6.73E-03 | 4.40E-05 | 1.69E-01 | 0.00003 | 5.08E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 1.51E-02 | 1.00E-04 | 3.81E-01 | 0.03 | 1.14E-02 |
| PCB 189 | 8.27 | 1.1E+00 | 1.15 | 3.68E-03 | 2.20E-05 | 9.25E-02 | 0.00003 | 2.78E-06 |
| *Congener total:* [8] | | | | | | | | 1.74E-02 |

**Table 5.4.11**
**Exposure Calculation for the Tulare Grasshopper Mouse - Adult**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | $BAF_{inv}$ (ng/kg)/(ng/kg) [4] | Intake from Invertebrate Ingestion (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (mammal) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 0.95 | 8.31E-03 | 6.00E-05 | 2.09E-01 | 0.0001 | 2.09E-05 |
| PCB 81 | 6.34 | 5.0E-01 | 0.92 | 1.34E-03 | 1.00E-05 | 3.37E-02 | 0.0003 | 1.01E-05 |
| PCB 105 | 6.79 | 9.5E+00 | 0.97 | 2.68E-02 | 1.90E-04 | 6.75E-01 | 0.00003 | 2.02E-05 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 1.44E-02 | 1.00E-04 | 3.63E-01 | 0.00003 | 1.09E-05 |
| PCB 118 | 7.12 | 1.8E+01 | 1.01 | 5.27E-02 | 3.60E-04 | 1.33E+00 | 0.00003 | 3.98E-05 |
| PCB 123 | 6.98 | 1.3E+00 | 0.99 | 3.75E-03 | 2.60E-05 | 9.43E-02 | 0.00003 | 2.83E-06 |
| PCB 126 | 6.98 | 1.2E+00 | 0.99 | 3.46E-03 | 2.40E-05 | 8.71E-02 | 0.1 | 8.71E-03 |
| PCB 156 | 7.60 | 3.2E+00 | 1.07 | 9.91E-03 | 6.40E-05 | 2.49E-01 | 0.00003 | 7.48E-06 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 3.10E-03 | 2.00E-05 | 7.81E-02 | 0.00003 | 2.34E-06 |
| PCB 167 | 7.50 | 6.3E+00 | 1.06 | 1.93E-02 | 1.26E-04 | 4.85E-01 | 0.00003 | 1.46E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 1.51E-02 | 1.00E-04 | 3.81E-01 | 0.03 | 1.14E-02 |
| PCB 189 | 8.27 | 4.0E-01 | 1.15 | 1.34E-03 | 8.00E-06 | 3.36E-02 | 0.00003 | 1.01E-06 |
| *Congener total:* [8] | | | | | | | | 2.03E-02 |
| ***North*** | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 0.95 | 7.75E-03 | 5.60E-05 | 1.95E-01 | 0.0001 | 1.95E-05 |
| PCB 81 | 6.34 | 3.0E-01 | 0.92 | 8.03E-04 | 6.00E-06 | 2.02E-02 | 0.0003 | 6.07E-06 |
| PCB 105 | 6.79 | 1.2E+01 | 0.97 | 3.38E-02 | 2.40E-04 | 8.52E-01 | 0.00003 | 2.56E-05 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 1.44E-02 | 1.00E-04 | 3.63E-01 | 0.00003 | 1.09E-05 |
| PCB 118 | 7.12 | 1.9E+01 | 1.01 | 5.57E-02 | 3.80E-04 | 1.40E+00 | 0.00003 | 4.20E-05 |
| PCB 123 | 6.98 | 1.5E+00 | 0.99 | 4.32E-03 | 3.00E-05 | 1.09E-01 | 0.00003 | 3.27E-06 |
| PCB 126 | 6.98 | 7.0E-01 | 0.99 | 2.02E-03 | 1.40E-05 | 5.08E-02 | 0.1 | 5.08E-03 |
| PCB 156 | 7.60 | 3.0E+00 | 1.07 | 9.29E-03 | 6.00E-05 | 2.34E-01 | 0.00003 | 7.01E-06 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 3.10E-03 | 2.00E-05 | 7.81E-02 | 0.00003 | 2.34E-06 |
| PCB 167 | 7.50 | 6.6E+00 | 1.06 | 2.02E-02 | 1.32E-04 | 5.08E-01 | 0.00003 | 1.52E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 1.51E-02 | 1.00E-04 | 3.81E-01 | 0.03 | 1.14E-02 |
| PCB 189 | 8.27 | 7.0E-01 | 1.15 | 2.34E-03 | 1.40E-05 | 5.89E-02 | 0.00003 | 1.77E-06 |
| *Congener total:* [8] | | | | | | | | 1.66E-02 |
| ***Northeast*** | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 0.95 | 4.15E-02 | 3.00E-04 | 1.05E+00 | 0.0001 | 1.05E-04 |
| PCB 81 | 6.34 | 1.4E+00 | 0.92 | 3.75E-03 | 2.80E-05 | 9.44E-02 | 0.0003 | 2.83E-05 |
| PCB 105 | 6.79 | 6.5E+01 | 0.97 | 1.83E-01 | 1.30E-03 | 4.62E+00 | 0.00003 | 1.38E-04 |
| PCB 114 | 6.98 | 2.0E+00 | 0.99 | 5.76E-03 | 4.00E-05 | 1.45E-01 | 0.00003 | 4.35E-06 |
| PCB 118 | 7.12 | 1.0E+02 | 1.01 | 2.93E-01 | 2.00E-03 | 7.37E+00 | 0.00003 | 2.21E-04 |
| PCB 123 | 6.98 | 8.7E+00 | 0.99 | 2.51E-02 | 1.74E-04 | 6.31E-01 | 0.00003 | 1.89E-05 |
| PCB 126 | 6.98 | 5.9E+00 | 0.99 | 1.70E-02 | 1.18E-04 | 4.28E-01 | 0.1 | 4.28E-02 |
| PCB 156 | 7.60 | 2.9E+01 | 1.07 | 8.98E-02 | 5.80E-04 | 2.26E+00 | 0.00003 | 6.78E-05 |
| PCB 157 | 7.62 | 6.9E+00 | 1.07 | 2.14E-02 | 1.38E-04 | 5.39E-01 | 0.00003 | 1.62E-05 |
| PCB 167 | 7.50 | 1.6E+01 | 1.06 | 4.90E-02 | 3.20E-04 | 1.23E+00 | 0.00003 | 3.70E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 1.51E-02 | 1.00E-04 | 3.81E-01 | 0.03 | 1.14E-02 |
| PCB 189 | 8.27 | 9.3E+00 | 1.15 | 3.11E-02 | 1.86E-04 | 7.82E-01 | 0.00003 | 2.35E-05 |
| *Congener total:* [8] | | | | | | | | 5.49E-02 |
| ***B-18 Landfill*** | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 0.95 | 4.98E-02 | 3.60E-04 | 1.25E+00 | 0.0001 | 1.25E-04 |
| PCB 81 | 6.34 | 2.4E+00 | 0.92 | 6.43E-03 | 4.80E-05 | 1.62E-01 | 0.0003 | 4.86E-05 |
| PCB 105 | 6.79 | 6.2E+01 | 0.97 | 1.75E-01 | 1.24E-03 | 4.40E+00 | 0.00003 | 1.32E-04 |
| PCB 114 | 6.98 | 2.3E+00 | 0.99 | 6.63E-03 | 4.60E-05 | 1.67E-01 | 0.00003 | 5.01E-06 |
| PCB 118 | 7.12 | 8.5E+01 | 1.01 | 2.49E-01 | 1.70E-03 | 6.27E+00 | 0.00003 | 1.88E-04 |
| PCB 123 | 6.98 | 1.5E+01 | 0.99 | 4.32E-02 | 3.00E-04 | 1.09E+00 | 0.00003 | 3.27E-05 |
| PCB 126 | 6.98 | 3.5E+00 | 0.99 | 1.01E-02 | 7.00E-05 | 2.54E-01 | 0.1 | 2.54E-02 |
| PCB 156 | 7.60 | 3.1E+01 | 1.07 | 9.60E-02 | 6.20E-04 | 2.41E+00 | 0.00003 | 7.24E-05 |
| PCB 157 | 7.62 | 4.8E+00 | 1.07 | 1.49E-02 | 9.60E-05 | 3.75E-01 | 0.00003 | 1.12E-05 |
| PCB 167 | 7.50 | 1.3E+01 | 1.06 | 3.98E-02 | 2.60E-04 | 1.00E+00 | 0.00003 | 3.00E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 1.51E-02 | 1.00E-04 | 3.81E-01 | 0.03 | 1.14E-02 |
| PCB 189 | 8.27 | 8.2E+00 | 1.15 | 2.74E-02 | 1.64E-04 | 6.90E-01 | 0.00003 | 2.07E-05 |
| *Congener total:* [8] | | | | | | | | 3.75E-02 |

**Table 5.4.11**
**Exposure Calculation for the Tulare Grasshopper Mouse - Adult**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for soil-to-invertebrate BAF: soil-to-earthworm bioaccumulation equation for nonionic organic compounds from Connell (1990):
BAF = 0.445(Kow)0.05 . BAF is in units of (invertebrate tissue wet weight concentration) / (soil dry weight concentration).

(5) Exposure dose (ED) calculation:
ED = [(intake from invertebrate ingestion) + (intake from soil ingestion)] x (area foraging factor / body weight).
$ED = [(C_{soil} \times BAF_{inv} \times FIR_{inv}) + (C_{soil} \times SIR_{mouse})] \times [AFF/BW]$.
where:
ED = total exposure dose (ng/kg BW-day).
$C_{soil}$ = concentration in soil (ng/kg).
$FIR_{inv}$ = food ingestion rate (invertebrates) for grasshopper mouse = 0.0029 kg/day. See Table 5.4.2 for basis/source.
$SIR_{mouse}$ = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table 5.4.2 for basis/source.
$BAF_{inv}$ = bioaccumulation factor from soil to invertebrates [(ng/kg wet tissue) / (ng/kg dry soil)].
AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table 5.4.2 for home range.
BW = body weight (kg) = 0.04 kg. See Table 5.4.2 for basis/source.

(6) Mammal TEFs are from USEPA (June 2008).

(7) TED = (exposure dose based on PCB congener concentration) x (TEF).

(8) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram
TED = toxicity equivalence dose
TEF = toxicity equivalence factor

**Table 5.4.12**
**Exposure Calculation for the Tulare Grasshopper Mouse - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | $BAF_{inv}$ (ng/kg)/(ng/kg) [4] | Intake from Invertebrate Ingestion (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (mammal) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 0.95 | 1.58E-02 | 1.10E-04 | 7.93E-01 | 0.0001 | 7.93E-05 |
| PCB 81 | 6.34 | 1.3E+00 | 0.92 | 1.80E-03 | 1.30E-05 | 9.07E-02 | 0.0003 | 2.72E-05 |
| PCB 105 | 6.79 | 3.3E+01 | 0.97 | 4.81E-02 | 3.30E-04 | 2.42E+00 | 0.00003 | 7.27E-05 |
| PCB 114 | 6.98 | 1.6E+00 | 0.99 | 2.39E-03 | 1.60E-05 | 1.20E-01 | 0.00003 | 3.60E-06 |
| PCB 118 | 7.12 | 5.1E+01 | 1.01 | 7.73E-02 | 5.10E-04 | 3.89E+00 | 0.00003 | 1.17E-04 |
| PCB 123 | 6.98 | 5.4E+00 | 0.99 | 8.05E-03 | 5.40E-05 | 4.05E-01 | 0.00003 | 1.22E-05 |
| PCB 126 | 6.98 | 1.5E+00 | 0.99 | 2.24E-03 | 1.50E-05 | 1.13E-01 | 0.1 | 1.13E-02 |
| PCB 156 | 7.60 | 1.3E+01 | 1.07 | 2.08E-02 | 1.30E-04 | 1.05E+00 | 0.00003 | 3.14E-05 |
| PCB 157 | 7.62 | 2.0E+00 | 1.07 | 3.21E-03 | 2.00E-05 | 1.61E-01 | 0.00003 | 4.84E-06 |
| PCB 167 | 7.50 | 5.2E+00 | 1.06 | 8.23E-03 | 5.20E-05 | 4.14E-01 | 0.00003 | 1.24E-05 |
| PCB 169 | 7.41 | 1.1E+00 | 1.04 | 1.72E-03 | 1.10E-05 | 8.67E-02 | 0.03 | 2.60E-03 |
| PCB 189 | 8.27 | 4.3E+00 | 1.15 | 7.44E-03 | 4.30E-05 | 3.74E-01 | 0.00003 | 1.12E-05 |
| *Congener total:* [8] | | | | | | | | 1.42E-02 |
| ***South*** | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 0.95 | 7.59E-03 | 5.30E-05 | 3.82E-01 | 0.0001 | 3.82E-05 |
| PCB 81 | 6.34 | 6.0E-01 | 0.92 | 8.31E-04 | 6.00E-06 | 4.19E-02 | 0.0003 | 1.26E-05 |
| PCB 105 | 6.79 | 2.1E+01 | 0.97 | 3.06E-02 | 2.10E-04 | 1.54E+00 | 0.00003 | 4.63E-05 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 7.45E-03 | 5.00E-05 | 3.75E-01 | 0.00003 | 1.13E-05 |
| PCB 118 | 7.12 | 2.9E+01 | 1.01 | 4.39E-02 | 2.90E-04 | 2.21E+00 | 0.00003 | 6.63E-05 |
| PCB 123 | 6.98 | 1.9E+00 | 0.99 | 2.83E-03 | 1.90E-05 | 1.43E-01 | 0.00003 | 4.28E-06 |
| PCB 126 | 6.98 | 1.2E+00 | 0.99 | 1.79E-03 | 1.20E-05 | 9.01E-02 | 0.1 | 9.01E-03 |
| PCB 156 | 7.60 | 6.8E+00 | 1.07 | 1.09E-02 | 6.80E-05 | 5.48E-01 | 0.00003 | 1.64E-05 |
| PCB 157 | 7.62 | 1.8E+00 | 1.07 | 2.89E-03 | 1.80E-05 | 1.45E-01 | 0.00003 | 4.36E-06 |
| PCB 167 | 7.50 | 3.0E+00 | 1.06 | 4.75E-03 | 3.00E-05 | 2.39E-01 | 0.00003 | 7.17E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 7.83E-03 | 5.00E-05 | 3.94E-01 | 0.03 | 1.18E-02 |
| PCB 189 | 8.27 | 1.6E+00 | 1.15 | 2.77E-03 | 1.60E-05 | 1.39E-01 | 0.00003 | 4.18E-06 |
| *Congener total:* [8] | | | | | | | | 2.10E-02 |
| ***Southwest*** | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 0.95 | 3.72E-03 | 2.60E-05 | 1.87E-01 | 0.0001 | 1.87E-05 |
| PCB 81 | 6.34 | 5.0E+00 | 0.92 | 6.93E-03 | 5.00E-05 | 3.49E-01 | 0.0003 | 1.05E-04 |
| PCB 105 | 6.79 | 1.1E+01 | 0.97 | 1.60E-02 | 1.10E-04 | 8.08E-01 | 0.00003 | 2.42E-05 |
| PCB 114 | 6.98 | 1.0E+00 | 0.99 | 1.49E-03 | 1.00E-05 | 7.50E-02 | 0.00003 | 2.25E-06 |
| PCB 118 | 7.12 | 1.5E+01 | 1.01 | 2.27E-02 | 1.50E-04 | 1.14E+00 | 0.00003 | 3.43E-05 |
| PCB 123 | 6.98 | 1.2E+00 | 0.99 | 1.79E-03 | 1.20E-05 | 9.01E-02 | 0.00003 | 2.70E-06 |
| PCB 126 | 6.98 | 5.0E+00 | 0.99 | 7.45E-03 | 5.00E-05 | 3.75E-01 | 0.1 | 3.75E-02 |
| PCB 156 | 7.60 | 3.9E+00 | 1.07 | 6.24E-03 | 3.90E-05 | 3.14E-01 | 0.00003 | 9.43E-06 |
| PCB 157 | 7.62 | 9.2E-01 | 1.07 | 1.48E-03 | 9.20E-06 | 7.43E-02 | 0.00003 | 2.23E-06 |
| PCB 167 | 7.50 | 1.9E+00 | 1.06 | 3.01E-03 | 1.90E-05 | 1.51E-01 | 0.00003 | 4.54E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 7.83E-03 | 5.00E-05 | 3.94E-01 | 0.03 | 1.18E-02 |
| PCB 189 | 8.27 | 1.2E+00 | 1.15 | 2.08E-03 | 1.20E-05 | 1.04E-01 | 0.00003 | 3.13E-06 |
| *Congener total:* [8] | | | | | | | | 4.96E-02 |
| ***West*** | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 0.95 | 3.29E-03 | 2.30E-05 | 1.66E-01 | 0.0001 | 1.66E-05 |
| PCB 81 | 6.34 | 6.0E-01 | 0.92 | 8.31E-04 | 6.00E-06 | 4.19E-02 | 0.0003 | 1.26E-05 |
| PCB 105 | 6.79 | 1.0E+01 | 0.97 | 1.46E-02 | 1.00E-04 | 7.34E-01 | 0.00003 | 2.20E-05 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 7.45E-03 | 5.00E-05 | 3.75E-01 | 0.00003 | 1.13E-05 |
| PCB 118 | 7.12 | 1.9E+01 | 1.01 | 2.88E-02 | 1.90E-04 | 1.45E+00 | 0.00003 | 4.35E-05 |
| PCB 123 | 6.98 | 1.5E+00 | 0.99 | 2.24E-03 | 1.50E-05 | 1.13E-01 | 0.00003 | 3.38E-06 |
| PCB 126 | 6.98 | 8.0E-01 | 0.99 | 1.19E-03 | 8.00E-06 | 6.00E-02 | 0.1 | 6.00E-03 |
| PCB 156 | 7.60 | 3.9E+00 | 1.07 | 6.24E-03 | 3.90E-05 | 3.14E-01 | 0.00003 | 9.43E-06 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.60E-03 | 1.00E-05 | 8.07E-02 | 0.00003 | 2.42E-06 |
| PCB 167 | 7.50 | 2.2E+00 | 1.06 | 3.48E-03 | 2.20E-05 | 1.75E-01 | 0.00003 | 5.26E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 7.83E-03 | 5.00E-05 | 3.94E-01 | 0.03 | 1.18E-02 |
| PCB 189 | 8.27 | 1.1E+00 | 1.15 | 1.90E-03 | 1.10E-05 | 9.57E-02 | 0.00003 | 2.87E-06 |
| *Congener total:* [8] | | | | | | | | 1.80E-02 |

**Table 5.4.12**
**Exposure Calculation for the Tulare Grasshopper Mouse - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | $BAF_{inv}$ (ng/kg)/(ng/kg) [4] | Intake from Invertebrate Ingestion (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (mammal) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 0.95 | 4.30E-03 | 3.00E-05 | 2.16E-01 | 0.0001 | 2.16E-05 |
| PCB 81 | 6.34 | 5.0E-01 | 0.92 | 6.93E-04 | 5.00E-06 | 3.49E-02 | 0.0003 | 1.05E-05 |
| PCB 105 | 6.79 | 9.5E+00 | 0.97 | 1.39E-02 | 9.50E-05 | 6.98E-01 | 0.00003 | 2.09E-05 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 7.45E-03 | 5.00E-05 | 3.75E-01 | 0.00003 | 1.13E-05 |
| PCB 118 | 7.12 | 1.8E+01 | 1.01 | 2.73E-02 | 1.80E-04 | 1.37E+00 | 0.00003 | 4.12E-05 |
| PCB 123 | 6.98 | 1.3E+00 | 0.99 | 1.94E-03 | 1.30E-05 | 9.76E-02 | 0.00003 | 2.93E-06 |
| PCB 126 | 6.98 | 1.2E+00 | 0.99 | 1.79E-03 | 1.20E-05 | 9.01E-02 | 0.1 | 9.01E-03 |
| PCB 156 | 7.60 | 3.2E+00 | 1.07 | 5.12E-03 | 3.20E-05 | 2.58E-01 | 0.00003 | 7.73E-06 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.60E-03 | 1.00E-05 | 8.07E-02 | 0.00003 | 2.42E-06 |
| PCB 167 | 7.50 | 6.3E+00 | 1.06 | 9.97E-03 | 6.30E-05 | 5.02E-01 | 0.00003 | 1.51E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 7.83E-03 | 5.00E-05 | 3.94E-01 | 0.03 | 1.18E-02 |
| PCB 189 | 8.27 | 4.0E-01 | 1.15 | 6.92E-04 | 4.00E-06 | 3.48E-02 | 0.00003 | 1.04E-06 |
| *Congener total:* [8] | | | | | | | | 2.10E-02 |
| ***North*** | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 0.95 | 4.01E-03 | 2.80E-05 | 2.02E-01 | 0.0001 | 2.02E-05 |
| PCB 81 | 6.34 | 3.0E-01 | 0.92 | 4.16E-04 | 3.00E-06 | 2.09E-02 | 0.0003 | 6.28E-06 |
| PCB 105 | 6.79 | 1.2E+01 | 0.97 | 1.75E-02 | 1.20E-04 | 8.81E-01 | 0.00003 | 2.64E-05 |
| PCB 114 | 6.98 | 5.0E+00 | 0.99 | 7.45E-03 | 5.00E-05 | 3.75E-01 | 0.00003 | 1.13E-05 |
| PCB 118 | 7.12 | 1.9E+01 | 1.01 | 2.88E-02 | 1.90E-04 | 1.45E+00 | 0.00003 | 4.35E-05 |
| PCB 123 | 6.98 | 1.5E+00 | 0.99 | 2.24E-03 | 1.50E-05 | 1.13E-01 | 0.00003 | 3.38E-06 |
| PCB 126 | 6.98 | 7.0E-01 | 0.99 | 1.04E-03 | 7.00E-06 | 5.25E-02 | 0.1 | 5.25E-03 |
| PCB 156 | 7.60 | 3.0E+00 | 1.07 | 4.80E-03 | 3.00E-05 | 2.42E-01 | 0.00003 | 7.25E-06 |
| PCB 157 | 7.62 | 1.0E+00 | 1.07 | 1.60E-03 | 1.00E-05 | 8.07E-02 | 0.00003 | 2.42E-06 |
| PCB 167 | 7.50 | 6.6E+00 | 1.06 | 1.04E-02 | 6.60E-05 | 5.26E-01 | 0.00003 | 1.58E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 7.83E-03 | 5.00E-05 | 3.94E-01 | 0.03 | 1.18E-02 |
| PCB 189 | 8.27 | 7.0E-01 | 1.15 | 1.21E-03 | 7.00E-06 | 6.09E-02 | 0.00003 | 1.83E-06 |
| *Congener total:* [8] | | | | | | | | 1.72E-02 |
| ***Northeast*** | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 0.95 | 2.15E-02 | 1.50E-04 | 1.08E+00 | 0.0001 | 1.08E-04 |
| PCB 81 | 6.34 | 1.4E+00 | 0.92 | 1.94E-03 | 1.40E-05 | 9.77E-02 | 0.0003 | 2.93E-05 |
| PCB 105 | 6.79 | 6.5E+01 | 0.97 | 9.48E-02 | 6.50E-04 | 4.77E+00 | 0.00003 | 1.43E-04 |
| PCB 114 | 6.98 | 2.0E+00 | 0.99 | 2.98E-03 | 2.00E-05 | 1.50E-01 | 0.00003 | 4.50E-06 |
| PCB 118 | 7.12 | 1.0E+02 | 1.01 | 1.52E-01 | 1.00E-03 | 7.63E+00 | 0.00003 | 2.29E-04 |
| PCB 123 | 6.98 | 8.7E+00 | 0.99 | 1.30E-02 | 8.70E-05 | 6.53E-01 | 0.00003 | 1.96E-05 |
| PCB 126 | 6.98 | 5.9E+00 | 0.99 | 8.80E-03 | 5.90E-05 | 4.43E-01 | 0.1 | 4.43E-02 |
| PCB 156 | 7.60 | 2.9E+01 | 1.07 | 4.64E-02 | 2.90E-04 | 2.34E+00 | 0.00003 | 7.01E-05 |
| PCB 157 | 7.62 | 6.9E+00 | 1.07 | 1.11E-02 | 6.90E-05 | 5.57E-01 | 0.00003 | 1.67E-05 |
| PCB 167 | 7.50 | 1.6E+01 | 1.06 | 2.53E-02 | 1.60E-04 | 1.27E+00 | 0.00003 | 3.82E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 7.83E-03 | 5.00E-05 | 3.94E-01 | 0.03 | 1.18E-02 |
| PCB 189 | 8.27 | 9.3E+00 | 1.15 | 1.61E-02 | 9.30E-05 | 8.09E-01 | 0.00003 | 2.43E-05 |
| *Congener total:* [8] | | | | | | | | 5.68E-02 |
| ***B-18 Landfill*** | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 0.95 | 2.58E-02 | 1.80E-04 | 1.30E+00 | 0.0001 | 1.30E-04 |
| PCB 81 | 6.34 | 2.4E+00 | 0.92 | 3.32E-03 | 2.40E-05 | 1.67E-01 | 0.0003 | 5.02E-05 |
| PCB 105 | 6.79 | 6.2E+01 | 0.97 | 9.04E-02 | 6.20E-04 | 4.55E+00 | 0.00003 | 1.37E-04 |
| PCB 114 | 6.98 | 2.3E+00 | 0.99 | 3.43E-03 | 2.30E-05 | 1.73E-01 | 0.00003 | 5.18E-06 |
| PCB 118 | 7.12 | 8.5E+01 | 1.01 | 1.29E-01 | 8.50E-04 | 6.48E+00 | 0.00003 | 1.94E-04 |
| PCB 123 | 6.98 | 1.5E+01 | 0.99 | 2.24E-02 | 1.50E-04 | 1.13E+00 | 0.00003 | 3.38E-05 |
| PCB 126 | 6.98 | 3.5E+00 | 0.99 | 5.22E-03 | 3.50E-05 | 2.63E-01 | 0.1 | 2.63E-02 |
| PCB 156 | 7.60 | 3.1E+01 | 1.07 | 4.96E-02 | 3.10E-04 | 2.50E+00 | 0.00003 | 7.49E-05 |
| PCB 157 | 7.62 | 4.8E+00 | 1.07 | 7.70E-03 | 4.80E-05 | 3.88E-01 | 0.00003 | 1.16E-05 |
| PCB 167 | 7.50 | 1.3E+01 | 1.06 | 2.06E-02 | 1.30E-04 | 1.04E+00 | 0.00003 | 3.11E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.04 | 7.83E-03 | 5.00E-05 | 3.94E-01 | 0.03 | 1.18E-02 |
| PCB 189 | 8.27 | 8.2E+00 | 1.15 | 1.42E-02 | 8.20E-05 | 7.13E-01 | 0.00003 | 2.14E-05 |
| *Congener total:* [8] | | | | | | | | 3.88E-02 |

**Table 5.4.12**
**Exposure Calculation for the Tulare Grasshopper Mouse - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for soil-to-invertebrate BAF: soil-to-earthworm bioaccumulation equation for nonionic organic compounds from Connell (1990):
$BAF = 0.445(Kow)^{0.05}$. BAF is in units of (invertebrate tissue wet weight concentration) / (soil dry weight concentration).

(5) Exposure dose (ED) calculation:
ED = [(intake from invertebrate ingestion) + (intake from soil ingestion)] x (area foraging factor / body weight).
$ED = [(C_{soil} \times BAF_{inv} \times FIR_{inv}) + (C_{soil} \times SIR_{mouse})] \times [AFF/BW]$.
where:
ED = total exposure dose (ng/kg BW-day).
$C_{soil}$ = concentration in soil (ng/kg).
$FIR_{inv}$ = food ingestion rate (invertebrates) for grasshopper mouse = 0.0015 kg/day. See Table 5.4.2 for basis/source.
$SIR_{mouse}$ = soil ingestion rate for grasshopper mouse = 0.00001 kg/day. See Table 5.4.2 for basis/source.
$BAF_{inv}$ = bioaccumulation factor from soil to invertebrates [(ng/kg wet tissue) / (ng/kg dry soil)].
AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table 5.4.2 for home range.
BW = body weight (kg) = 0.02 kg. See Table 5.4.2 for basis/source.

(6) Mammal TEFs are from USEPA (June 2008).

(7) TED = (exposure dose based on PCB congener concentration) x (TEF).

(8) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram
TED = toxicity equivalence dose
TEF = toxicity equivalence factor

**Table 5.4.13**
**Exposure Calculation for the Burrowing Owl - Adult Male Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area (1) | Log Kow (2) | Soil Concentration (ng/kg) (3) | Plant Concentration (ng/kg) (3) | BTF (day/kg) (4) | Intake from Small Mammal Ingestion (ng/day) (5) | Intake from Incidental Soil Ingestion (ng/day) (5) | Exposure Dose (ng/kg BW-day) (5) | TEF (bird) (6) | TED (ng/kg BW-day) (7) |
|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 9.7E+01 | 0.0076 | 3.86E-05 | 4.40E-03 | 2.58E-02 | 0.05 | 1.29E-03 |
| PCB 81 | 6.34 | 1.3E+00 | 1.4E+01 | 0.0088 | 6.32E-06 | 5.20E-04 | 3.06E-03 | 0.1 | 3.06E-04 |
| PCB 105 | 6.79 | 3.3E+01 | 1.5E+02 | 0.0069 | 5.43E-05 | 1.32E-02 | 7.71E-02 | 0.0001 | 7.71E-06 |
| PCB 114 | 6.98 | 1.6E+00 | 8.7E+00 | 0.0061 | 2.77E-06 | 6.40E-04 | 3.74E-03 | 0.0001 | 3.74E-07 |
| PCB 118 | 7.12 | 5.1E+01 | 2.7E+02 | 0.0055 | 7.74E-05 | 2.04E-02 | 1.19E-01 | 0.00001 | 1.19E-06 |
| PCB 123 | 6.98 | 5.4E+00 | 1.7E+01 | 0.0061 | 5.50E-06 | 2.16E-03 | 1.26E-02 | 0.00001 | 1.26E-07 |
| PCB 126 | 6.98 | 1.5E+00 | 1.3E+01 | 0.0061 | 3.99E-06 | 6.00E-04 | 3.51E-03 | 0.1 | 3.51E-04 |
| PCB 156 | 7.60 | 1.3E+01 | 3.3E+01 | 0.0036 | 6.26E-06 | 5.20E-03 | 3.03E-02 | 0.0001 | 3.03E-06 |
| PCB 157 | 7.62 | 2.0E+00 | 6.8E+00 | 0.0035 | 1.25E-06 | 8.00E-04 | 4.66E-03 | 0.0001 | 4.66E-07 |
| PCB 167 | 7.50 | 5.2E+00 | 1.7E+01 | 0.0039 | 3.54E-06 | 2.08E-03 | 1.21E-02 | 0.00001 | 1.21E-07 |
| PCB 169 | 7.41 | 1.1E+00 | 7.5E-01 | 0.0043 | 1.72E-07 | 4.40E-04 | 2.56E-03 | 0.001 | 2.56E-06 |
| PCB 189 | 8.27 | 4.3E+00 | 8.6E+00 | 0.0016 | 7.51E-07 | 1.72E-03 | 1.00E-02 | 0.00001 | 1.00E-07 |
| *Congener total: (8)* | | | | | | | | | 1.96E-03 |
| ***South*** | | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 7.0E+01 | 0.0076 | 2.76E-05 | 2.12E-03 | 1.25E-02 | 0.05 | 6.24E-04 |
| PCB 81 | 6.34 | 6.0E-01 | 6.5E+00 | 0.0088 | 2.94E-06 | 2.40E-04 | 1.41E-03 | 0.1 | 1.41E-04 |
| PCB 105 | 6.79 | 2.1E+01 | 1.3E+02 | 0.0069 | 4.64E-05 | 8.40E-03 | 4.91E-02 | 0.0001 | 4.91E-06 |
| PCB 114 | 6.98 | 5.0E+00 | 5.4E+00 | 0.0061 | 1.73E-06 | 2.00E-03 | 1.16E-02 | 0.0001 | 1.16E-06 |
| PCB 118 | 7.12 | 2.9E+01 | 1.8E+02 | 0.0055 | 5.09E-05 | 1.16E-02 | 6.77E-02 | 0.00001 | 6.77E-07 |
| PCB 123 | 6.98 | 1.9E+00 | 7.3E+00 | 0.0061 | 2.31E-06 | 7.60E-04 | 4.43E-03 | 0.00001 | 4.43E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 7.1E+00 | 0.0061 | 2.23E-06 | 4.80E-04 | 2.80E-03 | 0.1 | 2.80E-04 |
| PCB 156 | 7.60 | 6.8E+00 | 2.1E+01 | 0.0036 | 3.89E-06 | 2.72E-03 | 1.58E-02 | 0.0001 | 1.58E-06 |
| PCB 157 | 7.62 | 1.8E+00 | 4.8E+00 | 0.0035 | 8.72E-07 | 7.20E-04 | 4.19E-03 | 0.0001 | 4.19E-07 |
| PCB 167 | 7.50 | 3.0E+00 | 2.4E+01 | 0.0039 | 4.89E-06 | 1.20E-03 | 7.01E-03 | 0.00001 | 7.01E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 6.6E-01 | 0.0043 | 1.71E-07 | 2.00E-03 | 1.16E-02 | 0.001 | 1.16E-05 |
| PCB 189 | 8.27 | 1.6E+00 | 1.2E+00 | 0.0016 | 1.01E-07 | 6.40E-04 | 3.72E-03 | 0.00001 | 3.72E-08 |
| *Congener total: (8)* | | | | | | | | | 1.07E-03 |
| ***Southwest*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 9.2E+00 | 0.0076 | 3.42E-06 | 1.04E-03 | 6.07E-03 | 0.05 | 3.03E-04 |
| PCB 81 | 6.34 | 5.0E+00 | 1.1E+00 | 0.0088 | 4.98E-07 | 2.00E-03 | 1.16E-02 | 0.1 | 1.16E-03 |
| PCB 105 | 6.79 | 1.1E+01 | 1.9E+01 | 0.0069 | 6.53E-06 | 4.40E-03 | 2.56E-02 | 0.0001 | 2.56E-06 |
| PCB 114 | 6.98 | 1.0E+00 | 1.1E+00 | 0.0061 | 3.16E-07 | 4.00E-04 | 2.33E-03 | 0.0001 | 2.33E-07 |
| PCB 118 | 7.12 | 1.5E+01 | 2.9E+01 | 0.0055 | 7.82E-06 | 6.00E-03 | 3.49E-02 | 0.00001 | 3.49E-07 |
| PCB 123 | 6.98 | 1.2E+00 | 1.6E+00 | 0.0061 | 4.85E-07 | 4.80E-04 | 2.79E-03 | 0.00001 | 2.79E-08 |
| PCB 126 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 3.45E-07 | 2.00E-03 | 1.16E-02 | 0.1 | 1.16E-03 |
| PCB 156 | 7.60 | 3.9E+00 | 4.2E+00 | 0.0036 | 7.37E-07 | 1.56E-03 | 9.07E-03 | 0.0001 | 9.07E-07 |
| PCB 157 | 7.62 | 9.2E-01 | 1.9E+00 | 0.0035 | 3.34E-07 | 3.68E-04 | 2.14E-03 | 0.0001 | 2.14E-07 |
| PCB 167 | 7.50 | 1.9E+00 | 1.0E+01 | 0.0039 | 2.00E-06 | 7.60E-04 | 4.43E-03 | 0.00001 | 4.43E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 2.43E-07 | 2.00E-03 | 1.16E-02 | 0.001 | 1.16E-05 |
| PCB 189 | 8.27 | 1.2E+00 | 1.1E+00 | 0.0016 | 8.61E-08 | 4.80E-04 | 2.79E-03 | 0.00001 | 2.79E-08 |
| *Congener total: (8)* | | | | | | | | | 2.65E-03 |
| ***West*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 1.2E+01 | 0.0076 | 4.77E-06 | 9.20E-04 | 5.38E-03 | 0.05 | 2.69E-04 |
| PCB 81 | 6.34 | 6.0E-01 | 1.7E+00 | 0.0088 | 8.02E-07 | 2.40E-04 | 1.40E-03 | 0.1 | 1.40E-04 |
| PCB 105 | 6.79 | 1.0E+01 | 1.9E+01 | 0.0069 | 7.30E-06 | 4.00E-03 | 2.33E-02 | 0.0001 | 2.33E-06 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 3.97E-07 | 2.00E-03 | 1.16E-02 | 0.0001 | 1.16E-06 |
| PCB 118 | 7.12 | 1.9E+01 | 3.0E+01 | 0.0055 | 8.86E-06 | 7.60E-03 | 4.42E-02 | 0.00001 | 4.42E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 1.9E+00 | 0.0061 | 6.24E-07 | 6.00E-04 | 3.49E-03 | 0.00001 | 3.49E-08 |
| PCB 126 | 6.98 | 8.0E-01 | 1.1E+00 | 0.0061 | 3.66E-07 | 3.20E-04 | 1.86E-03 | 0.1 | 1.86E-04 |
| PCB 156 | 7.60 | 3.9E+00 | 3.6E+00 | 0.0036 | 7.08E-07 | 1.56E-03 | 9.07E-03 | 0.0001 | 9.07E-07 |
| PCB 157 | 7.62 | 1.0E+00 | 8.0E-01 | 0.0035 | 1.55E-07 | 4.00E-04 | 2.33E-03 | 0.0001 | 2.33E-07 |
| PCB 167 | 7.50 | 2.2E+00 | 8.1E+00 | 0.0039 | 1.72E-06 | 8.80E-04 | 5.13E-03 | 0.00001 | 5.13E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 4.8E-01 | 0.0043 | 1.37E-07 | 2.00E-03 | 1.16E-02 | 0.001 | 1.16E-05 |
| PCB 189 | 8.27 | 1.1E+00 | 1.1E+00 | 0.0016 | 9.98E-08 | 4.40E-04 | 2.56E-03 | 0.00001 | 2.56E-08 |
| *Congener total: (8)* | | | | | | | | | 6.12E-04 |

**Table 5.4.13**
**Exposure Calculation for the Burrowing Owl - Adult Male Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area(1) | Log Kow (2) | Soil Concentration (ng/kg) (3) | Plant Concentration (ng/kg) (3) | BTF (day/kg) (4) | Intake from Small Mammal Ingestion (ng/day) (5) | Intake from Incidental Soil Ingestion (ng/day) (5) | Exposure Dose (ng/kg BW-day) (5) | TEF (bird) (6) | TED (ng/kg BW-day) (7) |
|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 6.9E+00 | 0.0076 | 2.56E-06 | 1.20E-03 | 6.99E-03 | 0.05 | 3.50E-04 |
| PCB 81 | 6.34 | 5.0E-01 | 1.1E+00 | 0.0088 | 4.53E-07 | 2.00E-04 | 1.17E-03 | 0.1 | 1.17E-04 |
| PCB 105 | 6.79 | 9.5E+00 | 9.8E+00 | 0.0069 | 3.37E-06 | 3.80E-03 | 2.21E-02 | 0.0001 | 2.21E-06 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 3.47E-07 | 2.00E-03 | 1.16E-02 | 0.0001 | 1.16E-06 |
| PCB 118 | 7.12 | 1.8E+01 | 2.0E+01 | 0.0055 | 5.36E-06 | 7.20E-03 | 4.19E-02 | 0.00001 | 4.19E-07 |
| PCB 123 | 6.98 | 1.3E+00 | 7.0E-01 | 0.0061 | 2.16E-07 | 5.20E-04 | 3.02E-03 | 0.00001 | 3.02E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 1.1E+00 | 0.0061 | 3.19E-07 | 4.80E-04 | 2.79E-03 | 0.1 | 2.79E-04 |
| PCB 156 | 7.60 | 3.2E+00 | 2.1E+00 | 0.0036 | 3.75E-07 | 1.28E-03 | 7.44E-03 | 0.0001 | 7.44E-07 |
| PCB 157 | 7.62 | 1.0E+00 | 1.6E+00 | 0.0035 | 2.77E-07 | 4.00E-04 | 2.33E-03 | 0.0001 | 2.33E-07 |
| PCB 167 | 7.50 | 6.3E+00 | 6.0E+00 | 0.0039 | 1.18E-06 | 2.52E-03 | 1.47E-02 | 0.00001 | 1.47E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 2.44E-07 | 2.00E-03 | 1.16E-02 | 0.001 | 1.16E-05 |
| PCB 189 | 8.27 | 4.0E-01 | 1.1E+00 | 0.0016 | 8.48E-08 | 1.60E-04 | 9.31E-04 | 0.00001 | 9.31E-09 |
| *Congener total:* (8) | | | | | | | | | 7.62E-04 |
| ***North*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 7.8E+00 | 0.0076 | 3.00E-06 | 1.12E-03 | 6.53E-03 | 0.05 | 3.26E-04 |
| PCB 81 | 6.34 | 3.0E-01 | 6.0E-01 | 0.0088 | 2.69E-07 | 1.20E-04 | 6.99E-04 | 0.1 | 6.99E-05 |
| PCB 105 | 6.79 | 1.2E+01 | 1.3E+01 | 0.0069 | 4.50E-06 | 4.80E-03 | 2.79E-02 | 0.0001 | 2.79E-06 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 3.58E-07 | 2.00E-03 | 1.16E-02 | 0.0001 | 1.16E-06 |
| PCB 118 | 7.12 | 1.9E+01 | 2.9E+01 | 0.0055 | 7.98E-06 | 7.60E-03 | 4.42E-02 | 0.00001 | 4.42E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 5.6E-01 | 0.0061 | 1.81E-07 | 6.00E-04 | 3.49E-03 | 0.00001 | 3.49E-08 |
| PCB 126 | 6.98 | 7.0E-01 | 1.1E+00 | 0.0061 | 3.27E-07 | 2.80E-04 | 1.63E-03 | 0.1 | 1.63E-04 |
| PCB 156 | 7.60 | 3.0E+00 | 2.5E+00 | 0.0036 | 4.56E-07 | 1.20E-03 | 6.98E-03 | 0.0001 | 6.98E-07 |
| PCB 157 | 7.62 | 1.0E+00 | 5.4E-01 | 0.0035 | 9.93E-08 | 4.00E-04 | 2.33E-03 | 0.0001 | 2.33E-07 |
| PCB 167 | 7.50 | 6.6E+00 | 5.1E+00 | 0.0039 | 1.03E-06 | 2.64E-03 | 1.54E-02 | 0.00001 | 1.54E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 2.52E-07 | 2.00E-03 | 1.16E-02 | 0.001 | 1.16E-05 |
| PCB 189 | 8.27 | 7.0E-01 | 4.7E-01 | 0.0016 | 4.00E-08 | 2.80E-04 | 1.63E-03 | 0.00001 | 1.63E-08 |
| *Congener total:* (8) | | | | | | | | | 5.77E-04 |
| ***Northeast*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 1.3E+01 | 0.0076 | 4.75E-06 | 6.00E-03 | 3.49E-02 | 0.05 | 1.75E-03 |
| PCB 81 | 6.34 | 1.4E+00 | 6.4E-01 | 0.0088 | 2.85E-07 | 5.60E-04 | 3.26E-03 | 0.1 | 3.26E-04 |
| PCB 105 | 6.79 | 6.5E+01 | 2.3E+01 | 0.0069 | 8.13E-06 | 2.60E-02 | 1.51E-01 | 0.0001 | 1.51E-05 |
| PCB 114 | 6.98 | 2.0E+00 | 1.1E+00 | 0.0061 | 3.38E-07 | 8.00E-04 | 4.65E-03 | 0.0001 | 4.65E-07 |
| PCB 118 | 7.12 | 1.0E+02 | 4.4E+01 | 0.0055 | 1.23E-05 | 4.00E-02 | 2.33E-01 | 0.00001 | 2.33E-06 |
| PCB 123 | 6.98 | 8.7E+00 | 7.6E-01 | 0.0061 | 2.87E-07 | 3.48E-03 | 2.02E-02 | 0.00001 | 2.02E-07 |
| PCB 126 | 6.98 | 5.9E+00 | 1.1E+00 | 0.0061 | 3.66E-07 | 2.36E-03 | 1.37E-02 | 0.1 | 1.37E-03 |
| PCB 156 | 7.60 | 2.9E+01 | 4.8E+00 | 0.0036 | 9.46E-07 | 1.16E-02 | 6.74E-02 | 0.0001 | 6.74E-06 |
| PCB 157 | 7.62 | 6.9E+00 | 1.8E+00 | 0.0035 | 3.27E-07 | 2.76E-03 | 1.60E-02 | 0.0001 | 1.60E-06 |
| PCB 167 | 7.50 | 1.6E+01 | 1.3E+01 | 0.0039 | 2.46E-06 | 6.40E-03 | 3.72E-02 | 0.00001 | 3.72E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 3.3E-01 | 0.0043 | 9.42E-08 | 2.00E-03 | 1.16E-02 | 0.001 | 1.16E-05 |
| PCB 189 | 8.27 | 9.3E+00 | 1.1E+00 | 0.0016 | 1.06E-07 | 3.72E-03 | 2.16E-02 | 0.00001 | 2.16E-07 |
| *Congener total:* (8) | | | | | | | | | 3.48E-03 |
| ***B-18 Landfill*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 1.7E+02 | 0.0076 | 6.25E-05 | 7.20E-03 | 4.22E-02 | 0.05 | 2.11E-03 |
| PCB 81 | 6.34 | 2.4E+00 | 1.2E+01 | 0.0088 | 4.89E-06 | 9.60E-04 | 5.61E-03 | 0.1 | 5.61E-04 |
| PCB 105 | 6.79 | 6.2E+01 | 3.1E+02 | 0.0069 | 1.04E-04 | 2.48E-02 | 1.45E-01 | 0.0001 | 1.45E-05 |
| PCB 114 | 6.98 | 2.3E+00 | 2.1E+01 | 0.0061 | 6.17E-06 | 9.20E-04 | 5.38E-03 | 0.0001 | 5.38E-07 |
| PCB 118 | 7.12 | 8.5E+01 | 5.2E+02 | 0.0055 | 1.38E-04 | 3.40E-02 | 1.98E-01 | 0.00001 | 1.98E-06 |
| PCB 123 | 6.98 | 1.5E+01 | 3.1E+01 | 0.0061 | 9.19E-06 | 6.00E-03 | 3.49E-02 | 0.00001 | 3.49E-07 |
| PCB 126 | 6.98 | 3.5E+00 | 1.0E+01 | 0.0061 | 3.09E-06 | 1.40E-03 | 8.16E-03 | 0.1 | 8.16E-04 |
| PCB 156 | 7.60 | 3.1E+01 | 9.9E+01 | 0.0036 | 1.72E-05 | 1.24E-02 | 7.22E-02 | 0.0001 | 7.22E-06 |
| PCB 157 | 7.62 | 4.8E+00 | 1.6E+01 | 0.0035 | 2.72E-06 | 1.92E-03 | 1.12E-02 | 0.0001 | 1.12E-06 |
| PCB 167 | 7.50 | 1.3E+01 | 6.3E+01 | 0.0039 | 1.20E-05 | 5.20E-03 | 3.03E-02 | 0.00001 | 3.03E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 3.2E+00 | 0.0043 | 6.86E-07 | 2.00E-03 | 1.16E-02 | 0.001 | 1.16E-05 |
| PCB 189 | 8.27 | 8.2E+00 | 1.1E+00 | 0.0016 | 1.03E-07 | 3.28E-03 | 1.91E-02 | 0.00001 | 1.91E-07 |
| *Congener total:* (8) | | | | | | | | | 3.53E-03 |

**Table 5.4.13**
**Exposure Calculation for the Burrowing Owl - Adult Male Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for BTF (biotransfer factor from diet to small mammal tissue): diet-to-fat transfer equation from RTI (2005): Log BTF = -0.099(log Kow)$^2$ + 1.07(log Kow) - 3.56
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of wild rodents of 5% (0.05 kg fat/kg BW) to convert transfer factor to whole body basis.
Fat composition based on upper end of range from study of mice and kangaroo rats at arid prairie site in Pueblo, Colorado (Sovell et al. 2004).

(5) Exposure dose (ED) calculation:

ED = [(intake from small mammal ingestion) + (intake from soil ingestion)] x (area foraging factor / body weight).

ED = {[((C$_{plants}$ x FIR$_{mouse}$ x CF$_{dw}$) + (C$_{soil}$ x SIR$_{mouse}$)) x BTF x FIR$_{owl}$] + (C$_{soil}$ x SIR$_{owl}$)} x {AFF/BW}.

where:

ED = total exposure dose (ng/kg BW-day).

C$_{plants}$ = concentration in plants (ng/kg).

C$_{soil}$ = concentration in soil (ng/kg).

FIR$_{mouse}$ = food ingestion rate (plants) for mouse = 0.00089 kg/day (based on San Joaquin pocket mouse).

FIR$_{owl}$ = food ingestion rate (mice) for owl = 0.066 kg/day. See Table 5.4.2 for basis/source.

SIR$_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table 5.4.2 for basis/source.

SIR$_{owl}$ = soil ingestion rate for owl (kg/day) = 0.0004 kg/day. See Table 5.4.2 for basis/source.

CF$_{dw}$ = dry-to-wet-weight conversion factor for plants, based on % moisture in vegetation (mean of April and August samples) from each exposure area
(southeast 11.3%, south 12.4%, southwest 17.6%, west 8.3%, northwest 17.3%, north 14.3%, northeast 17.7%, B-18 18%) = 1- fraction moisture =
0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.917 for west, 0.827 for northwest, 0.857 for north, 0.823 for northeast, 0.82 for B-18 landfill

BTF = biotransfer factor from diet to small mammal (day/kg).

AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table 5.4.2 for home range.

BW = body weight (kg) = 0.172 kg. See Table 5.4.2 for basis/source.

(6) Avian TEFs are from USEPA (June 2008).

(7) TED = (exposure dose based on PCB congener concentration) x (TEF).

(8) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

**Table 5.4.14**
**Exposure Calculation for the Burrowing Owl - Female/Juvenile Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area (1) | Log Kow (2) | Soil Concentration (ng/kg) (3) | Plant Concentration (ng/kg) (3) | BTF (day/kg) (4) | Intake from Small Mammal Ingestion (ng/day) (5) | Intake from Incidental Soil Ingestion (ng/day) (5) | Exposure Dose (ng/kg BW-day) (5) | TEF (bird) (6) | TED (ng/kg BW-day) (7) |
|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 9.7E+01 | 0.0076 | 3.04E-05 | 3.30E-03 | 2.64E-02 | 0.05 | 1.32E-03 |
| PCB 81 | 6.34 | 1.3E+00 | 1.4E+01 | 0.0088 | 4.98E-06 | 3.90E-04 | 3.13E-03 | 0.1 | 3.13E-04 |
| PCB 105 | 6.79 | 3.3E+01 | 1.5E+02 | 0.0069 | 4.28E-05 | 9.90E-03 | 7.89E-02 | 0.0001 | 7.89E-06 |
| PCB 114 | 6.98 | 1.6E+00 | 8.7E+00 | 0.0061 | 2.18E-06 | 4.80E-04 | 3.83E-03 | 0.0001 | 3.83E-07 |
| PCB 118 | 7.12 | 5.1E+01 | 2.7E+02 | 0.0055 | 6.10E-05 | 1.53E-02 | 1.22E-01 | 0.00001 | 1.22E-06 |
| PCB 123 | 6.98 | 5.4E+00 | 1.7E+01 | 0.0061 | 4.33E-06 | 1.62E-03 | 1.29E-02 | 0.00001 | 1.29E-07 |
| PCB 126 | 6.98 | 1.5E+00 | 1.3E+01 | 0.0061 | 3.15E-06 | 4.50E-04 | 3.60E-03 | 0.1 | 3.60E-04 |
| PCB 156 | 7.60 | 1.3E+01 | 3.3E+01 | 0.0036 | 4.93E-06 | 3.90E-03 | 3.10E-02 | 0.0001 | 3.10E-06 |
| PCB 157 | 7.62 | 2.0E+00 | 6.8E+00 | 0.0035 | 9.83E-07 | 6.00E-04 | 4.77E-03 | 0.0001 | 4.77E-07 |
| PCB 167 | 7.50 | 5.2E+00 | 1.7E+01 | 0.0039 | 2.79E-06 | 1.56E-03 | 1.24E-02 | 0.00001 | 1.24E-07 |
| PCB 169 | 7.41 | 1.1E+00 | 7.5E-01 | 0.0043 | 1.36E-07 | 3.30E-04 | 2.62E-03 | 0.001 | 2.62E-06 |
| PCB 189 | 8.27 | 4.3E+00 | 8.6E+00 | 0.0016 | 5.91E-07 | 1.29E-03 | 1.02E-02 | 0.00001 | 1.02E-07 |
| *Congener total:* (8) | | | | | | | | | 2.01E-03 |
| ***South*** | | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 7.0E+01 | 0.0076 | 2.17E-05 | 1.59E-03 | 1.28E-02 | 0.05 | 6.40E-04 |
| PCB 81 | 6.34 | 6.0E-01 | 6.5E+00 | 0.0088 | 2.32E-06 | 1.80E-04 | 1.45E-03 | 0.1 | 1.45E-04 |
| PCB 105 | 6.79 | 2.1E+01 | 1.3E+02 | 0.0069 | 3.66E-05 | 6.30E-03 | 5.03E-02 | 0.0001 | 5.03E-06 |
| PCB 114 | 6.98 | 5.0E+00 | 5.4E+00 | 0.0061 | 1.36E-06 | 1.50E-03 | 1.19E-02 | 0.0001 | 1.19E-06 |
| PCB 118 | 7.12 | 2.9E+01 | 1.8E+02 | 0.0055 | 4.01E-05 | 8.70E-03 | 6.94E-02 | 0.00001 | 6.94E-07 |
| PCB 123 | 6.98 | 1.9E+00 | 7.3E+00 | 0.0061 | 1.82E-06 | 5.70E-04 | 4.54E-03 | 0.00001 | 4.54E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 7.1E+00 | 0.0061 | 1.76E-06 | 3.60E-04 | 2.87E-03 | 0.1 | 2.87E-04 |
| PCB 156 | 7.60 | 6.8E+00 | 2.1E+01 | 0.0036 | 3.06E-06 | 2.04E-03 | 1.62E-02 | 0.0001 | 1.62E-06 |
| PCB 157 | 7.62 | 1.8E+00 | 4.8E+00 | 0.0035 | 6.87E-07 | 5.40E-04 | 4.29E-03 | 0.0001 | 4.29E-07 |
| PCB 167 | 7.50 | 3.0E+00 | 2.4E+01 | 0.0039 | 3.85E-06 | 9.00E-04 | 7.17E-03 | 0.00001 | 7.17E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 6.6E-01 | 0.0043 | 1.34E-07 | 1.50E-03 | 1.19E-02 | 0.001 | 1.19E-05 |
| PCB 189 | 8.27 | 1.6E+00 | 1.2E+00 | 0.0016 | 7.93E-08 | 4.80E-04 | 3.81E-03 | 0.00001 | 3.81E-08 |
| *Congener total:* (8) | | | | | | | | | 1.09E-03 |
| ***Southwest*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 9.2E+00 | 0.0076 | 2.70E-06 | 7.80E-04 | 6.21E-03 | 0.05 | 3.11E-04 |
| PCB 81 | 6.34 | 5.0E+00 | 1.1E+00 | 0.0088 | 3.93E-07 | 1.50E-03 | 1.19E-02 | 0.1 | 1.19E-03 |
| PCB 105 | 6.79 | 1.1E+01 | 1.9E+01 | 0.0069 | 5.14E-06 | 3.30E-03 | 2.62E-02 | 0.0001 | 2.62E-06 |
| PCB 114 | 6.98 | 1.0E+00 | 1.1E+00 | 0.0061 | 2.49E-07 | 3.00E-04 | 2.38E-03 | 0.0001 | 2.38E-07 |
| PCB 118 | 7.12 | 1.5E+01 | 2.9E+01 | 0.0055 | 6.16E-06 | 4.50E-03 | 3.58E-02 | 0.00001 | 3.58E-07 |
| PCB 123 | 6.98 | 1.2E+00 | 1.6E+00 | 0.0061 | 3.82E-07 | 3.60E-04 | 2.86E-03 | 0.00001 | 2.86E-08 |
| PCB 126 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 2.72E-07 | 1.50E-03 | 1.19E-02 | 0.1 | 1.19E-03 |
| PCB 156 | 7.60 | 3.9E+00 | 4.2E+00 | 0.0036 | 5.81E-07 | 1.17E-03 | 9.29E-03 | 0.0001 | 9.29E-07 |
| PCB 157 | 7.62 | 9.2E-01 | 1.9E+00 | 0.0035 | 2.63E-07 | 2.76E-04 | 2.19E-03 | 0.0001 | 2.19E-07 |
| PCB 167 | 7.50 | 1.9E+00 | 1.0E+01 | 0.0039 | 1.57E-06 | 5.70E-04 | 4.54E-03 | 0.00001 | 4.54E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 1.92E-07 | 1.50E-03 | 1.19E-02 | 0.001 | 1.19E-05 |
| PCB 189 | 8.27 | 1.2E+00 | 1.1E+00 | 0.0016 | 6.78E-08 | 3.60E-04 | 2.86E-03 | 0.00001 | 2.86E-08 |
| *Congener total:* (8) | | | | | | | | | 2.71E-03 |
| ***West*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 1.2E+01 | 0.0076 | 3.76E-06 | 6.90E-04 | 5.51E-03 | 0.05 | 2.75E-04 |
| PCB 81 | 6.34 | 6.0E-01 | 1.7E+00 | 0.0088 | 6.32E-07 | 1.80E-04 | 1.43E-03 | 0.1 | 1.43E-04 |
| PCB 105 | 6.79 | 1.0E+01 | 1.9E+01 | 0.0069 | 5.75E-06 | 3.00E-03 | 2.39E-02 | 0.0001 | 2.39E-06 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 3.13E-07 | 1.50E-03 | 1.19E-02 | 0.0001 | 1.19E-06 |
| PCB 118 | 7.12 | 1.9E+01 | 3.0E+01 | 0.0055 | 6.98E-06 | 5.70E-03 | 4.53E-02 | 0.00001 | 4.53E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 1.9E+00 | 0.0061 | 4.92E-07 | 4.50E-04 | 3.58E-03 | 0.00001 | 3.58E-08 |
| PCB 126 | 6.98 | 8.0E-01 | 1.1E+00 | 0.0061 | 2.89E-07 | 2.40E-04 | 1.91E-03 | 0.1 | 1.91E-04 |
| PCB 156 | 7.60 | 3.9E+00 | 3.6E+00 | 0.0036 | 5.58E-07 | 1.17E-03 | 9.29E-03 | 0.0001 | 9.29E-07 |
| PCB 157 | 7.62 | 1.0E+00 | 8.0E-01 | 0.0035 | 1.22E-07 | 3.00E-04 | 2.38E-03 | 0.0001 | 2.38E-07 |
| PCB 167 | 7.50 | 2.2E+00 | 8.1E+00 | 0.0039 | 1.36E-06 | 6.60E-04 | 5.25E-03 | 0.00001 | 5.25E-08 |
| PCB 169 | 7.41 | 5.0E+00 | 4.8E-01 | 0.0043 | 1.08E-07 | 1.50E-03 | 1.19E-02 | 0.001 | 1.19E-05 |
| PCB 189 | 8.27 | 1.1E+00 | 1.1E+00 | 0.0016 | 7.86E-08 | 3.30E-04 | 2.62E-03 | 0.00001 | 2.62E-08 |
| *Congener total:* (8) | | | | | | | | | 6.27E-04 |

**Table 5.4.14**
**Exposure Calculation for the Burrowing Owl - Female/Juvenile Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area (1) | Log Kow (2) | Soil Concentration (ng/kg) (3) | Plant Concentration (ng/kg) (3) | BTF (day/kg) (4) | Intake from Small Mammal Ingestion (ng/day) (5) | Intake from Incidental Soil Ingestion (ng/day) (5) | Exposure Dose (ng/kg BW-day) (5) | TEF (bird) (6) | TED (ng/kg BW-day) (7) |
|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 6.9E+00 | 0.0076 | 2.02E-06 | 9.00E-04 | 7.16E-03 | 0.05 | 3.58E-04 |
| PCB 81 | 6.34 | 5.0E-01 | 1.1E+00 | 0.0088 | 3.57E-07 | 1.50E-04 | 1.19E-03 | 0.1 | 1.19E-04 |
| PCB 105 | 6.79 | 9.5E+00 | 9.8E+00 | 0.0069 | 2.66E-06 | 2.85E-03 | 2.26E-02 | 0.0001 | 2.26E-06 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 2.73E-07 | 1.50E-03 | 1.19E-02 | 0.0001 | 1.19E-06 |
| PCB 118 | 7.12 | 1.8E+01 | 2.0E+01 | 0.0055 | 4.23E-06 | 5.40E-03 | 4.29E-02 | 0.00001 | 4.29E-07 |
| PCB 123 | 6.98 | 1.3E+00 | 7.0E-01 | 0.0061 | 1.71E-07 | 3.90E-04 | 3.10E-03 | 0.00001 | 3.10E-08 |
| PCB 126 | 6.98 | 1.2E+00 | 1.1E+00 | 0.0061 | 2.51E-07 | 3.60E-04 | 2.86E-03 | 0.1 | 2.86E-04 |
| PCB 156 | 7.60 | 3.2E+00 | 2.1E+00 | 0.0036 | 2.96E-07 | 9.60E-04 | 7.62E-03 | 0.0001 | 7.62E-07 |
| PCB 157 | 7.62 | 1.0E+00 | 1.6E+00 | 0.0035 | 2.19E-07 | 3.00E-04 | 2.38E-03 | 0.0001 | 2.38E-07 |
| PCB 167 | 7.50 | 6.3E+00 | 6.0E+00 | 0.0039 | 9.27E-07 | 1.89E-03 | 1.50E-02 | 0.00001 | 1.50E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 1.92E-07 | 1.50E-03 | 1.19E-02 | 0.001 | 1.19E-05 |
| PCB 189 | 8.27 | 4.0E-01 | 1.1E+00 | 0.0016 | 6.68E-08 | 1.20E-04 | 9.53E-04 | 0.00001 | 9.53E-09 |
| *Congener total:* (8) | | | | | | | | | 7.80E-04 |
| ***North*** | | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 7.8E+00 | 0.0076 | 2.37E-06 | 8.40E-04 | 6.69E-03 | 0.05 | 3.34E-04 |
| PCB 81 | 6.34 | 3.0E-01 | 6.0E-01 | 0.0088 | 2.12E-07 | 9.00E-05 | 7.16E-04 | 0.1 | 7.16E-05 |
| PCB 105 | 6.79 | 1.2E+01 | 1.3E+01 | 0.0069 | 3.54E-06 | 3.60E-03 | 2.86E-02 | 0.0001 | 2.86E-06 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.0061 | 2.82E-07 | 1.50E-03 | 1.19E-02 | 0.0001 | 1.19E-06 |
| PCB 118 | 7.12 | 1.9E+01 | 2.9E+01 | 0.0055 | 6.29E-06 | 5.70E-03 | 4.53E-02 | 0.00001 | 4.53E-07 |
| PCB 123 | 6.98 | 1.5E+00 | 5.6E-01 | 0.0061 | 1.43E-07 | 4.50E-04 | 3.57E-03 | 0.00001 | 3.57E-08 |
| PCB 126 | 6.98 | 7.0E-01 | 1.1E+00 | 0.0061 | 2.57E-07 | 2.10E-04 | 1.67E-03 | 0.1 | 1.67E-04 |
| PCB 156 | 7.60 | 3.0E+00 | 2.5E+00 | 0.0036 | 3.59E-07 | 9.00E-04 | 7.15E-03 | 0.0001 | 7.15E-07 |
| PCB 157 | 7.62 | 1.0E+00 | 5.4E-01 | 0.0035 | 7.82E-08 | 3.00E-04 | 2.38E-03 | 0.0001 | 2.38E-07 |
| PCB 167 | 7.50 | 6.6E+00 | 5.1E+00 | 0.0039 | 8.14E-07 | 1.98E-03 | 1.57E-02 | 0.00001 | 1.57E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 0.0043 | 1.98E-07 | 1.50E-03 | 1.19E-02 | 0.001 | 1.19E-05 |
| PCB 189 | 8.27 | 7.0E-01 | 4.7E-01 | 0.0016 | 3.15E-08 | 2.10E-04 | 1.67E-03 | 0.00001 | 1.67E-08 |
| *Congener total:* (8) | | | | | | | | | 5.90E-04 |
| ***Northeast*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 1.3E+01 | 0.0076 | 3.75E-06 | 4.50E-03 | 3.57E-02 | 0.05 | 1.79E-03 |
| PCB 81 | 6.34 | 1.4E+00 | 6.4E-01 | 0.0088 | 2.24E-07 | 4.20E-04 | 3.34E-03 | 0.1 | 3.34E-04 |
| PCB 105 | 6.79 | 6.5E+01 | 2.3E+01 | 0.0069 | 6.41E-06 | 1.95E-02 | 1.55E-01 | 0.0001 | 1.55E-05 |
| PCB 114 | 6.98 | 2.0E+00 | 1.1E+00 | 0.0061 | 2.66E-07 | 6.00E-04 | 4.76E-03 | 0.0001 | 4.76E-07 |
| PCB 118 | 7.12 | 1.0E+02 | 4.4E+01 | 0.0055 | 9.70E-06 | 3.00E-02 | 2.38E-01 | 0.00001 | 2.38E-06 |
| PCB 123 | 6.98 | 8.7E+00 | 7.6E-01 | 0.0061 | 2.26E-07 | 2.61E-03 | 2.07E-02 | 0.00001 | 2.07E-07 |
| PCB 126 | 6.98 | 5.9E+00 | 1.1E+00 | 0.0061 | 2.89E-07 | 1.77E-03 | 1.40E-02 | 0.1 | 1.40E-03 |
| PCB 156 | 7.60 | 2.9E+01 | 4.8E+00 | 0.0036 | 7.45E-07 | 8.70E-03 | 6.91E-02 | 0.0001 | 6.91E-06 |
| PCB 157 | 7.62 | 6.9E+00 | 1.8E+00 | 0.0035 | 2.57E-07 | 2.07E-03 | 1.64E-02 | 0.0001 | 1.64E-06 |
| PCB 167 | 7.50 | 1.6E+01 | 1.3E+01 | 0.0039 | 1.94E-06 | 4.80E-03 | 3.81E-02 | 0.00001 | 3.81E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 3.3E-01 | 0.0043 | 7.42E-08 | 1.50E-03 | 1.19E-02 | 0.001 | 1.19E-05 |
| PCB 189 | 8.27 | 9.3E+00 | 1.1E+00 | 0.0016 | 8.34E-08 | 2.79E-03 | 2.21E-02 | 0.00001 | 2.21E-07 |
| *Congener total:* (8) | | | | | | | | | 3.57E-03 |
| ***B-18 Landfill*** | | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 1.7E+02 | 0.0076 | 4.92E-05 | 5.40E-03 | 4.32E-02 | 0.05 | 2.16E-03 |
| PCB 81 | 6.34 | 2.4E+00 | 1.2E+01 | 0.0088 | 3.86E-06 | 7.20E-04 | 5.74E-03 | 0.1 | 5.74E-04 |
| PCB 105 | 6.79 | 6.2E+01 | 3.1E+02 | 0.0069 | 8.18E-05 | 1.86E-02 | 1.48E-01 | 0.0001 | 1.48E-05 |
| PCB 114 | 6.98 | 2.3E+00 | 2.1E+01 | 0.0061 | 4.86E-06 | 6.90E-04 | 5.51E-03 | 0.0001 | 5.51E-07 |
| PCB 118 | 7.12 | 8.5E+01 | 5.2E+02 | 0.0055 | 1.09E-04 | 2.55E-02 | 2.03E-01 | 0.00001 | 2.03E-06 |
| PCB 123 | 6.98 | 1.5E+01 | 3.1E+01 | 0.0061 | 7.24E-06 | 4.50E-03 | 3.58E-02 | 0.00001 | 3.58E-07 |
| PCB 126 | 6.98 | 3.5E+00 | 1.0E+01 | 0.0061 | 2.43E-06 | 1.05E-03 | 8.35E-03 | 0.1 | 8.35E-04 |
| PCB 156 | 7.60 | 3.1E+01 | 9.9E+01 | 0.0036 | 1.35E-05 | 9.30E-03 | 7.39E-02 | 0.0001 | 7.39E-06 |
| PCB 157 | 7.62 | 4.8E+00 | 1.6E+01 | 0.0035 | 2.14E-06 | 1.44E-03 | 1.14E-02 | 0.0001 | 1.14E-06 |
| PCB 167 | 7.50 | 1.3E+01 | 6.3E+01 | 0.0039 | 9.46E-06 | 3.90E-03 | 3.10E-02 | 0.00001 | 3.10E-07 |
| PCB 169 | 7.41 | 5.0E+00 | 3.2E+00 | 0.0043 | 5.40E-07 | 1.50E-03 | 1.19E-02 | 0.001 | 1.19E-05 |
| PCB 189 | 8.27 | 8.2E+00 | 1.1E+00 | 0.0016 | 8.14E-08 | 2.46E-03 | 1.95E-02 | 0.00001 | 1.95E-07 |
| *Congener total:* (8) | | | | | | | | | 3.61E-03 |

**Table 5.4.14**
**Exposure Calculation for the Burrowing Owl - Female/Juvenile Consuming Herbivorous Prey**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for BTF (biotransfer factor from diet to small mammal tissue): diet-to-fat transfer equation from RTI (2005): Log BTF = -0.099(log Kow)$^2$ + 1.07(log Kow) - 3.56
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of wild rodents of 5% (0.05 kg fat/kg BW) to convert transfer factor to whole body basis.
Fat composition based on upper end of range from study of mice and kangaroo rats at arid prairie site in Pueblo, Colorado (Sovell et al. 2004).

(5) Exposure dose (ED) calculation:

ED = [(intake from small mammal ingestion) + (intake from soil ingestion)] x (area foraging factor / body weight).

ED = {[(($C_{plants}$ x $FIR_{mouse}$ x $CF_{dw}$) + ($C_{soil}$ x $SIR_{mouse}$)) x BTF x $FIR_{owl}$] + ($C_{soil}$ x $SIR_{owl}$)} x {AFF/BW}.

where:

ED = total exposure dose (ng/kg BW-day).

$C_{plants}$ = concentration in plants (ng/kg).

$C_{soil}$ = concentration in soil (ng/kg).

$FIR_{mouse}$ = food ingestion rate (plants) for mouse = 0.00089 kg/day (based on San Joaquin pocket mouse).

$FIR_{owl}$ = food ingestion rate (mice) for owl = 0.052 kg/day. See Table 5.4.2 for basis/source.

$SIR_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table 5.4.2 for basis/source.

$SIR_{owl}$ = soil ingestion rate for owl (kg/day) = 0.0003 kg/day. See Table 5.4.2 for basis/source.

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants, based on % moisture in vegetation (mean of April and August samples) from each exposure area
(southeast 11.3%, south 12.4%, southwest 17.6%, west 8.3%, northwest 17.3%, north 14.3%, northeast 17.7%, B-18 18%) = 1- fraction moisture =
0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.917 for west, 0.827 for northwest, 0.857 for north, 0.823 for northeast, 0.82 for B-18 landfill

BTF = biotransfer factor from diet to small mammal (day/kg).

AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table 5.4.2 for home range.

BW = body weight (kg) = 0.126 kg. See Table 5.4.2 for basis/source.

(6) Avian TEFs are from USEPA (June 2008).

(7) TED = (exposure dose based on PCB congener concentration) x (TEF).

(8) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

**Table 5.4.15**
**Exposure Calculation for the Burrowing Owl - Female Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | BAF (unitless) [3] | Intake from Carnivorous Prey (ng/day) [4] | Intake from Incidental Soil Ingestion (ng/day) [4] | Exposure Dose (ng/kg BW-day) [4] | TEF (bird) [5] | TED (ng/kg BW-day) [6] |
|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | |
| PCB 77 | 1.1E+01 | 0.20 | 1.14E-01 | 3.30E-03 | 9.34E-01 | 0.05 | 4.67E-02 |
| PCB 81 | 1.3E+00 | 0.20 | 1.35E-02 | 3.90E-04 | 1.10E-01 | 0.1 | 1.10E-02 |
| PCB 105 | 3.3E+01 | 0.20 | 3.43E-01 | 9.90E-03 | 2.80E+00 | 0.0001 | 2.80E-04 |
| PCB 114 | 1.6E+00 | 0.20 | 1.66E-02 | 4.80E-04 | 1.36E-01 | 0.0001 | 1.36E-05 |
| PCB 118 | 5.1E+01 | 0.20 | 5.30E-01 | 1.53E-02 | 4.33E+00 | 0.00001 | 4.33E-05 |
| PCB 123 | 5.4E+00 | 0.20 | 5.62E-02 | 1.62E-03 | 4.59E-01 | 0.00001 | 4.59E-06 |
| PCB 126 | 1.5E+00 | 0.20 | 1.56E-02 | 4.50E-04 | 1.27E-01 | 0.1 | 1.27E-02 |
| PCB 156 | 1.3E+01 | 0.20 | 1.35E-01 | 3.90E-03 | 1.10E+00 | 0.0001 | 1.10E-04 |
| PCB 157 | 2.0E+00 | 0.20 | 2.08E-02 | 6.00E-04 | 1.70E-01 | 0.0001 | 1.70E-05 |
| PCB 167 | 5.2E+00 | 0.20 | 5.41E-02 | 1.56E-03 | 4.42E-01 | 0.00001 | 4.42E-06 |
| PCB 169 | 1.1E+00 | 0.20 | 1.14E-02 | 3.30E-04 | 9.34E-02 | 0.001 | 9.34E-05 |
| PCB 189 | 4.3E+00 | 0.20 | 4.47E-02 | 1.29E-03 | 3.65E-01 | 0.00001 | 3.65E-06 |
| *Congener total:* [7] | | | | | | | 7.11E-02 |
| ***South*** | | | | | | | |
| PCB 77 | 5.3E+00 | 0.20 | 5.51E-02 | 1.59E-03 | 4.50E-01 | 0.05 | 2.25E-02 |
| PCB 81 | 6.0E-01 | 0.20 | 6.24E-03 | 1.80E-04 | 5.10E-02 | 0.1 | 5.10E-03 |
| PCB 105 | 2.1E+01 | 0.20 | 2.18E-01 | 6.30E-03 | 1.78E+00 | 0.0001 | 1.78E-04 |
| PCB 114 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.0001 | 4.25E-05 |
| PCB 118 | 2.9E+01 | 0.20 | 3.02E-01 | 8.70E-03 | 2.46E+00 | 0.00001 | 2.46E-05 |
| PCB 123 | 1.9E+00 | 0.20 | 1.98E-02 | 5.70E-04 | 1.61E-01 | 0.00001 | 1.61E-06 |
| PCB 126 | 1.2E+00 | 0.20 | 1.25E-02 | 3.60E-04 | 1.02E-01 | 0.1 | 1.02E-02 |
| PCB 156 | 6.8E+00 | 0.20 | 7.07E-02 | 2.04E-03 | 5.77E-01 | 0.0001 | 5.77E-05 |
| PCB 157 | 1.8E+00 | 0.20 | 1.87E-02 | 5.40E-04 | 1.53E-01 | 0.0001 | 1.53E-05 |
| PCB 167 | 3.0E+00 | 0.20 | 3.12E-02 | 9.00E-04 | 2.55E-01 | 0.00001 | 2.55E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.001 | 4.25E-04 |
| PCB 189 | 1.6E+00 | 0.20 | 1.66E-02 | 4.80E-04 | 1.36E-01 | 0.00001 | 1.36E-06 |
| *Congener total:* [7] | | | | | | | 3.85E-02 |
| ***Southwest*** | | | | | | | |
| PCB 77 | 2.6E+00 | 0.20 | 2.70E-02 | 7.80E-04 | 2.21E-01 | 0.05 | 1.10E-02 |
| PCB 81 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.1 | 4.25E-02 |
| PCB 105 | 1.1E+01 | 0.20 | 1.14E-01 | 3.30E-03 | 9.34E-01 | 0.0001 | 9.34E-05 |
| PCB 114 | 1.0E+00 | 0.20 | 1.04E-02 | 3.00E-04 | 8.49E-02 | 0.0001 | 8.49E-06 |
| PCB 118 | 1.5E+01 | 0.20 | 1.56E-01 | 4.50E-03 | 1.27E+00 | 0.00001 | 1.27E-05 |
| PCB 123 | 1.2E+00 | 0.20 | 1.25E-02 | 3.60E-04 | 1.02E-01 | 0.00001 | 1.02E-06 |
| PCB 126 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.1 | 4.25E-02 |
| PCB 156 | 3.9E+00 | 0.20 | 4.06E-02 | 1.17E-03 | 3.31E-01 | 0.0001 | 3.31E-05 |
| PCB 157 | 9.2E-01 | 0.20 | 9.57E-03 | 2.76E-04 | 7.81E-02 | 0.0001 | 7.81E-06 |
| PCB 167 | 1.9E+00 | 0.20 | 1.98E-02 | 5.70E-04 | 1.61E-01 | 0.00001 | 1.61E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.001 | 4.25E-04 |
| PCB 189 | 1.2E+00 | 0.20 | 1.25E-02 | 3.60E-04 | 1.02E-01 | 0.00001 | 1.02E-06 |
| *Congener total:* [7] | | | | | | | 9.65E-02 |
| ***West*** | | | | | | | |
| PCB 77 | 2.3E+00 | 0.20 | 2.39E-02 | 6.90E-04 | 1.95E-01 | 0.05 | 9.77E-03 |
| PCB 81 | 6.0E-01 | 0.20 | 6.24E-03 | 1.80E-04 | 5.10E-02 | 0.1 | 5.10E-03 |
| PCB 105 | 1.0E+01 | 0.20 | 1.04E-01 | 3.00E-03 | 8.49E-01 | 0.0001 | 8.49E-05 |
| PCB 114 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.0001 | 4.25E-05 |
| PCB 118 | 1.9E+01 | 0.20 | 1.98E-01 | 5.70E-03 | 1.61E+00 | 0.00001 | 1.61E-05 |
| PCB 123 | 1.5E+00 | 0.20 | 1.56E-02 | 4.50E-04 | 1.27E-01 | 0.00001 | 1.27E-06 |
| PCB 126 | 8.0E-01 | 0.20 | 8.32E-03 | 2.40E-04 | 6.79E-02 | 0.1 | 6.79E-03 |
| PCB 156 | 3.9E+00 | 0.20 | 4.06E-02 | 1.17E-03 | 3.31E-01 | 0.0001 | 3.31E-05 |
| PCB 157 | 1.0E+00 | 0.20 | 1.04E-02 | 3.00E-04 | 8.49E-02 | 0.0001 | 8.49E-06 |
| PCB 167 | 2.2E+00 | 0.20 | 2.29E-02 | 6.60E-04 | 1.87E-01 | 0.00001 | 1.87E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.001 | 4.25E-04 |
| PCB 189 | 1.1E+00 | 0.20 | 1.14E-02 | 3.30E-04 | 9.34E-02 | 0.00001 | 9.34E-07 |
| *Congener total:* [7] | | | | | | | 2.23E-02 |

**Table 5.4.15**
**Exposure Calculation for the Burrowing Owl - Female Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | BAF (unitless) [3] | Intake from Carnivorous Prey (ng/day) [4] | Intake from Incidental Soil Ingestion (ng/day) [4] | Exposure Dose (ng/kg BW-day) [4] | TEF (bird) [5] | TED (ng/kg BW-day) [6] |
|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | |
| PCB 77 | 3.0E+00 | 0.20 | 3.12E-02 | 9.00E-04 | 2.55E-01 | 0.05 | 1.27E-02 |
| PCB 81 | 5.0E-01 | 0.20 | 5.20E-03 | 1.50E-04 | 4.25E-02 | 0.1 | 4.25E-03 |
| PCB 105 | 9.5E+00 | 0.20 | 9.88E-02 | 2.85E-03 | 8.07E-01 | 0.0001 | 8.07E-05 |
| PCB 114 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.0001 | 4.25E-05 |
| PCB 118 | 1.8E+01 | 0.20 | 1.87E-01 | 5.40E-03 | 1.53E+00 | 0.00001 | 1.53E-05 |
| PCB 123 | 1.3E+00 | 0.20 | 1.35E-02 | 3.90E-04 | 1.10E-01 | 0.00001 | 1.10E-06 |
| PCB 126 | 1.2E+00 | 0.20 | 1.25E-02 | 3.60E-04 | 1.02E-01 | 0.1 | 1.02E-02 |
| PCB 156 | 3.2E+00 | 0.20 | 3.33E-02 | 9.60E-04 | 2.72E-01 | 0.0001 | 2.72E-05 |
| PCB 157 | 1.0E+00 | 0.20 | 1.04E-02 | 3.00E-04 | 8.49E-02 | 0.0001 | 8.49E-06 |
| PCB 167 | 6.3E+00 | 0.20 | 6.55E-02 | 1.89E-03 | 5.35E-01 | 0.00001 | 5.35E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.001 | 4.25E-04 |
| PCB 189 | 4.0E-01 | 0.20 | 4.16E-03 | 1.20E-04 | 3.40E-02 | 0.00001 | 3.40E-07 |
| *Congener total:* [7] | | | | | | | 2.78E-02 |
| ***North*** | | | | | | | |
| PCB 77 | 2.8E+00 | 0.20 | 2.91E-02 | 8.40E-04 | 2.38E-01 | 0.05 | 1.19E-02 |
| PCB 81 | 3.0E-01 | 0.20 | 3.12E-03 | 9.00E-05 | 2.55E-02 | 0.1 | 2.55E-03 |
| PCB 105 | 1.2E+01 | 0.20 | 1.25E-01 | 3.60E-03 | 1.02E+00 | 0.0001 | 1.02E-04 |
| PCB 114 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.0001 | 4.25E-05 |
| PCB 118 | 1.9E+01 | 0.20 | 1.98E-01 | 5.70E-03 | 1.61E+00 | 0.00001 | 1.61E-05 |
| PCB 123 | 1.5E+00 | 0.20 | 1.56E-02 | 4.50E-04 | 1.27E-01 | 0.00001 | 1.27E-06 |
| PCB 126 | 7.0E-01 | 0.20 | 7.28E-03 | 2.10E-04 | 5.94E-02 | 0.1 | 5.94E-03 |
| PCB 156 | 3.0E+00 | 0.20 | 3.12E-02 | 9.00E-04 | 2.55E-01 | 0.0001 | 2.55E-05 |
| PCB 157 | 1.0E+00 | 0.20 | 1.04E-02 | 3.00E-04 | 8.49E-02 | 0.0001 | 8.49E-06 |
| PCB 167 | 6.6E+00 | 0.20 | 6.86E-02 | 1.98E-03 | 5.60E-01 | 0.00001 | 5.60E-06 |
| PCB 169 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.001 | 4.25E-04 |
| PCB 189 | 7.0E-01 | 0.20 | 7.28E-03 | 2.10E-04 | 5.94E-02 | 0.00001 | 5.94E-07 |
| *Congener total:* [7] | | | | | | | 2.10E-02 |
| ***Northeast*** | | | | | | | |
| PCB 77 | 1.5E+01 | 0.20 | 1.56E-01 | 4.50E-03 | 1.27E+00 | 0.05 | 6.37E-02 |
| PCB 81 | 1.4E+00 | 0.20 | 1.46E-02 | 4.20E-04 | 1.19E-01 | 0.1 | 1.19E-02 |
| PCB 105 | 6.5E+01 | 0.20 | 6.76E-01 | 1.95E-02 | 5.52E+00 | 0.0001 | 5.52E-04 |
| PCB 114 | 2.0E+00 | 0.20 | 2.08E-02 | 6.00E-04 | 1.70E-01 | 0.0001 | 1.70E-05 |
| PCB 118 | 1.0E+02 | 0.20 | 1.04E+00 | 3.00E-02 | 8.49E+00 | 0.00001 | 8.49E-05 |
| PCB 123 | 8.7E+00 | 0.20 | 9.05E-02 | 2.61E-03 | 7.39E-01 | 0.00001 | 7.39E-06 |
| PCB 126 | 5.9E+00 | 0.20 | 6.14E-02 | 1.77E-03 | 5.01E-01 | 0.1 | 5.01E-02 |
| PCB 156 | 2.9E+01 | 0.20 | 3.02E-01 | 8.70E-03 | 2.46E+00 | 0.0001 | 2.46E-04 |
| PCB 157 | 6.9E+00 | 0.20 | 7.18E-02 | 2.07E-03 | 5.86E-01 | 0.0001 | 5.86E-05 |
| PCB 167 | 1.6E+01 | 0.20 | 1.66E-01 | 4.80E-03 | 1.36E+00 | 0.00001 | 1.36E-05 |
| PCB 169 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.001 | 4.25E-04 |
| PCB 189 | 9.3E+00 | 0.20 | 9.67E-02 | 2.79E-03 | 7.90E-01 | 0.00001 | 7.90E-06 |
| *Congener total:* [7] | | | | | | | 1.27E-01 |
| ***B-18 Landfill*** | | | | | | | |
| PCB 77 | 1.8E+01 | 0.20 | 1.87E-01 | 5.40E-03 | 1.53E+00 | 0.05 | 7.64E-02 |
| PCB 81 | 2.4E+00 | 0.20 | 2.50E-02 | 7.20E-04 | 2.04E-01 | 0.1 | 2.04E-02 |
| PCB 105 | 6.2E+01 | 0.20 | 6.45E-01 | 1.86E-02 | 5.27E+00 | 0.0001 | 5.27E-04 |
| PCB 114 | 2.3E+00 | 0.20 | 2.39E-02 | 6.90E-04 | 1.95E-01 | 0.0001 | 1.95E-05 |
| PCB 118 | 8.5E+01 | 0.20 | 8.84E-01 | 2.55E-02 | 7.22E+00 | 0.00001 | 7.22E-05 |
| PCB 123 | 1.5E+01 | 0.20 | 1.56E-01 | 4.50E-03 | 1.27E+00 | 0.00001 | 1.27E-05 |
| PCB 126 | 3.5E+00 | 0.20 | 3.64E-02 | 1.05E-03 | 2.97E-01 | 0.1 | 2.97E-02 |
| PCB 156 | 3.1E+01 | 0.20 | 3.22E-01 | 9.30E-03 | 2.63E+00 | 0.0001 | 2.63E-04 |
| PCB 157 | 4.8E+00 | 0.20 | 4.99E-02 | 1.44E-03 | 4.08E-01 | 0.0001 | 4.08E-05 |
| PCB 167 | 1.3E+01 | 0.20 | 1.35E-01 | 3.90E-03 | 1.10E+00 | 0.00001 | 1.10E-05 |
| PCB 169 | 5.0E+00 | 0.20 | 5.20E-02 | 1.50E-03 | 4.25E-01 | 0.001 | 4.25E-04 |
| PCB 189 | 8.2E+00 | 0.20 | 8.53E-02 | 2.46E-03 | 6.96E-01 | 0.00001 | 6.96E-06 |
| *Congener total:* [7] | | | | | | | 1.28E-01 |

**Table 5.4.15**
**Exposure Calculation for the Burrowing Owl - Female Consuming Carnivorous Prey (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(3) Basis for BAF: A study by Blankenship et al. (2005) in which co-located soil and wildlife tissue samples were analyzed for PCBs at a forested site in a Michigan flood plain. Total PCB concentrations in tissue were divided by total PCB concentrations in soil to calculate BSAFs for a variety of wildlife. Shrews were found to have the highest BSAF among small mammals. Using data from the study, the total PCB concentration in shrew tissue (1.31 mg/kg) and in soil (6.53 mg/kg) were used to calculate a BAF of 0.20.

(4) Exposure dose (ED) calculation:

ED = [(intake from carnivorous prey) + (intake from soil ingestion)] x [area foraging factor / body weight].

ED = $[(C_{soil} \times BAF \times FIR_{owl}) + (C_{soil} \times SIR_{owl})] \times AFF/BW$.

where:

ED = total exposure dose (ng/kg BW-day).

$C_{soil}$ = concentration in soil (ng/kg).

BAF = bioaccumulation factor (unitless) for carnivorous prey (factor based on shrew used for grasshopper mouse) = 0.20.

$FIR_{owl}$ = food ingestion rate (mice) for female owl (kg/day) = 0.052. See Table 5.4.2 for basis/source.

$SIR_{owl}$ = soil ingestion rate for female owl (kg/day) = 0.0003 kg/day. See Table 5.4.2 for basis/source.

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table 5.4.2 for basis/source of home range.

BW = body weight (kg) = 0.126 kg. See Table 5.4.2 for basis/source.

(5) Avian TEFs are from USEPA (June 2008).

(6) TED = (exposure dose based on PCB congener concentration) x (TEF).

(7) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

BAF = bioaccumulation factor

BSAF = biota-soil accumulation factor

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

**Table 5.4.16**
**Exposure Calculation for the Western Meadowlark - Adult Male**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | Plant Concentration (ng/kg) [3] | $BAF_{inv}$ (ng/kg)/(ng/kg) [4] | Intake from Invertebrate Ingestion (ng/day) [5] | Intake from Plant Ingestion (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (bird) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 9.7E+01 | 0.95 | 2.73E-01 | 4.22E-01 | 1.65E-02 | 6.35E+00 | 0.05 | 3.17E-01 |
| PCB 81 | 6.34 | 1.3E+00 | 1.4E+01 | 0.92 | 3.12E-02 | 5.99E-02 | 1.95E-03 | 8.31E-01 | 0.1 | 8.31E-02 |
| PCB 105 | 6.79 | 3.3E+01 | 1.5E+02 | 0.97 | 8.34E-01 | 6.52E-01 | 4.95E-02 | 1.37E+01 | 0.0001 | 1.37E-03 |
| PCB 114 | 6.98 | 1.6E+00 | 8.7E+00 | 0.99 | 4.13E-02 | 3.78E-02 | 2.40E-03 | 7.28E-01 | 0.0001 | 7.28E-05 |
| PCB 118 | 7.12 | 5.1E+01 | 2.7E+02 | 1.01 | 1.34E+00 | 1.17E+00 | 7.65E-02 | 2.31E+01 | 0.00001 | 2.31E-04 |
| PCB 123 | 6.98 | 5.4E+00 | 1.7E+01 | 0.99 | 1.40E-01 | 7.48E-02 | 8.10E-03 | 1.99E+00 | 0.00001 | 1.99E-05 |
| PCB 126 | 6.98 | 1.5E+00 | 1.3E+01 | 0.99 | 3.88E-02 | 5.46E-02 | 2.25E-03 | 8.54E-01 | 0.1 | 8.54E-02 |
| PCB 156 | 7.60 | 1.3E+01 | 3.3E+01 | 1.07 | 3.61E-01 | 1.45E-01 | 1.95E-02 | 4.69E+00 | 0.0001 | 4.69E-04 |
| PCB 157 | 7.62 | 2.0E+00 | 6.8E+00 | 1.07 | 5.56E-02 | 2.95E-02 | 3.00E-03 | 7.87E-01 | 0.0001 | 7.87E-05 |
| PCB 167 | 7.50 | 5.2E+00 | 1.7E+01 | 1.06 | 1.43E-01 | 7.45E-02 | 7.80E-03 | 2.01E+00 | 0.00001 | 2.01E-05 |
| PCB 169 | 7.41 | 1.1E+00 | 7.5E-01 | 1.04 | 2.99E-02 | 3.25E-03 | 1.65E-03 | 3.10E-01 | 0.001 | 3.10E-04 |
| PCB 189 | 8.27 | 4.3E+00 | 8.6E+00 | 1.15 | 1.29E-01 | 3.76E-02 | 6.45E-03 | 1.54E+00 | 0.00001 | 1.54E-05 |
| *Congener total:* [8] | | | | | | | | | | 4.89E-01 |
| ***South*** | | | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 7.0E+01 | 0.95 | 1.32E-01 | 3.02E-01 | 7.95E-03 | 3.94E+00 | 0.05 | 1.97E-01 |
| PCB 81 | 6.34 | 6.0E-01 | 6.5E+00 | 0.92 | 1.44E-02 | 2.79E-02 | 9.00E-04 | 3.85E-01 | 0.1 | 3.85E-02 |
| PCB 105 | 6.79 | 2.1E+01 | 1.3E+02 | 0.97 | 5.31E-01 | 5.58E-01 | 3.15E-02 | 1.00E+01 | 0.0001 | 1.00E-03 |
| PCB 114 | 6.98 | 5.0E+00 | 5.4E+00 | 0.99 | 1.29E-01 | 2.32E-02 | 7.50E-03 | 1.43E+00 | 0.0001 | 1.43E-04 |
| PCB 118 | 7.12 | 2.9E+01 | 1.8E+02 | 1.01 | 7.62E-01 | 7.73E-01 | 4.35E-02 | 1.41E+01 | 0.00001 | 1.41E-04 |
| PCB 123 | 6.98 | 1.9E+00 | 7.3E+00 | 0.99 | 4.91E-02 | 3.15E-02 | 2.85E-03 | 7.45E-01 | 0.00001 | 7.45E-06 |
| PCB 126 | 6.98 | 1.2E+00 | 7.1E+00 | 0.99 | 3.10E-02 | 3.05E-02 | 1.80E-03 | 5.65E-01 | 0.1 | 5.65E-02 |
| PCB 156 | 7.60 | 6.8E+00 | 2.1E+01 | 1.07 | 1.89E-01 | 9.01E-02 | 1.02E-02 | 2.58E+00 | 0.0001 | 2.58E-04 |
| PCB 157 | 7.62 | 1.8E+00 | 4.8E+00 | 1.07 | 5.01E-02 | 2.06E-02 | 2.70E-03 | 6.55E-01 | 0.0001 | 6.55E-05 |
| PCB 167 | 7.50 | 3.0E+00 | 2.4E+01 | 1.06 | 8.23E-02 | 1.03E-01 | 4.50E-03 | 1.70E+00 | 0.00001 | 1.70E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 6.6E-01 | 1.04 | 1.36E-01 | 2.83E-03 | 7.50E-03 | 1.30E+00 | 0.001 | 1.30E-03 |
| PCB 189 | 8.27 | 1.6E+00 | 1.2E+00 | 1.15 | 4.80E-02 | 4.94E-03 | 2.40E-03 | 4.94E-01 | 0.00001 | 4.94E-06 |
| *Congener total:* [8] | | | | | | | | | | 2.95E-01 |
| ***Southwest*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 9.2E+00 | 0.95 | 6.45E-02 | 3.73E-02 | 3.90E-03 | 9.44E-01 | 0.05 | 4.72E-02 |
| PCB 81 | 6.34 | 5.0E+00 | 1.1E+00 | 0.92 | 1.20E-01 | 4.24E-03 | 7.50E-03 | 1.18E+00 | 0.1 | 1.18E-01 |
| PCB 105 | 6.79 | 1.1E+01 | 1.9E+01 | 0.97 | 2.78E-01 | 7.76E-02 | 1.65E-02 | 3.32E+00 | 0.0001 | 3.32E-04 |
| PCB 114 | 6.98 | 1.0E+00 | 1.1E+00 | 0.99 | 2.58E-02 | 4.24E-03 | 1.50E-03 | 2.82E-01 | 0.0001 | 2.82E-05 |
| PCB 118 | 7.12 | 1.5E+01 | 2.9E+01 | 1.01 | 3.94E-01 | 1.18E-01 | 2.25E-02 | 4.77E+00 | 0.00001 | 4.77E-05 |
| PCB 123 | 6.98 | 1.2E+00 | 1.6E+00 | 0.99 | 3.10E-02 | 6.52E-03 | 1.80E-03 | 3.51E-01 | 0.00001 | 3.51E-06 |
| PCB 126 | 6.98 | 5.0E+00 | 1.1E+00 | 0.99 | 1.29E-01 | 4.24E-03 | 7.50E-03 | 1.26E+00 | 0.1 | 1.26E-01 |
| PCB 156 | 7.60 | 3.9E+00 | 4.2E+00 | 1.07 | 1.08E-01 | 1.68E-02 | 5.85E-03 | 1.17E+00 | 0.0001 | 1.17E-04 |
| PCB 157 | 7.62 | 9.2E-01 | 1.9E+00 | 1.07 | 2.56E-02 | 7.86E-03 | 1.38E-03 | 3.11E-01 | 0.0001 | 3.11E-05 |
| PCB 167 | 7.50 | 1.9E+00 | 1.0E+01 | 1.06 | 5.21E-02 | 4.21E-02 | 2.85E-03 | 8.67E-01 | 0.00001 | 8.67E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 1.04 | 1.36E-01 | 4.24E-03 | 7.50E-03 | 1.32E+00 | 0.001 | 1.32E-03 |
| PCB 189 | 8.27 | 1.2E+00 | 1.1E+00 | 1.15 | 3.60E-02 | 4.24E-03 | 1.80E-03 | 3.75E-01 | 0.00001 | 3.75E-06 |
| *Congener total:* [8] | | | | | | | | | | 2.93E-01 |
| ***West*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 1.2E+01 | 0.95 | 5.71E-02 | 5.21E-02 | 3.45E-03 | 1.01E+00 | 0.05 | 5.03E-02 |
| PCB 81 | 6.34 | 6.0E-01 | 1.7E+00 | 0.92 | 1.44E-02 | 7.56E-03 | 9.00E-04 | 2.04E-01 | 0.1 | 2.04E-02 |
| PCB 105 | 6.79 | 1.0E+01 | 1.9E+01 | 0.97 | 2.53E-01 | 8.70E-02 | 1.50E-02 | 3.17E+00 | 0.0001 | 3.17E-04 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.99 | 1.29E-01 | 4.94E-03 | 7.50E-03 | 1.26E+00 | 0.0001 | 1.26E-04 |
| PCB 118 | 7.12 | 1.9E+01 | 3.0E+01 | 1.01 | 4.99E-01 | 1.33E-01 | 2.85E-02 | 5.90E+00 | 0.00001 | 5.90E-05 |
| PCB 123 | 6.98 | 1.5E+00 | 1.9E+00 | 0.99 | 3.88E-02 | 8.40E-03 | 2.25E-03 | 4.41E-01 | 0.00001 | 4.41E-06 |
| PCB 126 | 6.98 | 8.0E-01 | 1.1E+00 | 0.99 | 2.07E-02 | 4.94E-03 | 1.20E-03 | 2.39E-01 | 0.1 | 2.39E-02 |
| PCB 156 | 7.60 | 3.9E+00 | 3.6E+00 | 1.07 | 1.08E-01 | 1.62E-02 | 5.85E-03 | 1.16E+00 | 0.0001 | 1.16E-04 |
| PCB 157 | 7.62 | 1.0E+00 | 8.0E-01 | 1.07 | 2.78E-02 | 3.58E-03 | 1.50E-03 | 2.94E-01 | 0.0001 | 2.94E-05 |
| PCB 167 | 7.50 | 2.2E+00 | 8.1E+00 | 1.06 | 6.04E-02 | 3.62E-02 | 3.30E-03 | 8.92E-01 | 0.00001 | 8.92E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 4.8E-01 | 1.04 | 1.36E-01 | 2.17E-03 | 7.50E-03 | 1.30E+00 | 0.001 | 1.30E-03 |
| PCB 189 | 8.27 | 1.1E+00 | 1.1E+00 | 1.15 | 3.30E-02 | 4.94E-03 | 1.65E-03 | 3.53E-01 | 0.00001 | 3.53E-06 |
| *Congener total:* [8] | | | | | | | | | | 9.66E-02 |

**Table 5.4.16**
**Exposure Calculation for the Western Meadowlark - Adult Male**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | Plant Concentration (ng/kg) [3] | $BAF_{inv}$ (ng/kg)/ (ng/kg) [4] | Intake from Invertebrate Ingestion (ng/day) [5] | Intake from Plant Ingestion (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (bird) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 6.9E+00 | 0.95 | 7.45E-02 | 2.78E-02 | 4.50E-03 | 9.53E-01 | 0.05 | 4.76E-02 |
| PCB 81 | 6.34 | 5.0E-01 | 1.1E+00 | 0.92 | 1.20E-02 | 4.25E-03 | 7.50E-04 | 1.52E-01 | 0.1 | 1.52E-02 |
| PCB 105 | 6.79 | 9.5E+00 | 9.8E+00 | 0.97 | 2.40E-01 | 3.97E-02 | 1.43E-02 | 2.63E+00 | 0.0001 | 2.63E-04 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.99 | 1.29E-01 | 4.25E-03 | 7.50E-03 | 1.26E+00 | 0.0001 | 1.26E-04 |
| PCB 118 | 7.12 | 1.8E+01 | 2.0E+01 | 1.01 | 4.73E-01 | 7.99E-02 | 2.70E-02 | 5.18E+00 | 0.00001 | 5.18E-05 |
| PCB 123 | 6.98 | 1.3E+00 | 7.0E-01 | 0.99 | 3.36E-02 | 2.84E-03 | 1.95E-03 | 3.43E-01 | 0.00001 | 3.43E-06 |
| PCB 126 | 6.98 | 1.2E+00 | 1.1E+00 | 0.99 | 3.10E-02 | 4.25E-03 | 1.80E-03 | 3.31E-01 | 0.1 | 3.31E-02 |
| PCB 156 | 7.60 | 3.2E+00 | 2.1E+00 | 1.07 | 8.88E-02 | 8.45E-03 | 4.80E-03 | 9.11E-01 | 0.0001 | 9.11E-05 |
| PCB 157 | 7.62 | 1.0E+00 | 1.6E+00 | 1.07 | 2.78E-02 | 6.51E-03 | 1.50E-03 | 3.20E-01 | 0.0001 | 3.20E-05 |
| PCB 167 | 7.50 | 6.3E+00 | 6.0E+00 | 1.06 | 1.73E-01 | 2.43E-02 | 9.45E-03 | 1.84E+00 | 0.00001 | 1.84E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 1.04 | 1.36E-01 | 4.25E-03 | 7.50E-03 | 1.32E+00 | 0.001 | 1.32E-03 |
| PCB 189 | 8.27 | 4.0E-01 | 1.1E+00 | 1.15 | 1.20E-02 | 4.25E-03 | 6.00E-04 | 1.50E-01 | 0.00001 | 1.50E-06 |
| *Congener total:* [8] | | | | | | | | | | 9.78E-02 |
| ***North*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 7.8E+00 | 0.95 | 6.95E-02 | 3.27E-02 | 4.20E-03 | 9.50E-01 | 0.05 | 4.75E-02 |
| PCB 81 | 6.34 | 3.0E-01 | 6.0E-01 | 0.92 | 7.20E-03 | 2.53E-03 | 4.50E-04 | 9.09E-02 | 0.1 | 9.09E-03 |
| PCB 105 | 6.79 | 1.2E+01 | 1.3E+01 | 0.97 | 3.03E-01 | 5.30E-02 | 1.80E-02 | 3.34E+00 | 0.0001 | 3.34E-04 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.99 | 1.29E-01 | 4.41E-03 | 7.50E-03 | 1.26E+00 | 0.0001 | 1.26E-04 |
| PCB 118 | 7.12 | 1.9E+01 | 2.9E+01 | 1.01 | 4.99E-01 | 1.20E-01 | 2.85E-02 | 5.78E+00 | 0.00001 | 5.78E-05 |
| PCB 123 | 6.98 | 1.5E+00 | 5.6E-01 | 0.99 | 3.88E-02 | 2.33E-03 | 2.25E-03 | 3.87E-01 | 0.00001 | 3.87E-06 |
| PCB 126 | 6.98 | 7.0E-01 | 1.1E+00 | 0.99 | 1.81E-02 | 4.41E-03 | 1.05E-03 | 2.10E-01 | 0.1 | 2.10E-02 |
| PCB 156 | 7.60 | 3.0E+00 | 2.5E+00 | 1.07 | 8.33E-02 | 1.04E-02 | 4.50E-03 | 8.76E-01 | 0.0001 | 8.76E-05 |
| PCB 157 | 7.62 | 1.0E+00 | 5.4E-01 | 1.07 | 2.78E-02 | 2.27E-03 | 1.50E-03 | 2.82E-01 | 0.0001 | 2.82E-05 |
| PCB 167 | 7.50 | 6.6E+00 | 5.1E+00 | 1.06 | 1.81E-01 | 2.12E-02 | 9.90E-03 | 1.89E+00 | 0.00001 | 1.89E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 1.04 | 1.36E-01 | 4.41E-03 | 7.50E-03 | 1.32E+00 | 0.001 | 1.32E-03 |
| PCB 189 | 8.27 | 7.0E-01 | 4.7E-01 | 1.15 | 2.10E-02 | 1.96E-03 | 1.05E-03 | 2.14E-01 | 0.00001 | 2.14E-06 |
| *Congener total:* [8] | | | | | | | | | | 7.96E-02 |
| ***Northeast*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 1.3E+01 | 0.95 | 3.72E-01 | 5.06E-02 | 2.25E-02 | 3.98E+00 | 0.05 | 1.99E-01 |
| PCB 81 | 6.34 | 1.4E+00 | 6.4E-01 | 0.92 | 3.36E-02 | 2.57E-03 | 2.10E-03 | 3.42E-01 | 0.1 | 3.42E-02 |
| PCB 105 | 6.79 | 6.5E+01 | 2.3E+01 | 0.97 | 1.64E+00 | 9.16E-02 | 9.75E-02 | 1.64E+01 | 0.0001 | 1.64E-03 |
| PCB 114 | 6.98 | 2.0E+00 | 1.1E+00 | 0.99 | 5.17E-02 | 4.44E-03 | 3.00E-03 | 5.28E-01 | 0.0001 | 5.28E-05 |
| PCB 118 | 7.12 | 1.0E+02 | 4.4E+01 | 1.01 | 2.63E+00 | 1.77E-01 | 1.50E-01 | 2.64E+01 | 0.00001 | 2.64E-04 |
| PCB 123 | 6.98 | 8.7E+00 | 7.6E-01 | 0.99 | 2.25E-01 | 3.07E-03 | 1.31E-02 | 2.15E+00 | 0.00001 | 2.15E-05 |
| PCB 126 | 6.98 | 5.9E+00 | 1.1E+00 | 0.99 | 1.52E-01 | 4.44E-03 | 8.85E-03 | 1.48E+00 | 0.1 | 1.48E-01 |
| PCB 156 | 7.60 | 2.9E+01 | 4.8E+00 | 1.07 | 8.05E-01 | 1.92E-02 | 4.35E-02 | 7.75E+00 | 0.0001 | 7.75E-04 |
| PCB 157 | 7.62 | 6.9E+00 | 1.8E+00 | 1.07 | 1.92E-01 | 7.10E-03 | 1.04E-02 | 1.87E+00 | 0.0001 | 1.87E-04 |
| PCB 167 | 7.50 | 1.6E+01 | 1.3E+01 | 1.06 | 4.39E-01 | 5.06E-02 | 2.40E-02 | 4.59E+00 | 0.00001 | 4.59E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 3.3E-01 | 1.04 | 1.36E-01 | 1.34E-03 | 7.50E-03 | 1.29E+00 | 0.001 | 1.29E-03 |
| PCB 189 | 8.27 | 9.3E+00 | 1.1E+00 | 1.15 | 2.79E-01 | 4.44E-03 | 1.40E-02 | 2.65E+00 | 0.00001 | 2.65E-05 |
| *Congener total:* [8] | | | | | | | | | | 3.85E-01 |
| ***B-18 Landfill*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 1.7E+02 | 0.95 | 4.47E-01 | 6.83E-01 | 2.70E-02 | 1.03E+01 | 0.05 | 5.16E-01 |
| PCB 81 | 6.34 | 2.4E+00 | 1.2E+01 | 0.92 | 5.76E-02 | 4.63E-02 | 3.60E-03 | 9.60E-01 | 0.1 | 9.60E-02 |
| PCB 105 | 6.79 | 6.2E+01 | 3.1E+02 | 0.97 | 1.57E+00 | 1.25E+00 | 9.30E-02 | 2.59E+01 | 0.0001 | 2.59E-03 |
| PCB 114 | 6.98 | 2.3E+00 | 2.1E+01 | 0.99 | 5.94E-02 | 8.44E-02 | 3.45E-03 | 1.31E+00 | 0.0001 | 1.31E-04 |
| PCB 118 | 7.12 | 8.5E+01 | 5.2E+02 | 1.01 | 2.23E+00 | 2.09E+00 | 1.28E-01 | 3.97E+01 | 0.00001 | 3.97E-04 |
| PCB 123 | 6.98 | 1.5E+01 | 3.1E+01 | 0.99 | 3.88E-01 | 1.25E-01 | 2.25E-02 | 4.77E+00 | 0.00001 | 4.77E-05 |
| PCB 126 | 6.98 | 3.5E+00 | 1.0E+01 | 0.99 | 9.04E-02 | 4.20E-02 | 5.25E-03 | 1.23E+00 | 0.1 | 1.23E-01 |
| PCB 156 | 7.60 | 3.1E+01 | 9.9E+01 | 1.07 | 8.60E-01 | 3.98E-01 | 4.65E-02 | 1.16E+01 | 0.0001 | 1.16E-03 |
| PCB 157 | 7.62 | 4.8E+00 | 1.6E+01 | 1.07 | 1.34E-01 | 6.43E-02 | 7.20E-03 | 1.83E+00 | 0.0001 | 1.83E-04 |
| PCB 167 | 7.50 | 1.3E+01 | 6.3E+01 | 1.06 | 3.57E-01 | 2.53E-01 | 1.95E-02 | 5.62E+00 | 0.00001 | 5.62E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 3.2E+00 | 1.04 | 1.36E-01 | 1.29E-02 | 7.50E-03 | 1.39E+00 | 0.001 | 1.39E-03 |
| PCB 189 | 8.27 | 8.2E+00 | 1.1E+00 | 1.15 | 2.46E-01 | 4.42E-03 | 1.23E-02 | 2.34E+00 | 0.00001 | 2.34E-05 |
| *Congener total:* [8] | | | | | | | | | | 7.41E-01 |

**Table 5.4.16**
**Exposure Calculation for the Western Meadowlark - Adult Male**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for soil-to-invertebrate BAF: soil-to-earthworm bioaccumulation equation for nonionic organic compounds from Connell (1990): $BAF = 0.445(Kow)^{0.05}$
BAF is in units of (invertebrate tissue wet weight concentration) / (soil dry weight concentration).

(5) Exposure dose (ED) calculation:

ED = [(intake from invertebrate ingestion) + (intake from plant ingestion) + (intake from soil ingestion)] x (area foraging factor / body weight).

$ED = [(C_{soil} \times BAF_{inv} \times FIR_{inv}) + (C_{plant} \times FIR_{plant} \times CF_{dw}) + (C_{soil} \times SIR_{lark})] \times [AFF/BW]$.

where:

ED = total exposure dose (ng/kg BW-day).

$C_{plants}$ = concentration in plants (ng/kg).

$C_{soil}$ = concentration in soil (ng/kg).

$FIR_{inv}$ = food ingestion rate (invertebrates) for meadowlark = 0.026 kg/day. See Table 5.4.2 for basis/source.

$FIR_{plant}$ = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0049. See Table 5.4.2 for basis/source.

$SIR_{lark}$ = soil ingestion rate for meadowlark = 0.0015 kg/day. See Table 5.4.2 for basis/source.

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants, based on % moisture in vegetation (mean of April and August samples) from each exposure area
(southeast 11.3%, south 12.4%, southwest 17.6%, west 8.3%, northwest 17.3%, north 14.3%, northeast 17.7%, B-18 18%) = 1- fraction moisture =
0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.917 for west, 0.827 for northwest, 0.857 for north, 0.823 for northeast, 0.82 for B-18 landfill

$BAF_{inv}$ = bioaccumulation factor from soil to invertebrates [(ng/kg wet tissue) / (ng/kg dry soil)].

AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table 5.4.2 for home range.

BW = body weight (kg) = 0.112 kg. See Table 5.4.2 for basis/source.

(6) Avian TEFs are from USEPA (June 2008).

(7) TED = (exposure dose based on PCB congener concentration) x (TEF).

(8) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram
TED = toxicity equivalence dose
TEF = toxicity equivalence factor

**Table 5.4.17**
**Exposure Calculation for the Western Meadowlark - Female/Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area [1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | Plant Concentration (ng/kg) [3] | $BAF_{inv}$ (ng/kg)/(ng/kg) [4] | Intake from Invertebrate Ingestion (ng/day) [5] | Intake from Plant Ingestion (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (bird) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.1E+01 | 9.7E+01 | 0.95 | 2.21E-01 | 3.44E-01 | 1.32E-02 | 6.46E+00 | 0.05 | 3.23E-01 |
| PCB 81 | 6.34 | 1.3E+00 | 1.4E+01 | 0.92 | 2.52E-02 | 4.89E-02 | 1.56E-03 | 8.47E-01 | 0.1 | 8.47E-02 |
| PCB 105 | 6.79 | 3.3E+01 | 1.5E+02 | 0.97 | 6.74E-01 | 5.32E-01 | 3.96E-02 | 1.39E+01 | 0.0001 | 1.39E-03 |
| PCB 114 | 6.98 | 1.6E+00 | 8.7E+00 | 0.99 | 3.34E-02 | 3.08E-02 | 1.92E-03 | 7.40E-01 | 0.0001 | 7.40E-05 |
| PCB 118 | 7.12 | 5.1E+01 | 2.7E+02 | 1.01 | 1.08E+00 | 9.58E-01 | 6.12E-02 | 2.35E+01 | 0.00001 | 2.35E-04 |
| PCB 123 | 6.98 | 5.4E+00 | 1.7E+01 | 0.99 | 1.13E-01 | 6.11E-02 | 6.48E-03 | 2.02E+00 | 0.00001 | 2.02E-05 |
| PCB 126 | 6.98 | 1.5E+00 | 1.3E+01 | 0.99 | 3.13E-02 | 4.46E-02 | 1.80E-03 | 8.69E-01 | 0.1 | 8.69E-02 |
| PCB 156 | 7.60 | 1.3E+01 | 3.3E+01 | 1.07 | 2.91E-01 | 1.18E-01 | 1.56E-02 | 4.76E+00 | 0.0001 | 4.76E-04 |
| PCB 157 | 7.62 | 2.0E+00 | 6.8E+00 | 1.07 | 4.49E-02 | 2.41E-02 | 2.40E-03 | 7.99E-01 | 0.0001 | 7.99E-05 |
| PCB 167 | 7.50 | 5.2E+00 | 1.7E+01 | 1.06 | 1.15E-01 | 6.08E-02 | 6.24E-03 | 2.04E+00 | 0.00001 | 2.04E-05 |
| PCB 169 | 7.41 | 1.1E+00 | 7.5E-01 | 1.04 | 2.41E-02 | 2.65E-03 | 1.32E-03 | 3.14E-01 | 0.001 | 3.14E-04 |
| PCB 189 | 8.27 | 4.3E+00 | 8.6E+00 | 1.15 | 1.04E-01 | 3.07E-02 | 5.16E-03 | 1.57E+00 | 0.00001 | 1.57E-05 |
| *Congener total:* [8] | | | | | | | | | | 4.97E-01 |
| ***South*** | | | | | | | | | | |
| PCB 77 | 6.63 | 5.3E+00 | 7.0E+01 | 0.95 | 1.06E-01 | 2.46E-01 | 6.36E-03 | 4.01E+00 | 0.05 | 2.01E-01 |
| PCB 81 | 6.34 | 6.0E-01 | 6.5E+00 | 0.92 | 1.16E-02 | 2.27E-02 | 7.20E-04 | 3.93E-01 | 0.1 | 3.93E-02 |
| PCB 105 | 6.79 | 2.1E+01 | 1.3E+02 | 0.97 | 4.29E-01 | 4.56E-01 | 2.52E-02 | 1.02E+01 | 0.0001 | 1.02E-03 |
| PCB 114 | 6.98 | 5.0E+00 | 5.4E+00 | 0.99 | 1.04E-01 | 1.89E-02 | 6.00E-03 | 1.45E+00 | 0.0001 | 1.45E-04 |
| PCB 118 | 7.12 | 2.9E+01 | 1.8E+02 | 1.01 | 6.15E-01 | 6.31E-01 | 3.48E-02 | 1.43E+01 | 0.00001 | 1.43E-04 |
| PCB 123 | 6.98 | 1.9E+00 | 7.3E+00 | 0.99 | 3.97E-02 | 2.57E-02 | 2.28E-03 | 7.57E-01 | 0.00001 | 7.57E-06 |
| PCB 126 | 6.98 | 1.2E+00 | 7.1E+00 | 0.99 | 2.50E-02 | 2.49E-02 | 1.44E-03 | 5.74E-01 | 0.1 | 5.74E-02 |
| PCB 156 | 7.60 | 6.8E+00 | 2.1E+01 | 1.07 | 1.52E-01 | 7.36E-02 | 8.16E-03 | 2.62E+00 | 0.0001 | 2.62E-04 |
| PCB 157 | 7.62 | 1.8E+00 | 4.8E+00 | 1.07 | 4.04E-02 | 1.68E-02 | 2.16E-03 | 6.65E-01 | 0.0001 | 6.65E-05 |
| PCB 167 | 7.50 | 3.0E+00 | 2.4E+01 | 1.06 | 6.65E-02 | 8.43E-02 | 3.60E-03 | 1.73E+00 | 0.00001 | 1.73E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 6.6E-01 | 1.04 | 1.10E-01 | 2.31E-03 | 6.00E-03 | 1.32E+00 | 0.001 | 1.32E-03 |
| PCB 189 | 8.27 | 1.6E+00 | 1.2E+00 | 1.15 | 3.87E-02 | 4.03E-03 | 1.92E-03 | 5.00E-01 | 0.00001 | 5.00E-06 |
| *Congener total:* [8] | | | | | | | | | | 3.00E-01 |
| ***Southwest*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.6E+00 | 9.2E+00 | 0.95 | 5.21E-02 | 3.04E-02 | 3.12E-03 | 9.58E-01 | 0.05 | 4.79E-02 |
| PCB 81 | 6.34 | 5.0E+00 | 1.1E+00 | 0.92 | 9.70E-02 | 3.46E-03 | 6.00E-03 | 1.19E+00 | 0.1 | 1.19E-01 |
| PCB 105 | 6.79 | 1.1E+01 | 1.9E+01 | 0.97 | 2.25E-01 | 6.34E-02 | 1.32E-02 | 3.37E+00 | 0.0001 | 3.37E-04 |
| PCB 114 | 6.98 | 1.0E+00 | 1.1E+00 | 0.99 | 2.09E-02 | 3.46E-03 | 1.20E-03 | 2.86E-01 | 0.0001 | 2.86E-05 |
| PCB 118 | 7.12 | 1.5E+01 | 2.9E+01 | 1.01 | 3.18E-01 | 9.60E-02 | 1.80E-02 | 4.83E+00 | 0.00001 | 4.83E-05 |
| PCB 123 | 6.98 | 1.2E+00 | 1.6E+00 | 0.99 | 2.50E-02 | 5.33E-03 | 1.44E-03 | 3.56E-01 | 0.00001 | 3.56E-06 |
| PCB 126 | 6.98 | 5.0E+00 | 1.1E+00 | 0.99 | 1.04E-01 | 3.46E-03 | 6.00E-03 | 1.27E+00 | 0.1 | 1.27E-01 |
| PCB 156 | 7.60 | 3.9E+00 | 4.2E+00 | 1.07 | 8.74E-02 | 1.37E-02 | 4.68E-03 | 1.18E+00 | 0.0001 | 1.18E-04 |
| PCB 157 | 7.62 | 9.2E-01 | 1.9E+00 | 1.07 | 2.07E-02 | 6.42E-03 | 1.10E-03 | 3.15E-01 | 0.0001 | 3.15E-05 |
| PCB 167 | 7.50 | 1.9E+00 | 1.0E+01 | 1.06 | 4.21E-02 | 3.44E-02 | 2.28E-03 | 8.81E-01 | 0.00001 | 8.81E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 1.04 | 1.10E-01 | 3.46E-03 | 6.00E-03 | 1.33E+00 | 0.001 | 1.33E-03 |
| PCB 189 | 8.27 | 1.2E+00 | 1.1E+00 | 1.15 | 2.91E-02 | 3.46E-03 | 1.44E-03 | 3.80E-01 | 0.00001 | 3.80E-06 |
| *Congener total:* [8] | | | | | | | | | | 2.96E-01 |
| ***West*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.3E+00 | 1.2E+01 | 0.95 | 4.61E-02 | 4.25E-02 | 2.76E-03 | 1.02E+00 | 0.05 | 5.11E-02 |
| PCB 81 | 6.34 | 6.0E-01 | 1.7E+00 | 0.92 | 1.16E-02 | 6.17E-03 | 7.20E-04 | 2.07E-01 | 0.1 | 2.07E-02 |
| PCB 105 | 6.79 | 1.0E+01 | 1.9E+01 | 0.97 | 2.04E-01 | 7.10E-02 | 1.20E-02 | 3.21E+00 | 0.0001 | 3.21E-04 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.99 | 1.04E-01 | 4.03E-03 | 6.00E-03 | 1.28E+00 | 0.0001 | 1.28E-04 |
| PCB 118 | 7.12 | 1.9E+01 | 3.0E+01 | 1.01 | 4.03E-01 | 1.09E-01 | 2.28E-02 | 5.98E+00 | 0.00001 | 5.98E-05 |
| PCB 123 | 6.98 | 1.5E+00 | 1.9E+00 | 0.99 | 3.13E-02 | 6.86E-03 | 1.80E-03 | 4.47E-01 | 0.00001 | 4.47E-06 |
| PCB 126 | 6.98 | 8.0E-01 | 1.1E+00 | 0.99 | 1.67E-02 | 4.03E-03 | 9.60E-04 | 2.43E-01 | 0.1 | 2.43E-02 |
| PCB 156 | 7.60 | 3.9E+00 | 3.6E+00 | 1.07 | 8.74E-02 | 1.32E-02 | 4.68E-03 | 1.18E+00 | 0.0001 | 1.18E-04 |
| PCB 157 | 7.62 | 1.0E+00 | 8.0E-01 | 1.07 | 2.25E-02 | 2.93E-03 | 1.20E-03 | 2.97E-01 | 0.0001 | 2.97E-05 |
| PCB 167 | 7.50 | 2.2E+00 | 8.1E+00 | 1.06 | 4.88E-02 | 2.96E-02 | 2.64E-03 | 9.06E-01 | 0.00001 | 9.06E-06 |
| PCB 169 | 7.41 | 5.0E+00 | 4.8E-01 | 1.04 | 1.10E-01 | 1.77E-03 | 6.00E-03 | 1.31E+00 | 0.001 | 1.31E-03 |
| PCB 189 | 8.27 | 1.1E+00 | 1.1E+00 | 1.15 | 2.66E-02 | 4.03E-03 | 1.32E-03 | 3.58E-01 | 0.00001 | 3.58E-06 |
| *Congener total:* [8] | | | | | | | | | | 9.81E-02 |

**Table 5.4.17**
**Exposure Calculation for the Western Meadowlark - Female/Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | Soil Concentration (ng/kg) [3] | Plant Concentration (ng/kg) [3] | $BAF_{inv}$ (ng/kg)/ (ng/kg) [4] | Intake from Invertebrate Ingestion (ng/day) [5] | Intake from Plant Ingestion (ng/day) [5] | Intake from Incidental Soil Ingestion (ng/day) [5] | Exposure Dose (ng/kg BW-day) [5] | TEF (bird) [6] | TED (ng/kg BW-day) [7] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | | |
| PCB 77 | 6.63 | 3.0E+00 | 6.9E+00 | 0.95 | 6.01E-02 | 2.27E-02 | 3.60E-03 | 9.67E-01 | 0.05 | 4.83E-02 |
| PCB 81 | 6.34 | 5.0E-01 | 1.1E+00 | 0.92 | 9.70E-03 | 3.47E-03 | 6.00E-04 | 1.54E-01 | 0.1 | 1.54E-02 |
| PCB 105 | 6.79 | 9.5E+00 | 9.8E+00 | 0.97 | 1.94E-01 | 3.24E-02 | 1.14E-02 | 2.66E+00 | 0.0001 | 2.66E-04 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.99 | 1.04E-01 | 3.47E-03 | 6.00E-03 | 1.27E+00 | 0.0001 | 1.27E-04 |
| PCB 118 | 7.12 | 1.8E+01 | 2.0E+01 | 1.01 | 3.82E-01 | 6.52E-02 | 2.16E-02 | 5.24E+00 | 0.00001 | 5.24E-05 |
| PCB 123 | 6.98 | 1.3E+00 | 7.0E-01 | 0.99 | 2.71E-02 | 2.32E-03 | 1.56E-03 | 3.47E-01 | 0.00001 | 3.47E-06 |
| PCB 126 | 6.98 | 1.2E+00 | 1.1E+00 | 0.99 | 2.50E-02 | 3.47E-03 | 1.44E-03 | 3.35E-01 | 0.1 | 3.35E-02 |
| PCB 156 | 7.60 | 3.2E+00 | 2.1E+00 | 1.07 | 7.17E-02 | 6.90E-03 | 3.84E-03 | 9.22E-01 | 0.0001 | 9.22E-05 |
| PCB 157 | 7.62 | 1.0E+00 | 1.6E+00 | 1.07 | 2.25E-02 | 5.32E-03 | 1.20E-03 | 3.24E-01 | 0.0001 | 3.24E-05 |
| PCB 167 | 7.50 | 6.3E+00 | 6.0E+00 | 1.06 | 1.40E-01 | 1.98E-02 | 7.56E-03 | 1.87E+00 | 0.00001 | 1.87E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 1.04 | 1.10E-01 | 3.47E-03 | 6.00E-03 | 1.33E+00 | 0.001 | 1.33E-03 |
| PCB 189 | 8.27 | 4.0E-01 | 1.1E+00 | 1.15 | 9.69E-03 | 3.47E-03 | 4.80E-04 | 1.53E-01 | 0.00001 | 1.53E-06 |
| *Congener total:* [8] | | | | | | | | | | 9.92E-02 |
| ***North*** | | | | | | | | | | |
| PCB 77 | 6.63 | 2.8E+00 | 7.8E+00 | 0.95 | 5.61E-02 | 2.67E-02 | 3.36E-03 | 9.64E-01 | 0.05 | 4.82E-02 |
| PCB 81 | 6.34 | 3.0E-01 | 6.0E-01 | 0.92 | 5.82E-03 | 2.06E-03 | 3.60E-04 | 9.22E-02 | 0.1 | 9.22E-03 |
| PCB 105 | 6.79 | 1.2E+01 | 1.3E+01 | 0.97 | 2.45E-01 | 4.33E-02 | 1.44E-02 | 3.39E+00 | 0.0001 | 3.39E-04 |
| PCB 114 | 6.98 | 5.0E+00 | 1.1E+00 | 0.99 | 1.04E-01 | 3.60E-03 | 6.00E-03 | 1.27E+00 | 0.0001 | 1.27E-04 |
| PCB 118 | 7.12 | 1.9E+01 | 2.9E+01 | 1.01 | 4.03E-01 | 9.77E-02 | 2.28E-02 | 5.86E+00 | 0.00001 | 5.86E-05 |
| PCB 123 | 6.98 | 1.5E+00 | 5.6E-01 | 0.99 | 3.13E-02 | 1.90E-03 | 1.80E-03 | 3.92E-01 | 0.00001 | 3.92E-06 |
| PCB 126 | 6.98 | 7.0E-01 | 1.1E+00 | 0.99 | 1.46E-02 | 3.60E-03 | 8.40E-04 | 2.13E-01 | 0.1 | 2.13E-02 |
| PCB 156 | 7.60 | 3.0E+00 | 2.5E+00 | 1.07 | 6.73E-02 | 8.45E-03 | 3.60E-03 | 8.87E-01 | 0.0001 | 8.87E-05 |
| PCB 157 | 7.62 | 1.0E+00 | 5.4E-01 | 1.07 | 2.25E-02 | 1.85E-03 | 1.20E-03 | 2.85E-01 | 0.0001 | 2.85E-05 |
| PCB 167 | 7.50 | 6.6E+00 | 5.1E+00 | 1.06 | 1.46E-01 | 1.73E-02 | 7.92E-03 | 1.92E+00 | 0.00001 | 1.92E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 1.1E+00 | 1.04 | 1.10E-01 | 3.60E-03 | 6.00E-03 | 1.33E+00 | 0.001 | 1.33E-03 |
| PCB 189 | 8.27 | 7.0E-01 | 4.7E-01 | 1.15 | 1.70E-02 | 1.60E-03 | 8.40E-04 | 2.17E-01 | 0.00001 | 2.17E-06 |
| *Congener total:* [8] | | | | | | | | | | 8.07E-02 |
| ***Northeast*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.5E+01 | 1.3E+01 | 0.95 | 3.01E-01 | 4.13E-02 | 1.80E-02 | 4.03E+00 | 0.05 | 2.01E-01 |
| PCB 81 | 6.34 | 1.4E+00 | 6.4E-01 | 0.92 | 2.71E-02 | 2.09E-03 | 1.68E-03 | 3.46E-01 | 0.1 | 3.46E-02 |
| PCB 105 | 6.79 | 6.5E+01 | 2.3E+01 | 0.97 | 1.33E+00 | 7.48E-02 | 7.80E-02 | 1.66E+01 | 0.0001 | 1.66E-03 |
| PCB 114 | 6.98 | 2.0E+00 | 1.1E+00 | 0.99 | 4.17E-02 | 3.62E-03 | 2.40E-03 | 5.34E-01 | 0.0001 | 5.34E-05 |
| PCB 118 | 7.12 | 1.0E+02 | 4.4E+01 | 1.01 | 2.12E+00 | 1.45E-01 | 1.20E-01 | 2.67E+01 | 0.00001 | 2.67E-04 |
| PCB 123 | 6.98 | 8.7E+00 | 7.6E-01 | 0.99 | 1.82E-01 | 2.51E-03 | 1.04E-02 | 2.18E+00 | 0.00001 | 2.18E-05 |
| PCB 126 | 6.98 | 5.9E+00 | 1.1E+00 | 0.99 | 1.23E-01 | 3.62E-03 | 7.08E-03 | 1.50E+00 | 0.1 | 1.50E-01 |
| PCB 156 | 7.60 | 2.9E+01 | 4.8E+00 | 1.07 | 6.50E-01 | 1.57E-02 | 3.48E-02 | 7.84E+00 | 0.0001 | 7.84E-04 |
| PCB 157 | 7.62 | 6.9E+00 | 1.8E+00 | 1.07 | 1.55E-01 | 5.80E-03 | 8.28E-03 | 1.89E+00 | 0.0001 | 1.89E-04 |
| PCB 167 | 7.50 | 1.6E+01 | 1.3E+01 | 1.06 | 3.55E-01 | 4.13E-02 | 1.92E-02 | 4.64E+00 | 0.00001 | 4.64E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 3.3E-01 | 1.04 | 1.10E-01 | 1.09E-03 | 6.00E-03 | 1.31E+00 | 0.001 | 1.31E-03 |
| PCB 189 | 8.27 | 9.3E+00 | 1.1E+00 | 1.15 | 2.25E-01 | 3.62E-03 | 1.12E-02 | 2.68E+00 | 0.00001 | 2.68E-05 |
| *Congener total:* [8] | | | | | | | | | | 3.90E-01 |
| ***B-18 Landfill*** | | | | | | | | | | |
| PCB 77 | 6.63 | 1.8E+01 | 1.7E+02 | 0.95 | 3.61E-01 | 5.58E-01 | 2.16E-02 | 1.05E+01 | 0.05 | 5.26E-01 |
| PCB 81 | 6.34 | 2.4E+00 | 1.2E+01 | 0.92 | 4.65E-02 | 3.78E-02 | 2.88E-03 | 9.75E-01 | 0.1 | 9.75E-02 |
| PCB 105 | 6.79 | 6.2E+01 | 3.1E+02 | 0.97 | 1.27E+00 | 1.02E+00 | 7.44E-02 | 2.64E+01 | 0.0001 | 2.64E-03 |
| PCB 114 | 6.98 | 2.3E+00 | 2.1E+01 | 0.99 | 4.80E-02 | 6.89E-02 | 2.76E-03 | 1.34E+00 | 0.0001 | 1.34E-04 |
| PCB 118 | 7.12 | 8.5E+01 | 5.2E+02 | 1.01 | 1.80E+00 | 1.71E+00 | 1.02E-01 | 4.04E+01 | 0.00001 | 4.04E-04 |
| PCB 123 | 6.98 | 1.5E+01 | 3.1E+01 | 0.99 | 3.13E-01 | 1.02E-01 | 1.80E-02 | 4.84E+00 | 0.00001 | 4.84E-05 |
| PCB 126 | 6.98 | 3.5E+00 | 1.0E+01 | 0.99 | 7.31E-02 | 3.43E-02 | 4.20E-03 | 1.25E+00 | 0.1 | 1.25E-01 |
| PCB 156 | 7.60 | 3.1E+01 | 9.9E+01 | 1.07 | 6.95E-01 | 3.25E-01 | 3.72E-02 | 1.18E+01 | 0.0001 | 1.18E-03 |
| PCB 157 | 7.62 | 4.8E+00 | 1.6E+01 | 1.07 | 1.08E-01 | 5.25E-02 | 5.76E-03 | 1.86E+00 | 0.0001 | 1.86E-04 |
| PCB 167 | 7.50 | 1.3E+01 | 6.3E+01 | 1.06 | 2.88E-01 | 2.07E-01 | 1.56E-02 | 5.71E+00 | 0.00001 | 5.71E-05 |
| PCB 169 | 7.41 | 5.0E+00 | 3.2E+00 | 1.04 | 1.10E-01 | 1.05E-02 | 6.00E-03 | 1.41E+00 | 0.001 | 1.41E-03 |
| PCB 189 | 8.27 | 8.2E+00 | 1.1E+00 | 1.15 | 1.99E-01 | 3.61E-03 | 9.84E-03 | 2.37E+00 | 0.00001 | 2.37E-05 |
| *Congener total:* [8] | | | | | | | | | | 7.54E-01 |

**Table 5.4.17**
**Exposure Calculation for the Western Meadowlark - Female/Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(4) Basis for soil-to-invertebrate BAF: soil-to-earthworm bioaccumulation equation for nonionic organic compounds from Connell (1990): $BAF = 0.445(Kow)^{0.05}$
BAF is in units of (invertebrate tissue wet weight concentration) / (soil dry weight concentration).

(5) Exposure dose (ED) calculation:

ED = [(intake from invertebrate ingestion) + (intake from plant ingestion) + (intake from soil ingestion)] x (area foraging factor / body weight).

$ED = [(C_{soil} \times BAF_{inv} \times FIR_{inv}) + (C_{plant} \times FIR_{plant} \times CF_{dw}) + (C_{soil} \times SIR_{lark})] \times [AFF/BW]$.

where:

ED = total exposure dose (ng/kg BW-day).

$C_{plants}$ = concentration in plants (ng/kg).

$C_{soil}$ = concentration in soil (ng/kg).

$FIR_{inv}$ = food ingestion rate (invertebrates) for meadowlark = 0.021 kg/day. See Table 5.4.2 for basis/source.

$FIR_{plant}$ = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0040. See Table 5.4.2 for basis/source.

$SIR_{lark}$ = soil ingestion rate for meadowlark = 0.0012 kg/day. See Table 5.4.2 for basis/source.

$CF_{dw}$ = dry-to-wet-weight conversion factor for plants, based on % moisture in vegetation (mean of April and August samples) from each exposure area (southeast 11.3%, south 12.4%, southwest 17.6%, west 8.3%, northwest 17.3%, north 14.3%, northeast 17.7%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.917 for west, 0.827 for northwest, 0.857 for north, 0.823 for northeast, 0.82 for B-18 landfill

$BAF_{inv}$ = bioaccumulation factor from soil to invertebrates [(ng/kg wet tissue) / (ng/kg dry soil)].

AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table 5.4.2 for home range.

BW = body weight (kg) = 0.0894 kg. See Table 5.4.2 for basis/source.

(6) Avian TEFs are from USEPA (June 2008).

(7) TED = (exposure dose based on PCB congener concentration) x (TEF).

(8) Congener total represents the sum of congener-specific exposure doses based on TECs (derived from congener exposure doses multiplied by TEFs) for an exposure area.

ng = nanogram

TEC = toxicity equivalence concentration

TEF = toxicity equivalence factor

**Table 5.4.18**
**Egg Concentration Calculation for the Burrowing Owl - Female Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area (1) | Log Kow (2) | BTF -fat (day/kg) (3) | BTF -egg (day/kg) (4) | Total Intake - Adult Female (ng/day) (5) | PCB Congener Concentration in Egg (ng/kg wet wt) (6) | TEF (bird) (7) | TEC in Egg (ng/kg wet wt) (8) |
|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 1.18E-01 | 1.43E-03 | 0.05 | 7.16E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 1.39E-02 | 1.95E-04 | 0.1 | 1.95E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 3.53E-01 | 3.91E-03 | 0.0001 | 3.91E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 1.71E-02 | 1.67E-04 | 0.0001 | 1.67E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 5.46E-01 | 4.78E-03 | 0.00001 | 4.78E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 5.78E-02 | 5.63E-04 | 0.00001 | 5.63E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 1.61E-02 | 1.56E-04 | 0.1 | 1.56E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 1.39E-01 | 7.95E-04 | 0.0001 | 7.95E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 2.14E-02 | 1.20E-04 | 0.0001 | 1.20E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 5.56E-02 | 3.51E-04 | 0.00001 | 3.51E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 1.18E-02 | 8.07E-05 | 0.001 | 8.07E-08 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 4.60E-02 | 1.21E-04 | 0.00001 | 1.21E-09 |
| *Congener total:* (9) | | | | | | | 1.07E-04 |
| ***South*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 5.67E-02 | 6.90E-04 | 0.05 | 3.45E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 6.42E-03 | 9.02E-05 | 0.1 | 9.02E-06 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 2.25E-01 | 2.49E-03 | 0.0001 | 2.49E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 5.35E-02 | 5.21E-04 | 0.0001 | 5.21E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 3.10E-01 | 2.72E-03 | 0.00001 | 2.72E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 2.03E-02 | 1.98E-04 | 0.00001 | 1.98E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 1.28E-02 | 1.25E-04 | 0.1 | 1.25E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 7.28E-02 | 4.16E-04 | 0.0001 | 4.16E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 1.93E-02 | 1.08E-04 | 0.0001 | 1.08E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 3.21E-02 | 2.02E-04 | 0.00001 | 2.02E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 5.35E-02 | 3.67E-04 | 0.001 | 3.67E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 1.71E-02 | 4.51E-05 | 0.00001 | 4.51E-10 |
| *Congener total:* (9) | | | | | | | 5.68E-05 |
| ***Southwest*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 2.78E-02 | 3.39E-04 | 0.05 | 1.69E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 5.35E-02 | 7.51E-04 | 0.1 | 7.51E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 1.18E-01 | 1.30E-03 | 0.0001 | 1.30E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 1.07E-02 | 1.04E-04 | 0.0001 | 1.04E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 1.61E-01 | 1.41E-03 | 0.00001 | 1.41E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 1.28E-02 | 1.25E-04 | 0.00001 | 1.25E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 5.35E-02 | 5.21E-04 | 0.1 | 5.21E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 4.17E-02 | 2.38E-04 | 0.0001 | 2.38E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 9.84E-03 | 5.51E-05 | 0.0001 | 5.51E-09 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 2.03E-02 | 1.28E-04 | 0.00001 | 1.28E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 5.35E-02 | 3.67E-04 | 0.001 | 3.67E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 1.28E-02 | 3.39E-05 | 0.00001 | 3.39E-10 |
| *Congener total:* (9) | | | | | | | 1.45E-04 |
| ***West*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 2.46E-02 | 3.00E-04 | 0.05 | 1.50E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 6.42E-03 | 9.02E-05 | 0.1 | 9.02E-06 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 1.07E-01 | 1.18E-03 | 0.0001 | 1.18E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 5.35E-02 | 5.21E-04 | 0.0001 | 5.21E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 2.03E-01 | 1.78E-03 | 0.00001 | 1.78E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 1.61E-02 | 1.56E-04 | 0.00001 | 1.56E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 8.56E-03 | 8.33E-05 | 0.1 | 8.33E-06 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 4.17E-02 | 2.38E-04 | 0.0001 | 2.38E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 1.07E-02 | 5.99E-05 | 0.0001 | 5.99E-09 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 2.35E-02 | 1.48E-04 | 0.00001 | 1.48E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 5.35E-02 | 3.67E-04 | 0.001 | 3.67E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 1.18E-02 | 3.10E-05 | 0.00001 | 3.10E-10 |
| *Congener total:* (9) | | | | | | | 3.29E-05 |

**Table 5.4.18**
**Egg Concentration Calculation for the Burrowing Owl - Female Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area(1) | Log Kow (2) | BTF -fat (day/kg) (3) | BTF -egg (day/kg) (4) | Total Intake - Adult Female (ng/day) (5) | PCB Congener Concentration in Egg (ng/kg wet wt)(6) | TEF (bird) (7) | TEC in Egg (ng/kg wet wt) (8) |
|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 3.21E-02 | 3.91E-04 | 0.05 | 1.95E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 5.35E-03 | 7.51E-05 | 0.1 | 7.51E-06 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 1.02E-01 | 1.13E-03 | 0.0001 | 1.13E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 5.35E-02 | 5.21E-04 | 0.0001 | 5.21E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 1.93E-01 | 1.69E-03 | 0.00001 | 1.69E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 1.39E-02 | 1.35E-04 | 0.00001 | 1.35E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 1.28E-02 | 1.25E-04 | 0.1 | 1.25E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 3.42E-02 | 1.96E-04 | 0.0001 | 1.96E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 1.07E-02 | 5.99E-05 | 0.0001 | 5.99E-09 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 6.74E-02 | 4.25E-04 | 0.00001 | 4.25E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 5.35E-02 | 3.67E-04 | 0.001 | 3.67E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 4.28E-03 | 1.13E-05 | 0.00001 | 1.13E-10 |
| *Congener total:* (9) | | | | | | | 4.01E-05 |
| ***North*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 3.00E-02 | 3.65E-04 | 0.05 | 1.82E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 3.21E-03 | 4.51E-05 | 0.1 | 4.51E-06 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 1.28E-01 | 1.42E-03 | 0.0001 | 1.42E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 5.35E-02 | 5.21E-04 | 0.0001 | 5.21E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 2.03E-01 | 1.78E-03 | 0.00001 | 1.78E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 1.61E-02 | 1.56E-04 | 0.00001 | 1.56E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 7.49E-03 | 7.29E-05 | 0.1 | 7.29E-06 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 3.21E-02 | 1.83E-04 | 0.0001 | 1.83E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 1.07E-02 | 5.99E-05 | 0.0001 | 5.99E-09 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 7.06E-02 | 4.45E-04 | 0.00001 | 4.45E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 5.35E-02 | 3.67E-04 | 0.001 | 3.67E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 7.49E-03 | 1.98E-05 | 0.00001 | 1.98E-10 |
| *Congener total:* (9) | | | | | | | 3.06E-05 |
| ***Northeast*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 1.61E-01 | 1.95E-03 | 0.05 | 9.77E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 1.50E-02 | 2.10E-04 | 0.1 | 2.10E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 6.96E-01 | 7.70E-03 | 0.0001 | 7.70E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 2.14E-02 | 2.08E-04 | 0.0001 | 2.08E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 1.07E+00 | 9.38E-03 | 0.00001 | 9.38E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 9.31E-02 | 9.06E-04 | 0.00001 | 9.06E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 6.31E-02 | 6.15E-04 | 0.1 | 6.15E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 3.10E-01 | 1.77E-03 | 0.0001 | 1.77E-07 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 7.38E-02 | 4.13E-04 | 0.0001 | 4.13E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 1.71E-01 | 1.08E-03 | 0.00001 | 1.08E-08 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 5.35E-02 | 3.67E-04 | 0.001 | 3.67E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 9.95E-02 | 2.62E-04 | 0.00001 | 2.62E-09 |
| *Congener total:* (9) | | | | | | | 1.82E-04 |
| ***B-18 Landfill*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 1.93E-01 | 2.34E-03 | 0.05 | 1.17E-04 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 2.57E-02 | 3.61E-04 | 0.1 | 3.61E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 6.63E-01 | 7.34E-03 | 0.0001 | 7.34E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 2.46E-02 | 2.40E-04 | 0.0001 | 2.40E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 9.10E-01 | 7.97E-03 | 0.00001 | 7.97E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 1.61E-01 | 1.56E-03 | 0.00001 | 1.56E-08 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 3.75E-02 | 3.65E-04 | 0.1 | 3.65E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 3.32E-01 | 1.89E-03 | 0.0001 | 1.89E-07 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 5.14E-02 | 2.88E-04 | 0.0001 | 2.88E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 1.39E-01 | 8.76E-04 | 0.00001 | 8.76E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 5.35E-02 | 3.67E-04 | 0.001 | 3.67E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 8.77E-02 | 2.31E-04 | 0.00001 | 2.31E-09 |
| *Congener total:* (9) | | | | | | | 1.91E-04 |

**Table 5.4.18**
**Egg Concentration Calculation for the Burrowing Owl - Female Consuming Carnivorous Prey (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Basis for BTF (biotransfer factor from diet to fat): diet-to-fat transfer equation from RTI (2005): Log BTF = -0.099(log Kow)$^2$ + 1.07(log Kow) - 3.56

(4) Beef BTF in (mg/kg fat)/(mg/day) was multiplied by fat content of chicken eggs (0.08 kg fat/kg wet weight) to convert transfer factor to a chicken egg BTF. Based on approach from USEPA (2005).

(5) Total intake for adult female from sum of intakes from food and soil ingestion pathways provided in Table 5.4.15.

(6) Congener concentration in egg = total intake by adult female x $BTF_{egg}$

(7) Avian TEFs are from USEPA (June 2008).

(8) TEC in egg = (PCB congener concentration in egg, wet weight) x (TEF).

(9) Congener total represents the sum of congener-specific concentrations based on TECs (derived from concentrations multiplied by TEFs) for an exposure area.

ng = nanogram

BTF = biotransfer factor: (chemical concentration in tissue of consuming animal) / (dietary intake of chemical per day)

TEF = toxicity equivalence factor

TEC = toxicity equivalence concentration

**Table 5.4.19**
**Egg Concentration Calculation for the Western Meadowlark (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area (1) | Log Kow (2) | BTF -fat (day/kg) (3) | BTF -egg (day/kg) (4) | Total Intake - Adult Female (ng/day) (5) | PCB Congener Concentration in Egg (ng/kg wet wt) (6) | TEF (bird) (7) | TEC in Egg (ng/kg wet wt) (8) |
|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 5.78E-01 | 7.04E-03 | 0.05 | 3.52E-04 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 7.57E-02 | 1.06E-03 | 0.1 | 1.06E-04 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 1.25E+00 | 1.38E-02 | 0.0001 | 1.38E-06 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 6.61E-02 | 6.44E-04 | 0.0001 | 6.44E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 2.10E+00 | 1.84E-02 | 0.00001 | 1.84E-07 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 1.80E-01 | 1.76E-03 | 0.00001 | 1.76E-08 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 7.77E-02 | 7.56E-04 | 0.1 | 7.56E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 4.25E-01 | 2.43E-03 | 0.0001 | 2.43E-07 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 7.14E-02 | 4.00E-04 | 0.0001 | 4.00E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 1.82E-01 | 1.15E-03 | 0.00001 | 1.15E-08 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 2.81E-02 | 1.93E-04 | 0.001 | 1.93E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 1.40E-01 | 3.69E-04 | 0.00001 | 3.69E-09 |
| *Congener total:* (9) | | | | | | | 5.36E-04 |
| ***South*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 3.59E-01 | 4.37E-03 | 0.05 | 2.18E-04 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 3.51E-02 | 4.93E-04 | 0.1 | 4.93E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 9.10E-01 | 1.01E-02 | 0.0001 | 1.01E-06 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 1.29E-01 | 1.26E-03 | 0.0001 | 1.26E-07 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 1.28E+00 | 1.12E-02 | 0.00001 | 1.12E-07 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 6.76E-02 | 6.59E-04 | 0.00001 | 6.59E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 5.14E-02 | 5.00E-04 | 0.1 | 5.00E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 2.34E-01 | 1.34E-03 | 0.0001 | 1.34E-07 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 5.94E-02 | 3.33E-04 | 0.0001 | 3.33E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 1.54E-01 | 9.73E-04 | 0.00001 | 9.73E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 1.18E-01 | 8.08E-04 | 0.001 | 8.08E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 4.47E-02 | 1.18E-04 | 0.00001 | 1.18E-09 |
| *Congener total:* (9) | | | | | | | 3.20E-04 |
| ***Southwest*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 8.57E-02 | 1.04E-03 | 0.05 | 5.21E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 1.06E-01 | 1.49E-03 | 0.1 | 1.49E-04 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 3.01E-01 | 3.33E-03 | 0.0001 | 3.33E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 2.55E-02 | 2.49E-04 | 0.0001 | 2.49E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 4.32E-01 | 3.79E-03 | 0.00001 | 3.79E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 3.18E-02 | 3.10E-04 | 0.00001 | 3.10E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 1.14E-01 | 1.11E-03 | 0.1 | 1.11E-04 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 1.06E-01 | 6.05E-04 | 0.0001 | 6.05E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 2.82E-02 | 1.58E-04 | 0.0001 | 1.58E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 7.88E-02 | 4.96E-04 | 0.00001 | 4.96E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 1.19E-01 | 8.16E-04 | 0.001 | 8.16E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 3.40E-02 | 8.95E-05 | 0.00001 | 8.95E-10 |
| *Congener total:* (9) | | | | | | | 3.14E-04 |
| ***West*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 9.14E-02 | 1.11E-03 | 0.05 | 5.56E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 1.85E-02 | 2.60E-04 | 0.1 | 2.60E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 2.87E-01 | 3.18E-03 | 0.0001 | 3.18E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 1.14E-01 | 1.11E-03 | 0.0001 | 1.11E-07 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 5.34E-01 | 4.68E-03 | 0.00001 | 4.68E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 4.00E-02 | 3.89E-04 | 0.00001 | 3.89E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 2.17E-02 | 2.11E-04 | 0.1 | 2.11E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 1.05E-01 | 6.02E-04 | 0.0001 | 6.02E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 2.66E-02 | 1.49E-04 | 0.0001 | 1.49E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 8.10E-02 | 5.10E-04 | 0.00001 | 5.10E-09 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 1.17E-01 | 8.05E-04 | 0.001 | 8.05E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 3.20E-02 | 8.44E-05 | 0.00001 | 8.44E-10 |
| *Congener total:* (9) | | | | | | | 1.04E-04 |

**Table 5.4.19**
**Egg Concentration Calculation for the Western Meadowlark (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Log Kow [2] | BTF -fat (day/kg) [3] | BTF -egg (day/kg) [4] | Total Intake - Adult Female (ng/day) [5] | PCB Congener Concentration in Egg (ng/kg wet wt)[6] | TEF (bird) [7] | TEC in Egg (ng/kg wet wt) [8] |
|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 8.64E-02 | 1.05E-03 | 0.05 | 5.26E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 1.38E-02 | 1.93E-04 | 0.1 | 1.93E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 2.38E-01 | 2.63E-03 | 0.0001 | 2.63E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 1.14E-01 | 1.11E-03 | 0.0001 | 1.11E-07 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 4.69E-01 | 4.11E-03 | 0.00001 | 4.11E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 3.10E-02 | 3.02E-04 | 0.00001 | 3.02E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 3.00E-02 | 2.92E-04 | 0.1 | 2.92E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 8.25E-02 | 4.71E-04 | 0.0001 | 4.71E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 2.90E-02 | 1.62E-04 | 0.0001 | 1.62E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 1.67E-01 | 1.05E-03 | 0.00001 | 1.05E-08 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 1.19E-01 | 8.16E-04 | 0.001 | 8.16E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 1.36E-02 | 3.60E-05 | 0.00001 | 3.60E-10 |
| *Congener total:* [9] | | | | | | | 1.02E-04 |
| ***North*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 8.62E-02 | 1.05E-03 | 0.05 | 5.24E-05 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 8.24E-03 | 1.16E-04 | 0.1 | 1.16E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 3.03E-01 | 3.35E-03 | 0.0001 | 3.35E-07 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 1.14E-01 | 1.11E-03 | 0.0001 | 1.11E-07 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 5.24E-01 | 4.59E-03 | 0.00001 | 4.59E-08 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 3.50E-02 | 3.41E-04 | 0.00001 | 3.41E-09 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 1.91E-02 | 1.85E-04 | 0.1 | 1.85E-05 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 7.93E-02 | 4.53E-04 | 0.0001 | 4.53E-08 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 2.55E-02 | 1.43E-04 | 0.0001 | 1.43E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 1.72E-01 | 1.08E-03 | 0.00001 | 1.08E-08 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 1.19E-01 | 8.17E-04 | 0.001 | 8.17E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 1.94E-02 | 5.11E-05 | 0.00001 | 5.11E-10 |
| *Congener total:* [9] | | | | | | | 8.40E-05 |
| ***Northeast*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 3.60E-01 | 4.38E-03 | 0.05 | 2.19E-04 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 3.09E-02 | 4.34E-04 | 0.1 | 4.34E-05 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 1.48E+00 | 1.64E-02 | 0.0001 | 1.64E-06 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 4.78E-02 | 4.65E-04 | 0.0001 | 4.65E-08 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 2.39E+00 | 2.09E-02 | 0.00001 | 2.09E-07 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 1.95E-01 | 1.89E-03 | 0.00001 | 1.89E-08 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 1.34E-01 | 1.30E-03 | 0.1 | 1.30E-04 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 7.01E-01 | 4.00E-03 | 0.0001 | 4.00E-07 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 1.69E-01 | 9.47E-04 | 0.0001 | 9.47E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 4.15E-01 | 2.62E-03 | 0.00001 | 2.62E-08 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 1.17E-01 | 8.00E-04 | 0.001 | 8.00E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 2.40E-01 | 6.33E-04 | 0.00001 | 6.33E-09 |
| *Congener total:* [9] | | | | | | | 3.96E-04 |
| ***B-18 Landfill*** | | | | | | | |
| PCB 77 | 6.63 | 0.1522 | 0.0122 | 9.40E-01 | 1.14E-02 | 0.05 | 5.72E-04 |
| PCB 81 | 6.34 | 0.1756 | 0.0140 | 8.72E-02 | 1.22E-03 | 0.1 | 1.22E-04 |
| PCB 105 | 6.79 | 0.1384 | 0.0111 | 2.36E+00 | 2.61E-02 | 0.0001 | 2.61E-06 |
| PCB 114 | 6.98 | 0.1217 | 0.0097 | 1.20E-01 | 1.16E-03 | 0.0001 | 1.16E-07 |
| PCB 118 | 7.12 | 0.1096 | 0.0088 | 3.61E+00 | 3.16E-02 | 0.00001 | 3.16E-07 |
| PCB 123 | 6.98 | 0.1217 | 0.0097 | 4.33E-01 | 4.21E-03 | 0.00001 | 4.21E-08 |
| PCB 126 | 6.98 | 0.1217 | 0.0097 | 1.12E-01 | 1.09E-03 | 0.1 | 1.09E-04 |
| PCB 156 | 7.60 | 0.0714 | 0.0057 | 1.06E+00 | 6.04E-03 | 0.0001 | 6.04E-07 |
| PCB 157 | 7.62 | 0.0700 | 0.0056 | 1.66E-01 | 9.30E-04 | 0.0001 | 9.30E-08 |
| PCB 167 | 7.50 | 0.0787 | 0.0063 | 5.10E-01 | 3.22E-03 | 0.00001 | 3.22E-08 |
| PCB 169 | 7.41 | 0.0857 | 0.0069 | 1.26E-01 | 8.65E-04 | 0.001 | 8.65E-07 |
| PCB 189 | 8.27 | 0.0330 | 0.0026 | 2.12E-01 | 5.59E-04 | 0.00001 | 5.59E-09 |
| *Congener total:* [9] | | | | | | | 8.08E-04 |

**Table 5.4.19**
**Egg Concentration Calculation for the Western Meadowlark (BTF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Log Kow source: ORNL (2009).

(3) Basis for BTF (biotransfer factor from diet to fat): diet-to-fat transfer equation from RTI (2005): Log BTF = $-0.099(\log Kow)^2 + 1.07(\log Kow) - 3.56$

(4) Fat BTF in (mg/kg fat)/(mg/day) was multiplied by fat content of chicken eggs (0.08 kg fat/kg wet weight) to convert transfer factor to a chicken egg BTF. Based on approach from USEPA (2005).

(5) Total intake for adult female from sum of intakes from food and soil ingestion pathways provided in Table 5.4.17.

(6) Congener concentration in egg = total intake by adult female x $BTF_{egg}$

(7) Avian TEFs are from USEPA (June 2008).

(8) TEC in egg = (PCB congener concentration in egg, wet weight) x (TEF).

(9) Congener total represents the sum of congener-specific concentrations based on TECs (derived from concentrations multiplied by TEFs) for an exposure area.

ng = nanogram

BTF = biotransfer factor: (chemical concentration in tissue of consuming animal) / (dietary intake of chemical per day)

TEF = toxicity equivalence factor

TEC = toxicity equivalence concentration

**Table 5.4.20**
**Egg Concentration Calculation for the Burrowing Owl and Western Meadowlark (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | BAF (unitless) [3] | PCB Congener Concentration in Egg (ng/kg wet wt)[4] | TEF (bird) [5] | TEC in Egg (ng/kg wet wt) [6] |
|---|---|---|---|---|---|
| ***Southeast*** | | | | | |
| PCB 77 | 1.1E+01 | 1.26 | 1.39E+01 | 0.05 | 6.93E-01 |
| PCB 81 | 1.3E+00 | 1.26 | 1.64E+00 | 0.1 | 1.64E-01 |
| PCB 105 | 3.3E+01 | 1.26 | 4.16E+01 | 0.0001 | 4.16E-03 |
| PCB 114 | 1.6E+00 | 1.26 | 2.02E+00 | 0.0001 | 2.02E-04 |
| PCB 118 | 5.1E+01 | 1.26 | 6.43E+01 | 0.00001 | 6.43E-04 |
| PCB 123 | 5.4E+00 | 1.26 | 6.80E+00 | 0.00001 | 6.80E-05 |
| PCB 126 | 1.5E+00 | 1.26 | 1.89E+00 | 0.1 | 1.89E-01 |
| PCB 156 | 1.3E+01 | 1.26 | 1.64E+01 | 0.0001 | 1.64E-03 |
| PCB 157 | 2.0E+00 | 1.26 | 2.52E+00 | 0.0001 | 2.52E-04 |
| PCB 167 | 5.2E+00 | 1.26 | 6.55E+00 | 0.00001 | 6.55E-05 |
| PCB 169 | 1.1E+00 | 1.26 | 1.39E+00 | 0.001 | 1.39E-03 |
| PCB 189 | 4.3E+00 | 1.26 | 5.42E+00 | 0.00001 | 5.42E-05 |
| *Congener total:* [7] | | | | | 1.05E+00 |
| ***South*** | | | | | |
| PCB 77 | 5.3E+00 | 1.26 | 6.68E+00 | 0.05 | 3.34E-01 |
| PCB 81 | 6.0E-01 | 1.26 | 7.56E-01 | 0.1 | 7.56E-02 |
| PCB 105 | 2.1E+01 | 1.26 | 2.65E+01 | 0.0001 | 2.65E-03 |
| PCB 114 | 5.0E+00 | 1.26 | 6.30E+00 | 0.0001 | 6.30E-04 |
| PCB 118 | 2.9E+01 | 1.26 | 3.65E+01 | 0.00001 | 3.65E-04 |
| PCB 123 | 1.9E+00 | 1.26 | 2.39E+00 | 0.00001 | 2.39E-05 |
| PCB 126 | 1.2E+00 | 1.26 | 1.51E+00 | 0.1 | 1.51E-01 |
| PCB 156 | 6.8E+00 | 1.26 | 8.57E+00 | 0.0001 | 8.57E-04 |
| PCB 157 | 1.8E+00 | 1.26 | 2.27E+00 | 0.0001 | 2.27E-04 |
| PCB 167 | 3.0E+00 | 1.26 | 3.78E+00 | 0.00001 | 3.78E-05 |
| PCB 169 | 5.0E+00 | 1.26 | 6.30E+00 | 0.001 | 6.30E-03 |
| PCB 189 | 1.6E+00 | 1.26 | 2.02E+00 | 0.00001 | 2.02E-05 |
| *Congener total:* [7] | | | | | 5.72E-01 |
| ***Southwest*** | | | | | |
| PCB 77 | 2.6E+00 | 1.26 | 3.28E+00 | 0.05 | 1.64E-01 |
| PCB 81 | 5.0E+00 | 1.26 | 6.30E+00 | 0.1 | 6.30E-01 |
| PCB 105 | 1.1E+01 | 1.26 | 1.39E+01 | 0.0001 | 1.39E-03 |
| PCB 114 | 1.0E+00 | 1.26 | 1.26E+00 | 0.0001 | 1.26E-04 |
| PCB 118 | 1.5E+01 | 1.26 | 1.89E+01 | 0.00001 | 1.89E-04 |
| PCB 123 | 1.2E+00 | 1.26 | 1.51E+00 | 0.00001 | 1.51E-05 |
| PCB 126 | 5.0E+00 | 1.26 | 6.30E+00 | 0.1 | 6.30E-01 |
| PCB 156 | 3.9E+00 | 1.26 | 4.91E+00 | 0.0001 | 4.91E-04 |
| PCB 157 | 9.2E-01 | 1.26 | 1.16E+00 | 0.0001 | 1.16E-04 |
| PCB 167 | 1.9E+00 | 1.26 | 2.39E+00 | 0.00001 | 2.39E-05 |
| PCB 169 | 5.0E+00 | 1.26 | 6.30E+00 | 0.001 | 6.30E-03 |
| PCB 189 | 1.2E+00 | 1.26 | 1.51E+00 | 0.00001 | 1.51E-05 |
| *Congener total:* [7] | | | | | 1.43E+00 |
| ***West*** | | | | | |
| PCB 77 | 2.3E+00 | 1.26 | 2.90E+00 | 0.05 | 1.45E-01 |
| PCB 81 | 6.0E-01 | 1.26 | 7.56E-01 | 0.1 | 7.56E-02 |
| PCB 105 | 1.0E+01 | 1.26 | 1.26E+01 | 0.0001 | 1.26E-03 |
| PCB 114 | 5.0E+00 | 1.26 | 6.30E+00 | 0.0001 | 6.30E-04 |
| PCB 118 | 1.9E+01 | 1.26 | 2.39E+01 | 0.00001 | 2.39E-04 |
| PCB 123 | 1.5E+00 | 1.26 | 1.89E+00 | 0.00001 | 1.89E-05 |
| PCB 126 | 8.0E-01 | 1.26 | 1.01E+00 | 0.1 | 1.01E-01 |
| PCB 156 | 3.9E+00 | 1.26 | 4.91E+00 | 0.0001 | 4.91E-04 |
| PCB 157 | 1.0E+00 | 1.26 | 1.26E+00 | 0.0001 | 1.26E-04 |
| PCB 167 | 2.2E+00 | 1.26 | 2.77E+00 | 0.00001 | 2.77E-05 |
| PCB 169 | 5.0E+00 | 1.26 | 6.30E+00 | 0.001 | 6.30E-03 |
| PCB 189 | 1.1E+00 | 1.26 | 1.39E+00 | 0.00001 | 1.39E-05 |
| *Congener total:* [7] | | | | | 3.30E-01 |

**Table 5.4.20**
**Egg Concentration Calculation for the Burrowing Owl and Western Meadowlark (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | BAF (unitless) [3] | PCB Congener Concentration in Egg (ng/kg wet wt)[4] | TEF (bird) [5] | TEC in Egg (ng/kg wet wt) [6] |
|---|---|---|---|---|---|
| ***Northwest*** | | | | | |
| PCB 77 | 3.0E+00 | 1.26 | 3.78E+00 | 0.05 | 1.89E-01 |
| PCB 81 | 5.0E-01 | 1.26 | 6.30E-01 | 0.1 | 6.30E-02 |
| PCB 105 | 9.5E+00 | 1.26 | 1.20E+01 | 0.0001 | 1.20E-03 |
| PCB 114 | 5.0E+00 | 1.26 | 6.30E+00 | 0.0001 | 6.30E-04 |
| PCB 118 | 1.8E+01 | 1.26 | 2.27E+01 | 0.00001 | 2.27E-04 |
| PCB 123 | 1.3E+00 | 1.26 | 1.64E+00 | 0.00001 | 1.64E-05 |
| PCB 126 | 1.2E+00 | 1.26 | 1.51E+00 | 0.1 | 1.51E-01 |
| PCB 156 | 3.2E+00 | 1.26 | 4.03E+00 | 0.0001 | 4.03E-04 |
| PCB 157 | 1.0E+00 | 1.26 | 1.26E+00 | 0.0001 | 1.26E-04 |
| PCB 167 | 6.3E+00 | 1.26 | 7.94E+00 | 0.00001 | 7.94E-05 |
| PCB 169 | 5.0E+00 | 1.26 | 6.30E+00 | 0.001 | 6.30E-03 |
| PCB 189 | 4.0E-01 | 1.26 | 5.04E-01 | 0.00001 | 5.04E-06 |
| *Congener total:* [7] | | | | | 4.12E-01 |
| ***North*** | | | | | |
| PCB 77 | 2.8E+00 | 1.26 | 3.53E+00 | 0.05 | 1.76E-01 |
| PCB 81 | 3.0E-01 | 1.26 | 3.78E-01 | 0.1 | 3.78E-02 |
| PCB 105 | 1.2E+01 | 1.26 | 1.51E+01 | 0.0001 | 1.51E-03 |
| PCB 114 | 5.0E+00 | 1.26 | 6.30E+00 | 0.0001 | 6.30E-04 |
| PCB 118 | 1.9E+01 | 1.26 | 2.39E+01 | 0.00001 | 2.39E-04 |
| PCB 123 | 1.5E+00 | 1.26 | 1.89E+00 | 0.00001 | 1.89E-05 |
| PCB 126 | 7.0E-01 | 1.26 | 8.82E-01 | 0.1 | 8.82E-02 |
| PCB 156 | 3.0E+00 | 1.26 | 3.78E+00 | 0.0001 | 3.78E-04 |
| PCB 157 | 1.0E+00 | 1.26 | 1.26E+00 | 0.0001 | 1.26E-04 |
| PCB 167 | 6.6E+00 | 1.26 | 8.32E+00 | 0.00001 | 8.32E-05 |
| PCB 169 | 5.0E+00 | 1.26 | 6.30E+00 | 0.001 | 6.30E-03 |
| PCB 189 | 7.0E-01 | 1.26 | 8.82E-01 | 0.00001 | 8.82E-06 |
| *Congener total:* [7] | | | | | 3.12E-01 |
| ***Northeast*** | | | | | |
| PCB 77 | 1.5E+01 | 1.26 | 1.89E+01 | 0.05 | 9.45E-01 |
| PCB 81 | 1.4E+00 | 1.26 | 1.76E+00 | 0.1 | 1.76E-01 |
| PCB 105 | 6.5E+01 | 1.26 | 8.19E+01 | 0.0001 | 8.19E-03 |
| PCB 114 | 2.0E+00 | 1.26 | 2.52E+00 | 0.0001 | 2.52E-04 |
| PCB 118 | 1.0E+02 | 1.26 | 1.26E+02 | 0.00001 | 1.26E-03 |
| PCB 123 | 8.7E+00 | 1.26 | 1.10E+01 | 0.00001 | 1.10E-04 |
| PCB 126 | 5.9E+00 | 1.26 | 7.43E+00 | 0.1 | 7.43E-01 |
| PCB 156 | 2.9E+01 | 1.26 | 3.65E+01 | 0.0001 | 3.65E-03 |
| PCB 157 | 6.9E+00 | 1.26 | 8.69E+00 | 0.0001 | 8.69E-04 |
| PCB 167 | 1.6E+01 | 1.26 | 2.02E+01 | 0.00001 | 2.02E-04 |
| PCB 169 | 5.0E+00 | 1.26 | 6.30E+00 | 0.001 | 6.30E-03 |
| PCB 189 | 9.3E+00 | 1.26 | 1.17E+01 | 0.00001 | 1.17E-04 |
| *Congener total:* [7] | | | | | 1.89E+00 |
| ***B-18 Landfill*** | | | | | |
| PCB 77 | 1.8E+01 | 1.26 | 2.27E+01 | 0.05 | 1.13E+00 |
| PCB 81 | 2.4E+00 | 1.26 | 3.02E+00 | 0.1 | 3.02E-01 |
| PCB 105 | 6.2E+01 | 1.26 | 7.81E+01 | 0.0001 | 7.81E-03 |
| PCB 114 | 2.3E+00 | 1.26 | 2.90E+00 | 0.0001 | 2.90E-04 |
| PCB 118 | 8.5E+01 | 1.26 | 1.07E+02 | 0.00001 | 1.07E-03 |
| PCB 123 | 1.5E+01 | 1.26 | 1.89E+01 | 0.00001 | 1.89E-04 |
| PCB 126 | 3.5E+00 | 1.26 | 4.41E+00 | 0.1 | 4.41E-01 |
| PCB 156 | 3.1E+01 | 1.26 | 3.91E+01 | 0.0001 | 3.91E-03 |
| PCB 157 | 4.8E+00 | 1.26 | 6.05E+00 | 0.0001 | 6.05E-04 |
| PCB 167 | 1.3E+01 | 1.26 | 1.64E+01 | 0.00001 | 1.64E-04 |
| PCB 169 | 5.0E+00 | 1.26 | 6.30E+00 | 0.001 | 6.30E-03 |
| PCB 189 | 8.2E+00 | 1.26 | 1.03E+01 | 0.00001 | 1.03E-04 |
| *Congener total:* [7] | | | | | 1.90E+00 |

**Table 5.4.20**
**Egg Concentration Calculation for the Burrowing Owl and Western Meadowlark (BAF Approach)**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Concentration detected in ten multi-increment samples from each exposure area, or surrogate concentration of 1/2 reporting limit for nondetects.

(3) Basis for BAF: A study by Blankenship et al. (2005) in which co-located soil and wildlife tissue samples were analyzed for PCBs at a forested site in a Michigan flood plain. Total PCB concentrations in tissue were divided by total PCB concentrations in soil to calculate BSAFs for a variety of wildlife. House wren eggs were found to have the highest BSAF among eggs of four bird species. Using data from the study, the total PCB concentration in wren eggs (8.23 mg/kg wet weight) and in soil (6.53 mg/kg dry weight) were used to calculate a soil-to-egg BAF of 1.26.

(4) Congener concentration in egg = soil concentration x BAF

(5) Avian TEFs are from USEPA (June 2008).

(6) TEC in egg = (PCB congener concentration in egg, wet weight) x (TEF).

(7) Congener total represents the sum of congener-specific concentrations based on TECs (derived from concentrations multiplied by TEFs) for an exposure area.

BAF = bioaccumulation factor

BSAF = biota-soil accumulation factor

ng = nanogram

TEC = toxicity equivalence concentration

TEF = toxicity equivalence factor

**Table 5.4.21**
**Risk Calculation for the San Joaquin Kit Fox**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Diet Exposure Area | TED - Adult (ng/kg BW-day) (1) | TED - Juvenile (ng/kg BW-day) (2) | TRV (ng/kg BW-day) | | $HQ_{low}$ (5) | | $HQ_{high}$ (6) | |
|---|---|---|---|---|---|---|---|---|
| | | | Low (3) | High (4) | Adult | Juvenile | Adult | Juvenile |
| Diet of Herbivorous Prey | | | | | | | | |
| Southeast | 9.44E-05 | 1.57E-04 | 1 | 10 | 9E-5 | 2E-4 | 9E-6 | 2E-5 |
| South | 1.37E-04 | 2.28E-04 | 1 | 10 | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Southwest | 3.26E-04 | 5.44E-04 | 1 | 10 | 3E-4 | 5E-4 | 3E-5 | 5E-5 |
| West | 1.16E-04 | 1.93E-04 | 1 | 10 | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Northwest | 1.36E-04 | 2.27E-04 | 1 | 10 | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| North | 1.11E-04 | 1.85E-04 | 1 | 10 | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Northeast | 3.75E-04 | 6.24E-04 | 1 | 10 | 4E-4 | 6E-4 | 4E-5 | 6E-5 |
| B-18 Landfill | 2.55E-04 | 4.25E-04 | 1 | 10 | 3E-4 | 4E-4 | 3E-5 | 4E-5 |
| Diet of Carnivorous Prey | | | | | | | | |
| BTF Approach | | | | | | | | |
| Southeast | 9.42E-05 | 1.57E-04 | 1 | 10 | 9E-5 | 2E-4 | 9E-6 | 2E-5 |
| South | 1.37E-04 | 2.28E-04 | 1 | 10 | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Southwest | 3.27E-04 | 5.45E-04 | 1 | 10 | 3E-4 | 5E-4 | 3E-5 | 5E-5 |
| West | 1.16E-04 | 1.93E-04 | 1 | 10 | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Northwest | 1.36E-04 | 2.27E-04 | 1 | 10 | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| North | 1.11E-04 | 1.85E-04 | 1 | 10 | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Northeast | 3.75E-04 | 6.25E-04 | 1 | 10 | 4E-4 | 6E-4 | 4E-5 | 6E-5 |
| B-18 Landfill | 2.55E-04 | 4.25E-04 | 1 | 10 | 3E-4 | 4E-4 | 3E-5 | 4E-5 |
| BAF Approach | | | | | | | | |
| Southeast | 2.35E-03 | 3.92E-03 | 1 | 10 | 2E-3 | 4E-3 | 2E-4 | 4E-4 |
| South | 3.41E-03 | 5.68E-03 | 1 | 10 | 3E-3 | 6E-3 | 3E-4 | 6E-4 |
| Southwest | 8.16E-03 | 1.36E-02 | 1 | 10 | 8E-3 | 1E-2 | 8E-4 | 1E-3 |
| West | 2.90E-03 | 4.83E-03 | 1 | 10 | 3E-3 | 5E-3 | 3E-4 | 5E-4 |
| Northwest | 3.40E-03 | 5.66E-03 | 1 | 10 | 3E-3 | 6E-3 | 3E-4 | 6E-4 |
| North | 2.77E-03 | 4.62E-03 | 1 | 10 | 3E-3 | 5E-3 | 3E-4 | 5E-4 |
| Northeast | 9.36E-03 | 1.56E-02 | 1 | 10 | 9E-3 | 2E-2 | 9E-4 | 2E-3 |
| B-18 Landfill | 6.36E-03 | 1.06E-02 | 1 | 10 | 6E-3 | 1E-2 | 6E-4 | 1E-3 |

Notes:

(1) TEDs for adults from Table 5.4.3 for herbivorous prey,
and from Tables 5.4.5 and 5.4.7 for carnivorous prey (BTF and BAF approaches, respectively).

(2) TEDs for juveniles from Table 5.4.4 for herbivorous prey,
and from Tables 5.4.6 and 5.4.8 for carnivorous prey (BTF and BAF approaches, respectively).

(3) Low TRV is based on a mammalian NOAEL from USEPA (1999) and Sample *et al*. (1996).

(4) High TRV is based on a mammalian LOAEL from USEPA (1999) and Sample *et al*. (1996).

(5) $HQ_{low}$ = (exposure dose) / (NOAEL-based TRV).

(6) $HQ_{high}$ = (exposure dose) / (LOAEL-based TRV).

BAF = bioaccumulation factor
BTF = biotransfer factor
BW = body weight.
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
NOAEL = no observed adverse effect level
TED = toxicity equivalence dose
TRV = toxicity reference value

**Table 5.4.22**
**Risk Calculation for the San Joaquin Pocket Mouse**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | TED - Adult (ng/kg BW-day) (1) | TED - Juvenile (ng/kg BW-day) (1) | TRV (ng/kg BW-day) | | $HQ_{low}$ (4) | | $HQ_{high}$ (5) | |
|---|---|---|---|---|---|---|---|---|
| | | | Low (2) | High (3) | Adult | Juvenile | Adult | Juvenile |
| Southeast | 8.63E-02 | 8.65E-02 | 1 | 10 | 9E-2 | 9E-2 | 9E-3 | 9E-3 |
| South | 4.91E-02 | 4.92E-02 | 1 | 10 | 5E-2 | 5E-2 | 5E-3 | 5E-3 |
| Southwest | 9.52E-03 | 9.58E-03 | 1 | 10 | 1E-2 | 1E-2 | 1E-3 | 1E-3 |
| West | 9.06E-03 | 9.09E-03 | 1 | 10 | 9E-3 | 9E-3 | 9E-4 | 9E-4 |
| Northwest | 8.92E-03 | 8.95E-03 | 1 | 10 | 9E-3 | 9E-3 | 9E-4 | 9E-4 |
| North | 9.17E-03 | 9.20E-03 | 1 | 10 | 9E-3 | 9E-3 | 9E-4 | 9E-4 |
| Northeast | 8.70E-03 | 8.76E-03 | 1 | 10 | 9E-3 | 9E-3 | 9E-4 | 9E-4 |
| B-18 Landfill | 7.33E-02 | 7.35E-02 | 1 | 10 | 7E-2 | 7E-2 | 7E-3 | 7E-3 |

Notes:
(1) TEDs from Table 5.4.9 for adult and Table 5.4.10 for juvenile.
(2) Low TRV is based on a mammalian NOAEL from USEPA (1999) and Sample *et al* . (1996).
(3) High TRV is based on a mammalian LOAEL from USEPA (1999) and Sample *et al* . (1996).
(4) $HQ_{low}$ = (exposure dose) / (NOAEL-based TRV).
(5) $HQ_{high}$ = (exposure dose) / (LOAEL-based TRV).

BW = body weight
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
NOAEL = no observed adverse effect level
TED = toxicity equivalence dose
TRV = toxicity reference value

**Table 5.4.23**
**Risk Calculation for the Tulare Grasshopper Mouse**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | TED - Adult (ng/kg BW-day) (1) | TED - Juvenile (ng/kg BW-day) (1) | TRV (ng/kg BW-day) | | $HQ_{low}$ (4) | | $HQ_{high}$ (5) | |
|---|---|---|---|---|---|---|---|---|
| | | | Low (2) | High (3) | Adult | Juvenile | Adult | Juvenile |
| Southeast | 1.38E-02 | 1.42E-02 | 1 | 10 | 1E-2 | 1E-2 | 1E-3 | 1E-3 |
| South | 2.03E-02 | 2.10E-02 | 1 | 10 | 2E-2 | 2E-2 | 2E-3 | 2E-3 |
| Southwest | 4.79E-02 | 4.96E-02 | 1 | 10 | 5E-2 | 5E-2 | 5E-3 | 5E-3 |
| West | 1.74E-02 | 1.80E-02 | 1 | 10 | 2E-2 | 2E-2 | 2E-3 | 2E-3 |
| Northwest | 2.03E-02 | 2.10E-02 | 1 | 10 | 2E-2 | 2E-2 | 2E-3 | 2E-3 |
| North | 1.66E-02 | 1.72E-02 | 1 | 10 | 2E-2 | 2E-2 | 2E-3 | 2E-3 |
| Northeast | 5.49E-02 | 5.68E-02 | 1 | 10 | 5E-2 | 6E-2 | 5E-3 | 6E-3 |
| B-18 Landfill | 3.75E-02 | 3.88E-02 | 1 | 10 | 4E-2 | 4E-2 | 4E-3 | 4E-3 |

Notes:
(1) TEDs from Table 5.4.11 for adult and Table 5.4.12 for juvenile.
(2) Low TRV is based on a mammalian NOAEL from USEPA (1999) and Sample *et al* . (1996).
(3) High TRV is based on a mammalian LOAEL from USEPA (1999) and Sample *et al* . (1996).
(4) $HQ_{low}$ = (exposure dose) / (NOAEL-based TRV).
(5) $HQ_{high}$ = (exposure dose) / (LOAEL-based TRV).

BW = body weight
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
NOAEL = no observed adverse effect level
TED = toxicity equivalence dose
TRV = toxicity reference value

**Table 5.4.24**
**Risk Calculation for the Burrowing Owl**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | TED - Adult Male (ng/kg BW-day) (1) | TED - Female/Juvenile (ng/kg BW-day) (1) | TRV (ng/kg BW-day) | | $HQ_{low}$ (4) | | $HQ_{high}$ (5) | |
|---|---|---|---|---|---|---|---|---|
| | | | Low (2) | High (3) | Adult Male | Female/ Juvenile | Adult Male | Female/ Juvenile |
| | | | | | | | | |
| Diet of Herbivorous Prey | | | | | | | | |
| Southeast | 1.96E-03 | 2.01E-03 | 10 | 100 | 2E-4 | 2E-4 | 2E-5 | 2E-5 |
| South | 1.07E-03 | 1.09E-03 | 10 | 100 | 1E-4 | 1E-4 | 1E-5 | 1E-5 |
| Southwest | 2.65E-03 | 2.71E-03 | 10 | 100 | 3E-4 | 3E-4 | 3E-5 | 3E-5 |
| West | 6.12E-04 | 6.27E-04 | 10 | 100 | 6E-5 | 6E-5 | 6E-6 | 6E-6 |
| Northwest | 7.62E-04 | 7.80E-04 | 10 | 100 | 8E-5 | 8E-5 | 8E-6 | 8E-6 |
| North | 5.77E-04 | 5.90E-04 | 10 | 100 | 6E-5 | 6E-5 | 6E-6 | 6E-6 |
| Northeast | 3.48E-03 | 3.57E-03 | 10 | 100 | 3E-4 | 4E-4 | 3E-5 | 4E-5 |
| B-18 Landfill | 3.53E-03 | 3.61E-03 | 10 | 100 | 4E-4 | 4E-4 | 4E-5 | 4E-5 |
| Diet of Carnivorous Prey | | | | | | | | |
| BAF Approach | | | | | | | | |
| Southeast | NC | 7.11E-02 | 10 | 100 | NC | 7E-3 | NC | 7E-4 |
| South | NC | 3.85E-02 | 10 | 100 | NC | 4E-3 | NC | 4E-4 |
| Southwest | NC | 9.65E-02 | 10 | 100 | NC | 1E-2 | NC | 1E-3 |
| West | NC | 2.23E-02 | 10 | 100 | NC | 2E-3 | NC | 2E-4 |
| Northwest | NC | 2.78E-02 | 10 | 100 | NC | 3E-3 | NC | 3E-4 |
| North | NC | 2.10E-02 | 10 | 100 | NC | 2E-3 | NC | 2E-4 |
| Northeast | NC | 1.27E-01 | 10 | 100 | NC | 1E-2 | NC | 1E-3 |
| B-18 Landfill | NC | 1.28E-01 | 10 | 100 | NC | 1E-2 | NC | 1E-3 |

Notes:

(1) TEDs for adults with a diet of herbivorous prey are from Table 5.4.13 for adult males and Table 5.4.14 for females/juveniles. TEDs for adult males with a diet of carnivorous prey were not calculated. TEDs for females/juveniles with a diet of carnivorous prey are from Table 5.4.15 for females.

(2) Low TRV is based on an avian NOAEL from USEPA (1999) and Sample *et al* . (1996).

(3) High TRV is based on an avian LOAEL from USEPA (1999) and Sample *et al* . (1996).

(4) $HQ_{low}$ = (exposure dose) / (NOAEL-based TRV).

(5) $HQ_{high}$ = (exposure dose) / (LOAEL-based TRV).

BAF = bioaccumulation factor
BW = body weight
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
NC = not calculated
NOAEL = no observed adverse effect level
TED = toxicity equivalence dose
TRV = toxicity reference value

**Table 5.4.25**
**Risk Calculation for the Western Meadowlark**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Exposure Area | TED - Adult Male (ng/kg BW-day) (1) | TED - Female/Juvenile (ng/kg BW-day) (1) | TRV (ng/kg BW-day) | | $HQ_{low}$ (4) | | $HQ_{high}$ (5) | |
|---|---|---|---|---|---|---|---|---|
| | | | Low (2) | High (3) | Adult Male | Female/ Juvenile | Adult Male | Female/ Juvenile |
| Southeast | 4.89E-01 | 4.97E-01 | 10 | 100 | 5E-2 | 5E-2 | 5E-3 | 5E-3 |
| South | 2.95E-01 | 3.00E-01 | 10 | 100 | 3E-2 | 3E-2 | 3E-3 | 3E-3 |
| Southwest | 2.93E-01 | 2.96E-01 | 10 | 100 | 3E-2 | 3E-2 | 3E-3 | 3E-3 |
| West | 9.66E-02 | 9.81E-02 | 10 | 100 | 1E-2 | 1E-2 | 1E-3 | 1E-3 |
| Northwest | 9.78E-02 | 9.92E-02 | 10 | 100 | 1E-2 | 1E-2 | 1E-3 | 1E-3 |
| North | 7.96E-02 | 8.07E-02 | 10 | 100 | 8E-3 | 8E-3 | 8E-4 | 8E-4 |
| Northeast | 3.85E-01 | 3.90E-01 | 10 | 100 | 4E-2 | 4E-2 | 4E-3 | 4E-3 |
| B-18 Landfill | 7.41E-01 | 7.54E-01 | 10 | 100 | 7E-2 | 8E-2 | 7E-3 | 8E-3 |

Notes:
(1) TEDs from Table 5.4.16 for adult male and Table 5.4.17 for adult female/juvenile.
(2) Low TRV is based on an avian NOAEL from USEPA (1999) and Sample *et al* . (1996).
(3) High TRV is based on an avian LOAEL from USEPA (1999) and Sample *et al* . (1996).
(4) $HQ_{low}$ = (exposure dose) / (NOAEL-based TRV).
(5) $HQ_{high}$ = (exposure dose) / (LOAEL-based TRV).

BW = body weight
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
NOAEL = no observed adverse effect level
TED = toxicity equivalence dose
TRV = toxicity reference value

**Table 5.4.26**
**Risk Calculation for Bird Eggs/Embryos -- Burrowing Owl and Western Meadowlark**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Species<br>Exposure Area | TEC<br>in Egg<br>(ng/kg wet wt) (1) | TRV (ng/kg wet wt) | | $HQ_{low}$ (3) | $HQ_{high}$ (4) |
|---|---|---|---|---|---|
| | | Low (2) | High (2) | Egg/<br>Embryo | Egg/<br>Embryo |
| Burrowing Owl | | | | | |
| BTF Approach | | | | | |
| Southeast | 1.07E-04 | 66 | 150 | 2E-6 | 7E-7 |
| South | 5.68E-05 | 66 | 150 | 9E-7 | 4E-7 |
| Southwest | 1.45E-04 | 66 | 150 | 2E-6 | 1E-6 |
| West | 3.29E-05 | 66 | 150 | 5E-7 | 2E-7 |
| Northwest | 4.01E-05 | 66 | 150 | 6E-7 | 3E-7 |
| North | 3.06E-05 | 66 | 150 | 5E-7 | 2E-7 |
| Northeast | 1.82E-04 | 66 | 150 | 3E-6 | 1E-6 |
| B-18 Landfill | 1.91E-04 | 66 | 150 | 3E-6 | 1E-6 |
| BAF Approach | | | | | |
| Southeast | 1.05E+00 | 66 | 150 | 2E-2 | 7E-3 |
| South | 5.72E-01 | 66 | 150 | 9E-3 | 4E-3 |
| Southwest | 1.43E+00 | 66 | 150 | 2E-2 | 1E-2 |
| West | 3.30E-01 | 66 | 150 | 5E-3 | 2E-3 |
| Northwest | 4.12E-01 | 66 | 150 | 6E-3 | 3E-3 |
| North | 3.12E-01 | 66 | 150 | 5E-3 | 2E-3 |
| Northeast | 1.89E+00 | 66 | 150 | 3E-2 | 1E-2 |
| B-18 Landfill | 1.90E+00 | 66 | 150 | 3E-2 | 1E-2 |
| Western Meadowlark | | | | | |
| BTF Approach | | | | | |
| Southeast | 5.36E-04 | 66 | 150 | 8E-6 | 4E-6 |
| South | 3.20E-04 | 66 | 150 | 5E-6 | 2E-6 |
| Southwest | 3.14E-04 | 66 | 150 | 5E-6 | 2E-6 |
| West | 1.04E-04 | 66 | 150 | 2E-6 | 7E-7 |
| Northwest | 1.02E-04 | 66 | 150 | 2E-6 | 7E-7 |
| North | 8.40E-05 | 66 | 150 | 1E-6 | 6E-7 |
| Northeast | 3.96E-04 | 66 | 150 | 6E-6 | 3E-6 |
| B-18 Landfill | 8.08E-04 | 66 | 150 | 1E-5 | 5E-6 |
| BAF Approach | | | | | |
| Southeast | 1.05E+00 | 66 | 150 | 2E-2 | 7E-3 |
| South | 5.72E-01 | 66 | 150 | 9E-3 | 4E-3 |
| Southwest | 1.43E+00 | 66 | 150 | 2E-2 | 1E-2 |
| West | 3.30E-01 | 66 | 150 | 5E-3 | 2E-3 |
| Northwest | 4.12E-01 | 66 | 150 | 6E-3 | 3E-3 |
| North | 3.12E-01 | 66 | 150 | 5E-3 | 2E-3 |
| Northeast | 1.89E+00 | 66 | 150 | 3E-2 | 1E-2 |
| B-18 Landfill | 1.90E+00 | 66 | 150 | 3E-2 | 1E-2 |

**Table 5.4.26**
**Risk Calculation for Bird Eggs/Embryos -- Burrowing Owl and Western Meadowlark**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Egg TECs based on the BTF approach are from Table 5.4.18 for the burrowing owl, Table 5.4.19 for the meadowlark. Egg TECs based on the BAF approach are from Table 5.4.20 for both species.

(2) Low and high TRVs were based on an avian NOAEL and LOAEL, respectively, for developmental impairment or embryo mortality effects associated with concentrations in eggs from studies in chickens (USEPA 2003). The chicken was found to be the most sensitive bird for which data for dioxin-like compounds were available.

(3) $HQ_{low}$ = (exposure dose) / (NOAEL-based TRV).

(4) $HQ_{high}$ = (exposure dose) / (LOAEL-based TRV).

BW = body weight
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
NOAEL = no observed adverse effect level
TEC = toxicity equivalence concentration
TRV = toxicity reference value

**Table 5.4.27**
**Summary of Hazard Quotients**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Receptor / Exposure Area | $HQ_{low}$ | | $HQ_{high}$ | |
|---|---|---|---|---|
| **San Joaquin Kit Fox** | Adult | Juvenile | Adult | Juvenile |
| BTF Approach | | | | |
| Herbivorous prey | | | | |
| Southeast | 9E-5 | 2E-4 | 9E-6 | 2E-5 |
| South | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Southwest | 3E-4 | 5E-4 | 3E-5 | 5E-5 |
| West | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Northwest | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| North | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Northeast | 4E-4 | 6E-4 | 4E-5 | 6E-5 |
| B-18 Landfill | 3E-4 | 4E-4 | 3E-5 | 4E-5 |
| Carnivorous prey | | | | |
| Southeast | 9E-5 | 2E-4 | 9E-6 | 2E-5 |
| South | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Southwest | 3E-4 | 5E-4 | 3E-5 | 5E-5 |
| West | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Northwest | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| North | 1E-4 | 2E-4 | 1E-5 | 2E-5 |
| Northeast | 4E-4 | 6E-4 | 4E-5 | 6E-5 |
| B-18 Landfill | 3E-4 | 4E-4 | 3E-5 | 4E-5 |
| BAF Approach | | | | |
| Carnivorous prey | | | | |
| Southeast | 2E-3 | 4E-3 | 2E-4 | 4E-4 |
| South | 3E-3 | 6E-3 | 3E-4 | 6E-4 |
| Southwest | 8E-3 | 1E-2 | 8E-4 | 1E-3 |
| West | 3E-3 | 5E-3 | 3E-4 | 5E-4 |
| Northwest | 3E-3 | 6E-3 | 3E-4 | 6E-4 |
| North | 3E-3 | 5E-3 | 3E-4 | 5E-4 |
| Northeast | 9E-3 | 2E-2 | 9E-4 | 2E-3 |
| B-18 Landfill | 6E-3 | 1E-2 | 6E-4 | 1E-3 |
| **San Joaquin Pocket Mouse** | Adult | Juvenile | Adult | Juvenile |
| Southeast | 9E-2 | 9E-2 | 9E-3 | 9E-3 |
| South | 5E-2 | 5E-2 | 5E-3 | 5E-3 |
| Southwest | 1E-2 | 1E-2 | 1E-3 | 1E-3 |
| West | 9E-3 | 9E-3 | 9E-4 | 9E-4 |
| Northwest | 9E-3 | 9E-3 | 9E-4 | 9E-4 |
| North | 9E-3 | 9E-3 | 9E-4 | 9E-4 |
| Northeast | 9E-3 | 9E-3 | 9E-4 | 9E-4 |
| B-18 Landfill | 7E-2 | 7E-2 | 7E-3 | 7E-3 |
| **Tulare Grasshopper Mouse** | Adult | Juvenile | Adult | Juvenile |
| Southeast | 1E-2 | 1E-2 | 1E-3 | 1E-3 |
| South | 2E-2 | 2E-2 | 2E-3 | 2E-3 |
| Southwest | 5E-2 | 5E-2 | 5E-3 | 5E-3 |
| West | 2E-2 | 2E-2 | 2E-3 | 2E-3 |
| Northwest | 2E-2 | 2E-2 | 2E-3 | 2E-3 |
| North | 2E-2 | 2E-2 | 2E-3 | 2E-3 |
| Northeast | 5E-2 | 6E-2 | 5E-3 | 6E-3 |
| B-18 Landfill | 4E-2 | 4E-2 | 4E-3 | 4E-3 |

**Table 5.4.27**
**Summary of Hazard Quotients**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| **Receptor** <br> **Exposure Area** | **$HQ_{low}$** | | | **$HQ_{high}$** | | |
|---|---|---|---|---|---|---|
| **Burrowing Owl** | Adult Male | Female/Juvenile | Egg | Adult Male | Female/Juvenile | Egg |
| BTF Approach | | | | | | |
| Herbivorous prey | | | | | | |
| Southeast | 2E-4 | 2E-4 | 2E-6 | 2E-5 | 2E-5 | 7E-7 |
| South | 1E-4 | 1E-4 | 9E-7 | 1E-5 | 1E-5 | 4E-7 |
| Southwest | 3E-4 | 3E-4 | 2E-6 | 3E-5 | 3E-5 | 1E-6 |
| West | 6E-5 | 6E-5 | 5E-7 | 6E-6 | 6E-6 | 2E-7 |
| Northwest | 8E-5 | 8E-5 | 6E-7 | 8E-6 | 8E-6 | 3E-7 |
| North | 6E-5 | 6E-5 | 5E-7 | 6E-6 | 6E-6 | 2E-7 |
| Northeast | 3E-4 | 4E-4 | 3E-6 | 3E-5 | 4E-5 | 1E-6 |
| B-18 Landfill | 4E-4 | 4E-4 | 3E-6 | 4E-5 | 4E-5 | 1E-6 |
| BAF Approach | | | | | | |
| Carnivorous prey (1) | | | | | | |
| Southeast | NC | 7E-3 | 2E-2 | NC | 7E-4 | 7E-3 |
| South | NC | 4E-3 | 9E-3 | NC | 4E-4 | 4E-3 |
| Southwest | NC | 1E-2 | 2E-2 | NC | 1E-3 | 1E-2 |
| West | NC | 2E-3 | 5E-3 | NC | 2E-4 | 2E-3 |
| Northwest | NC | 3E-3 | 6E-3 | NC | 3E-4 | 3E-3 |
| North | NC | 2E-3 | 5E-3 | NC | 2E-4 | 2E-3 |
| Northeast | NC | 1E-2 | 3E-2 | NC | 1E-3 | 1E-2 |
| B-18 Landfill | NC | 1E-2 | 3E-2 | NC | 1E-3 | 1E-2 |
| **Western Meadowlark** | Adult Male | Female/Juvenile | Egg | Adult Male | Female/Juvenile | Egg |
| BTF Approach | | | | | | |
| Southeast | 5E-2 | 5E-2 | 8E-6 | 5E-3 | 5E-3 | 4E-6 |
| South | 3E-2 | 3E-2 | 5E-6 | 3E-3 | 3E-3 | 2E-6 |
| Southwest | 3E-2 | 3E-2 | 5E-6 | 3E-3 | 3E-3 | 2E-6 |
| West | 1E-2 | 1E-2 | 2E-6 | 1E-3 | 1E-3 | 7E-7 |
| Northwest | 1E-2 | 1E-2 | 2E-6 | 1E-3 | 1E-3 | 7E-7 |
| North | 8E-3 | 8E-3 | 1E-6 | 8E-4 | 8E-4 | 6E-7 |
| Northeast | 4E-2 | 4E-2 | 6E-6 | 4E-3 | 4E-3 | 3E-6 |
| B-18 Landfill | 7E-2 | 8E-2 | 1E-5 | 7E-3 | 8E-3 | 5E-6 |
| BAF Approach | | | | | | |
| Southeast | NC | NC | 2E-2 | NC | NC | 7E-3 |
| South | NC | NC | 9E-3 | NC | NC | 4E-3 |
| Southwest | NC | NC | 2E-2 | NC | NC | 1E-2 |
| West | NC | NC | 5E-3 | NC | NC | 2E-3 |
| Northwest | NC | NC | 6E-3 | NC | NC | 3E-3 |
| North | NC | NC | 5E-3 | NC | NC | 2E-3 |
| Northeast | NC | NC | 3E-2 | NC | NC | 1E-2 |
| B-18 Landfill | NC | NC | 3E-2 | NC | NC | 1E-2 |

Notes:
(1) For the burrowing owl, diet of carnivorous prey was assumed for the female/juvenile and is not applicable to the egg HQs.
HQs are of potential concern if equal to or greater than 1.0. The highest HQ for a given receptor and exposure area is 0.09 (for the San Joaquin Pocket mouse in the Southeast exposure area).

HQ = hazard quotient
$HQ_{low}$ = exposure dose / NOAEL-based TRV
$HQ_{high}$ = exposure dose / LOAEL-based TRV
NC = not calculated

**Table 5.4.28**
**Summary of KHF Exposure Area TECs in Soil**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

**SOIL**

| KHF Exposure Area TECs [(1)] (ng/kg) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Southeast** | **South** | **Southwest** | **West** | **Northwest** | **North** | **Northeast** | **B-18 Landfill** | **Mean** |
| 0.19 | 0.27 | 0.65 | 0.23 | 0.27 | 0.22 | 0.75 | 0.51 | 0.39 |

**Notes:**

(1) TECs were derived by summing congener-specific TECs calculated by multiplying concentrations of the dioxin-like congeners by TEFs for mammals from Van den Berg et al. (2006).

ng/kg - nanograms per kilogram

KHF - Kettleman Hills Facility

TEC - toxicity equivalence concentration

TEF - toxicity equivalence factor

**Table 5.4.29**
**Uncertainty Analysis: Maximal Risk Calculation for the San Joaquin Kit Fox - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[1] | Soil Concentration (ng/kg) [2] | Plant Concentration (ng/kg) [2] | Maximal Soil or Plant Concentration (ng/kg) [3] | San Joaquin Kit Fox Food Ingestion Rate (kg/day) [4] | San Joaquin Kit Fox Body Weight (kg) [4] | Maximal Exposure Dose (ng/kg BW-day) [5] | TEF (mammal) [6] | Maximal TED (ng/kg BW-day) [7] | Low TRV (ng/kg BW -day)[8] | $HQ_{low}$[9] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Southeast*** | | | | | | | | | | |
| PCB 77 | 1.1E+01 | 9.7E+01 | 9.70E+01 | 0.12 | 1.2 | 9.70E+00 | 0.0001 | 9.70E-04 | | |
| PCB 81 | 1.3E+00 | 1.4E+01 | 1.38E+01 | 0.12 | 1.2 | 1.38E+00 | 0.0003 | 4.14E-04 | | |
| PCB 105 | 3.3E+01 | 1.5E+02 | 1.50E+02 | 0.12 | 1.2 | 1.50E+01 | 0.00003 | 4.50E-04 | | |
| PCB 114 | 1.6E+00 | 8.7E+00 | 8.69E+00 | 0.12 | 1.2 | 8.69E-01 | 0.00003 | 2.61E-05 | | |
| PCB 118 | 5.1E+01 | 2.7E+02 | 2.70E+02 | 0.12 | 1.2 | 2.70E+01 | 0.00003 | 8.10E-04 | | |
| PCB 123 | 5.4E+00 | 1.7E+01 | 1.72E+01 | 0.12 | 1.2 | 1.72E+00 | 0.00003 | 5.16E-05 | | |
| PCB 126 | 1.5E+00 | 1.3E+01 | 1.26E+01 | 0.12 | 1.2 | 1.26E+00 | 0.1 | 1.26E-01 | | |
| PCB 156 | 1.3E+01 | 3.3E+01 | 3.34E+01 | 0.12 | 1.2 | 3.34E+00 | 0.00003 | 1.00E-04 | | |
| PCB 157 | 2.0E+00 | 6.8E+00 | 6.80E+00 | 0.12 | 1.2 | 6.80E-01 | 0.00003 | 2.04E-05 | | |
| PCB 167 | 5.2E+00 | 1.7E+01 | 1.71E+01 | 0.12 | 1.2 | 1.71E+00 | 0.00003 | 5.14E-05 | | |
| PCB 169 | 1.1E+00 | 7.5E-01 | 1.10E+00 | 0.12 | 1.2 | 1.10E-01 | 0.03 | 3.30E-03 | | |
| PCB 189 | 4.3E+00 | 8.6E+00 | 8.64E+00 | 0.12 | 1.2 | 8.64E-01 | 0.00003 | 2.59E-05 | | |
| *Congener total:* [10] | | | | | | | | 1.32E-01 | 1 | 1E-1 |
| ***South*** | | | | | | | | | | |
| PCB 77 | 5.3E+00 | 7.0E+01 | 7.03E+01 | 0.12 | 1.2 | 7.03E+00 | 0.0001 | 7.03E-04 | | |
| PCB 81 | 6.0E-01 | 6.5E+00 | 6.49E+00 | 0.12 | 1.2 | 6.49E-01 | 0.0003 | 1.95E-04 | | |
| PCB 105 | 2.1E+01 | 1.3E+02 | 1.30E+02 | 0.12 | 1.2 | 1.30E+01 | 0.00003 | 3.90E-04 | | |
| PCB 114 | 5.0E+00 | 5.4E+00 | 5.40E+00 | 0.12 | 1.2 | 5.40E-01 | 0.00003 | 1.62E-05 | | |
| PCB 118 | 2.9E+01 | 1.8E+02 | 1.80E+02 | 0.12 | 1.2 | 1.80E+01 | 0.00003 | 5.40E-04 | | |
| PCB 123 | 1.9E+00 | 7.3E+00 | 7.34E+00 | 0.12 | 1.2 | 7.34E-01 | 0.00003 | 2.20E-05 | | |
| PCB 126 | 1.2E+00 | 7.1E+00 | 7.10E+00 | 0.12 | 1.2 | 7.10E-01 | 0.1 | 7.10E-02 | | |
| PCB 156 | 6.8E+00 | 2.1E+01 | 2.10E+01 | 0.12 | 1.2 | 2.10E+00 | 0.00003 | 6.30E-05 | | |
| PCB 157 | 1.8E+00 | 4.8E+00 | 4.80E+00 | 0.12 | 1.2 | 4.80E-01 | 0.00003 | 1.44E-05 | | |
| PCB 167 | 3.0E+00 | 2.4E+01 | 2.41E+01 | 0.12 | 1.2 | 2.41E+00 | 0.00003 | 7.22E-05 | | |
| PCB 169 | 5.0E+00 | 6.6E-01 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.03 | 1.50E-02 | | |
| PCB 189 | 1.6E+00 | 1.2E+00 | 1.60E+00 | 0.12 | 1.2 | 1.60E-01 | 0.00003 | 4.80E-06 | | |
| *Congener total:* [10] | | | | | | | | 8.80E-02 | 1 | 9E-2 |
| ***Southwest*** | | | | | | | | | | |
| PCB 77 | 2.6E+00 | 9.2E+00 | 9.23E+00 | 0.12 | 1.2 | 9.23E-01 | 0.0001 | 9.23E-05 | | |
| PCB 81 | 5.0E+00 | 1.1E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.0003 | 1.50E-04 | | |
| PCB 105 | 1.1E+01 | 1.9E+01 | 1.92E+01 | 0.12 | 1.2 | 1.92E+00 | 0.00003 | 5.77E-05 | | |
| PCB 114 | 1.0E+00 | 1.1E+00 | 1.05E+00 | 0.12 | 1.2 | 1.05E-01 | 0.00003 | 3.15E-06 | | |
| PCB 118 | 1.5E+01 | 2.9E+01 | 2.91E+01 | 0.12 | 1.2 | 2.91E+00 | 0.00003 | 8.74E-05 | | |
| PCB 123 | 1.2E+00 | 1.6E+00 | 1.62E+00 | 0.12 | 1.2 | 1.62E-01 | 0.00003 | 4.85E-06 | | |
| PCB 126 | 5.0E+00 | 1.1E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.1 | 5.00E-02 | | |
| PCB 156 | 3.9E+00 | 4.2E+00 | 4.17E+00 | 0.12 | 1.2 | 4.17E-01 | 0.00003 | 1.25E-05 | | |
| PCB 157 | 9.2E-01 | 1.9E+00 | 1.95E+00 | 0.12 | 1.2 | 1.95E-01 | 0.00003 | 5.84E-06 | | |
| PCB 167 | 1.9E+00 | 1.0E+01 | 1.04E+01 | 0.12 | 1.2 | 1.04E+00 | 0.00003 | 3.13E-05 | | |
| PCB 169 | 5.0E+00 | 1.1E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.03 | 1.50E-02 | | |
| PCB 189 | 1.2E+00 | 1.1E+00 | 1.20E+00 | 0.12 | 1.2 | 1.20E-01 | 0.00003 | 3.60E-06 | | |
| *Congener total:* [10] | | | | | | | | 6.54E-02 | 1 | 7E-2 |
| ***West*** | | | | | | | | | | |
| PCB 77 | 2.3E+00 | 1.2E+01 | 1.16E+01 | 0.12 | 1.2 | 1.16E+00 | 0.0001 | 1.16E-04 | | |
| PCB 81 | 6.0E-01 | 1.7E+00 | 1.68E+00 | 0.12 | 1.2 | 1.68E-01 | 0.0003 | 5.05E-05 | | |
| PCB 105 | 1.0E+01 | 1.9E+01 | 1.94E+01 | 0.12 | 1.2 | 1.94E+00 | 0.00003 | 5.81E-05 | | |
| PCB 114 | 5.0E+00 | 1.1E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.00003 | 1.50E-05 | | |
| PCB 118 | 1.9E+01 | 3.0E+01 | 2.96E+01 | 0.12 | 1.2 | 2.96E+00 | 0.00003 | 8.88E-05 | | |
| PCB 123 | 1.5E+00 | 1.9E+00 | 1.87E+00 | 0.12 | 1.2 | 1.87E-01 | 0.00003 | 5.61E-06 | | |
| PCB 126 | 8.0E-01 | 1.1E+00 | 1.10E+00 | 0.12 | 1.2 | 1.10E-01 | 0.1 | 1.10E-02 | | |
| PCB 156 | 3.9E+00 | 3.6E+00 | 3.90E+00 | 0.12 | 1.2 | 3.90E-01 | 0.00003 | 1.17E-05 | | |
| PCB 157 | 1.0E+00 | 8.0E-01 | 1.00E+00 | 0.12 | 1.2 | 1.00E-01 | 0.00003 | 3.00E-06 | | |
| PCB 167 | 2.2E+00 | 8.1E+00 | 8.07E+00 | 0.12 | 1.2 | 8.07E-01 | 0.00003 | 2.42E-05 | | |
| PCB 169 | 5.0E+00 | 4.8E-01 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.03 | 1.50E-02 | | |
| PCB 189 | 1.1E+00 | 1.1E+00 | 1.10E+00 | 0.12 | 1.2 | 1.10E-01 | 0.00003 | 3.30E-06 | | |
| *Congener total:* [10] | | | | | | | | 2.64E-02 | 1 | 3E-2 |

**Table 5.4.29**
**Uncertainty Analysis: Maximal Risk Calculation for the San Joaquin Kit Fox - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

| Congeners per Exposure Area[(1)] | Soil Concentration (ng/kg) [(2)] | Plant Concentration (ng/kg) [(2)] | Maximal Soil or Plant Concentration (ng/kg) [(3)] | San Joaquin Kit Fox Food Ingestion Rate (kg/day) [(4)] | San Joaquin Kit Fox Body Weight (kg) [(4)] | Maximal Exposure Dose (ng/kg BW-day) [(5)] | TEF (mammal) [(6)] | Maximal TED (ng/kg BW-day) [(7)] | Low TRV (ng/kg BW -day)[(8)] | $HQ_{low}$[(9)] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Northwest*** | | | | | | | | | | |
| PCB 77 | 3.0E+00 | 6.9E+00 | 6.85E+00 | 0.12 | 1.2 | 6.85E-01 | 0.0001 | 6.85E-05 | | |
| PCB 81 | 5.0E-01 | 1.1E+00 | 1.05E+00 | 0.12 | 1.2 | 1.05E-01 | 0.0003 | 3.15E-05 | | |
| PCB 105 | 9.5E+00 | 9.8E+00 | 9.80E+00 | 0.12 | 1.2 | 9.80E-01 | 0.00003 | 2.94E-05 | | |
| PCB 114 | 5.0E+00 | 1.1E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.00003 | 1.50E-05 | | |
| PCB 118 | 1.8E+01 | 2.0E+01 | 1.97E+01 | 0.12 | 1.2 | 1.97E+00 | 0.00003 | 5.91E-05 | | |
| PCB 123 | 1.3E+00 | 7.0E-01 | 1.30E+00 | 0.12 | 1.2 | 1.30E-01 | 0.00003 | 3.90E-06 | | |
| PCB 126 | 1.2E+00 | 1.1E+00 | 1.20E+00 | 0.12 | 1.2 | 1.20E-01 | 0.1 | 1.20E-02 | | |
| PCB 156 | 3.2E+00 | 2.1E+00 | 3.20E+00 | 0.12 | 1.2 | 3.20E-01 | 0.00003 | 9.60E-06 | | |
| PCB 157 | 1.0E+00 | 1.6E+00 | 1.61E+00 | 0.12 | 1.2 | 1.61E-01 | 0.00003 | 4.82E-06 | | |
| PCB 167 | 6.3E+00 | 6.0E+00 | 6.30E+00 | 0.12 | 1.2 | 6.30E-01 | 0.00003 | 1.89E-05 | | |
| PCB 169 | 5.0E+00 | 1.1E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.03 | 1.50E-02 | | |
| PCB 189 | 4.0E-01 | 1.1E+00 | 1.05E+00 | 0.12 | 1.2 | 1.05E-01 | 0.00003 | 3.15E-06 | | |
| *Congener total:* [(10)] | | | | | | | | 2.72E-02 | 1 | 3E-2 |
| ***North*** | | | | | | | | | | |
| PCB 77 | 2.8E+00 | 7.8E+00 | 7.78E+00 | 0.12 | 1.2 | 7.78E-01 | 0.0001 | 7.78E-05 | | |
| PCB 81 | 3.0E-01 | 6.0E-01 | 6.02E-01 | 0.12 | 1.2 | 6.02E-02 | 0.0003 | 1.81E-05 | | |
| PCB 105 | 1.2E+01 | 1.3E+01 | 1.26E+01 | 0.12 | 1.2 | 1.26E+00 | 0.00003 | 3.79E-05 | | |
| PCB 114 | 5.0E+00 | 1.1E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.00003 | 1.50E-05 | | |
| PCB 118 | 1.9E+01 | 2.9E+01 | 2.85E+01 | 0.12 | 1.2 | 2.85E+00 | 0.00003 | 8.55E-05 | | |
| PCB 123 | 1.5E+00 | 5.6E-01 | 1.50E+00 | 0.12 | 1.2 | 1.50E-01 | 0.00003 | 4.50E-06 | | |
| PCB 126 | 7.0E-01 | 1.1E+00 | 1.05E+00 | 0.12 | 1.2 | 1.05E-01 | 0.1 | 1.05E-02 | | |
| PCB 156 | 3.0E+00 | 2.5E+00 | 3.00E+00 | 0.12 | 1.2 | 3.00E-01 | 0.00003 | 9.00E-06 | | |
| PCB 157 | 1.0E+00 | 5.4E-01 | 1.00E+00 | 0.12 | 1.2 | 1.00E-01 | 0.00003 | 3.00E-06 | | |
| PCB 167 | 6.6E+00 | 5.1E+00 | 6.60E+00 | 0.12 | 1.2 | 6.60E-01 | 0.00003 | 1.98E-05 | | |
| PCB 169 | 5.0E+00 | 1.1E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.03 | 1.50E-02 | | |
| PCB 189 | 7.0E-01 | 4.7E-01 | 7.00E-01 | 0.12 | 1.2 | 7.00E-02 | 0.00003 | 2.10E-06 | | |
| *Congener total:* [(10)] | | | | | | | | 2.58E-02 | 1 | 3E-2 |
| ***Northeast*** | | | | | | | | | | |
| PCB 77 | 1.5E+01 | 1.3E+01 | 1.50E+01 | 0.12 | 1.2 | 1.50E+00 | 0.0001 | 1.50E-04 | | |
| PCB 81 | 1.4E+00 | 6.4E-01 | 1.40E+00 | 0.12 | 1.2 | 1.40E-01 | 0.0003 | 4.20E-05 | | |
| PCB 105 | 6.5E+01 | 2.3E+01 | 6.50E+01 | 0.12 | 1.2 | 6.50E+00 | 0.00003 | 1.95E-04 | | |
| PCB 114 | 2.0E+00 | 1.1E+00 | 2.00E+00 | 0.12 | 1.2 | 2.00E-01 | 0.00003 | 6.00E-06 | | |
| PCB 118 | 1.0E+02 | 4.4E+01 | 1.00E+02 | 0.12 | 1.2 | 1.00E+01 | 0.00003 | 3.00E-04 | | |
| PCB 123 | 8.7E+00 | 7.6E-01 | 8.70E+00 | 0.12 | 1.2 | 8.70E-01 | 0.00003 | 2.61E-05 | | |
| PCB 126 | 5.9E+00 | 1.1E+00 | 5.90E+00 | 0.12 | 1.2 | 5.90E-01 | 0.1 | 5.90E-02 | | |
| PCB 156 | 2.9E+01 | 4.8E+00 | 2.90E+01 | 0.12 | 1.2 | 2.90E+00 | 0.00003 | 8.70E-05 | | |
| PCB 157 | 6.9E+00 | 1.8E+00 | 6.90E+00 | 0.12 | 1.2 | 6.90E-01 | 0.00003 | 2.07E-05 | | |
| PCB 167 | 1.6E+01 | 1.3E+01 | 1.60E+01 | 0.12 | 1.2 | 1.60E+00 | 0.00003 | 4.80E-05 | | |
| PCB 169 | 5.0E+00 | 3.3E-01 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.03 | 1.50E-02 | | |
| PCB 189 | 9.3E+00 | 1.1E+00 | 9.30E+00 | 0.12 | 1.2 | 9.30E-01 | 0.00003 | 2.79E-05 | | |
| *Congener total:* [(10)] | | | | | | | | 7.49E-02 | 1 | 7E-2 |
| ***B-18 Landfill*** | | | | | | | | | | |
| PCB 77 | 1.8E+01 | 1.7E+02 | 1.70E+02 | 0.12 | 1.2 | 1.70E+01 | 0.0001 | 1.70E-03 | | |
| PCB 81 | 2.4E+00 | 1.2E+01 | 1.15E+01 | 0.12 | 1.2 | 1.15E+00 | 0.0003 | 3.45E-04 | | |
| PCB 105 | 6.2E+01 | 3.1E+02 | 3.10E+02 | 0.12 | 1.2 | 3.10E+01 | 0.00003 | 9.30E-04 | | |
| PCB 114 | 2.3E+00 | 2.1E+01 | 2.10E+01 | 0.12 | 1.2 | 2.10E+00 | 0.00003 | 6.30E-05 | | |
| PCB 118 | 8.5E+01 | 5.2E+02 | 5.20E+02 | 0.12 | 1.2 | 5.20E+01 | 0.00003 | 1.56E-03 | | |
| PCB 123 | 1.5E+01 | 3.1E+01 | 3.10E+01 | 0.12 | 1.2 | 3.10E+00 | 0.00003 | 9.30E-05 | | |
| PCB 126 | 3.5E+00 | 1.0E+01 | 1.04E+01 | 0.12 | 1.2 | 1.04E+00 | 0.1 | 1.04E-01 | | |
| PCB 156 | 3.1E+01 | 9.9E+01 | 9.90E+01 | 0.12 | 1.2 | 9.90E+00 | 0.00003 | 2.97E-04 | | |
| PCB 157 | 4.8E+00 | 1.6E+01 | 1.60E+01 | 0.12 | 1.2 | 1.60E+00 | 0.00003 | 4.80E-05 | | |
| PCB 167 | 1.3E+01 | 6.3E+01 | 6.30E+01 | 0.12 | 1.2 | 6.30E+00 | 0.00003 | 1.89E-04 | | |
| PCB 169 | 5.0E+00 | 3.2E+00 | 5.00E+00 | 0.12 | 1.2 | 5.00E-01 | 0.03 | 1.50E-02 | | |
| PCB 189 | 8.2E+00 | 1.1E+00 | 8.20E+00 | 0.12 | 1.2 | 8.20E-01 | 0.00003 | 2.46E-05 | | |
| *Congener total:* [(10)] | | | | | | | | 1.25E-01 | 1 | 1E-1 |

**Table 5.4.29**
**Uncertainty Analysis: Maximal Risk Calculation for the San Joaquin Kit Fox - Juvenile**
**Ecological Risk Assessment**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**

Notes:

(1) Includes both detected and non-detected congeners.

(2) Dry weight concentrations detected in ten multi-increment samples from each exposure area. Includes surrogate values of 1/2 reporting limit substituted for nondetects.

(3) Maximal concentration detected in soil or vegetation (including 1/2 reporting limit values substituted for nondetects).

(4) Kit fox food ingestion rate and juvenile body weight: see Table 5.4.2 for basis/source.

(5) Maximal exposure dose = [maximal concentration (ng/kg) x food ingestion rate (kg/day)] / body weight (kg)

(6) Mammal TEFs are from USEPA (June 2008).

(7) Maximal TED = (maximal exposure dose based on PCB congener concentration) x (TEF).

(8) Low TRV is based on a mammalian NOAEL from USEPA (1999) and Sample et al. (1996).

(9) $HQ_{low}$ = (TED) / (NOAEL-based TRV)

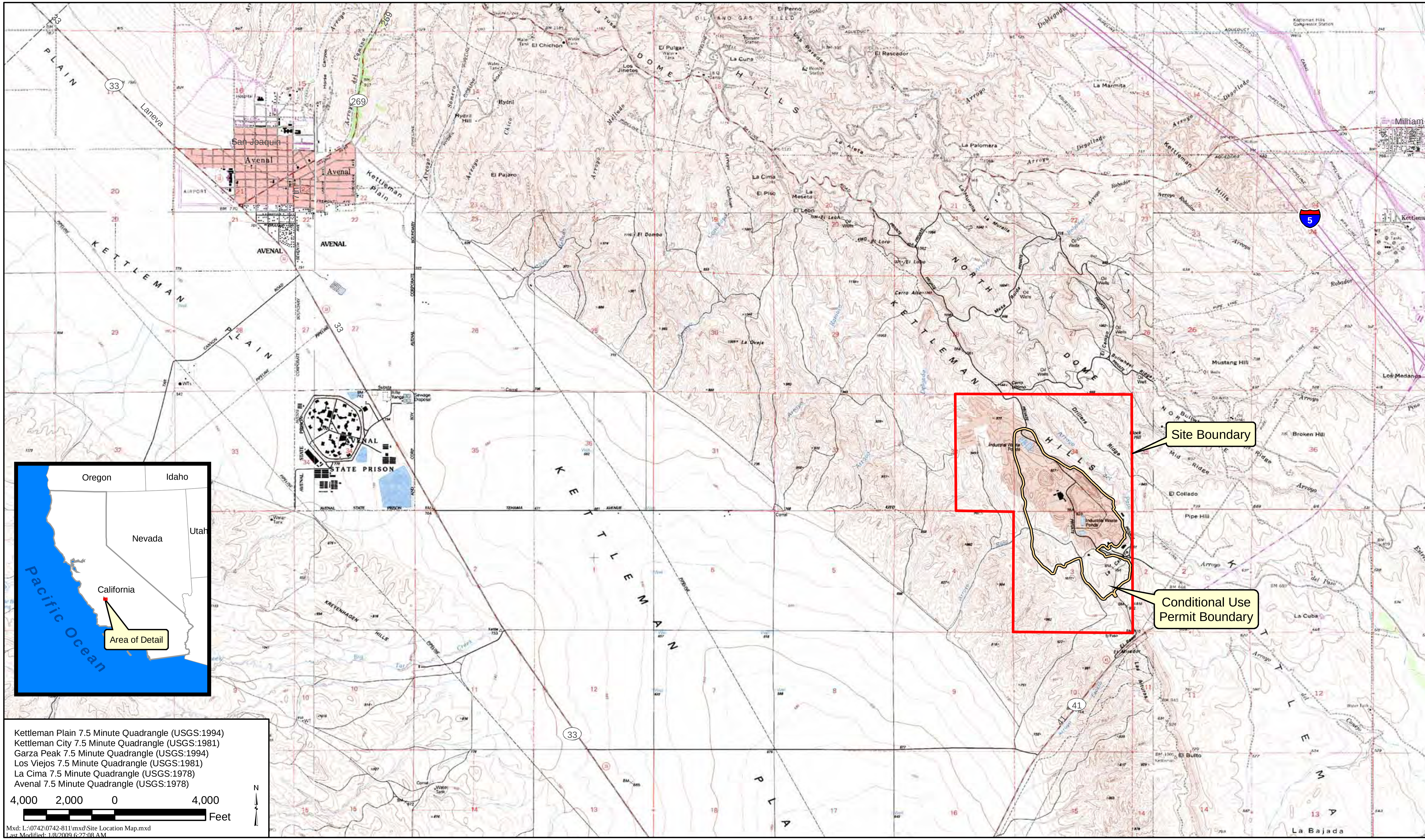
(10) Congener total represents the sum of congener-specific TEDs for an exposure area.

ng = nanogram

TED = toxicity equivalence dose

TEF = toxicity equivalence factor

# Figures




CHEMICAL WASTE MANAGEMENT, INC. - KETTLEMAN HILLS FACILITY

Site Location Map

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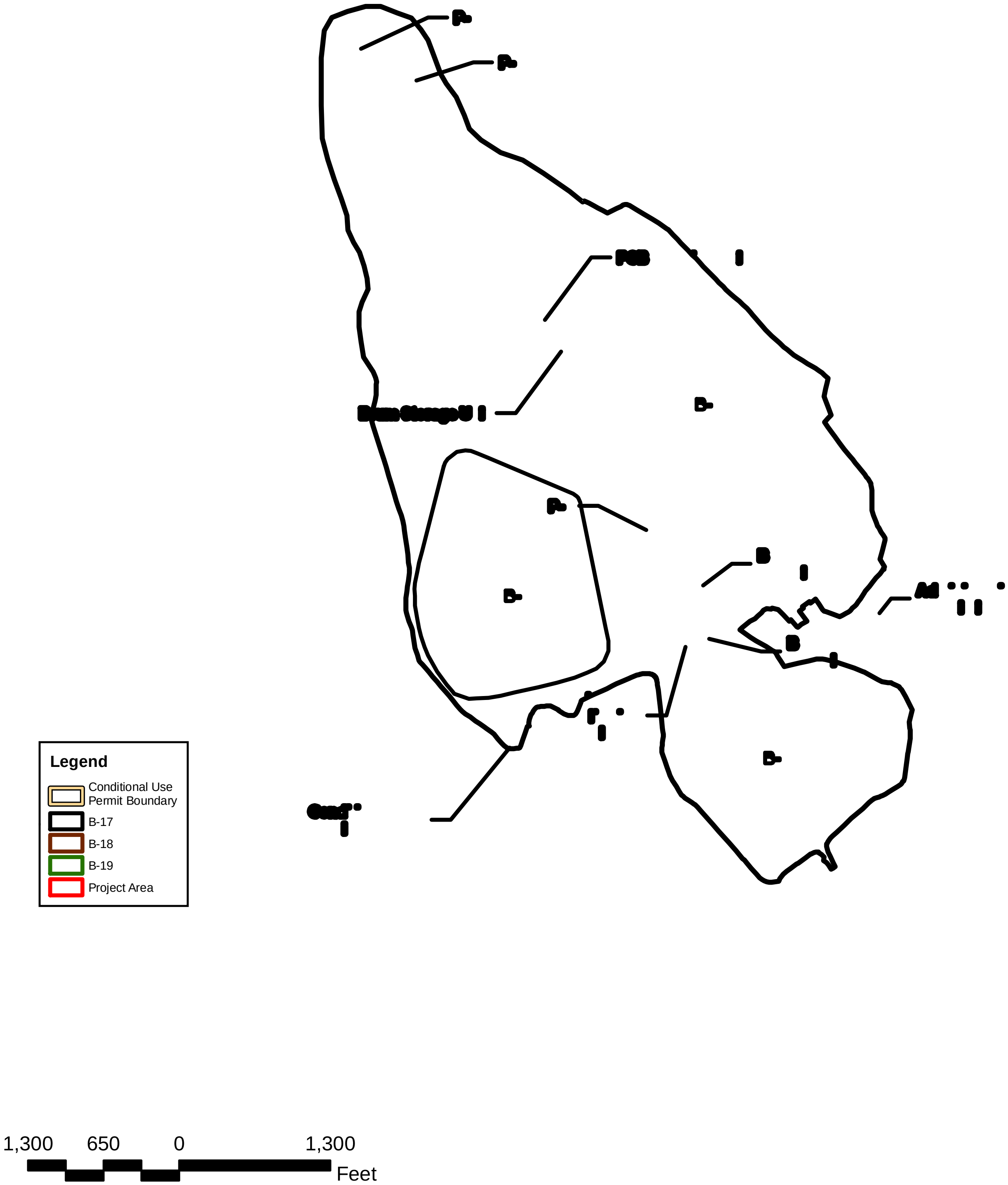
Wenck
Engineers • Scientists
Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359-0429

NOV 2010

Figure 1

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Last Modified: 1/9/2009 9:37:03 AM

CHEMICAL WASTE MANAGEMENT, INC.
KETTLEMAN HILLS FACILITY

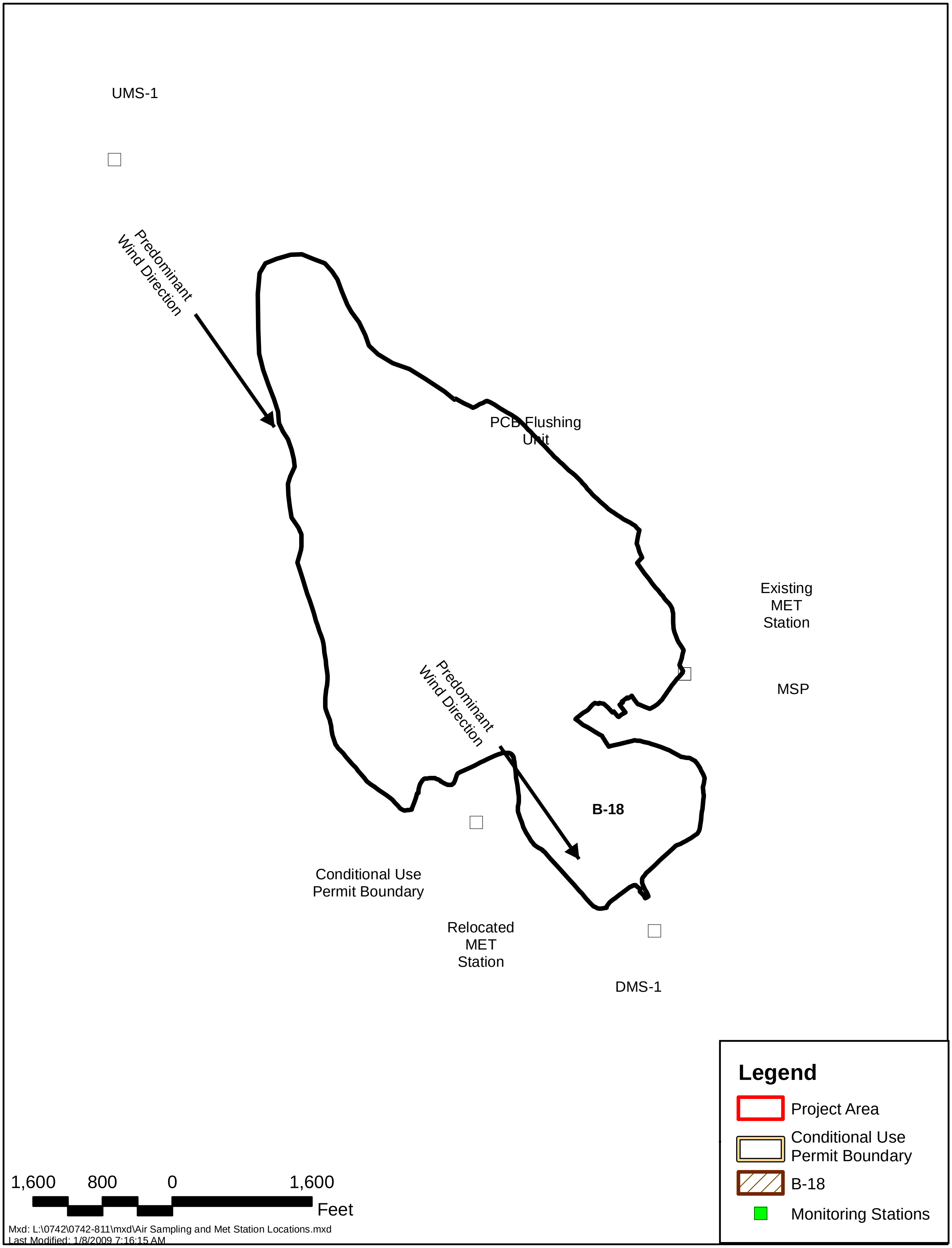
Facility Diagram



Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center Maple Plain, MN 55359-0429

NOV 2010

Figure 2




CHEMICAL WASTE MANAGEMENT, INC.
KETTLEMAN HILLS FACILITY

Air Sampling and Met Station Locations

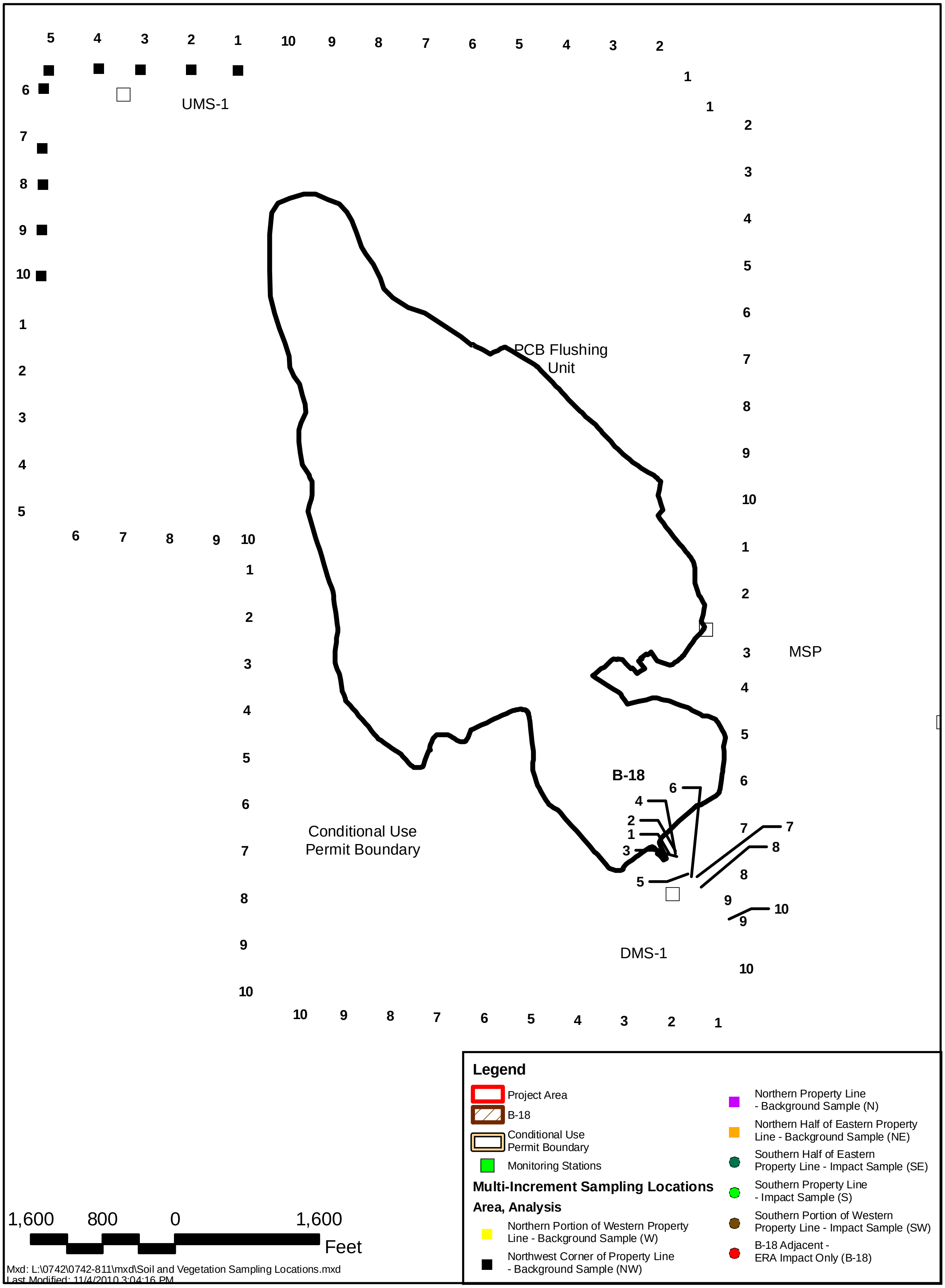


Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

NOV 2010

Figure 3




CHEMICAL WASTE MANAGEMENT, INC.
KETTLEMAN HILLS FACILITY

Soil and Vegetation Sampling Locations



Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center Maple Plain, MN 55359-0429

NOV 2010

Figure 4

# Figure 5 Air Sampling Data Capture

### Upwind Monitoring Station (UMS-1)

| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | % Capture* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  | 106% |
| Feb | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  |  |  | 93% |
| Mar |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  | 100% |
| Apr |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  | 97% |
| May |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  |  | 100% |
| Jun |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  | 99% |
| Jul |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  | 100% |
| Aug |  |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | 100% |
| Sep |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  | 98% |
| Oct |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  | 100% |
| Nov |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  | 64% |
| Dec |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  | 100% |

### Downwind Monitoring Station (DMS-1)

| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | % Capture* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  | 95% |
| Feb | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  |  |  | 100% |
| Mar |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  | 100% |
| Apr |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  | 88% |
| May |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  |  | 92% |
| Jun |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  | 100% |
| Jul |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  | 100% |
| Aug |  |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | 100% |
| Sep |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  | 98% |
| Oct |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  | 103% |
| Nov |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  | 92% |
| Dec |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  | 100% |

### Met Station Pad (MSP)

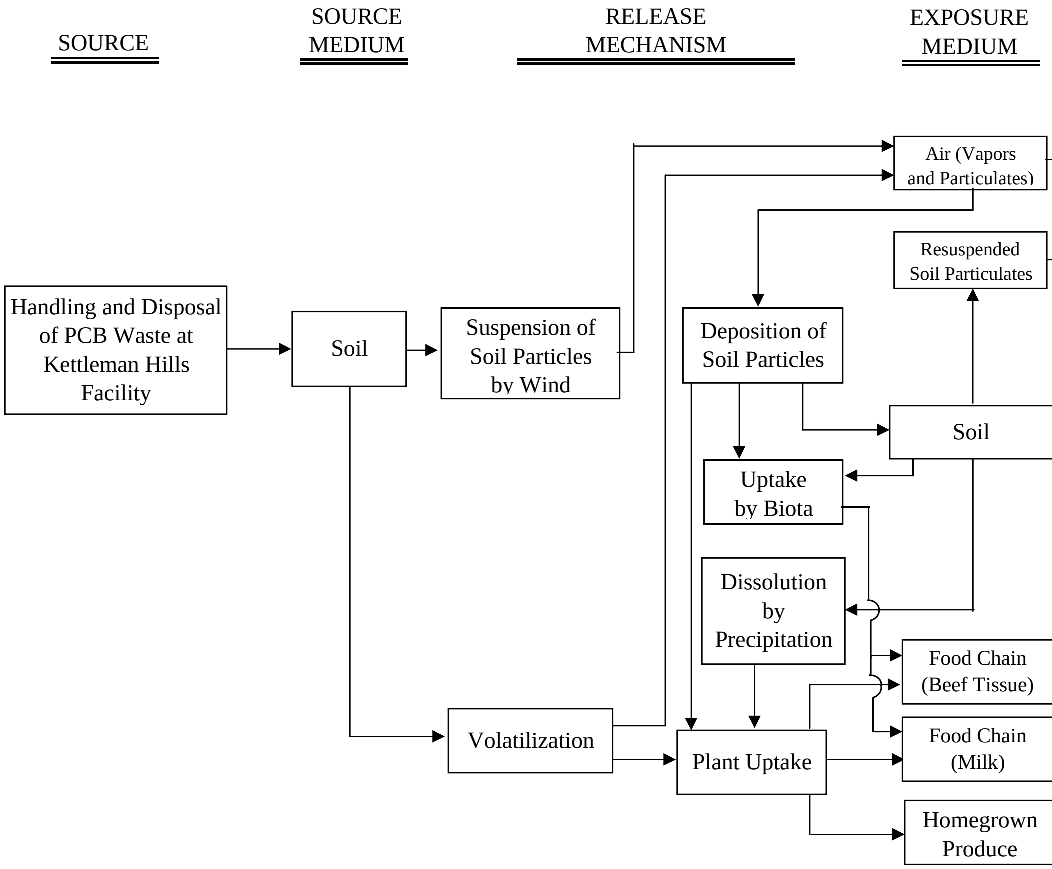
| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | % Capture* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  | 86% |
| Feb | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  |  |  | 100% |
| Mar |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  | 96% |
| Apr |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  | 97% |
| May |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  |  | 100% |
| Jun |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  | 100% |
| Jul |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  | 100% |
| Aug |  |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | 100% |
| Sep |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  | 86% |
| Oct |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  | 100% |
| Nov |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  | 69% |
| Dec |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  | 100% |

### Mobile Station (DUP)

| Location | Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | % Capture* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MSP-Alt | Apr |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  | 100% |
| UMS-1 | May |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  |  | 99% |
| DMS-1 | Jun |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  | 102% |
| MSP | Jul |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  | 100% |
| Fresno | Aug |  |  |  |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | 55% |
| Hanford | Sep |  |  |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  | 94% |
| Coalinga | Oct |  |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X |  |  |  |  |  |  | 75% |

24 hours or less of data loss
48 hours or less of data loss
72 hours or less of data loss
More than 72 hours of data loss

* Percent capture based on total hours sampled compared to the target of 480 hours.

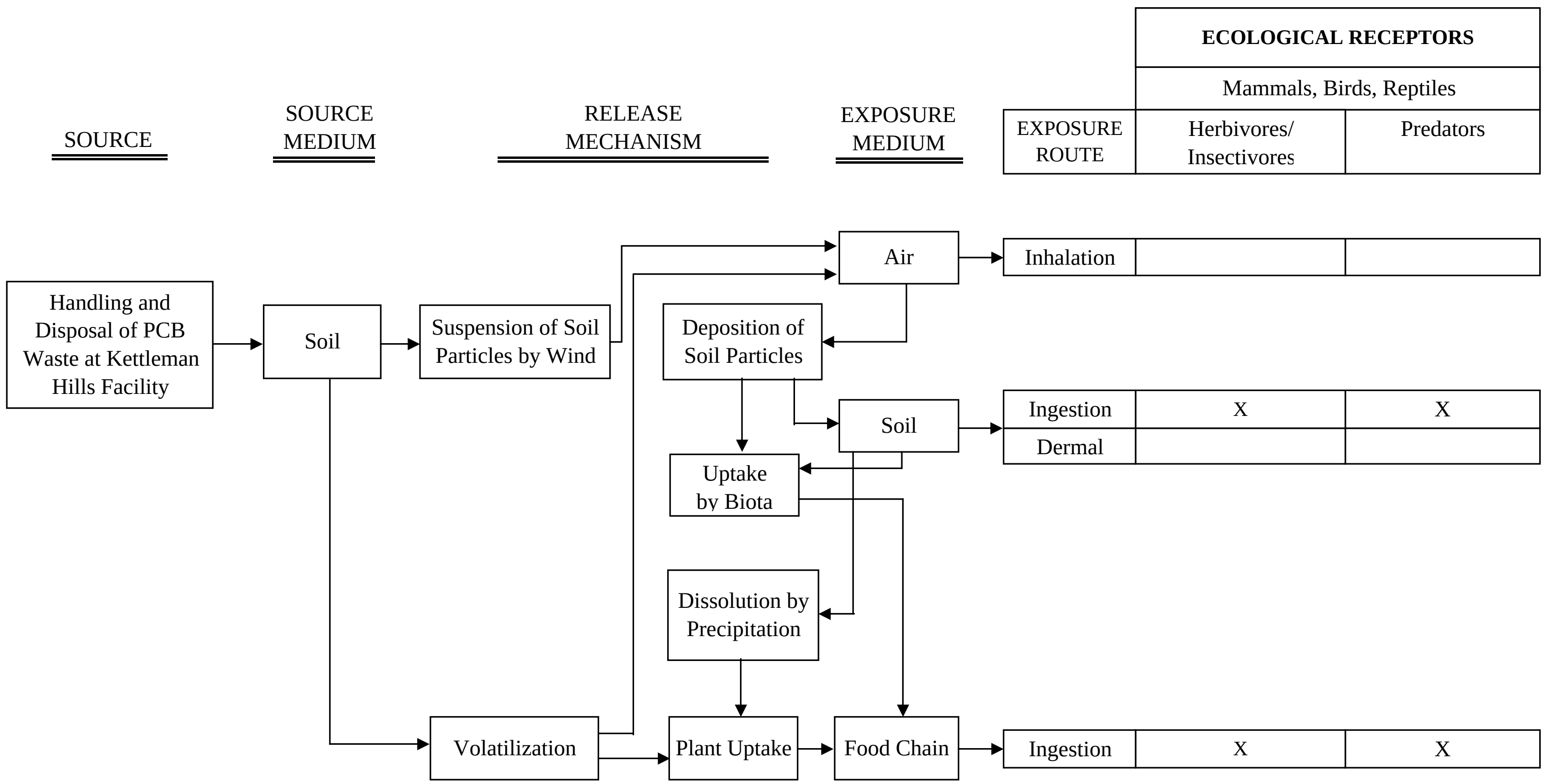



| | HUMAN RECEPTOR | | | |
|---|---|---|---|---|
| | CURRENT | FUTURE | | |
| EXPOSURE ROUTE | RANCHER | RESIDENT RANCHER | SUBSISTENCE RESIDENT RANCHER | RESIDENT |
| Inhalation | X | X | X | X |
| Inhalation | X | X | X | X |
| Ingestion | X | X | X | X |
| Dermal | X | X | X | X |
| Ingestion | | X | X | |
| Ingestion | | | X | |
| Ingestion | | | X | X |

LEGEND

X = Potentially complete exposure pathway evaluated in HHRA.
Empty Block = Incomplete pathway or insignificant pathway not evaluated.

**Figure 6**
**Human Health Conceptual Site Model**
**PCB Congener Study for Kettleman Hills Facility**
**Kettleman City, California**




LEGEND

X = Potentially complete exposure pathway evaluated in ERA
Empty Block = Incomplete pathway or insignificant pathway
not evaluated.

**Figure 7**
**Ecological Conceptual Site Model**
**PCB Congener Study for Kettleman Hills Facility**
**Kings County, California**