Dispersion Modeling Report Associated with the PCB Congener Study

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

Wenck File #0742-816

Prepared for:

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October 2009

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1.0 Introduction

The Chemical Waste Management, Inc. (CWMI) - Kettleman Hills Facility (KHF) is a commercial Class I hazardous 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. (USEPA 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 landfill B-18 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 and corresponding attachment, 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 "Congener Study"). The overall purpose of the Congener Study is to characterize and quantify the potential human and ecological risk posed by the current and accumulated impact from the management, storage, and disposal of PCB contaminated waste at KHF. As determined in several conference calls with USEPA-IX, this study only focuses on the 12 World Health Organization (WHO) Dioxin-Like PCB Congeners due to the risk these compounds pose relative to the other congener species.

1.1 Air Sampling

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 have been sampled for the identified congeners at or near the KHF property line. These include:

- ambient air;
- surficial soil; and
- vegetation, both in it's green and dry phases.

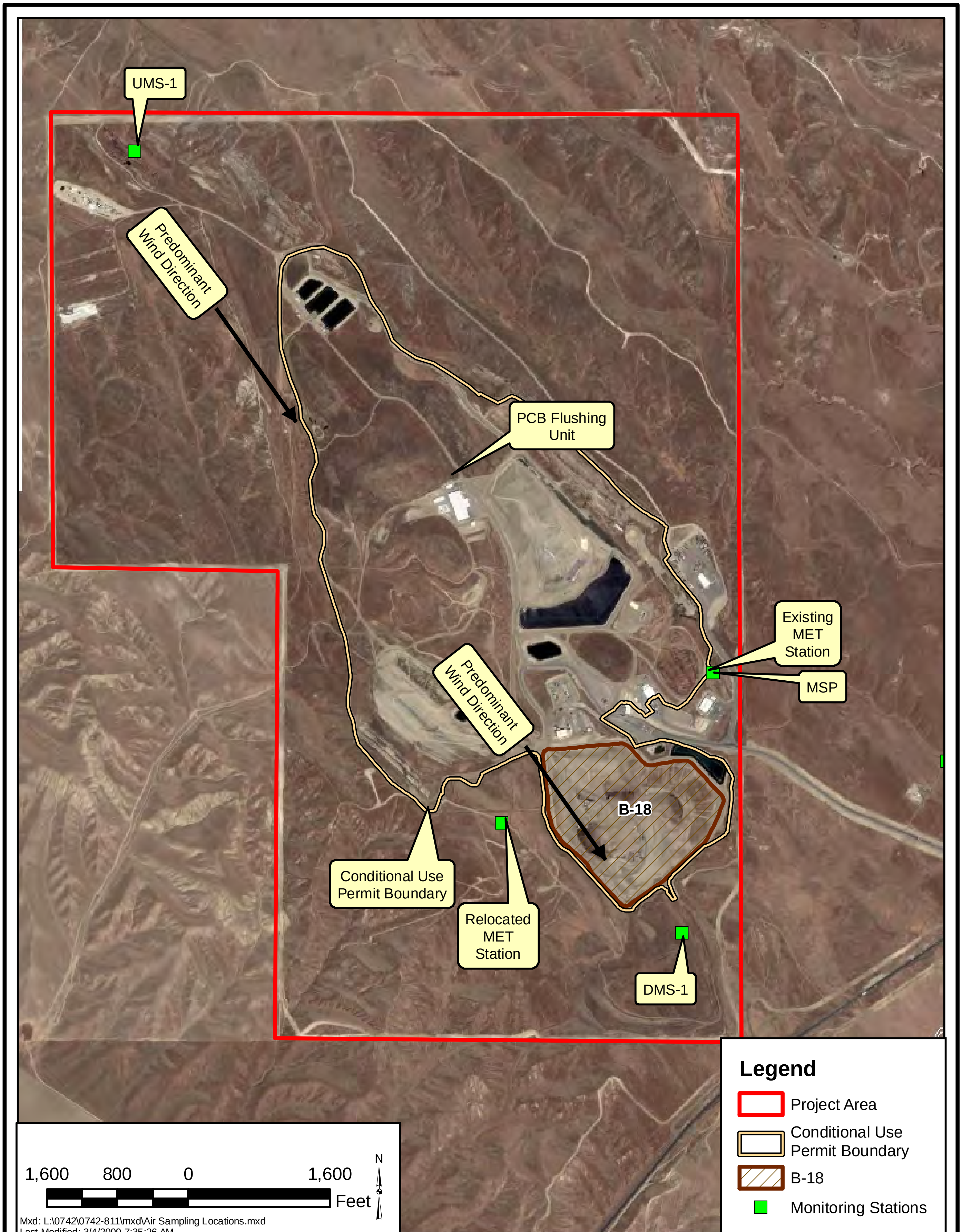
The air sampling strategy was designed to capture PCB congeners in both the volatile and particulate bound phase. While PCB congeners potentially measured in the buffer zone ambient air may have originated from accumulated on-site deposition (re-suspension of crustal particulates), the air sampling is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

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. 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 currently used by the Ambient Air Monitoring Program (AAMP). With the exception of two new monitoring locations to be specifically used for this Congener Study, the Congener Study utilizes two of the existing AAMP sampling network air monitoring locations.

Considering that winds predominantly come from the northwest the two impact monitoring locations consist of: (1) one stationary monitoring site located downwind of the B-18 landfill (current downwind monitoring station 1 (DMS-1) located southeast of B-18 near the property line); and (2) one new site located at the existing meteorological station pad (MSP), northeast of

B-18, southeast of B-19, and north of the administration building. A third stationary monitoring site is located near the property line in the north-northwest section of the facility to measure background ambient air entering the facility property (this site is the upwind monitoring site 1 (UMS-1) currently in use by the AAMP). The monitoring locations are identified in Figure 1.

Air dispersion modeling was performed to demonstrate that the ambient air monitors described above are properly located to measure PCB congeners that could potentially be originating from the B-18 landfill (locations DMS-1 & MSP), as well as ambient background (UMS-1). This modeling report outlines the conventions and assumptions used to complete the modeling analysis along with the results of the modeling analysis. This modeling report was developed according to USEPA modeling guidance (References 1 and 2), and the USEPA approved Dispersion Modeling Protocol Associated with the PCB Congener Study (Final Revision April 2009).



CHEMICAL WASTE MANAGEMENT, INC.
KETTLEMAN HILLS FACILITY

Air Sampling Locations

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Oct 2009

Figure 1

2.0 Model Input Parameters

The air dispersion model selection and input parameters that were used to estimate concentrations and deposition rates at the KHF facility are described in this section. The B-18 landfill and receptors were entered using Universal Transverse Mercator (UTM), zone 10 (extended) coordinates in meters, referenced to the North American Datum of 1983 (NAD 83).

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 approximately six miles southeast of Avenal. The coordinates of the facility are 35.96^{o}N, 120.01^{o}W and has an average elevation of 830 feet.

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 (Reference 3). The estimated 100-year, 24-hour storm would result in 2.6 inches of precipitation. Mean annual evaporation is 102.94 inches (pan measurement). The mean annual temperature is 65 degrees Fahrenheit (18 degrees Celsius (^{o}C)). Seasonal average temperatures range from the low 50s in the winter to the high 90s in the summer.

Historic average winds of 5.8 meters per second (m/s) (13 miles per hour (mph)) are predominantly from the northwest and winds are rarely calm. Winter conditions include variable winds.

2.1 Model Selection

KHF used the AMS/EPA Regulatory Model with Plume Rise Model Enhancements (AERMOD), version 07026 to estimate concentrations, dry deposition, and total deposition at and within the

KHF property boundary. On November 9, 2005, the USEPA established AERMOD as the preferred air dispersion model in the agency's Guideline on Air Quality Models, 40 CFR 51 Appendix W. The update to the Guideline on Air Quality Models was published in the Federal Register on November 9, 2005 and became effective on December 9, 2005. Facilities are required to use AERMOD for short-range air dispersion modeling analyses.

AERMOD has several features that are superior to the previously used steady-state Gaussian plume dispersion models. These features include AERMOD's ability to treat the vertical inhomogeneity of the planetary boundary layer, special treatment of surface releases, and its treatment of irregularly shaped area sources. Also, AERMOD includes a treatment of intermediate and complex terrain.

It is important to note that AERMOD does include the Plume Rise Model Enhancements (PRIME) algorithm. The naming convention of "AERMOD" is used throughout this Report with the understanding that PRIME is included in the model.

AERMOD was used in this analysis as it is the current guideline model for short range analyses. Short-range analyses are those involving near-field dispersion, with transport distances of less than 50 kilometers (km). An August 13, 2008 memorandum from Richard A. Wayland, Director of the USEPA Air Quality Assessment Division (Reference 4) to Regional Air Division Directors further clarified that CALPUFF is not required for short-range analyses. AERMOD is the USEPA-preferred model for near-field regulatory applications (less than 50 km) for simple and complex terrain.

2.2 Modeling Options

All options within AERMOD recommended by the USEPA as regulatory defaults were used (References 1 and 2). These options include: 1) using elevated terrain algorithms that require the input of terrain height data; 2) using stack-tip downwash as applicable; 3) using routines to process averages during calm winds; and 4) using algorithms to handle missing meteorological data. A "unit" emission rate of 1 gram per second per square meter (g/s/m^2) was modeled for the landfill area B-18. Concentrations and deposition rates predicted by AERMOD are directly proportional to modeled emission rates. The deposition modeling was completed for particle, particle-bound, and gaseous phases. Additional discussion is provided in Section 3 regarding the required inputs for the deposition modeling. An assumed emission rate from the B-18 landfill is appropriate for this analysis because the objective of this modeling analysis is to identify the location of maximum impacts, not the "potential or actual" air concentrations at the modeled receptors. The modeled emission unit is limited to the B-18 landfill as this is the only active and significant source of potential PCB emissions from KHF and is the only landfill at KHF permitted to accept PCB contaminated waste.

The modeling was completed for the 1-month and annual averaging periods. The month-long averaging period was selected to correlate with the air sampling durations required by USEPA-IX for the PCB Congener Study.

For gaseous deposition, seasonal categories and land use are required to be specified. The seasonal categories are provided in Deposition Parameterizations for the Industrial Source Complex (ISC3) Model, June 2002 (ANL/ER/TR-01/003) (Reference 5). As noted above, the Kettleman Hills area is semiarid with extremely low rainfall. The seasonal categories are shown below in Table 1. The seasonal categories are based on information provided from Mr. Glenn Reed of the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) on April 27, 2009.

Table 1. Kettleman Hills Seasonal Categories for Each Month

Months	Season
December, January, February	3 – Late autumn after frost and harvest, or winter with no snow
March, April	5 – Transitional spring with partial green coverage or short annuals
May, June, July, August	1 – Midsummer with lush vegetation
September, October, November	2 – Autumn with unharvested cropland

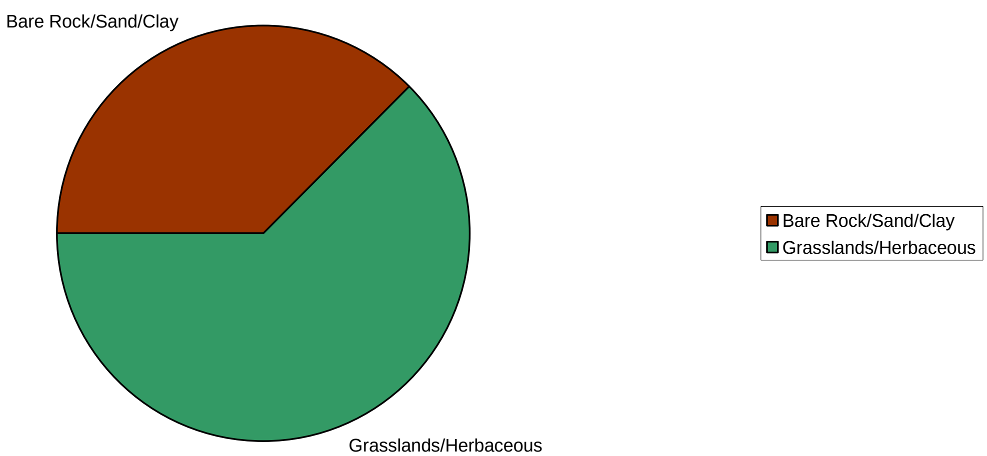
The KHF facility is surrounded by general agriculture and grazing lands for several miles in all directions. KHF is also located at the southeastern end of Kettleman Hills, an extensive area that has been active for decades in the production of natural gas and oil. The description of land area surrounding the facility property is consistent with the land description inside the property line.

The land use for the area surrounding the site was obtained using the USEPA's AERSURFACE utility. The most common land use for each sector was selected. AERSURFACE was executed with 8 sectors (45°). Additional information regarding the AERSURFACE analysis is discussed in Section 2.5. The areas surrounding the site were defined as:

1. Grasslands/Herbaceous: 40° - 270°
2. Bare/Rock/Sand/Clay: 270° - 360°, and 0° - 40°

Figure 2 (below) also shows the land use definitions. Directly north of the facility is considered 0° by the AERMOD model.

Figure 2. Land Use Surrounding KHF



2.3 Building Downwash

The modeling was completed for B-18 landfill using an area source. See additional discussion in Section 3 regarding source type selection. Since downwash is not calculated for area sources, building data is not necessary.

2.4 Receptor Grid

Receptors were placed every 25 meters along the facility property boundary. In addition, receptors were included within the property boundary but not within the conditional use permit boundary at a spacing of 50 meters. The area inside the conditional use permit boundary was excluded from the analysis because this is the area permitted for active waste treatment and disposal activity. Therefore, this area is inappropriate for siting air monitors used for measuring impacts to the facility's buffer zone at or outside the facility property line.

On April 20, 2009, USEPA-IX staff commented that the receptor grid along the southeast corner of the site allowed only one row of receptors between the conditional use permit boundary and the facility property. USEPA-IX mentioned that having a single row of receptors in this area will make differentiating the resolution of model results in this area difficult. KHF increased receptor resolution in this area by adding additional receptors off-property. Receptors were placed 500 meters to the east of the property boundary at a spacing of 50 meters. KHF extended the receptor grid halfway up the eastern property boundary starting with the southeast corner of the site. See Figure 3, located at the end of Section 2, for additional detail. Table 2 summarizes the receptors locations and grid spacing.

Table 2. Receptor Spacing

Receptor Type	Receptor Placement
Property Line	Every 25 meters along the property lines
Uniform Cartesian Coordinates	Every 50 meters between the property boundary and the conditional use permit boundary. Receptors were also placed outside of the property boundary to a distance of 500 meters from the southeast corner of the site.
Discrete	Discrete receptors at UMS-1, DMS-1, MSP, which are the air monitoring site designations identified in the USEPA-IX approved Final PCB Congener Study Workplan (Reference 3)

Receptor elevations was determined using the AERMOD Terrain preprocessor (AERMAP), version 06341. The facility did conduct a flyover of the area on March 28, 2008 which includes the elevation of the B-18 landfill. This flyover focused on the southern portion of the site. The elevation for any receptors located outside of the 2008 flyover area was determined using data from a 1992 flyover for the site. Using ArcGIS, an elevation value was assigned to each point based on the merged grid terrain file. The coordinates were calculated using the Universal Transverse Mercator Zone 10, NAD 83 coordinate system, and the coordinates with their elevations were exported to an XYZ text file for input into AERMAP.

The option of “NADA=4” was used to reference the North American Datum (NAD) of 1983 anchor coordinates based on the AERMAP users manual.

2.5 Meteorological Data

For refined modeling analysis, USEPA guidelines specify the use of either one (1) year of on-site meteorological data, or five (5) years of representative, hourly National Weather Service (NWS) observations.

The NWS meteorological data necessary for the AERMOD meteorological preprocessor (AERMET) was based on hourly surface observation data from the Hanford, California NWS station no. 53119 and upper air sounding data from the Oakland, California NWS station no.

23230 for meteorological years 2000 through 2004. This data was obtained from the SJVUAPCD website (http://www.valleyair.org/busind/pto/Tox_Resources/AirQualityMonitoring.htm)

In choosing meteorological data for a particular project, USEPA-IX indicated that site-specific land use and land cover data from the meteorological station is preferred over the modeled facility's land use data. However, the meteorological station with the most similar land use and land cover to the project site should be selected.

The available observational sites include: Fresno, Hanford, and the Lemoore Air Force Base (Lemoore). KHF compared land use and land cover data at these three meteorological stations with land use and land cover data from the project site. KHF used USEPA's AERSURFACE utility to compare the surface characteristics at the three surface stations with the project site. The AERSURFACE analysis for the Lemoore site was provided by the SJVUAPCD. The land use and land cover data used in the Lemoore analysis was obtained from the United States Geological Survey (USGS) National Land Cover Data 1992 (NLCD92) archives. All options for monthly seasonal descriptions and wind sector assignments used in the Lemoore analysis were also used for the Fresno, Hanford, and KHF AERSURFACE analyses. The meteorological observation station with surface roughness values most similar to the project site was selected as the most appropriate meteorological data set to use in this modeling analysis. The North American Datum (NAD) of 1983 geographic coordinates of the meteorological observation sites are:

1. Fresno: 36.780° N Latitude, 119.719° W Longitude
2. Hanford: 36.317° N Latitude, 119.633° W Longitude
3. Lemoore: 36.333° N Latitude, 119.950° W Longitude

The geographic coordinates of the project site is: 35.960° N Latitude, 120.010° W Longitude

Eight 45-degree wind sectors were used to determine the surface characteristics out to one kilometer from the site. The site-specific seasons for the four sites were defined within AERSURFACE by using the monthly frequency setting and the following seasonal breakdown:

- Late autumn after frost and harvest, or winter with no snow – December through February
- Transitional spring – March and April
- Midsummer with lush vegetation – May through August
- Autumn with unharvested cropland – September through November

For determination of the Bowen ratio, moisture conditions can be selected as dry, average and moist. Average moisture conditions were selected for all modeling analyses because the Lemoore analysis used this selection. The options chosen for this analysis are consistent with the procedures used in the AERSURFACE analysis for Lemoore as prepared by the SJVUAPCD. The surface roughness, Bowen ratio, and albedo values calculated for the four sites are given in Tables 3 through 6. A summary of the average annual surface roughness values are provided in Table 7.

Table 3. Albedo, Bowen Ratio, and Surface Roughness – KHF Project Site

Sector Index No.	Albedo											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
2	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
3	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
4	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
5	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
6	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
7	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
8	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Sector Index No.	Bowen Ratio (Avg. Moisture)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.07	1.07	0.57	0.57	0.88	0.88	0.88	0.88	1.07	1.07	1.07	1.07
2	1.07	1.07	0.57	0.57	0.88	0.88	0.88	0.88	1.07	1.07	1.07	1.07
3	1.07	1.07	0.57	0.57	0.88	0.88	0.88	0.88	1.07	1.07	1.07	1.07
4	1.07	1.07	0.57	0.57	0.88	0.88	0.88	0.88	1.07	1.07	1.07	1.07
5	1.07	1.07	0.57	0.57	0.88	0.88	0.88	0.88	1.07	1.07	1.07	1.07
6	1.07	1.07	0.57	0.57	0.88	0.88	0.88	0.88	1.07	1.07	1.07	1.07
7	1.07	1.07	0.57	0.57	0.88	0.88	0.88	0.88	1.07	1.07	1.07	1.07
8	1.07	1.07	0.57	0.57	0.88	0.88	0.88	0.88	1.07	1.07	1.07	1.07
Sector Index No.	Surface Roughness (m)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.042	0.042	0.058	0.058	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.042
2	0.036	0.036	0.062	0.062	0.078	0.078	0.078	0.078	0.078	0.078	0.078	0.036
3	0.031	0.031	0.057	0.057	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.031
4	0.039	0.039	0.067	0.067	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.039
5	0.029	0.029	0.068	0.068	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.029
6	0.043	0.043	0.076	0.076	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.043
7	0.044	0.044	0.060	0.060	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.044
8	0.047	0.047	0.058	0.058	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.047

Table 4. Albedo, Bowen Ratio, and Surface Roughness – Fresno

Sector Index No.	Albedo											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.18	0.18	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18
2	0.18	0.18	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18
3	0.18	0.18	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18
4	0.18	0.18	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18
5	0.18	0.18	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18
6	0.18	0.18	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18
7	0.18	0.18	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18
8	0.18	0.18	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18
Sector Index No.	Bowen Ratio (Avg. Moisture)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.02	1.02	0.73	0.73	0.82	0.82	0.82	0.82	1.02	1.02	1.02	1.02
2	1.02	1.02	0.73	0.73	0.82	0.82	0.82	0.82	1.02	1.02	1.02	1.02
3	1.02	1.02	0.73	0.73	0.82	0.82	0.82	0.82	1.02	1.02	1.02	1.02
4	1.02	1.02	0.73	0.73	0.82	0.82	0.82	0.82	1.02	1.02	1.02	1.02
5	1.02	1.02	0.73	0.73	0.82	0.82	0.82	0.82	1.02	1.02	1.02	1.02
6	1.02	1.02	0.73	0.73	0.82	0.82	0.82	0.82	1.02	1.02	1.02	1.02
7	1.02	1.02	0.73	0.73	0.82	0.82	0.82	0.82	1.02	1.02	1.02	1.02
8	1.02	1.02	0.73	0.73	0.82	0.82	0.82	0.82	1.02	1.02	1.02	1.02
Sector Index No.	Surface Roughness (m)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.065	0.065	0.102	0.102	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.065
2	0.025	0.025	0.055	0.055	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.025
3	0.079	0.079	0.089	0.089	0.095	0.095	0.095	0.095	0.092	0.092	0.092	0.079
4	0.152	0.152	0.153	0.153	0.154	0.154	0.154	0.154	0.154	0.154	0.154	0.152
5	0.143	0.143	0.144	0.144	0.146	0.146	0.146	0.146	0.145	0.145	0.145	0.143
6	0.156	0.156	0.158	0.158	0.159	0.159	0.159	0.159	0.159	0.159	0.159	0.156
7	0.163	0.163	0.170	0.170	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.163
8	0.099	0.099	0.116	0.116	0.129	0.129	0.129	0.129	0.126	0.126	0.126	0.099

Table 5. Albedo, Bowen Ratio, and Surface Roughness – Hanford

Sector Index No.	Albedo											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.18	0.18	0.15	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
2	0.18	0.18	0.15	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
3	0.18	0.18	0.15	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
4	0.18	0.18	0.15	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
5	0.18	0.18	0.15	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
6	0.18	0.18	0.15	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
7	0.18	0.18	0.15	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
8	0.18	0.18	0.15	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
Sector Index No.	Bowen Ratio (Avg. Moisture)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.79	0.79	0.39	0.39	0.59	0.59	0.59	0.59	0.79	0.79	0.79	0.79
2	0.79	0.79	0.39	0.39	0.59	0.59	0.59	0.59	0.79	0.79	0.79	0.79
3	0.79	0.79	0.39	0.39	0.59	0.59	0.59	0.59	0.79	0.79	0.79	0.79
4	0.79	0.79	0.39	0.39	0.59	0.59	0.59	0.59	0.79	0.79	0.79	0.79
5	0.79	0.79	0.39	0.39	0.59	0.59	0.59	0.59	0.79	0.79	0.79	0.79
6	0.79	0.79	0.39	0.39	0.59	0.59	0.59	0.59	0.79	0.79	0.79	0.79
7	0.79	0.79	0.39	0.39	0.59	0.59	0.59	0.59	0.79	0.79	0.79	0.79
8	0.79	0.79	0.39	0.39	0.59	0.59	0.59	0.59	0.79	0.79	0.79	0.79
Sector Index No.	Surface Roughness (m)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.047	0.047	0.067	0.067	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.047
2	0.030	0.030	0.045	0.045	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.030
3	0.042	0.042	0.060	0.060	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.042
4	0.041	0.041	0.057	0.057	0.159	0.159	0.159	0.159	0.159	0.159	0.159	0.041
5	0.074	0.074	0.094	0.094	0.184	0.184	0.184	0.184	0.183	0.183	0.183	0.074
6	0.050	0.050	0.070	0.070	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.050
7	0.037	0.037	0.054	0.054	0.142	0.142	0.142	0.142	0.139	0.139	0.139	0.037
8	0.033	0.033	0.055	0.055	0.131	0.131	0.131	0.131	0.127	0.127	0.127	0.033

Table 6. Albedo, Bowen Ratio, and Surface Roughness – Lemoore

Sector Index No.	Albedo											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.18	0.18	0.14	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
2	0.18	0.18	0.14	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
3	0.18	0.18	0.14	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
4	0.18	0.18	0.14	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
5	0.18	0.18	0.14	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
6	0.18	0.18	0.14	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
7	0.18	0.18	0.14	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
8	0.18	0.18	0.14	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18
Sector Index No.	Bowen Ratio (Avg. Moisture)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.74	0.74	0.34	0.34	0.54	0.54	0.54	0.54	0.74	0.74	0.74	0.74
2	0.74	0.74	0.34	0.34	0.54	0.54	0.54	0.54	0.74	0.74	0.74	0.74
3	0.74	0.74	0.34	0.34	0.54	0.54	0.54	0.54	0.74	0.74	0.74	0.74
4	0.74	0.74	0.34	0.34	0.54	0.54	0.54	0.54	0.74	0.74	0.74	0.74
5	0.74	0.74	0.34	0.34	0.54	0.54	0.54	0.54	0.74	0.74	0.74	0.74
6	0.74	0.74	0.34	0.34	0.54	0.54	0.54	0.54	0.74	0.74	0.74	0.74
7	0.74	0.74	0.34	0.34	0.54	0.54	0.54	0.54	0.74	0.74	0.74	0.74
8	0.74	0.74	0.34	0.34	0.54	0.54	0.54	0.54	0.74	0.74	0.74	0.74
Sector Index No.	Surface Roughness (m)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.031	0.031	0.051	0.051	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.031
2	0.036	0.036	0.054	0.054	0.135	0.135	0.135	0.135	0.134	0.134	0.134	0.036
3	0.040	0.040	0.065	0.065	0.115	0.115	0.115	0.115	0.114	0.114	0.114	0.040
4	0.074	0.074	0.087	0.087	0.109	0.109	0.109	0.109	0.108	0.108	0.108	0.074
5	0.068	0.068	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.068
6	0.055	0.055	0.075	0.075	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.055
7	0.059	0.059	0.077	0.077	0.122	0.122	0.122	0.122	0.122	0.122	0.122	0.059
8	0.036	0.036	0.056	0.056	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.036

Table 7. Average Annual Surface Roughness Values

Sector Index No.	Surface Roughness (m)			
	KHF	Fresno	Hanford	Lemoore
1	0.081	0.116	0.140	0.093
2	0.069	0.085	0.113	0.097
3	0.071	0.089	0.108	0.088
4	0.072	0.153	0.113	0.096
5	0.123	0.145	0.141	0.101
6	0.091	0.158	0.121	0.093
7	0.136	0.171	0.100	0.099
8	0.163	0.119	0.093	0.097
Average	0.101	0.130	0.116	0.095

Table 7 shows that the average surface roughness value for the project site (0.101 m) compares best with the surface roughness at the Hanford station (0.116 m) and the Lemoore station (0.095 m). The average surface roughness value at the Fresno observation station is greater than the project site surface roughness or the other two observation stations.

KHF next examined the appropriateness of the three observation sites by graphing the surface roughness values for each month and each sector. Figure 4 shows a comparison of the surface roughness values of the project site and the three meteorological data sites. The figure shows a graph of surface roughness height as a function of the combination of the eight sectors and the twelve months for each sector. Each sector corresponds to one of the eight 45-degree wind sectors set up to determine the land use out to one kilometer from each respective site. The first twelve data points shown in the figure represent the monthly surface roughness values that were calculated for Sector 1.

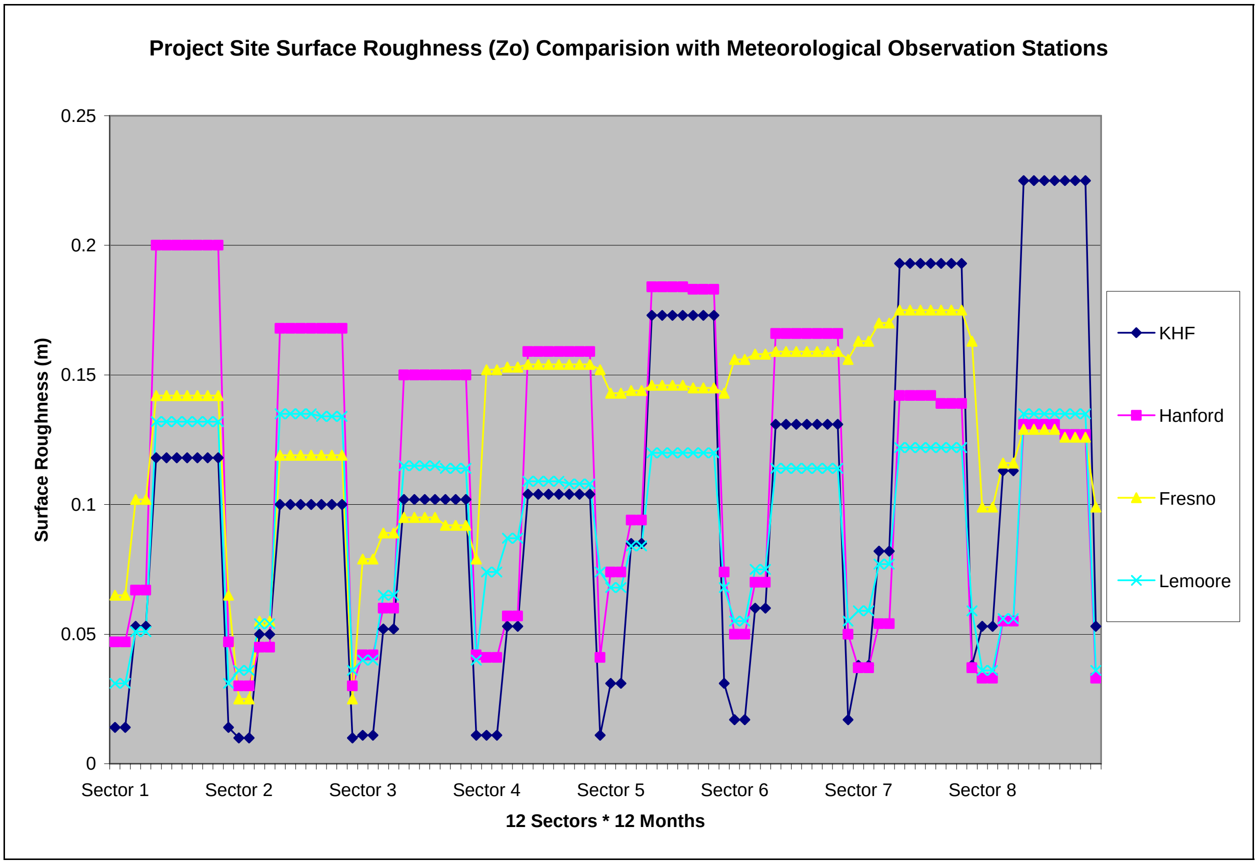


Figure 4. Surface Roughness Comparison between the Project Site and the Meteorological Observation Stations

Figure 4 highlights the differences in surface roughness for each sector and each month. The surface roughness values for the Fresno site (yellow line) show very little monthly variability in the southern and western sectors compared with KHF and the other observation stations. Surface roughness values at the project site and the two remaining observation stations appear to be similar to each other in many of the sectors.

The next step in the analysis of the meteorological observation stations was to review aerial photographs and land use/land cover plots. Appendix A contains these figures for the project site and for the three observation stations. Each figure contains a 1-kilometer radius circle to focus on the area around each site used to calculate the surface roughness. The figures show that the KHF site is extremely rural. Fresno and Lemoore appear much more urban than Hanford and the KHF site. The majority of land use categories at Hanford (Pasture/Hay) better reflect the land use categories at KHF (Bare Rock/Clay/Sand/Grassland/Herbaceous) than Fresno or Lemoore (Commercial/Industrial/Transportation).

KHF reviewed wind rose plots of wind data at each location. These plots can be found in Appendix B. The Hanford, Lemoore, and Fresno data all have distinctive northwest lobes of prevailing winds with minimal variability. The KHF data shows more of a north to north-northwest lobes of prevailing winds with more variability to the northeast, west, and southwest sectors. It is difficult to determine which set of wind data best reflects KHF because the wind data at the three observation sites all appear similar.

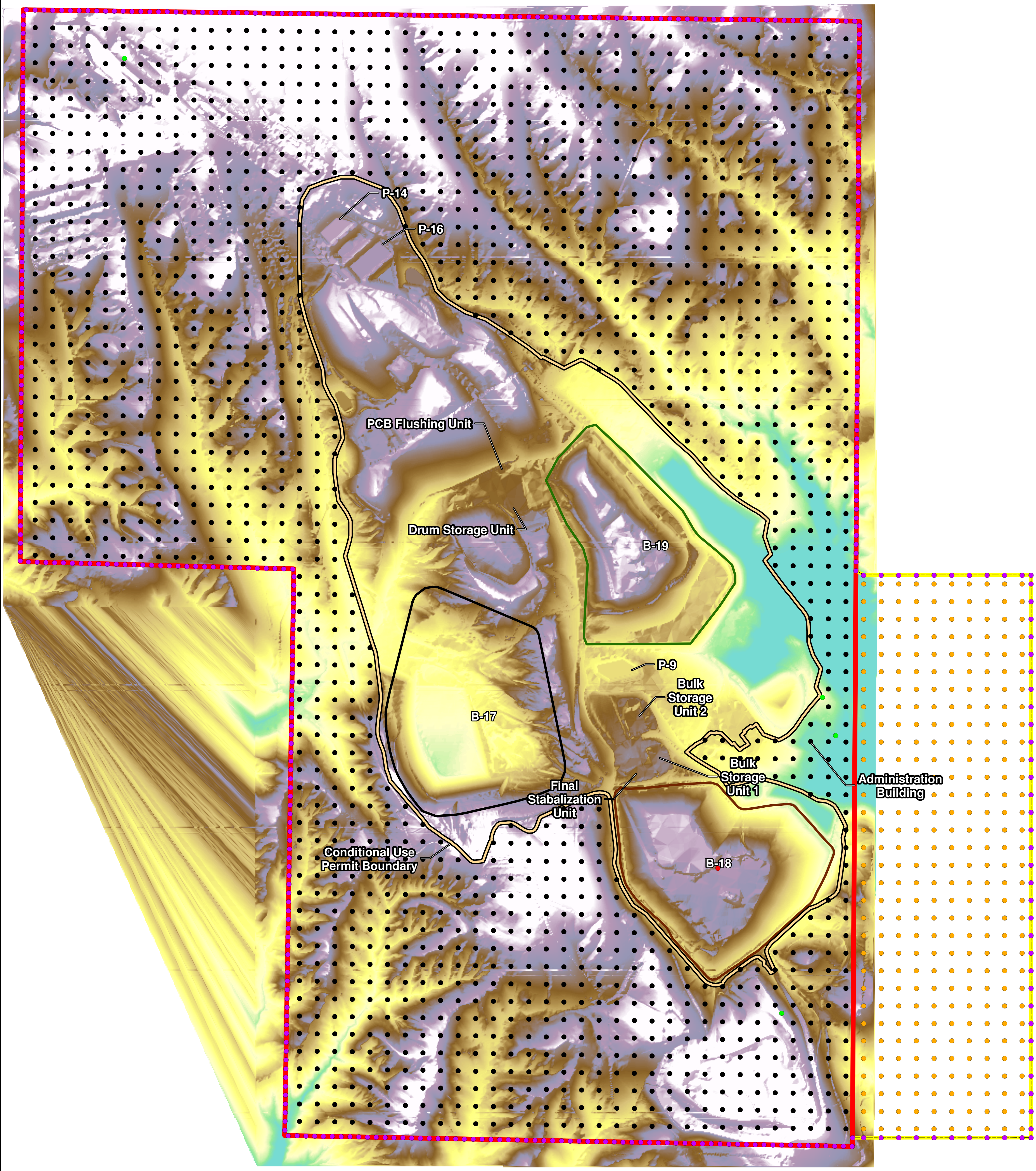
Based on the surface roughness data, aerial photographs, land use/land cover data, and wind rose plots, Hanford surface data was determined to best represent the project site. The decision to use Hanford is based on:

1. The Fresno average surface roughness is higher than the other three sites.
2. The plot of Fresno surface roughness show minimal variability in the south and west sectors compared with the other three sites. Therefore, Fresno should not be chosen.
3. Aerial photographs and land use/land cover data shows Hanford to be less urban than Fresno or Lemoore; thus a better fit of the extremely rural KHF site.
4. Wind rose plots showed similar trends between the Hanford, Lemoore, and Fresno data, which are unlike the wind rose plots of the wind data collected at KHF.
5. Five years of Hanford data is available while only two years of Lemoore data is available.

Therefore, this modeling analysis used surface observation data from the Hanford, California NWS station no. 53119 and upper air sounding data from the Oakland, California NWS station no. 23230 for meteorological years 2000 through 2004. As indicated previously, this data was obtained from the SJVUAPCD website. The meteorological data obtained from the SJVUAPCD website does not contain precipitation. Therefore, KHF did not model for wet deposition. KHF did not re-process the meteorological data due to the arid nature of the facility location. It was assumed that there would be minimal wet deposition due to the low annual rainfall amounts.

2.6 Background Concentration

Background concentrations are not required since the modeling analysis is not determining compliance with the National Ambient Air Quality Standards (NAAQS). Rather the modeling is to be used to determine the proper siting locations for ambient monitors. However, the model data was also used to verify that the monitoring site used to measure background concentrations (designated as UMS-1 in the draft PCB Congener Study Workplan) is appropriately sited.



Legend

Receptor Locations

- 25M Receptors
- 50M Receptors
- 50 Meter Outside Boundary Spacing
- Center of B-18
- Sample Location Receptors
- Ambient Air Quality Boundary

- Conditional Use Permit Boundary
- B-17
- B-18
- B-19
- Project Area

Elevation Grid

Value

High : 1105.88

Low : 692.469

800 400 0 800 Feet

N

Mxd: L:\0742\0742-811\mxd\ReceptorsWorking.mxd
Last Modified: 10/20/2009 10:39 AM

CHEMICAL WASTE MANAGEMENT, INC. KETTLEMAN HILLS FACILITY

Receptor Grid

COPYRIGHT

Wenck
Engineers • Scientists
Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359-0429

OCT 2009

Figure 3

3.0 Emission Sources

Low-level or ground-level releases are typically modeled in AERMOD as "area" sources. The modeling analysis was completed for the B-18 landfill. B-18 is the only active TSCA landfill unit, which has a foot print of 53-acres. B-18 was modeled as a 53-acre polygon area source. The landfill cell is not a rectangle and is better represented using a polygon shape.

The modeling analysis for KHF focused on assessing off-site impacts from the 12 dioxin-like PCB congeners. For the purpose of these modeling, the 12 dioxin-like PCB congeners are represented as a single PCB pollutant in the gaseous, particle, and particle-bound states. Any PCB emissions most likely come from the disposal of bulk contaminated soils. The PCB contaminated wastes enter KHF, then proceed to the receiving area. At the receiving area the trucks are uncovered, visually inspected, weighed, and finally approved for disposal. Once loads receive approval for disposal, the trucks then drive approximately 1 mile on access roads within the Conditional Use Permit Boundary to the active disposal area (working face) in the B-18 landfill. There are no potential PCB emissions until the trucks dump their loads at the active face. Trucks travel on clean, watered, access roads at low speeds (less than 15 miles per hour) to minimize fugitive dust emissions and wind erosion of the contaminated waste soils in the haul trucks.

Once inside the B-18 landfill footprint, haul trucks stop at the "gridder" where the paperwork is checked and the disposal grid location is entered into the paperwork. The haul trucks then proceed to the assigned grid location on the working face of the landfill. The active portion working face of the landfill is approximately 1-2 acres of the 53-acre B-18 landfill. The location of the active face moves on a daily basis as waste lifts are created as waste is disposed. The remainder of the B-18 landfill is covered with clean soil to satisfy the permitted daily cover requirements. The contaminated soil is then dumped and the haul truck leaves. Periodically, the contaminated soil piles are pushed by a bulldozer to form the lift. The working active face of the landfill is covered with clean soil at the end of each day. PCB contaminated soil is only worked and exposed in the active face region of the landfill. Therefore, any potential PCB emissions would only be emitted from the dumping, and pushing of the contaminated soil, and any wind erosion prior to covering with clean soil. The daily emissions would only originate from the area within the small working active face of the landfill.

As stated above, PCB emissions were modeled from the B-18 landfill as an area source the total size of the landfill (i.e. 53-acre area source). Since PCB contaminated soils are only exposed within the working active face rather than the entire area of the landfill, this modeling scenario is extremely conservative.

The selection of using an area source is applicable when modeling is performed to represent low-level or ground-level releases. This is the case with the B-18 landfill. The activity of dumping, and pushing the contaminated soil along with the wind erosion would occur close to the ground level. In addition, the purpose of the modeling analysis is to determine the location of maximum impact, not the magnitude of impact. The modeling was completed using a unit emission flux of 1 grams per second of emissions per unit area (g/sec-m^2). Emissions from area sources are expressed in g/sec-m^2. The emission rate of the 53-acre landfill is approximately 214,483 g/sec. The emission rate of the 1-acre working face is approximately 4,047 g/sec. By modeling the entire landfill results in nearly 53 times more emissions compared with modeling the working face only. The potential emissions from the dumping and bulldozing activities is addressed by modeling the entire landfill instead of modeling only the daily working face. The location of maximum ambient air and deposition impacts PCB emissions originating from the B-18 landfill is also conservatively addressed by modeling the entire B-18 footprint and not just the working active face.

Unfortunately, there is minimal guidance on choosing the most representative modeling parameters for a landfill source. The purpose of this modeling project is to verify locational placement of ambient air monitoring sites in the vicinity of the landfill, which is not related to the typical modeling triggers for Title V and PSD modeling analyses. Landfills are typically not modeled because criteria pollutant releases from these sources are small enough to prevent the modeling triggers for Title V and PSD modeling analyses. As a result, the representativeness of a landfill release has not been studied in depth.

The base elevation for B-18 is based on the 2008 flyover data described in Section 2.4. The base elevation is based on the average height of the B-18 landfill unit. The release height is based on half the distance between the base elevation and the maximum height of the B-18 landfill unit. The maximum height of B-18 was also obtained from the 2008 flyover data.

Emissions can be emitted from all heights of a landfill similar to a storage pile. However, AERMOD only allows for one release height per source. Another issue with both landfills and storage piles is that the height can vary at different points over the pile. Since a single release height must be assumed, KHF estimated a release height based on half the distance between the base elevation and the maximum height of the B-18 landfill. This is a reasonable estimate based on the following meteorological observations: 1) wind speeds increase with elevation and greater winds speeds lead to greater erosion and 2) the surface area of the pile (or landfill) above a given height decreases as the given height increases. Therefore, an average of both of these factors was used to account for the most representative release height of the B-18 landfill.

This method for determining a proper release height is documented in several sources such as: 1) "Modeling Fugitive Dust Sources with AERMOD", National Stone, Sand and Gravel Association (Reference 6), 2) Iowa Department of Natural Resources Air Dispersion Modeling Guidelines for PSD Projects (July 22, 2008) (Reference 7) (http://www.iowadnr.gov/air/prof/progdev/files/psd_modeling_guideline.pdf), and 3) Wisconsin Department of Natural Resources Dispersion Modeling Guidelines (Feb 2007) (Reference 8) (http://dnr.wi.gov/air/pdf/wdnrguidance_v6_3.pdf).

Table 8 below provides the modeling parameters used for this analysis of the B-18 landfill.

Table 8. Modeling Parameters – B-18

Source ID	Base Elevation (m)	Emission Rate (g/sec-m^2)	Release Height (m)
B18	273.01	1	6.97

Particle size distributions and physical characteristics of the PCBs are required for deposition modeling. Additional discussion on development of these parameters is below.

Particle size distributions were obtained from AP-42 Section 11.9, Western Surface Coal Mining (October, 1998). The majority of the particulate matter will be generated by the clean soil used for daily cover for B-18 with a small portion from the hazardous waste. The majority of waste disposed on the B-18 landfill is contaminated soils.   The clean daily cover is obtained from other portions of the facility. The daily cover consists of soil not containing PCBs. The overburden bulldozer particle size distribution is the most representative of the daily cover.

Mass-based particle size distribution is shown in Table 9.

Table 9. AP-42 Mass-Based Particle Size Distributions

Model Source ID	Particle Size (µm):	< 2.5	< 10	< 30
	Geometric Mean[1] (µm):	1.57	6.79	20.89
B18	B-18 Landfill	10.5	64.5	25.0

[1] The geometric mean is calculated as $[0.25 \cdot (D1^3 + D1^2 D2 + D2^2 D1 + D2^3)]^{0.33}$

Surface area-based particle-bound size distribution is shown in Table 10.

Table 10. AP-42 Surface Area-Based Particle-Bound Size Distributions

Model Source ID	Particle Size (µm):	< 2.5	< 10	< 30
	Geometric Mean[1] (µm):	1.57	6.79	20.89
B18	B-18 Landfill	38.51	54.61	6.88

A particle density of 1 g/cm^3 was assumed for all particles.

For gaseous dioxin-like PCB congener emission impacts, physical characteristics of the gas must be specified. The values for dioxin-like PCB congeners were selected. The values vary based on the type of PCB congener. The parameters were obtained for all 12 WHO designated dioxin-like PCB congener that are targeted in the ongoing air sampling. The most conservative value of all 12 was chosen for each parameter. The most conservative value for diffusivity in air (Da) and in water (Dw) is the maximum value for all 12 dioxin-like PCB congeners. The most conservative value for cuticular resistance (rcl) and Henry's Law Constant (H) is the minimum value. The parameters were obtained from "Application of AERMOD in a Combustion Source Risk Assessment"; E. R. Farstad, M. G. Hacker, W. P. Desmond; Tetra Tech EM Inc. (Reference 9). These physical characteristics are shown below in Table 11.

Table 11. Gaseous Deposition Parameters[2]

Parameter	PCBs
Diffusivity in air (Da)	0.05113 cm^2/s
Diffusivity in water (Dw)	0.4384 cm^2/s
Cuticular Resistance (rcl)	63.6 s/cm
Henry's Law Constant (H)	6.6 $Pa \cdot m^3/mol$

[2] Values obtained from: "Deposition Parameterizations for the Industrial Source Complex (ISC3) Model", June 2002 (ANL/ER/TR-01/003) (Reference 5).

4.0 Modeling Results

As indicated in Section 2, modeling was completed for total concentration, total deposition and dry deposition. The deposition modeling was completed for particle, particle-bound, and gaseous phases. Modeling was performed for the 1-month and annual averaging periods. The month-long averaging period was selected to correlate with the air sampling durations required by USEPA-IX for the PCB Congener Study.

The ANNUAL command was selected instead of the PERIOD command to calculate the annual average concentrations and deposition rates for the B-18 landfill source. The five years of meteorological data were concatenated to a single file instead of five separate files.

Plot files of each of the scenarios were analyzed in order to determine if the ambient air monitors are properly located to meet the objectives of the PCB Congener Study. A unit emission rate was used to perform the modeling. Therefore, the magnitude of the results is not relevant; rather the location of the high concentration is what was analyzed.

Figures 5 though 16 presented at the end of Section 5 show the results from the following modeled scenarios:

- Particle Phase – Total Concentration and Total Deposition
- Particle-bound Phase – Total Concentration and Total Deposition
- Vapor Phase – Total Concentration and Total Deposition.

Dry deposition was included in the modeling. However, because precipitation was not included in the modeling files, total and dry deposition results are equivalent. Therefore, figures of these dry deposition results are not provided.

The three monitoring locations are as follows: (1) one stationary monitoring site located downwind of the B-18 landfill (current downwind monitoring station 1 (DMS-1) located southeast of B-18 near the property line); (2) one stationary monitoring site located at the existing meteorological station pad (MSP), northeast of B-18, southeast of B-19, and north of the administration building; (3) a third stationary monitoring site is located near the property line in the north-northwest section of the facility to measure background ambient air entering the facility property (this site is the upwind monitoring site 1 (UMS-1) currently in use by the AAMP).

The figures included below indicate that the location for the current monitoring station 1 (DMS-1) is effectively located to capture maximum impact emissions from the B-18 landfill. The particle and particle bound 1-month deposition (Figures 6 and 10) and annual concentration (Figures 7 and 11) and annual deposition (Figures 8 and 12) high results are south to southeast of the B-18 landfill in the proximity of DMS-1. This is expected as the predominant wind direction is out of the northwest. These figures substantiate the initial conclusion that the DMS-1 monitor location is downwind of the B-18 landfill site and will be able to monitor maximum PCB emissions emitted from the landfill.

The additional downwind (impact) monitoring location is located at the original meteorological station pad (MSP), northeast of B-18. MSP is not in the direction of the predominant wind direction. However, MSP is effectively located when the wind is out of the southwest, which has been shown to frequently occur since the PCB Congener Study air monitoring began in January 2009. Further, MSP is ideally located for measuring PCB congener impacts in the direction of the Kettleman City. This is of significant value given the public concerns about KHF impact to Kettleman City which is the nearest population center to KHF.

The upwind (background) monitoring site (UMS-1) is effectively located to represent ambient background air. The concentrations observed at this location were negligible compared to the high concentrations. Figure 17 provides a full view of one modeled scenario. This figure confirms the initial conclusion that the UMS-1 monitor location is upwind of the B-18 landfill site, therefore making this a good location to determine the ambient or background concentrations of the area. Figure 17 is representative of the other modeled scenarios regarding the placement of the UMS-1 monitor relative to potential PCB emissions from the B-18 landfill.

In conclusion, the modeling results indicate that DMS-1 and UMS-1 are appropriately located to meet the objectives of the PCB Congener 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, and to represent ambient background air

A CD-ROM containing all modeling input and output files from the modeling analysis is included in Appendix C.

Figure 5. Particle Phase Monthly High 1st High Total Concentration Results

Figure 6. Particle Phase Monthly High 1st High Total Deposition Results

Figure 7. Particle Phase Annual 1st High Total Concentration Results

Figure 8. Particle Phase Annual 1st High Total Deposition Results

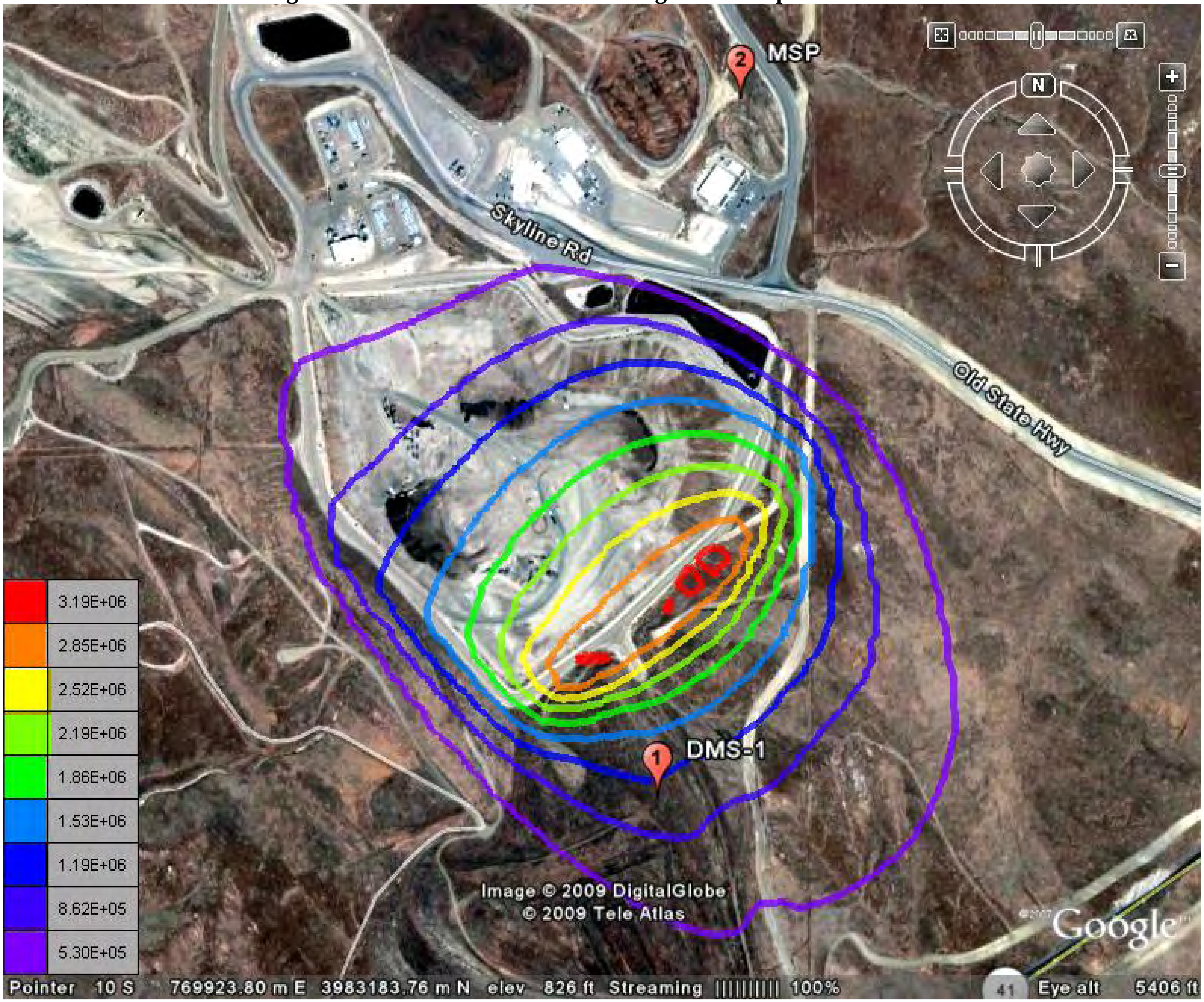


Figure 9. Particle Bound Phase Monthly High 1st High Total Concentration Results

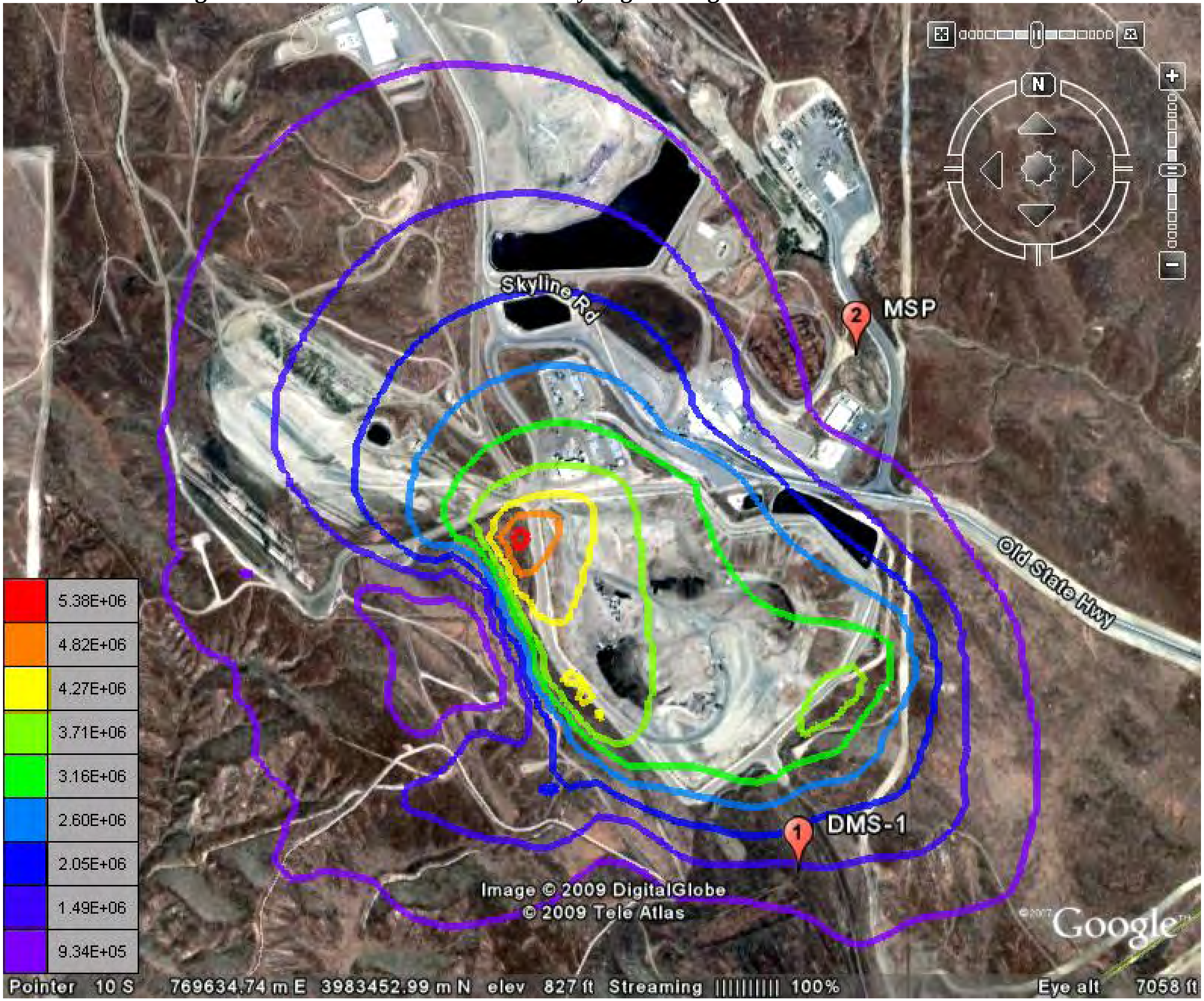


Figure 10. Particle Bound Phase Monthly High 1st High Total Deposition Results

Figure 11. Particle Bound Phase Annual 1st High Total Concentration Results

Figure 12. Particle Bound Phase Annual 1st High Total Deposition Results

Figure 13. Vapor Phase Monthly High 1st High Total Concentration Results

Figure 14. Vapor Phase Monthly High 1st High Total Deposition Results

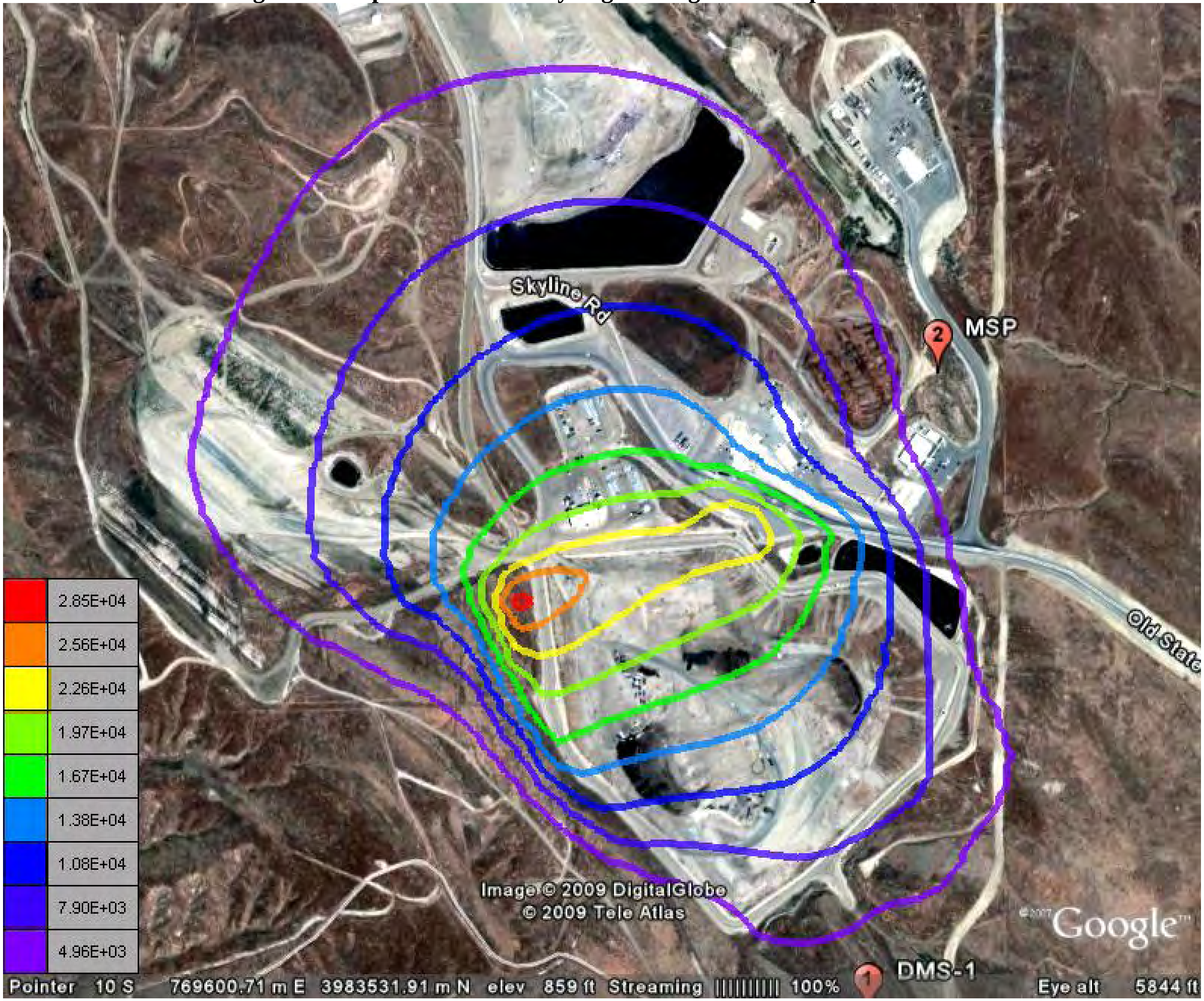


Figure 15. Vapor Phase Annual 1st High Total Concentration Results

Figure 16. Vapor Phase Annual 1st High Total Deposition Results

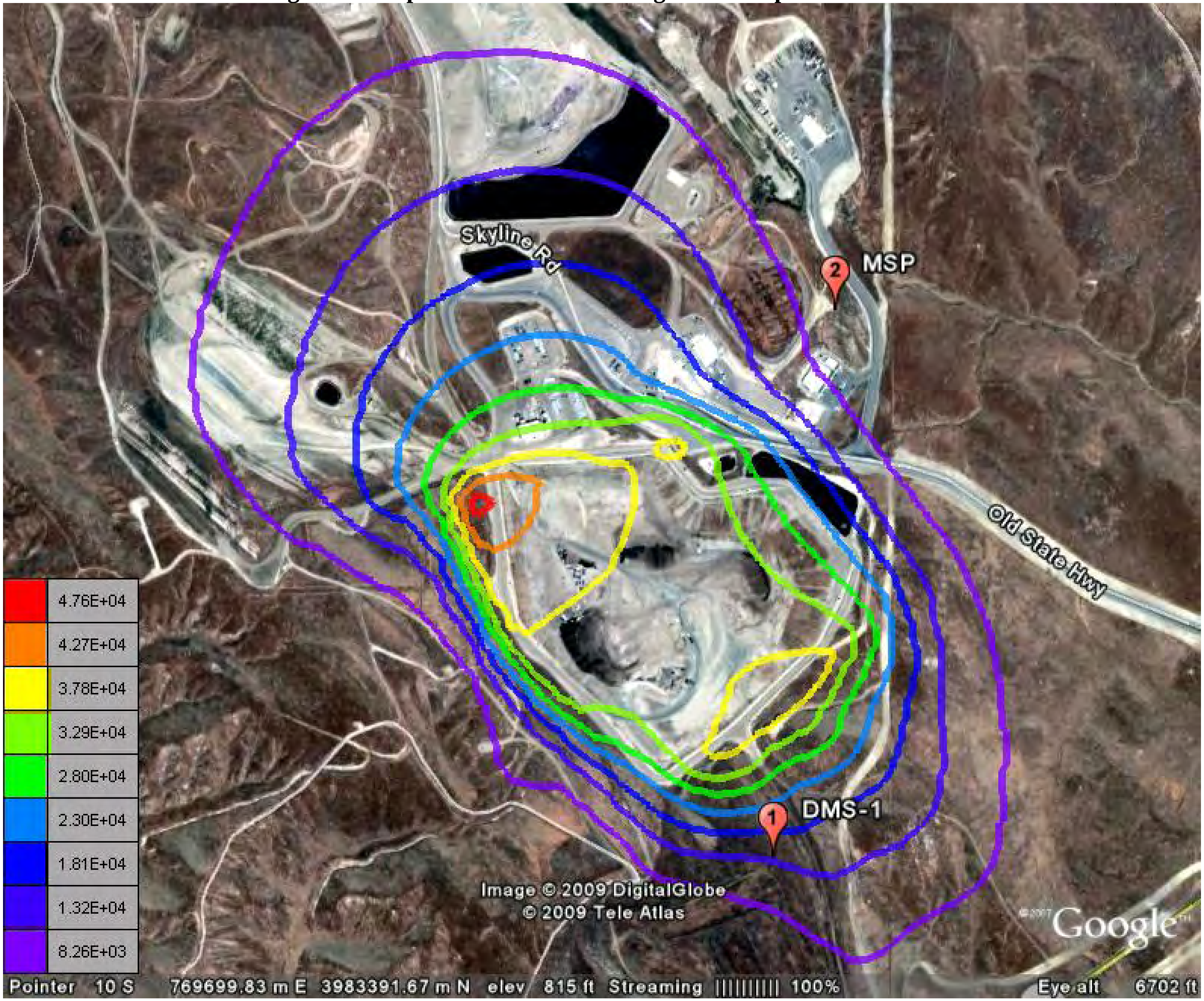
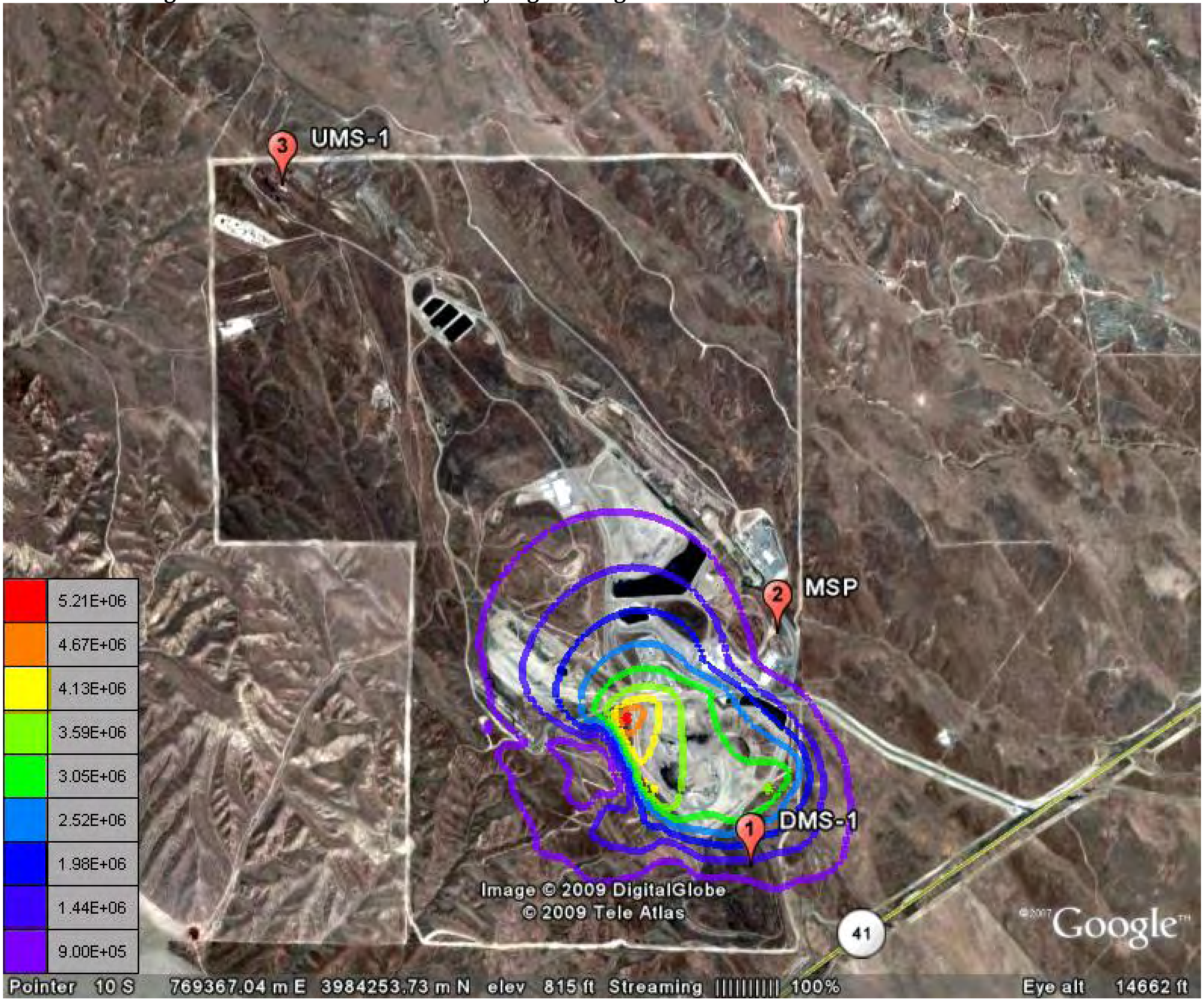


Figure 17. Particle Phase Monthly High 1st High Total Concentration Results – Full View



5.0 References

1 User's Guide for the AMS/EPA Regulatory Model – AERMOD, EPA-454/B-03-001, September 2004

2 User's Guide for the AMS/EPA Regulatory Model – AERMOD - Addendum, EPA-454/B-03-001, December 2006.

3 Dioxin-Line Polychlorinated Biphenyl (PBC) Congeners Study Workplan, April 2009

4 USEPA Memorandum, August 13, 2008, Clarification of Regulatory Status of CALPUFF for Near-field Applications. Richard A. Wayland, Director, Air Quality Assessment Division (C304-02)

5 Deposition Parameterizations for the Industrial Source Complex (ISC3) Model, June 2002 (ANL/ER/TR-01/003)

6 Modeling Fugitive Dust Sources with AERMOD, National Stone, Sand and Gravel Association, Prepared by Trinity Consultants, January 2007

7 Iowa Department of Natural Resources Air Dispersion Modeling Guidelines for PSD Projects, July 22, 2008, (http://www.iowadnr.gov/air/prof/progdev/files/psd_modeling_guideline.pdf)

8 Wisconsin Department of Natural Resources Dispersion Modeling Guidelines, February 2007, (http://dnr.wi.gov/air/pdf/wdnrguidance_v6_3.pdf).

9 Application of AERMOD in a Combustion Source Risk Assessment; E. R. Farstad, M. G. Hacker, W. P. Desmond; Tetra Tech EM Inc

Appendix A

Aerial Photographs and Land Use/Land Cover Plots

Legend

Point Locations

1 KM Buffer

naip_1-1_2n_s_ca031_2006_1.sid

RGB

Red: Band_1

Green: Band_2

Blue: Band_3

900 450 0 900

Feet

N

Legend

Point Locations

1 KM Buffer

naip_1-1_2n_s_ca031_2006_1.sid

RGB

Red: Band_1

Green: Band_2

Blue: Band_3

900 450 0 900

Feet

N

Legend

Point Locations

1 KM Radius

900 450 0 900

Feet

N

Legend

Point Locations

1 KM Buffer

naip_1-1_2n_s_ca031_2006_1.sid

RGB

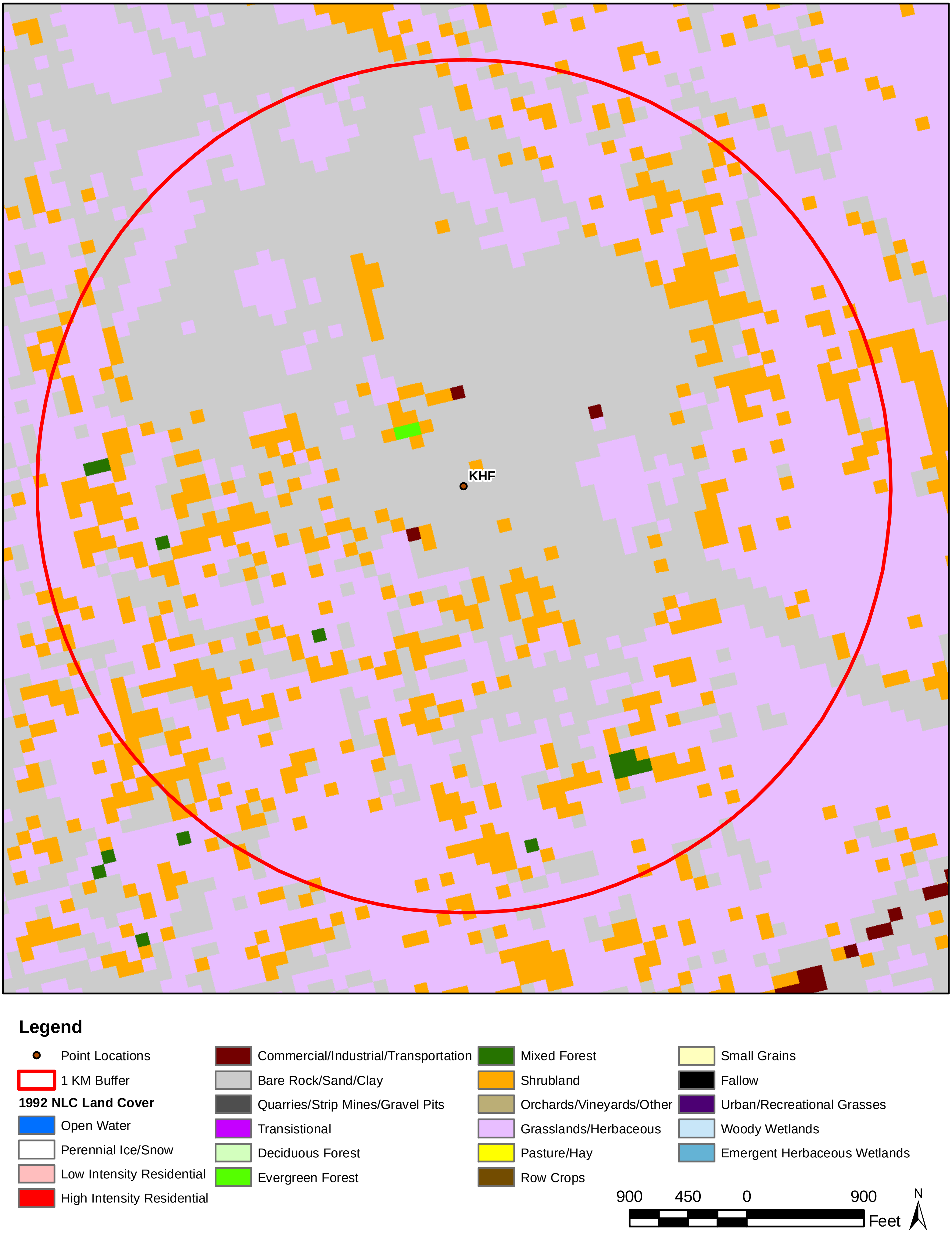
Red: Band_1

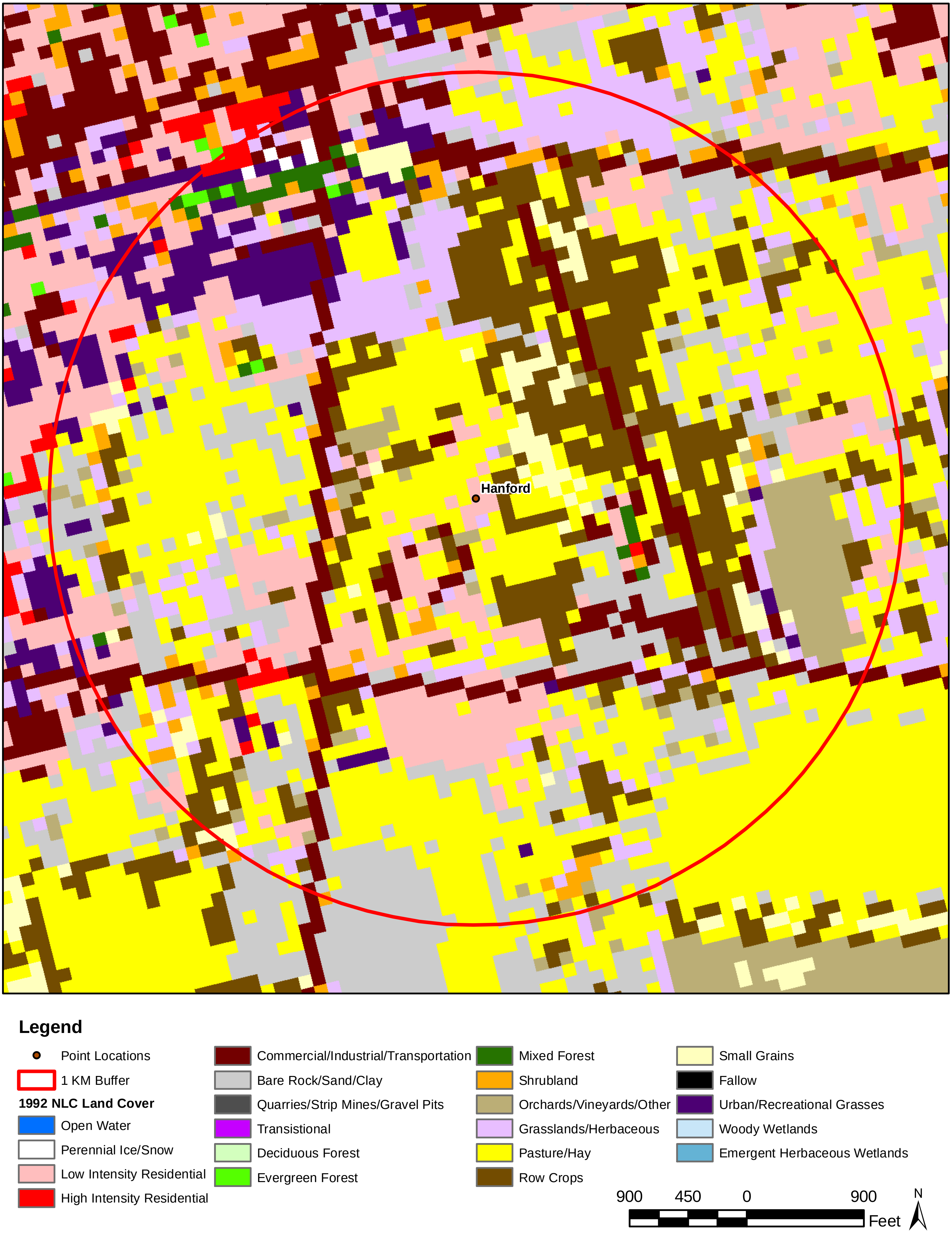
Green: Band_2

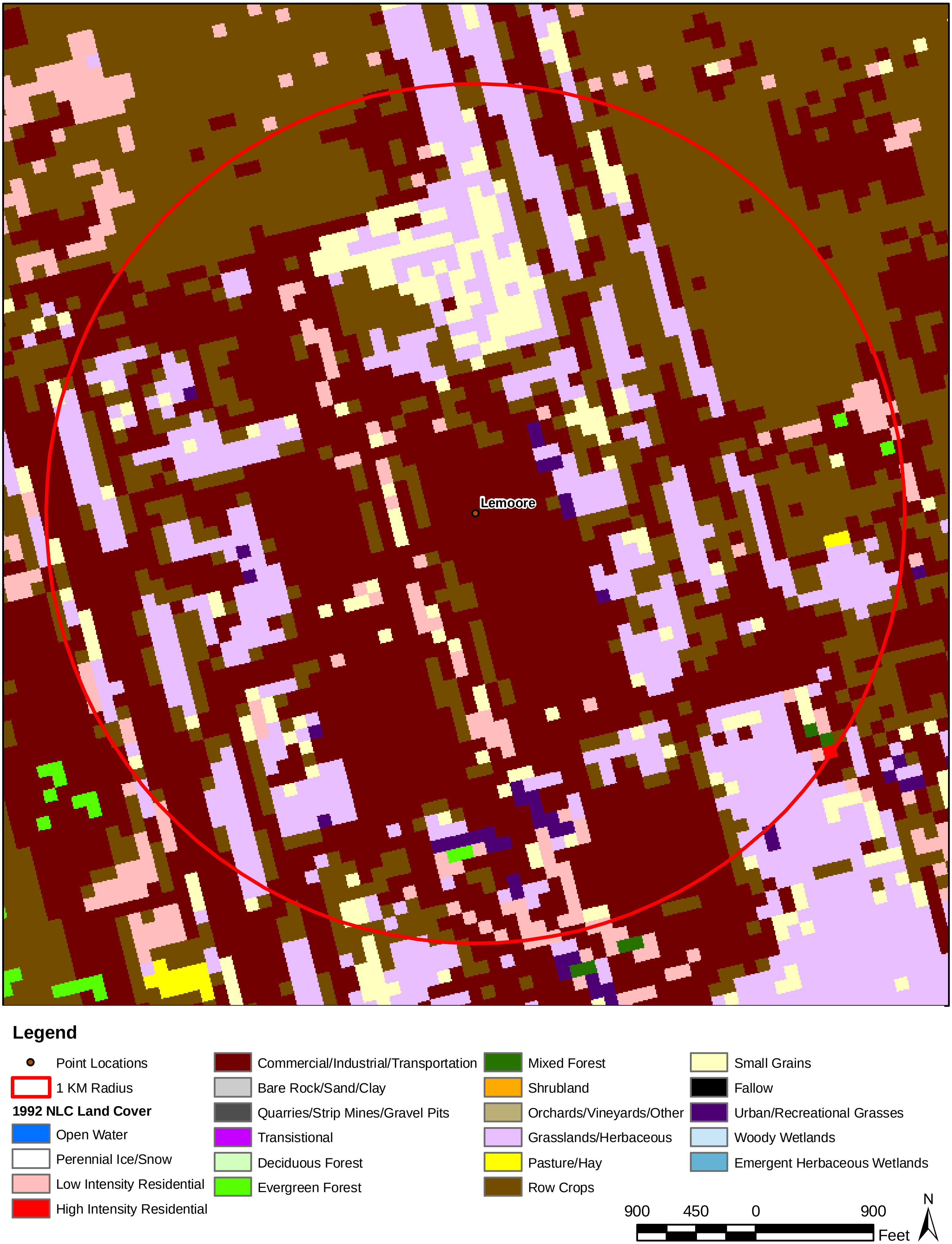
Blue: Band_3

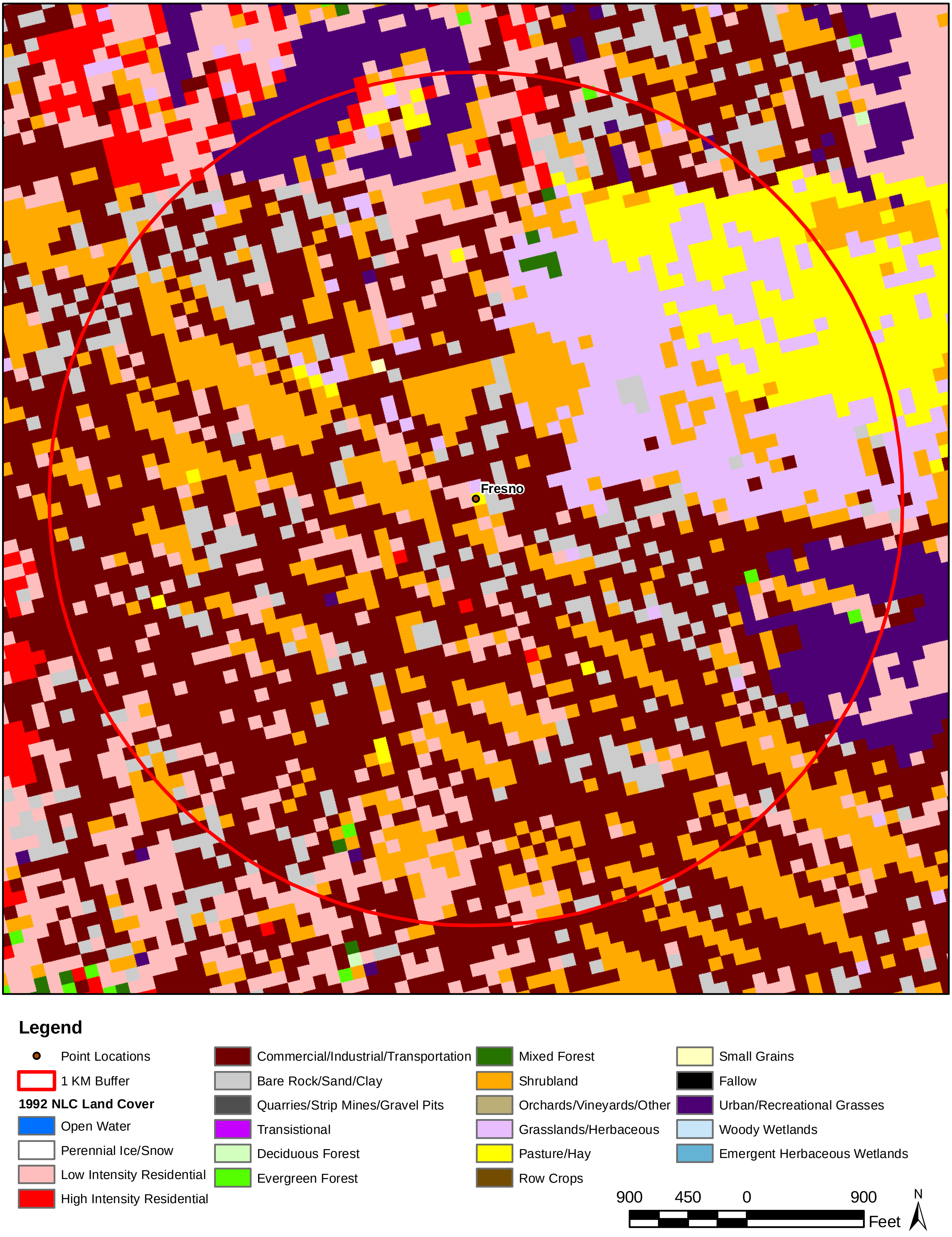
900 450 0 900 Feet

N


KHF
Legend
Point Locations
1 KM Buffer
1992 NLC Land Cover
Open Water
Perennial Ice/Snow
Low Intensity Residential
High Intensity Residential
Commercial/Industrial/Transportation
Bare Rock/Sand/Clay
Quarries/Strip Mines/Gravel Pits
Transitional
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrubland
Orchards/Vineyards/Other
Grasslands/Herbaceous
Pasture/Hay
Row Crops
Small Grains
Fallow
Urban/Recreational Grasses
Woody Wetlands
Emergent Herbaceous Wetlands
900 450 0 900
Feet
N


Hanford
Legend
Point Locations
1 KM Buffer
1992 NLC Land Cover
Open Water
Perennial Ice/Snow
Low Intensity Residential
High Intensity Residential
Commercial/Industrial/Transportation
Bare Rock/Sand/Clay
Quarries/Strip Mines/Gravel Pits
Transitional
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrubland
Orchards/Vineyards/Other
Grasslands/Herbaceous
Pasture/Hay
Row Crops
Small Grains
Fallow
Urban/Recreational Grasses
Woody Wetlands
Emergent Herbaceous Wetlands
900 450 0 900
Feet
N


Lemoore
Legend
Point Locations
1 KM Radius
1992 NLC Land Cover
Open Water
Perennial Ice/Snow
Low Intensity Residential
High Intensity Residential
Commercial/Industrial/Transportation
Bare Rock/Sand/Clay
Quarries/Strip Mines/Gravel Pits
Transitional
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrubland
Orchards/Vineyards/Other
Grasslands/Herbaceous
Pasture/Hay
Row Crops
Small Grains
Fallow
Urban/Recreational Grasses
Woody Wetlands
Emergent Herbaceous Wetlands
900 450 0 900
Feet
N


Fresno
Legend
Point Locations
1 KM Buffer
1992 NLC Land Cover
Open Water
Perennial Ice/Snow
Low Intensity Residential
High Intensity Residential
Commercial/Industrial/Transportation
Bare Rock/Sand/Clay
Quarries/Strip Mines/Gravel Pits
Transitional
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrubland
Orchards/Vineyards/Other
Grasslands/Herbaceous
Pasture/Hay
Row Crops
Small Grains
Fallow
Urban/Recreational Grasses
Woody Wetlands
Emergent Herbaceous Wetlands
900 450 0 900
Feet
N

Appendix B

Wind Rose Plots

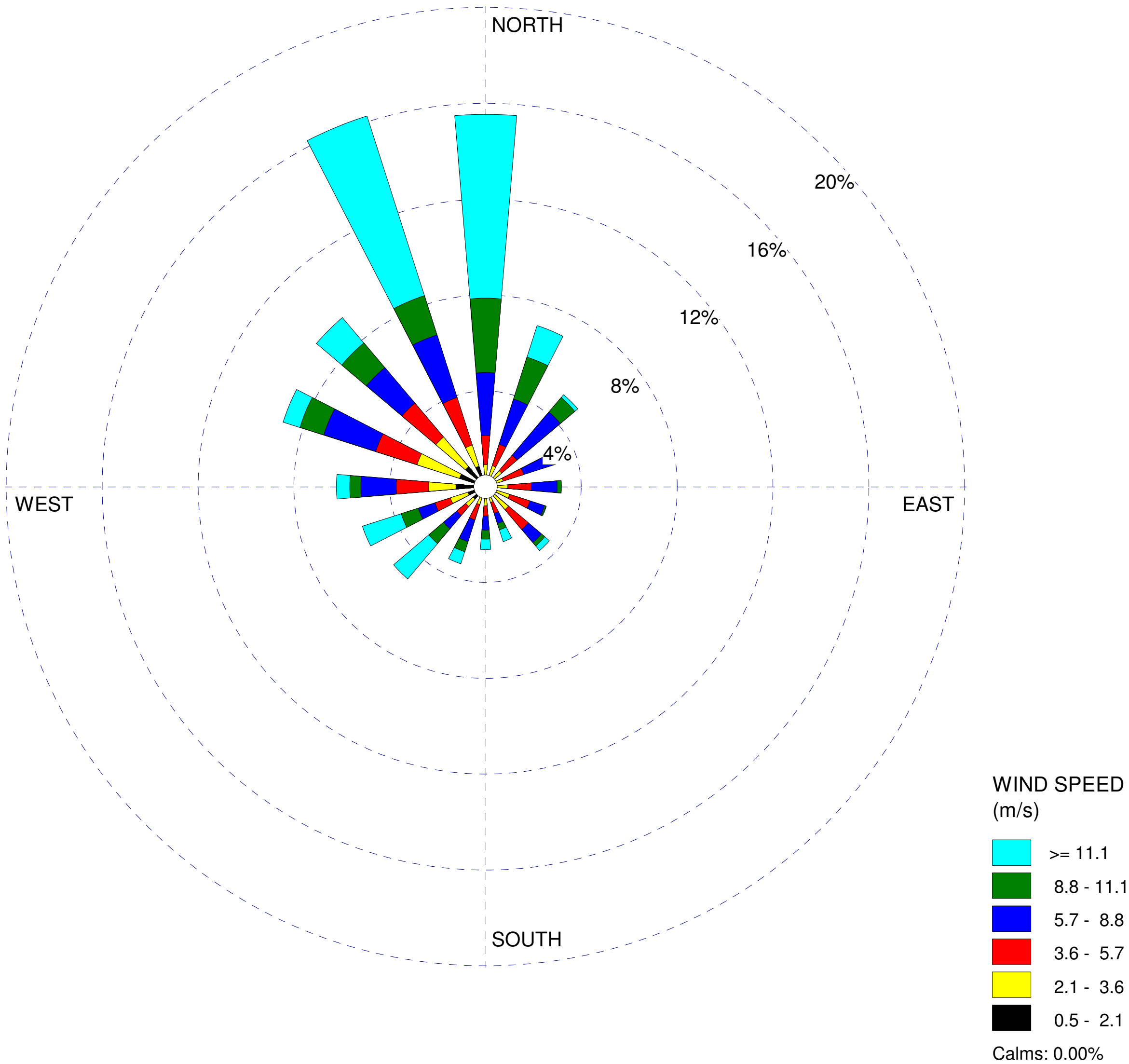
2000 – 2008 Kettleman Hills Facility Wind Rose Plots

WIND ROSE PLOT:

2000 Meteorological Data

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2000** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	
	CALM WINDS: **0.00%**	TOTAL COUNT: **8766 hrs.**	
	AVG. WIND SPEED: **8.13 m/s**	DATE: **12/30/2008**	PROJECT NO.: **0742-811**

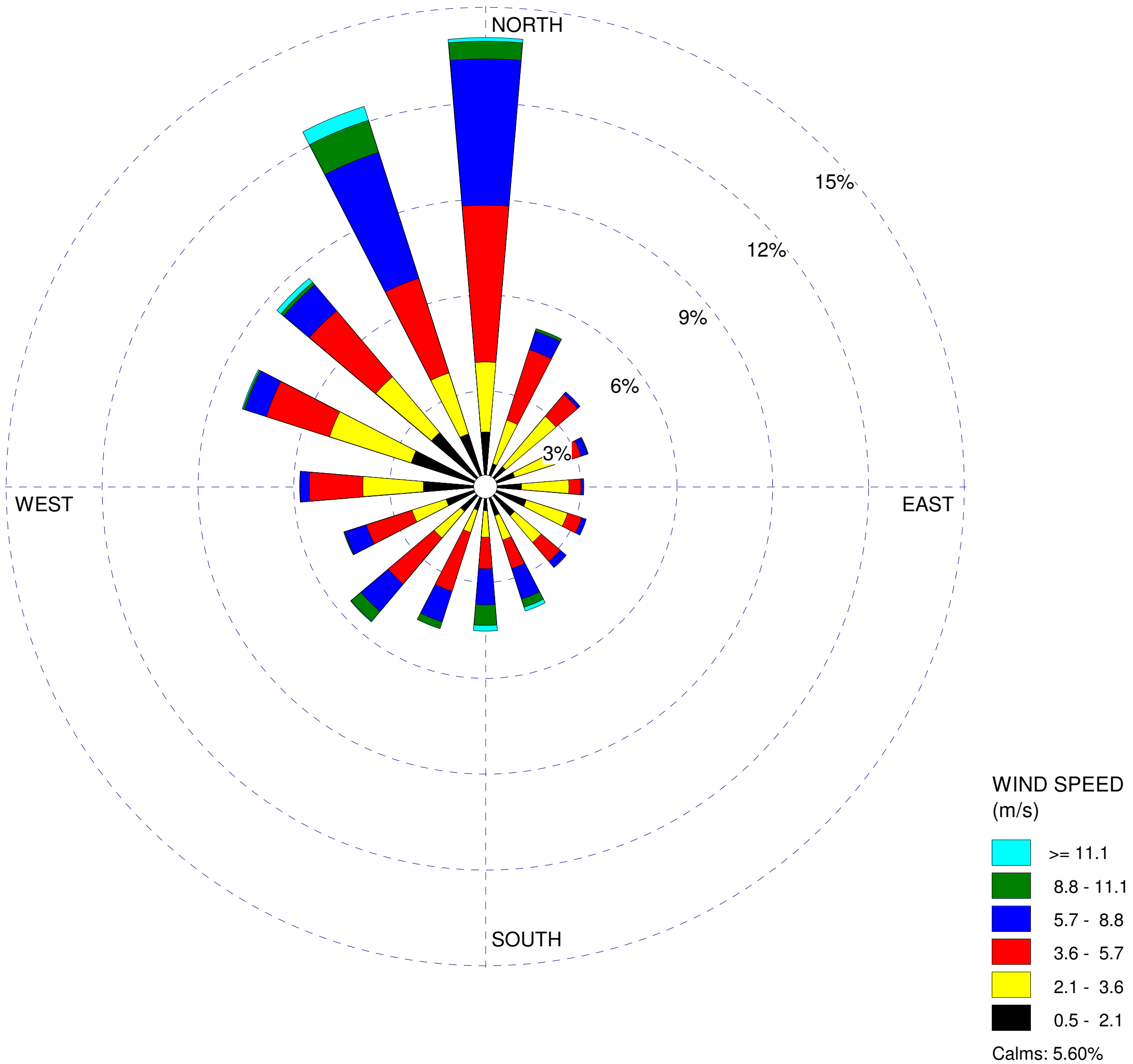
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2001 Meteorological Data

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2001** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**
		MODELER: **Wenck Associates, Inc.**
	CALM WINDS: **5.60%**	TOTAL COUNT: **7959 hrs.**
	AVG. WIND SPEED: **3.89 m/s**	DATE: **12/30/2008**
		PROJECT NO.: **0742-811**

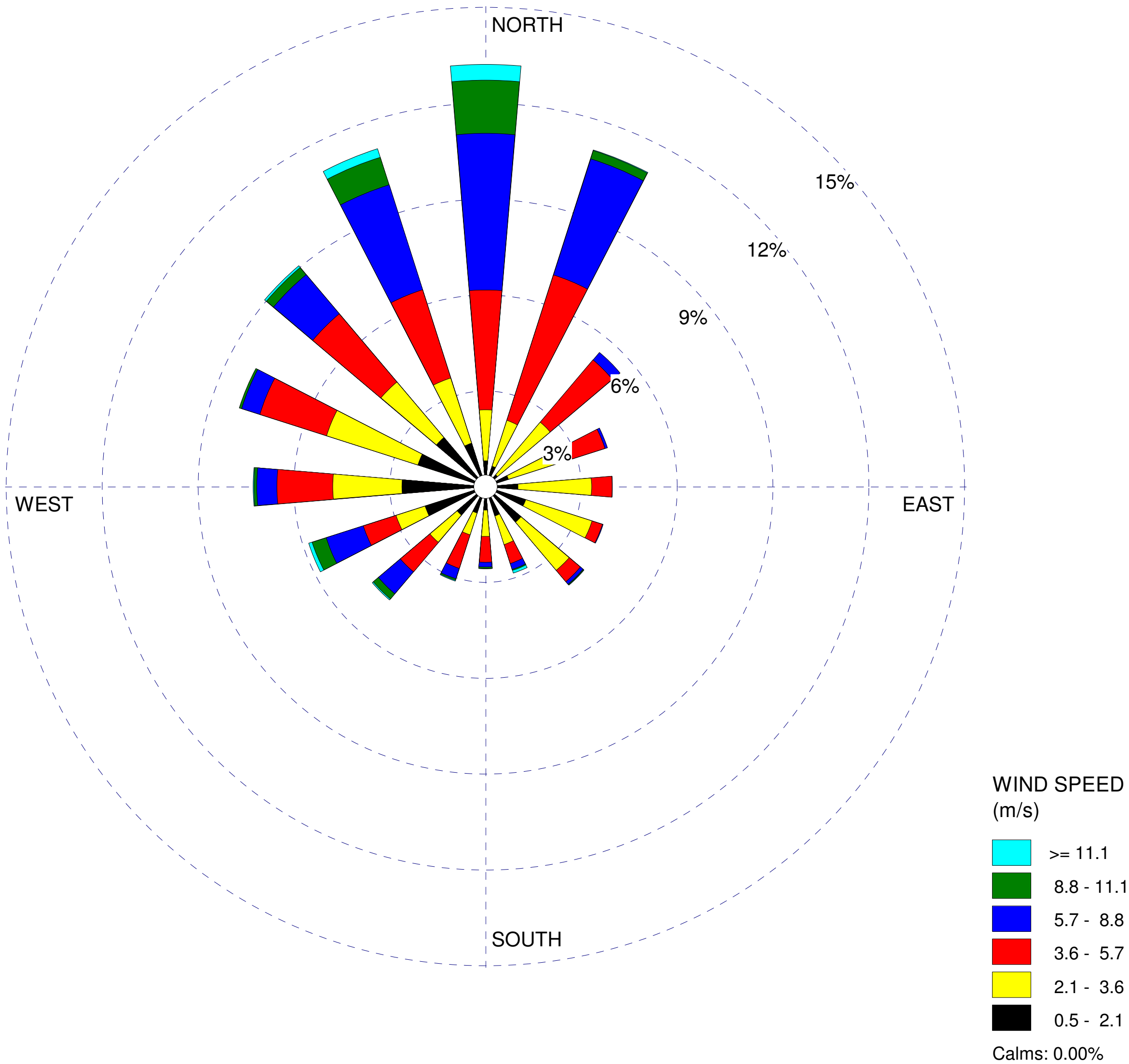
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2002 Meteorological Data

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the Northwest.

DATA PERIOD:

2002
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

0.00%

TOTAL COUNT:

8721 hrs.

AVG. WIND SPEED:

4.17 m/s

DATE:

12/30/2008

PROJECT NO.:

0742-811

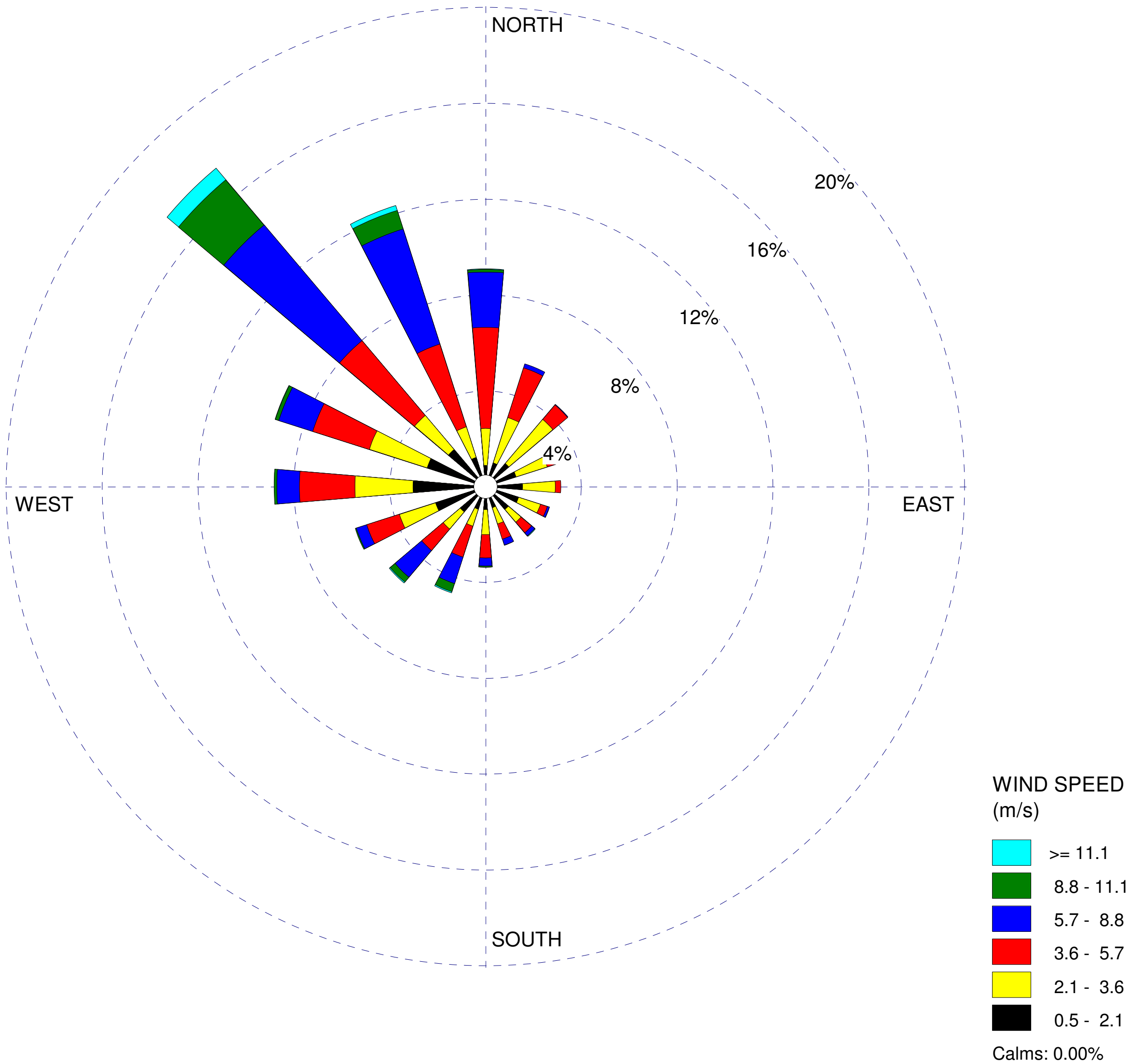
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2003 Meteorological Data

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2003** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**
		MODELER: **Wenck Associates, Inc.**
	CALM WINDS: **0.00%**	TOTAL COUNT: **8557 hrs.**
	AVG. WIND SPEED: **4.16 m/s**	DATE: **1/6/2009**
		PROJECT NO.: **0742-811**

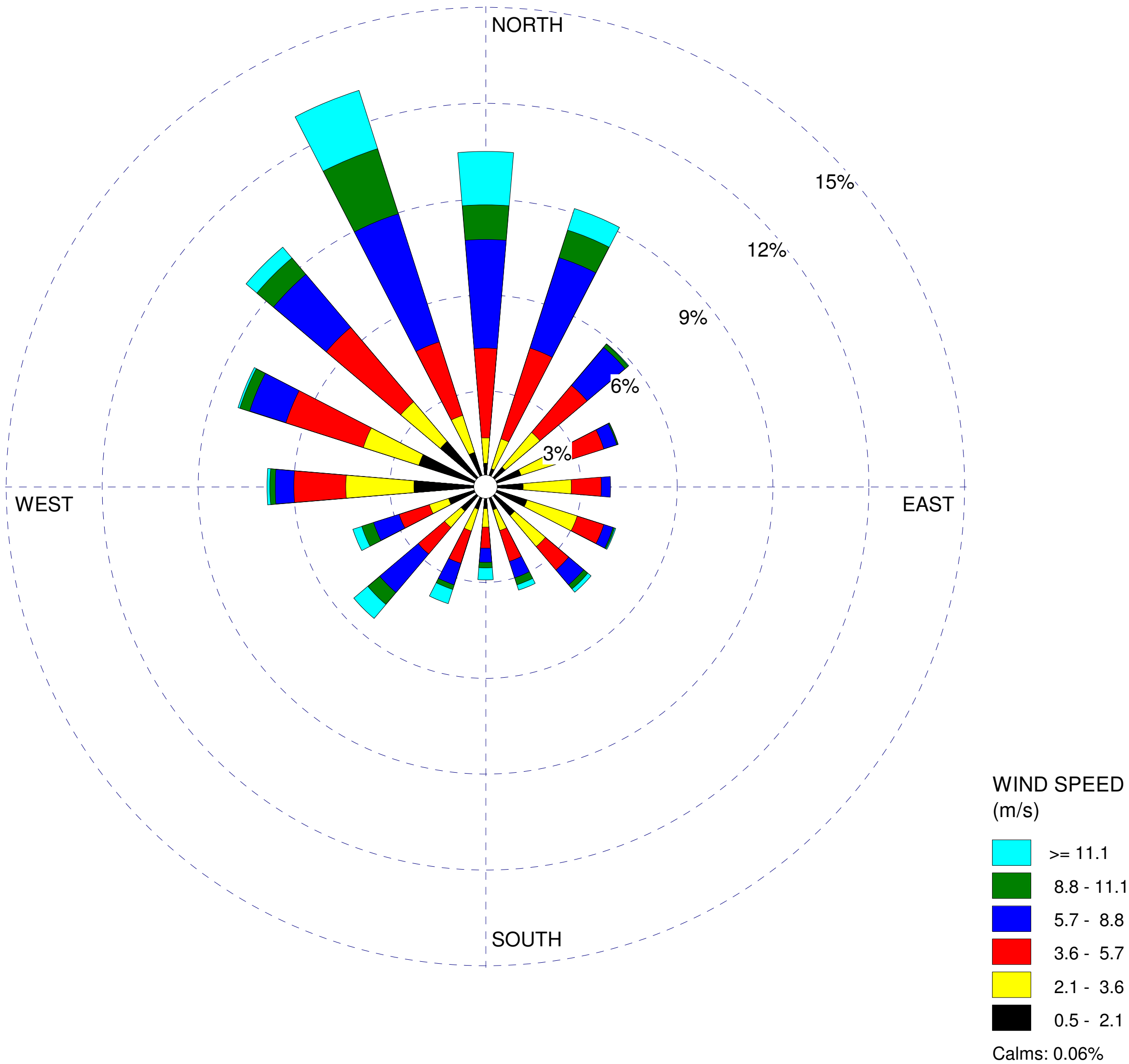
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2004 Meteorological Data

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the Northwest.

DATA PERIOD:

2004
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

0.06%

TOTAL COUNT:

8568 hrs.

AVG. WIND SPEED:

5.24 m/s

DATE:

12/18/2008

PROJECT NO.:

0742-811

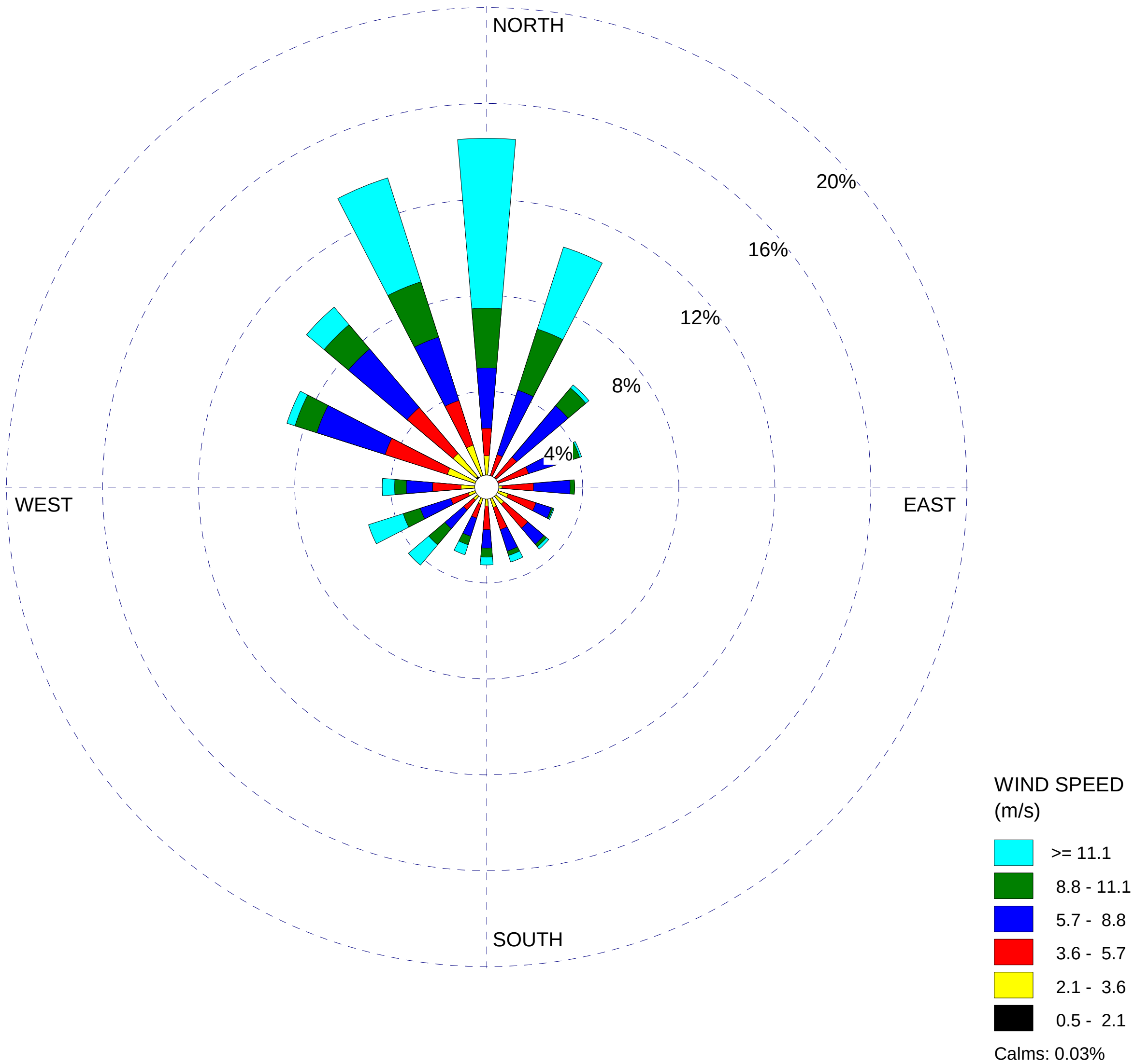
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2005 Meteorological Data

DISPLAY:

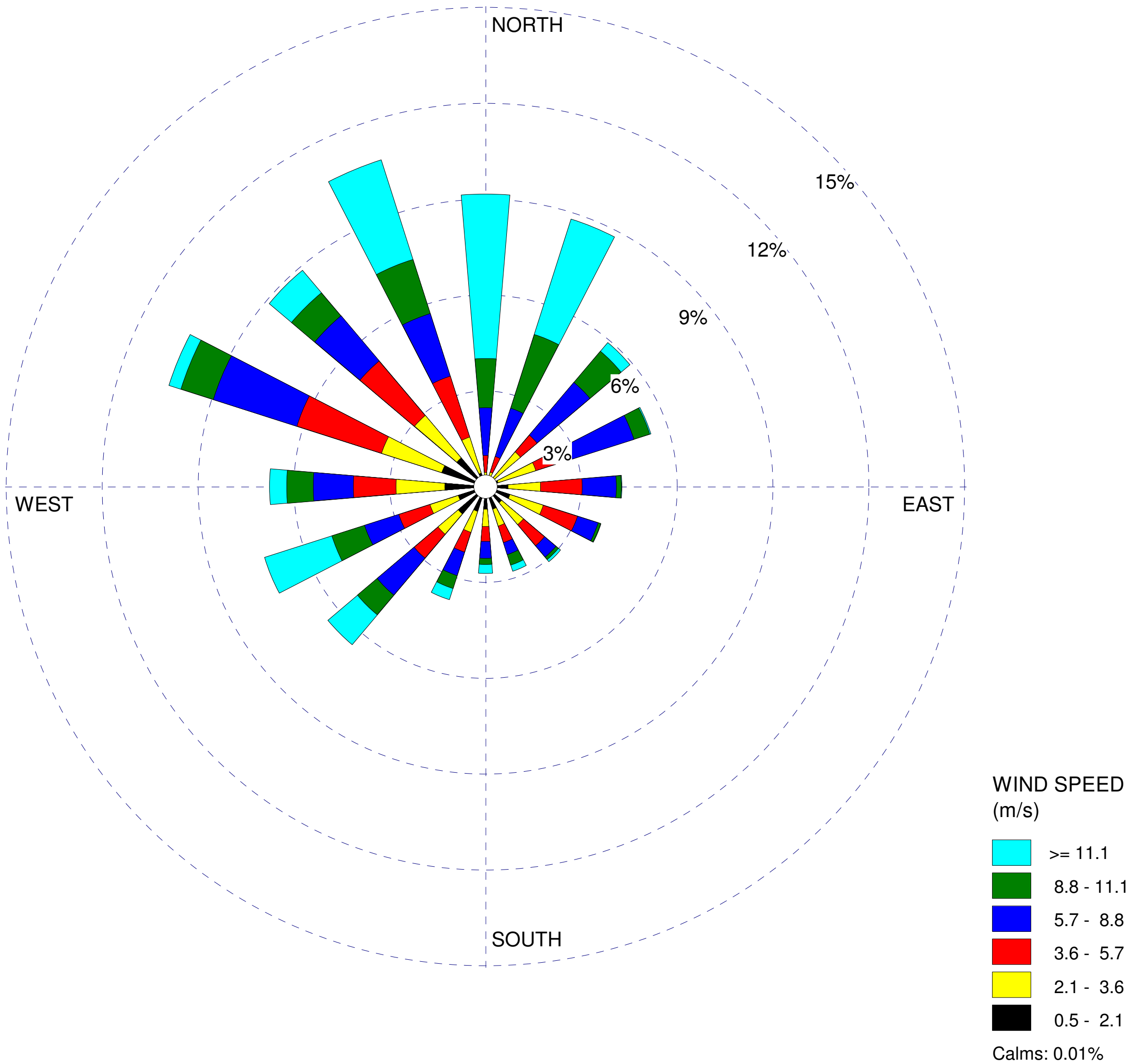
Wind Speed
Direction (blowing from)



COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2005** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **0.03%**	TOTAL COUNT: **8746 hrs.**	
	AVG. WIND SPEED: **7.88 m/s**	DATE: **12/18/2008**	PROJECT NO.: **0742-811**

WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:	DISPLAY:
2006 Meteorological Data	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Winds were predominately from the Northwest.	**2006** **Jan 1 - Dec 31** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **0.01%**	TOTAL COUNT: **8466 hrs.**	
	AVG. WIND SPEED: **7.11 m/s**	DATE: **12/19/2008**	PROJECT NO.: **0742-811**

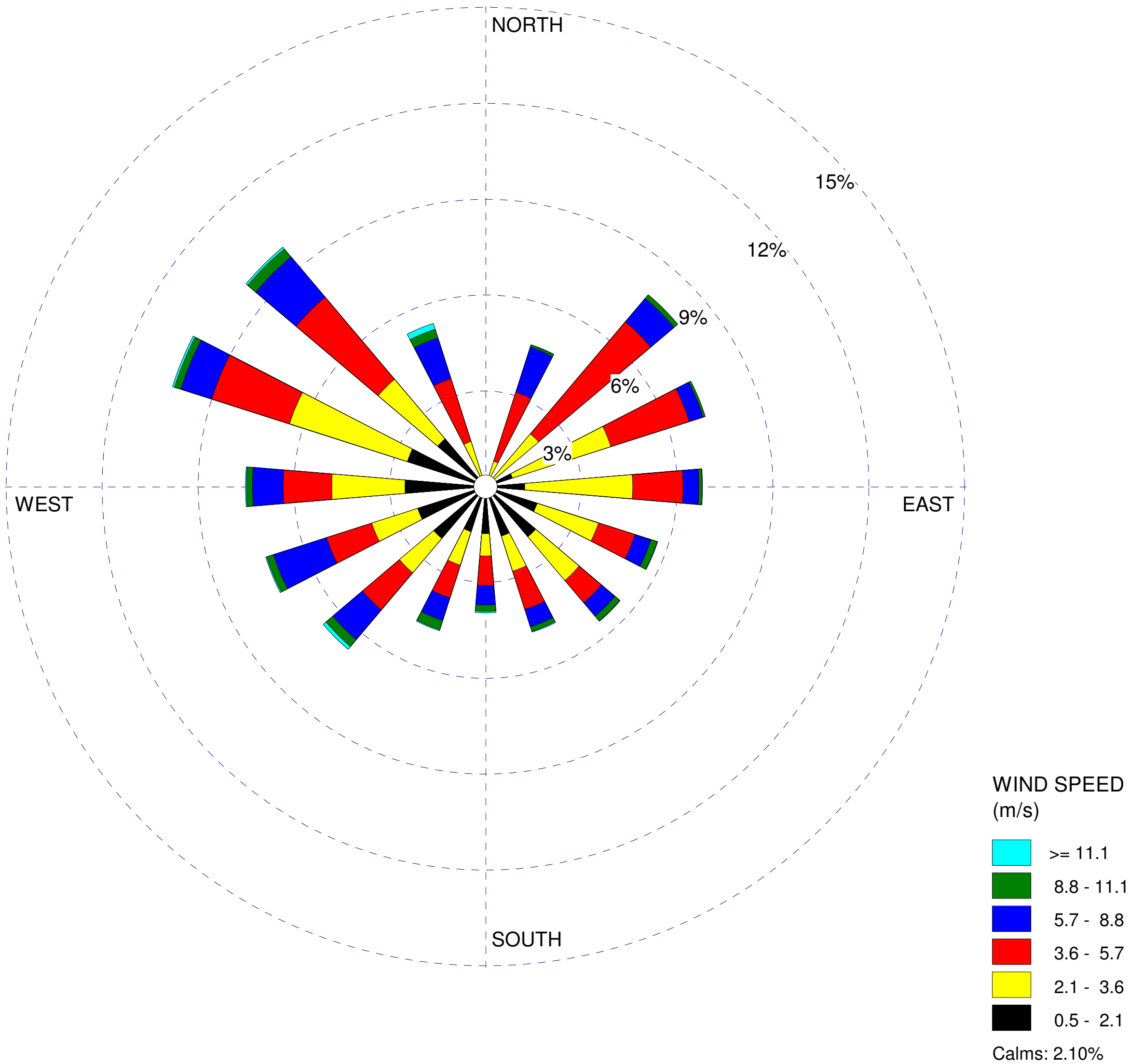
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2007 Meteorological Data

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were variable with no distinct pattern.

DATA PERIOD:

2007
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

2.10%

TOTAL COUNT:

8570 hrs.

AVG. WIND SPEED:

3.82 m/s

DATE:

12/22/2008

PROJECT NO.:

0742-811

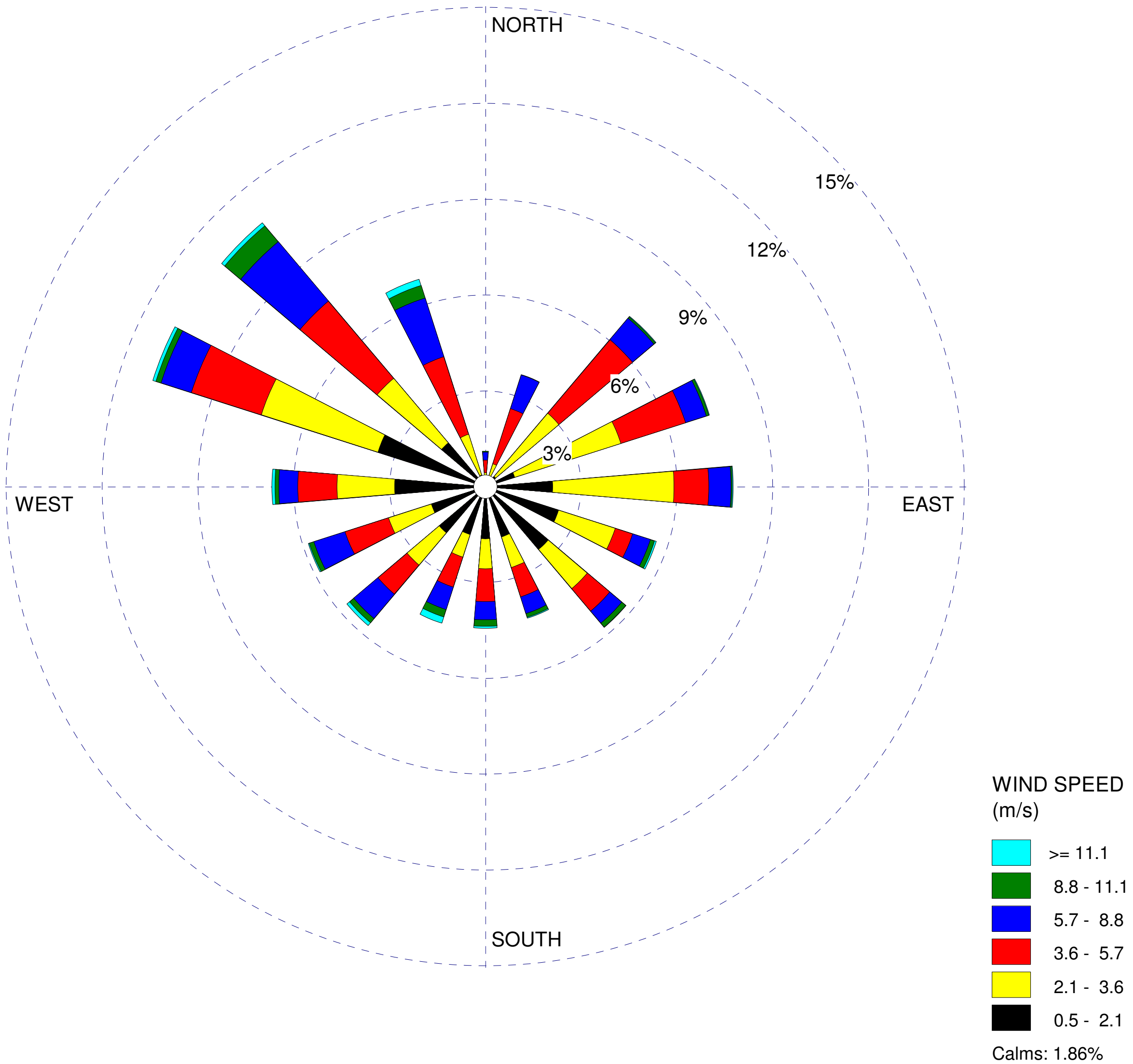
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2008 Meteorological Data

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were variable with no distinct pattern.

DATA PERIOD:

2008
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

1.86%

TOTAL COUNT:

8771 hrs.

AVG. WIND SPEED:

3.76 m/s

DATE:

1/6/2009

PROJECT NO.:

0742-811

WRPLOT View - Lakes Environmental Software

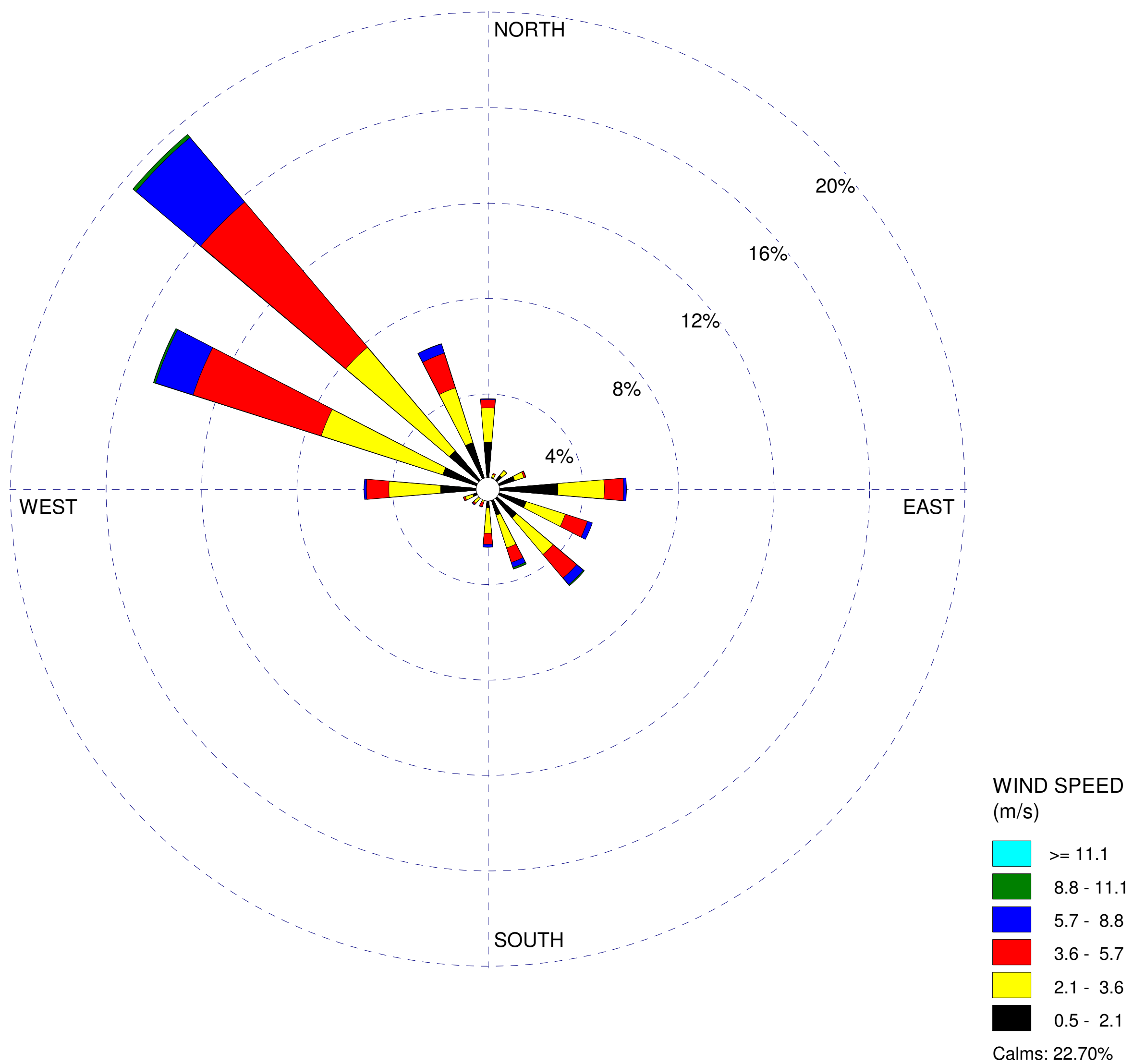
2000 – 2008 Fresno Wind Rose Plots

WIND ROSE PLOT:

2000 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2000** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**
		MODELER: **Wenck Associates, Inc.**
	CALM WINDS: **22.70%**	TOTAL COUNT: **8107 hrs.**
	AVG. WIND SPEED: **2.74 m/s**	DATE: **1/8/2009**
		PROJECT NO.: **0742-816**

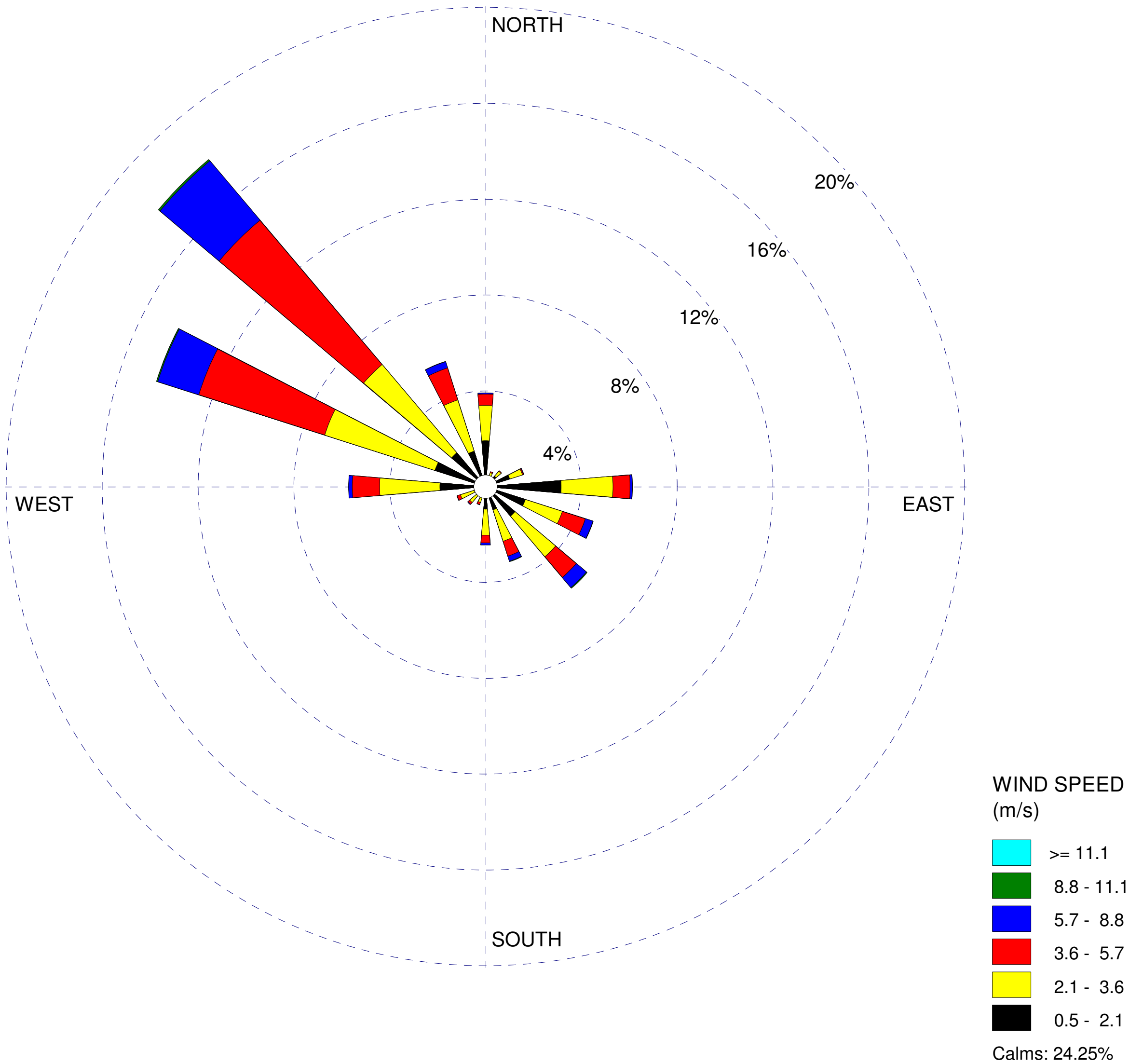
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2001 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the Northwest.

DATA PERIOD:

2001
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

24.25%

TOTAL COUNT:

8082 hrs.

AVG. WIND SPEED:

2.68 m/s

DATE:

1/8/2009

PROJECT NO.:

0742-816

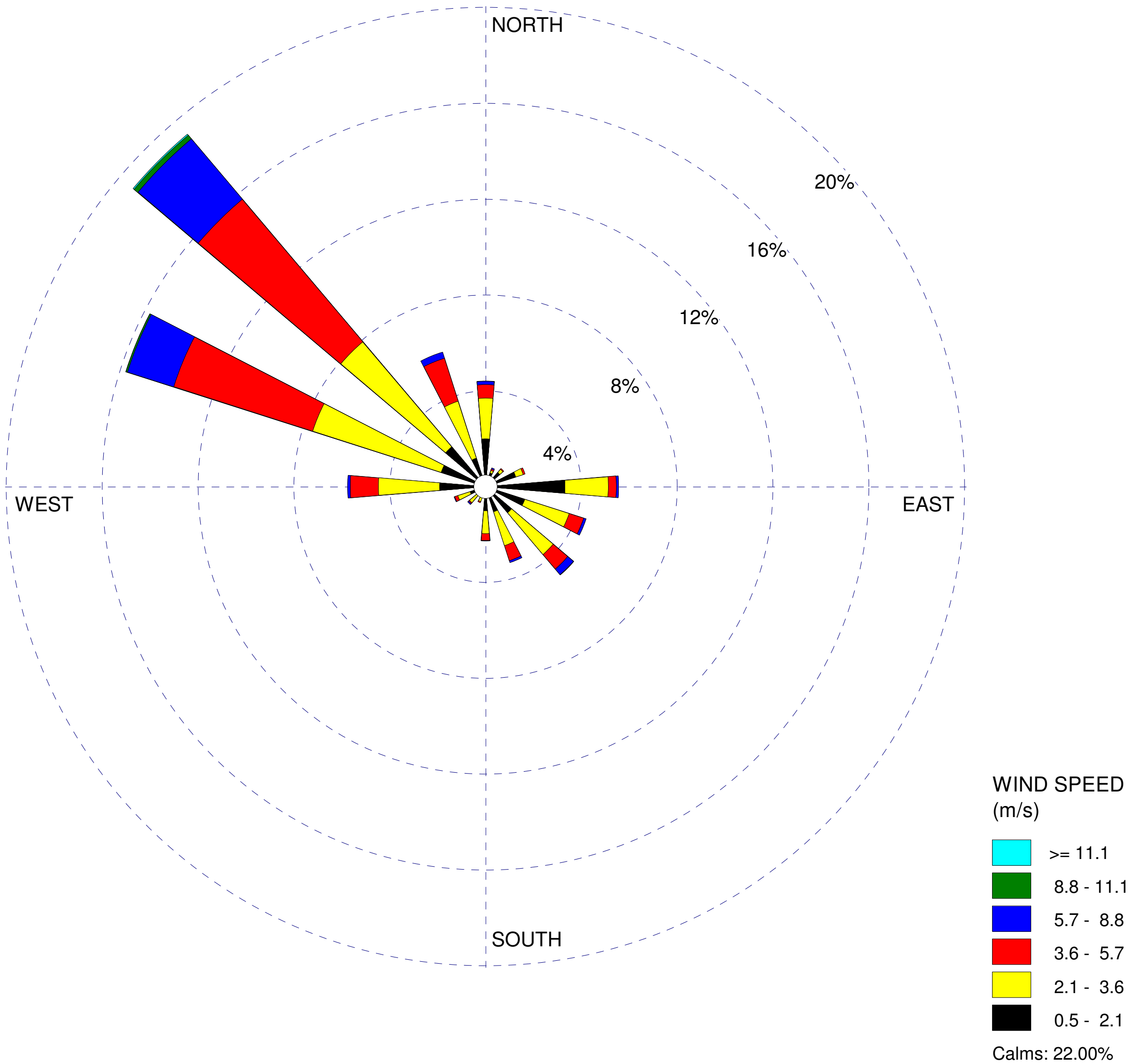
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2002 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the Northwest.

DATA PERIOD:

2002
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

22.00%

TOTAL COUNT:

7965 hrs.

AVG. WIND SPEED:

2.73 m/s

DATE:

1/8/2009

PROJECT NO.:

0742-816

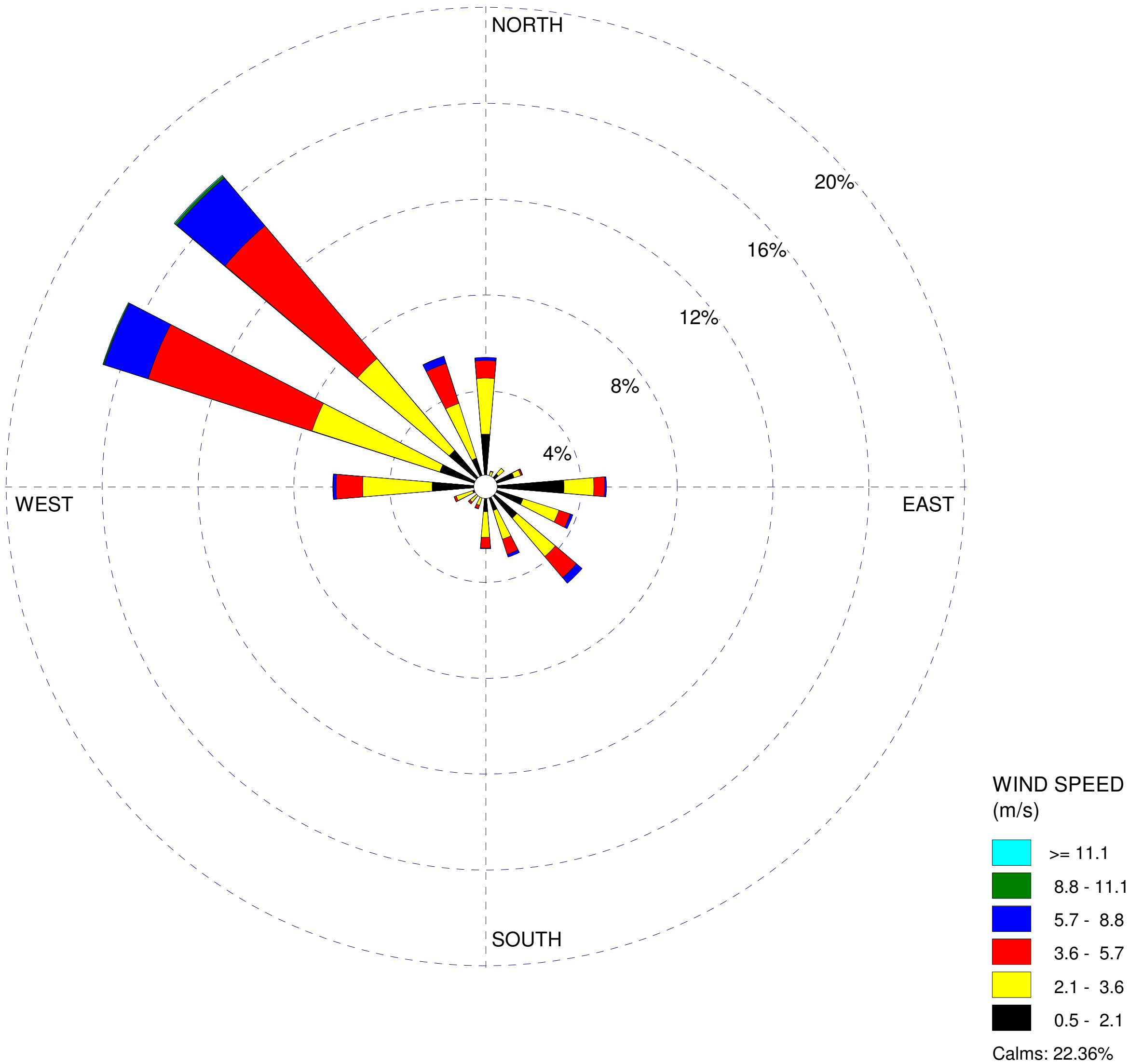
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2003 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2003** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	
	CALM WINDS: **22.36%**	TOTAL COUNT: **7933 hrs.**	
	AVG. WIND SPEED: **2.70 m/s**	DATE: **1/8/2009**	PROJECT NO.: **0742-816**

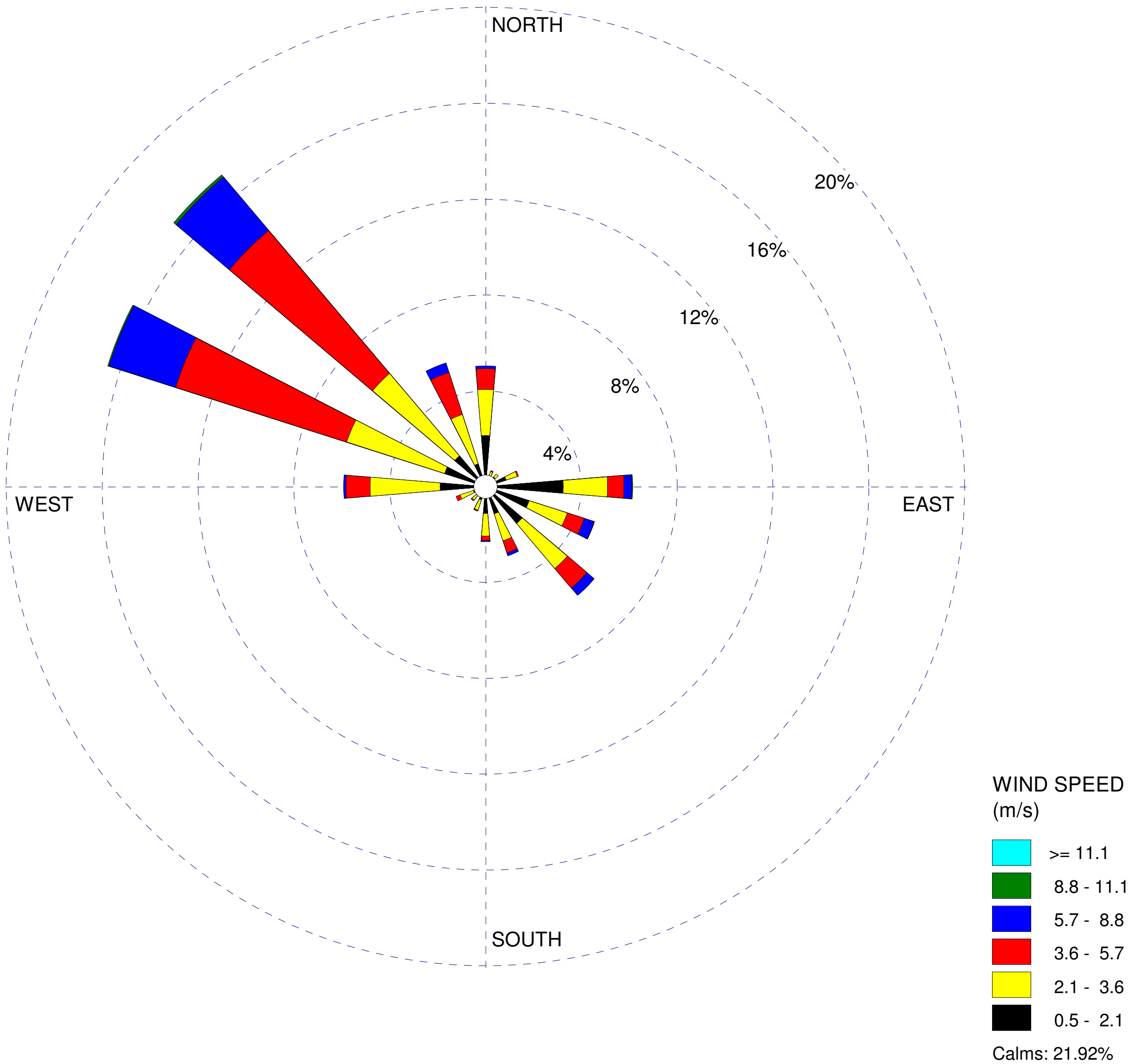
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2004 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2004** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**
		MODELER: **Wenck Associates, Inc.**
	CALM WINDS: **21.92%**	TOTAL COUNT: **7961 hrs.**
	AVG. WIND SPEED: **2.83 m/s**	DATE: **1/8/2009**
		PROJECT NO.: **0742-816**

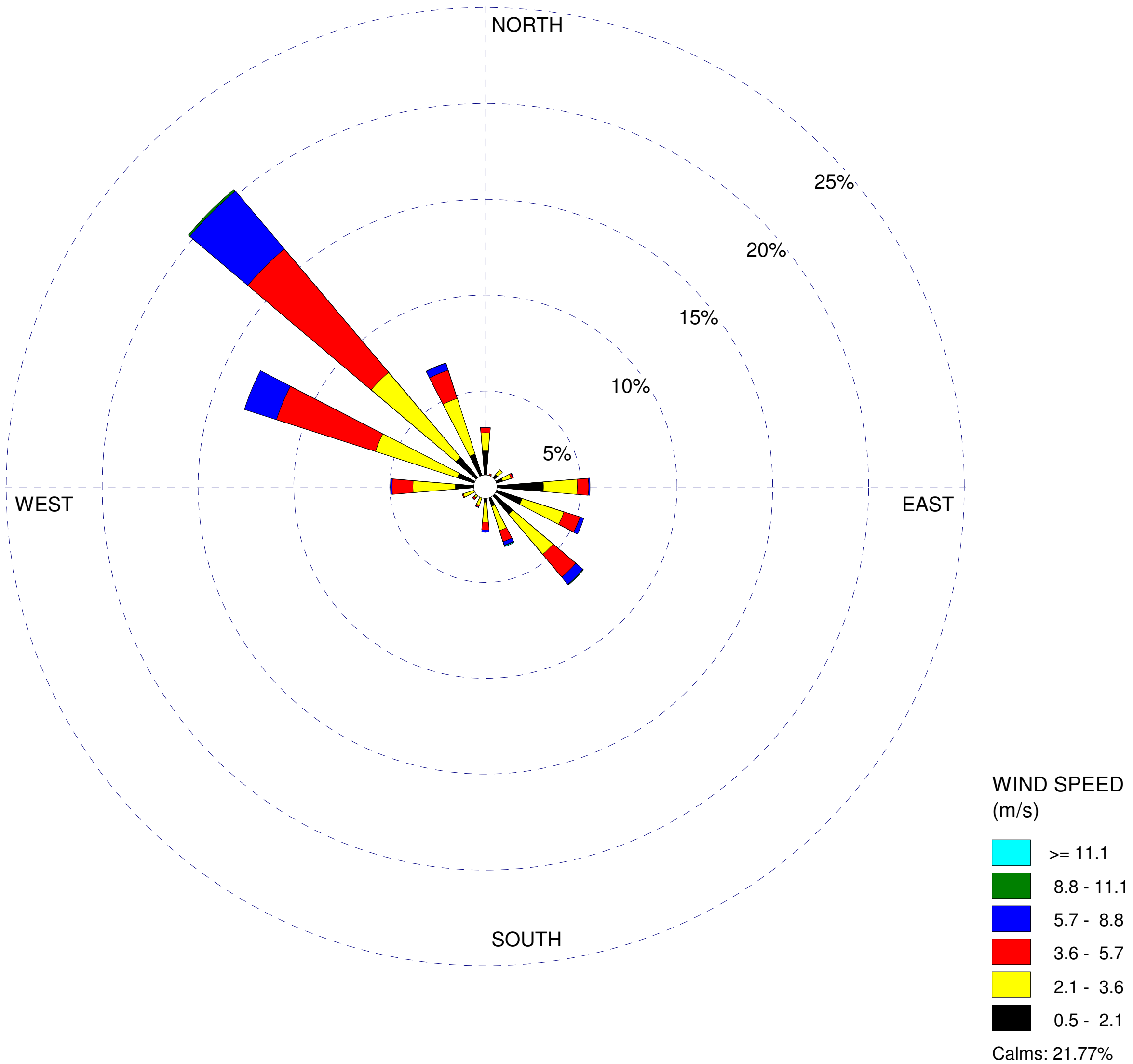
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2005 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Winds were predominately from the Northwest.	**2005** **Jan 1 - Dec 31** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	
	CALM WINDS: **21.77%**	TOTAL COUNT: **8104 hrs.**	
	AVG. WIND SPEED: **2.78 m/s**	DATE: **1/8/2009**	PROJECT NO.: **0742-816**

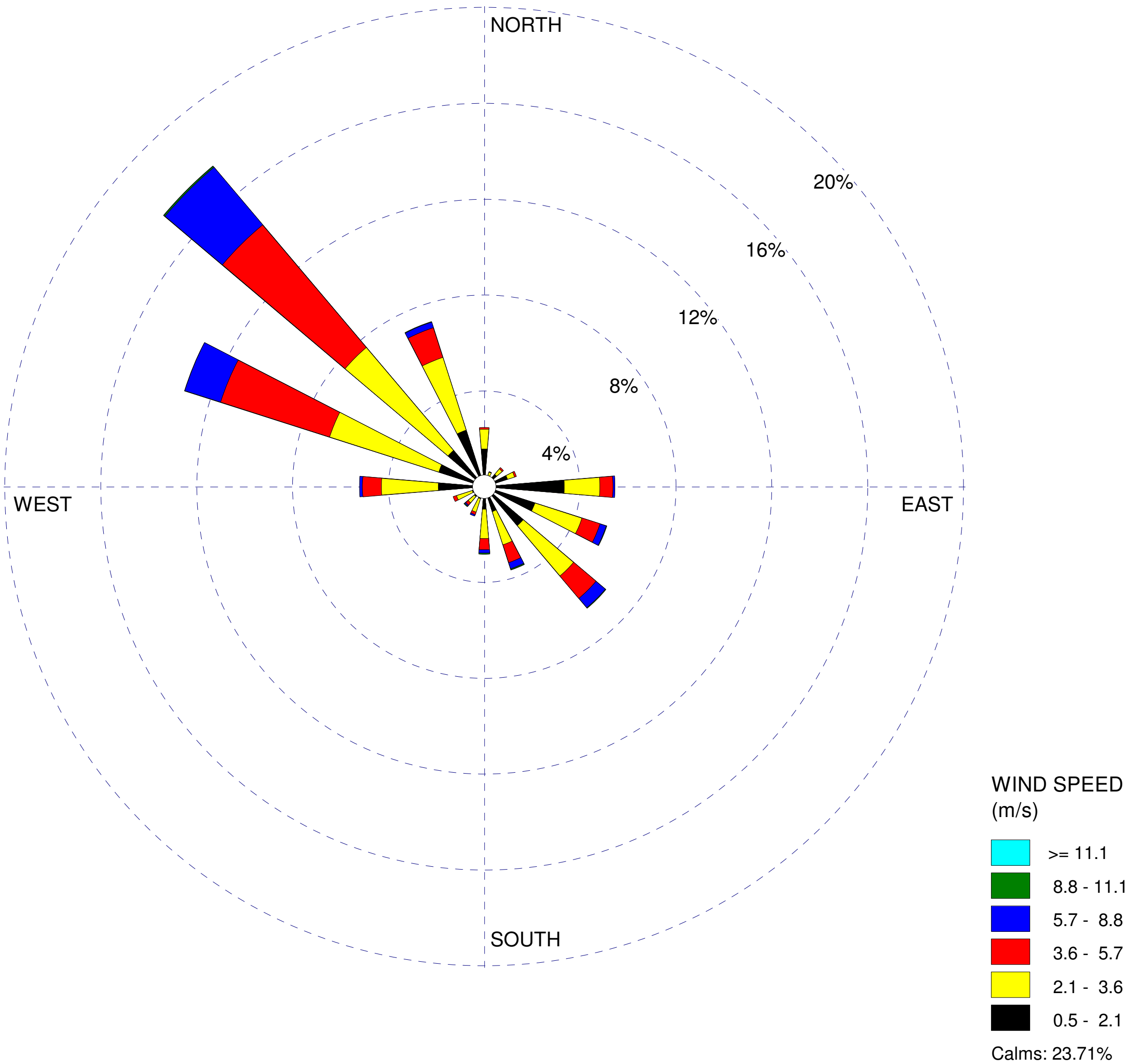
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2006 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the Northwest.

DATA PERIOD:

2006
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

23.71%

TOTAL COUNT:

8118 hrs.

AVG. WIND SPEED:

2.61 m/s

DATE:

1/8/2009

PROJECT NO.:

0742-816

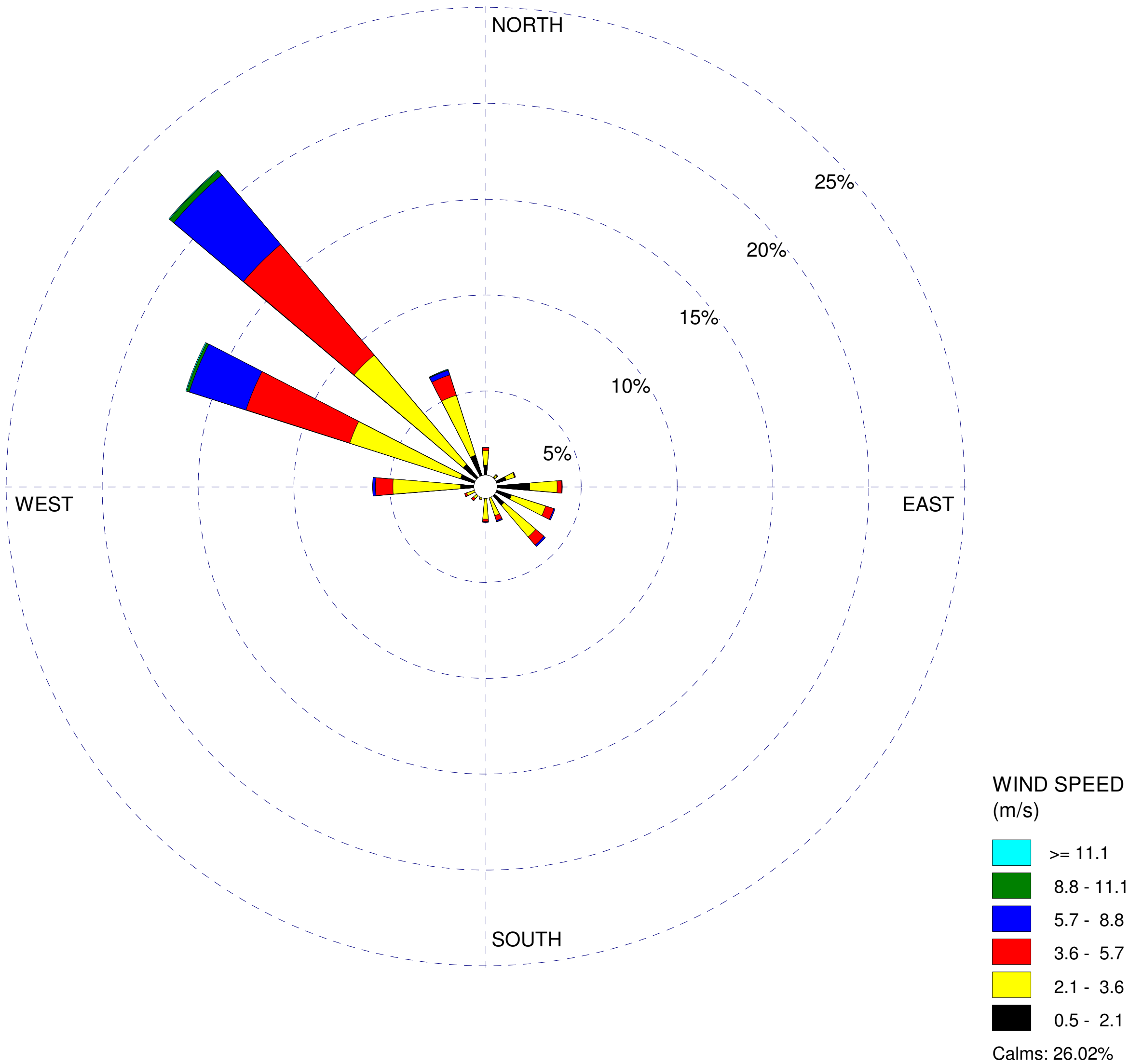
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2007 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



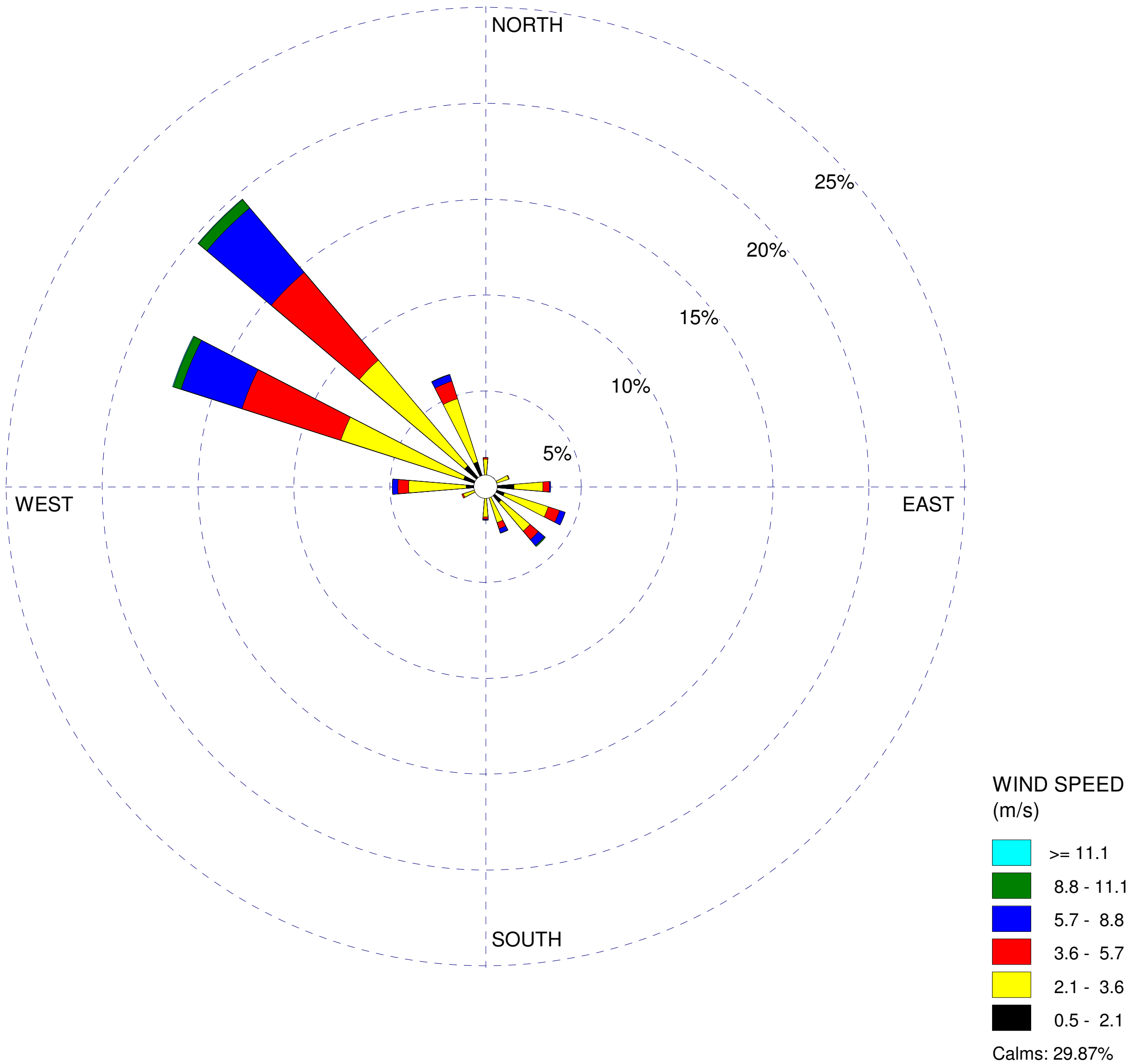
COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2007** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **26.02%**	TOTAL COUNT: **8294 hrs.**	
	AVG. WIND SPEED: **2.59 m/s**	DATE: **1/8/2009**	PROJECT NO.: **0742-816**

WIND ROSE PLOT:

2008 Meteorological Data
Fresno, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the Northwest.

DATA PERIOD:

2008
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

29.87%

TOTAL COUNT:

8376 hrs.

AVG. WIND SPEED:

2.47 m/s

DATE:

1/9/2009

PROJECT NO.:

0742-816

WRPLOT View - Lakes Environmental Software

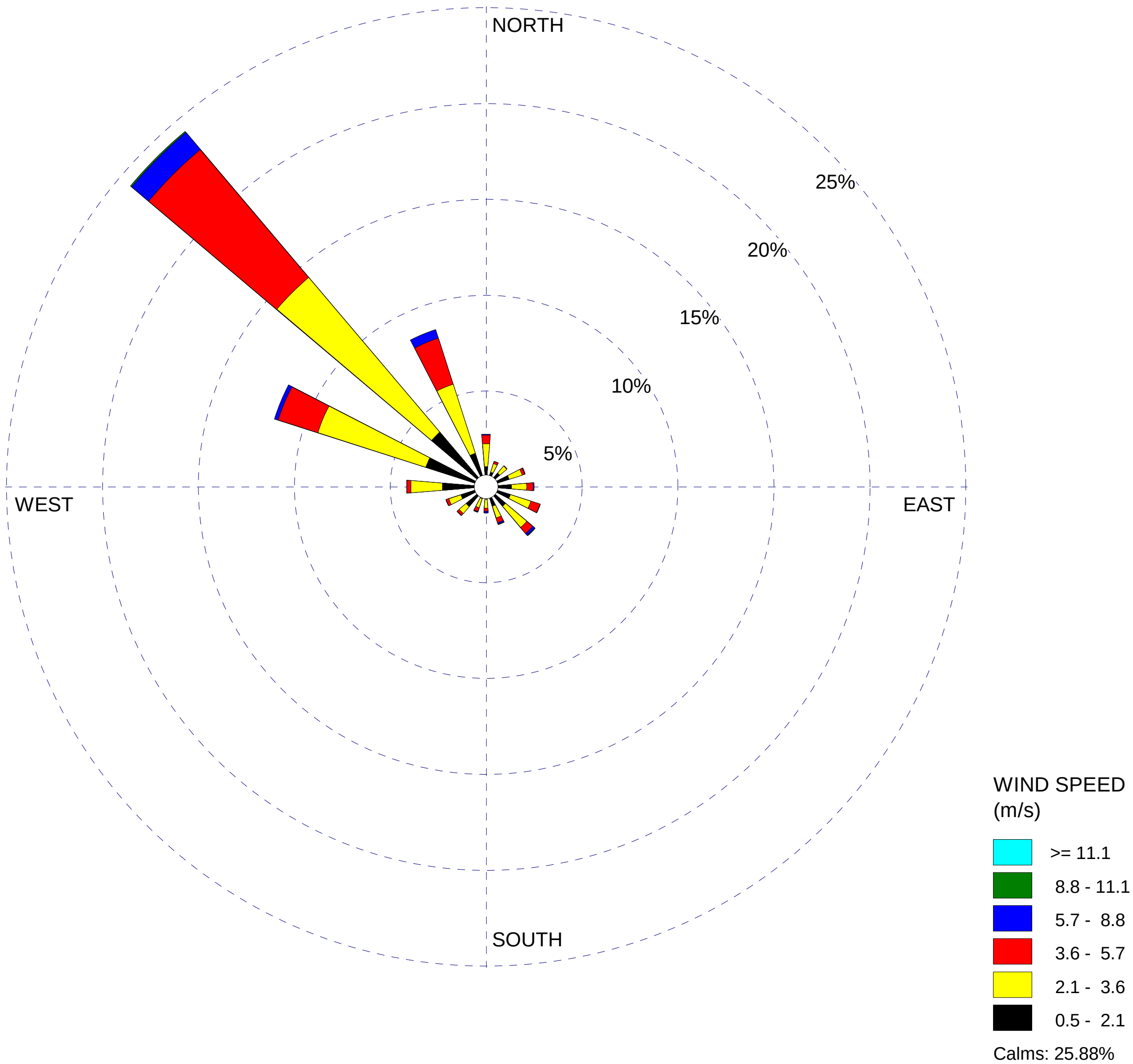
2000 – 2004 Hanford Wind Rose Plots

WIND ROSE PLOT:

2000 Meteorological Data
Hanford, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Winds were predominately from the Northwest.	**2000** **Jan 1 - Dec 31** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **25.88%**	TOTAL COUNT: **8005 hrs.**	
	AVG. WIND SPEED: **2.31 m/s**	DATE: **5/1/2009**	PROJECT NO.: **0742-816**

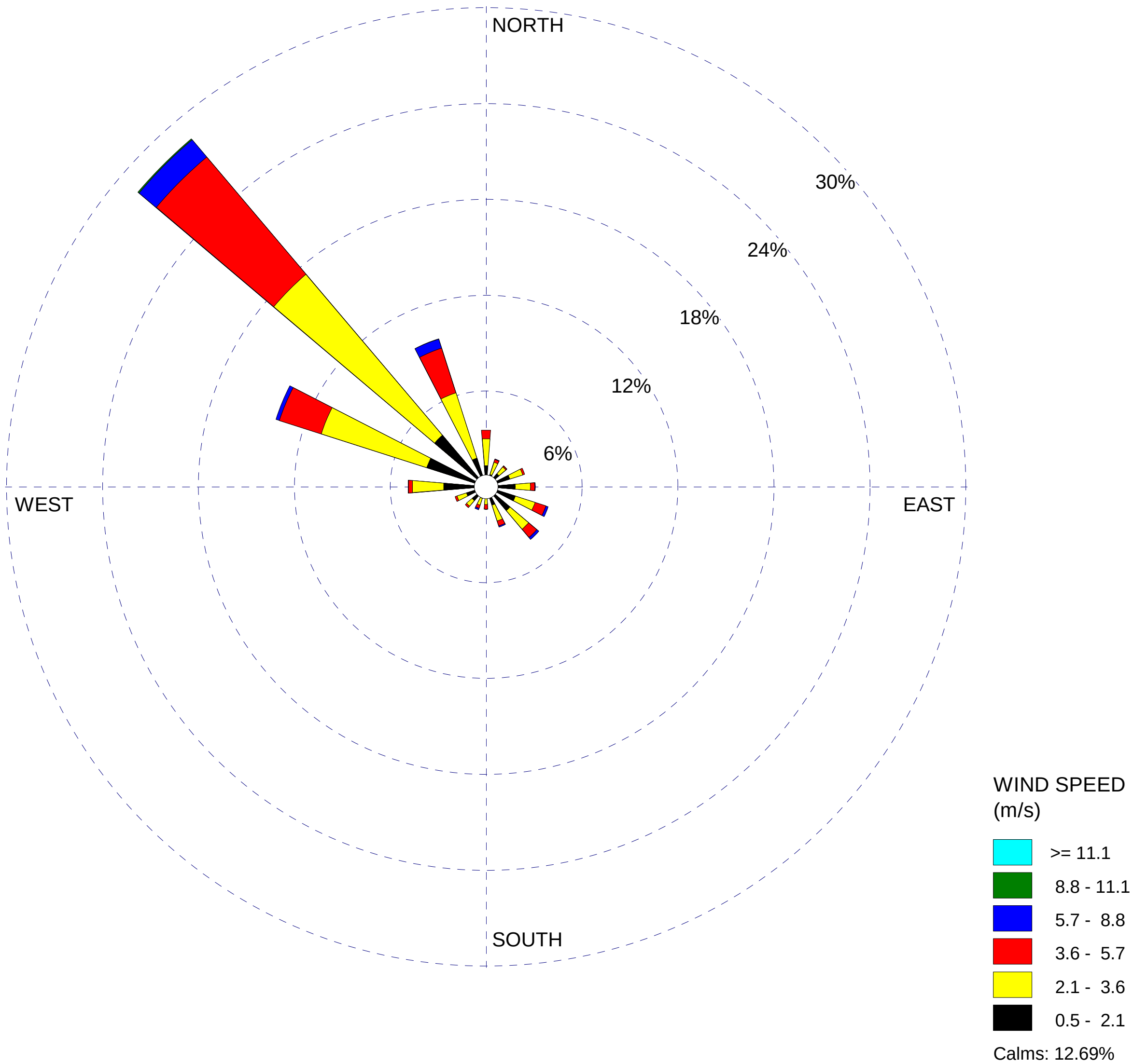
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2001 Meteorological Data
Hanford, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the Northwest.

DATA PERIOD:

2001
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

Wenck

CALM WINDS:

12.69%

TOTAL COUNT:

6542 hrs.

AVG. WIND SPEED:

2.72 m/s

DATE:

5/1/2009

PROJECT NO.:

0742-816

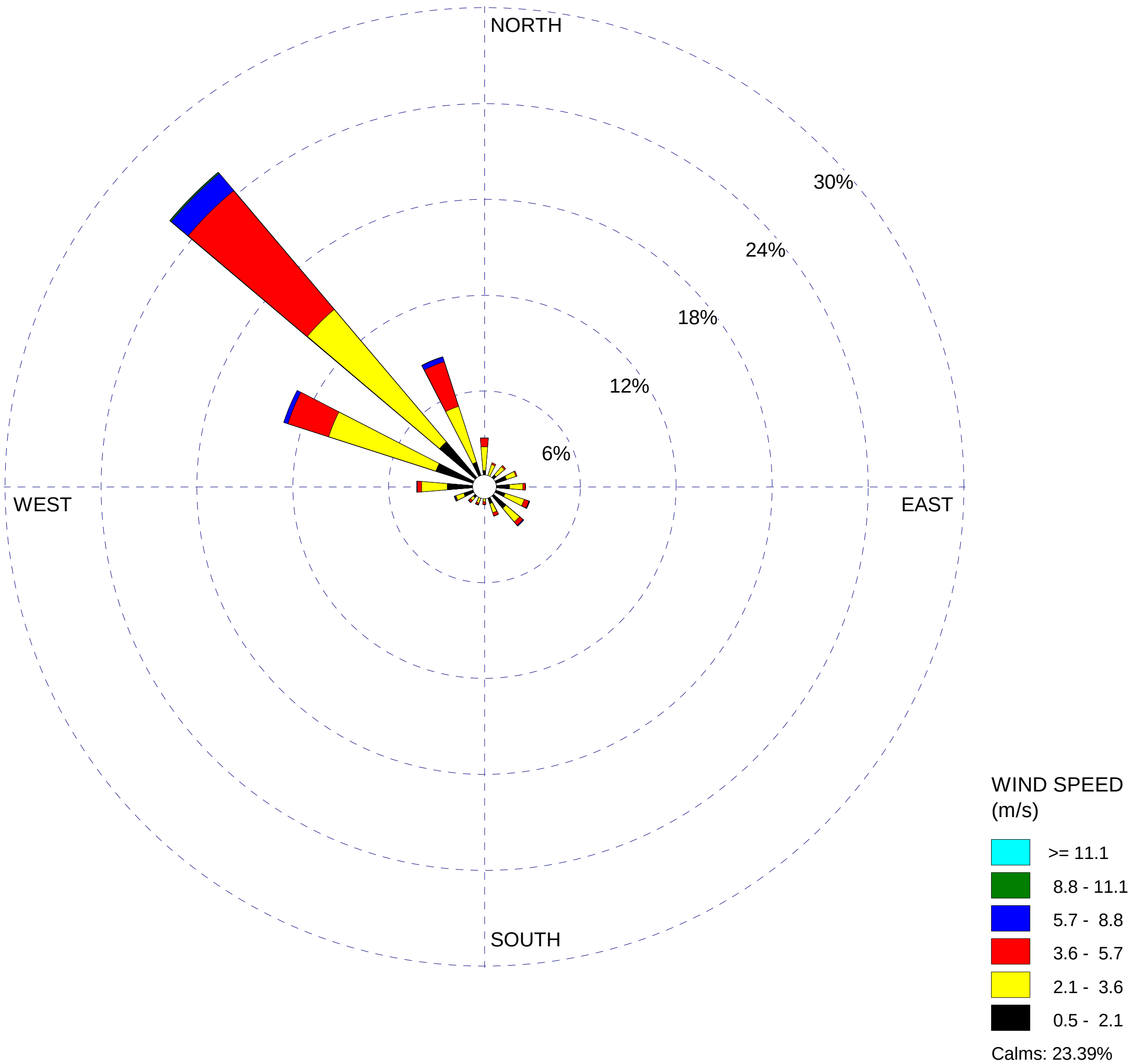
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2002 Meteorological Data
Hanford, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Winds were predominately from the Northwest.	**2002** **Jan 1 - Dec 31** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **23.39%**	TOTAL COUNT: **7705 hrs.**	
	AVG. WIND SPEED: **2.40 m/s**	DATE: **5/1/2009**	PROJECT NO.: **0742-816**

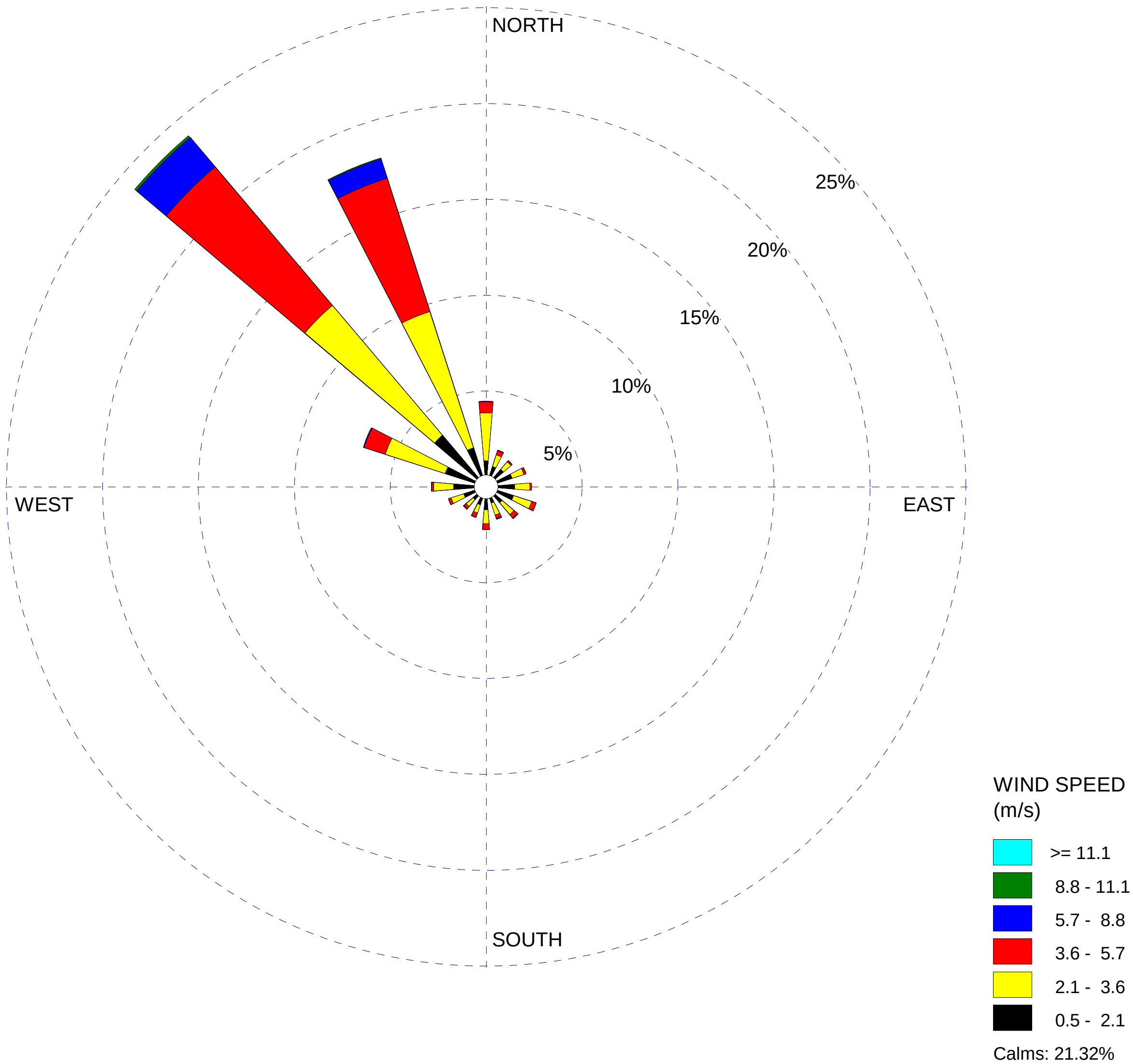
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2003 Meteorological Data
Hanford, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were predominately from the Northwest.	DATA PERIOD: **2003** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	
	CALM WINDS: **21.32%**	TOTAL COUNT: **7510 hrs.**	
	AVG. WIND SPEED: **2.57 m/s**	DATE: **5/1/2009**	PROJECT NO.: **0742-816**

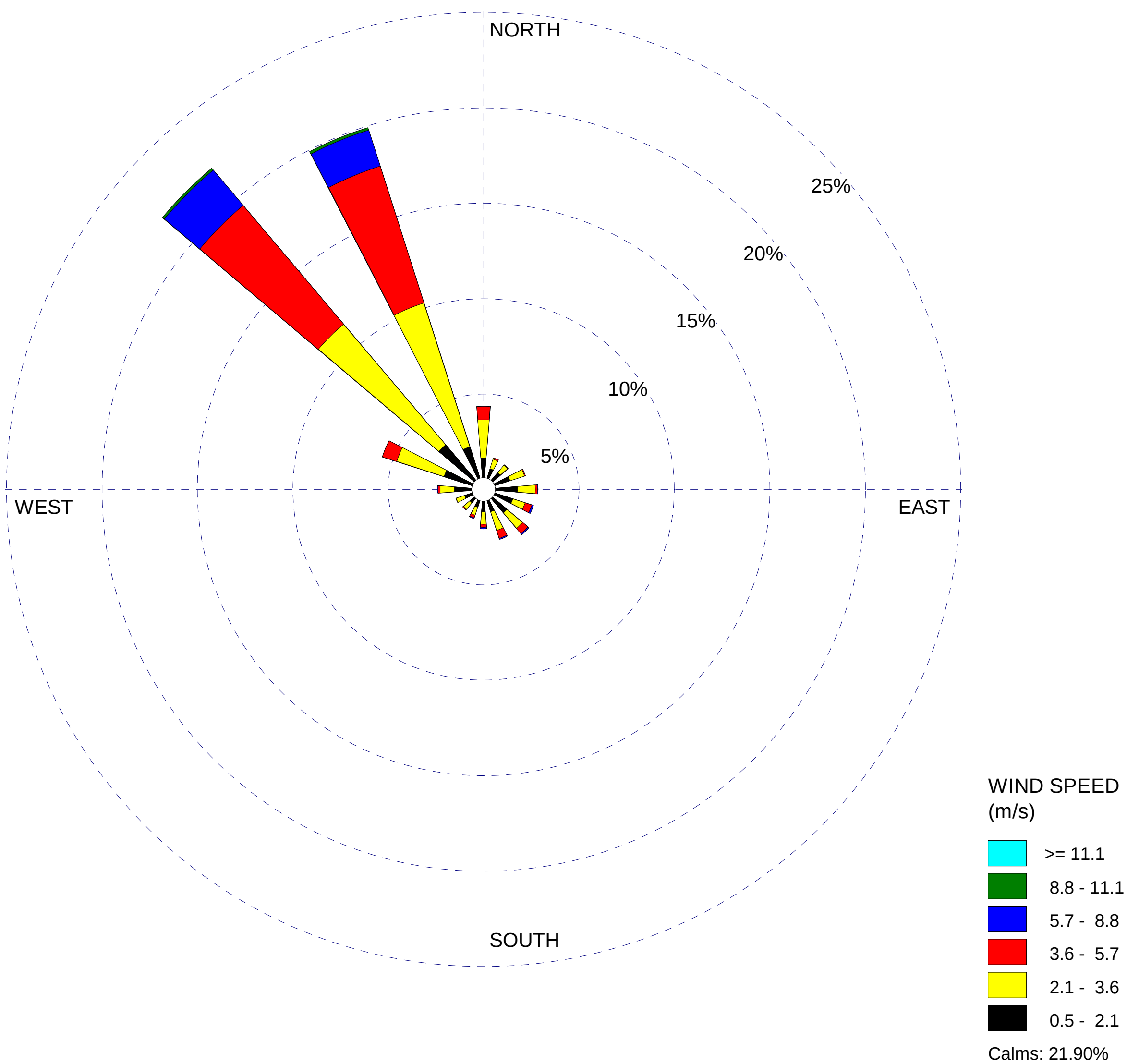
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2004 Meteorological Data
Hanford, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the Northwest.

DATA PERIOD:

2004
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

Wenck

CALM WINDS:

21.90%

TOTAL COUNT:

8090 hrs.

AVG. WIND SPEED:

2.58 m/s

DATE:

5/1/2009

PROJECT NO.:

0742-816

WRPLOT View - Lakes Environmental Software

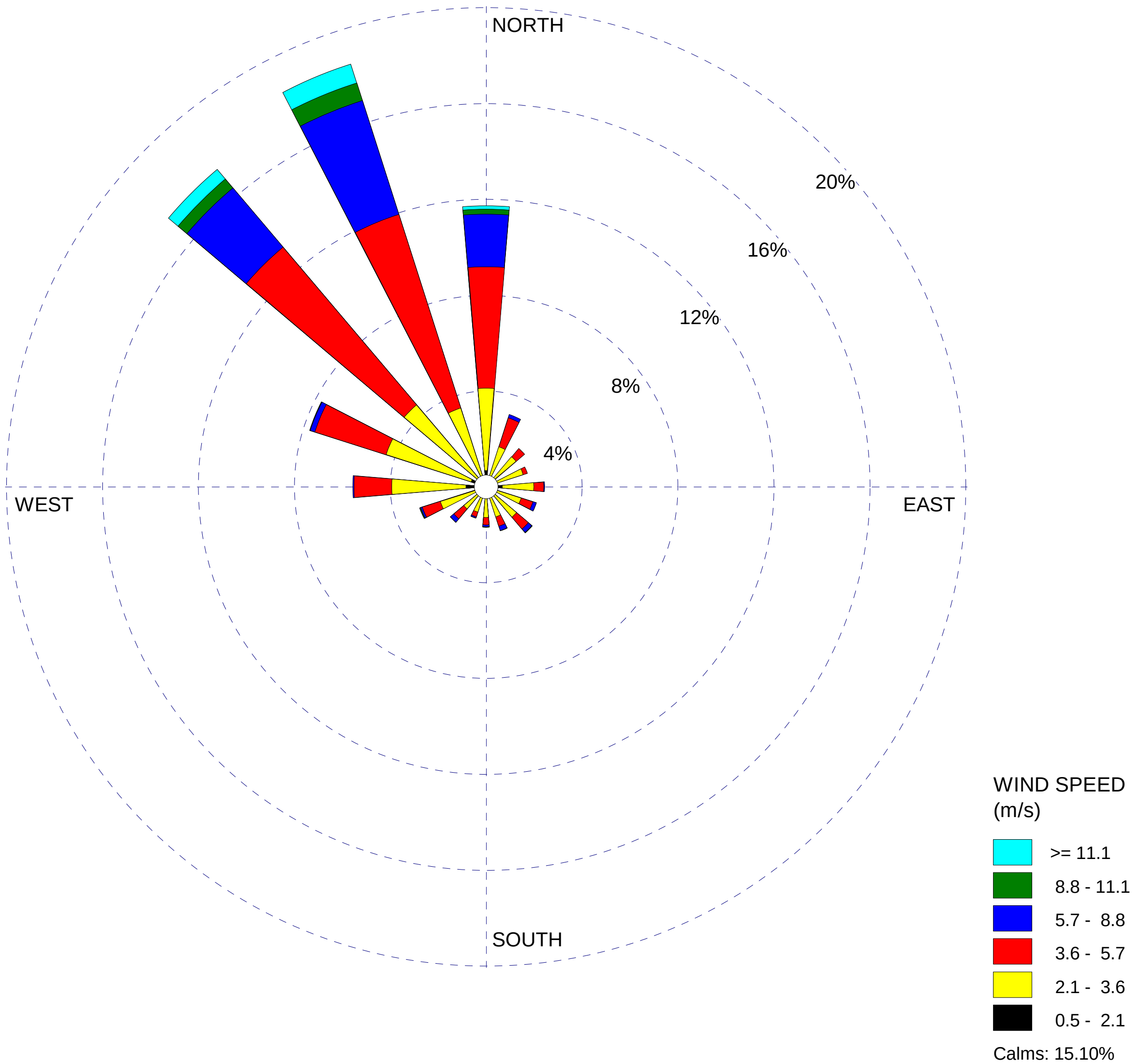
2007 – 2008 Lemoore Wind Rose Plots

WIND ROSE PLOT:

2007 Meteorological Data
Lemoore AFB, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the North-Northwest.

DATA PERIOD:

2007
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

15.10%

TOTAL COUNT:

8717 hrs.

AVG. WIND SPEED:

3.81 m/s

DATE:

5/1/2009

PROJECT NO.:

0742-816

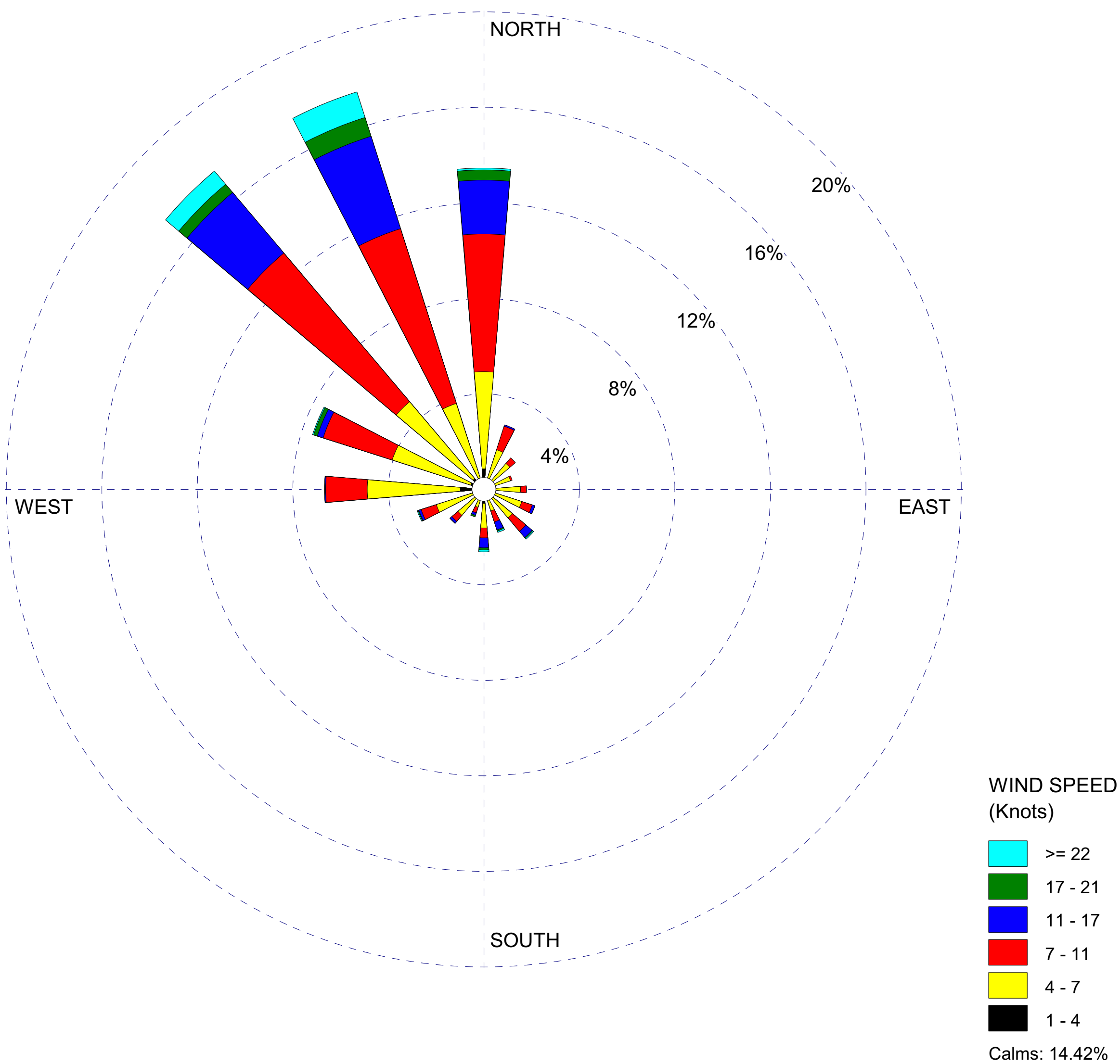
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

2008 Meteorological Data
Lemoore AFB, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were predominately from the North-Northwest.

DATA PERIOD:

2008
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

Wenck

CALM WINDS:

14.42%

TOTAL COUNT:

8716 hrs.

AVG. WIND SPEED:

7.61 Knots

DATE:

5/6/2009

PROJECT NO.:

0742-816

WRPLOT View - Lakes Environmental Software

Appendix C

Modeling Input and Output Files

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README file for:

Chemical Waste Management, Inc.
Kettleman Hills Facility (KHF)
Dispersion Modeling Report Associated with the PCB Congener Study

Wenck File #0742-816
Contacts:       Bill Brown, Wenck Associates, Inc., (678) 987-5841
                Haley Hudson, Wenck Associates, Inc., (678) 987-5842
                Kathryn Anderson, Wenck Associates, Inc., (651) 294-4593

The enclosed CD-ROM contains three (3) folders each containing several
files as described below.  The folders are the following:

AERMAP
AERMET
AERMOD

See report for discussion and interpretation of AERMOD results.


AERMAP Folder (contains 2 files)

        KHFrec.ROU              AERMAP receptor file
        Receptor Locations.txt  XYZ terrain data file


AERMET Folder (contains 2 files)


        HANF.SFC        AERMET meteorological data files combined for 2000 - 2004
        HANF.PFL        (2 files, 1 surface, 1 upper air)
                        Surface Station: Hanford, CA 53119
                        Upper Air Station: Oakland, CA 23230

AERMOD Folder (contains 3 subfolders)

        Particle subfolder (contains 4 files)

        KHFpd**.ami     Particle Phase input file for
                        2000 - 2004 (1 file)

        KHFpd**.aml     Particle Phase output file for
                        2000 - 2004 (1 file)

        KHFpdm.plt      Particle Phase month plot file (1 file)

        KHFpdan.plt     Particle Phase annual plot file (1 file)


        Particle Bound subfolder (contains 4 files)

        KHFpbd**.ami    Particle Bound Phase input file for
                        2000 - 2004 (1 file)

        KHFpbd**.aml    Particle Bound Phase output file for
                        2000 - 2004 (1 file)

        KHFpbdm.plt     Particle Bound Phase month plot file (1 file)

        KHFpbdan.plt    Particle Bound Phase annual plot file (1 file)
```

Vapor subfolder (contains 4 files)

KHFvd**.ami	Vapor Phase input file for 2000 - 2004 (1 file)
KHFvd**.aml	Vapor Phase output file for 2000 - 2004 (1 file)
KHFvdm.plt	Vapor Phase month plot file (1 file)
KHFvdan.plt	Vapor Phase annual plot file (1 file)

DRAFT

DRAFT

USEPA Region 9 Review of Air Monitoring Practices for the:

Chemical Waste Management, Inc. (CWM)
Kettleman Hills Facility
Congener Study

Conducted March 30, 2009

By: Mathew C. Plate, USEPA
Region 9 Quality Assurance Office

USEPA observed Steve Holshouser, CWM, remove the sampling media from the three PCB congener sampling locations, observed Mr. Holshouser prepare samples for shipment to the laboratory, and reviewed calibration and sampling documentation related to these samples on March 30, 2009. Based on these field observations, the air sampling network for PCB congeners is being operated appropriately and according to the QAPP. Comments and recommendations for improving the quality of the monitoring data are presented below.

Comments

1. [Documentation] Field visits to the air monitoring sites are being recorded using a checklist and electronic forms to record flow data and calibration information. Generally, field data is recorded to "scratch" paper and transposed into the electronic forms and there is no field logbook dedicated to the air sampling effort (nor is a personal logbook used by the technician). It is recommended that handwritten documentation in a dedicated field notebook be implemented and include instrument readings and other site visit and sample preparation information. This practice improves the completeness of the sampling program documentation and transcription can be checked and errors corrected by referring to handwritten records.

2. [Potential Background Contamination / Blank Controls] There is the potential for the field samples to be exposed to levels of PCB congeners that are not controlled for by the blank samples. The blank media used in the sampling program is treated like a trip blank, it travels with the field sample but is not exposed to all the conditions field samples are exposed to. Specifically, the field samples are exposed to the sampling equipment, decontamination solvent, and the sampling processing environments (the sample control room is a former electronics shop) to a much greater extent than the blank samples. These are all potential sources of background contamination which are not controlled. Therefore, it is recommended that either the sample data be evaluated for potential blank contamination (elevated levels from all sample locations) and/or other blank controls be implemented.

3. [Insects on the Filters] Insects were observed on several of the filters. The field technician has not been removing insects prior to shipping samples to the laboratory. In general, when ambient air is sampled for particulates, insects are removed from filters in the field or by the laboratory. If insects are found on filters, it is recommended that these either be removed or noted in the sample documentation.

4. [Number of Filters in a Blank] The field technician has been including one filter in the trip blank sample. Because the field samples consist of four filters, it is recommend that the trip blank also included four filters.

5. [Chart Recorders] The high volume samplers used do not include chart recorders or data loggers that record operation of the sampler over each one week sampling period. While this is not required, EPA generally recommends collecting such data to avoid data inaccuracies that may occur due to motor failures and flow fluctuations and otherwise would not be documented.

TO-9A PUF Field Data Summary (Jan 2009 - Dec 2009)

Upwind Monitoring Station (UMS-1)

Setup Date	Start Timer	Stop Timer	Elapsed Time	Set Point Flow	Average Flow	End Flow	% Diff	Volume	Start Pressure	Start Temperature	End Pressure	End Temperature	Slope	Intercept
5-Jan-09	1458.22	1586.70	128.48	0.225	0.223	0.221	1.9%	1717.91	756.92	282.00	770.89	285.40	30.2836	-0.3396
11-Jan-09	1586.70	1714.90	128.20	0.225	0.216	0.208	7.9%	1664.59	770.89	285.40	767.08	288.70	31.2351	-0.5393
17-Jan-09	1714.95	1841.23	126.28	0.225	0.215	0.205	9.4%	1628.45	767.08	288.70	763.27	288.70	31.2772	-0.6028
23-Jan-09	1841.50	1964.95	123.45	0.225	0.226	0.227	-1.0%	1675.28	763.27	288.70	769.62	277.44	31.7130	-0.6139
31-Jan-09	1965.11	2051.20	86.09	0.225	0.221	0.216	3.9%	1140.09	767.08	280.77	762.00	286.88	30.4491	-0.3825
6-Feb-09	2051.26	2171.25	119.99	0.225	0.223	0.222	1.6%	1607.28	762.00	286.88	741.68	281.88	32.1098	-0.7692
12-Feb-09	2171.25	2291.32	120.07	0.225	0.224	0.222	1.3%	1610.70	741.68	281.88	741.68	289.66	30.7470	-0.4540
18-Feb-09	2291.32	2411.45	120.13	0.225	0.225	0.225	-0.1%	1622.60	741.68	289.66	740.41	284.66	30.0431	-0.2219
6-Mar-09	2421.08	2541.09	120.01	0.225	0.224	0.223	1.0%	1612.33	739.65	290.22	740.41	289.11	30.9387	-0.3999
12-Mar-09	2541.12	2661.13	120.01	0.225	0.224	0.223	0.8%	1613.82	740.41	289.11	744.73	289.66	30.9387	-0.3999
18-Mar-09	2661.14	2781.18	120.04	0.225	0.226	0.227	-1.0%	1628.46	744.73	289.66	741.93	281.33	30.9387	-0.3999
24-Mar-09	2781.21	2901.24	120.03	0.225	0.225	0.226	-0.4%	1623.27	741.93	281.33	736.60	283.00	30.9387	-0.3999
3-Apr-09	2909.56	3029.62	120.06	0.225	0.223	0.220	2.2%	1602.83	733.55	286.88	735.08	293.20	30.7316	-0.3356
9-Apr-09	3029.68	3136.47	106.79	0.225	0.226	0.228	-1.3%	1451.21	735.08	293.20	737.36	285.90	30.7316	-0.3356
15-Apr-09	3136.48	3256.59	120.11	0.225	0.210	0.194	14.6%	1511.12	737.36	285.90	734.31	308.00	30.7316	-0.3356
21-Apr-09	3256.61	3376.63	120.02	0.225	0.229	0.233	-3.4%	1647.92	734.31	308.00	732.80	290.77	30.7316	-0.3356
1-May-09	3376.81	3494.60	117.79	0.225	0.226	0.227	-0.7%	1595.92	735.84	290.22	738.12	299.11	28.6398	0.1810
7-May-09	3494.63	3614.68	120.05	0.225	0.225	0.225	0.0%	1620.52	738.12	299.11	734.31	294.66	28.6398	0.1810
13-May-09	3614.68	3734.83	120.15	0.225	0.215	0.205	9.1%	1551.13	734.31	294.66	732.03	304.66	28.6398	0.1810
19-May-09	3734.83	3854.87	120.04	0.225	0.224	0.223	0.7%	1614.56	732.03	304.66	732.03	301.88	28.6398	0.1810
6-Jun-09	3898.88	4018.89	120.01	0.225	0.231	0.237	-5.3%	1664.17	732.79	292.44	734.31	300.77	30.3453	-0.1434
11-Jun-09	4018.90	4139.07	120.17	0.225	0.224	0.224	0.6%	1617.47	734.31	300.77	734.31	293.55	30.3453	-0.1434
17-Jun-09	4139.08	4259.09	120.01	0.225	0.219	0.214	5.2%	1578.96	734.31	293.55	730.76	299.66	30.3453	-0.1434
23-Jun-09	4259.11	4375.72	116.61	0.225	0.216	0.207	8.3%	1511.75	730.76	299.66	731.52	304.11	30.3453	-0.1434
3-Jul-09	4375.92	4496.02	120.10	0.225	0.227	0.228	-1.5%	1633.43	735.08	309.66	735.84	299.66	31.2055	-0.3276
9-Jul-09	4496.04	4616.05	120.01	0.225	0.219	0.213	5.5%	1576.92	735.84	299.66	737.36	304.11	31.2055	-0.3276
15-Jul-09	4616.06	4736.06	120.00	0.225	0.214	0.203	10.3%	1540.55	737.62	304.11	732.79	313.15	31.2055	-0.3276
21-Jul-09	4736.20	4856.25	120.05	0.225	0.218	0.212	6.2%	1572.06	737.87	313.15	735.08	300.37	31.2055	-0.3276
7-Aug-09	4863.52	4983.55	120.03	0.225	0.212	0.199	12.3%	1526.51	738.89	298.00	735.08	304.11	31.7207	-0.4688
13-Aug-09	4983.57	5103.63	120.06	0.225	0.217	0.208	7.7%	1560.63	735.08	304.11	731.50	296.88	31.7207	-0.4688
19-Aug-09	5103.63	5223.73	120.10	0.225	0.213	0.200	11.5%	1533.06	731.50	296.88	738.12	300.22	31.7207	-0.4688
25-Aug-09	5223.78	5343.78	120.00	0.225	0.216	0.207	8.2%	1556.37	738.12	300.22	735.08	301.33	31.7207	-0.4688
4-Sep-09	5343.90	5463.95	120.05	0.225	0.224	0.224	0.6%	1615.97	734.31	306.48	738.12	305.22	30.5249	-0.2238
10-Sep-09	5463.96	5576.15	112.19	0.225	0.221	0.217	3.8%	1486.22	738.12	305.22	735.84	304.11	30.5249	-0.2238
16-Sep-09	5576.18	5696.18	120.00	0.225	0.221	0.217	3.5%	1591.88	735.84	304.11	739.65	307.44	30.5249	-0.2238
22-Sep-09	5696.18	5816.18	120.00	0.225	0.218	0.211	6.5%	1569.18	739.65	307.44	730.76	296.88	30.5249	-0.2238
2-Oct-09	5816.24	5936.24	120.00	0.225	0.219	0.214	5.0%	1580.14	736.60	300.77	738.12	299.11	29.7577	0.0089
8-Oct-09	5936.24	6055.60	119.36	0.225	0.224	0.224	0.6%	1606.46	738.12	299.11	737.36	293.00	29.7577	0.0089
14-Oct-09	6055.60	6175.61	120.01	0.225	0.226	0.228	-1.1%	1629.23	737.36	293.00	738.12	289.66	29.7577	0.0089
20-Oct-09	6175.61	6295.62	120.01	0.225	0.220	0.215	4.8%	1582.37	738.12	289.66	736.60	296.88	29.7577	0.0089
6-Nov-09	6295.69	6403.37	107.68	0.225	0.227	0.229	-1.7%	1466.30	739.65	290.22	733.55	284.66	31.8258	-0.5420
12-Nov-09	6403.38	6499.33	95.95	0.225	0.225	0.225	0.1%	1294.71	733.55	284.66	738.12	284.66	31.8258	-0.5420
18-Nov-09	6499.43	6499.70	0.27	0.225	0.227	0.229	-1.9%	3.68	738.12	284.66	741.68	292.44	33.0082	-0.8036
24-Nov-09	6499.96	6604.59	104.63	0.225	0.226	0.228	-1.2%	1421.33	741.68	292.44	744.22	284.66	33.0082	-0.8036
4-Dec-09	0.17	120.24	120.07	0.225	0.228	0.231	-2.5%	1641.61	744.98	283.00	735.84	279.66	31.1707	-0.3032
10-Dec-09	120.24	240.25	120.01	0.225	0.226	0.227	-0.8%	1626.51	735.84	279.66	741.93	279.66	31.1707	-0.3032
16-Dec-09	240.28	360.28	120.00	0.225	0.224	0.223	0.7%	1614.27	741.93	279.66	735.84	279.66	31.1707	-0.3032
22-Dec-09	360.29	480.33	120.04	0.225	0.220	0.215	4.4%	1586.04	735.84	279.66	737.36	281.33	31.1707	-0.3032

TO-9A PUF Field Data Summary (Jan 2009 - Dec 2009)

Downwind Monitoring Station (DMS-1)

Setup Date	Start Timer	Stop Timer	Elapsed Time	Set Point Flow	Average Flow	End Flow	% Diff	Volume	Start Pressure	Start Temperature	End Pressure	End Temperature	Slope	Intercept
5-Jan-09	23.00	140.49	117.49	0.225	0.223	0.220	2.0%	1570.24	760.73	284.80	770.89	297.60	30.8299	-0.5041
11-Jan-09	140.49	239.68	99.19	0.225	0.220	0.216	4.2%	1311.53	770.89	297.60	767.08	294.30	31.7922	-0.6683
17-Jan-09	239.68	357.75	118.07	0.225	0.202	0.179	22.5%	1432.75	767.08	295.40	763.27	285.40	31.2772	-0.5973
23-Jan-09	357.80	477.10	119.30	0.225	0.226	0.228	-1.1%	1619.86	763.27	285.40	769.62	281.88	32.0851	-0.6774
31-Jan-09	477.16	597.14	119.98	0.225	0.223	0.221	1.7%	1605.90	767.08	286.33	762.00	288.00	31.9406	-0.6220
6-Feb-09	597.20	717.18	119.98	0.225	0.225	0.224	0.4%	1616.69	762.00	288.00	741.68	282.44	31.7130	-0.6113
12-Feb-09	717.22	837.25	120.03	0.225	0.223	0.221	1.8%	1605.83	741.68	282.44	745.49	291.33	32.4103	-0.8259
18-Feb-09	837.32	957.41	120.09	0.225	0.225	0.225	0.1%	1620.53	745.49	291.33	741.93	284.66	33.1762	-0.9459
6-Mar-09	968.20	1088.24	120.04	0.225	0.225	0.224	0.3%	1618.31	735.84	286.88	736.60	288.55	31.3516	-0.4741
12-Mar-09	1088.24	1208.25	120.01	0.225	0.224	0.223	0.9%	1613.06	736.60	288.55	741.17	294.11	31.3516	-0.4741
18-Mar-09	1208.29	1328.35	120.06	0.225	0.225	0.225	0.1%	1619.80	741.17	294.11	741.93	286.33	31.3516	-0.4741
24-Mar-09	1328.38	1448.43	120.05	0.225	0.222	0.218	3.1%	1596.28	741.93	286.33	737.36	285.22	31.3516	-0.4741
3-Apr-09	1448.50	1568.52	120.02	0.225	0.222	0.218	3.1%	1595.40	736.60	289.11	741.17	295.40	30.7033	-0.1920
9-Apr-09	1568.54	1675.33	106.79	0.225	0.226	0.226	-0.6%	1445.95	741.17	295.40	742.70	287.00	30.7033	-0.1920
15-Apr-09	1675.35	1752.09	76.74	0.225	0.213	0.202	10.8%	982.73	742.70	287.00	738.89	305.22	30.7033	-0.1920
21-Apr-09	0.15	120.19	120.04	0.225	0.231	0.236	-4.9%	1661.52	735.08	309.11	738.12	290.22	28.3166	0.2252
1-May-09	120.34	237.99	117.65	0.225	0.229	0.233	-3.7%	1618.02	735.84	299.11	738.12	295.77	30.8282	-0.3427
7-May-09	238.02	358.02	120.00	0.225	0.223	0.221	1.8%	1605.66	738.12	295.77	735.08	289.11	30.8282	-0.3427
13-May-09	358.06	478.07	120.01	0.225	0.214	0.202	10.6%	1538.72	735.08	289.11	732.79	305.77	30.8282	-0.3427
19-May-09	478.08	561.97	83.89	0.225	0.226	0.227	-0.8%	1137.13	732.79	305.77	732.03	298.55	30.8282	-0.3427
6-Jun-09	682.10	802.36	120.26	0.225	0.223	0.221	1.8%	1609.37	732.79	291.88	735.08	301.33	32.3055	-0.5814
11-Jun-09	802.36	922.63	120.27	0.225	0.223	0.220	2.1%	1606.58	735.08	301.33	732.03	295.77	32.3055	-0.5814
17-Jun-09	922.64	1042.85	120.21	0.225	0.220	0.214	4.8%	1584.70	732.03	295.77	730.00	298.55	32.3055	-0.5814
23-Jun-09	1042.87	1162.97	120.10	0.225	0.218	0.210	6.8%	1568.17	730.00	298.55	732.28	305.22	32.3055	-0.5814
3-Jul-09	1163.06	1283.13	120.07	0.225	0.223	0.220	2.1%	1603.80	733.55	312.59	735.84	302.44	31.6873	-0.3543
9-Jul-09	1283.17	1403.18	120.01	0.225	0.215	0.205	9.4%	1547.63	735.84	302.44	739.65	308.00	31.6873	-0.3543
15-Jul-09	1403.19	1523.22	120.03	0.225	0.213	0.200	11.5%	1532.17	739.65	308.00	734.06	315.93	31.6873	-0.3543
21-Jul-09	1523.35	1643.38	120.03	0.225	0.223	0.220	2.1%	1603.94	734.06	315.37	738.90	303.15	31.6873	-0.3543
7-Aug-09	1643.55	1763.65	120.10	0.225	0.216	0.206	8.7%	1553.87	736.60	300.77	735.08	303.55	32.6432	-0.7265
13-Aug-09	1763.69	1883.69	120.00	0.225	0.214	0.203	10.3%	1540.62	735.08	303.55	735.84	298.55	32.6432	-0.7265
19-Aug-09	1883.70	2003.70	120.00	0.225	0.217	0.209	7.4%	1561.93	735.84	298.55	736.60	303.55	32.6432	-0.7265
25-Aug-09	2003.71	2123.73	120.02	0.225	0.213	0.202	10.8%	1537.34	736.60	303.55	737.36	302.44	32.6432	-0.7265
4-Sep-09	2123.78	2255.79	132.01	0.225	0.217	0.210	6.9%	1722.40	738.89	306.48	741.17	306.88	31.9880	-0.4837
10-Sep-09	2255.80	2367.93	112.13	0.225	0.220	0.216	4.1%	1483.33	741.17	306.88	735.84	304.11	31.9880	-0.4837
16-Sep-09	2367.93	2475.98	108.05	0.225	0.219	0.212	5.8%	1417.68	735.84	304.11	740.41	306.33	31.9880	-0.4837
22-Sep-09	2475.99	2596.00	120.01	0.225	0.213	0.200	11.7%	1530.27	740.41	306.33	730.76	303.00	31.9880	-0.4837
2-Oct-09	2596.08	2717.36	121.28	0.225	0.219	0.213	5.5%	1593.10	737.36	301.88	741.17	299.11	30.5626	-0.1939
8-Oct-09	2717.37	2839.92	122.55	0.225	0.221	0.217	3.5%	1625.97	741.17	299.11	735.08	291.33	30.5626	-0.1939
14-Oct-09	2839.98	2971.84	131.86	0.225	0.223	0.221	1.7%	1764.74	735.08	291.33	737.36	288.55	30.5626	-0.1939
20-Oct-09	2971.84	3091.87	120.03	0.225	0.221	0.217	3.8%	1589.93	737.36	288.55	741.17	295.77	30.5626	-0.1939
6-Nov-09	3091.96	3199.74	107.78	0.225	0.224	0.223	1.1%	1446.97	742.70	288.00	738.89	285.22	32.4033	-0.6395
12-Nov-09	3199.75	3319.78	120.03	0.225	0.225	0.225	0.1%	1619.38	738.89	285.22	741.93	283.55	32.4033	-0.6395
18-Nov-09	3319.79	3439.78	119.99	0.225	0.223	0.221	1.8%	1605.32	741.93	283.55	740.41	290.22	32.4033	-0.6395
24-Nov-09	3439.88	3535.89	96.01	0.225	0.226	0.227	-0.8%	1301.31	740.41	290.22	744.22	285.22	32.4033	-0.6395
4-Dec-09	3536.05	3656.06	120.01	0.225	0.226	0.228	-1.2%	1629.84	741.17	283.00	742.70	278.55	32.3214	-0.6546
10-Dec-09	3656.07	3776.09	120.02	0.225	0.225	0.225	-0.1%	1620.93	742.70	278.55	746.51	280.22	32.3214	-0.6546
16-Dec-09	3776.10	3896.10	120.00	0.225	0.224	0.223	1.0%	1612.06	746.51	280.22	735.08	279.11	32.3214	-0.6546
22-Dec-09	3896.11	4016.16	120.05	0.225	0.219	0.214	5.1%	1580.37	735.08	279.11	740.41	281.88	32.3214	-0.6546

TO-9A PUF Field Data Summary (Jan 2009 - Dec 2009)

Met Station Pad (MSP)

Setup Date	Start Timer	Stop Timer	Elapsed Time	Set Point Flow	Average Flow	End Flow	% Diff	Volume	Start Pressure	Start Temperature	End Pressure	End Temperature	Slope	Intercept
5-Jan-09	1196.17	1318.15	121.98	0.225	0.224	0.223	1.0%	1638.54	756.92	282.00	774.70	287.60	32.5553	-0.9586
11-Jan-09	1318.15	1386.10	67.95	0.225	0.218	0.211	6.3%	889.48	774.70	287.60	767.08	294.80	31.9364	-0.8166
17-Jan-09	1386.10	1503.98	117.88	0.225	0.207	0.190	17.0%	1466.72	767.08	294.80	763.27	285.40	32.4801	-0.9415
23-Jan-09	1504.05	1609.45	105.40	0.225	0.224	0.223	0.7%	1418.08	763.27	285.40	773.43	280.22	33.4281	-1.0575
31-Jan-09	1609.57	1729.54	119.97	0.225	0.222	0.218	3.1%	1594.78	746.76	280.77	762.00	288.00	31.5502	-0.6857
6-Feb-09	1729.63	1849.62	119.99	0.225	0.226	0.226	-0.5%	1624.29	762.00	286.88	741.68	283.00	32.3216	-0.8211
12-Feb-09	1849.65	1969.67	120.02	0.225	0.224	0.222	1.2%	1610.55	741.68	283.00	745.49	289.66	31.2772	-0.5995
18-Feb-09	1969.74	2089.75	120.01	0.225	0.225	0.225	0.1%	1618.93	745.49	289.66	743.46	284.11	33.1331	-0.9975
6-Mar-09	2100.02	2220.09	120.07	0.225	0.224	0.223	0.7%	1614.99	739.65	286.33	741.17	289.11	32.1260	-0.7947
12-Mar-09	605.04	725.11	120.07	0.225	0.225	0.225	0.1%	1620.42	739.65	286.33	742.44	287.44	30.5631	-0.3502
18-Mar-09	725.19	824.45	99.26	0.225	0.223	0.222	1.5%	1330.27	742.44	287.44	742.44	290.22	30.7510	-0.3277
24-Mar-09	824.50	944.56	120.06	0.225	0.229	0.232	-3.2%	1646.92	742.44	290.22	742.70	280.22	31.7130	-0.6032
3-Apr-09	954.03	1074.03	120.00	0.225	0.223	0.220	2.2%	1602.73	736.60	289.66	739.65	294.80	30.9163	-0.3799
9-Apr-09	1074.13	1180.92	106.79	0.225	0.227	0.229	-1.7%	1453.82	739.65	294.80	741.17	285.40	30.9163	-0.3799
15-Apr-09	1180.94	1301.05	120.11	0.225	0.217	0.208	7.8%	1560.53	741.17	285.40	739.65	300.77	30.9163	-0.3799
21-Apr-09	1301.10	1421.12	120.02	0.225	0.228	0.231	-2.6%	1641.55	739.65	300.77	735.08	290.22	30.9163	-0.3799
1-May-09	1421.26	1538.92	117.66	0.225	0.225	0.225	0.1%	1587.38	735.84	298.55	737.36	293.55	28.8334	0.1783
7-May-09	1538.94	1659.06	120.12	0.225	0.220	0.216	4.3%	1587.57	737.36	293.55	735.08	289.11	28.8334	0.1783
13-May-09	1659.08	1779.09	120.01	0.225	0.212	0.200	11.8%	1529.70	735.08	289.11	732.79	305.22	28.8334	0.1783
19-May-09	1779.10	1899.11	120.01	0.225	0.227	0.229	-1.9%	1636.05	732.79	305.22	732.03	298.55	28.8334	0.1783
6-Jun-09	1907.18	2027.23	120.05	0.225	0.229	0.232	-3.2%	1646.77	732.79	290.22	738.12	296.33	30.2909	-0.1170
11-Jun-09	2027.24	2147.34	120.10	0.225	0.224	0.223	1.1%	1612.85	738.12	296.33	732.03	294.11	30.2909	-0.1170
17-Jun-09	2147.35	2267.45	120.10	0.225	0.220	0.215	4.6%	1585.05	732.03	294.11	732.28	298.55	30.2909	-0.1170
23-Jun-09	2267.46	2387.45	119.99	0.225	0.216	0.206	8.6%	1552.89	732.28	298.55	735.08	306.33	30.2909	-0.1170
3-Jul-09	2387.59	2507.71	120.12	0.225	0.215	0.205	9.1%	1551.00	735.08	312.04	738.12	300.77	33.4017	-0.6567
9-Jul-09	2507.73	2627.74	120.01	0.225	0.212	0.199	12.0%	1528.21	738.12	300.77	738.89	305.22	33.4017	-0.6567
15-Jul-09	2627.74	2747.43	119.69	0.225	0.217	0.209	7.5%	1557.60	738.89	305.22	737.87	315.37	33.4017	-0.6567
21-Jul-09	2747.96	2868.03	120.07	0.225	0.220	0.216	4.1%	1588.35	737.87	311.48	735.84	302.04	33.4017	-0.6567
7-Aug-09	2868.33	2988.39	120.06	0.225	0.209	0.193	15.1%	1506.91	737.36	298.55	736.60	304.11	31.0678	-0.4095
13-Aug-09	2988.40	3108.40	120.00	0.225	0.219	0.212	5.8%	1573.98	736.60	304.11	734.31	297.44	31.0678	-0.4095
19-Aug-09	3108.44	3228.44	120.00	0.225	0.216	0.208	8.0%	1557.65	734.31	297.44	741.17	302.44	31.0678	-0.4095
25-Aug-09	3228.44	3348.49	120.05	0.225	0.213	0.202	10.9%	1536.74	741.17	302.44	733.55	301.88	31.0678	-0.4095
4-Sep-09	3348.55	3409.59	61.04	0.225	0.220	0.215	4.6%	805.62	738.12	306.48	740.41	306.33	29.4594	0.0518
10-Sep-09	3409.60	3521.76	112.16	0.225	0.224	0.223	0.9%	1507.19	740.41	306.33	742.70	299.11	29.4594	0.0518
16-Sep-09	3521.78	3641.80	120.02	0.225	0.217	0.210	7.0%	1565.60	742.70	299.11	738.89	305.77	29.4594	0.0518
22-Sep-09	3641.81	3761.81	120.00	0.225	0.213	0.201	11.4%	1532.30	738.89	305.77	734.31	299.66	29.4594	0.0518
2-Oct-09	3761.81	3881.89	120.08	0.225	0.216	0.208	7.9%	1559.64	737.36	301.88	741.17	298.55	30.5626	-0.1939
8-Oct-09	3881.91	4002.12	120.21	0.225	0.224	0.223	1.0%	1614.50	741.17	299.11	739.65	291.88	30.5626	-0.1939
14-Oct-09	4002.13	4122.14	120.01	0.225	0.228	0.231	-2.6%	1641.43	739.65	291.88	740.41	289.66	30.5626	-0.1939
20-Oct-09	4122.15	4242.17	120.02	0.225	0.218	0.211	6.2%	1571.56	740.41	289.66	741.17	295.77	30.5626	-0.1939
6-Nov-09	4242.30	4338.12	95.82	0.225	--	--	--	--	742.70	288.00	738.89	285.22	30.7026	-0.2720
12-Nov-09	4338.19	4454.58	116.39	0.225	0.226	0.227	-1.0%	1578.91	736.60	286.88	739.65	284.66	31.2483	-0.4039
18-Nov-09	0.15	120.15	120.00	0.225	0.223	0.221	1.9%	1605.00	739.65	284.66	744.22	288.55	30.3068	-0.1755
24-Nov-09	120.16	120.28	0.12	0.225	0.225	0.225	0.2%	1.62	744.22	288.55	742.70	284.66	30.3068	-0.1755
4-Dec-09	120.38	240.39	120.01	0.225	0.225	0.225	0.0%	1620.01	745.74	281.88	742.70	278.55	31.3763	-0.3537
10-Dec-09	240.41	360.42	120.01	0.225	0.226	0.227	-0.9%	1627.38	742.70	278.55	744.22	280.22	31.3763	-0.3537
16-Dec-09	360.43	480.44	120.01	0.225	0.224	0.223	0.9%	1613.02	744.22	280.22	735.08	280.77	31.3763	-0.3537
22-Dec-09	480.45	600.51	120.06	0.225	0.221	0.217	3.8%	1590.79	735.08	280.77	743.46	280.77	31.3763	-0.3537

- Error

TO-9A PUF Field Data Summary (Jan 2009 - Dec 2009)

Mobile Station (DUP)

DUP Location	Setup Date	Start Timer	Stop Timer	Elapsed Time	Set Point Flow	Average Flow	End Flow	% Diff	Volume	Start Pressure	Start Temperature	End Pressure	End Temperature	Slope	Intercept
MSP ALT	3-Apr-09	2100.45	2220.46	120.01	0.225	0.215	0.205	9.3%	1548.36	735.84	290.22	740.41	295.40	30.5109	-0.2265
	9-Apr-09	2220.47	2340.42	119.95	0.225	0.219	0.213	5.3%	1577.17	740.41	295.40	740.41	287.00	30.5109	-0.2265
	15-Apr-09	2340.42	2460.52	120.10	0.225	0.210	0.194	14.7%	1510.47	740.41	297.00	739.65	303.55	30.5109	-0.2265
	21-Apr-09	2460.52	2580.56	120.04	0.225	0.225	0.224	0.3%	1618.44	739.65	303.55	737.36	290.22	30.5109	-0.2265
UMS1	1-May-09	2580.90	2698.66	117.76	0.225	0.218	0.211	6.6%	1539.05	735.84	290.22	738.12	299.11	30.3644	-0.2531
	7-May-09	2698.68	2818.72	120.04	0.225	0.216	0.206	8.6%	1553.41	738.12	299.11	734.31	294.66	30.3644	-0.2531
	13-May-09	2818.70	2934.29	115.59	0.225	0.211	0.197	13.0%	1464.93	734.31	294.66	732.03	304.66	30.3644	-0.2531
	19-May-09	2934.30	3054.31	120.01	0.225	0.217	0.209	7.4%	1562.11	732.03	304.66	732.03	301.88	30.3644	-0.2531
DMS1	6-Jun-09	3174.38	3294.61	120.23	0.225	0.221	0.216	3.9%	1592.20	732.79	291.88	735.08	301.33	32.8403	-0.6202
	11-Jun-09	3294.62	3414.78	120.16	0.225	0.216	0.206	8.7%	1554.46	735.08	301.33	732.03	295.77	32.8403	-0.6202
	17-Jun-09	3414.79	3542.55	127.76	0.225	0.214	0.203	10.4%	1639.22	732.03	295.77	730.00	298.55	32.8403	-0.6202
	23-Jun-09	3542.56	3662.66	120.10	0.225	0.218	0.210	6.8%	1568.35	730.00	298.55	732.28	305.22	32.8403	-0.6202
MSP	3-Jul-09	3662.75	3782.86	120.11	0.225	0.222	0.218	3.1%	1596.74	735.08	312.04	738.12	300.77	32.4726	-0.5764
	9-Jul-09	3782.88	3902.86	119.98	0.225	0.220	0.214	4.8%	1581.92	738.12	300.77	738.89	305.22	32.4726	-0.5764
	15-Jul-09	3902.86	4022.96	120.10	0.225	0.213	0.202	10.8%	1538.31	738.89	305.22	737.87	315.37	32.4726	-0.5764
	21-Jul-09	4023.30	4143.38	120.08	0.225	0.222	0.219	2.9%	1597.78	737.87	311.48	735.84	302.04	32.4726	-0.5764
Fresno	7-Aug-09	4143.56	4263.60	120.04	0.225	0.221	0.216	4.1%	1588.13	752.35	303.00	751.59	306.88	31.2483	-0.3988
	13-Aug-09	4263.62	4383.62	120.00	0.225	0.218	0.210	6.8%	1566.98	751.59	306.88	748.03	308.00	31.2483	-0.3988
	19-Aug-09	4383.63	4405.14	21.51	0.225	0.220	0.216	4.3%	284.29	748.03	308.00	752.35	308.55	31.2483	-0.3988
	25-Aug-09	4405.16	4405.90	0.74	0.225	0.221	0.216	3.9%	9.80	752.35	308.55	749.30	304.88	31.2483	-0.3988
Hanford	4-Sep-09	4406.05	4495.88	89.83	0.225	0.218	0.210	6.7%	1173.27	751.59	308.15	754.63	306.88	31.0457	-0.3207
	10-Sep-09	4495.90	4615.13	119.23	0.225	0.224	0.224	0.5%	1605.75	754.63	306.88	755.40	289.65	31.0457	-0.3207
	16-Sep-09	4615.15	4735.15	120.00	0.225	0.212	0.200	11.9%	1528.78	755.40	289.65	753.87	308.00	31.0457	-0.3207
	22-Sep-09	4735.17	4855.20	120.03	0.225	0.213	0.202	10.8%	1537.35	753.87	308.00	748.03	290.12	31.0457	-0.3207
Coalinga	2-Oct-09	4855.54	4975.66	120.12	0.225	0.218	0.210	6.8%	1568.39	736.60	296.88	737.36	294.66	30.7026	-0.2685
	8-Oct-09	4975.70	4975.70	0.00	0.225	0.226	0.226	-0.5%	0.00	737.36	294.66	733.55	290.77	30.7026	-0.2685
	14-Oct-09	4975.70	5095.91	120.21	0.225	0.228	0.232	-2.9%	1647.07	733.55	290.77	739.65	284.66	30.7026	-0.2685
	20-Oct-09	5095.92	5216.04	120.12	0.225	0.220	0.216	4.2%	1588.03	739.65	284.66	745.49	289.66	30.7026	-0.2685

- Error

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER CALIBRATION LOG

Date of Calibration	Elapsed Time Meter Reading	Technician's Initials
9/25/06 DMS2 805	18.85	[illegible]
10/1/06 UMS1 794	0.85	[illegible]
10/1/06 DMS1 806	3.5	[illegible]
10/1/06 mobile 803	0.97	[illegible]
10/20/06 mobile 803	24.53	[illegible]
11/15/06 mobile 803	48.90	[illegible]
12/12/06 mobile 803	73.28	[illegible]
1/29/07 mobile 803	120.87	[illegible]
2/22/07 mobile 803	144.77	[illegible]
3/9/07 ~~W~~UMS1 794	338.61	[illegible]
3/9/07 DMS2 805	369.29	[illegible]
3/15/07 DMS1 806	372.78	[illegible]
3/15/07 mobile 803	169.07	[illegible]
4/10/07 mobile 803	193.87	[illegible]
6/29/07 mobile 803	265.73	[illegible]
6/29/07 UMS1 794	558.63	[illegible]
6/29/07 DMS1 806	607.56	[illegible]
6/29/07 DMS2 805	586.48	[illegible]
7/16/07 mobile 803	266.34	[illegible]
8/9/07 mobile 803	290.54	[illegible]
9/26/07 mobile 803	~~314.67~~ [illegible] 338.59	[illegible]
9/26/07 UMS1 794	912.45	[illegible]
9/26/07 DMS1 806	809.95	[illegible]
9/26/07 DMS2 805	763.65	[illegible]
10/18/07 UMS1 794	963.9	[illegible]
10/18/07 DMS2 805	~~857.6~~ [illegible] 10/22/07 811.29	[illegible]
10/18/07 DMS1 806	853.6	[illegible]
10/18/07 mobile 803	362.54	[illegible]
03/12/08 mobile 803		SA
03/12/08 UMS1 794		SA
03/12/08 DMS1 806		SA
03/12/08 DMS2 805		SA
~~03/12/08~~		

NOTE: 1) **Calibrator must be re-certified and sent to Tisch Environmental each year. Replace the certification worksheet (Form 3).**

2) **Each unit must be calibrated on a quarterly schedule and after any maintenance, movement, or failed calibration check.**

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER CALIBRATION LOG

Date of Calibration	Elapsed Time Meter Reading	Technician's Initials
04/28/08	UMS1 CAL — 1409.67	SEA
↓	MOBILE CAL - 580.62	↓
	DMS1 CAL - 1215.39	
	DMS2 CAL - 1172.91	
10/29/08	UMS1 CAL - 1432.90	SEA
↓	DMS1 - 1215.63	↓
	DMS2 - 1171.32	
	MOBILE - 580.80	
01/05/09	UMS1 - 794 - 1458.22	SEA
↓	DMS1 - 806 - 23.0	↓
	MET - 803 - 1196.17	
01/11/09	MET ~~MOBILE~~ SEA - 803 - 1318.15	SEA
↓	UMS1 - 794 - 1586.7	↓
	DMS1 - 806 - 140.49	
01/17/09	UMS1 - 794 - 1714.95	SEA
↓	DMS1 - 806 - 239.68	↓
	MET ~~MOBILE~~ SEA - 803 - 1386.1	
01/23/09	UMS1 - 794 - 1841.5	SEA
↓	DMS1 - 806 - 357.8	↓
	MET - 803 - 1504.05	
01/30/09	UMS1 794 - 1965.00	SEA
↓	DMS1 806 - 477.1	↓
	MET 803 - 1609.46	
02/06/09	UMS1 794 - 2051.20	SEA
↓	DMS1 806 - 597.20	↓
	MET 803 - 1729.60	
02/12/09	UMS1 794 - 2171.25	SEA
↓	DMS1 806 - 717.22	↓
	MET 803 - 1849.65	
02/18/09	UMS1 794 - 2291.32	SEA
↓	DMS1 806 - 837.25	↓
	MET 803 - 1969.67	

SEA

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER CALIBRATION LOG

Date of Calibration	Elapsed Time Meter Reading	Technician's Initials
03/06/09	UMSI-794 - 2421.08	SH
03/06/09	DMSI-806 - 868.2	SH
03/06/09	MET -803 - 2100.02	SH
03/12/09	MET-803 - 605.04	SH
~~03/18/09~~ SH 03/24/08	MET-803 - 824.50	SH
04/03/09	UMSI 794 - ~~2809.62~~ SH 2909.56	SH
04/03/09	DMSI 806 - ~~1568.52~~ 1485	SH
04/03/09	~~MOBILE~~ SH MET 805 - ~~1077.03~~ 954.03 SH	SH
04/03/09	MOBILE MPS ALT 803 ~~2220.46~~ 2100.45 SH	SH
04/21/09	DMSI - 806 - 3256.61	SH
05/01/09	UMSI -794 -3376.81	SH
05/01/09	DMSI -806 - 120.34	SH
05/01/09	MSP-805 - 1421.26	SH
05/01/09	UMSI DUP (MOBILE) -803 - 2580.9	SH
06/05/09	UMSI 794 3898.88	SH
06/05/09	DMSI 806 682.1	SH
06/05/09	MSP 805 1907.18	SH
06/05/09	MOBILE (DMSI DUP) 803 3174.38	SH
07/02/09	UMSI-794 — 4375.92	SH
07/02/09	DMSI-806 — 1163.06	SH
07/02/09	MSP-805 — 2387.59	SH
07/02/09	~~DMSI~~ SH MOBILE (MSP DUP) 803 - 3162.75	SH

NOTE: 1) Calibrator must be re-certified and sent to Tisch Environmental each year. Replace the certification worksheet (Form 3).

2) Each unit must be calibrated on a quarterly schedule and after any maintenance, movement, or failed calibration check.

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER PREVENTATIVE MAINTENANCE LOG

Date of Maintenance	Elapsed Time Meter Reading	Description of Maintenance Performed	Technician's Initials
3/8/07 UMS1		Replaced Motor brushes	F
3/8/07 DMS1		Replaced Motor brushes	F
3/8/07 DMS2		Replaced Motor brushes	F
3/8/07 mobile		Replaced Motor brushes	F
5/23/07	Timer did not work properly. seems to run longer than programmed. Will replace timer mechanism DMS1		F
~~6/~~ 5/23/07		Replaced 7 day timer with an Identical item. Ran a mock event on 6/1/07 with satisfactory results DMS1	F
9/26/07	~~Performed~~ F Cleaned spider webs and dirt from all units. UMS1, DMS1, DMS2, mobile		F
10/15/07	Maintenance department replaced all motors ~~that~~ at UMS1, DMS1, DMS2, Trailer (UMS1 963.9) (DMS1 853.6), (DMS2 811.29) (trailer 362.54)		F
03/12/08	PERFORMED QUARTERLY PREVENTATIVE MAINTENANCE CLEANING ON ALL UNITS (UMS1, DMS1, DMS2, AND MOBILE).		SEA
04/24/08 ↓	UMS1 - 1409.67 DMS1 - 1215.39 DMS2 - 1170.89 MOBILE - 580.62	MAINTENANCE REPLACED MOTORS AT UMS1, DMS1, DMS2, AND MOBILE UNIT.	SEA ↓
04/28/08 ↓		QUARTERLY PREVENTATIVE MAINT UMS1, MOBILE, DMS1, DMS2	SEA ↓
08/20/08 ↓		MAINTENANCE REMOVED ELECTRICAL CONNECTIONS FROM UMS1, DMS1, DMS2, AND MOBILE UNITS	SEA ↓
08/27/08 ↓		REMOVED UNITS FROM UMS1, DMS1, DMS2, AND MOBILE STATION, WRAPPED IN PLASTIC AND STORED IN THE EMD SHOP ATTIC.	SEA ↓

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER PREVENTATIVE MAINTENANCE LOG

Date of Maintenance	Elapsed Time Meter Reading	Description of Maintenance Performed	Technician's Initials
12/13/08		INSTALLED PUF UNITS BACK AT	SGL
↓		UMS1, DMS1, MOBILE STATION,	↓
		AND DMS2.	
12/17/08		REMOVED PUF UNIT FROM DMS2	SGL
↓		AND DELIVERED TO MAINTENANCE SHOP	↓
		FOR INSTALLATION AT THE MET STATION.	
12/29/09		MAINTENACE INSTALLED PUF UNIT	SGL
↓		SERIAL # 803 AT MET STATION.	↓
12/29/09	756.92	MET STATION - 803 MAINTENANCE INSTALLED	SGL
↓	1458.22	UMS1 - 794 NEW MOTORS	↓
	23.00	DMS1 - 806 ON PUF UNITS	
02/02/09	UMS1 - 1964.95	MOTOR REPLACED UMS1	SGL
↓	DMS1 - 477.1	MOTOR REPLACED DMS1	↓
	MET - 1609.45	MOTOR REPLACED MET	
02/26/09	UMS1 - 2411.45	MOTORS REPLACED UMS1	SGL
↓	DMS1 - 957.41	DMS1	↓
	MET - 2089.75	↓ MET STATION	
03/12/09	MET - 605.04	CANNIBALIZED HOUR METER FROM	SGL
↓	↓	MOBILE STATION	↓
03/24/09	MET - 824.45	MOTOR FAILED - REPLACED BY SITE	SGL
↓	↓	MAINTENANCE.	↓
04/28/09	UMS1, DMS1, MET, DUP (MOBILE)	SITE MAINTENANCE R+R'D ALL MOTORS.	SGL
06/02/09	UMS1, DMS1, MET, MOBILE	SITE MAINTENANCED REPLACED MOTORS	SGL
06/30/09	UMS1, DMS1, MET, MOBILE	SITE MAINTENANCE R+R'D MOTORS	SGL

PUF - EPA CONGENER STUDY

STARTED: 04/09/09

04/09/09 MPS - 1135 - ARRIVED.

TEMP: ~~739.65°K~~ SEH 294.8°K

BP: 739.65 ~~in/Hg~~ SEH mm/Hg

MAGNEHELIC READING: 42 in/Hg TIMER - 1074.03

SET BLANK INSIDE PUF, INSTALLED AND UNCAPPED.

CAL READING AT 50 INCHES - 5.3 ON SLAC TUBE

INITIAL MAGNAHELIC: 44.0 SEH

TIMER: 1074.13

MPS ALT - 1210

FINAL MAG = 37

TIMER: 2220.46

BP = 29.15 in/Hg = 740.41 mm/Hg

TEMP = 71.9°F = 295.4°K

CAL AT 50 INCHES = 5.4 ON SLAC TUBE

INITIAL SETTING: 39.5 in/Hg

START TIMER: 2220.47

DMS1 - 1240

BP = 741.17

TEMP = 72°F = 295.4°K

MAG FINAL: 43

TIMER: 1568.52

CAL AT 50 INCHES: 5.3 ON SLAC TUBE

INITIAL SETTING: 45.9

STARTING TIMER: 1568.

UMS1 TEMP: ~~65.4°F~~ SEH 68°F = 293.2°K, BP: 28.94 = 735.08 mm/Hg - 1325

FINAL PRESS: 43, TIMER: 3029.62

CAL PRESS AT 50 IN/~~Hg~~ H_2O = 5.3 ON SLAC TUBE

INITIAL PRESS SETTING: 44 TIMER: 3029.68

SEH

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BOOK NO. 0131

04/15/09 1115 MPS

TEMP: 285.4°K, BP: 741.17 mm/Hg

FINAL MAG. PRESS: 44

~~S~~TIMER 1180.92

START 1180.94

INIT. PRESS 42.5

1200 MPS ALT

TEMP 287°K, BP = 741.17

FINAL MAG PRESS: 39

FINAL TIMER: 2340.42

START TIMER: 2340.42

INITIAL PRESS 39.5

1230 DMSI

TEMP: 287°K, BP: 742.70

FINAL MAG PRESS: 45

FINAL TIMER: 1675.33

START TIMER: 1675.35

INITIAL PRESS: 44.5

1300 UMSI

TEMP: 285.9°K, BP = 737.36 mm/Hg

FINAL MAG PRESS:

FINAL TIMER:

START TIMER:

INITIAL PRESS:

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04/21/09 0944 MPS

BP: 739.65 mm/Hg, Temp: 300.77° K
Final Mag Press: 38
Timer: 1301.05
1 PT CAL 50 inch/H2O = 4.9
Start Timer: 1301.10
Initial Press: 44.9

1130 MPS/ALT

BP: 739.65, Temp: 303.55
Final Mag Press: 34
Timer: 2460.49
1 PT CAL 50 inch/H2O = 4.7
Start Timer: 2460.52
Initial Press: 39.5

1209 DMS1

BP: 738.89 mm/Hg, Temp: 305.22° K
Final Mag Press: 38
Timer: 1752.09
1 PT CAL 50 inch/H2O = 4.7
Start Timer: 0.15
Initial Press: 46.7
Replaced Timer and Recalibrated Unit. Completed at 1345

1404 UMS1

BP: 734.31, Temp: 308
Final Mag Pressure: 34
Timer: 3256.59
1PT CAL: 50 inch/H2O = 4.7
Start Timer: 3256.59
Initial Press: 46.3

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04/27/09 MPS 1015 63°F = 290.22°K 28.94 in/Hg = 735.08 mm/Hg
TIMER-HOURMETER: 1421.12 FINAL PRESSURE: 46
MPS ALT 1025 63°F = 290.22 °K 29.03 in/Hg = 737.36
HOURMETER: 2580.56 FINAL PRESSURE: 44
DMSI 1030 63°F = 290.22 °K 29.06 in/Hg = 738.12
HOURMETER: 120.19 FINAL PRESSURE: 48
UMSI ~~DMSI~~ 1050
" " TEMP 64°F = 290.77°K 28.85 in/Hg = 732.80 mm/Hg
HOURMETER: 3376.63 FINAL PRESSURE: 47

05/01/09 SEL MSP 1340 298.55°K, 735.84 mm/Hg
HOURMETER 1421.26, INITIAL PRESSURE: ~~1421.26~~ 46
MAGNAHELIC 50 in/H2O — SLAC TUBE_ 4.6
DMSI 1410 299.11°K, 735.84 mm/Hg
HOURMETER: 120.34, INITIAL PRESSURE: 45.1
SLAC TUBE READING 4.6 AT 50 in/H2O ON MAGNAHELIC
UMSI 1445 290.22°K, 735.84 mm/Hg
HOURMETER: 3376.81, INITIAL PRESSURE: 44.1
SLAC TUBE 4.7 @ 50 in/H2O ON MAGNAHELIC
UMSI DUPE 1450 290.22°K, 735.84 mm/Hg
HOURMETER: 2580.9, INITIAL PRESSURE: 39.5
SLAC TUBE: 4.8 @ 50 in/H2O ON MAGNAHELIC
PUF RENTAL ORIFICE USED FOR CALIBRATION.

SEL 05/07/09

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DATE	TECH	STATION	TEMP °K	BP mm/Hg	SLAC TUBE READING @50 in/H_2O	PRESSURE FINAL	INITIAL PRESSURE	FINAL HOURS	INITIAL HOURS
05/07/09	S&L	UMSI 1255	299.11	738.12	5.5	46	45.4	3494.10	3494.63
↓	↓	MSP 1010	293.55	737.36	5.3	45	45.1 ~~44.6~~ SS	1538.92	1538.94
		UMSI DUP 1255	29.11	738.12	5.2	39	39.5	2698.66	2698.68
05/07/09	S&L	DMSI 1055	295.77	738.12	5.3	48	44.4 ~~48~~ SL	237.99	238.02
05/13/09	S&L	MSP - 0700	289.11	735.08	5.4	41	44.6	1659.06	1659.08
↓	↓	DMSI - 0730	289.11	735.08	5.3	42	43.6	358.02	358.06
		UMSI - 0940	294.66	734.31	5.3	42	44.9	3614.68	3614.70
		UMSI DUP - 0940	294.66	734.31	5.4	37	39.5	2818.70	2818.72
05/19/09	S&L	UMSI - 1110	304.66	732.03	5.3	39	46.6	3734.82	3734.83
↓	↓	UMSI DUP - 1110	304.66	732.03	5.4	35	39.5	2934.29	2934.30
		MSP - 1150	305.22	732.79	5.4	37.5	47.2	1779.09	1779.10
		DMSI - 1205	305.77	732.79	5.3	37	46.3	478.07	478.08
05/26/09	S&L	MSP - 0850	298.55	732.03	N/A	48	N/A	1899.11	N/A
↓		DMSI - 0900	298.55	732.03	N/A	46	N/A	561.97	N/A
		UMSI 1005	301.88	732.03	N/A	45.5	N/A	3854.87	N/A
		UMSI DUP - 1005	301.88	732.03	N/A	39	N/A	3054.31	N/A
06/05/09	7-4 S&L	MSP 1130	290.22	732.79	5.4	N/A	45.3	N/A	1907.18
		DMSI - 1200	291.88	732.79	5.3	N/A	45.4	N/A	682.10
		DMSI - DUP	291.88	732.79	5.3	N/A	39.5	N/A	3174.38
		UMSI - 1250	292.44	732.79	5.3	N/A	45.4 ~~44.7~~ SL	N/A	3898.88
06/11/09	6-3 S&L	MSP 1145	296.33	738.12	5.4	49	45.9 ~~39.5~~ SL	2027.23	2027.24
↓	↓	DMSI DUP 1155	301.33	735.08	5.2	44	39.5 ~~46.8~~ SL	3294.61	3294.62
		DMSI ~~DUP~~ SL 1155	301.33	735.08	5.2	45	46.8	802.35 ~~3294~~ SL	802.36
		UMSI 1135	300.77	734.31	5.2	52	46.6	4018.89	4018.90

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DATE	TECH	STATION	TEMP °K	BP mm/Hg	SLAC TUBE @50wHg	FINAL PRESS	INITIAL PRESS	FINAL HOURS	INITIAL HOURS	COMMENTS
06/17/09	SL	0700 UMS1	293.55	739.31	5.4	45	45.5	4139.07	4139.08	
↓	↓	0730 MSP	294.11	732.03	5.3	45	46	2147.34	2147.35	
		0810 DMS1	295.77	732.03	5.3	44	46.1	922.63	922.64	
		0810 DMS1 DUP	295.77	732.03	5.3	39	39.5	3414.78	3414.79	
06/17/09	SL	0725 MSP	298.55	732.28	5.4	42.5	46.7	2267.45	2267.45	
↓	↓	0745 DMS1	298.55	730.00	5.3	42	46.6	1042.85	1042.87	
		0745 DMS1 DUP	298.55	730.00	5.3	38	47.8	3542.55	3542.56	STOP TIMER NOT SET
		0840 UMS1	299.66	730.76	5.3	42	46.7	4259.09	4259.11	
06/29/09	SL	0650 UMS1	304.11	731.52			N/A	4375.72	N/A	MOTOR INOP
↓	↓	MSP 0820	306.33	735.08			N/A	2387.45	N/A	MOTOR INOP
		DMS1 0830	305.22	732.28		41	N/A	1162.97	N/A	
		DMS1 DUP 0830	305.22	732.28		42	N/A	3662.66	N/A	
07/02/09	SL	1345 UMS1	309.66	735.08		N/A	48.1	N/A	4375.92	
↓	↓	1700 DMS1	312.59	733.55		N/A	49.9	N/A	1163.06	
		1630 MSP	312.04	735.08		N/A	50.9	N/A	2387.59	
		1630 MSP DUP	312.04	735.08		N/A	49	N/A	3662.75	
07/09/09	SL	1030 UMS1	299.66	735.84	5.4	48	48.6	4496.02	4496.04	
↓	↓	1100 MSP	300.77	738.12	5.3	40	48.9	2507.71	2507.73	
		1100 MSP DUP	300.77	738.12	5.2	44	47.1	3782.86	3782.86	
		1130 DMS1	302.44	735.84	5.4	46	48.1	1283.13	1283.17	
7/15/09	SL	0920 UMS1	304.11	737.62	5.4	42	47.1	4616.05	4616.06	
↓		0950 MSP	305.22	738.89	5.3	38	49.6	~~2627.74~~ 2627.74	2627.74	
		0950 MSP DUP	305.22	738.89	5.4	43	47.7	3902.86	3902.86	
07/15/09	SL	1010 DMS1	308	739.65	5.4	40	48.8	1403.18	1403.19	

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PROJECT NO.

BOOK NO. 0131

DATE	TECH	STATION	TEMP°K	BP mm/Hg	SLAC TUBE	FINAL PRESS	INITIAL PRESS	FINAL HOURS	INITIAL HOURS	COMMENTS
07/21/09	DG SEH	1611 UMS1	313.15	737.87	5.4	39.3	48.5	4736.06	4736.20	
↓	↓	DMS1 -1527	315.37	734.06	5.4	39.5	50.3	1523.22	1523.35	
		MSP ~~0950~~ 1407	3[illegible].48	737.87	5.4	43.5	50.6	2747.43	2747.96	
		1400 MSP DUP	311.48	737.87	5.3	39	48.8	4022.96	4023.30	
07/27/09	SEH	0700 UMS1	300.[illegible]	735.08	N/A	41	N/A	~~[illegible]~~	N/A	4856.25 FINAL HOURS
↓	↓	0720 MSP	302.04	735.84	N/A	45	N/A	2868.03	N/A	
		0720 MSP DUP	302.04	735.84	N/A	44.5	N/A	4143.38	N/A	
		DMS1	303.15	738.89	N/A	46	N/A	1643.38	N/A	

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BOOK NO. 0131

DATE	TECH	STATION	TEMP °K	BP mm/Hg	SLAC TUBE	FINAL PRESS	INITIAL PRESS	FINAL HOURS	INITIAL HOURS	COMMENTS
07/21/09	DG SEH	1611 UMS1	313.15	737.87	5.4	39.3	48.5	4736.06	4736.20	
↓	↓	DMS1 -1527	315.37	734.06	5.4	39.5	50.3	1523.22	1523.35	
↓	↓	MSP ~~1450~~ 1407	3[illegible].48	737.87	5.4	43.5	50.6	2747.43	2747.96	
↓	↓	1400 MSP DUP	311.48	737.87	5.3	39	48.8	4022.96	4023.30	
07/27/09	SEH	0700 UMS1	300.37	735.08	N/A	41	N/A	~~4856.25~~	N/A	4856.25 FINAL HOURS
↓	↓	0720 MSP	302.04	735.84	N/A	45	N/A	2868.03	N/A	
↓	↓	0720 MSP DUP	302.04	735.84	N/A	44.5	N/A	4143.38	N/A	
↓	↓	DMS1	303.15	738.89	N/A	46	N/A	1643.38	N/A	
08/05/09	SEH	0815 UMS1	248	738.89	5.4	N/A	46.1	N/A	4863.58	BLANK AT UMS1.
	↓	0900 MSP	298.55	737.38	5.4	N/A	44.7	N/A	2868.33	
	↓	0950 DMS1	300.77	736.60	5.4	N/A	45.6	N/A	1643.55	

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US EPA ARCHIVE DOCUMENT

Air Sampling Stations
Photo Log
Dioxin-Like PCB Congener Study
Kettleman Hills Facility
Kings County, CA

Previous Meteorological Sampling Location

Meteorological Station Pad Sampling Location

Meteorological Station Pad Sampling Location

Administrative Building Temporary Sampling Location

Administrative Building Temporary Sampling Location

UMS-1 Sampling Location

Relocated Meteorological Station Location

ADDENDUM TO FIELD SAMPLING FOR VEGETATION AND SOIL STANDARD OPERATING PROCEDURES (SOP)

Dioxin-Like Polychlorinated Biphenyl (PCB) Congener Study Work Plan
Chemical Waste Management, Inc. - Kettleman Hills Facility

SCOPE AND APPLICATION

This addendum describes the additional procedures for dry stage vegetation sampling in the event that adequate mass cannot be collected from original green stage vegetation sample locations.

The sampling team will complete dry stage vegetation sampling in accordance with the initial Field Sampling for Vegetation and Soil SOP. When necessary, the sampling team will follow the procedures as listed in this addendum.

Sample Collection

The following steps will be followed in the event that adequate mass of dry stage vegetation cannot be collected from the original 1 square meter green stage vegetation sample area.

VEGETATION SAMPLE COLLECTION

Dry Stage Vegetation Sampling:

In the event that dry stage vegetation available for collection in the original 1 square meter green stage vegetation sample area is not sufficient to produce enough mass for laboratory compositing and analysis, the sample area will be extended in quarter-meter increments in all directions other than the direction of approach. Sampling teams will collect dry stage vegetation from the extended sample area in accordance with the sampling procedures listed in the initial SOP. The sample area will be extended in quarter-meter increments until sufficient mass has been collected for laboratory analysis.

During the dry stage vegetation sampling, the sampling team will identify any extension of the sample area (e.g., extended by ___ meters) in a bound logbook. The use of additional flags will indicate the final sample area for dry stage vegetation sampling.

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FIRST QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility, Kings County, CA

Submitted to:
Chemical Waste Management, Inc, Kings County, CA

Submitted by:
AMEC Geomatrix, Inc., Fresno, CA

May 18, 2009

Project 8151.006

amec

May 18, 2009

Project 8151.006

Mr. Paul Turek
Chemical Waste Management, Inc.
35251 Old Skyline Road
Kettleman City, California 93239

Subject: **First Quarter 2009 Meteorological Station Audit Report**
Kettleman Hills Facility, Kings County, California

Dear Mr. Turek:

AMEC Geomatrix, Inc. (AMEC), is pleased to submit the enclosed First Quarter 2009 Meteorological Station Audit Report for the Chemical Waste Management, Inc., Kettleman Hills facility in Kings County, California. This report documents the weather station audit performed by AMEC on April 10 and 17, 2009. The audit was completed in general accordance with U.S. Environmental Protection Agency and equipment manufacturer guidelines.

Please call either of the undersigned if you have any questions or if we may provide additional information.

Sincerely yours,
AMEC Geomatrix, Inc.

for

Martin E. Spongberg, PhD, PE, PG
Senior Engineer

Philip P. Ross, PG
Principal Hydrogeologist

Enclosure

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AMEC Geomatrix

FIRST QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility, Kings County, CA

Submitted to:
Chemical Waste Management, Inc, Kings County, CA

Submitted by:
AMEC Geomatrix, Inc., Fresno, CA

May 18, 2009

Project 8151.006

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FIRST QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility
Kings County, California

1.0 INTRODUCTION

AMEC Geomatrix, Inc. (AMEC), has prepared this First Quarter 2009 Meteorological Station Audit Report for the Chemical Waste Management, Inc. (CWMI), Kettleman Hills facility (KHF) in Kings County, California. This report documents the meteorological station (MET Station) audit performed by AMEC on April 10 and 17, 2009. The audit of the MET Station was completed in general accordance with U.S. Environmental Protection Agency (EPA) and equipment manufacturer guidelines.

2.0 BACKGROUND

This section presents background information on the KHF and the MET Station.

2.1 SITE LOCATION AND OPERATIONS

The KHF is located in Kings County, California, approximately 3 miles west of Interstate 5 and immediately north of State Route 41. The nearest towns are Avenal and Kettleman City, located about 8 miles northwest and 5 miles northeast of the KHF, respectively (Figure 1).

The KHF has been operated by CWMI since 1979 when the site was purchased from Environmental Disposal Services (EDS). The operations conducted by EDS consisted of solar evaporation in surface impoundments, land farming, and waste burial in cells. Current permitted activities at the KHF include solar evaporation in lined surface impoundments, waste stabilization, burial of solid wastes, and drum storage. Active waste management units (WMUs) currently include the drum storage unit, final stabilization unit, and polychlorinated biphenyl flushing/storage unit. In November 1998, the site was permitted to accept Class II designated waste and Class III municipal solid waste in landfill B-19. Active land disposal units currently include landfills B-18 and B-19 and surface impoundments P-09, P-14, and P-16. A new Class II/III WMU, the B-17 landfill, began receiving designated and municipal solid waste during the first quarter 2009.

2.2 METEOROLOGICAL STATION COMPONENTS

The MET Station is a multiple component weather station located on the hilltop between landfill B-18 and proposed landfill B-20. Between April 6 and 10, 2009, the MET Station equipment was moved to its current location from its previous location near the administration building. The MET Station equipment was relocated because of the potential for the build-out of landfill B-19 to effect wind patterns at the previous location.

Horizontal wind speed and horizontal wind direction sensors are installed 10 meters (m) above the ground surface on top of a tower. An ambient temperature sensor is installed 1.7 m above the ground surface. At ground level, the MET Station includes components measuring precipitation and barometric pressure. Manufacturer information for each component is contained in Table 1.

2.3 Calibration, Audit, and Maintenance Schedule

The MET Station is operated and maintained according to equipment manufacturer guidelines (Campbell Scientific, 2004a; 2004b; 2005; and 2006). Calibrations and audits of the system are conducted in general accordance with the guidelines published by the manufacturers and the U.S. EPA (U.S. EPA, 1994a; 1994b; and 1994c).

Calibration and maintenance of the MET Station is conducted semiannually in the second and fourth quarters. Performance audits are conducted four times per year. This report documents the first 2009 audit conducted in April, as soon as practical after the MET Station equipment was relocated.

3.0 AUDIT EQUIPMENT, PROCEDURE, AND ACCURACY TOLERANCE LIMITS

The audit was performed by AMEC staff with the equipment described in this section.

3.1 Audit Equipment

Known audit wind speeds were generated with a R.M. Young Model 18811 selectable-speed anemometer drive. For auditing the wind direction sensor, a Model 18112 Vane Angle Bench Stand and a Suunto KB-14 precision compass were used. Starting threshold torque of the wind speed and wind direction sensors were measured with a R.M. Young Model 18312 Torque Disc and a R.M. Young Model 18331 Vane Torque Gauge, respectively.

Reference temperatures were measured with a Control Company Model 4110 Universal digital thermometer with a certification traceable to the National Institute of Standards and Technology. A water bath was used to produce three different audit temperatures. The rain gauge was audited using a graduated cylinder with a control valve.

3.2 Audit Procedure

MET Station audits are performed in general accordance with equipment manufacturer and U.S. EPA guidelines.

3.2.1 Wind Speed

Before auditing the wind speed sensor, the wind speed propeller is inspected to determine that it is secure. Bearings are inspected to make sure the sensor is freely moving. The propeller is removed and threshold torque is measured with a torque gauge.

An anemometer drive is connected to the propeller shaft. To audit the wind speed sensor, the anemometer drive was operated at speeds ranging from about 300 to 8,000 revolutions per minute (rpm), corresponding to audit wind speeds up to about 90 miles per hour (mph). A manufacturer-supplied equation (mph = 0.01145 x rpm) is used to convert from rotation rate to wind speed. The wind speed sensor response at each audit wind speed is collected from the data logger for comparison with the calculated wind speed.

3.2.2 Wind Direction

The equipment is inspected to make sure that all connections are secure and the sensor is freely moving. Threshold velocity in the clockwise and counter-clockwise directions is measured with a torque meter pressed against the vane 10 centimeters from the pivot point with increasing force until the vane starts to move.

To audit the direction sensor, the device is secured to a Model 18112 Vane Angle Bench Stand and a precision compass is used to align the wind direction vane alternately to the north, east, south, and west. At each of these orientations, the vane is immobilized and the orientation recorded on the data logger is collected for comparison with the compass reading.

After auditing the wind speed and wind direction sensors, the propeller is secured to the propeller shaft.

3.2.3 Ambient Temperature

The temperature-sensing system is audited at three temperatures ranging from about freezing to more than 100 degrees Fahrenheit (°F). The lowest temperature is achieved by adding ice to a water bath. The highest temperature is maintained by placing a water-heating coil in the water bath. The middle reading is taken in tap water with a temperature approximately equal to the ambient temperature. At each audit temperature, the temperature sensor and the audit thermometer are immersed in the bath and the readings for each sensor are recorded for comparison.

3.2.4 Precipitation

Prior to audit testing, the precipitation gauge is inspected to make sure the collection funnel is clear of obstructions. Accumulated debris, if present, is removed.

The precipitation gauge is audited by adding a known volume of water at a slow, controlled rate into the gauge. A manufacturer-supplied function is used to convert the water volume in milliliters to an equivalent precipitation depth in inches. A volume equivalent to about 1 inch of precipitation is added to the gauge over a period of 45 minutes or greater. The precipitation gauge reading is then collected from the data logger and compared to the measured input volume (converted into equivalent rainfall depth).

3.2.5 Barometric Pressure Sensor

Prior to auditing the barometric pressure sensor, all connections and the housing are inspected to assess whether they are secure and undamaged. The external case is cleaned with a damp cloth.

To audit the sensor, the barometric pressure reading on the data logger is recorded for comparison with barometric readings from nearby National Weather Service Station KHJO at the Hanford Municipal Airport.

3.3 Audit Accuracy Tolerance Limits

For each component of the MET Station system, the audit inputs are compared with the values measured by each sensor and recorded on the data logger. Accuracy tolerance limits for audits are listed in Table 2. System components that are not performing within the manufacturer-recommended tolerance limits should be repaired, replaced, or recalibrated.

4.0 PERFORMANCE AUDIT RESULTS

System performance is determined by comparing the readings of the system sensors with known audit input values. The equipment was audited on April 10 and 17, 2009, and the collected data are presented in Tables 3 through 5.

4.1 Wind Speed

Information collected during the wind speed sensor audit is listed in Table 3. This information includes: the input rotation rate, calculated wind speed, recorded wind speed, and the difference between the calculated and recorded wind speed.

Three of the seven audit measurements were outside the manufacturer-recommended accuracy tolerance limit of 0.6 mph of the calculated velocity. All audit measurements were within 1 mph of the calculated velocity.

Starting threshold torque was less than 1 gram-centimeter (g-cm) in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.2 Wind Direction

Information collected during the wind direction audit is listed in Table 4. This information includes: the reference orientation set with a compass, the orientation detected by the sensor, and the difference between these two measurements. All audit measurements met the accuracy tolerance limit.

Starting threshold torque was measured at 3 g-cm in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.3 Ambient Temperature

Information collected during the temperature sensor audit is listed in Table 5. This information includes: the audit reference temperatures, the temperatures recorded by the MET Station sensor, and the difference between the two measurements. The temperature sensor did not meet the manufacturer-recommended accuracy tolerance limit (0.4 °F) at one of the three audit temperatures. The difference between the recorded and reference temperature was less than 1 °F.

4.4 Precipitation

A volume corresponding to 1 inch of precipitation was added to the rain gauge. The data logger recorded 1.02 inch of precipitation, which meets the accuracy tolerance limit of 0.03 inch (3 percent of the input).

4.5 Barometric Pressure

The barometer reading taken during this audit at 10:10 a.m. was 29.58 inches of mercury (in Hg), or 1,002 millibars (mb). The reading from the nearby official gauge at Station KHJO at 9:53 a.m. indicated a barometric pressure of 29.84 in Hg (1,011 mb). The difference in readings between the site and control barometers was 9 mb, which does not meet the manufacturer-recommended accuracy tolerance limit of 2 mb.

5.0 SUMMARY

MET Station equipment was moved to a new location prior to this first quarterly 2009 audit event. During audit testing, wind direction and precipitation components performed within the accuracy tolerance limits specified by the equipment manufacturer. Three of seven wind speed measurements and one of three temperature measurements slightly exceeded accuracy tolerance limits. The barometric pressure reading did not meet the accuracy tolerance limit.

MET Station equipment will be calibrated in May 2009. MET Station equipment not meeting accuracy tolerance limits may be recalibrated, repaired, or replaced.

6.0 REFERENCES

Campbell Scientific, 2004, Instruction Manual, Model 107 Temperature Probe, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004a).

Campbell Scientific, 2004, Instruction Manual, TE525 Tipping Bucket Rain Gage, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004b).

Campbell Scientific, 2005, Instruction Manual, CS100 Barometric Pressure Sensor, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2005).

Campbell Scientific, 2006, R.M. Young Wind Monitors, Campbell Scientific (Canada) Corp., (Campbell Scientific, 2006).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, Principles, U.S. EPA Document 600/9-76-005 (U.S. EPA, 1994a).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, U.S. EPA Document 600/4-77/027a (U.S. EPA, 1994b).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Methods, U.S. EPA Document 600/4-82-060 (U.S. EPA, 1994c).

TABLE 1

METEOROLOGICAL STATION SYSTEM COMPONENTS

Kettleman Hills Facility
Kings County, California

Parameter	Manufactuer	Model Number	Range
Wind Speed	R.M. Young	05305	0 to 90 mph [1]
Wind Direction	R.M. Young	05305	0 to 360 degrees [2]
Temperature	Campbell Scientific	TE525	-31 to 122 °F [3]
Barometric Pressure	Campbell Scientific	CS100	600 to 1100 mb [4]
Precipitation	Campbell Scientific	107	NA [5]

1. Wind speed reported in miles per hour (mph), measured at 10 meters above ground level.
2. Wind direction reported in degrees of rotation from true north, measured at 10 meters above ground level.
3. Temperature measured in degrees Fahrenheit (°F) at 1.7 meters above ground level.
4. Barometric pressure measured in millibars (mb).
5. NA = not applicable.

TABLE 2

ACCURACY TOLERANCE LIMITS

Kettleman Hills Facility
Kings County, California

Parameter	Accuracy Tolerance Limits
Wind Speed	± 0.6 mph [1]
Wind Direction	± 5 degrees [2]
Wind Speed Starting Threshold Torque	1 g-cm [3]
Wind Direction Starting Threshold Torque	9 g-cm [3]
Temperature	± 0.4 °F [4]
Barometric Pressure	± 2 mb [5]
Precipitation	± 3 percent of input

1. Wind speed measured in miles per hour (mph). "±" = plus or minus;
2. Wind direction measured in degrees of rotation from true north.
3. Starting threshold is the minimum applied torque needed to move the sensors. Torque is measured in gram-centimeters (g-cm).
4. Temperature measured in degrees Fahrenheit (°F).
5. Barometric pressure measured in millibars (mb).

TABLE 3

HORIZONTAL WIND SPEED AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Input Rate [2] (rpm)	Calculated Velocity [3] (mph)	Recorded Velocity [4] (mph)	Difference [5] (mph)
1	300	3.43	3.43	0.00
2	600	6.87	6.87	0.00
3	1,000	11.45	10.53	-0.92
4	1,500	17.17	16.49	-0.68
5	2,500	28.62	27.94	-0.68
6	4,000	45.80	45.34	-0.46
7	8,000	91.60	91.14	-0.46

1. Audited on April 10, 2009, starting at 9:55 a.m.
2. Input rotation rate in revolutions per minute (rpm) by a R.M. Young Model 18811 anemometer drive.
3. Calculated wind velocity in miles per hour (mph) converted from rpm with a manufacturer-supplied function:
   (Input rate in rpm) * 0.01145 = velocity in mph
4. Wind speed in mph recorded by the sensor.
5. Difference between recorded and calculated wind speed expressed in mph (accuracy tolerance limit is ± 0.6 mph).

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TABLE 4

HORIZONTAL WIND DIRECTION AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Reference Orientation [2] (degrees)	Recorded Orientation [3] (degrees)	Difference [4] (degrees)
1	0	0.19	0.19
2	90	90.62	0.62
3	180	175.31	-4.69
4	270	268.33	-1.67

1. Audited on April 10, 2009, starting at 9:45 a.m.
2. Reference orientation in degrees (measured from true north) measured with a Suunto KB-14 precision compass.
3. Orientation detected by the wind direction sensor (R.M. Young Model 05305) in degrees measured from true north.
4. Difference between recorded and reference orientation in degrees. Accuracy tolerance limit is ± 5 degrees.

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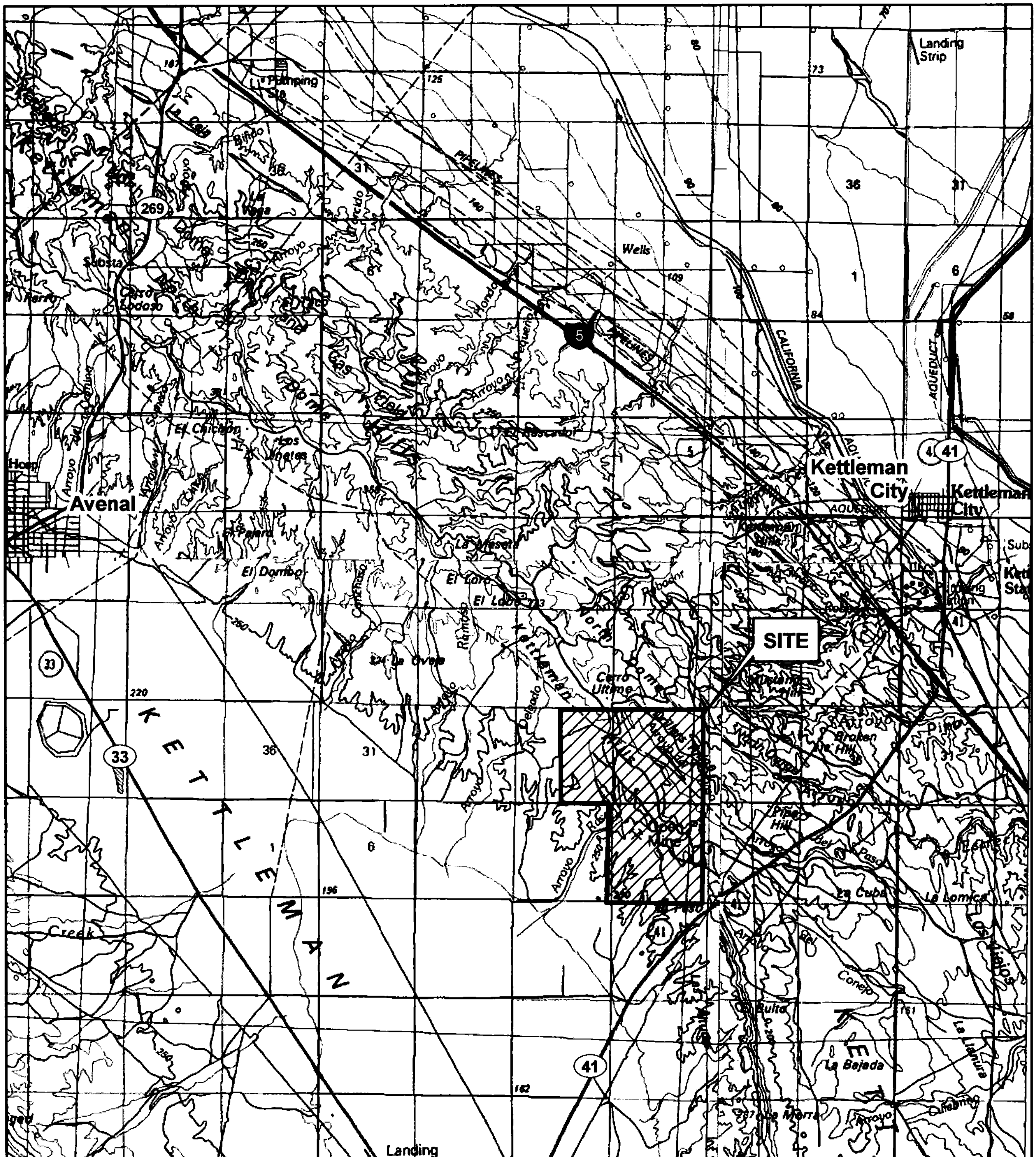
TABLE 5

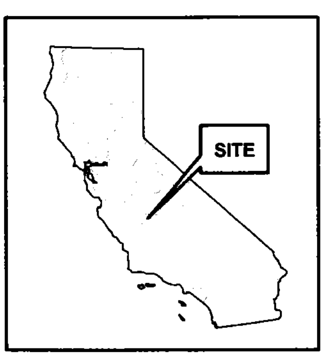
AMBIENT TEMPERATURE AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Reference Temperature [2] (°F)	Recorded Temperature [3] (°F)	Difference [4] (°F)
1	33.3	33.10	-0.20
2	53.2	53.73	0.53
3	117.7	117.73	0.03

1. Audited on April 10, 2009, starting at 9:15 a.m.
2. Reference temperature in degrees Fahrenheit (°F) measured with a Control Company Model 4110 Universal digital thermometer.
3. Temperature detected in °F by the temperature sensor (Campbell Scientific Model TE525).
4. Difference between recorded and reference temperature in °F. Accuracy tolerance limit is ± 0.4 °F.





California

N

APPROXIMATE SCALE IN FEET

0 4,000 8,000

0 1,200 2,400

APPROXIMATE SCALE IN METERS

Basemap modified from National Geographic Society TOPO!
(U. S. Geological Survey topographical map mosaic dataset).

SITE LOCATION MAP
Kettleman Hills Facility
Kings County, California

By: KLU	Date: 05/18/2009	Project No. 8151.006
AMEC Geomatrix		Figure 1

N:\8000s\008151\gis_SLM_v02.mxd

DAILY FIELD RECORD

amec

Project and Task Number: 8151	Date: 4-10-09
Project Name: KHF MET STATION	Field Activity: MET AUDIT
Location: KHF FACILITY	Weather:

PERSONNEL: Name	Company	Time In	Time Out
STEVE U.	AMEC	0700	1310
ALEX O.	↓	↓	↓
ALEX M.			

PERSONAL SAFETY CHECKLIST

X	Steel-toed Boots	X	Hard Hat		Tyvek Coveralls
X	Rubber Gloves	X	Safety Goggles		1/2-Face Respirator

DRUM I.D.	DESCRIPTION OF CONTENTS AND QUANTITY	LOCATION

TIME	DESCRIPTION OF WORK PERFORMED			
0700	arrive at office, load truck			
0730	left office			
0836	Signed in			
0903	Start RAW GAU			
	Set up			
0915	TEMP AUDIT		PANEL	REF
	F° COLD		33.1	33.3
	HOT		117.73	117.1
	AMBIENT		53.73	53.2
0945	WIND DRECTION REF		PANEL	
	0		0.19	
	90		90.62	
	180		175.31	
	270		268.33	
0955	WIND SPEED	RPM	mpH	REF
		300	3.43	300
		600	6.87	600

DAILY FIELD RECORD (continued)

amec

Project and Task Number: 815-1.005	Date: 4-10-09

TIME	DESCRIPTION OF WORK PERFORMED
	1000 10.53 1000
	1500 16.49 1500
	2500 27.94 2500
	4000 45.34 4000
	8000 91.14 8000
1003	WIND DIRECTION TORQUE
	CW - 3 gm-cm
	CCW - 3 gm-cm
1005	WIND SPEED TORQUE
	CW .4 gm cm
	CCW .4 gm cm
1010	BAROMETER READING - 29.58
	put station back together
1045	Signed out, talked w/ PAUL
1100	left Site
1110	stopped for lunch
1300	arrive at office ~~[illegible]~~
	unload truck
1305	BARAMOTER IN LEMOORE, CA -
	@ 1026 = 29.81
1310	Done w/ job

DAILY FIELD RECORD

amec

Project and Task Number: 008151.006.0	Date: 4-17-09
Project Name: W/M Kettlemen	Field Activity: Rain Gauge
Location: Kettleman	Weather: Sunny

PERSONNEL: Name	Company	Time In	Time Out
Steve V.	Amec	7:00	11:00

PERSONAL SAFETY CHECKLIST

	Steel-toed Boots		Hard Hat		Tyvek Coveralls
	Rubber Gloves		Safety Goggles		1/2-Face Respirator

DRUM I.D.	DESCRIPTION OF CONTENTS AND QUANTITY	LOCATION

TIME	DESCRIPTION OF WORK PERFORMED
7:00	Leaving for the Job site
7:20	Stopped for Gas
8:40	on Site ~~[illegible]~~ Start Rain gauge at
	Top of the Hour
9:04	Start the Rain gauge
9:40	Rain gauge Done Leaving the Job
	Site.
11:00	at the office off the Job

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SECOND QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility, Kings County, CA

Submitted to:

Chemical Waste Management, Inc, Kings County, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

July 13, 2009

Project 8151.006

amec

July 13, 2009

Project 8151.006

Mr. Paul Turek
Chemical Waste Management, Inc.
35251 Old Skyline Road
Kettleman City, California 93239

Subject: **Second Quarter 2009 Meteorological Station Audit Report**
Kettleman Hills Facility, Kings County, California

Dear Mr. Turek:

AMEC Geomatrix, Inc. (AMEC), is pleased to submit the enclosed Second Quarter 2009 Meteorological Station Audit Report for the Chemical Waste Management, Inc., Kettleman Hills facility in Kings County, California. This report documents the weather station audit performed by AMEC on June 25, 2009. The audit was completed in general accordance with U.S. Environmental Protection Agency and equipment manufacturer guidelines.

Please call either of the undersigned if you have any questions or if we may provide additional information.

Sincerely yours,
AMEC Geomatrix, Inc.

for

Martin Spongberg, PhD, PE, PG
Senior Engineer

Philip P. Ross, PG
Principal Hydrogeologist

Enclosure

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AMEC Geomatrix

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SECOND QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility, Kings County, CA

Submitted to:

Chemical Waste Management, Inc, Kings County, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

July 13, 2009

Project 8151.006

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SECOND QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility
Kings County, California

1.0 INTRODUCTION

AMEC Geomatrix, Inc. (AMEC), has prepared this Second Quarter 2009 Meteorological Station Audit Report for the Chemical Waste Management, Inc. (CWMI), Kettleman Hills facility (KHF) in Kings County, California. This report documents the meteorological station (MET Station) audit performed by AMEC on June 25, 2009. The audit of the MET Station was completed in general accordance with U.S. Environmental Protection Agency (EPA) and equipment manufacturer guidelines.

2.0 BACKGROUND

This section presents background information on the KHF and the MET Station.

2.1 SITE LOCATION AND OPERATIONS

The KHF is located in Kings County, California, approximately 3 miles west of Interstate 5 and immediately north of State Route 41. The nearest towns are Avenal and Kettleman City, located about 8 miles northwest and 5 miles northeast of the KHF, respectively (Figure 1).

The KHF has been operated by CWMI since 1979 when the site was purchased from Environmental Disposal Services (EDS). The operations conducted by EDS consisted of solar evaporation in surface impoundments, land farming, and waste burial in cells. Current permitted activities at the KHF include solar evaporation in lined surface impoundments, waste stabilization, burial of solid wastes, and drum storage. Active waste management units (WMUs) currently include the drum storage unit, final stabilization unit, and polychlorinated biphenyl flushing/storage unit. In November 1998, the site was permitted to accept Class II designated waste and Class III municipal solid waste in landfill B-19. The B-17 landfill, a new Class II/III WMU, has been permitted and began receiving designated and municipal solid waste on February 26, 2009. Active land disposal units currently include landfills B-17, B-18, and B-19 and surface impoundments P-09, P-14, and P-16.

2.2 METEOROLOGICAL STATION COMPONENTS

The MET Station is a multiple component weather station located on the hilltop between landfill B-18 and proposed landfill B-20. Between April 6 and 10, 2009, the MET Station equipment was moved from its previous location near the administration building. The MET

Station equipment was relocated because the build-out of landfill B-19 had the potential to affect wind patterns at the previous location.

Horizontal wind speed and horizontal wind direction sensors are installed 10 meters (m) above the ground surface on top of a tower. An ambient temperature sensor is installed 1.7 m above the ground surface. At ground level, the MET Station includes components measuring precipitation and barometric pressure. Manufacturer information for each component is contained in Table 1.

2.3 CALIBRATION, AUDIT, AND MAINTENANCE SCHEDULE

The MET Station is operated and maintained according to equipment manufacturer guidelines (Campbell Scientific, 2004a; 2004b; 2005; and 2006). Calibrations and audits of the system are conducted in general accordance with the guidelines published by the manufacturers and the U.S. EPA (U.S. EPA, 1994a; 1994b; and 1994c).

Calibration and maintenance of the MET Station is conducted semiannually in the second and fourth quarters. Performance audits are conducted four times per year. This report documents the second quarter 2009 audit conducted in June.

3.0 AUDIT EQUIPMENT, PROCEDURE, AND ACCURACY TOLERANCE LIMITS

The audit was performed by AMEC staff with the equipment described in this section.

3.1 AUDIT EQUIPMENT

Known audit wind speeds were generated with a R.M. Young Model 18811 selectable-speed anemometer drive. For auditing the wind direction sensor, a Model 18112 Vane Angle Bench Stand and a Suunto KB-14 precision compass were used. Starting threshold torque of the wind speed and wind direction sensors were measured with a R.M. Young Model 18312 Torque Disc and a R.M. Young Model 18331 Vane Torque Gauge, respectively.

Reference temperatures were measured with a Control Company Model 4110 Universal digital thermometer with a certification traceable to the National Institute of Standards and Technology. A water bath was used to produce three different audit temperatures. The rain gauge was audited using a graduated cylinder with a control valve.

3.2 AUDIT PROCEDURE

MET Station audits are performed in general accordance with equipment manufacturer and U.S. EPA guidelines.

3.2.1 Wind Speed

Before auditing the wind speed sensor, the wind speed propeller is inspected to determine that it is secure. Bearings are inspected to make sure the sensor is freely moving. The propeller is removed and threshold torque is measured with a torque gauge.

An anemometer drive is connected to the propeller shaft. To audit the wind speed sensor, the anemometer drive was operated at speeds ranging from about 300 to 8,000 revolutions per minute (rpm), corresponding to audit wind speeds up to about 90 miles per hour (mph). A manufacturer-supplied equation (mph = 0.01145 x rpm) is used to convert from rotation rate to wind speed. The wind speed sensor response at each audit wind speed is collected from the data logger for comparison with the calculated wind speed.

3.2.2 Wind Direction

The equipment is inspected to make sure that all connections are secure and the sensor is freely moving. Threshold velocity in the clockwise and counter-clockwise directions is measured with a torque meter pressed against the vane 10 centimeters from the pivot point with increasing force until the vane starts to move.

To audit the direction sensor, the device is secured to a Model 18112 Vane Angle Bench Stand and a precision compass is used to align the wind direction vane alternately to the north, east, south, and west. At each of these orientations, the vane is immobilized and the orientation recorded on the data logger is collected for comparison with the compass reading.

After auditing the wind speed and wind direction sensors, the propeller is secured to the propeller shaft.

3.2.3 Ambient Temperature

The temperature-sensing system is audited at three temperatures ranging from about freezing to more than 100 degrees Fahrenheit (°F). The lowest temperature is achieved by adding ice to a water bath. The highest temperature is maintained by placing a water-heating coil in the water bath. The middle reading is taken in tap water with a temperature approximately equal to the ambient temperature. At each audit temperature, the temperature sensor and the audit thermometer are immersed in the bath and the readings for each sensor are recorded for comparison.

3.2.4 Precipitation

Prior to audit testing, the precipitation gauge is inspected to make sure the collection funnel is clear of obstructions. Accumulated debris, if present, is removed.

The precipitation gauge is audited by adding a known volume of water at a slow, controlled rate into the gauge. A manufacturer-supplied function is used to convert the water volume in milliliters to an equivalent precipitation depth in inches. A volume equivalent to about 1 inch of precipitation is added to the gauge over a period of 45 minutes or greater. The precipitation gauge reading is then collected from the data logger and compared to the measured input volume (converted into equivalent rainfall depth).

3.2.5 Barometric Pressure Sensor

Prior to auditing the barometric pressure sensor, all connections and the housing are inspected to assess whether they are secure and undamaged. The external case is cleaned with a damp cloth.

To audit the sensor, the barometric pressure reading on the data logger is recorded for comparison with barometric readings from nearby National Weather Service Station KHJO at the Hanford Municipal Airport.

3.3 Audit Accuracy Tolerance Limits

For each component of the MET Station system, the audit inputs are compared with the values measured by each sensor and recorded on the data logger. Accuracy tolerance limits for audits are listed in Table 2. System components that are not performing within the manufacturer-recommended tolerance limits should be repaired, replaced, or recalibrated.

4.0 PERFORMANCE AUDIT RESULTS

System performance is determined by comparing the readings of the system sensors with known audit input values. The equipment was audited on June 25, 2009, and the collected data are presented below and in Tables 3 through 5.

4.1 Wind Speed

Information collected during the wind speed sensor audit is listed in Table 3. This information includes: the input rotation rate, calculated wind speed, recorded wind speed, and the difference between the calculated and recorded wind speed. All audit measurements were within 0.6 mph of the calculated velocity, which meets the manufacturer-recommended accuracy tolerance limit.

Starting threshold torque was less than 1 gram-centimeter (g-cm) in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.2 WIND DIRECTION

Information collected during the wind direction audit is listed in Table 4. This information includes: the reference orientation set with a compass, the orientation detected by the sensor, and the difference between these two measurements. All audit measurements met the accuracy tolerance limit.

Starting threshold torque was measured at 4 g-cm in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.3 AMBIENT TEMPERATURE

Information collected during the temperature sensor audit is listed in Table 5. This information includes: the audit reference temperatures, the temperatures recorded by the MET Station sensor, and the difference between the two measurements. All audit measurements were within 0.4 °F of the reference temperature, which meets the manufacturer-recommended accuracy tolerance limit.

4.4 PRECIPITATION

A volume corresponding to 1 inch of precipitation was added to the rain gauge. The data logger recorded 1.00 inch of precipitation, which meets the accuracy tolerance limit of 0.03 inch (3 percent of the input).

4.5 BAROMETRIC PRESSURE

Prior to this audit, the barometer offset programming was modified based on the elevation of its new location. The barometer reading taken during this audit at 10:05 a.m. was 29.92 inches of mercury (in Hg), or 1,013 millibars (mb). The reading from the nearby official gauge at Station KHJO at 10:53 a.m. indicated a barometric pressure of 29.89 in Hg (1,012 mb). The difference in readings between the site and control barometers was 1 mb, which meets the manufacturer-recommended accuracy tolerance limit of 2 mb.

5.0 SUMMARY

During audit testing, wind speed, wind direction, temperature, precipitation, and barometric pressure sensors all performed within the accuracy tolerance limits specified by the equipment manufacturer.

6.0 REFERENCES

Campbell Scientific, 2004, Instruction Manual, Model 107 Temperature Probe, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004a).

Campbell Scientific, 2004, Instruction Manual, TE525 Tipping Bucket Rain Gage, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004b).

Campbell Scientific, 2005, Instruction Manual, CS100 Barometric Pressure Sensor, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2005).

Campbell Scientific, 2006, R.M. Young Wind Monitors, Campbell Scientific (Canada) Corp., (Campbell Scientific, 2006).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, Principles, U.S. EPA Document 600/9-76-005 (U.S. EPA, 1994a).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, U.S. EPA Document 600/4-77/027a (U.S. EPA, 1994b).

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TABLE 1

METEOROLOGICAL STATION SYSTEM COMPONENTS

Kettleman Hills Facility
Kings County, California

Parameter	Manufactuer	Model Number	Range
Wind Speed	R.M. Young	05305	0 to 90 mph [1]
Wind Direction	R.M. Young	05305	0 to 360 degrees [2]
Temperature	Campbell Scientific	TE525	-31 to 122 °F [3]
Barometric Pressure	Campbell Scientific	CS100	600 to 1100 mb [4]
Precipitation	Campbell Scientific	107	NA [5]

1. Wind speed reported in miles per hour (mph), measured at 10 meters above ground level.
2. Wind direction reported in degrees of rotation from true north, measured at 10 meters above ground level.
3. Temperature measured in degrees Fahrenheit (°F) at 1.7 meters above ground level.
4. Barometric pressure measured in millibars (mb).
5. NA = not applicable.

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TABLE 2

ACCURACY TOLERANCE LIMITS

Kettleman Hills Facility
Kings County, California

Parameter	Accuracy Tolerance Limits
Wind Speed	± 0.6 mph [1]
Wind Direction	± 5 degrees [2]
Wind Speed Starting Threshold Torque	1 g-cm [3]
Wind Direction Starting Threshold Torque	9 g-cm [3]
Temperature	± 0.4 °F [4]
Barometric Pressure	± 2 mb [5]
Precipitation	± 3 percent of input

1. Wind speed measured in miles per hour (mph). "±" = plus or minus;
2. Wind direction measured in degrees of rotation from true north.
3. Starting threshold is the minimum applied torque needed to move the sensors. Torque is measured in gram-centimeters (g-cm).
4. Temperature measured in degrees Fahrenheit (°F).
5. Barometric pressure measured in millibars (mb).

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TABLE 3

HORIZONTAL WIND SPEED AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Input Rate [2] (rpm)	Calculated Velocity [3] (mph)	Recorded Velocity [4] (mph)	Difference [5] (mph)
1	300	3.43	3.43	0.00
2	600	6.87	6.87	0.00
3	1,000	11.45	11.45	0.00
4	1,500	17.17	17.17	0.00
5	2,500	28.62	28.63	0.01
6	4,000	45.80	45.80	0.00
7	8,000	91.60	91.60	0.00

1. Audited on June 25, 2009, starting at 9:45 a.m.
2. Input rotation rate in revolutions per minute (rpm) by a R.M. Young Model 18811 anemometer drive.
3. Calculated wind velocity in miles per hour (mph) converted from rpm with a manufacturer-supplied function: (Input rate in rpm) * 0.01145 = velocity in mph
4. Wind speed in mph recorded by the sensor.
5. Difference between recorded and calculated wind speed expressed in mph (accuracy tolerance limit is ± 0.6 mph).

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TABLE 4

HORIZONTAL WIND DIRECTION AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Reference Orientation [2] (degrees)	Recorded Orientation [3] (degrees)	Difference [4] (degrees)
1	0	1.55	1.55
2	90	90.77	0.77
3	180	177.43	-2.57
4	270	270.42	0.42

1. Audited on June 25, 2009, starting at 9:43 a.m.
2. Reference orientation in degrees (measured from true north) measured with a Suunto KB-14 precision compass.
3. Orientation detected by the wind direction sensor (R.M. Young Model 05305) in degrees measured from true north.
4. Difference between recorded and reference orientation in degrees. Accuracy tolerance limit is ± 5 degrees.

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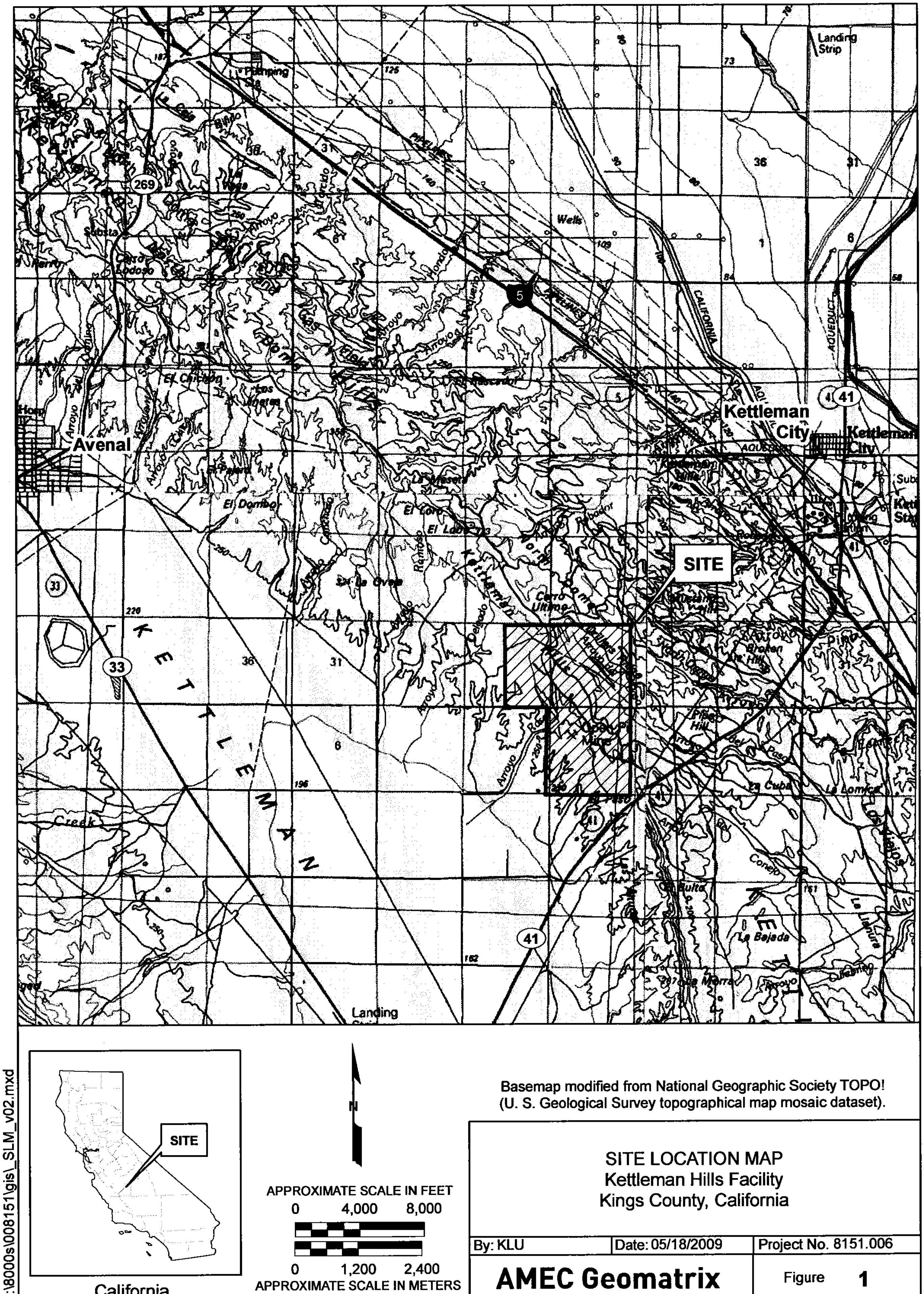
TABLE 5

AMBIENT TEMPERATURE AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Reference Temperature [2] (°F)	Recorded Temperature [3] (°F)	Difference [4] (°F)
1	36.1	36.02	-0.08
2	87.1	87.17	0.07
3	121.5	121.50	0.00

1. Audited on June 25, 2009, starting at 9:30 a.m.
2. Reference temperature in degrees Fahrenheit (°F) measured with a Control Company Model 4110 Universal digital thermometer.
3. Temperature detected in °F by the temperature sensor (Campbell Scientific Model TE525).
4. Difference between recorded and reference temperature in °F. Accuracy tolerance limit is ± 0.4 °F.



Basemap modified from National Geographic Society TOPO! (U. S. Geological Survey topographical map mosaic dataset).

SITE LOCATION MAP
Kettleman Hills Facility
Kings County, California

By: KLU	Date: 05/18/2009	Project No. 8151.006
AMEC Geomatrix		Figure 1

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APPENDIX A

Audit Field Records

DAILY FIELD RECORD

amec

Project and Task Number: 8151.005.0	Date: 6.25.09
Project Name: W/M Kettleman	Field Activity: Calibration
Location: Kettleman	Weather: Sunny

PERSONNEL: Name	Company	Time In	Time Out
Steve V.	Amec	7:00	
Alex O.	Amec		

PERSONAL SAFETY CHECKLIST

	Steel-toed Boots		Hard Hat		Tyvek Coveralls
	Rubber Gloves		Safety Goggles		1/2-Face Respirator

DRUM I.D.	DESCRIPTION OF CONTENTS AND QUANTITY	LOCATION

TIME	DESCRIPTION OF WORK PERFORMED			
7:00	Leaving for the Job			
8:50	on Site Set up the equip			
0908	START RAW GAUGE			
0930	TEMPERATURE	TEMP		REF
	AMBIENT	87.17		87.1
	COLD	36.02		36.1
	HOT	121.5		121.5
0943	DO WIND DIRECTION		DIR	REF
			1.55	0
			90.77	90
			177.43	180
			270.42	270
0945	DO WIND SPEED	RPM	MPH	REF
		300	3.43	300
		600	6.87	600
		1000	11.45	1000
		1500	17.17	1500

DAILY FIELD RECORD (continued)

amec

Project and Task Number: 8151.005.0

Date: 6.25.09

TIME	DESCRIPTION OF WORK PERFORMED
	2500 28.63 2500
	4000 45.80 4000
	8000 91.60 8000
0958	DO WIND SPEED TORQUE
	CW 0.3 gm-cm
	CCW 0.3 gm-cm
1001	DO WIND DIR TORQUE
	CW 4 gm-cm
	CCW 4 gm-cm
1005	BAROMETER READING
	~~29.98~~ 29.92
1010	Start PUTTING MET BACK TOGETHER
1040	Leaving the Job Site
1230	off the Job.

THIRD QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility, Kings County, CA

Submitted to:
Chemical Waste Management, Inc, Kings County, CA

Submitted by:
AMEC Geomatrix, Inc., Fresno, CA

October 1, 2009

Project 8151.006

October 1, 2009

Project 8151.006

Mr. Paul Turek
Chemical Waste Management, Inc.
35251 Old Skyline Road
Kettleman City, California 93239

Subject: Third Quarter 2009 Meteorological Station Audit Report
Kettleman Hills Facility, Kings County, California

Dear Mr. Turek:

AMEC Geomatrix, Inc. (AMEC), is pleased to submit the enclosed Third Quarter 2009 Meteorological Station Audit Report for the Chemical Waste Management, Inc., Kettleman Hills facility in Kings County, California. This report documents the weather station audit performed by AMEC on September 2, 2009. The audit was completed in general accordance with U.S. Environmental Protection Agency and equipment manufacturer guidelines.

Please call either of the undersigned if you have any questions or if we may provide additional information.

Sincerely yours,
AMEC Geomatrix, Inc.

for

Martin Spongberg, PhD, PE, PG
Senior Engineer

Philip F. Ross, PG
Principal Hydrogeologist

Enclosure

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AMEC Geomatrix, Inc.
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www.amecgeomatrixinc.com

AMEC Geomatrix

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THIRD QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility, Kings County, CA

Submitted to:
Chemical Waste Management, Inc, Kings County, CA

Submitted by:
AMEC Geomatrix, Inc., Fresno, CA

October 1, 2009

Project 8151.006

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METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility
Kings County, California

1.0 INTRODUCTION

AMEC Geomatrix, Inc. (AMEC), has prepared this Third Quarter 2009 Meteorological Station Audit Report for the Chemical Waste Management, Inc. (CWMI), Kettleman Hills facility (KHF) in Kings County, California. This report documents the meteorological station (MET Station) audit performed by AMEC on September 2, 2009. The audit of the MET Station was completed in general accordance with U.S. Environmental Protection Agency (EPA) and equipment manufacturer guidelines.

2.0 BACKGROUND

This section presents background information on the KHF and the MET Station.

2.1 SITE LOCATION AND OPERATIONS

The KHF is located in Kings County, California, approximately 3 miles west of Interstate 5 and immediately north of State Route 41. The nearest towns are Avenal and Kettleman City, located about 8 miles northwest and 5 miles northeast of the KHF, respectively (Figure 1).

The KHF has been operated by CWMI since 1979 when the site was purchased from Environmental Disposal Services (EDS). The operations conducted by EDS consisted of solar evaporation in surface impoundments, land farming, and waste burial in cells. Current permitted activities at the KHF include solar evaporation in lined surface impoundments, waste stabilization, burial of solid wastes, and drum storage. Active waste management units (WMUs) currently include the drum storage unit, final stabilization unit, and polychlorinated biphenyl flushing/storage unit. In November 1998, the site was permitted to accept Class II designated waste and Class III municipal solid waste in landfill B-19. The B-17 landfill, a new Class II/III WMU, has been permitted and began receiving designated and municipal solid waste on February 26, 2009. Active land disposal units currently include landfills B-17, B-18, and B-19 and surface impoundments P-09, P-14, and P-16.

2.2 METEOROLOGICAL STATION COMPONENTS

The MET Station is a multiple component weather station located on the hilltop between landfill B-18 and proposed landfill B-20. Horizontal wind speed and horizontal wind direction sensors are installed 10 meters (m) above the ground surface on top of a tower. An ambient

temperature sensor is installed 1.7 m above the ground surface. At ground level, the MET Station includes components measuring precipitation and barometric pressure. Manufacturer information for each component is contained in Table 1.

2.3 Calibration, Audit, and Maintenance Schedule

The MET Station is operated and maintained according to equipment manufacturer guidelines (Campbell Scientific, 2004a; 2004b; 2005; and 2006). Calibrations and audits of the system are conducted in general accordance with the guidelines published by the manufacturers and the U.S. EPA (U.S. EPA, 1994a; 1994b; and 1994c).

Calibration and maintenance of the MET Station is conducted semiannually in the second and fourth quarters. Performance audits are conducted four times per year. This report documents the third quarter 2009 audit conducted in September.

3.0 AUDIT EQUIPMENT, PROCEDURE, AND ACCURACY TOLERANCE LIMITS

The audit was performed by AMEC staff with the equipment described in this section.

3.1 Audit Equipment

Known audit wind speeds were generated with a R.M. Young Model 18811 selectable-speed anemometer drive. For auditing the wind direction sensor, a Model 18112 Vane Angle Bench Stand and a Suunto KB-14 precision compass were used. Starting threshold torque of the wind speed and wind direction sensors were measured with a R.M. Young Model 18312 Torque Disc and a R.M. Young Model 18331 Vane Torque Gauge, respectively.

Reference temperatures were measured with a Control Company Model 4110 Universal digital thermometer with a certification traceable to the National Institute of Standards and Technology. A water bath was used to produce three different audit temperatures. The rain gauge was audited using a graduated cylinder with a control valve.

3.2 Audit Procedure

MET Station audits are performed in general accordance with equipment manufacturer and U.S. EPA guidelines.

3.2.1 Wind Speed

Before auditing the wind speed sensor, the wind speed propeller is inspected to determine that it is secure. Bearings are inspected to make sure the sensor is freely moving. The propeller is removed and threshold torque is measured with a torque gauge.

An anemometer drive is connected to the propeller shaft. To audit the wind speed sensor, the anemometer drive was operated at speeds ranging from about 300 to 8,000 revolutions per minute (rpm), corresponding to audit wind speeds up to about 90 miles per hour (mph). A manufacturer-supplied equation (mph = 0.01145 x rpm) is used to convert from rotation rate to wind speed. The wind speed sensor response at each audit wind speed is collected from the data logger for comparison with the calculated wind speed.

3.2.2 Wind Direction

The equipment is inspected to make sure that all connections are secure and the sensor is freely moving. Threshold velocity in the clockwise and counter-clockwise directions is measured with a torque meter pressed against the vane 10 centimeters from the pivot point with increasing force until the vane starts to move.

To audit the direction sensor, the device is secured to a Model 18112 Vane Angle Bench Stand and a precision compass is used to align the wind direction vane alternately to the north, east, south, and west. At each of these orientations, the vane is immobilized and the orientation recorded on the data logger is collected for comparison with the compass reading.

After auditing the wind speed and wind direction sensors, the propeller is secured to the propeller shaft.

3.2.3 Ambient Temperature

The temperature-sensing system is audited at three temperatures ranging from about freezing to more than 100 degrees Fahrenheit (°F). The lowest temperature is achieved by adding ice to a water bath. The highest temperature is maintained by placing a water-heating coil in the water bath. The middle reading is taken in tap water with a temperature approximately equal to the ambient temperature. At each audit temperature, the temperature sensor and the audit thermometer are immersed in the bath and the readings for each sensor are recorded for comparison.

3.2.4 Precipitation

Prior to audit testing, the precipitation gauge is inspected to make sure the collection funnel is clear of obstructions. Accumulated debris, if present, is removed.

The precipitation gauge is audited by adding a known volume of water at a slow, controlled rate into the gauge. A manufacturer-supplied function is used to convert the water volume in milliliters to an equivalent precipitation depth in inches. A volume equivalent to about 1 inch of precipitation is added to the gauge over a period of 45 minutes or greater. The precipitation gauge reading is then collected from the data logger and compared to the measured input volume (converted into equivalent rainfall depth).

3.2.5 Barometric Pressure Sensor

Prior to auditing the barometric pressure sensor, all connections and the housing are inspected to assess whether they are secure and undamaged. The external case is cleaned with a damp cloth.

To audit the sensor, the barometric pressure reading on the data logger is recorded for comparison with barometric readings from nearby National Weather Service Station KHJO at the Hanford Municipal Airport.

3.3 Audit Accuracy Tolerance Limits

For each component of the MET Station system, the audit inputs are compared with the values measured by each sensor and recorded on the data logger. Accuracy tolerance limits for audits are listed in Table 2. System components that are not performing within the manufacturer-recommended tolerance limits are evaluated for repair, replacement, or recalibration.

4.0 PERFORMANCE AUDIT RESULTS

System performance is determined by comparing the readings of the system sensors with known audit input values. The equipment was audited on September 2, 2009, and the collected data are presented below and in Tables 3 through 5.

4.1 Wind Speed

Information collected during the wind speed sensor audit is listed in Table 3. This information includes: the input rotation rate, calculated wind speed, recorded wind speed, and the difference between the calculated and recorded wind speed. All audit measurements were within 0.6 mph of the calculated velocity, which meets the manufacturer-recommended accuracy tolerance limit.

Starting threshold torque was less than 1 gram-centimeter (g-cm) in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.2 Wind Direction

Information collected during the wind direction audit is listed in Table 4. This information includes: the reference orientation set with a compass, the orientation detected by the sensor, and the difference between these two measurements. All audit measurements met the accuracy tolerance limit.

Starting threshold torque was measured at 4 g-cm in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.3 AMBIENT TEMPERATURE

Information collected during the temperature sensor audit is listed in Table 5. This information includes: the audit reference temperatures, the temperatures recorded by the MET Station sensor, and the difference between the two measurements. All audit measurements were within 0.4 °F of the reference temperature, which meets the manufacturer-recommended accuracy tolerance limit.

4.4 PRECIPITATION

A volume corresponding to 1 inch of precipitation was added to the rain gauge. The data logger recorded 1.00 inch of precipitation, which meets the accuracy tolerance limit of 0.03 inch (3 percent of the input).

4.5 BAROMETRIC PRESSURE

The barometer reading taken during this audit at 11:00 a.m. was 29.94 inches of mercury (in Hg), or 1,014 millibars (mb). The reading from the nearby official gauge at Station KHJO at 10:53 a.m. indicated a barometric pressure of 29.94 in Hg (1,014 mb). The difference in readings between the site and control barometers was less than 2 mb, which meets the manufacturer-recommended accuracy tolerance limit.

5.0 SUMMARY

During audit testing, wind speed, wind direction, temperature, precipitation, and barometric pressure sensors all performed within the accuracy tolerance limits specified by the equipment manufacturer.

6.0 REFERENCES

Campbell Scientific, 2004, Instruction Manual, Model 107 Temperature Probe, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004a).

Campbell Scientific, 2004, Instruction Manual, TE525 Tipping Bucket Rain Gage, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004b).

Campbell Scientific, 2005, Instruction Manual, CS100 Barometric Pressure Sensor, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2005).

Campbell Scientific, 2006, R.M. Young Wind Monitors, Campbell Scientific (Canada) Corp., (Campbell Scientific, 2006).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, Principles, U.S. EPA Document 600/9-76-005 (U.S. EPA, 1994a).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, U.S. EPA Document 600/4-77/027a (U.S. EPA, 1994b).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Methods, U.S. EPA Document 600/4-82-060 (U.S. EPA, 1994c).

amec

TABLE 1

METEOROLOGICAL STATION SYSTEM COMPONENTS

Kettleman Hills Facility
Kings County, California

Parameter	Manufacturer	Model Number	Range
Wind Speed	R.M. Young	05305	0 to 90 mph [1]
Wind Direction	R.M. Young	05305	0 to 360 degrees [2]
Temperature	Campbell Scientific	TE525	-31 to 122 °F [3]
Barometric Pressure	Campbell Scientific	CS100	600 to 1100 mb [4]
Precipitation	Campbell Scientific	107	NA [5]

1. Wind speed reported in miles per hour (mph), measured at 10 meters above ground level.
2. Wind direction reported in degrees of rotation from true north, measured at 10 meters above ground level. Degrees of rotation increase clockwise.
3. Temperature measured in degrees Fahrenheit (°F) at 1.7 meters above ground level.
4. Barometric pressure measured in millibars (mb).
5. NA = not applicable.

TABLE 2

ACCURACY TOLERANCE LIMITS

Kettleman Hills Facility
Kings County, California

Parameter	Accuracy Tolerance Limits
Wind Speed	± 0.6 mph [1]
Wind Direction	± 5 degrees [2]
Wind Speed Starting Threshold Torque	1 g-cm [3]
Wind Direction Starting Threshold Torque	9 g-cm [3]
Temperature	± 0.4 °F [4]
Barometric Pressure	± 2 mb [5]
Precipitation	± 3 percent of input

1. Wind speed measured in miles per hour (mph). "±" = plus or minus;
2. Wind direction measured in degrees of rotation from true north. Degrees of rotation increase clockwise.
3. Starting threshold is the minimum applied torque needed to move the sensors. Torque is measured in gram-centimeters (g-cm).
4. Temperature measured in degrees Fahrenheit (°F).
5. Barometric pressure measured in millibars (mb).

TABLE 3

HORIZONTAL WIND SPEED AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Input Rate [2] (rpm)	Calculated Velocity [3] (mph)	Recorded Velocity [4] (mph)	Difference [5] (mph)
1	300	3.43	3.43	0.00
2	600	6.87	6.87	0.00
3	1,000	11.45	11.45	0.00
4	1,500	17.17	17.17	0.00
5	2,500	28.62	28.17	-0.45
6	4,000	45.80	45.80	0.00
7	8,000	91.60	91.60	0.00

1. Audited on September 2, 2009, starting at 10:38 a.m.
2. Input rotation rate in revolutions per minute (rpm) by a R.M. Young Model 18811 anemometer drive.
3. Calculated wind velocity in miles per hour (mph) converted from rpm with a manufacturer-supplied function: (Input rate in rpm) * 0.01145 = velocity in mph
4. Wind speed in mph recorded by the sensor.
5. Difference between recorded and calculated wind speed expressed in mph (accuracy tolerance limit is ± 0.6 mph).

TABLE 4

HORIZONTAL WIND DIRECTION AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Reference Orientation [2] (degrees)	Recorded Orientation [3] (degrees)	Difference [4] (degrees)
1	0	0.24	0.24
2	90	88.13	-1.87
3	180	177.48	-2.52
4	270	267.86	-2.14

1. Audited on September 2, 2009, starting at 10:24 a.m.
2. Reference orientation in degrees (measured from true north) measured with a Suunto KB-14 precision compass. Degrees of rotation increase clockwise.
3. Orientation detected by the wind direction sensor (R.M. Young Model 05305) in degrees measured from true north. Degrees of rotation increase clockwise.
4. Difference between recorded and reference orientation in degrees. Accuracy tolerance limit is ± 5 degrees.

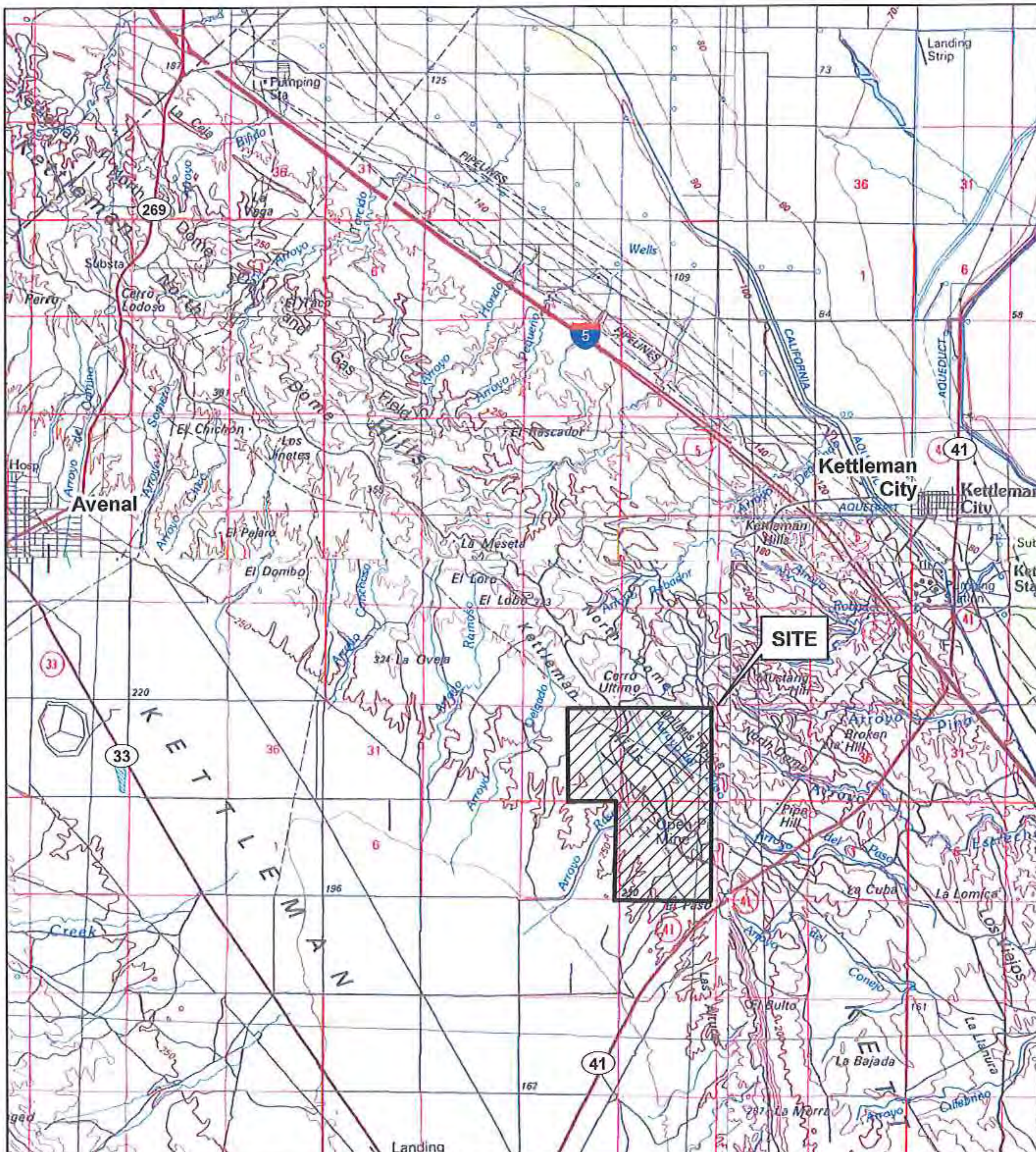
TABLE 5

AMBIENT TEMPERATURE AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Reference Temperature [2] (°F)	Recorded Temperature [3] (°F)	Difference [4] (°F)
1	35.7	35.52	-0.18
2	92.1	92.09	-0.01
3	116.9	116.83	-0.07

1. Audited on September 2, 2009, starting at 10:54 a.m.
2. Reference temperature in degrees Fahrenheit (°F) measured with a Control Company Model 4110 Universal digital thermometer.
3. Temperature detected in °F by the temperature sensor (Campbell Scientific Model TE525).
4. Difference between recorded and reference temperature in °F. Accuracy tolerance limit is ± 0.4 °F.



APPROXIMATE SCALE IN FEET
0 4,000 8,000

0 1,200 2,400
APPROXIMATE SCALE IN METERS

Basemap modified from National Geographic Society TOPO!
(U. S. Geological Survey topographical map mosaic dataset).

SITE LOCATION MAP
Kettleman Hills Facility
Kings County, California

By: KLU	Date: 05/18/2009	Project No. 8151.006
	AMEC Geomatrix	Figure 1

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APPENDIX A

Audit Field Records

DAILY FIELD RECORD

amec

Project and Task Number: 8151.000	Date: 9-2-09
Project Name: KHF MET	Field Activity: MET AUDIT. CORRECT.
Location: KHF BA	Weather:

PERSONNEL: Name	Company	Time In	Time Out
ALEX O	AMEC	0930	1315
STEVE V	AMEC	0930	1315

PERSONAL SAFETY CHECKLIST

	Steel-toed Boots		Hard Hat		Tyvek Coveralls
	Rubber Gloves		Safety Goggles		1/2-Face Respirator

DRUM I.D.	DESCRIPTION OF CONTENTS AND QUANTITY	LOCATION

TIME	DESCRIPTION OF WORK PERFORMED			
0945	MOVE TO MET STATION			
	BEGIN TEARING APART MET			
0946	NEED KEY TO ACCESS MET			
	WENT BACK TO GET KEY FROM PAUL, PAUL HAD			
	NO IDEA ABOUT KEY			
1006	WITH PAUL TUREK'S PERMISSION CUT LOCK			
	ON MET W/ BOLT CUTTERS			
1010	START RAIN GAUGE.			
1024	WIND DIRECTION	REF	ACTUAL	
		0	0.24	
		90	88.13	
		180	177.48	
		270	267.86	
1038	WIND SPEED	REF	MPH	RPM
		300	3.43	300
		600	6.87	600
		1000	11.45	1000

DAILY FIELD RECORD (continued)

Geomatrix

Project and Task Number: 9151.000 | Date: 9-2-09

TIME	DESCRIPTION OF WORK PERFORMED
	1500 17.17 1500
	2500 28.17 2500
	4000 45.80 4000
	8000 91.60 8000
1045	DO WIND SPEED TORQUE
	CW — .3 gm-cm
	CCW — .3 gm-cm
	DO WIND DIR TORQUE
1050	CW - 4 gm-cm
	CCW - 4 gm-cm
1054	DO TEMPERATURE REF GAUGE
	AMBIENT 92.10 92.09
	COLD 35.7 35.52
	HOT 116.9 116.83
1100	DO BAROMETER READING
	29.97 in Hg
1105	PUT MET BACK TOGETHER
1120	GOT RAIN GAUGE FROM PAUL
	1.00 in
1130	Sign out left site
1300	arrive back at office
	in load truck
1310	back in office got Barometer reading off
	web site
	29.94
1315	DONE W/ JOB

H:\TEMPLATE\Field Forms\Daily Field Record Pg2.doc

amec

FOURTH QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility, Kings County, CA

Submitted to:

Chemical Waste Management, Inc, Kings County, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

December 21, 2009

Project 8151.006

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December 21, 2009

Project 8151.006

Mr. Paul Turek
Chemical Waste Management, Inc.
35251 Old Skyline Road
Kettleman City, California 93239

Subject: **Fourth Quarter 2009 Meteorological Station Audit Report**
Kettleman Hills Facility, Kings County, California

Dear Mr. Turek:

AMEC Geomatrix, Inc. (AMEC), is pleased to submit the enclosed Fourth Quarter 2009 Meteorological Station Audit Report for the Chemical Waste Management, Inc., Kettleman Hills facility in Kings County, California. This report documents the weather station audit performed by AMEC on December 8, 2009. The audit was completed in general accordance with U.S. Environmental Protection Agency and equipment manufacturer guidelines.

Please call either of the undersigned if you have any questions or if we may provide additional information.

Sincerely yours,
AMEC Geomatrix, Inc.

Martin Spongberg, PhD, PE, PG
Senior Engineer

Philip P. Ross, PG
Principal Hydrogeologist

Enclosure

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AMEC Geomatrix

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FOURTH QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility, Kings County, CA

Submitted to:

Chemical Waste Management, Inc, Kings County, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

December 21, 2009

Project 8151.006

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FOURTH QUARTER 2009
METEOROLOGICAL STATION AUDIT REPORT
Kettleman Hills Facility
Kings County, California

1.0 INTRODUCTION

AMEC Geomatrix, Inc. (AMEC), has prepared this Fourth Quarter 2009 Meteorological Station Audit Report for the Chemical Waste Management, Inc. (CWMI), Kettleman Hills facility (KHF) in Kings County, California. This report documents the meteorological station (MET Station) audit performed by AMEC on December 8, 2009. The audit of the MET Station was completed in general accordance with U.S. Environmental Protection Agency (EPA) and equipment manufacturer guidelines.

2.0 BACKGROUND

This section presents background information on the KHF and the MET Station.

2.1 SITE LOCATION AND OPERATIONS

The KHF is located in Kings County, California, approximately 3 miles west of Interstate 5 and immediately north of State Route 41. The nearest towns are Avenal and Kettleman City, located about 8 miles northwest and 5 miles northeast of the KHF, respectively (Figure 1).

The KHF has been operated by CWMI since 1979 when the site was purchased from Environmental Disposal Services (EDS). The operations conducted by EDS consisted of solar evaporation in surface impoundments, land farming, and waste burial in cells. Current permitted activities at the KHF include solar evaporation in lined surface impoundments, waste stabilization, burial of solid wastes, and drum storage. Active waste management units (WMUs) currently include the drum storage unit, final stabilization unit, and polychlorinated biphenyl flushing/storage unit. In November 1998, the site was permitted to accept Class II designated waste and Class III municipal solid waste in landfill B-19. The B-17 landfill, a new Class II/III WMU, has been permitted and began receiving designated and municipal solid waste on February 26, 2009. Active land disposal units currently include landfills B-17, B-18, and B-19 and surface impoundments P-09, P-14, and P-16.

2.2 METEOROLOGICAL STATION COMPONENTS

The MET Station is a multiple component weather station located on the hilltop between landfill B-18 and proposed landfill B-20. Horizontal wind speed and horizontal wind direction sensors are installed 10 meters (m) above the ground surface on top of a tower. An ambient

temperature sensor is installed 1.7 m above the ground surface. At ground level, the MET Station includes components measuring precipitation and barometric pressure. Manufacturer information for each component is contained in Table 1.

2.3 CALIBRATION, AUDIT, AND MAINTENANCE SCHEDULE

The MET Station is operated and maintained according to equipment manufacturer guidelines (Campbell Scientific, 2004a; 2004b; 2005; and 2006). Calibrations and audits of the system are conducted in general accordance with the guidelines published by the manufacturers and the U.S. EPA (U.S. EPA, 1994a; 1994b; and 1994c).

Calibration and maintenance of the MET Station is conducted semiannually in the second and fourth quarters. Performance audits are conducted four times per year. This report documents the fourth quarter 2009 audit conducted in December.

3.0 AUDIT EQUIPMENT, PROCEDURE, AND ACCURACY TOLERANCE LIMITS

The audit is performed by AMEC staff with the equipment described in this section.

3.1 AUDIT EQUIPMENT

Known audit wind speeds are generated with a R.M. Young Model 18802 selectable-speed anemometer drive. For auditing the wind direction sensor, a R.M. Young Model 18112 Vane Angle Bench Stand is used. Starting threshold torque of the wind speed and wind direction sensors are measured with a R.M. Young Model 18312 Torque Disc and a R.M. Young Model 18331 Vane Torque Gauge, respectively.

Reference temperatures are measured with a Control Company Model 4110 Universal digital thermometer with a certification traceable to the National Institute of Standards and Technology. The temperature sensor is checked at three different audit temperatures. The rain gauge is audited by filling a calibration bottle with 870 milliliters of water using a graduated cylinder. The bottle is inverted into the rain gauge and drips into the tipping bucket over a period of 45 minutes to simulate 1 inch of rainfall.

3.2 AUDIT PROCEDURE

MET Station audits are performed in general accordance with equipment manufacturer and U.S. EPA guidelines. For each component of the MET Station system, the audit inputs are compared with the values measured by each sensor and recorded on the data logger. Accuracy tolerance limits for audits are listed in Table 2. System components that are not performing within the manufacturer-recommended tolerance limits are evaluated for repair, replacement, or recalibration.

3.2.1 Wind Speed

Before auditing the wind speed sensor, the wind speed propeller is inspected to determine that it is secure. Bearings are inspected to make sure the sensor is freely moving. The propeller is removed and threshold torque is measured with a torque gauge.

An anemometer drive is connected to the propeller shaft. To audit the wind speed sensor, the anemometer drive was operated at speeds ranging from about 300 to 8,000 revolutions per minute (rpm), corresponding to audit wind speeds up to about 90 miles per hour (mph). A manufacturer-supplied equation (mph = 0.01145 x rpm) is used to convert from rotation rate to wind speed. The wind speed sensor response at each audit wind speed is collected from the data logger for comparison with the calculated wind speed.

3.2.2 Wind Direction

The equipment is inspected to make sure that all connections are secure and the sensor is freely moving. Threshold velocity in the clockwise and counter-clockwise directions is measured with a torque meter pressed against the vane, 10 centimeters from the pivot point, with increasing force until the vane starts to move.

To audit the direction sensor, the device is secured to a R.M. Young Model 18112 Vane Angle Bench Stand and the stand is aligned with a north arrow marked on the weather station's cement pad. The wind direction vane is aligned alternately to the north, east, south, and west. At each of these orientations, the vane is immobilized and the orientation recorded on the data logger is collected for comparison with the compass reading.

After auditing the wind speed and wind direction sensors, the propeller is secured to the propeller shaft.

3.2.3 Ambient Temperature

The temperature-sensing system is audited at three temperatures ranging from about freezing to more than 100 degrees Fahrenheit (°F). The lowest temperature is achieved by adding ice to a water bath. The highest temperature is maintained by placing a container of water on a hot pad. The middle reading is taken in air at ambient temperature. At each audit temperature, the temperature sensor and the audit thermometer readings are recorded for comparison.

3.2.4 Precipitation

Prior to audit testing, the precipitation gauge is inspected to make sure the collection funnel is clear of obstructions. Accumulated debris, if present, is removed.

The precipitation gauge is audited by adding a known volume of water at a slow, controlled rate into the gauge. A manufacturer-supplied function is used to convert the water volume in milliliters to an equivalent precipitation depth in inches. A volume equivalent to about 1 inch of precipitation is added to the gauge over a period of 45 minutes or greater. The precipitation gauge reading is then collected from the data logger and compared to the measured input volume (converted into equivalent rainfall depth).

3.2.5 Barometric Pressure Sensor

Prior to auditing the barometric pressure sensor, all connections and the housing are inspected to assess whether they are secure and undamaged. The external case is cleaned with a damp cloth.

To audit the sensor, the barometric pressure reading on the data logger is recorded for comparison with barometric readings from nearby National Weather Service Station KHJO at the Hanford Municipal Airport.

4.0 PERFORMANCE AUDIT RESULTS

System performance is determined by comparing the readings of the system sensors with known audit input values. The equipment was audited on December 8, 2009, and the collected data are presented below and in Tables 3 through 5.

4.1 Wind Speed

Information collected during the wind speed sensor audit is listed in Table 3. This information includes: the input rotation rate, calculated wind speed, recorded wind speed, and the difference between the calculated and recorded wind speed. All audit measurements were within 0.6 mph of the calculated velocity, which meets the manufacturer-recommended accuracy tolerance limit.

Starting threshold torque was less than 1 gram-centimeter (g-cm) in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.2 Wind Direction

Information collected during the wind direction audit is listed in Table 4. This information includes: the reference orientation, the orientation detected by the sensor, and the difference between these two measurements. All audit measurements met the accuracy tolerance limit.

Starting threshold torque was measured at 4 g-cm in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.3 AMBIENT TEMPERATURE

Information collected during the temperature sensor audit is listed in Table 5. This information includes: the audit reference temperatures, the temperatures recorded by the MET Station sensor, and the difference between the two measurements. All audit measurements were within 0.4 °F of the reference temperature, which meets the manufacturer-recommended accuracy tolerance limit.

4.4 PRECIPITATION

A volume corresponding to 1 inch of precipitation was added to the rain gauge. The data logger recorded 0.99 inch of precipitation, which meets the accuracy tolerance limit of 0.03 inch (3 percent of the input).

4.5 BAROMETRIC PRESSURE

The barometer reading, taken at 12:30 p.m., was 30.08 inches of mercury (in Hg), or 1,019 millibars (mb). The 12:39 p.m. reading from the control barometer at Station KHJO (http://www.wunderground.com/history/airport/KHJO/2009/12/8/DailyHistory.html) was 30.12 in Hg (1,020 mb). The difference in readings between the site and control barometers was less than 2 mb, which meets the manufacturer-recommended accuracy tolerance limit.

5.0 SUMMARY

During audit testing, wind speed, wind direction, temperature, precipitation, and barometric pressure sensors all performed within the accuracy tolerance limits specified by the equipment manufacturer.

6.0 REFERENCES

Campbell Scientific, 2004, Instruction Manual, Model 107 Temperature Probe, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004a).

Campbell Scientific, 2004, Instruction Manual, TE525 Tipping Bucket Rain Gage, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004b).

Campbell Scientific, 2005, Instruction Manual, CS100 Barometric Pressure Sensor, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2005).

Campbell Scientific, 2006, R.M. Young Wind Monitors, Campbell Scientific (Canada) Corp., (Campbell Scientific, 2006).

Station KHJO weather history (http://www.wunderground.com/history/airport/KHJO/2009/12/8/DailyHistory.html).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, Principles, U.S. EPA Document 600/9-76-005 (U.S. EPA, 1994a).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, U.S. EPA Document 600/4-77/027a (U.S. EPA, 1994b).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Methods, U.S. EPA Document 600/4-82-060 (U.S. EPA, 1994c).

TABLE 1

METEOROLOGICAL STATION SYSTEM COMPONENTS

Kettleman Hills Facility
Kings County, California

Parameter	Manufacturer	Model Number	Range
Wind Speed	R.M. Young	05305	0 to 90 mph [1]
Wind Direction	R.M. Young	05305	0 to 360 degrees [2]
Temperature	Campbell Scientific	TE525	-31 to 122 °F [3]
Barometric Pressure	Campbell Scientific	CS100	600 to 1100 mb [4]
Precipitation	Campbell Scientific	107	NA [5]

1. Wind speed reported in miles per hour (mph), measured at 10 meters above ground level.
2. Wind direction reported in degrees of rotation from true north, measured at 10 meters above ground level. Degrees of rotation increase clockwise.
3. Temperature measured in degrees Fahrenheit (°F) at 1.7 meters above ground level.
4. Barometric pressure measured in inches of mercury and converted to millibars (mb).
5. NA = not applicable.

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TABLE 2

ACCURACY TOLERANCE LIMITS

Kettleman Hills Facility
Kings County, California

Parameter	Accuracy Tolerance Limits
Wind Speed	± 0.6 mph [1]
Wind Direction	± 5 degrees [2]
Wind Speed Starting Threshold Torque	≤ 1 g-cm [3]
Wind Direction Starting Threshold Torque	≤ 9 g-cm [3]
Temperature	± 0.4 °F [4]
Barometric Pressure	± 2 mb [5]
Precipitation	± 3 percent of input

1. Wind speed measured in miles per hour (mph). "±" = plus or minus;
2. Wind direction measured in degrees of rotation from true north.
   Degrees of rotation increase clockwise.
3. Starting threshold is the minimum applied torque needed to move the sensors.
   Torque is measured in gram-centimeters (g-cm).
4. Temperature measured in degrees Fahrenheit (°F).
5. Barometric pressure measured in inches of mercury and converted to millibars (mb).

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TABLE 3

HORIZONTAL WIND SPEED AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Input Rate [2] (rpm)	Calculated Velocity [3] (mph)	Recorded Velocity [4] (mph)	Difference [5] (mph)
1	300	3.44	3.43	-0.01
2	600	6.87	6.87	0.00
3	1,000	11.45	11.45	0.00
4	1,500	17.18	17.17	-0.01
5	2,500	28.63	28.63	0.00
6	4,000	45.80	45.80	0.00
7	8,000	91.60	91.60	0.00

1. Audited on December 8, 2009, starting at 12:05 p.m.
2. Input rotation rate in revolutions per minute (rpm) by a R.M. Young Model 18802 anemometer drive.
3. Calculated wind velocity in miles per hour (mph) converted from rpm with a manufacturer-supplied function: (Input rate in rpm) * 0.01145 = velocity in mph
4. Wind speed in mph recorded by the sensor.
5. Difference between recorded and calculated wind speed expressed in mph (accuracy tolerance limit is ± 0.6 mph).

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TABLE 4

HORIZONTAL WIND DIRECTION AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Reference Orientation [2] (degrees)	Recorded Orientation [3] (degrees)	Difference [4] (degrees)
1	0	1.31	1.31
2	90	88.12	-1.88
3	180	179.38	-0.62
4	270	266.68	-3.32

1. Audited on December 8, 2009, starting at 11:59 a.m.
2. Reference orientation in degrees (measured from true north) are from reference points inscribed on MET station. Degrees of rotation increase clockwise.
3. Orientation detected by the wind direction sensor (R.M. Young Model 05305) in degrees measured from true north. Degrees of rotation increase clockwise.
4. Difference between recorded and reference orientation in degrees. Accuracy tolerance limit is ± 5 degrees.

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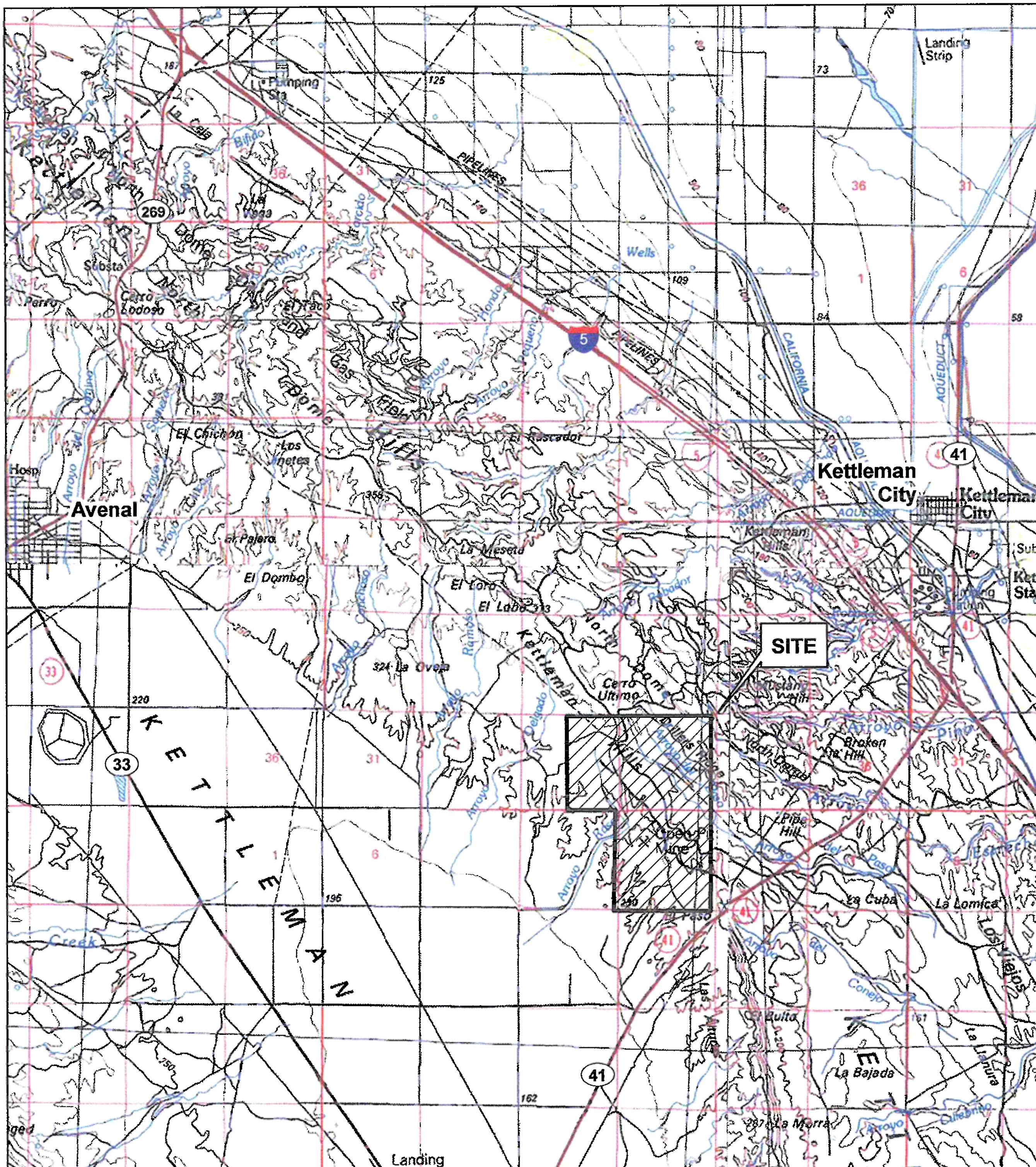
TABLE 5

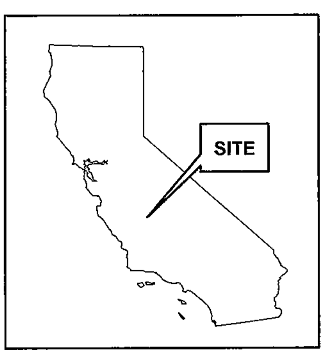
AMBIENT TEMPERATURE AUDIT DATA

Kettleman Hills Facility
Kings County, California

Audit Point [1]	Reference Temperature [2] (°F)	Recorded Temperature [3] (°F)	Difference [4] (°F)
1	32.3	32.66	0.36
2	52.8	52.84	0.04
3	121.8	121.86	0.06

1. Audited on December 8, 2009, starting at 12:20 p.m.
2. Reference temperature in degrees Fahrenheit (°F) measured with a Control Company Model 4110 Universal digital thermometer.
3. Temperature detected in °F by the temperature sensor (Campbell Scientific Model TE525).
4. Difference between recorded and reference temperature in °F. Accuracy tolerance limit is ± 0.4 °F.





APPROXIMATE SCALE IN FEET
0 4,000 8,000

0 1,200 2,400
APPROXIMATE SCALE IN METERS

N

Basemap modified from National Geographic Society TOPO! (U. S. Geological Survey topographical map mosaic dataset).

SITE LOCATION MAP
Kettleman Hills Facility
Kings County, California

By: KLU	Date: 05/18/2009	Project No. 8151.006
AMEC Geomatrix		Figure 1

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APPENDIX A

Audit Field Records

DAILY FIELD RECORD

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Project and Task Number: 8151.006	Date: 12-8-09
Project Name: KHF MET STATION	Field Activity: MET CAL
Location: KHF FACILITY	Weather:

PERSONNEL: Name	Company	Time In	Time Out
ALEK O	AMEC	0900	1450
~~A~~ STEVE U	AMEC	0900	1450

PERSONAL SAFETY CHECKLIST

	Steel-toed Boots		Hard Hat		Tyvek Coveralls
	Rubber Gloves		Safety Goggles		1/2-Face Respirator

DRUM I.D.	DESCRIPTION OF CONTENTS AND QUANTITY	LOCATION

TIME	DESCRIPTION OF WORK PERFORMED			
1125	ARRIVE ON SITE, SIGNED IN			
	CHECKED IN W/ PAUL TURER			
1141	MOVE UP TO MET			
1147	START TEARING DOWN MET STATION			
1159	DO WIND DIRECTION	REF	ACTUAL	
		0	1.31	
		90	88.12	
		180	179.38	
		270	266.68	
1202	START RAIN GAUGE			
1205	DO WIND SPEED	REF	MPH	RPM
		300	3.43	300
		600	6.87	600
		1000	11.45	1000
		1500	17.17	1500
		2500	28.63	2500
		4000	45.80	4000
		8000	91.60	8000

DAILY FIELD RECORD (continued)

Geomatrix

Project and Task Number: 8151.006	Date: 12-8-09

TIME	DESCRIPTION OF WORK PERFORMED
1210	DO WIND SPEED TORQUE
	CW - .3 gm-cm
	CCW - .3 gm-cm
1215	DO WIND ~~SPEED~~ DIR TORQUE
	CW - 4 gm-cm
	CCW - 4 gm-cm
1220	DO TEMPERATURE REF GAUGE
	AMBIENT 52.8 52.84
	COLD 32.3 32.66
	HOT 121.8 121.86
1230	DO BAROMETER READING - 30.08
1235	PUT MET BACK TOGETHER, CLEAN UP
1300	TALK W/ PAUL GET RAIN GAUGE MEASUREMENT
	- 0.99 INCHES
1305	SIGN OUT, LEFT SITE
1439	ARRIVE BACK AT OFFICE UNLOAD TRUCK
1445	NOAA BAROMETER READING
	AT 1300 30.14
1450	DONE W/ JOB

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FIRST SEMIANNUAL 2009 METEOROLOGICAL STATION CALIBRATION REPORT

Kettleman Hills Facility
Kings County, CA

Submitted to:

Chemical Waste Management, Inc., Kings County, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

June 26, 2009

Project 8151.006

amec

June 26, 2009

Project 8151.006

Mr. Paul Turek
Chemical Waste Management, Inc.
35251 Old Skyline Road
Kettleman City, California 93239

Subject: **First Semiannual 2009 Meteorological Station Calibration Report**
Kettleman Hills Facility, Kings County, California

Dear Mr. Turek:

AMEC Geomatrix, Inc. (AMEC), is pleased to submit the enclosed First Semiannual 2009 Meteorological Station Calibration Report for the Chemical Waste Management, Inc., Kettleman Hills facility in Kings County, California. This report documents the weather station calibration and maintenance performed by AMEC on May 27, 2009. The field calibration was completed in general accordance with U.S. Environmental Protection Agency and equipment manufacturer guidelines.

Please call either of the undersigned if you have any questions or if we may provide additional information.

Sincerely yours,
AMEC Geomatrix, Inc.

for

Martin E. Spongberg, PhD, PE, PG
Senior Engineer

Philip P. Ross, PG
Principal Hydrogeologist

Enclosure

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AMEC Geomatrix

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FIRST SEMIANNUAL 2009 METEOROLOGICAL STATION CALIBRATION REPORT

Kettleman Hills Facility
Kings County, CA

Submitted to:

Chemical Waste Management, Inc., Kings County, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

June 26, 2009

Project 8151.006

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FIGURE

APPENDIX

FIRST SEMIANNUAL 2009
METEOROLOGICAL STATION CALIBRATION REPORT
Kettleman Hills Facility
Kings County, California

1.0 INTRODUCTION

AMEC Geomatrix, Inc. (AMEC), is submitting the enclosed First Semiannual 2009 Meteorological Station Calibration Report for the Chemical Waste Management, Inc. (CWMI), Kettleman Hills facility (KHF) in Kings County, California. This report documents the meteorological station (MET Station) calibration and maintenance performed by AMEC on May 27, 2009. The calibration of the MET Station was completed in general accordance with U.S. Environmental Protection Agency (EPA) and equipment manufacturer guidelines.

2.0 BACKGROUND

This section presents background information on the KHF and MET Station.

2.1 SITE LOCATION AND OPERATIONS

The KHF is located in Kings County, California, approximately 3 miles west of Interstate 5 and immediately north of State Route 41. The nearest towns are Avenal and Kettleman City, located about 8 miles northwest and 5 miles northeast of the KHF, respectively (Figure 1).

The KHF has been operated by CWMI since 1979 when the site was purchased from Environmental Disposal Services (EDS). The operations conducted by EDS consisted of solar evaporation in surface impoundments, land farming, and waste burial in cells. Current permitted activities at the KHF include solar evaporation in lined surface impoundments, waste stabilization, burial of solid wastes, and drum storage. Active waste management units (WMUs) currently include the drum storage unit, final stabilization unit, and polychlorinated biphenyl flushing/storage unit. In November 1998, the site was permitted to accept Class II designated waste and Class III municipal solid waste in landfill B-19. The B-17 landfill, a new Class II/III WMU, has been permitted and began receiving designated and municipal solid waste on February 26, 2009. Active land disposal units currently include landfills B-17, B-18, and B-19 and surface impoundments P-09, P-14, and P-16.

2.2 METEOROLOGICAL STATION COMPONENTS

The MET Station is a multiple component weather station located on the hilltop between landfill B-18 and proposed landfill B-20. Between April 6 and 10, 2009, the MET Station equipment was moved from its previous location near the administration building. The MET

Station equipment was relocated because the build-out of landfill B-19 had the potential to affect wind patterns at the previous location.

Horizontal wind speed and horizontal wind direction sensors are installed 10 meters (m) above the ground surface on top of a tower. An ambient temperature sensor is installed 1.7 m above the ground surface. At ground level, the MET Station includes components measuring precipitation and barometric pressure. Manufacturer information for each component is contained in Table 1.

2.3 CALIBRATION, AUDIT, AND MAINTENANCE SCHEDULE

The MET Station is operated and maintained according to equipment manufacturer guidelines (Campbell Scientific, 2004a, 2004b, 2005, and 2006). Calibrations and audits of the system are conducted in general accordance with the guidelines published by the manufacturers and the U.S. EPA (U.S. EPA, 1994a, 1994b, and 1994c).

Calibration and maintenance of the MET Station is conducted semiannually in the second and fourth quarters. Performance audits are conducted quarterly. This report documents the first semiannual 2009 calibration and maintenance event conducted in May.

3.0 CALIBRATION EQUIPMENT, PROCEDURE, AND ACCURACY TOLERANCE LIMITS

Calibration and maintenance are performed by AMEC staff using the equipment described in Section 3.1. Calibration procedures are described in Section 3.2. Calibration accuracy tolerance limits are explained in Section 3.3.

3.1 CALIBRATION EQUIPMENT

Known calibration wind speeds are generated with a R.M. Young Model 18811 selectable-speed anemometer drive. For calibrating the wind direction sensor, a R.M. Young Model 18112 Vane Angle Bench Stand and a Suunto KB-14 precision compass are used. Starting threshold torque of the wind speed and wind direction sensors are measured with a R.M. Young Model 18312 Torque Disc and a R.M. Young Model 18331 Vane Torque Gauge, respectively.

Reference temperatures are measured with a Control Company Model 4110 Universal digital thermometer with a certification traceable to the National Institute of Standards and Technology. A water bath is used to produce three different calibration temperatures. The rain gauge is calibrated using a graduated cylinder with a control valve.

3.2 CALIBRATION AND MAINTENANCE PROCEDURE

The calibration and maintenance are performed in general accordance with U.S. EPA and equipment manufacturer guidelines.

3.2.1 Wind Speed

Prior to testing the wind speed sensor calibration, the wind speed propeller is inspected to determine that it is secure. Bearings are inspected to make sure the sensor is freely moving. The propeller is removed and threshold torque is measured with a torque gauge. Bearings must be replaced if the starting threshold is greater than 1 gram-centimeters (g-cm).

To test the calibration of the wind speed sensor, an anemometer drive is connected to the propeller shaft. The anemometer drive is operated at speeds ranging from about 300 to 8,000 revolutions per minute, corresponding to calibration wind speeds up to about 90 miles per hour (mph). A manufacturer-supplied equation (mph = 0.01145 x rpm) is used to convert the rotation rate to wind speed. The wind speed sensor response at each calibration wind speed is collected from the data logger for comparison with the calculated wind speed. After calibration, the propeller is secured to the propeller shaft.

The wind speed sensor will be calibrated in the field or returned to the manufacturer for calibration if it does not meet the calibration accuracy tolerance limits. Field calibration consists of adjusting the electronics so that the output speed from the data logger closely matches the input speed produced by the anemometer drive.

3.2.2 Wind Direction

The equipment is inspected to make sure that all connections are secure and the sensor is freely moving. Threshold velocities in the clockwise and counter-clockwise directions are measured with a torque meter pressed against the vane, 10 centimeters from the pivot point, with increasing force until the vane starts to move. The bearings are replaced if the starting threshold is greater than 9 g-cm.

To test the calibration of the direction sensor, the device is secured to a Model 18112 Vane Angle Bench Stand and a precision compass is used to align the wind direction vane alternately to the north, east, south, and west. At each of these orientations, the vane is immobilized and the orientation recorded on the data logger is collected for comparison with the compass reading.

If the vane position and indicator are not within the calibration target (5 degrees), the direction sensor is calibrated in the field (by adjusting the potentiometer coupling inside the main housing) or returned to the manufacturer for calibration.

3.2.3 Ambient Temperature

Calibration of the temperature-sensing system is tested at three temperatures ranging from about freezing to more than 100 degrees Fahrenheit. The low temperature is achieved by adding ice to a water bath. The high temperature is maintained by placing a water-heating coil in the water bath. The middle reading is taken in tap water with a temperature that is approximately equal to the current site temperature. At each calibration temperature, the temperature sensor and the calibration thermometer are immersed in the bath and the readings are recorded.

The temperature sensor cannot be calibrated in the field. If the sensor does not meet the calibration accuracy tolerance limits, it should be replaced or sent to the manufacturer for calibration.

3.2.4 Precipitation

Prior to testing calibration, the precipitation gauge is inspected to make sure the collection funnel is clear of obstructions. Accumulated debris, if present, is removed.

Calibration of the precipitation gauge is tested by adding a known volume of water at a slow, controlled rate into the gauge. A manufacturer-supplied function is used to convert the water volume in milliliters to an equivalent precipitation depth in inches. A volume equivalent to about 1 inch of precipitation is added to the gauge over a period of 45 minutes or greater. The precipitation gauge reading is then collected from the data logger and compared to the measured input volume (converted into rainfall depth).

If the precipitation gauge does not meet the calibration criterion, it is calibrated in the field by making slight adjustments to the calibration screw. After adjustment, another volume of water equivalent to about 1 inch of precipitation is added to the gauge. The procedure is repeated until the difference between the input and measured water volumes meets the calibration performance criterion.

3.2.5 Barometric Pressure Sensor

Prior to calibration of the barometric pressure sensor, all connections and the housing are visually inspected to assess whether they are secure and undamaged. The external case is cleaned with a damp cloth.

To check the calibration, the barometric pressure reading on the data logger is recorded for comparison with a nearby official barometer reading. The barometric pressure sensor cannot be field calibrated. If the sensor does not meet the accuracy tolerance limits it will be replaced or sent to the manufacturer for calibration.

3.3 CALIBRATION ACCURACY TOLERANCE LIMITS

For each component of the MET Station system, the calibration inputs are compared with the values measured by each sensor and recorded on the data logger. The accuracy tolerance limits for each calibration parameter are listed in Table 2.

4.0 CALIBRATION RESULTS

Calibration was tested by comparing the readings of the system sensors with known calibration input values. Equipment that does not meet the calibration accuracy tolerance limits should be adjusted and re-tested in the field, replaced, or sent to the manufacturer for recalibration. The equipment was calibrated on May 27, 2009, and the calibration data are summarized in Tables 3 through 5.

4.1 WIND SPEED

Information collected during the wind speed sensor calibration is listed in Table 3. This information includes: the input rotation rate, calculated wind speed, recorded wind speed, and the difference between the calculated and recorded wind speed.

The wind speed sensor was calibrated at seven wind speeds ranging from about 3 to 90 mph. Six of seven calibration measurements were within 0.6 mph of the calculated velocity, which meets the manufacturer-recommended accuracy tolerance limit. At an input rate of 2,500 rpm (calculated velocity of 28.63 mph), the data logger fluctuated between 28.70 and 27.94 mph. The 28.70 mph measurement meets the recommended accuracy tolerance limit; however, the 27.94 mph measurement differs from the calculated velocity by 0.69 mph, which exceeds the accuracy tolerance limit of 0.6 mph.

Starting threshold torque was 0.3 to 0.4 g-cm in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.2 WIND DIRECTION

Information collected during the wind direction sensor calibration test is listed in Table 4. This information includes: the reference orientation set with a compass, the orientation detected by the sensor, and the difference between these two measurements. The wind direction sensor was operating within the manufacturer-recommended accuracy at each of the calibration points.

Starting threshold torque was measured at 4 g-cm in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limits.

4.3 AMBIENT TEMPERATURE

Information collected during the temperature sensor calibration test is listed in Table 5. This information includes: the calibration reference temperatures, the temperatures recorded by the MET Station sensor, and the difference between the two measurements. All measurements were within the manufacturer-recommended accuracy tolerance limits.

4.4 PRECIPITATION

A volume equivalent to 1 inch of precipitation was added to the rain gauge. The data logger recorded 1.00 inches of precipitation, which meets the accuracy tolerance limit.

4.5 BAROMETRIC PRESSURE

The First Quarter 2009 Meteorological Station Audit Report (AMEC, 2009) stated that the barometer reading did not meet the accuracy tolerance. During this calibration event, the reference barometric pressure reading from the nearby official gauge at Station KHJO indicated a barometric pressure of 29.86 inches of mercury (in Hg) or 1,011 millibars (mb). The barometer reading from the MET Station was 29.63 in Hg (1,003 mb), which is 8 mb different than the reference pressure and outside the accuracy tolerance limit of 2 mb.

After the calibration event, it was discovered that the site barometer had not been adjusted for the elevation of the new site, which is about 240 feet higher than the previous location. The elevation-corrected reading is 1,012 mb. The difference between the corrected reading and reference reading is 1 mb, meeting the accuracy tolerance limit. The elevation-corrected reading collected for the First Quarter 2009 audit also meets the accuracy tolerance limit. The barometer will be reprogrammed with the appropriate elevation offset prior to the June audit.

5.0 SUMMARY

During the first semiannual 2009 MET Station calibration testing, wind direction, temperature, barometric pressure, and precipitation sensors performed within the accuracy tolerance limits specified by the equipment manufacturers.

One of seven calibration measurements for the wind speed sensor slightly exceeded the 0.6 mph accuracy tolerance limit. During subsequent calibrations, field staff will adjust the input rate of anemometer in order to obtain a stable data logger reading.

The initial barometer reading was outside the accuracy tolerance limit. However, it was later discovered that the barometer was not reprogrammed to account for the elevation of the new location. The elevation-corrected barometer reading was within 1 mb of the reference barometer reading during the first semiannual calibration event, which meets the accuracy tolerance limit.

6.0 REFERENCES

AMEC Geomatrix, Inc., 2009, First Quarter 2009 Meteorological Station Audit Report, Kettleman Hills Facility, Kings County, CA, May 18 (AMEC, 2009).

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Campbell Scientific, 2005, Instruction Manual, CS100 Barometric Pressure Sensor, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2005).

Campbell Scientific, 2006, R.M. Young Wind Monitors, Campbell Scientific (Canada) Corp., (Campbell Scientific, 2006).

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U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, U.S. EPA Document 600/4-77/027a (U.S. EPA, 1994b).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Methods, U.S. EPA Document 600/4-82-060 (U.S. EPA, 1994c).

TABLE 1

METEOROLOGICAL STATION SYSTEM COMPONENTS

Kettleman Hills Facility
Kings County, California

Parameter	Manufactuer	Model Number	Range
Wind Speed	R.M. Young	05305	0 to 90 mph [1]
Wind Direction	R.M. Young	05305	0 to 360 degrees [2]
Temperature	Campbell Scientific	TE525	-31 to 122 °F [3]
Barometric Pressure	Campbell Scientific	CS100	600 to 1100 mb [4]
Precipitation	Campbell Scientific	107	NA [5]

1. Wind speed reported in miles per hour (mph), measured at 10 meters above ground level.
2. Wind direction reported in degrees of rotation from true north, measured at 10 meters above ground level.
3. Temperature measured in degrees Fahrenheit (°F) at 1.7 meters above ground level.
4. Barometric pressure measured in millibars (mb).
5. NA = not applicable.

TABLE 2

ACCURACY TOLERANCE LIMITS

Kettleman Hills Facility
Kings County, California

Parameter	Accuracy Tolerance Limits
Wind Speed	± 0.6 mph [1]
Wind Direction	± 5 degrees [2]
Wind Sensor Starting Threshold	1 g-cm [3]
Wind Direction Starting Threshold	9 g-cm [3]
Temperature	± 0.4 °F [4]
Barometric Pressure	± 2 mb [5]
Precipitation	± 3 percent of input

1. Wind speed measured in miles per hour (mph). ± = plus or minus.
2. Wind direction measured in degrees of rotation from true north.
3. Starting threshold is the minimum applied torque needed to move the sensors. Torque is measured in gram-centimeters (g-cm).
4. Temperature measured in degrees Fahrenheit (°F).
5. Barometric pressure measured in millibars (mb).

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TABLE 3

HORIZONTAL WIND SPEED CALIBRATION DATA

Kettleman Hills Facility
Kings County, California

Calibration Point [1]	Input Rate [2] (rpm)	Calculated Velocity [3] (mph)	Recorded Velocity [4] (mph)	Difference [5] (mph)
1	300	3.44	3.43	-0.01
2	600	6.87	6.87	0.00
3	1,000	11.45	11.22	-0.23
4	1,500	17.18	16.95	-0.23
5	2,500	28.63	27.94 to 28.70[6]	-0.69 to 0.07
6	4,000	45.80	45.57	-0.23
7	8,000	91.60	91.60	0.00

1. Calibrated on May 27, 2009, beginning at 9:00 a.m.
2. Input rotation rate in revolutions per minute (rpm) by a R.M. Young Model 18811 anemometer drive.
3. Calculated wind velocity in miles per hour (mph) converted from rpm with a manufacturer-supplied function:
   (Input rate in rpm) * 0.01145 = velocity in mph
4. Wind speed in mph recorded by the sensor.
5. Difference between recorded and calculated wind speed expressed in mph (accuracy tolerance limit is ± 0.6 mph).
6. At a constant input rate of 2500 rpm, displayed velocity on the datalogger fluctuated between these two readings.

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TABLE 4

HORIZONTAL WIND DIRECTION CALIBRATION DATA

Kettleman Hills Facility
Kings County, California

Calibration Point [1]	Reference Orientation [2] (degrees)	Recorded Orientation [3] (degrees)	Difference [4] (degrees)
1	0	0.19	0.19
2	90	86.75	-3.25
3	180	176.75	-3.25
4	270	266.88	-3.12

1. Calibrated on May 27, 2009, beginning at 8:52 a.m.
2. Reference orientation in degrees (measured from true north) measured with a Suunto KB-14 precision compass.
3. Orientation detected by the wind direction sensor (R.M. Young Model 05305) in degrees measured from true north.
4. Difference between recorded and reference orientation in degrees. Accuracy tolerance limit is ± 5 degrees.

Note: Angle of declination is 15 degrees.

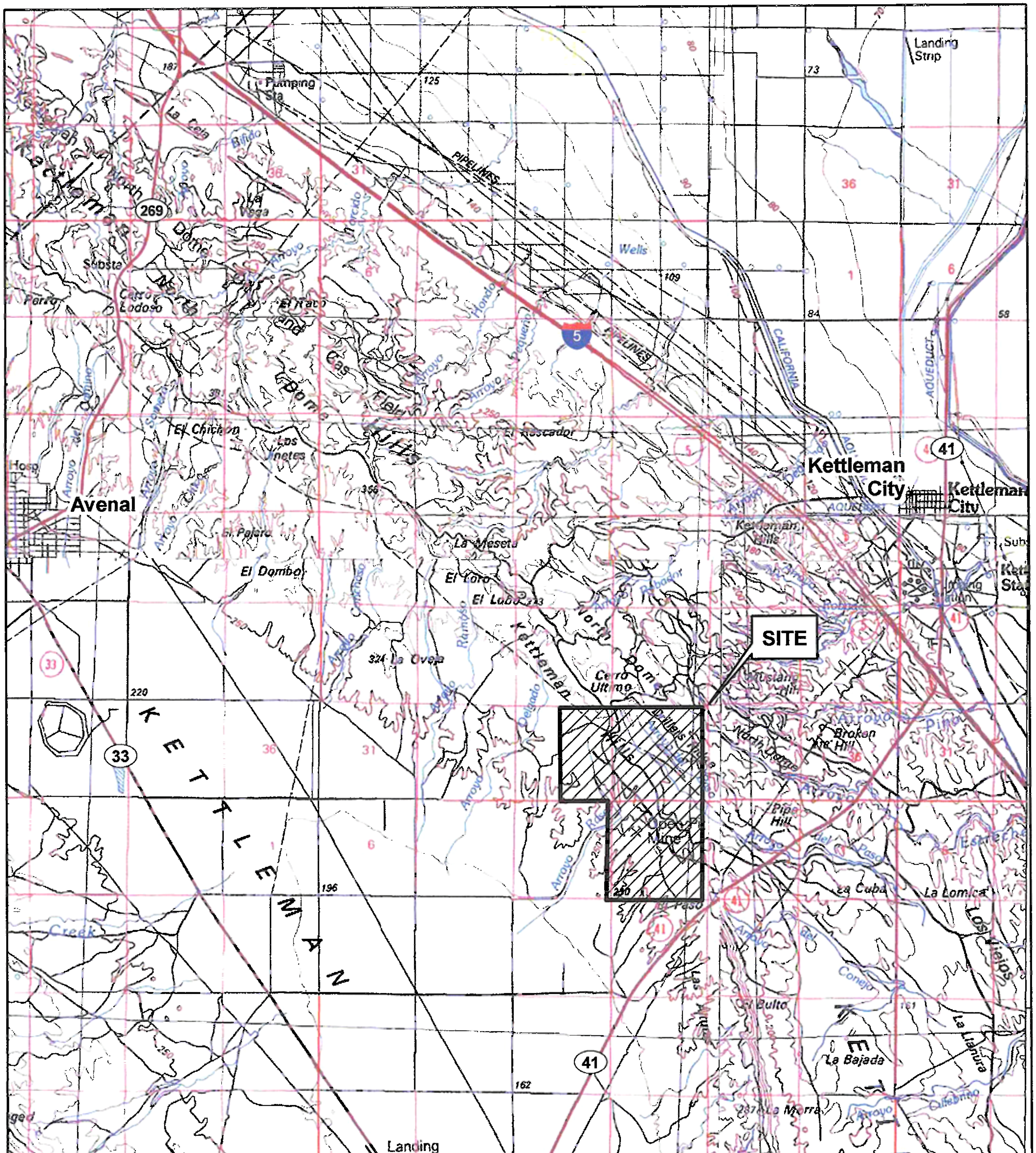
TABLE 5

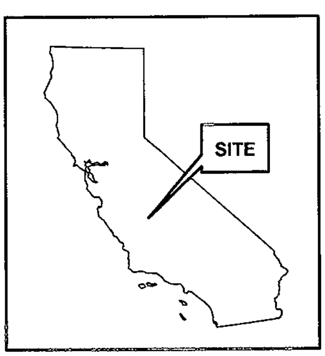
AMBIENT TEMPERATURE CALIBRATION DATA

Kettleman Hills Facility
Kings County, California

Calibration Point [1]	Reference Temperature [2] (°F)	Recorded Temperature [3] (°F)	Difference [4] (°F)
1	33.2	33.0	-0.2
2	85.6	85.9	0.3
3	127.5	127.4	-0.1

1. Calibrated on May 27, 2009, beginning at 8:31 a.m.
2. Reference temperature in degrees Fahrenheit (°F) measured with a Control Company Model 4110 Universal digital thermometer.
3. Temperature detected in °F by the temperature sensor (Campbell Scientific Model TE525).
4. Difference between recorded and reference temperature in °F. Accuracy tolerance limit is ± 0.4 °F.





California

APPROXIMATE SCALE IN FEET

0 4,000 8,000

0 1,200 2,400

APPROXIMATE SCALE IN METERS

Basemap modified from National Geographic Society TOPO!
(U. S. Geological Survey topographical map mosaic dataset).

SITE LOCATION MAP
Kettleman Hills Facility
Kings County, California

By: KLU	Date: 05/18/2009	Project No. 8151.006
AMEC Geomatrix		Figure 1

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APPENDIX A

Calibration Field Records

DAILY FIELD RECORD

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Project and Task Number: 8151	Date: 5-27-09
Project Name: KHF MET STATION	Field Activity: MET CAL
Location: KHF FACILITY	Weather:

PERSONNEL: Name	Company	Time In	Time Out
ALEX O	AMEC	0600	
GARY K	AMEC	0600	

PERSONAL SAFETY CHECKLIST

X	Steel-toed Boots	X	Hard Hat		Tyvek Coveralls
	Rubber Gloves	X	Safety Goggles		1/2-Face Respirator

DRUM I.D.	DESCRIPTION OF CONTENTS AND QUANTITY	LOCATION

TIME	DESCRIPTION OF WORK PERFORMED		
0600	gather paperwork, load truck w/ equipment		
0630	leave office		
0745	arrive on site, sign in		
0800	get to met station setup		
0806	Start RAIN GAUGE		
0810	Start tearing down MET (time stamp on system slow by 1hour)		
0831	Start temperature	REF	temp
	AMBIENT	85.6	85.91
	COLD	33.2	33.0
	HOT	127.5	127.36
0852	Start WIND DIRECTION		
	0	0.19	
	180	176.75	
	90	86.75	
	270	266.88	
0900	Start WIND SPEED mph	REF	Goal ~~Actual~~
	3.43	300	300

DAILY FIELD RECORD (continued)

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Project and Task Number: 8151	Date: 5-27-09

TIME	DESCRIPTION OF WORK PERFORMED
	6.87 600 600
	11.22 1000 1000
	16.95 1500 1500
	(27.94 - 28.7) 27.94 2500 2500 (fluctuates)
	45.~~80~~57 4000 4000
	91.60 8000 8000
0930	WIND SPEED TORQUE
	CW. 0.3 gm-cm
	CCW 0.3 - 0.4 gm-cm
0940	WIND DIRECTION TORQUE
	CW 4 gm-cm
	CCW 4 gm-cm
	(needs to be level before taking measurement)
1000	BAROMETER 29.63 inHg
1005	put met back together
1035	Signed out left Site
1145	Arrive at office unload truck
1200	Done of Job

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SECOND SEMIANNUAL 2009 METEOROLOGICAL STATION CALIBRATION REPORT

Kettleman Hills Facility
Kings County, CA

Submitted to:

Chemical Waste Management, Inc., Kings County, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

December 21, 2009

Project 8151.006

amec

December 21, 2009

Project 8151.006

Mr. Paul Turek
Chemical Waste Management, Inc.
35251 Old Skyline Road
Kettleman City, California 93239

Subject: **Second Semiannual 2009 Meteorological Station Calibration Report**
Kettleman Hills Facility, Kings County, California

Dear Mr. Turek:

AMEC Geomatrix, Inc. (AMEC), is pleased to submit the enclosed Second Semiannual 2009 Meteorological Station Calibration Report for the Chemical Waste Management, Inc., Kettleman Hills facility in Kings County, California. This report documents the weather station calibration and maintenance performed by AMEC on November 25, 2009. The field calibration was completed in general accordance with U.S. Environmental Protection Agency and equipment manufacturer guidelines.

Please call either of the undersigned if you have any questions or if we may provide additional information.

Sincerely yours,
AMEC Geomatrix, Inc.

Martin Spongberg, PhD, PE, PG
Senior Engineer

Philip P. Ross, PG
Principal Hydrogeologist

Enclosure

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AMEC Geomatrix

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SECOND SEMIANNUAL 2009 METEOROLOGICAL STATION CALIBRATION REPORT

Kettleman Hills Facility
Kings County, CA

Submitted to:

Chemical Waste Management, Inc., Kings County, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

December 21, 2009

Project 8151.006

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TABLE OF CONTENTS

TABLES

FIGURE

APPENDIX

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SECOND SEMIANNUAL 2009
METEOROLOGICAL STATION CALIBRATION REPORT
Kettleman Hills Facility
Kings County, California

1.0 INTRODUCTION

AMEC Geomatrix, Inc. (AMEC), is submitting the enclosed Second Semiannual 2009 Meteorological Station Calibration Report for the Chemical Waste Management, Inc. (CWMI), Kettleman Hills facility (KHF) in Kings County, California. This report documents the meteorological station (MET Station) calibration and maintenance performed by AMEC on November 25, 2009. The calibration of the MET Station was completed in general accordance with U.S. Environmental Protection Agency (EPA) and equipment manufacturer guidelines.

2.0 BACKGROUND

This section presents background information on the KHF and MET Station.

2.1 SITE LOCATION AND OPERATIONS

The KHF is located in Kings County, California, approximately 3 miles west of Interstate 5 and immediately north of State Route 41. The nearest towns are Avenal and Kettleman City, located about 8 miles northwest and 5 miles northeast of the KHF, respectively (Figure 1).

The KHF has been operated by CWMI since 1979 when the site was purchased from Environmental Disposal Services (EDS). The operations conducted by EDS consisted of solar evaporation in surface impoundments, land farming, and waste burial in cells. Current permitted activities at the KHF include solar evaporation in lined surface impoundments, waste stabilization, burial of solid wastes, and drum storage. Active waste management units (WMUs) currently include the drum storage unit, final stabilization unit, and polychlorinated biphenyl flushing/storage unit. In November 1998, the site was permitted to accept Class II designated waste and Class III municipal solid waste in landfill B-19. The B-17 landfill, a new Class II/III WMU, has been permitted and began receiving designated and municipal solid waste on February 26, 2009. Active land disposal units currently include landfills B-17, B-18, and B-19 and surface impoundments P-09, P-14, and P-16.

2.2 METEOROLOGICAL STATION COMPONENTS

The MET Station is a multiple component weather station located on the hilltop between landfill B-18 and proposed landfill B-20. Horizontal wind speed and horizontal wind direction sensors are installed 10 meters (m) above the ground surface on top of a tower. An ambient

temperature sensor is installed 1.7 m above the ground surface. At ground level, the MET Station includes components measuring precipitation and barometric pressure. Manufacturer information for each component is contained in Table 1.

2.3 CALIBRATION, AUDIT, AND MAINTENANCE SCHEDULE

The MET Station is operated and maintained according to equipment manufacturer guidelines (Campbell Scientific, 2004a, 2004b, 2005, and 2006). Calibrations and audits of the system are conducted in general accordance with the guidelines published by the manufacturers and the U.S. EPA (U.S. EPA, 1994a, 1994b, and 1994c).

Calibration and maintenance of the MET Station is conducted semiannually in the second and fourth quarters. Performance audits are conducted quarterly. This report documents the second semiannual 2009 calibration and maintenance event conducted in November.

3.0 CALIBRATION EQUIPMENT, PROCEDURE, AND ACCURACY TOLERANCE LIMITS

Calibration and maintenance are performed by AMEC staff using the equipment described in Section 3.1. Calibration and maintenance procedures are described in Section 3.2. Calibration accuracy tolerance limits are explained in Section 3.3.

3.1 CALIBRATION EQUIPMENT

Known calibration wind speeds are generated with a R.M. Young Model 18802 selectable-speed anemometer drive. For calibrating the wind direction sensor, a R.M. Young Model 18112 Vane Angle Bench Stand is used. Starting threshold torque of the wind speed and wind direction sensors are measured with a R.M. Young Model 18312 Torque Disc and a R.M. Young Model 18331 Vane Torque Gauge, respectively.

Reference temperatures are measured with a Control Company Model 4110 Universal digital thermometer with a certification traceable to the National Institute of Standards and Technology. The temperature sensor is checked at three different calibration temperatures. The rain gauge is calibrated by filling a calibration bottle with 870 milliliters of water using a graduated cylinder. The bottle is inverted into the rain gauge and drips into the tipping bucket over a period of 45 minutes to simulate 1 inch of rainfall.

3.2 CALIBRATION AND MAINTENANCE PROCEDURES

The calibration and maintenance are performed in general accordance with U.S. EPA and equipment manufacturer guidelines. For each component of the MET Station system, the calibration inputs are compared with the values measured by each sensor and recorded on the data logger. The accuracy tolerance limits for each calibration parameter are listed in Table 2.

3.2.1 Wind Speed

Prior to testing the wind speed sensor calibration, the wind speed propeller is inspected to determine that it is secure. Bearings are inspected to make sure the sensor is freely moving. The propeller is removed and threshold torque is measured with a torque gauge. Bearings must be replaced if the starting threshold is greater than 1 gram-centimeters (g-cm).

To test the calibration of the wind speed sensor, an anemometer drive is connected to the propeller shaft. The anemometer drive is operated at speeds ranging from about 300 to 8,000 revolutions per minute (rpm), corresponding to calibration wind speeds up to about 90 miles per hour (mph). A manufacturer-supplied equation (mph = 0.01145 x rpm) is used to convert the rotation rate to wind speed. The wind speed sensor response at each calibration wind speed is collected from the data logger for comparison with the calculated wind speed. After calibration, the propeller is secured to the propeller shaft.

The wind speed sensor will be calibrated in the field or returned to the manufacturer for calibration if it does not meet the calibration accuracy tolerance limits. Field calibration consists of adjusting the electronics so that the output speed from the data logger closely matches the input speed produced by the anemometer drive.

3.2.2 Wind Direction

The equipment is inspected to make sure that all connections are secure and the sensor is freely moving. Threshold velocities in the clockwise and counter-clockwise directions are measured with a torque meter pressed against the vane, 10 centimeters from the pivot point, with increasing force until the vane starts to move. The bearings are replaced if the starting threshold is greater than 9 g-cm.

To test the calibration of the direction sensor, the device is secured to a R. M. Young Model 18112 Vane Angle Bench Stand and the stand is aligned with a north arrow marked on the weather station's cement pad. The wind direction vane is aligned alternately to the north, east, south, and west. At each of these orientations, the vane is immobilized and the orientation recorded on the data logger is collected for comparison with the compass reading.

If the vane position and indicator are not within the calibration target (5 degrees), the direction sensor is calibrated in the field (by adjusting the potentiometer coupling inside the main housing) or returned to the manufacturer for calibration.

3.2.3 Ambient Temperature

Calibration of the temperature-sensing system is tested at three temperatures ranging from about freezing to more than 100 degrees Fahrenheit. The lowest temperature is achieved by adding ice to a water bath. The highest temperature is maintained by placing a container of water on a hot pad. The middle reading is taken in air at ambient temperature. At each calibration temperature, the temperature sensor and the calibration thermometer readings are recorded.

The temperature sensor cannot be calibrated in the field. If the sensor does not meet the calibration accuracy tolerance limits, it is either replaced or sent to the manufacturer for calibration.

3.2.4 Precipitation

Prior to testing calibration, the precipitation gauge is inspected to make sure the collection funnel is clear of obstructions. Accumulated debris, if present, is removed.

Calibration of the precipitation gauge is tested by adding a known volume of water at a slow, controlled rate into the gauge. A manufacturer-supplied function is used to convert the water volume in milliliters to an equivalent precipitation depth in inches. A volume equivalent to about 1 inch of precipitation is added to the gauge over a period of 45 minutes or greater. The precipitation gauge reading is then collected from the data logger and compared to the measured input volume (converted into equivalent rainfall depth).

If the precipitation gauge does not meet the calibration criterion, it is calibrated in the field by making slight adjustments to the calibration screw. After adjustment, another volume of water equivalent to about 1 inch of precipitation is added to the gauge. The procedure is repeated until the difference between the input and measured water volumes meets the calibration performance criterion.

3.2.5 Barometric Pressure Sensor

Prior to calibration of the barometric pressure sensor, all connections and the housing are visually inspected to assess whether they are secure and undamaged. The external case is cleaned with a damp cloth.

To check the calibration, the barometric pressure reading on the data logger is recorded for comparison with barometric readings from nearby National Weather Service Station KHJO at the Hanford Municipal Airport.. The barometric pressure sensor cannot be field calibrated. If the sensor does not meet the accuracy tolerance limits it is either replaced or sent to the manufacturer for calibration.

4.0 CALIBRATION RESULTS

Calibration was tested by comparing the readings of the system sensors with known calibration input values. The equipment was checked for calibrated on November 25, 2009, and the calibration data are summarized in Tables 3 through 5.

4.1 WIND SPEED

Information collected during the wind speed sensor calibration is listed in Table 3. This information includes: the input rotation rate, calculated wind speed, recorded wind speed, and the difference between the calculated and recorded wind speed.

The wind speed sensor was calibrated at seven wind speeds ranging from about 3 to 90 mph. All calibration measurements were within 0.6 mph of the calculated velocity, which meets the manufacturer-recommended accuracy tolerance limit.

Starting threshold torque was 0.3 g-cm in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limit.

4.2 WIND DIRECTION

Information collected during the wind direction sensor calibration test is listed in Table 4. This information includes: the reference orientation, the orientation detected by the sensor, and the difference between these two measurements. The wind direction sensor was operating within the manufacturer-recommended accuracy at each of the calibration points.

Starting threshold torque was measured at 4 g-cm in both the clockwise and counter-clockwise directions, which meets the accuracy tolerance limits.

4.3 AMBIENT TEMPERATURE

Information collected during the temperature sensor calibration test is listed in Table 5. This information includes: the calibration reference temperatures, the temperatures recorded by the MET Station sensor, and the difference between the two measurements. All measurements were within the manufacturer-recommended accuracy tolerance limits.

4.4 PRECIPITATION

A volume equivalent to 1 inch of precipitation was added to the rain gauge. The data logger recorded 1.00 inches of precipitation, which meets the accuracy tolerance limit.

4.5 BAROMETRIC PRESSURE

The barometer reading, taken at 8:40 a.m., was 30.15 inches of mercury (in Hg), or 1,021 millibars (mb). The 8:40 a.m. reading from the control barometer at Station KHJO (http://www.wunderground.com/history/airport/KHJO/2009/11/25/DailyHistory.html) was 30.19 in Hg (1,022 mb). The difference in readings between the site and control barometers was less than 2 mb, which meets the manufacturer-recommended accuracy tolerance limit.

5.0 SUMMARY

During the second semiannual 2009 MET Station calibration testing, wind speed, wind direction, temperature, precipitation, and barometric pressure sensors all performed within the accuracy tolerance limits specified by the equipment manufacturers.

6.0 REFERENCES

Campbell Scientific, 2004, Instruction Manual, Model 107 Temperature Probe, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004a).

Campbell Scientific, 2004, Instruction Manual, TE525 Tipping Bucket Rain Gage, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2004b).

Campbell Scientific, 2005, Instruction Manual, CS100 Barometric Pressure Sensor, Campbell Scientific, Inc., Logan, Utah (Campbell Scientific, 2005).

Campbell Scientific, 2006, R.M. Young Wind Monitors, Campbell Scientific (Canada) Corp., (Campbell Scientific, 2006).

Station KHJO weather history (http://www.wunderground.com/history/airport/KHJO/2009/11/25/DailyHistory.html).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, Principles, U.S. EPA Document 600/9-76-005 (U.S. EPA, 1994a).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, U.S. EPA Document 600/4-77/027a (U.S. EPA, 1994b).

U.S. Environmental Protection Agency, 1994, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Methods, U.S. EPA Document 600/4-82-060 (U.S. EPA, 1994c).

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TABLE 1

METEOROLOGICAL STATION SYSTEM COMPONENTS

Kettleman Hills Facility
Kings County, California

Parameter	Manufacturer	Model Number	Range
Wind Speed	R.M. Young	05305	0 to 90 mph [1]
Wind Direction	R.M. Young	05305	0 to 360 degrees [2]
Temperature	Campbell Scientific	TE525	-31 to 122 °F [3]
Barometric Pressure	Campbell Scientific	CS100	600 to 1100 mb [4]
Precipitation	Campbell Scientific	107	NA [5]

1. Wind speed reported in miles per hour (mph), measured at 10 meters above ground level.
2. Wind direction reported in degrees of rotation from true north, measured at 10 meters above ground level. Degrees of rotation increase clockwise.
3. Temperature measured in degrees Fahrenheit (°F) at 1.7 meters above ground level.
4. Barometric pressure measured in inches of mercury and converted to millibars (mb).
5. NA = not applicable.

TABLE 2

ACCURACY TOLERANCE LIMITS

Kettleman Hills Facility
Kings County, California

Parameter	Accuracy Tolerance Limits
Wind Speed	± 0.6 mph [1]
Wind Direction	± 5 degrees [2]
Wind Speed Starting Threshold Torque	≤ 1 g-cm [3]
Wind Direction Starting Threshold Torque	≤ 9 g-cm [3]
Temperature	± 0.4 °F [4]
Barometric Pressure	± 2 mb [5]
Precipitation	± 3 percent of input

1. Wind speed measured in miles per hour (mph). "±" = plus or minus;
2. Wind direction measured in degrees of rotation from true north. Degrees of rotation increase clockwise.
3. Starting threshold is the minimum applied torque needed to move the sensors. Torque is measured in gram-centimeters (g-cm).
4. Temperature measured in degrees Fahrenheit (°F).
5. Barometric pressure measured in inches of mercury and converted to millibars (mb).

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TABLE 3

HORIZONTAL WIND SPEED CALIBRATION DATA

Kettleman Hills Facility
Kings County, California

Calibration Point [1]	Input Rate [2] (rpm)	Calculated Velocity [3] (mph)	Recorded Velocity [4] (mph)	Difference [5] (mph)
1	300	3.44	3.43	-0.01
2	600	6.87	6.87	0.00
3	1,000	11.45	11.45	0.00
4	1,500	17.18	17.17	-0.01
5	2,500	28.63	28.63	0.00
6	4,000	45.80	45.80	0.00
7	8,000	91.60	91.60	0.00

1. Calibrated on November 25, 2009, beginning at 8:15 a.m.
2. Input rotation rate in revolutions per minute (rpm) by a R.M. Young Model 18802 anemometer drive.
3. Calculated wind velocity in miles per hour (mph) converted from rpm with a manufacturer-supplied function:
   (Input rate in rpm) * 0.01145 = velocity in mph
4. Wind speed in mph recorded by the sensor.
5. Difference between recorded and calculated wind speed expressed in mph (accuracy tolerance limit is ± 0.6 mph).

TABLE 4

HORIZONTAL WIND DIRECTION CALIBRATION DATA

Kettleman Hills Facility
Kings County, California

Calibration Point[1]	Reference Orientation[2] (degrees)	Recorded Orientation[3] (degrees)	Difference[4] (degrees)
1	0	2.28	2.28
2	90	89.92	-0.08
3	180	176.11	-3.89
4	270	265.89	-4.11

1. Calibrated on November 25, 2009, beginning at 8:10 a.m.
2. Reference orientation in degrees (measured from true north) are from reference points inscribed on MET station. Degrees of rotation increase clockwise.
3. Orientation detected by the wind direction sensor (R.M. Young Model 05305) in degrees measured from true north. Degrees of rotation increase clockwise.
4. Difference between recorded and reference orientation in degrees. Accuracy tolerance limit is ± 5 degrees.

Note: Angle of declination is 15 degrees.

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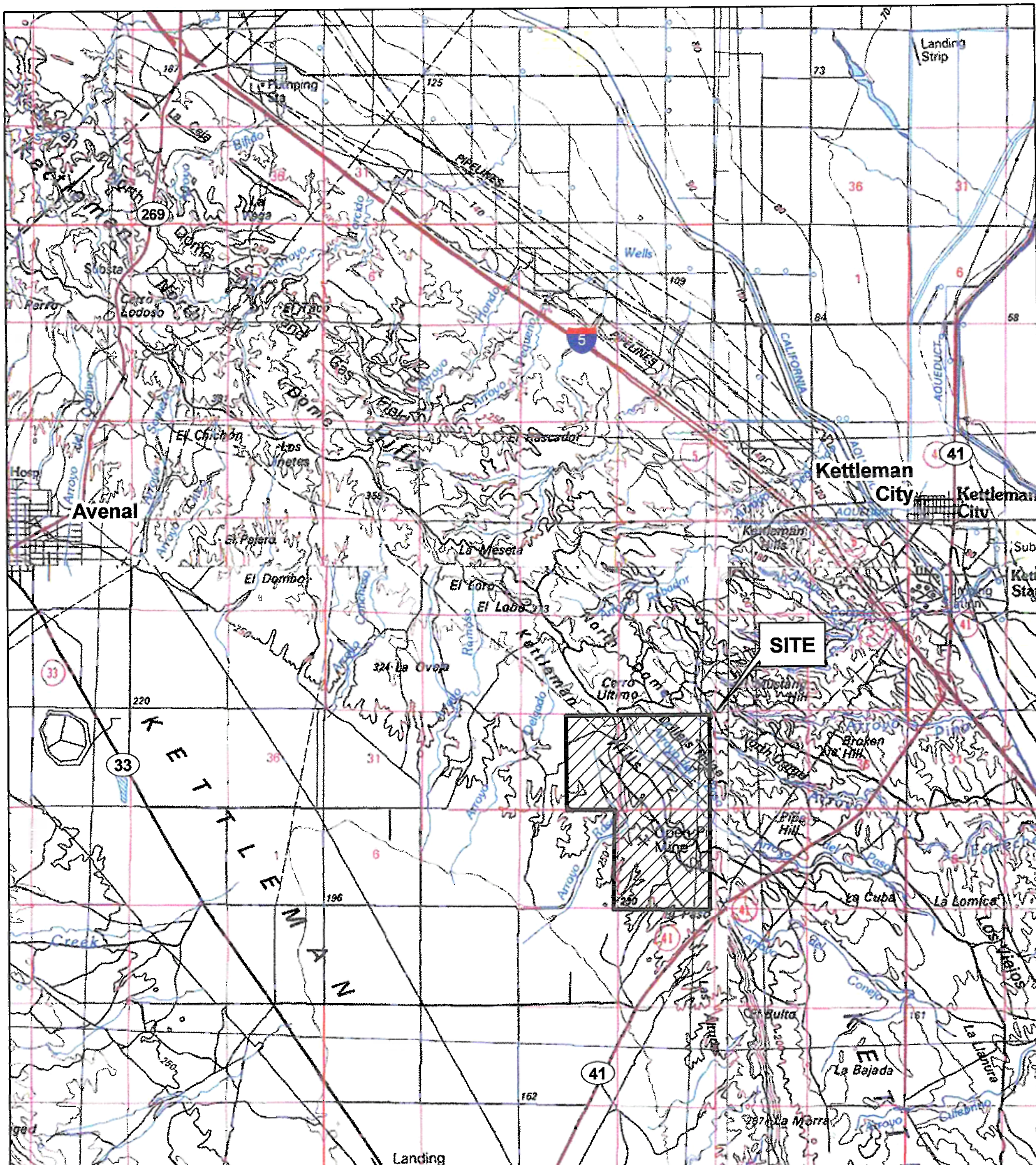
TABLE 5

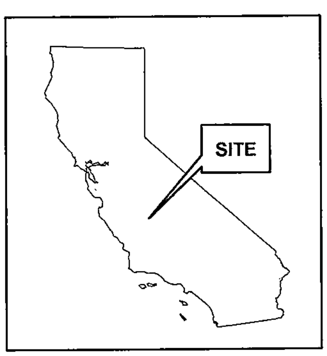
AMBIENT TEMPERATURE CALIBRATION DATA

Kettleman Hills Facility
Kings County, California

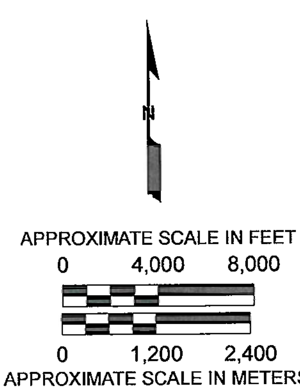
Calibration Point [1]	Reference Temperature [2] (°F)	Recorded Temperature [3] (°F)	Difference [4] (°F)
1	33.6	33.7	0.1
2	51.2	51.3	0.1
3	144.4	144.2	-0.2

1. Calibrated on November 25, 2009, beginning at 8:30 a.m.
2. Reference temperature in degrees Fahrenheit (°F) measured with a Control Company Model 4110 Universal digital thermometer.
3. Temperature detected in °F by the temperature sensor (Campbell Scientific Model TE525).
4. Difference between recorded and reference temperature in °F. Accuracy tolerance limit is ± 0.4 °F.





California



Basemap modified from National Geographic Society TOPO! (U. S. Geological Survey topographical map mosaic dataset).

SITE LOCATION MAP
Kettleman Hills Facility
Kings County, California

By: KLU	Date: 05/18/2009	Project No. 8151.006
AMEC Geomatrix		Figure 1

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APPENDIX A

Calibration Field Records

DAILY FIELD RECORD

amec

Project and Task Number: 8151.006 Cal	Date: 11-25-09
Project Name: KHF MET STATION	Field Activity: MET
Location: KHF	Weather:

PERSONNEL: Name	Company	Time In	Time Out
STEVE V.	AMEC	0600	11:00
ALEX O.	〃	0600	11:00

PERSONAL SAFETY CHECKLIST

	Steel-toed Boots		Hard Hat		Tyvek Coveralls
	Rubber Gloves		Safety Goggles		1/2-Face Respirator

DRUM I.D.	DESCRIPTION OF CONTENTS AND QUANTITY	LOCATION

TIME	DESCRIPTION OF WORK PERFORMED			
0600	ARRIVE AT OFFICE, LOAD TRUCK			
0630	LEFT FOR SITE			
0740	ARRIVE ON SITE CHECK IN			
0750	MOVE TO MET STATION, SET UP			
0803	START RAIN GAUGE			
	TEAR DOWN MET STATION			
0810	WIND DIRECTION		REF	ACTUAL
			0	2.28
			90	89.92
			180	176.11
			270	265.89
0815	WIND SPEED	REF	MPH	RPM
		300	3.43	300
		600	6.87	~~600~~ 600
		1000	11.45	1000
		1500	17.17	1500
		2500	28.63	2500

DAILY FIELD RECORD (continued)

amec

Project and Task Number: 8151.006 | Date: 11-25-09

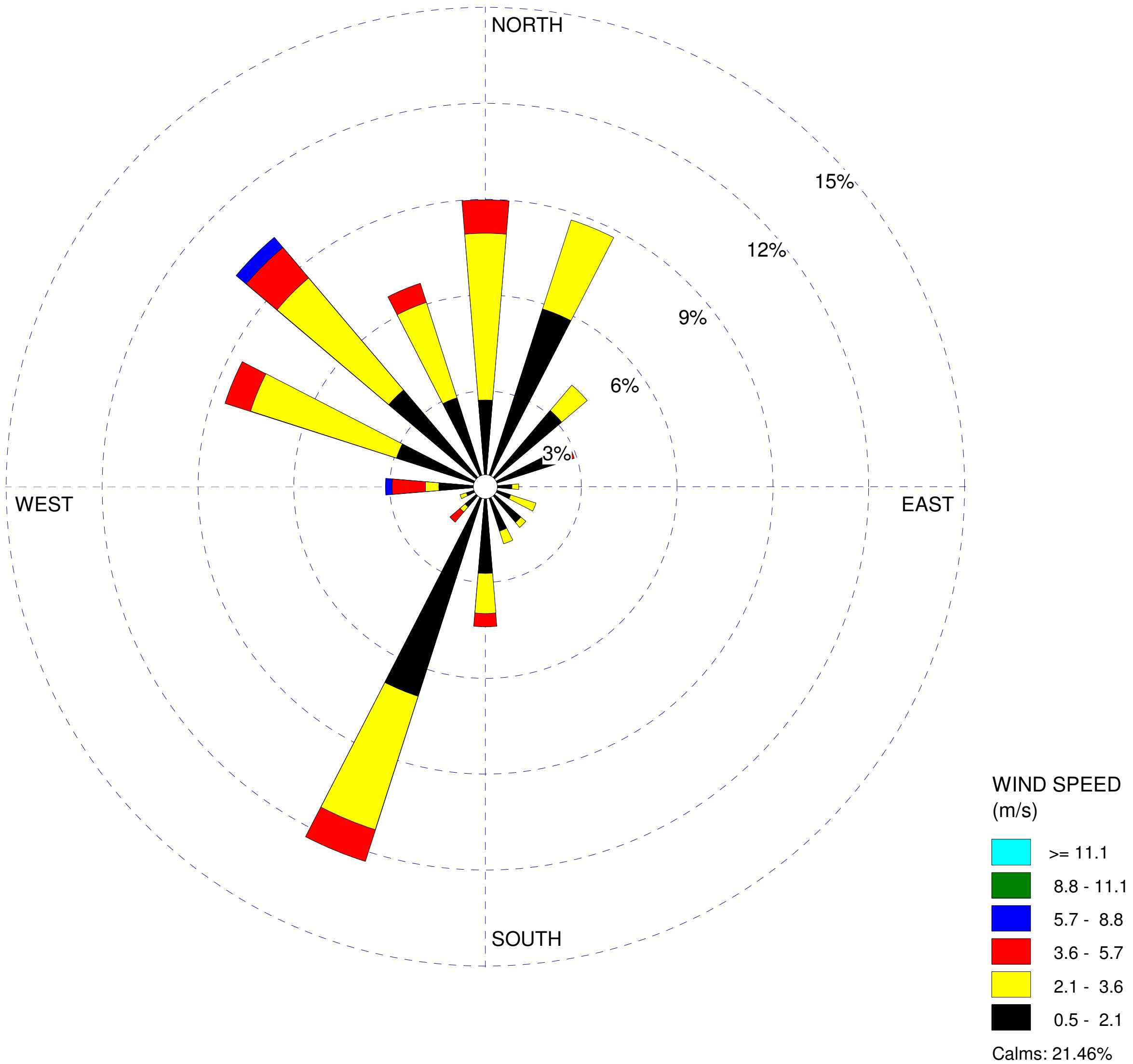
TIME	DESCRIPTION OF WORK PERFORMED			
		4000	45.80	4000
		8000	91.60	8000
0824	WIND SPEED TORQUE			
	CW - .3 gm-cm			
	CCW - .3 gm-cm			
0827	WIND DIR TORQUE			
	CW - 4 gm-cm			
	CCW - 4 gm-cm			
0830	DO TEMPERATURE		REF	GAUGE
		AMBIENT	51.2	51.30
		COLD	33.6	33.72
		HOT	144.4	144.21
0840	DO BAROMETER READING			
	30.15 IN Hg			
0841	PUT MET STATION BACK TOGETHER			
0900	GET RAIN GAUGE READING FROM PAUL T.			
	- 1.00 in			
0920	SIGN OUT, LEFT SITE			
1046	ARRIVE BACK AT OFFICE, UNLOAD TRUCK			
1107	NOAA BAROMETER READING			
	AT 0900 WAS 30.16			
1110	DONE W JOB			

WIND ROSE PLOT:

January 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2009
Check Date Range Report
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

CALM WINDS:

21.46%

TOTAL COUNT:

480 hrs.

AVG. WIND SPEED:

1.72 m/s

DATE:

4/20/2009

PROJECT NO.:

0742-816

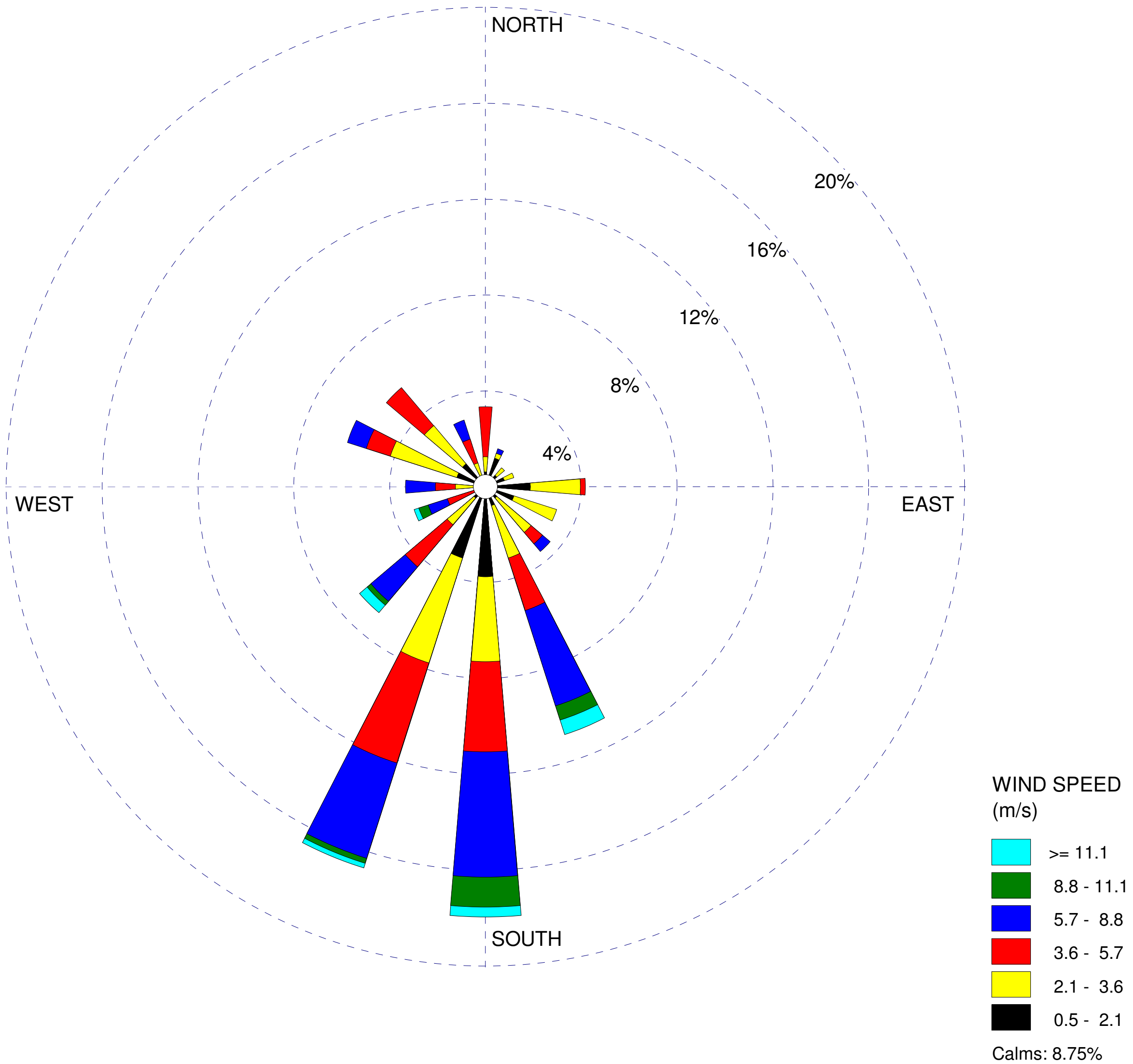
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

February 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2009 Check Date Range Report 00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **8.75%**	TOTAL COUNT: **480 hrs.**	
	AVG. WIND SPEED: **3.85 m/s**	DATE: **4/20/2009**	PROJECT NO.: **0742-816**

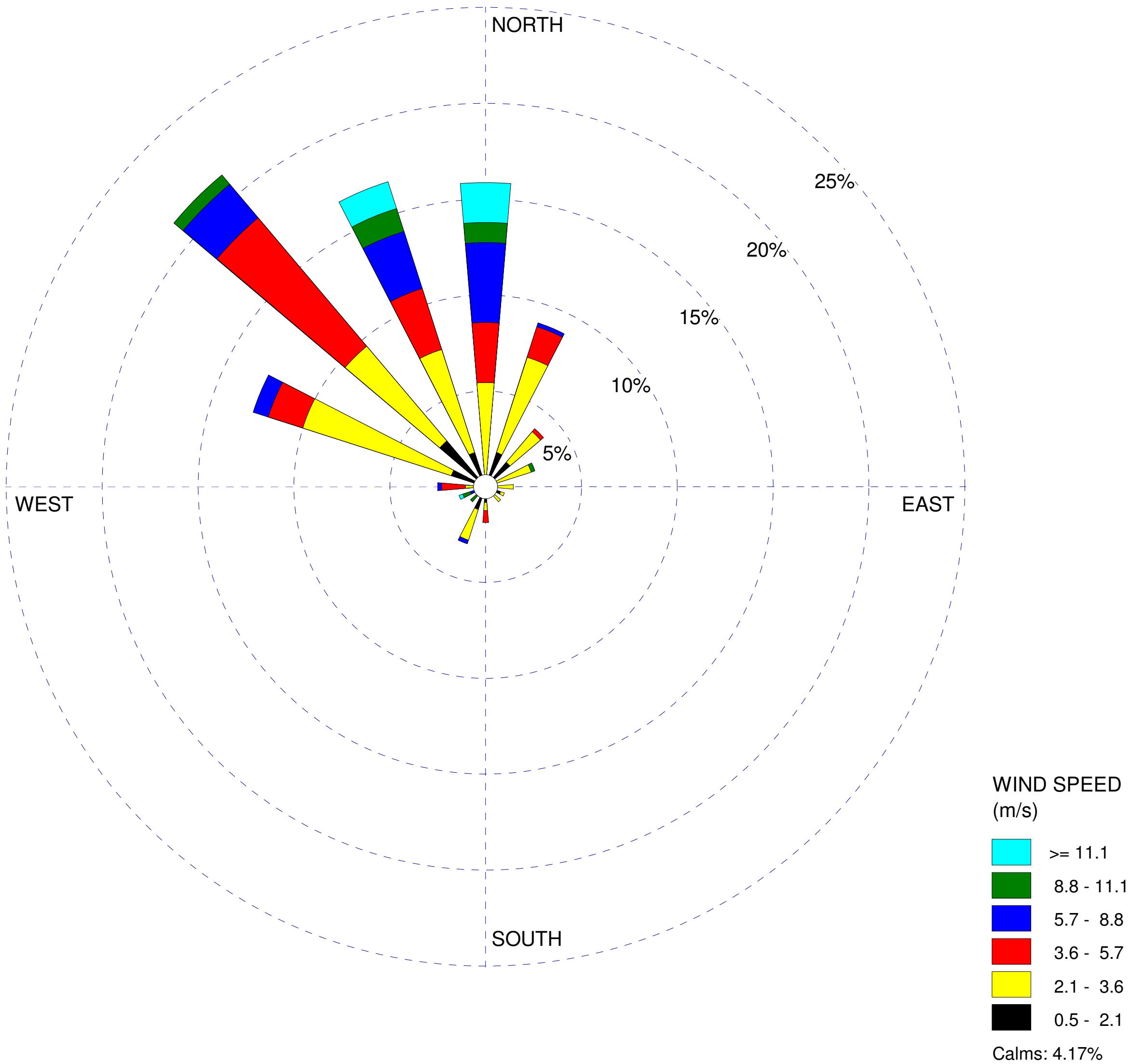
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

March 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2009** **Check Date Range Report** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **4.17%**	TOTAL COUNT: **480 hrs.**	
	AVG. WIND SPEED: **3.91 m/s**	DATE: **4/20/2009**	PROJECT NO.: **0742-816**

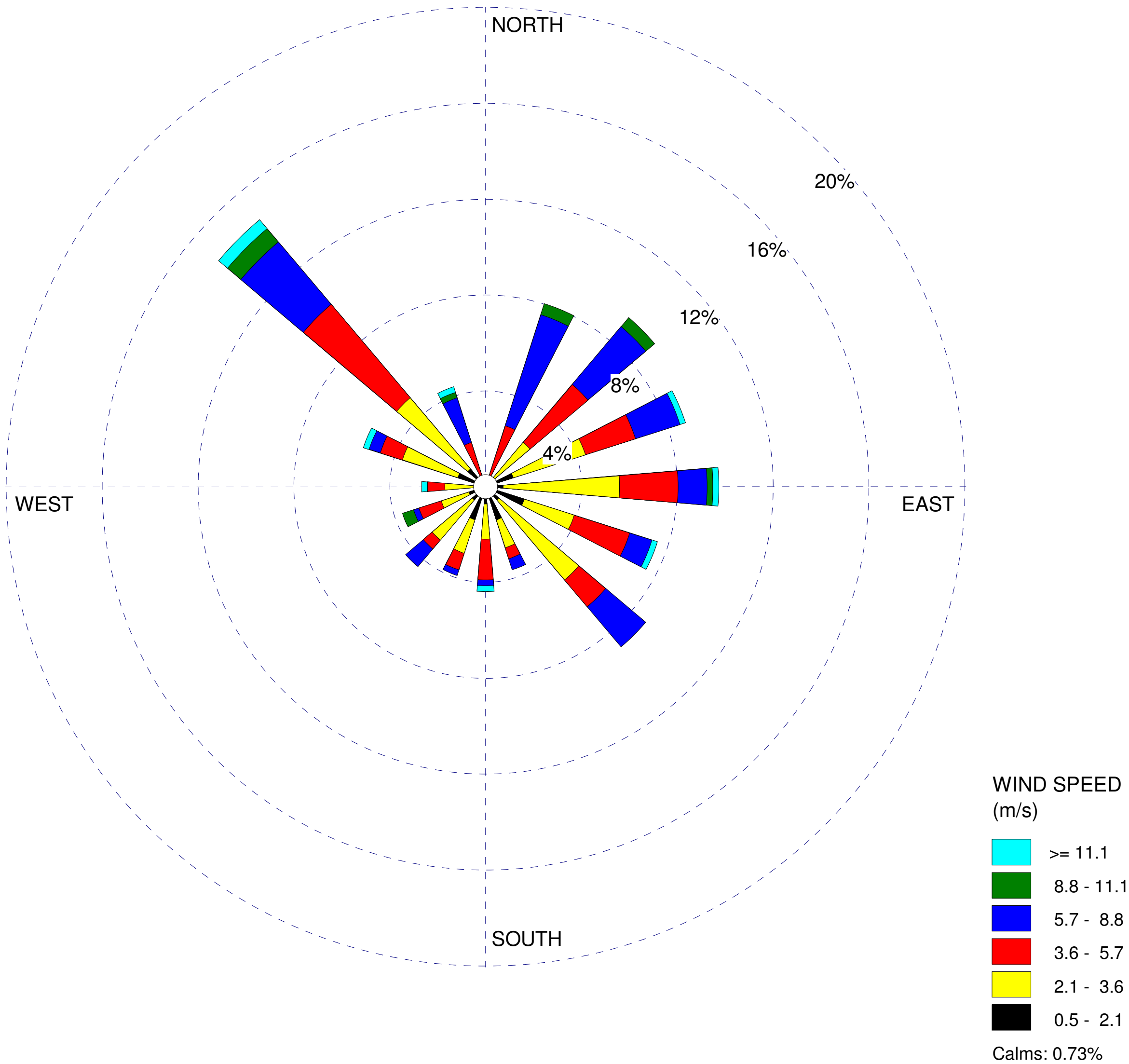
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

April 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2009 **Check Date Range Report** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **0.73%**	TOTAL COUNT: **412 hrs.**	
	AVG. WIND SPEED: **4.47 m/s**	DATE: **10/16/2009**	PROJECT NO.: **0742-816**

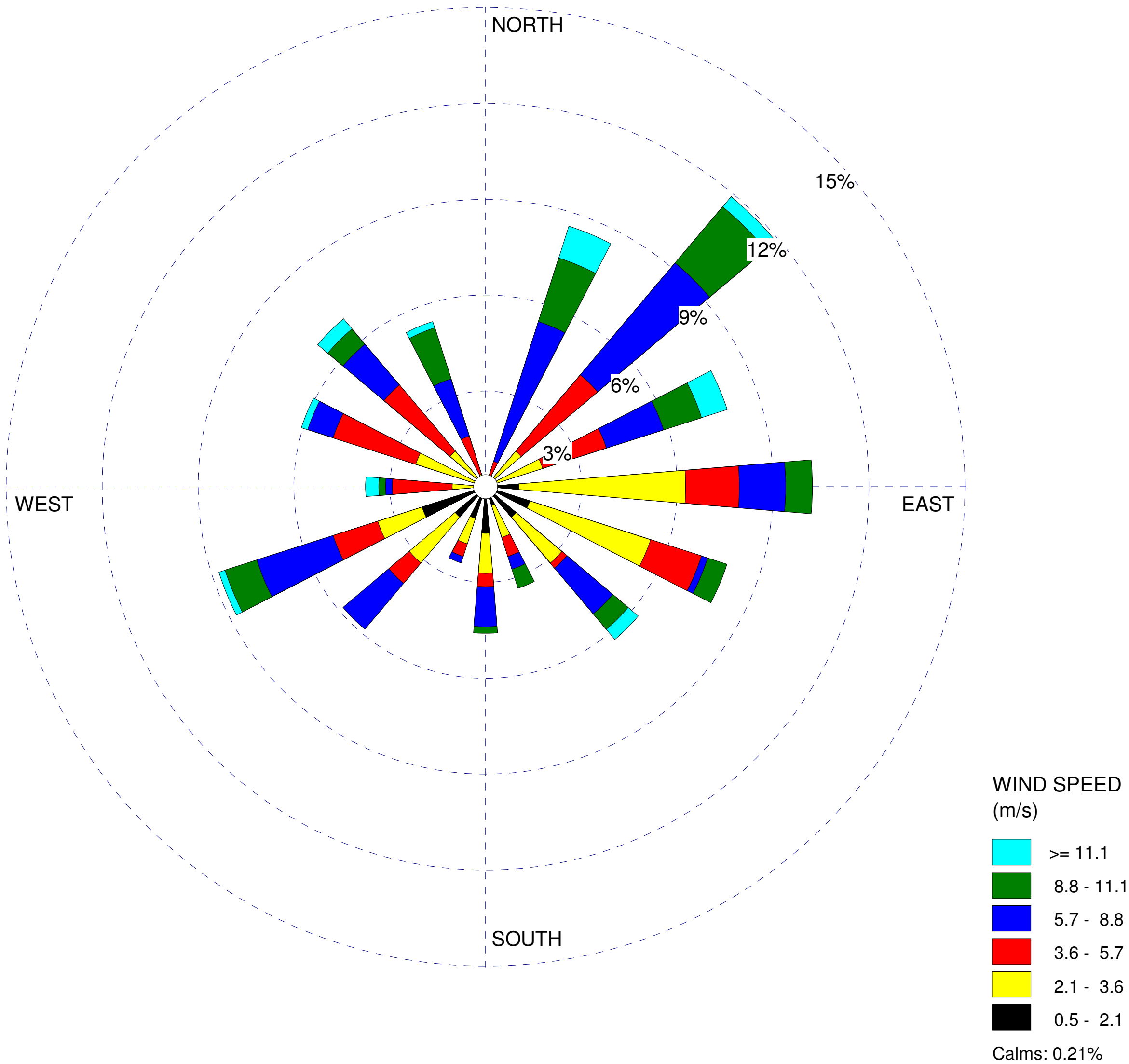
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

May 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2009 **Check Date Range Report** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **0.21%**	TOTAL COUNT: **480 hrs.**	
	AVG. WIND SPEED: **5.39 m/s**	DATE: **10/16/2009**	PROJECT NO.: **0742-816**

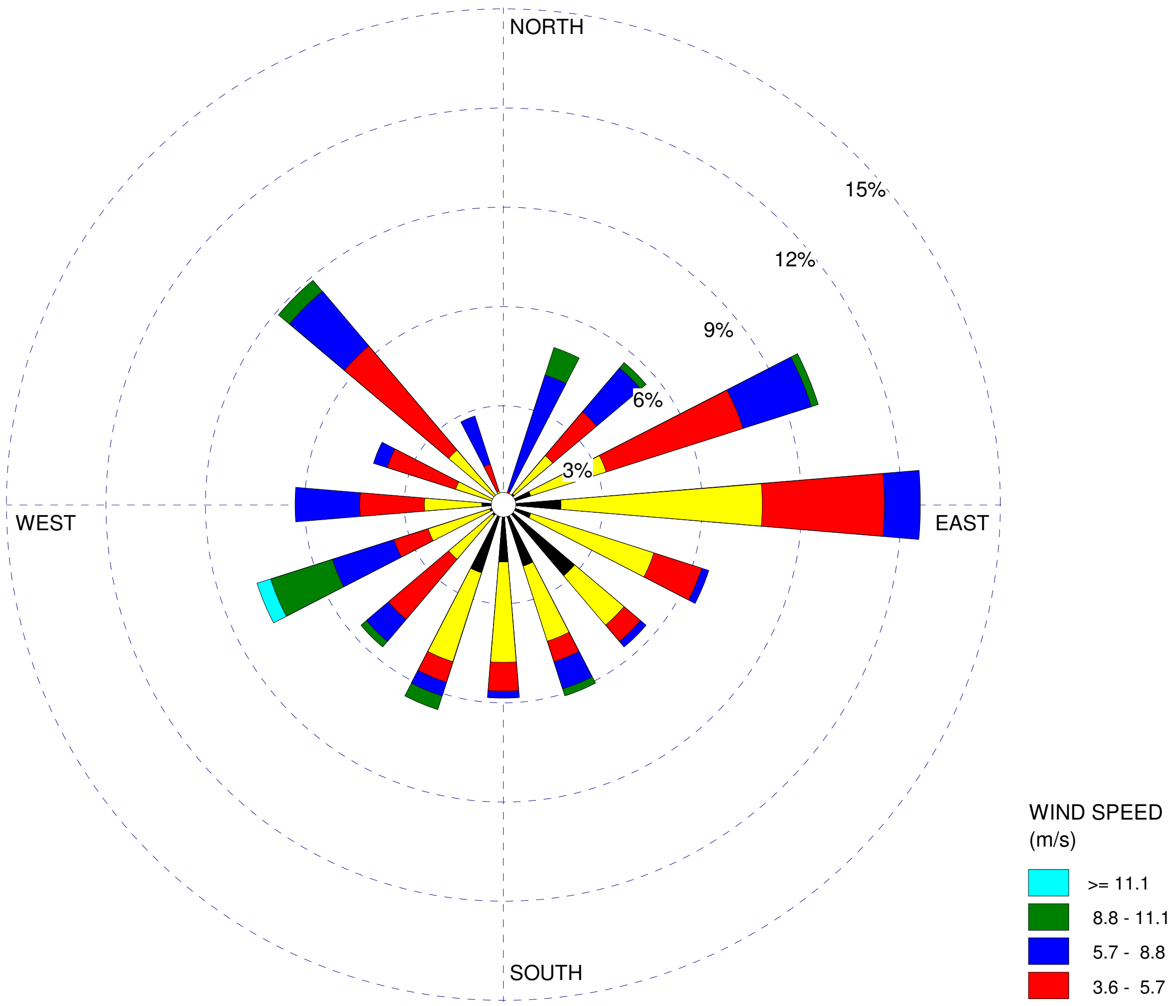
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

June 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2009 **Check Date Range Report** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **0.87%**	TOTAL COUNT: **462 hrs.**	
	AVG. WIND SPEED: **4.27 m/s**	DATE: **3/26/2010**	PROJECT NO.: **0742-820**

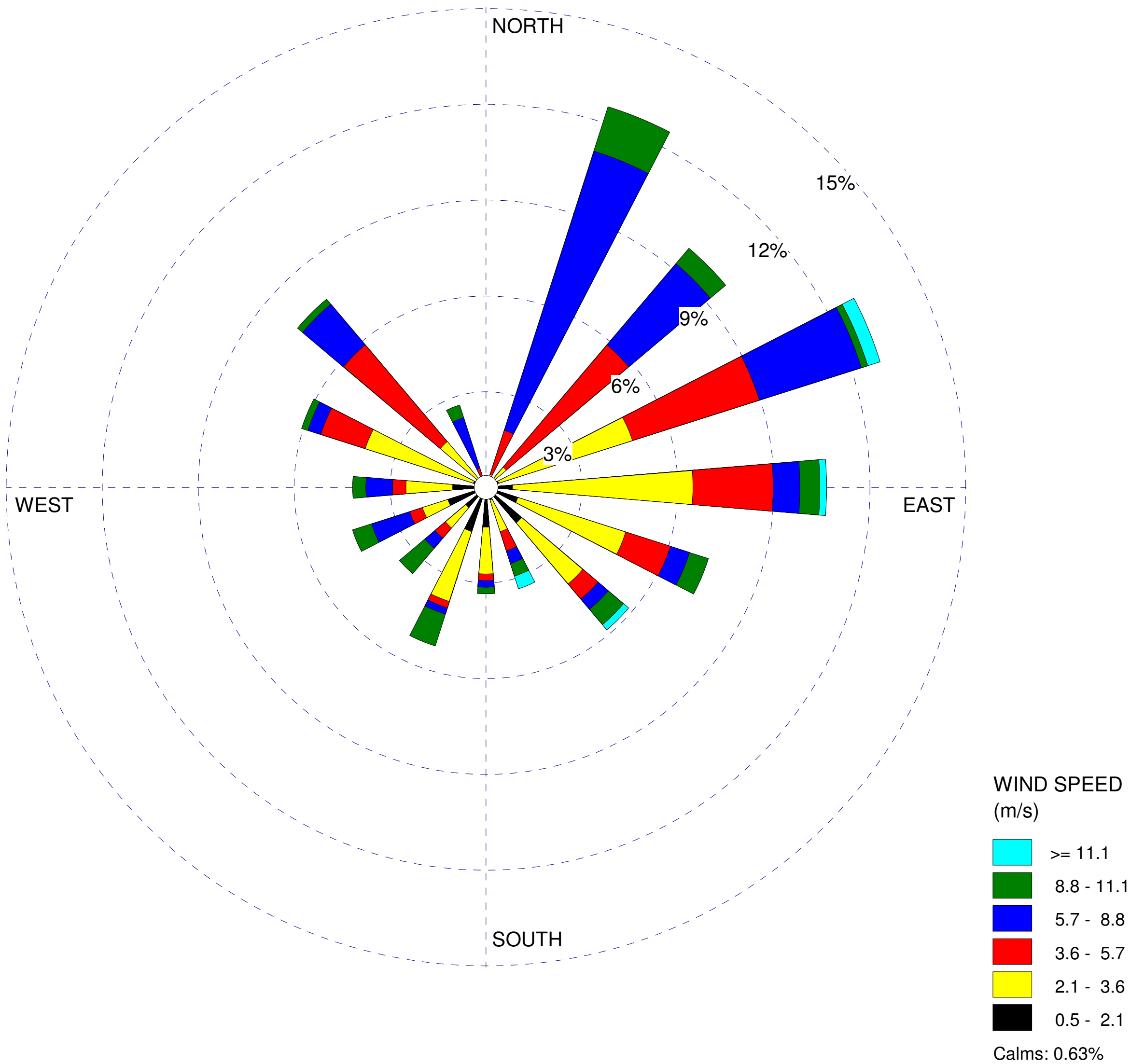
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

July 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2009
Check Date Range Report
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

Wenck

CALM WINDS:

0.63%

TOTAL COUNT:

480 hrs.

AVG. WIND SPEED:

4.88 m/s

DATE:

3/26/2010

PROJECT NO.:

0742-820

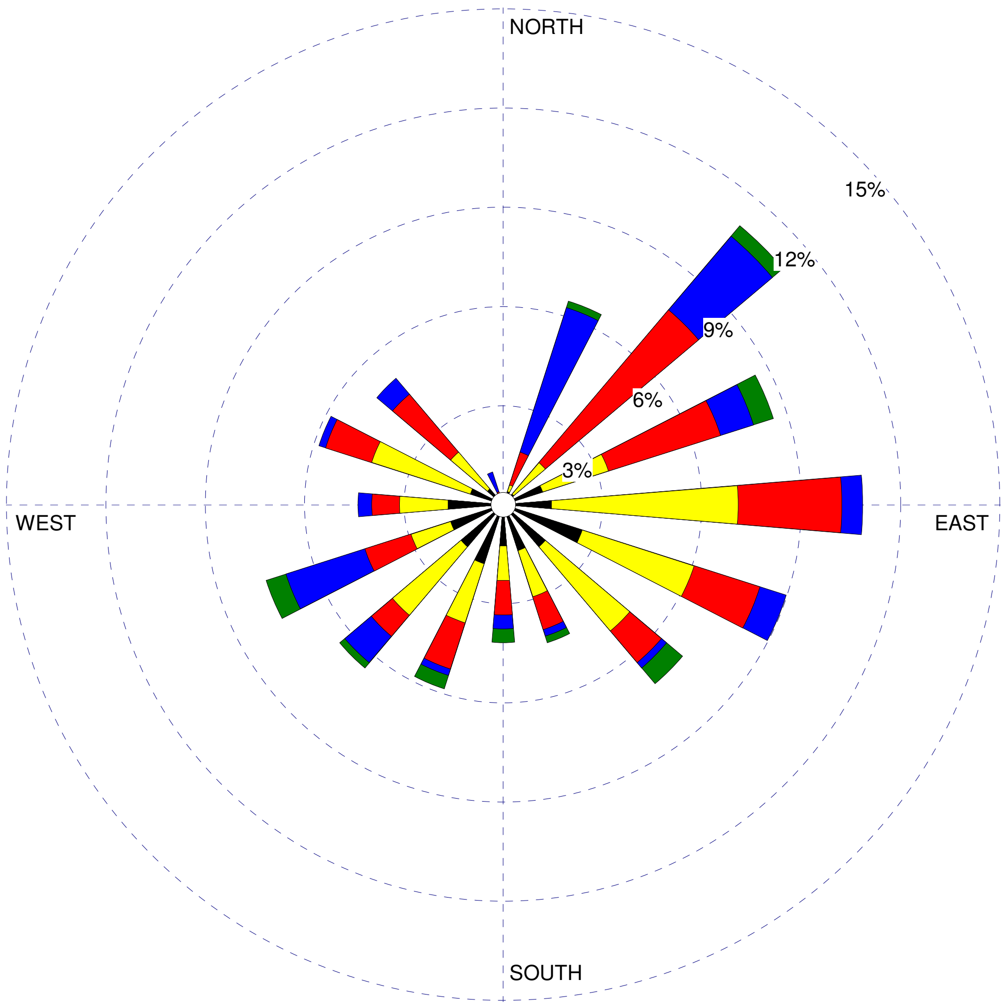
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

August 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2009 **Check Date Range Report** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **2.50%**	TOTAL COUNT: **480 hrs.**	
	AVG. WIND SPEED: **3.97 m/s**	DATE: **3/26/2010**	PROJECT NO.: **0742-820**

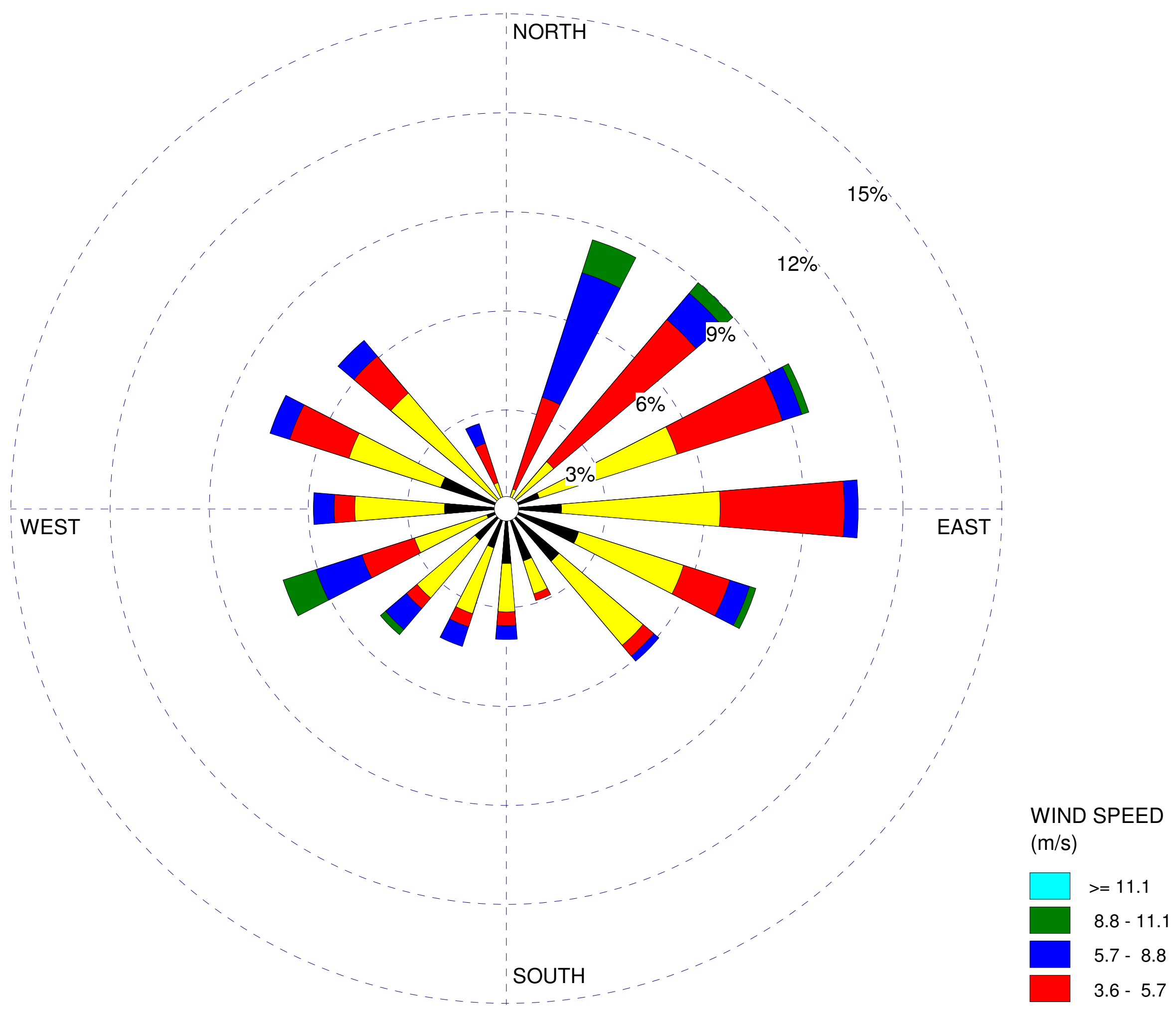
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

September 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2009** **Check Date Range Report** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**
		MODELER: **Wenck Associates, Inc.**
	CALM WINDS: **2.29%**	TOTAL COUNT: **480 hrs.**
	AVG. WIND SPEED: **3.74 m/s**	DATE: **3/26/2010**
		PROJECT NO.: **0742-820**

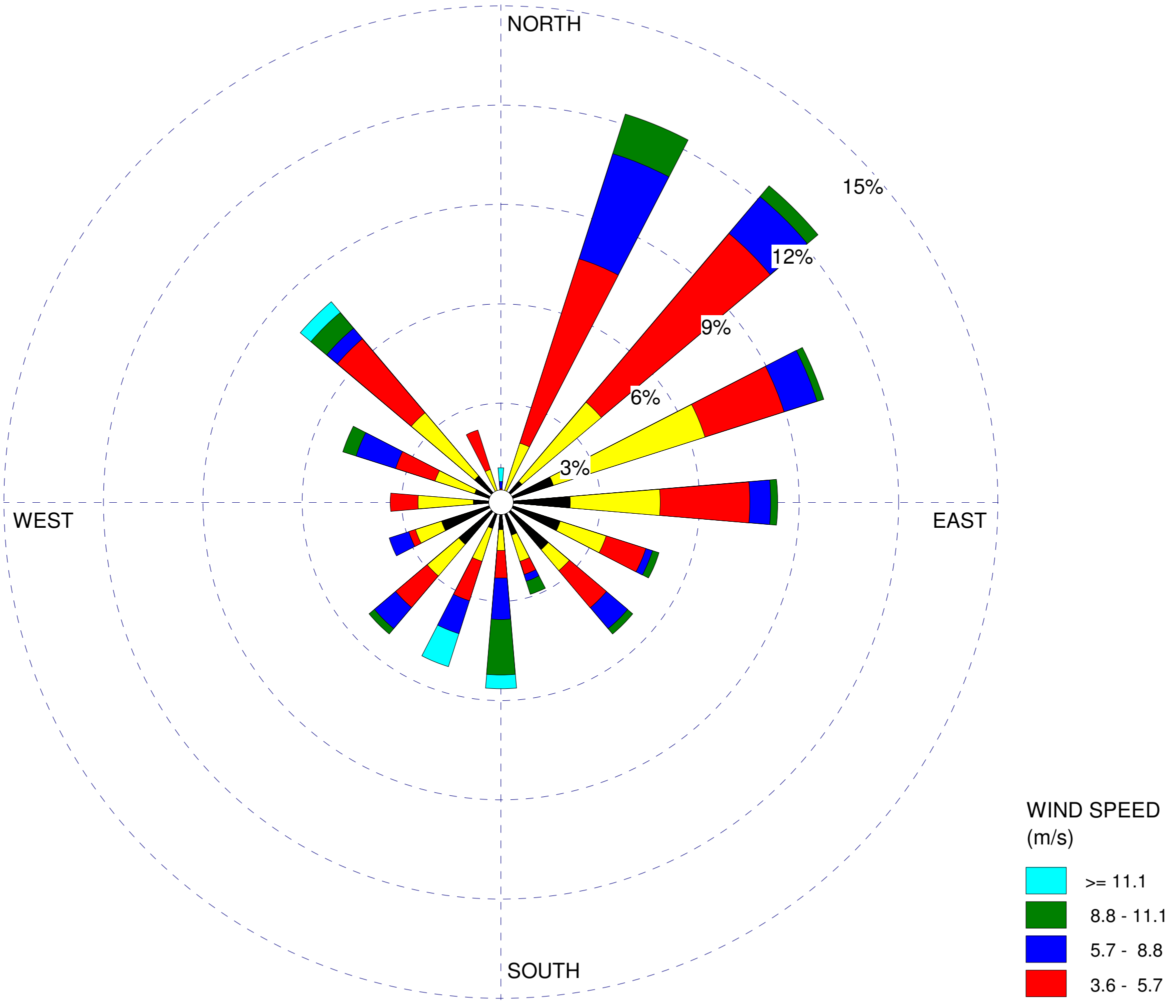
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

October 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2009 **Check Date Range Report** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **4.38%**	TOTAL COUNT: **480 hrs.**	
	AVG. WIND SPEED: **4.29 m/s**	DATE: **3/26/2010**	PROJECT NO.: **0742-820**

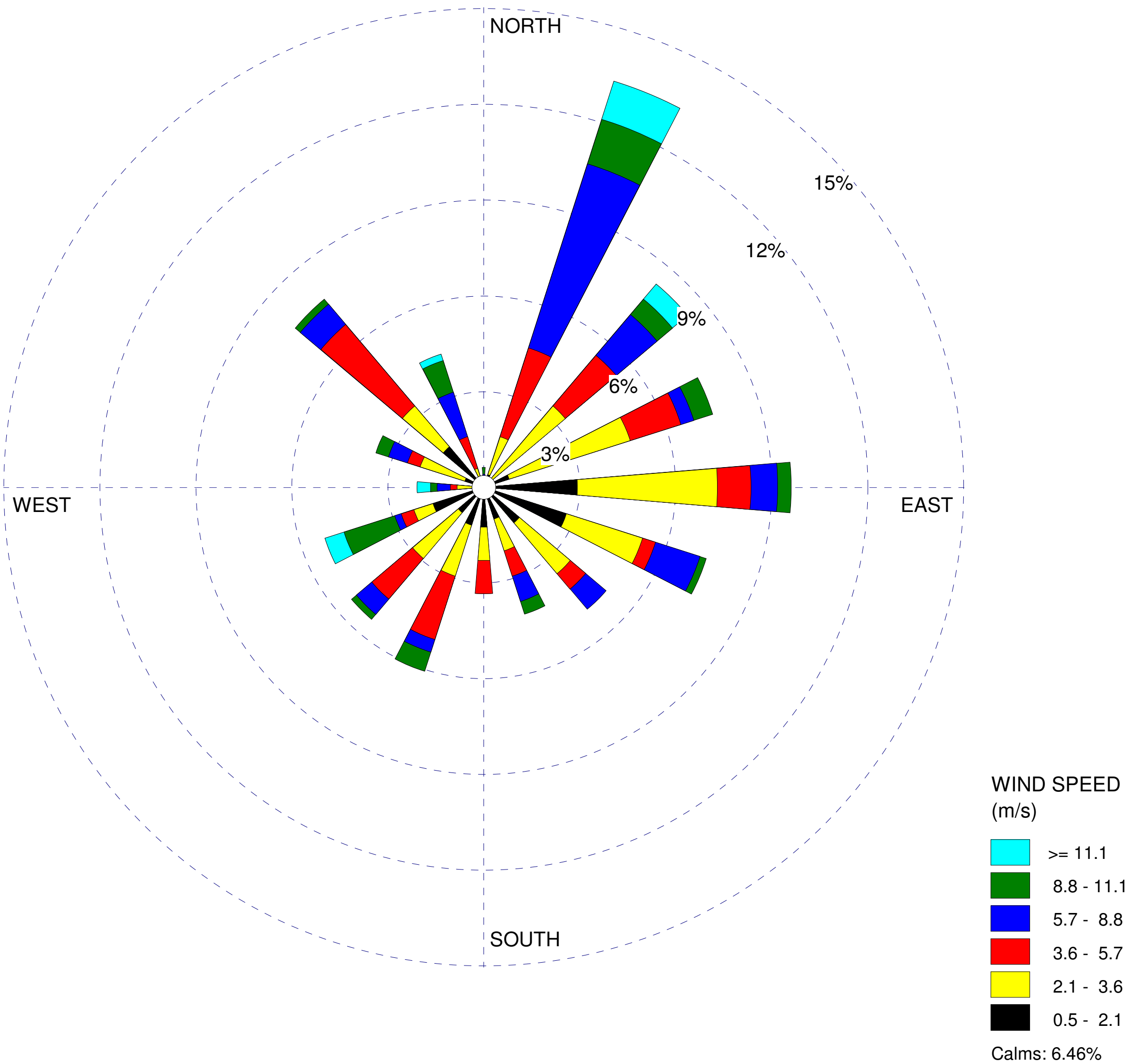
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

November 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2009** **Check Date Range Report** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **6.46%**	TOTAL COUNT: **480 hrs.**	
	AVG. WIND SPEED: **4.43 m/s**	DATE: **3/26/2010**	PROJECT NO.: **0742-820**

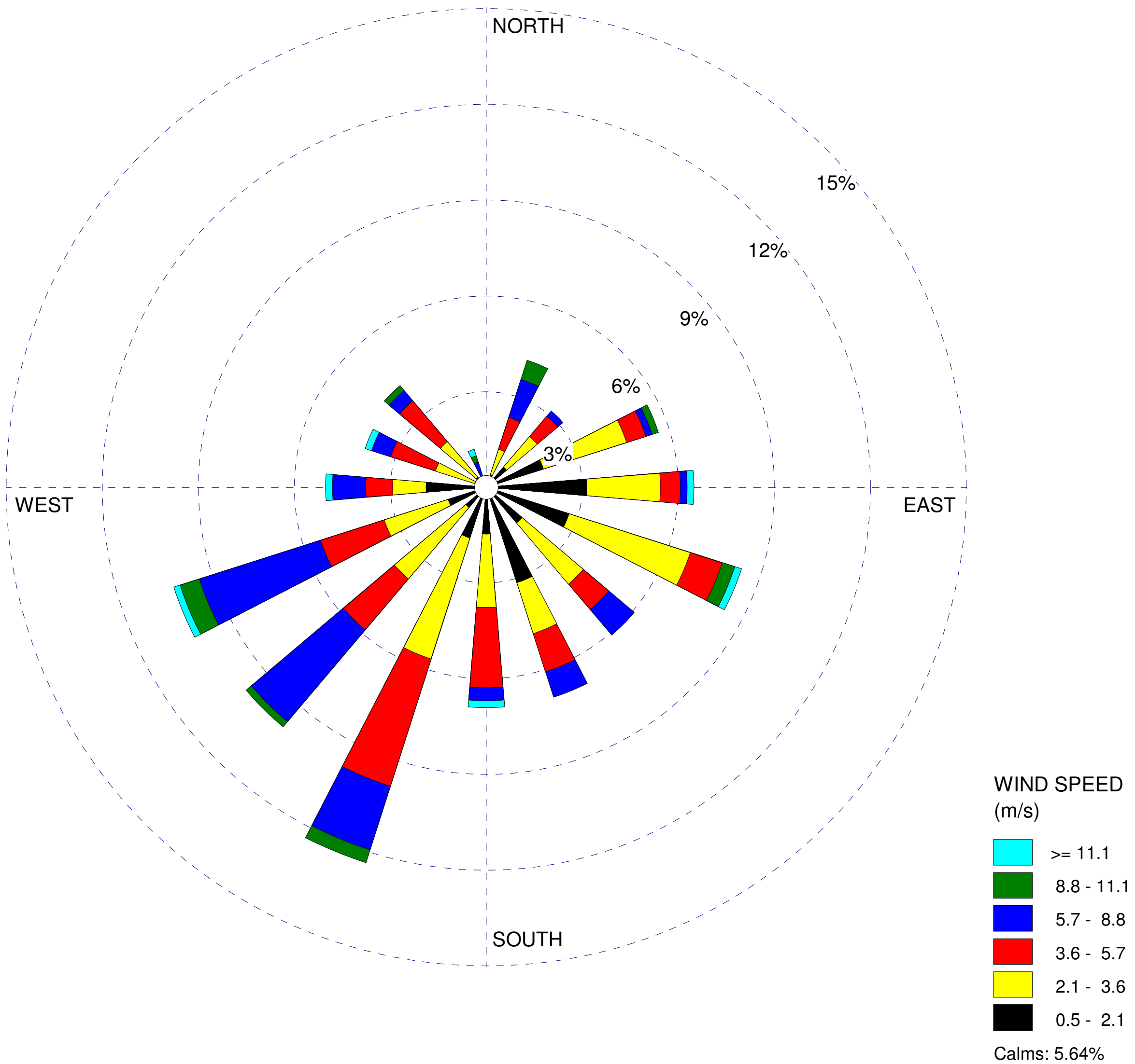
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

December 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2009 **Check Date Range Report** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **5.64%**	TOTAL COUNT: **479 hrs.**	
	AVG. WIND SPEED: **3.80 m/s**	DATE: **3/26/2010**	PROJECT NO.: **0742-820**

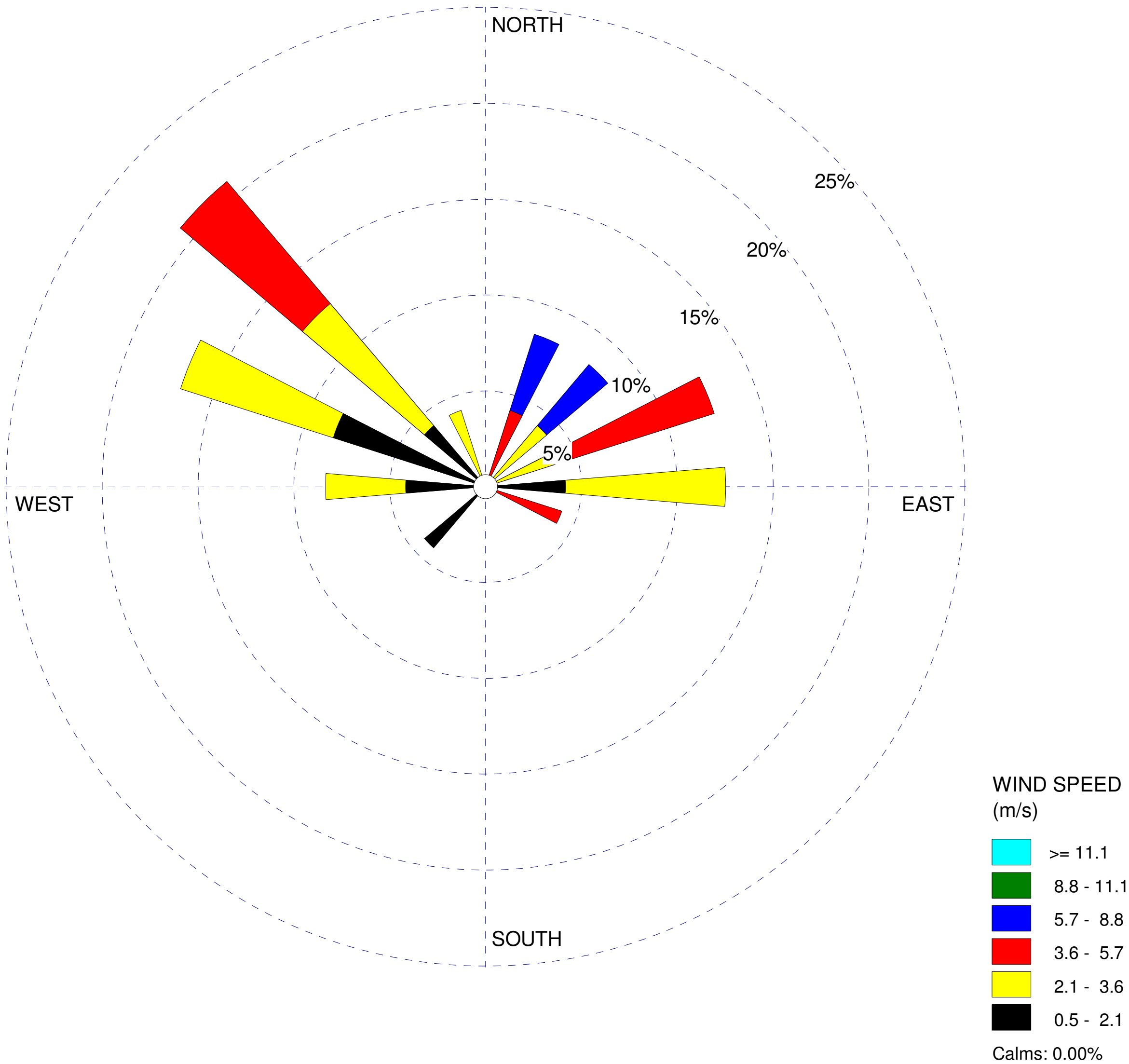
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

March 31, 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were variable with no distinct pattern.	DATA PERIOD: **2009** **Mar 31 - Mar 31** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**
		MODELER: **Wenck Associates, Inc.**
	CALM WINDS: **0.00%**	TOTAL COUNT: **24 hrs.**
	AVG. WIND SPEED: **3.48 m/s**	DATE: **10/16/2009**
		PROJECT NO.: **0742-816**

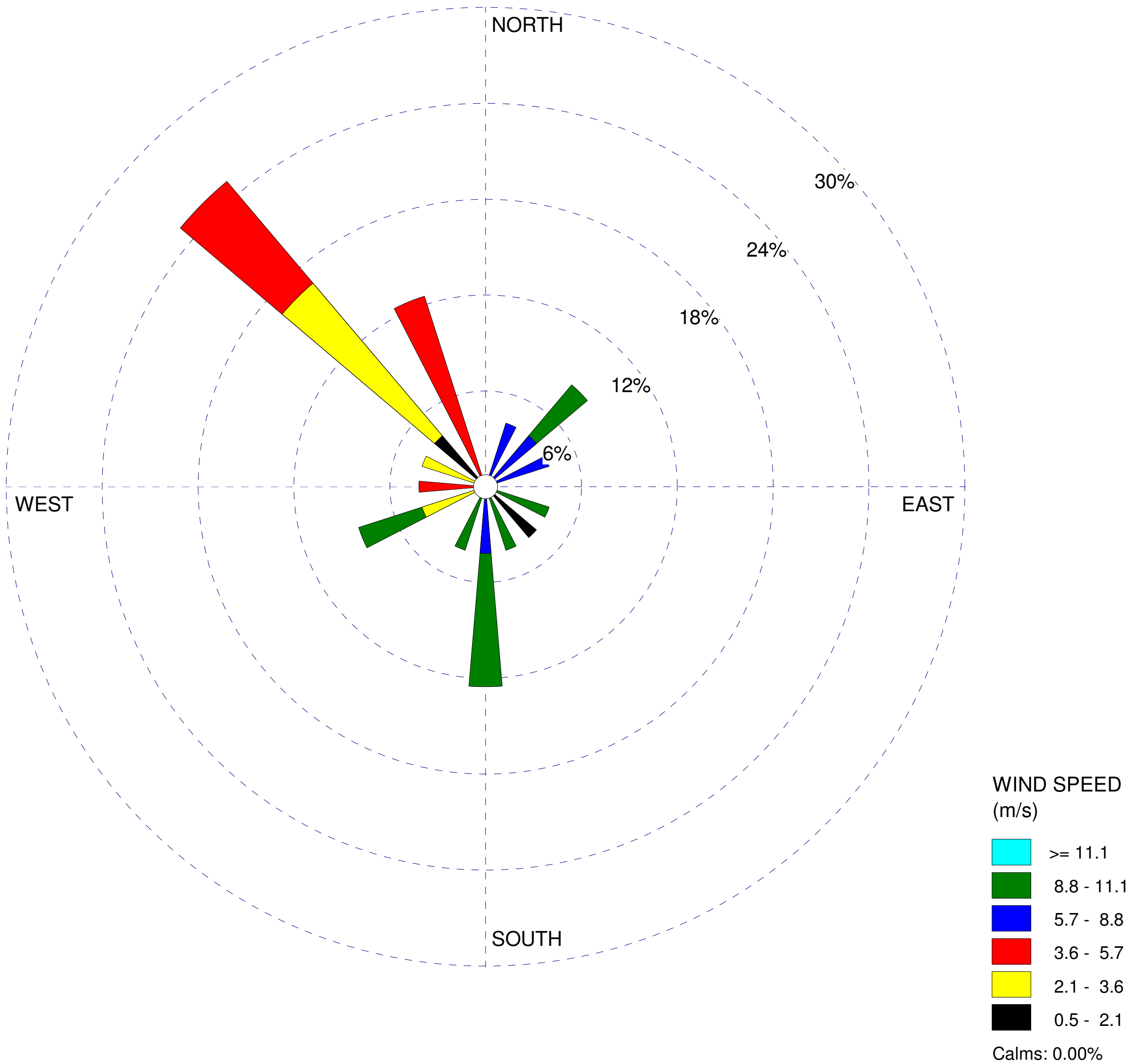
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

April 1, 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Winds were predominately from the Northwest.	**2009** **Apr 1 - Apr 1** **00:00 - 23:00**	**Chemical Waste Management - Kettleman Hills Facility**	
		MODELER: **Wenck Associates, Inc.**	Wenck
	CALM WINDS: **0.00%**	TOTAL COUNT: **24 hrs.**	
	AVG. WIND SPEED: **6.00 m/s**	DATE: **10/16/2009**	PROJECT NO.: **0742-816**

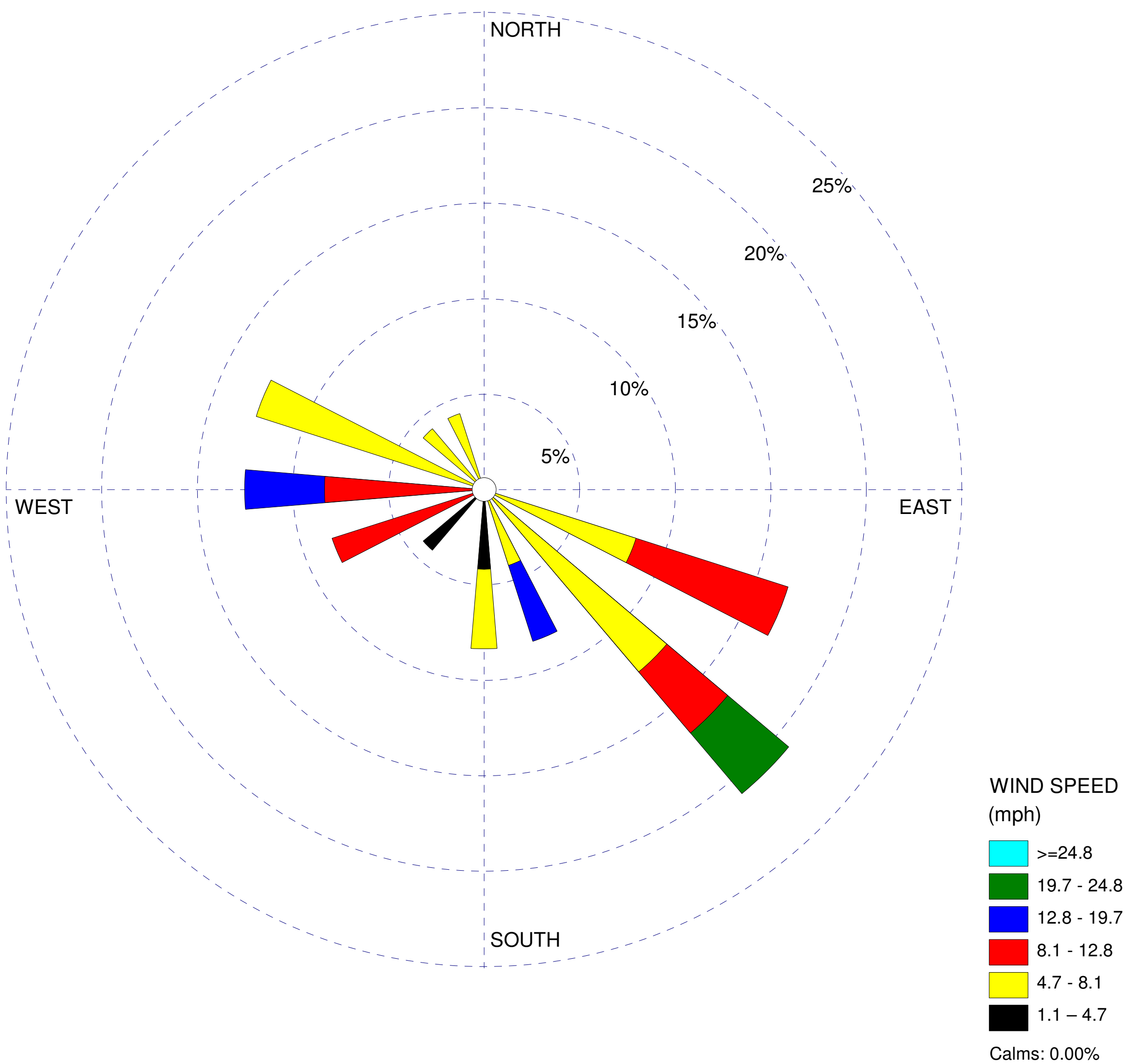
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

August 3, 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Winds were variable with no distinct pattern.

DATA PERIOD:

2009
Aug 3 - Aug 3
00:00 - 23:00

COMPANY NAME:

Chemical Waste Management - Kettleman Hills Facility

MODELER:

Wenck Associates, Inc.

Wenck

CALM WINDS:

0.00%

TOTAL COUNT:

24 hrs.

AVG. WIND SPEED:

8.95 mph

DATE:

3/30/2010

PROJECT NO.:

0742-820

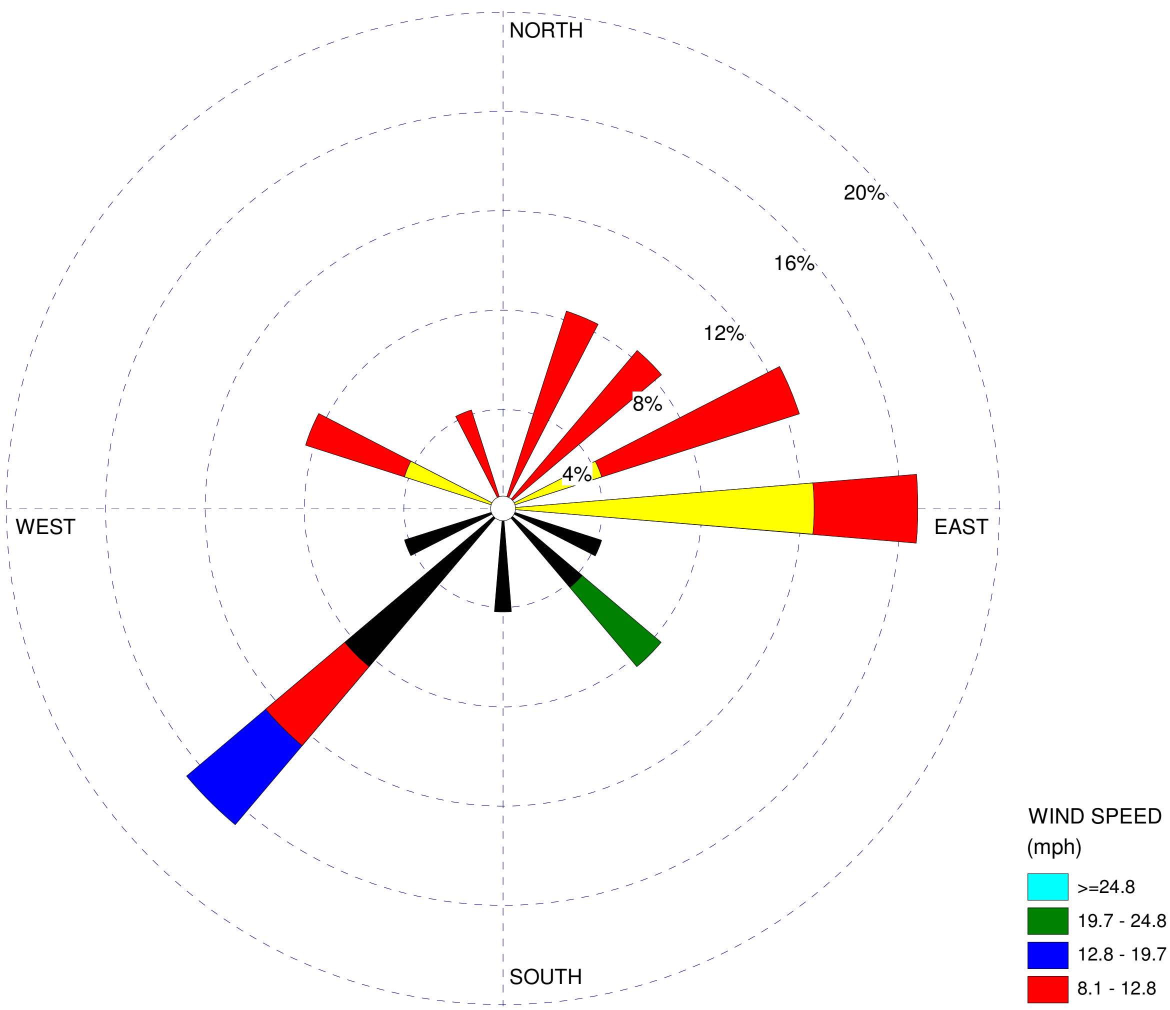
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

August 4, 2009 Sampling Event

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS: Winds were variable with no distinct pattern.	DATA PERIOD: **2009** **Aug 4 - Aug 4** **00:00 - 23:00**	COMPANY NAME: **Chemical Waste Management - Kettleman Hills Facility**
		MODELER: **Wenck Associates, Inc.**
	CALM WINDS: **4.17%**	TOTAL COUNT: **24 hrs.**
	AVG. WIND SPEED: **7.61 mph**	DATE: **3/30/2010**
		PROJECT NO.: **0742-820**

WRPLOT View - Lakes Environmental Software

DIOXIN-LIKE POLYCHLORINATED BIPHENYL (PCB) CONGENERS STUDY AIR AUDIT 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

Prepared by:

WENCK ASSOCIATES, INC.
11113 Houze Road
Suite 200
Roswell, Georgia 30076
(678) 987-5840

April 2010

Table of Contents

LIST OF APPENDICES

1.0 Background

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 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 and corresponding attachment, USEPA-IX requested that KHF sample air, soil, and vegetation for dioxin-like 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. The study is based on the overly conservative and biased assumption that any dioxin-like PCB congeners detected in the samples originated from KHF. The overall purpose of this Congener Study is to characterize and quantify the potential human and ecological risk posed by the current and accumulated impact from the management, storage, and disposal of PCB contaminated waste at KHF. The study will only focus on the 12 World Health Organization (WHO) Dioxin-Like PCB Congeners due to the risk these compounds pose relative to the other congener species.

An internal audit of the program was conducted on August 5th through August 13th 2009 under the following guidelines:

a. Occurred without special preparation or adjustment of the system to be audited.

Background (Cont.)

b. Conducted by an individual with a thorough knowledge of the instruments and processes being evaluated, but not by the routine operator.
c. Used accurate, certified National Institute of Standards and Technology (NIST) traceable transfer standards that were completely independent of those used in routine calibration.
d. The evaluation was conducted with complete documentation of all sampling data available during the systems audit.
e. Performed an overall review of all collected data for completeness and accuracy.
f. Completed in accordance with the audit requirements summarized in the final approved KHF PCB Congener Study Workplan (Workplan).

During the August audit, Mr. Michael Shoemaker visited and assessed the Congener Study sampling stations and setup activities prior to the August 2009 sampling event. Mr. Shoemaker was accompanied by Mr. Steve Holshouser, Environmental Technician at the facility during the assessment. Mr. Holshouser performed the event setup on August 5th. The takedown event was conducted by Mr. Holshouser on August 13th. All available environmental records, accumulated since the study began, were also examined. At the conclusion of the audit, the preliminary findings were discussed with Mr. Holshouser, as well as Mr. Paul Turek, the Environmental Manager for the facility.

2.0 Performance Audit Summary

The performance audit is a quantitative assessment to measure the accuracy and precision of the sampling equipment. During the audit, the auditor used certified NIST traceable calibration standards to audit the performance of the sampling instruments.

At the time the audit was performed, all polyurethane foam (PUF) sampling instruments were within the performance tolerance described in the Workplan. All performance audit results are attached in Appendix A.

3.0 Systems Audit Summary

The systems audit is a qualitative assessment to determine overall compliance with and adherence to the Workplan. Overall, during the twelve months encompassing this systems audit (January 2009 - December 2009), the percent data recovery was consistently high (100%) throughout the study. As discussed in the following Section 3.2, the primary source of flagged data was mechanical equipment problems. Throughout the study, the equipment issues were addressed as they occurred, thus providing consistent data capture.

3.1 SYSTEMS AUDIT – FIELD OBSERVATIONS

The systems audit checklist is a series of questions and observations that the auditor uses to evaluate compliance with the sampling methods and Workplan. During the systems audit, the auditor observed routine operations as they were being performed. The auditor recorded assessment data and evaluated/implemented any necessary changes and suggestions for improvement.

The following items were assessed:

- Routine operations adhering to the methods outlined in the Workplan;
- Condition of sampling equipment;
- Thoroughness of required recordkeeping;
- Records retention;

  -logbooks

  -data sheets

  -maintenance logs

  -chain-of-custody forms

  -calibration logs

The set-up audit was conducted on August 5, 2009. Mr. Shoemaker observed that monitor logbooks are being maintained for each monitoring location as outlined in the Workplan. Additionally, Mr. Matt Plate from USEPA-IX visited KHF and observed the final PUF sampling takedown at the end of the fourth

Systems Audit Summary (Cont.)

segment of the March event on March 30, 2009. Based on his observations, he submitted a letter of comments and suggestions to improve the ambient air sampling procedures. A copy of this letter is included in Appendix B of the Dioxin-like PCB Congener Study Report. Mr. Shoemaker observed KHF personnel implementation of the updated procedures in accordance with the suggestions submitted by Mr. Plate. This included hard and electronic copies of data sheets and calibration logs being updated on a regular basis and retained in a central location. The maintenance and corrective action logs were up-to-date.

The following items were also addressed:

- Overall, sampling and calibration data has been recorded properly onto hard copy data sheets and within the electronic forms. However, in a few instances data was not input or recorded correctly. The incorrect data was reviewed and corrected so that values were updated appropriately. However, going forward proper care should be taken to ensure that accurate information is recorded in the proper fields. This was corrected and discussed at the time of the audit.
- Because of its remote location, at the start of the Study, the DMS-1 monitor was powered by a portable, propane-powered electric generator. On occasion there were resulting power supply inconsistencies which affected the sampler during the sampling event setup process. Mr. Shoemaker pointed out that the sampler needs to be completely warmed up and power stabilized before making any adjustments to the flow rate at the time of setup. Several months into the study, permanent power-lines were installed, eliminating those earlier power problems.

The results of the systems audit are included in Appendix B.

3.2 SYSTEMS AUDIT – QA/QC OF MONITORING DATA

A systems audit of the collected monitoring data was performed by Ms. Haley Hudson to assess the completeness, accuracy, and adherence to the approved Workplan. A discussion of the general findings is included below, followed by a listing of the errors and issues that occurred during the sampling events. Tables summarizing the field data and flagged data from each air sampling event are included as Appendices C and D of this report, respectively.

A few minor recordkeeping issues were encountered during the Study. The recordkeeping issues involved incorrect sample identification and takedown readings on sampling event documentation. The recordkeeping issues were minor and, therefore, did not warrant specific corrective action other than paying attention to detail during documentation.

Recordkeeping issues resulting in flagged samples include:

- Sample identification nomenclature not being followed on sampling event documentation, and
- Data recorded incorrectly on field data sheet.

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. These mechanical issues were not preventable or controllable such as power and motor failures. Mechanical issues such as timer malfunctions and motor failures were addressed by replacing the timers or motors at the time the malfunction was noticed. 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 encountered 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 Appendix D of this report.

Mechanical issues resulting in flagged samples include:

- 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
- Power failures

4.0 Corrective Actions

4.1 CORRECTIVE ACTIONS – FIELD OBSERVATIONS

Issues identified during the field observations were addressed as they occurred. Based on field observations during the audit Mr. Shoemaker suggested that more care be taken with data recording.

4.2 CORRECTIVE ACTIONS – QA/QC OF MONITORING DATA

In order to decrease the number of issues during sampling event and increase the percentage of non-flagged data, corrective actions were taken to identify and correct issues/errors early before they occur. The following corrective actions were taken:

- Paying attention to detail during documentation.
- Timer malfunctions were addressed by replacing the timers.
- Motor failures were addressed by replacing motors more frequently.
- Average flow rates being slightly outside the target +/- 10% range caused by extreme high temperatures that affected takedown readings were addressed by attempting to perform the takedown step as early as possible to avoid such extreme temperatures.

5.0 Conclusions

With the exception of the recommended and implemented program improvements listed in the preceding text, the audit results determined that the Workplan is being implemented properly and the sampling equipment was operating in accordance with the method requirements. There were no additional discrepancies observed at the time of the audit.

APPENDIX A

PERFORMANCE AUDIT RESULTS

PUF SAMPLER QA AUDIT WORKSHEET
WHO Dioxin-Like PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Site Location:	Upwind (UMS)	Audit Orifice Serial Number:	774
Project Name:	**Waste Management- KHF**	Audit Orifice Certification Date:	10/31/2008
Auditor:	M. Shoemaker	Audit Orifice Slope (1) :	9.79183
Technician Name:	S. Holshouser	Audit Orifice Intercept (1) :	-0.04125
Sampler Serial Number:		PUF Sampler Slope (2) :	31.7207
		PUF Sampler Intercept (2) :	-0.4688

Date:	8/5/2009
Time:	8:20
Pressure, P_a (mmHg):	738.89
Temperature, T_a (°K):	298

AUDIT DATA

AUDIT ORIFICE			SAMPLER		VERIFICATION
T_a(°K) below = T_a above (°C) + 273.15 °C = (°F - 32) 5 / 9			Magnehelic Gauge (magn) (inches of H_2O)	Q_{std} Sampler flow rate indicated by magnehelic gauge (m^3/min)	% Difference $\frac{\lvert Q_{std} - Q_c \rvert}{Q_c} x100$ {must not be greater than ± 10%}
Observation Point	ΔH_2O Transfer Standard Reading (inches of H_2O)	Q_c True flow rate indicated by audit orifice (m^3/min)			
1	3.6	0.20	37	0.20	4.39
2	3.5	0.19	36	0.20	4.51
3	3.6	0.20	36	0.20	3.08

$$Q_c = \frac{\sqrt{\Delta H_2O\left(\frac{P_a}{760}\right)\left(\frac{298}{T_a}\right)} - \text{Audit Orifice intercept } (b)}{\text{Audit Orifice slope } (m)}$$

$$Q_{std} = \frac{\sqrt{magn\left(\frac{P_a}{760}\right)\left(\frac{298}{T_a}\right)} - \text{PUF Sampler intercept } (b)}{\text{PUF Sampler slope } (m)}$$

Notes:

(1) From the most recent Audit Orifice Certification.
(2) From the most recent Calibration Sheet.

Additional Comments and Notes:

Magnehelic pressure indicated proper flowrate for sampling assembly. Actual flowrate will be within tolerance limits based on actual pressure set point used for this assembly. Data from audit orifice indicates flow on magnehelic corresponds accurately to true flow rate.

PUF SAMPLER QA AUDIT WORKSHEET
WHO Dioxin-Like PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Site Location:	Downwind 1 (DMS-1)	Audit Orifice Serial Number:	774
Project Name:	**Waste Management- KHF**	Audit Orifice Certification Date:	10/31/2008
Auditor:	M. Shoemaker	Audit Orifice Slope (1) :	9.79183
Technician Name:	S. Holshouser	Audit Orifice Intercept (1) :	-0.04125
Sampler Serial Number:		PUF Sampler Slope (2) :	32.6432
		PUF Sampler Intercept (2) :	-0.7265

Date:	8/5/2009
Time:	9:50
Pressure, P_a (mmHg):	736.6
Temperature, T_a (°K):	300.77

AUDIT DATA

T_a(°K) below = T_a above (°C) + 273.15

$°C = \frac{(°F - 32)\,5}{9}$

AUDIT ORIFICE			SAMPLER		VERIFICATION
Observation Point	ΔH_2O Transfer Standard Reading (inches of H_2O)	Q_c True flow rate indicated by audit orifice (m^3/min)	Magnehelic Gauge (magn) (inches of H_2O)	Q_{std} Sampler flow rate indicated by magnehelic gauge (m^3/min)	% Difference $\frac{\lvert Q_{std} - Q_c \rvert}{Q_c} x100$ {must not be greater than ± 10%}
1	3.4	0.19	34	0.20	4.53
2	3.4	0.19	35	0.20	5.88
3	3.4	0.19	35	0.20	5.88

$$Q_c = \frac{\sqrt{\Delta H_2O\left(\frac{P_a}{760}\right)\left(\frac{298}{T_a}\right)} - \text{Audit Orifice intercept } (b)}{\text{Audit Orifice slope (m)}}$$

$$Q_{std} = \frac{\sqrt{magn\left(\frac{P_a}{760}\right)\left(\frac{298}{T_a}\right)} - \text{PUF Sampler intercept } (b)}{\text{PUF Sampler slope (m)}}$$

Notes:

(1) From the most recent Audit Orifice Certification.
(2) From the most recent Calibration Sheet.

Additional Comments and Notes:

PUF SAMPLER QA AUDIT WORKSHEET
WHO Dioxin-Like PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Site Location:	Downwind 2 (DMS-2)	Audit Orifice Serial Number:	774
Project Name:	**Waste Management- KHF**	Audit Orifice Certification Date:	10/31/2008
Auditor:	M. Shoemaker	Audit Orifice Slope (1) :	9.79183
Technician Name:	S. Holshouser	Audit Orifice Intercept (1) :	-0.04125
Sampler Serial Number:		PUF Sampler Slope (2) :	31.0678
		PUF Sampler Intercept (2) :	-0.4095

Date:	8/5/2009
Time:	9:07
Pressure, P_a (mmHg):	737.76
Temperature, T_a (°K):	298.55

AUDIT DATA

AUDIT ORIFICE			SAMPLER		VERIFICATION
T_a(°K) below = T_a above (°C) + 273.15 °C = (°F - 32) 5 / 9					
Observation Point	ΔH_2O Transfer Standard Reading (inches of H_2O)	Q_c True flow rate indicated by audit orifice (m^3/min)	Magnehelic Gauge (magn) (inches of H_2O)	Q_{std} Sampler flow rate indicated by magnehelic gauge (m^3/min)	% Difference $\frac{\lvert Q_{std} - Q_c \rvert}{Q_c} x100$ {must not be greater than ± 10%}
1	4.1	0.21	44	0.22	7.50
2	4.1	0.21	43	0.22	6.34
3	4.1	0.21	43	0.22	6.34

$$Q_c = \frac{\sqrt{\Delta H_2O\left(\frac{P_a}{760}\right)\left(\frac{298}{T_a}\right)} - \text{Audit Orifice intercept } (b)}{\text{Audit Orifice slope (m)}}$$

$$Q_{std} = \frac{\sqrt{magn\left(\frac{P_a}{760}\right)\left(\frac{298}{T_a}\right)} - \text{PUF Sampler intercept } (b)}{\text{PUF Sampler slope (m)}}$$

Notes:

(1) From the most recent Audit Orifice Certification.
(2) From the most recent Calibration Sheet.

Additional Comments and Notes:

PUF SAMPLER QA AUDIT WORKSHEET
WHO Dioxin-Like PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Site Location:	Mobile Station	Audit Orifice Serial Number:	774
Project Name:	**Waste Management- KHF**	Audit Orifice Certification Date:	10/31/2008
Auditor:	M. Shoemaker	Audit Orifice Slope (1) :	9.79183
Technician Name:	S. Holshouser	Audit Orifice Intercept (1) :	-0.04125
Sampler Serial Number:		PUF Sampler Slope (2) :	31.2483
		PUF Sampler Intercept (2) :	-0.3988

Date:	8/5/2009
Time:	15:40
Pressure, P_a (mmHg):	752.35
Temperature, T_a (°K):	303

AUDIT DATA

AUDIT ORIFICE			SAMPLER		VERIFICATION
T_a(°K) below = T_a above (°C) + 273.15 °C = (°F - 32) 5 / 9			Magnehelic Gauge (magn) (inches of H_2O)	Q_{std} Sampler flow rate indicated by magnehelic gauge (m^3/min)	% Difference $\frac{\lvert Q_{std} - Q_c \rvert}{Q_c} x100$ {must not be greater than ± 10%}
Observation Point	ΔH_2O Transfer Standard Reading (inches of H_2O)	Q_c True flow rate indicated by audit orifice (m^3/min)			
1	3.5	0.19	35	0.20	3.55
2	3.5	0.19	36	0.20	4.92
3	3.5	0.19	36	0.20	4.92

$$Q_c = \frac{\sqrt{\Delta H_2O\left(\frac{P_a}{760}\right)\left(\frac{298}{T_a}\right)} - \text{Audit Orifice intercept } (b)}{\text{Audit Orifice slope (m)}}$$

$$Q_{std} = \frac{\sqrt{magn\left(\frac{P_a}{760}\right)\left(\frac{298}{T_a}\right)} - \text{PUF Sampler intercept } (b)}{\text{PUF Sampler slope (m)}}$$

Notes:
(1) From the most recent Audit Orifice Certification.
(2) From the most recent Calibration Sheet.

Additional Comments and Notes:

APPENDIX B

SYSTEMS AUDIT RESULTS

WASTE MANAGEMENT

SYSTEMS AUDIT CHECKLIST
PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Wenck

Site Location UMS-1
Date 8/5/09
Auditor M. Shoemaker

Operation	YES	NO
A. NETWORK/SITE FACILITIES		
1. Upon arrival, was the security fence intact and locked?	X	
2. Is the fenced-in area free of trash, tall grass, and vandalism?	X	
3. Is the electrical system at the station in working order?	X	
B. SITE OPERATIONS		
1. Are the latest calibration data for all samplers available?	X	
2. Are the monitor logbooks maintained properly?	X	
3. Are proper and timely operator checklist entries noted?	X	
4. Are the calibrators currently certified?	X	
5. Are operation manuals available for all equipment?	X	
6. Are the field SOPs and QA/QC documents available?	X	
7. Does the operator keep the filter-handling area neat and clean?	X	
8. Do the sampler(s) appear to be well maintained and free of dirt and debris, bird/animal/insect nests, excessive rust and corrosion, etc.?	X	
9. Are the walkways to the station and equipment kept free of tall grass, weeds, and debris?	X	

Additional Questions or Comments:

- Filter area kept clean
- Preload area deconned thoroughly prior to loading units with required parts
- All decon steps followed in preload room
- All media stored in freezer with ice packs
- Filters stored in foil, PUF cartridges stored in ~~foil~~ freezer in foil
- Records copied morning of 8/5/09. ~~Not upd~~ MS prior to update for July/Aug maintenance [motor replacement and calibration]
- Blank taken at UMS-1. Followed blank procedures implemented after EPA-IX (M. Plate) audit and recommendation

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SYSTEMS AUDIT CHECKLIST (continued)
PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Operation UMS-1 8/5/09	YES	NO

C. SAMPLE MEDIA HANDLING

	YES	NO
1. Are all filters, cartridges, and/or canisters handled with the necessary care to avoid contamination?	X	___
2. Are field blanks routinely used by the monitoring organization? Check log books at the site to verify field blanks are run periodically, as specified by the weighing laboratory. *One field blank per sampling event.*	X	___
3. Observe the following handling steps for routine sample media, verifying that the operator follows the media handling SOPs correctly:		
• receipt of media at the sampling site and unpacking	X	___
• completion of logbook entries and other required documentation	X	___
• inspection of the media prior to sampling	X	___
• installation of media in the sampler	X	___
• retrieval from the sampler after sampling	___	___
• packing and sending to the laboratory	___	___
• completion of chain of custody and field data forms	___	___

Additional Questions or Comments:

WASTE MANAGEMENT

SYSTEMS AUDIT CHECKLIST
PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Wenck

Site Location MSP
Date 8/5/09
Auditor M. Shoemaker

Operation	YES	NO
A. NETWORK/SITE FACILITIES		
1. Upon arrival, was the security fence intact and locked?	X	
2. Is the fenced-in area free of trash, tall grass, and vandalism?	X	
3. Is the electrical system at the station in working order?	X	
B. SITE OPERATIONS		
1. Are the latest calibration data for all samplers available?	X	
2. Are the monitor logbooks maintained properly?	X	
3. Are proper and timely operator checklist entries noted?	X	
4. Are the calibrators currently certified?	X	
5. Are operation manuals available for all equipment?	X	
6. Are the field SOPs and QA/QC documents available?	X	
7. Does the operator keep the filter-handling area neat and clean?	X	
8. Do the sampler(s) appear to be well maintained and free of dirt and debris, bird/animal/insect nests, excessive rust and corrosion, etc.?	X	
9. Are the walkways to the station and equipment kept free of tall grass, weeds, and debris?	X	

Additional Questions or Comments:
See notes from UMS-1. All procedures followed according to SOP and updated EPA-1X recommendations

WASTE MANAGEMENT

SYSTEMS AUDIT CHECKLIST (continued)
PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Wenck

Operation MSP 8/5/09	YES	NO

C. SAMPLE MEDIA HANDLING

	YES	NO
1. Are all filters, cartridges, and/or canisters handled with the necessary care to avoid contamination?	X	
2. Are field blanks routinely used by the monitoring organization? Check log books at the site to verify field blanks are run periodically, as specified by the weighing laboratory. *One field blank per sampling event.*	X	
3. Observe the following handling steps for routine sample media, verifying that the operator follows the media handling SOPs correctly:		
• receipt of media at the sampling site and unpacking	X	
• completion of logbook entries and other required documentation	X	
• inspection of the media prior to sampling	X	
• installation of media in the sampler	X	
• retrieval from the sampler after sampling		
• packing and sending to the laboratory		
• completion of chain of custody and field data forms		

Additional Questions or Comments:

SYSTEMS AUDIT CHECKLIST
PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Site Location DMS-1
Date 8/5/09
Auditor M. Shoemaker

Operation	YES	NO
A. NETWORK/SITE FACILITIES		
1. Upon arrival, was the security fence intact and locked?	X	
2. Is the fenced-in area free of trash, tall grass, and vandalism?	X	
3. Is the electrical system at the station in working order?	X	
B. SITE OPERATIONS		
1. Are the latest calibration data for all samplers available?	X	
2. Are the monitor logbooks maintained properly?	X	
3. Are proper and timely operator checklist entries noted?	X	
4. Are the calibrators currently certified?	X	
5. Are operation manuals available for all equipment?	X	
6. Are the field SOPs and QA/QC documents available?	X	
7. Does the operator keep the filter-handling area neat and clean?	X	
8. Do the sampler(s) appear to be well maintained and free of dirt and debris, bird/animal/insect nests, excessive rust and corrosion, etc.?	X	
9. Are the walkways to the station and equipment kept free of tall grass, weeds, and debris?	X	

Additional Questions or Comments:

See notes for UMS-1

SYSTEMS AUDIT CHECKLIST (continued)
PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Operation DMS-1	YES	NO

C. SAMPLE MEDIA HANDLING

	YES	NO
1. Are all filters, cartridges, and/or canisters handled with the necessary care to avoid contamination?	X	___
2. Are field blanks routinely used by the monitoring organization? Check log books at the site to verify field blanks are run periodically, as specified by the weighing laboratory. *One field blank per sampling event.*	X	___
3. Observe the following handling steps for routine sample media, verifying that the operator follows the media handling SOPs correctly:		
• receipt of media at the sampling site and unpacking	X	___
• completion of logbook entries and other required documentation	X	___
• inspection of the media prior to sampling	X	___
• installation of media in the sampler	X	___
• retrieval from the sampler after sampling	___	___
• packing and sending to the laboratory	___	___
• completion of chain of custody and field data forms	___	___

Additional Questions or Comments:

SYSTEMS AUDIT CHECKLIST
PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Site Location Mobile
Date 8/5/09
Auditor M. Shoemaker

Operation	YES	NO
A. NETWORK/SITE FACILITIES		
1. Upon arrival, was the security fence intact and locked?	X	
2. Is the fenced-in area free of trash, tall grass, and vandalism?	X	
3. Is the electrical system at the station in working order?	X	
B. SITE OPERATIONS		
1. Are the latest calibration data for all samplers available?	X	
2. Are the monitor logbooks maintained properly?	X	
3. Are proper and timely operator checklist entries noted?	X	
4. Are the calibrators currently certified?	X	
5. Are operation manuals available for all equipment?	X	
6. Are the field SOPs and QA/QC documents available?	X	
7. Does the operator keep the filter-handling area neat and clean?	X	
8. Do the sampler(s) appear to be well maintained and free of dirt and debris, bird/animal/insect nests, excessive rust and corrosion, etc.?	X	
9. Are the walkways to the station and equipment kept free of tall grass, weeds, and debris?	✓	

Additional Questions or Comments:

WASTE MANAGEMENT

SYSTEMS AUDIT CHECKLIST (continued)
PCB Congener Study
Kettleman Hills Facility (KHF)
Kings County, California

Wenck

Operation	YES	NO
C. SAMPLE MEDIA HANDLING		
1. Are all filters, cartridges, and/or canisters handled with the necessary care to avoid contamination?	X	
2. Are field blanks routinely used by the monitoring organization? Check log books at the site to verify field blanks are run periodically, as specified by the weighing laboratory. *One field blank per sampling event.*	X	
3. Observe the following handling steps for routine sample media, verifying that the operator follows the media handling SOPs correctly:		
• receipt of media at the sampling site and unpacking	X	
• completion of logbook entries and other required documentation	X	
• inspection of the media prior to sampling	X	
• installation of media in the sampler	X	
• retrieval from the sampler after sampling		
• packing and sending to the laboratory		
• completion of chain of custody and field data forms		

Additional Questions or Comments:

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AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5040A

Date - Oct 31, 2008 Rootsmeter S/N 9833620 Ta (K) - 292
Operator Jim Tisch Orifice I.D. - 0774 Pa (mm) - 750.57

PLATE OR VDC #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	6.7280	3.6	2.00
2	NA	NA	1.00	4.0610	10.0	5.50
3	NA	NA	1.00	3.2590	15.3	8.50
4	NA	NA	1.00	2.7830	20.7	11.50
5	NA	NA	1.00	2.4650	26.1	14.50
6	NA	NA	1.00	2.3020	29.7	16.50

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
1.0029	0.1490	1.4198		0.9951	0.1479	0.8821
0.9944	0.2448	2.3544		0.9866	0.2429	1.4628
0.9873	0.3029	2.9269		0.9795	0.3005	1.8185
0.9800	0.3521	3.4045		0.9723	0.3493	2.1152
0.9727	0.3946	3.8229		0.9651	0.3915	2.3751
0.9680	0.4205	4.0780		0.9604	0.4172	2.5336

Qstd slope (m) =	9.79183	Qa slope (m) =	6.13148
intercept (b) =	-0.04125	intercept (b) =	-0.02562
coefficient (r) =	1.00000	coefficient (r) =	1.00000

y axis = SQRT[H2O(Pa/760)(298/Ta)]   y axis = SQRT[H2O(Ta/Pa)]

CALCULATIONS

Vstd = Diff. Vol[(Pa-Diff. Hg)/760](298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
Qa = Va/Time

For subsequent flow rate calculations:

Qstd = 1/m{[SQRT(H2O(Pa/760)(298/Ta))]- b}
Qa = 1/m{[SQRT H2O(Ta/Pa)]- b}

Audit Orifice

TISCH ENVIROMENTAL, INC.
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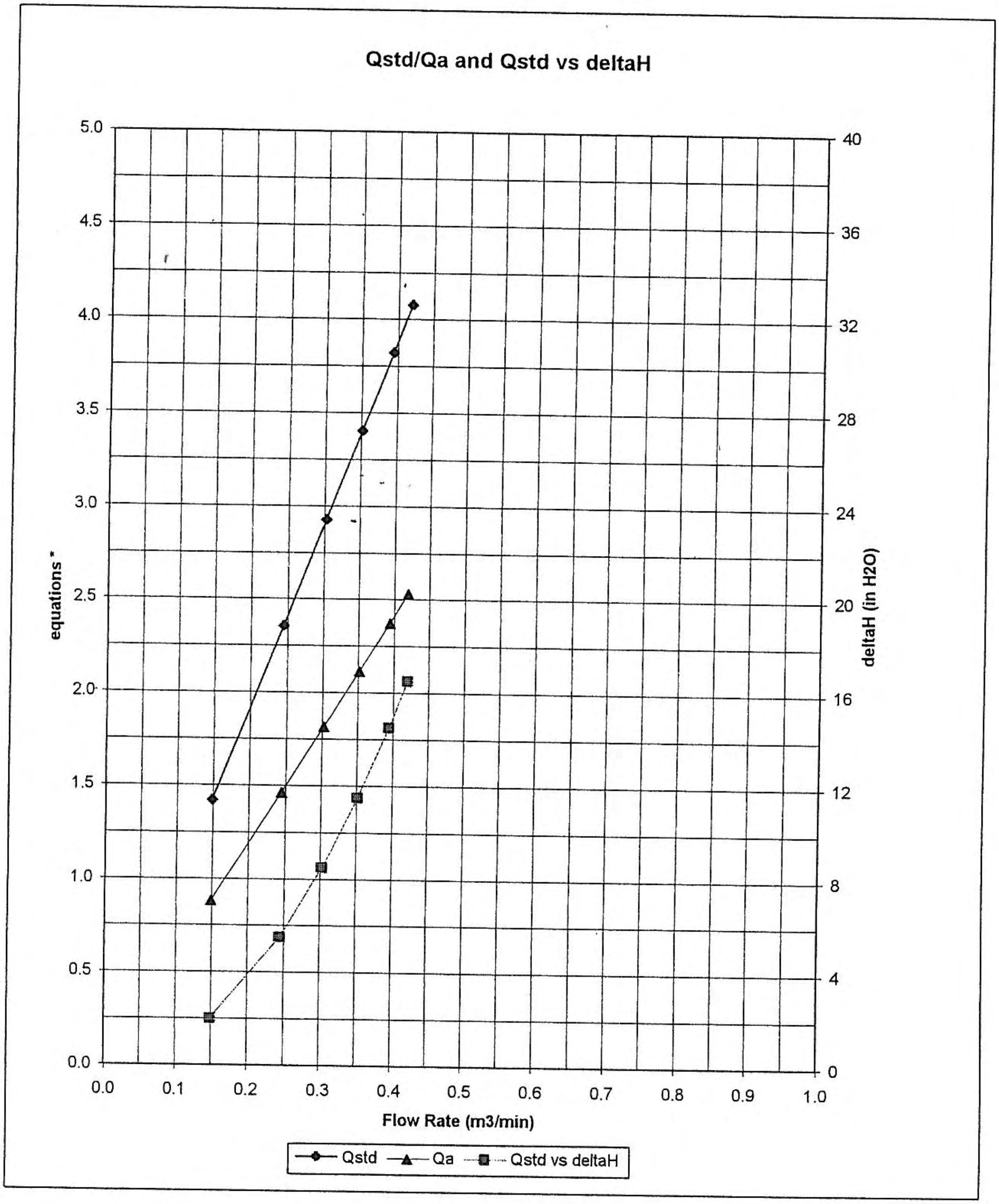
AIR POLLUTION MONITORING EQUIPMENT



*** y-axis equations:**

Qstd series: $$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$$

#0774

Qa series: $$\sqrt{(\Delta H\,(Ta\,/\,Pa))}$$

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AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5040A

Date - Apr 27, 2009 Rootsmeter S/N 9833620 Ta (K) - 299
Operator Jim Tisch Orifice I.D. - 1064 Pa (mm) - 756.92

PLATE OR VDC #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	6.7390	3.6	2.00
2	NA	NA	1.00	4.0260	10.0	5.50
3	NA	NA	1.00	3.2380	15.3	8.50
4	NA	NA	1.00	2.7720	20.7	11.50
5	NA	NA	1.00	2.4500	26.1	14.50
6	NA	NA	1.00	2.2850	29.7	16.50

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
0.9878	0.1465	1.4090		0.9951	0.1476	0.8888
0.9795	0.2432	2.3365		0.9867	0.2451	1.4740
0.9725	0.3003	2.9047		0.9797	0.3025	1.8324
0.9654	0.3482	3.3786		0.9726	0.3508	2.1314
0.9583	0.3911	3.7938		0.9654	0.3940	2.3933
0.9536	0.4173	4.0470		0.9607	0.4204	2.5530

Qstd slope (m) =	9.76855	Qa slope (m) =	6.11690
intercept (b) =	-0.02886	intercept (b) =	-0.01821
coefficient (r) =	0.99996	coefficient (r) =	0.99996

y axis = SQRT[H2O(Pa/760)(298/Ta)]   y axis = SQRT[H2O(Ta/Pa)]

CALCULATIONS

Vstd = Diff. Vol[(Pa-Diff. Hg)/760](298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
Qa = Va/Time

For subsequent flow rate calculations:

Qstd = 1/m{[SQRT(H2O(Pa/760)(298/Ta))]- b}
Qa = 1/m{[SQRT H2O(Ta/Pa)]- b}

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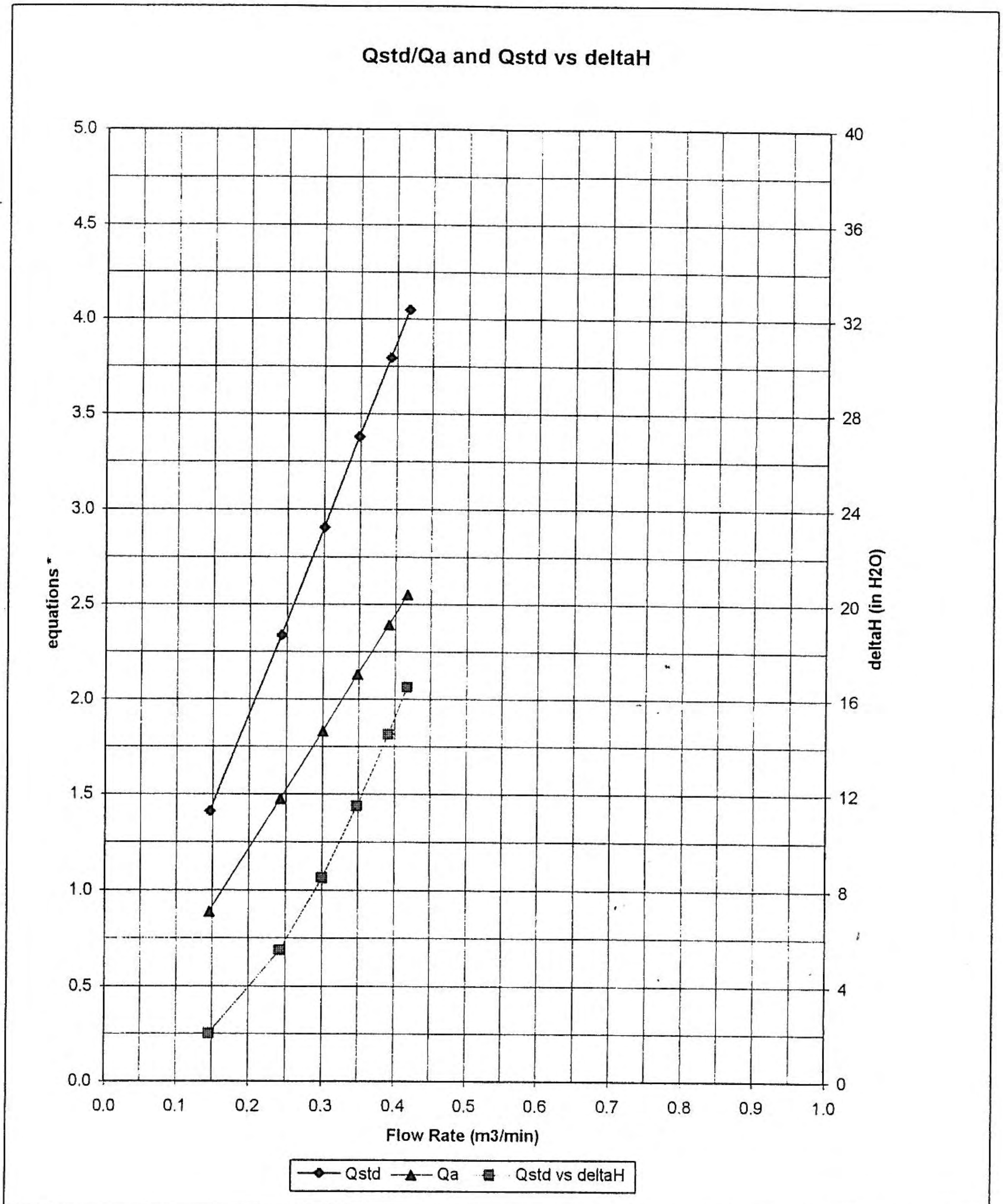
AIR POLLUTION MONITORING EQUIPMENT



*** y-axis equations:**

Qstd series: $\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$

Qa series: $\sqrt{(\Delta H\ (Ta\ /\ Pa))}$

#1064

TISCH ENVIRONMENTAL

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AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5040A

Date - Apr 21, 2008 Rootsmeter S/N 9833620 Ta (K) - 295
Operator Jim Tisch Orifice I.D. - 1064 PUF Pa (mm) - 753.11

PLATE OR VDC #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	6.6950	3.6	2.00
2	NA	NA	1.00	4.0270	10.0	5.50
3	NA	NA	1.00	3.2410	15.3	8.50
4	NA	NA	1.00	2.7660	20.7	11.50
5	NA	NA	1.00	2.4480	26.1	14.50
6	NA	NA	1.00	2.2860	29.7	16.50

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
0.9961	0.1487	1.4149		0.9951	0.1486	0.8851
0.9877	0.2452	2.3464		0.9867	0.2450	1.4678
0.9806	0.3025	2.9170		0.9796	0.3022	1.8247
0.9734	0.3519	3.3929		0.9724	0.3515	2.1224
0.9662	0.3947	3.8098		0.9652	0.3943	2.3832
0.9615	0.4206	4.0641		0.9605	0.4201	2.5423
Qstd slope (m) =		9.75202		Qa slope (m) =		6.10655
intercept (b) =		-0.03866		intercept (b) =		-0.02418
coefficient (r) =		0.99998		coefficient (r) =		0.99998

y axis = SQRT[H2O(Pa/760)(298/Ta)]

y axis = SQRT[H2O(Ta/Pa)]

CALCULATIONS

Vstd = Diff. Vol[(Pa-Diff. Hg)/760](298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
Qa = Va/Time

For subsequent flow rate calculations:

Qstd = 1/m{[SQRT(H2O(Pa/760)(298/Ta))]- b}
Qa = 1/m{[SQRT H2O(Ta/Pa)]- b}

TISCH ENVIROMENTAL, INC.
145 SOUTH MIAMI AVE.
VILLAGE OF CLEVES, OH 45002
513.467.9000
877.263.7610 TOLL FREE
513.467.9009 FAX
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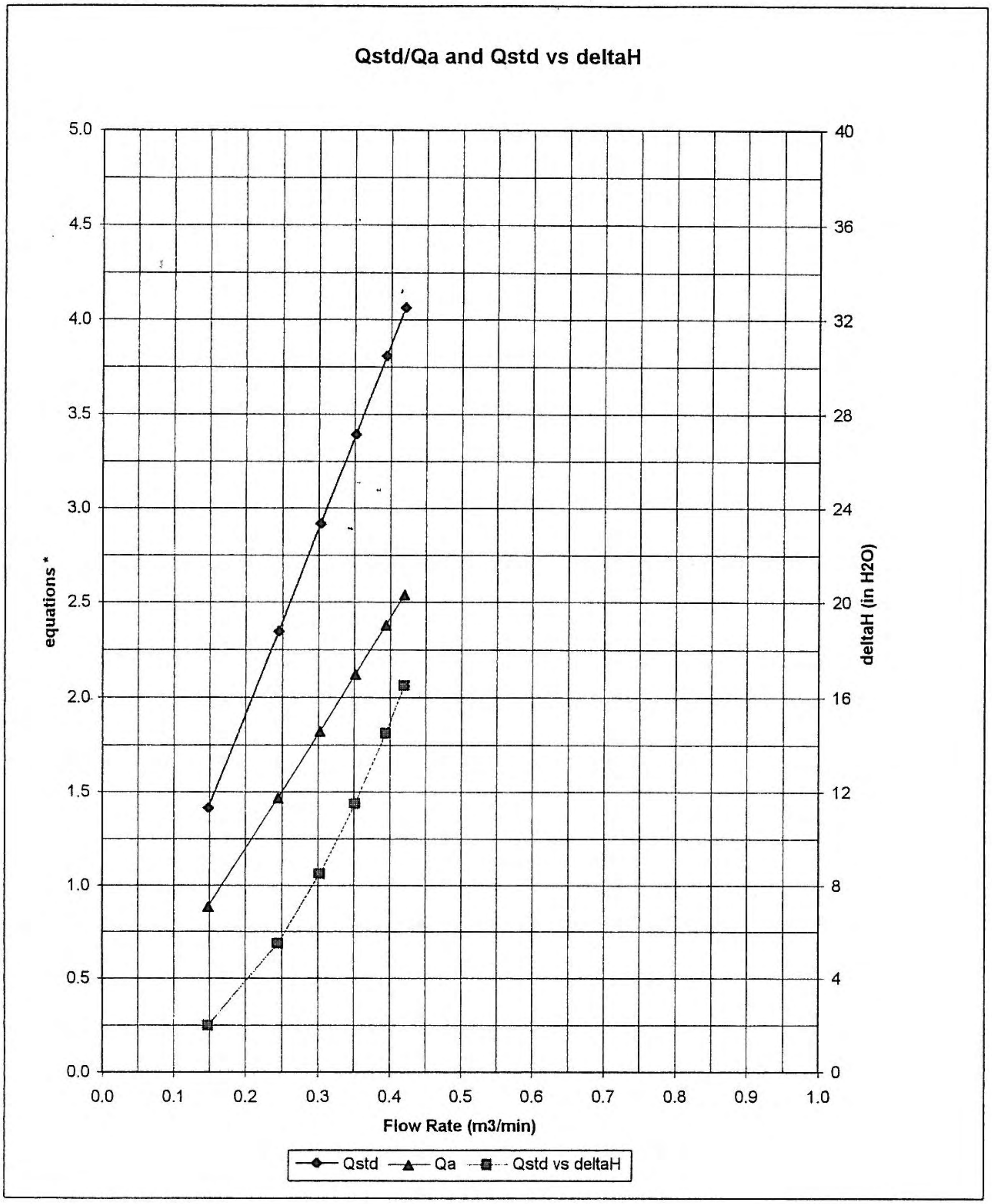
AIR POLLUTION MONITORING EQUIPMENT



*** y-axis equations:**

Qstd series: $\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$

Qa series: $\sqrt{(\Delta H \, (Ta / Pa))}$

#1064

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER CALIBRATION LOG

Date of Calibration	Elapsed Time Meter Reading	Technician's Initials
9/25/06 DMS2 805	18.85	[illegible]
10/1/06 UMS1 794	0.85	[illegible]
10/1/06 DMS1 806	3.5	[illegible]
10/1/06 mobile 803	0.97	[illegible]
10/20/06 mobile 803	24.53	[illegible]
11/15/06 mobile 803	48.90	[illegible]
12/12/06 mobile 803	73.28	[illegible]
1/29/07 mobile 803	120.87	[illegible]
2/22/07 mobile 803	144.77	[illegible]
3/9/07 UMS1 794	338.61	[illegible]
3/9/07 DMS2 805	369.29	[illegible]
3/18/07 DMS1 806	372.78	[illegible]
3/18/07 mobile 803	169.07	[illegible]
4/10/07 mobile 803	193.87	[illegible]
6/29/07 mobile 803	265.73	[illegible]
6/29/07 UMS1 794	558.63	[illegible]
6/29/07 DMS1 806	607.56	[illegible]
6/29/07 DMS2 805	586.48	[illegible]
7/16/07 mobile 803	266.34	[illegible]
8/9/07 mobile 803	290.54	[illegible]
9/26/07 mobile 803	~~314.67~~ 338.57	[illegible]
9/26/07 UMS1 794	912.45	[illegible]
9/26/07 DMS1 806	807.99	[illegible]
9/26/07 DMS2 805	763.65	[illegible]
10/18/07 UMS1 794	963.9	[illegible]
10/18/07 DMS2 805	~~853.6~~ 10/22/07 811.29	[illegible]
10/18/07 DMS1 806	853.6	[illegible]
10/18/07 mobile 803	362.54	[illegible]
03/12/08 mobile 803		[illegible]
03/12/08 UMS1 794		[illegible]
03/12/08 DMS1 806		[illegible]
03/12/08 DMS2 805		[illegible]
~~03/12/08~~		

NOTE: 1) **Calibrator must be re-certified and sent to Tisch Environmental each year. Replace the certification worksheet (Form 3).**

2) **Each unit must be calibrated on a quarterly schedule and after any maintenance, movement, or failed calibration check.**

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER CALIBRATION LOG

Date of Calibration	Elapsed Time Meter Reading	Technician's Initials
04/28/08	UMS1 CAL — 1409.67	SEA
↓	MOBILE CAL - 580.62	↓
↓	DMS1 CAL - 1215.39	↓
↓	DMS2 CAL - 1170.91	↓
10/29/08	UMS1 CAL - 1432.90	SEA
↓	DMS1 - 1215.63	↓
↓	DMS2 - 1171.32	↓
↓	MOBILE - 580.80.	↓
01/05/09	UMS1 - 794 - 1458.22	SEA
↓	DMS1 - 806 - 23.0	↓
↓	MET - 803 - 1196.17	↓
01/11/09	MET ~~MOBILE~~ SEA - 803 - 1318.15	SEA
↓	UMS1 - 794 - 1586.7	↓
↓	DMS1 - 806 - 140.49	↓
01/17/09	UMS1 - 794 - 1714.95	SEA
↓	DMS1 - 806 - 239.68	↓
↓	MET ~~MOBILE~~ SEA - 803 - 1386.1	↓
01/23/09	UMS1 - 794 - 1841.5	SEA
↓	DMS1 - 806 - 357.8	↓
↓	MET - 803 - 1504.05	↓
01/30/09	UMS1 794 - 1965.00	SEA
↓	DMS1 806 - 477.1	↓
↓	MET 803 - 1609.46	↓
02/06/09	UMS1 794 - 2051.20	SEA
↓	DMS1 806 - 597.20	↓
↓	MET 803 - 1729.60	↓
02/12/09	UMS1 794 - 2171.25	SEA
↓	DMS1 806 - 717.22	↓
↓	MET 803 - 1849.65	↓
02/18/09	UMS1 794 - 2291.32	SEA
↓	DMS1 806 - 837.25	↓
↓	MET 803 - 1969.67	↓

SEA

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER CALIBRATION LOG

Date of Calibration	Elapsed Time Meter Reading	Technician's Initials
03/06/09	UMSI-794-2421.08	SHL
03/06/09	DMSI-806-868.2	SHL
03/06/09	MET-803-2100.02	SHL
03/12/09	MET-803-605.04	SHL
~~03/18/09~~ SHL 03/24/08	MET-803-824.50	SHL
04/03/09	UMSI 794 - ~~2809.62~~ SHL 2909.56	SHL
04/03/09	DMSI 806 - SHL ~~1568.52~~ 1485	SHL
04/03/09	~~MOBILE~~ SHL MET 805 - ~~1077.03~~ 954.03 SHL	SHL
04/03/09	MOBILE MPS ALT 803 ~~2220.46~~ 2100.45 SHL	SHL
04/21/09	DMSI-806 - 3256.61	SHL
05/01/09	UMSI-794 - 3376.81	SHL
05/01/09	DMSI-806 - 120.34	SHL
05/01/09	MSP-805 - 1421.26	SHL
05/01/09	UMSI DUP (MOBILE)-803 - 2580.9	SHL
06/05/09	UMSI 794 3898.88	SHL
06/05/09	DMSI 806 682.1	SHL
06/05/09	MSP 805 1907.18	SHL
06/05/09	MOBILE (DMSI DUP) 803 3174.38	SHL
07/02/09	UMSI-794 - 4375.92	SHL
07/02/09	DMSI-806 - 1163.06	SHL
07/02/09	MSP-805 - 2387.59	SHL
07/02/09	~~DMSI~~ SHL MOBILE (MSP DUP) 803 - 3162.75	SHL

NOTE: 1) Calibrator must be re-certified and sent to Tisch Environmental each year. Replace the certification worksheet (Form 3).

2) Each unit must be calibrated on a quarterly schedule and after any maintenance, movement, or failed calibration check.

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER PREVENTATIVE MAINTENANCE LOG

Date of Maintenance	Elapsed Time Meter Reading	Description of Maintenance Performed	Technician's Initials
3/8/07 UMS1		Replaced Motor brushes	JF
3/8/07 DMS1		Replaced Motor brushes	JF
3/8/07 DMS2		Replaced Motor brushes	JF
3/8/07 mobile		Replaced Motor brushes	JF
5/23/07	Timer did not work properly. seems to run		
	longer than programmed. Will replace timer		
	mechanism DMS1		JF
~~6/~~ 5/23/07	Replaced 7 day timer with an		
	Identical item. Ran a mock event		
	on 6/1/07 with satisfactory results DMS1		JF
9/26/07	~~Performed~~ JF Cleaned spider webs and		
	dirt from all units. UMS1, DMS1, DMS2, mobile		JF
10/15/07	Maintenance department replaced all		
	motors ~~that~~ at UMS1, DMS1, DMS2, Trailer		
	(UMS1 963.9) (DMS1 853.6), (DMS2 811.29)		
	(trailer 362.54)		JF
03/12/08	PERFORMED QUARTERLY PREVENTATIVE MAINTENANCE		
	CLEANING ON ALL UNITS (UMS1, DMS1, DMS2,		
	AND MOBILE).		SEA
04/24/08	UMS1-1409.67	MAINTENANCE REPLACED MOTORS	SEA
↓	DMS1-1215.39	AT UMS1, DMS1, DMS2, AND	↓
	DMS2-1170.89	MOBILE UNIT.	
↓	MOBILE-580.62		↓
04/28/08		QUARTERLY PREVENTATIVE	SEA
↓		MAINT UMS1, MOBILE, DMS1,	↓
		DMS2	
08/20/08		MAINTENANCE REMOVED ELECTRICAL	SEA
↓		CONNECTIONS FROM UMS1, DMS1,	↓
		DMS2, AND MOBILE UNITS	
08/27/08		REMOVED UNITS FROM UMS1, DMS1,	SEA
↓		DMS2, AND MOBILE STATION, WRAPPED	↓
		IN PLASTIC AND STORED IN	
		THE EMD SHOP ATTIC.	

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KETTLEMAN HILLS FACILITY AMBIENT AIR MONITORING PROGRAM
PUF SAMPLER PREVENTATIVE MAINTENANCE LOG

Date of Maintenance	Elapsed Time Meter Reading	Description of Maintenance Performed	Technician's Initials
12/13/08		INSTALLED PUF UNITS BACK AT	SGL
↓		UMS1, DMS1, MOBILE STATION,	↓
		AND DMS2.	
12/17/08		REMOVED PUF UNIT FROM DMS2	SGL
↓		AND DELIVERED TO MAINTENANCE SHOP	↓
		FOR INSTALLATION AT THE MET STATION.	
12/29/09		MAINTENACE INSTALLED PUF UNIT	SGL
↓		SERIAL # 803 AT MET STATION.	↓
12/29/09	756.92	MET STATION - 803 MAINTENANCE INSTALLED	SGL
↓	1458.22	UMS1 - 794 NEW MOTORS	↓
	23.00	DMS1 - 806 ON PUF UNITS	
02/02/09	UMS1 - 1964.95	MOTOR REPLACED UMS1	SGL
↓	DMS1 - 477.1	MOTOR REPLACED DMS1	↓
	MET - 1609.45	MOTOR REPLACED MET	
02/26/09	UMS1 - 2411.45	MOTORS REPLACED UMS1	SGL
↓	DMS1 - 957.41	↓ DMS1	↓
	MET - 2089.75	MET STATION	
03/12/09	MET - 605.04	CANNIBALIZED HOUR METER FROM	SGL
↓	↓	MOBILE STATION	↓
03/24/09	MET - 824.45	MOTOR FAILED - REPLACED BY SITE	SGL
↓	↓	MAINTENANCE.	↓
04/28/09	UMS1, DMS1, MET, DUP (mobile)	SITE MAINTENANCE R+RD ALL MOTORS.	SGL
06/02/09	UMS1, DMS1, MET, MOBILE	SITE MAINTENANCED REPLACED MOTORS	SGL
06/30/09	UMS1, DMS1, MET, MOBILE	SITE MAINTENANCE R+R'D MOTORS	SGL

PUF - EPA CONGENER STUDY

STARTED: 04/09/09

TITLE

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PROJECT NO.

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04/09/09 MPS - 1135 - ARRIVED.

TEMP: ~~739.65°K~~ SEH 294.8°K

BP: 739.65 ~~in/Hg~~ SEH mm/Hg

MAGNEHELIC READING: 42 in/Hg TIMER - 1074.03

SET BLANK INSIDE PUF, INSTALLED AND UNCAPPED.

CAL READING AT 50 INCHES - 5.3 ON SLAC TUBE

INITIAL MAGNAHELIC: 44.0 SEH

TIMER: 1074.13

MPS ALT - 1210

FINAL MAG = 37

TIMER: 2220.46

BP = 29.15 in/Hg = 740.41 mm/Hg

TEMP = 71.9°F = 295.4°K

CAL AT 50 INCHES = 5.4 ON SLAC TUBE

INITIAL SETTING: 39.5 in/Hg

START TIMER: 2220.47

DMSI - 1240

BP = 741.17

TEMP = 72°F = 295.4°K

MAG FINAL: 43

TIMER: 1568.52

CAL AT 50 INCHES: 5.3 ON SLAC TUBE

INITIAL SETTING: 45.9

STARTING TIMER: 1568.

UMSI TEMP: ~~65.4°F~~ SEH 68°F = 293.2°K, BP: 28.94 = 735.08 mm/Hg - 1325

FINAL PRESS: 43, TIMER: 3029.62

CAL PRESS AT 50 in/Hg - H_2O = 5.3 ON SLAC TUBE

INITIAL PRESS SETTING: 44 TIMER: 3029.68

SEH

Work continued to Page________

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PROJECT NO.
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04/15/09 1115 MPS

TEMP: 285.4°K, BP: 741.17 mm/Hg
FINAL MAG. PRESS: 44
~~$~~TIMER 1180.92
START 1180.94
INIT. PRESS 42.5

1200 MPS ALT

TEMP 287°K, BP = 741.17
FINAL MAG PRESS: 39
FINAL TIMER: 2340.42
START TIMER: 2340.42
INITIAL PRESS 39.5

1230 DMS1

TEMP: 287°K, BP: 742.70
FINAL MAG PRESS: 45
FINAL TIMER: 1675.33
START TIMER: 1675.35
INITIAL PRESS: 44.5

1300 UMS1

TEMP: 285.9°K, BP = 737.36 mm/Hg
FINAL MAG PRESS:
FINAL TIMER:
START TIMER:
INITIAL PRESS:

NATURE

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04/21/09 0944 MPS

BP: 739.65 mm/Hg, TEMP: 300.77° K
FINAL MAG PRESS: 38
TIMER: 1301.05
1 PT CAL 50 inch/H2O = 4.9
START TIMER: 1301.10
INITIAL PRESS: 44.9

1130 MPS/ALT

BP: 739.65, TEMP: 303.55
FINAL MAG PRESS: 34
TIMER: 2460.49
1 PT CAL 50 inch/H2O = 4.7
START TIMER: 2460.52
INITIAL PRESS: 39.5

1209 DMSI

BP: 738.89 mm/Hg, TEMP: 305.22° K
FINAL MAG PRESS: 38
TIMER: 1752.09
1 PT CAL 50 inch/H2O = 4.7
START TIMER: 0.15
INITIAL PRESS: 46.7
REPLACED TIMER AND RECALIBRATED UNIT. COMPLETED AT 1345

1404 DMSI

BP: 734.31, TEMP: 308
FINAL MAG PRESSURE: 34
~~TEMP~~ SH TIMER: 3256.59
1PT CAL: 50 INCH/H2O = 4.7
START TIMER: 3256.59
INITIAL PRESS: 46.3

04/27/09 MPS 1015 63°F = 290.22°K 28.94 in/Hg = 735.08 mm/Hg
TIMER-HOUR METER: 1421.12 FINAL PRESSURE: 46
MPS ALT 1025 63°F = 290.22 °K 29.03 in/Hg = 737.36
HOURMETER: 2580.56 FINAL PRESSURE: 44
DMSI 1030 63°F = 290.22 °K 29.06 in/Hg = 738.12
HOURMETER: 120.19 FINAL PRESSURE: 48
UMSI ~~DMSI~~ SEL 1050
11 ' TEMP 64°F = 290.77°K 28.85 in/Hg = 732.80 mm/Hg
HOURMETER: 3376.63 FINAL PRESSURE: 47

05/01/09 SEL MSP 1340 298.55°K, 735.84 mm/Hg
HOURMETER 1421.26, INITIAL PRESSURE: ~~1421.26~~ SEL 46
MAGNAHELIC 50 in/H2O — SLAC TUBE 4.6
DMSI 1410 299.11°K, 735.84 mm/Hg
HOURMETER: 120.34, INITIAL PRESSURE: 45.1
SLAC TUBE READING 4.6 AT 50 in/H2O ON MAGNAHELIC
UMSI 1445 290.22°K, 735.84 mm/Hg
HOURMETER: 3376.81, INITIAL PRESSURE: 44.1
SLAC TUBE 4.7 @ 50 in/H2O ON MAGNAHELIC
UMSI DUPE 1450 290.22°K, 735.84 mm/Hg
HOURMETER: 2580.9, INITIAL PRESSURE: 39.5
SLAC TUBE: 4.8 @ 50 in/H2O ON MAGNAHELIC
PUF RENTAL ORIFICE USED FOR CALIBRATION.

SEL 05/07/09

DATE	TECH	STATION	TEMP °K	BP mm/Hg	SLAC TUBE READING @50 in/H2O	PRESSURE FINAL	INITIAL PRESSURE	FINAL HOURS	INITIAL HOURS
05/07/09	SGL	UMSI 1255	299.11	738.12	5.5	46	45.4	3494.60	3494.63
		MSP 1010	293.55	737.36	5.3	45	45.1 ~~44.6~~ SG	1538.92	1538.94
		UMSI DUP 1255	29.11	738.12	5.2	39	39.5	2698.66	2698.68
05/07/09	SGL	DMSI 1055	295.77	738.12	5.3	48	44.4 ~~48~~ SG	237.99	238.02
05/13/09	SGL	MSP - 0700	289.11	735.08	5.4	41	44.6	1659.06	1659.08
		DMSI - 0730	289.11	735.08	5.3	42	43.6	358.02	358.06
		UMSI - 0940	294.66	734.31	5.3	42	44.9	3614.68	3614.70
		UMSIDUP - 0940	294.66	734.31	5.4	37	39.5	2818.70	2818.72
05/19/09	SGL	UMSI - 1110	304.66	732.03	5.3	39	46.6	3734.82	3734.83
		UMSIDUP - 1110	304.66	732.03	5.4	35	39.5	2934.29	2934.30
		MSP - 1150	305.22	732.79	5.4	37.5	47.2	1779.09	1779.10
		DMSI - 1205	305.77	732.79	5.3	37	46.3	478.07	478.08
05/26/09	SGL	MSP - 0850	298.55	732.03	N/A	48	N/A	1899.11	N/A
		DMSI - 0900	298.55	732.03	N/A	46	N/A	561.97	N/A
		UMSI 1005	301.88	732.03	N/A	45.5	N/A	3854.87	N/A
		UMSIDUP - 1005	301.88	732.03	N/A	39	N/A	3054.31	N/A
06/05/09	7-4 SGL	MSP 1130	290.22	732.79	5.4	N/A	45.3	N/A	1907.18
		DMSI - 1200	291.88	732.79	5.3	N/A	45.4	N/A	682.10
		DMSI - DUP	291.88	732.79	5.3	N/A	39.5	N/A	3174.38
		UMSI - 1250	292.44	732.79	5.3	N/A	45.4 ~~44.7~~ S	N/A	389[illegible]8
06/11/09	6-3 SGL	MSP 1145	296.33	738.12	5.4	49	45.9 ~~39.5~~ S	2027.23	2027.24
		DMSI DUP 1155	301.33	735.08	5.3	44	39.5 ~~46.8~~ S	3294.61	3294.62
		DMSI ~~DUP~~ S 1155	301.33	735.08	5.2	45	46.8	802.35 ~~3294~~ S	802.36
		UMSI 1135	300.77	734.31	5.2	52	46.6	4018.89	4018.90

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PROJECT NO.

BOOK NO. 0131

DATE	TECH	STATION	TEMP °K	BP mm/Hg	SLAC TUBE @50 in Hg	FINAL PRESS	INITIAL PRESS	FINAL HOURS	INITIAL HOURS	COMMENTS
06/17/09	SL	0700 UMS1	293.55	739.31	5.4	45	45.5	4139.07	4139.08	
↓	↓	0730 MSP	294.11	732.03	5.3	45	46	2147.34	2147.35	
		0810 DMS1	295.77	732.03	5.3	44	46.1	922.63	922.64	
		0810 DMS1 DUP	295.77	732.03	5.3	39	39.5	3414.78	3414.79	
06/17/09	SL	0725 MSP	298.55	732.28	5.4	42.5	46.7	2267.45	2267.45	
↓	↓	0745 DMS1	298.55	730.00	5.3	42	46.6	1042.85	1042.87	
		0745 DMS1 DUP	298.55	730.00	5.3	38	47.8	3542.55	3542.86	STOP TIMER NOT SET
		0840 UMS1	299.66	730.76	5.3	42	46.7	4259.09	4259.11	
06/29/09	SL	0650 UMS1	304.11	731.52			N/A	4375.72	N/A	MOTOR INOP
↓	↓	MSP 0820	306.33	735.08			N/A	2387.45	N/A	MOTOR INOP
		DMS1 0830	305.22	732.28		41	N/A	1162.97	N/A	
		DMS1 DUP 0830	305.22	732.28		42	N/A	3662.66	N/A	
07/02/09	SL	1345 UMS1	309.66	735.08		N/A	48.1	N/A	4375.92	
↓	↓	1700 DMS1	312.59	733.55		N/A	49.9	N/A	1163.06	
		1630 MSP	312.04	735.08		N/A	50.9	N/A	2387.59	
		1630 MSP DUP	312.04	735.08		N/A	49	N/A	3662.75	
07/09/09	SL	1030 UMS1	299.66	735.84	5.4	48	48.6	4496.02	4496.04	
↓	↓	1100 MSP	300.77	738.12	5.3	40	48.9	2507.71	2507.73	
		1100 MSP DUP	300.77	738.12	5.2	44	47.1	3782.86	3782.86	
		1130 DMS1	302.44	735.84	5.4	46	48.1	1283.13	1283.17	
7/15/09	SL	0920 UMS1	304.11	737.62	5.4	42	47.1	4616.05	4616.06	
↓		0950 MSP	305.22	738.89	5.3	38	49.6	2627.74 ~~2627.74~~	2627.74	
		0950 MSP DUP	305.22	738.89	5.4	43	47.7	3902.86	3902.86	
07/15/09	SL	1010 DMS1	308	739.65	5.4	40	48.8	1403.18	1403.19	

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DATE	TECH	STATION	TEMP °K	BP mm/Hg	SLAC TUBE	FINAL PRESS	INITIAL PRESS	FINAL HOURS	INITIAL HOURS	COMMENTS
07/21/09	DG SEH	1611 UMS1	313.15	737.87	5.4	39.3	48.5	4736.06	4736.20	
↓	↓	DMS1 -1527	315.37	734.06	5.4	39.5	50.3	1523.22	1523.35	
↓	↓	MSP ~~0950~~ 1407	3[illegible].48	737.87	5.4	43.5	50.6	2747.43	2747.96	
↓	↓	1400 MSP DUP	311.48	737.87	5.3	39	48.8	4022.96	4023.30	
07/27/09	SEH	0700 UMS1	300.37	735.08	N/A	41	N/A	~~4856.25~~	N/A	4856.25 FINAL HOURS
↓	↓	0720 MSP	302.04	735.84	N/A	45	N/A	2868.03	N/A	
↓	↓	0720 MSP DUP	302.04	735.84	N/A	44.5	N/A	4143.38	N/A	
↓	↓	DMS1	303.15	738.89	N/A	46	N/A	1643.38	N/A	
										BLANK AT UMS1

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Work continued from Page ________

PROJECT NO.

BOOK NO. 0131

DATE	TECH	STATION	TEMP °K	BP mm/Hg	SLAC TUBE	FINAL PRESS	INITIAL PRESS	FINAL HOURS	INITIAL HOURS	COMMENTS
07/21/09	DG SEH	1611 UMS1	313.15	737.87	5.4	39.3	48.5	4736.06	4736.20	
↓	↓	DMS1 -1527	315.37	734.06	5.4	39.5	50.3	1523.22	1523.35	
		MSP ~~0950~~ 1407	3[illegible].48	737.87	5.4	43.5	50.6	2747.43	2747.96	
		1400 MSP DUP	311.48	737.87	5.3	39	48.8	4022.96	4023.30	
07/27/09	SEH	0700 UMS1	300.37	735.08	N/A	41	N/A	~~4856.25~~	N/A	4856.25 FINAL HOURS
↓	↓	0720 MSP	302.04	735.84	N/A	45	N/A	2868.03	N/A	
		0720 MSP DUP	302.04	735.84	N/A	44.5	N/A	4143.38	N/A	
		DMS1	303.15	738.89	N/A	46	N/A	1643.38	N/A	
08/05/09	SEH	0815 UMS1	298	738.89	5.4	N/A	46.1	N/A	4863.52	BLANK AT UMS1
	↓	0900 MSP	298.55	737.38	5.4	N/A	44.7	N/A	2868.33	
		0950 DMS1	300.77	736.60	5.4	N/A	45.6	N/A	1643.55	

Work continued to Page ________

SIGNATURE DATE

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

APPENDIX C

DATA SUMMARY

TO-9A PUF Field Data Summary (Jan 2009 - Dec 2009)

Upwind Monitoring Station (UMS-1)

Setup Date	Start Timer	Stop Timer	Elapsed Time	Set Point Flow	Average Flow	End Flow	% Diff	Volume	Start Pressure	Start Temperature	End Pressure	End Temperature	Slope	Intercept
5-Jan-09	1458.22	1586.70	128.48	0.225	0.223	0.221	1.9%	1717.91	756.92	282.00	770.89	285.40	30.2836	-0.3396
11-Jan-09	1586.70	1714.90	128.20	0.225	0.216	0.208	7.9%	1664.59	770.89	285.40	767.08	288.70	31.2351	-0.5393
17-Jan-09	1714.95	1841.23	126.28	0.225	0.215	0.205	9.4%	1628.45	767.08	288.70	763.27	288.70	31.2772	-0.6028
23-Jan-09	1841.50	1964.95	123.45	0.225	0.226	0.227	-1.0%	1675.28	763.27	288.70	769.62	277.44	31.7130	-0.6139
31-Jan-09	1965.11	2051.20	86.09	0.225	0.221	0.216	3.9%	1140.09	767.08	280.77	762.00	286.88	30.4491	-0.3825
6-Feb-09	2051.26	2171.25	119.99	0.225	0.223	0.222	1.6%	1607.28	762.00	286.88	741.68	281.88	32.1098	-0.7692
12-Feb-09	2171.25	2291.32	120.07	0.225	0.224	0.222	1.3%	1610.70	741.68	281.88	741.68	289.66	30.7470	-0.4540
18-Feb-09	2291.32	2411.45	120.13	0.225	0.225	0.225	-0.1%	1622.60	741.68	289.66	740.41	284.66	30.0431	-0.2219
6-Mar-09	2421.08	2541.09	120.01	0.225	0.224	0.223	1.0%	1612.33	739.65	290.22	740.41	289.11	30.9387	-0.3999
12-Mar-09	2541.12	2661.13	120.01	0.225	0.224	0.223	0.8%	1613.82	740.41	289.11	744.73	289.66	30.9387	-0.3999
18-Mar-09	2661.14	2781.18	120.04	0.225	0.226	0.227	-1.0%	1628.46	744.73	289.66	741.93	281.33	30.9387	-0.3999
24-Mar-09	2781.21	2901.24	120.03	0.225	0.225	0.226	-0.4%	1623.27	741.93	281.33	736.60	283.00	30.9387	-0.3999
3-Apr-09	2909.56	3029.62	120.06	0.225	0.223	0.220	2.2%	1602.83	733.55	286.88	735.08	293.20	30.7316	-0.3356
9-Apr-09	3029.68	3136.47	106.79	0.225	0.226	0.228	-1.3%	1451.21	735.08	293.20	737.36	285.90	30.7316	-0.3356
15-Apr-09	3136.48	3256.59	120.11	0.225	0.210	0.194	14.6%	1511.12	737.36	285.90	734.31	308.00	30.7316	-0.3356
21-Apr-09	3256.61	3376.63	120.02	0.225	0.229	0.233	-3.4%	1647.92	734.31	308.00	732.80	290.77	30.7316	-0.3356
1-May-09	3376.81	3494.60	117.79	0.225	0.226	0.227	-0.7%	1595.92	735.84	290.22	738.12	299.11	28.6398	0.1810
7-May-09	3494.63	3614.68	120.05	0.225	0.225	0.225	0.0%	1620.52	738.12	299.11	734.31	294.66	28.6398	0.1810
13-May-09	3614.68	3734.83	120.15	0.225	0.215	0.205	9.1%	1551.13	734.31	294.66	732.03	304.66	28.6398	0.1810
19-May-09	3734.83	3854.87	120.04	0.225	0.224	0.223	0.7%	1614.56	732.03	304.66	732.03	301.88	28.6398	0.1810
6-Jun-09	3898.88	4018.89	120.01	0.225	0.231	0.237	-5.3%	1664.17	732.79	292.44	734.31	300.77	30.3453	-0.1434
11-Jun-09	4018.90	4139.07	120.17	0.225	0.224	0.224	0.6%	1617.47	734.31	300.77	734.31	293.55	30.3453	-0.1434
17-Jun-09	4139.08	4259.09	120.01	0.225	0.219	0.214	5.2%	1578.96	734.31	293.55	730.76	299.66	30.3453	-0.1434
23-Jun-09	4259.11	4375.72	116.61	0.225	0.216	0.207	8.3%	1511.75	730.76	299.66	731.52	304.11	30.3453	-0.1434
3-Jul-09	4375.92	4496.02	120.10	0.225	0.227	0.228	-1.5%	1633.43	735.08	309.66	735.84	299.66	31.2055	-0.3276
9-Jul-09	4496.04	4616.05	120.01	0.225	0.219	0.213	5.5%	1576.92	735.84	299.66	737.36	304.11	31.2055	-0.3276
15-Jul-09	4616.06	4736.06	120.00	0.225	0.214	0.203	10.3%	1540.55	737.62	304.11	732.79	313.15	31.2055	-0.3276
21-Jul-09	4736.20	4856.25	120.05	0.225	0.218	0.212	6.2%	1572.06	737.87	313.15	735.08	300.37	31.2055	-0.3276
7-Aug-09	4863.52	4983.55	120.03	0.225	0.212	0.199	12.3%	1526.51	738.89	298.00	735.08	304.11	31.7207	-0.4688
13-Aug-09	4983.57	5103.63	120.06	0.225	0.217	0.208	7.7%	1560.63	735.08	304.11	731.50	296.88	31.7207	-0.4688
19-Aug-09	5103.63	5223.73	120.10	0.225	0.213	0.200	11.5%	1533.06	731.50	296.88	738.12	300.22	31.7207	-0.4688
25-Aug-09	5223.78	5343.78	120.00	0.225	0.216	0.207	8.2%	1556.37	738.12	300.22	735.08	301.33	31.7207	-0.4688
4-Sep-09	5343.90	5463.95	120.05	0.225	0.224	0.224	0.6%	1615.97	734.31	306.48	738.12	305.22	30.5249	-0.2238
10-Sep-09	5463.96	5576.15	112.19	0.225	0.221	0.217	3.8%	1486.22	738.12	305.22	735.84	304.11	30.5249	-0.2238
16-Sep-09	5576.18	5696.18	120.00	0.225	0.221	0.217	3.5%	1591.88	735.84	304.11	739.65	307.44	30.5249	-0.2238
22-Sep-09	5696.18	5816.18	120.00	0.225	0.218	0.211	6.5%	1569.18	739.65	307.44	730.76	296.88	30.5249	-0.2238
2-Oct-09	5816.24	5936.24	120.00	0.225	0.219	0.214	5.0%	1580.14	736.60	300.77	738.12	299.11	29.7577	0.0089
8-Oct-09	5936.24	6055.60	119.36	0.225	0.224	0.224	0.6%	1606.46	738.12	299.11	737.36	293.00	29.7577	0.0089
14-Oct-09	6055.60	6175.61	120.01	0.225	0.226	0.228	-1.1%	1629.23	737.36	293.00	738.12	289.66	29.7577	0.0089
20-Oct-09	6175.61	6295.62	120.01	0.225	0.220	0.215	4.8%	1582.37	738.12	289.66	736.60	296.88	29.7577	0.0089
6-Nov-09	6295.69	6403.37	107.68	0.225	0.227	0.229	-1.7%	1466.30	739.65	290.22	733.55	284.66	31.8258	-0.5420
12-Nov-09	6403.38	6499.33	95.95	0.225	0.225	0.225	0.1%	1294.71	733.55	284.66	738.12	284.66	31.8258	-0.5420
18-Nov-09	6499.43	6499.70	0.27	0.225	0.227	0.229	-1.9%	3.68	738.12	284.66	741.68	292.44	33.0082	-0.8036
24-Nov-09	6499.96	6604.59	104.63	0.225	0.226	0.228	-1.2%	1421.33	741.68	292.44	744.22	284.66	33.0082	-0.8036
4-Dec-09	0.17	120.24	120.07	0.225	0.228	0.231	-2.5%	1641.61	744.98	283.00	735.84	279.66	31.1707	-0.3032
10-Dec-09	120.24	240.25	120.01	0.225	0.226	0.227	-0.8%	1626.51	735.84	279.66	741.93	279.66	31.1707	-0.3032
16-Dec-09	240.28	360.28	120.00	0.225	0.224	0.223	0.7%	1614.27	741.93	279.66	735.84	279.66	31.1707	-0.3032
22-Dec-09	360.29	480.33	120.04	0.225	0.220	0.215	4.4%	1586.04	735.84	279.66	737.36	281.33	31.1707	-0.3032

TO-9A PUF Field Data Summary (Jan 2009 - Dec 2009)

Downwind Monitoring Station (DMS-1)

Setup Date	Start Timer	Stop Timer	Elapsed Time	Set Point Flow	Average Flow	End Flow	% Diff	Volume	Start Pressure	Start Temperature	End Pressure	End Temperature	Slope	Intercept
5-Jan-09	23.00	140.49	117.49	0.225	0.223	0.220	2.0%	1570.24	760.73	284.80	770.89	297.60	30.8299	-0.5041
11-Jan-09	140.49	239.68	99.19	0.225	0.220	0.216	4.2%	1311.53	770.89	297.60	767.08	294.30	31.7922	-0.6683
17-Jan-09	239.68	357.75	118.07	0.225	0.202	0.179	22.5%	1432.75	767.08	295.40	763.27	285.40	31.2772	-0.5973
23-Jan-09	357.80	477.10	119.30	0.225	0.226	0.228	-1.1%	1619.86	763.27	285.40	769.62	281.88	32.0851	-0.6774
31-Jan-09	477.16	597.14	119.98	0.225	0.223	0.221	1.7%	1605.90	767.08	286.33	762.00	288.00	31.9406	-0.6220
6-Feb-09	597.20	717.18	119.98	0.225	0.225	0.224	0.4%	1616.69	762.00	288.00	741.68	282.44	31.7130	-0.6113
12-Feb-09	717.22	837.25	120.03	0.225	0.223	0.221	1.8%	1605.83	741.68	282.44	745.49	291.33	32.4103	-0.8259
18-Feb-09	837.32	957.41	120.09	0.225	0.225	0.225	0.1%	1620.53	745.49	291.33	741.93	284.66	33.1762	-0.9459
6-Mar-09	968.20	1088.24	120.04	0.225	0.225	0.224	0.3%	1618.31	735.84	286.88	736.60	288.55	31.3516	-0.4741
12-Mar-09	1088.24	1208.25	120.01	0.225	0.224	0.223	0.9%	1613.06	736.60	288.55	741.17	294.11	31.3516	-0.4741
18-Mar-09	1208.29	1328.35	120.06	0.225	0.225	0.225	0.1%	1619.80	741.17	294.11	741.93	286.33	31.3516	-0.4741
24-Mar-09	1328.38	1448.43	120.05	0.225	0.222	0.218	3.1%	1596.28	741.93	286.33	737.36	285.22	31.3516	-0.4741
3-Apr-09	1448.50	1568.52	120.02	0.225	0.222	0.218	3.1%	1595.40	736.60	289.11	741.17	295.40	30.7033	-0.1920
9-Apr-09	1568.54	1675.33	106.79	0.225	0.226	0.226	-0.6%	1445.95	741.17	295.40	742.70	287.00	30.7033	-0.1920
15-Apr-09	1675.35	1752.09	76.74	0.225	0.213	0.202	10.8%	982.73	742.70	287.00	738.89	305.22	30.7033	-0.1920
21-Apr-09	0.15	120.19	120.04	0.225	0.231	0.236	-4.9%	1661.52	735.08	309.11	738.12	290.22	28.3166	0.2252
1-May-09	120.34	237.99	117.65	0.225	0.229	0.233	-3.7%	1618.02	735.84	299.11	738.12	295.77	30.8282	-0.3427
7-May-09	238.02	358.02	120.00	0.225	0.223	0.221	1.8%	1605.66	738.12	295.77	735.08	289.11	30.8282	-0.3427
13-May-09	358.06	478.07	120.01	0.225	0.214	0.202	10.6%	1538.72	735.08	289.11	732.79	305.77	30.8282	-0.3427
19-May-09	478.08	561.97	83.89	0.225	0.226	0.227	-0.8%	1137.13	732.79	305.77	732.03	298.55	30.8282	-0.3427
6-Jun-09	682.10	802.36	120.26	0.225	0.223	0.221	1.8%	1609.37	732.79	291.88	735.08	301.33	32.3055	-0.5814
11-Jun-09	802.36	922.63	120.27	0.225	0.223	0.220	2.1%	1606.58	735.08	301.33	732.03	295.77	32.3055	-0.5814
17-Jun-09	922.64	1042.85	120.21	0.225	0.220	0.214	4.8%	1584.70	732.03	295.77	730.00	298.55	32.3055	-0.5814
23-Jun-09	1042.87	1162.97	120.10	0.225	0.218	0.210	6.8%	1568.17	730.00	298.55	732.28	305.22	32.3055	-0.5814
3-Jul-09	1163.06	1283.13	120.07	0.225	0.223	0.220	2.1%	1603.80	733.55	312.59	735.84	302.44	31.6873	-0.3543
9-Jul-09	1283.17	1403.18	120.01	0.225	0.215	0.205	9.4%	1547.63	735.84	302.44	739.65	308.00	31.6873	-0.3543
15-Jul-09	1403.19	1523.22	120.03	0.225	0.213	0.200	11.5%	1532.17	739.65	308.00	734.06	315.93	31.6873	-0.3543
21-Jul-09	1523.35	1643.38	120.03	0.225	0.223	0.220	2.1%	1603.94	734.06	315.37	738.90	303.15	31.6873	-0.3543
7-Aug-09	1643.55	1763.65	120.10	0.225	0.216	0.206	8.7%	1553.87	736.60	300.77	735.08	303.55	32.6432	-0.7265
13-Aug-09	1763.69	1883.69	120.00	0.225	0.214	0.203	10.3%	1540.62	735.08	303.55	735.84	298.55	32.6432	-0.7265
19-Aug-09	1883.70	2003.70	120.00	0.225	0.217	0.209	7.4%	1561.93	735.84	298.55	736.60	303.55	32.6432	-0.7265
25-Aug-09	2003.71	2123.73	120.02	0.225	0.213	0.202	10.8%	1537.34	736.60	303.55	737.36	302.44	32.6432	-0.7265
4-Sep-09	2123.78	2255.79	132.01	0.225	0.217	0.210	6.9%	1722.40	738.89	306.48	741.17	306.88	31.9880	-0.4837
10-Sep-09	2255.80	2367.93	112.13	0.225	0.220	0.216	4.1%	1483.33	741.17	306.88	735.84	304.11	31.9880	-0.4837
16-Sep-09	2367.93	2475.98	108.05	0.225	0.219	0.212	5.8%	1417.68	735.84	304.11	740.41	306.33	31.9880	-0.4837
22-Sep-09	2475.99	2596.00	120.01	0.225	0.213	0.200	11.7%	1530.27	740.41	306.33	730.76	303.00	31.9880	-0.4837
2-Oct-09	2596.08	2717.36	121.28	0.225	0.219	0.213	5.5%	1593.10	737.36	301.88	741.17	299.11	30.5626	-0.1939
8-Oct-09	2717.37	2839.92	122.55	0.225	0.221	0.217	3.5%	1625.97	741.17	299.11	735.08	291.33	30.5626	-0.1939
14-Oct-09	2839.98	2971.84	131.86	0.225	0.223	0.221	1.7%	1764.74	735.08	291.33	737.36	288.55	30.5626	-0.1939
20-Oct-09	2971.84	3091.87	120.03	0.225	0.221	0.217	3.8%	1589.93	737.36	288.55	741.17	295.77	30.5626	-0.1939
6-Nov-09	3091.96	3199.74	107.78	0.225	0.224	0.223	1.1%	1446.97	742.70	288.00	738.89	285.22	32.4033	-0.6395
12-Nov-09	3199.75	3319.78	120.03	0.225	0.225	0.225	0.1%	1619.38	738.89	285.22	741.93	283.55	32.4033	-0.6395
18-Nov-09	3319.79	3439.78	119.99	0.225	0.223	0.221	1.8%	1605.32	741.93	283.55	740.41	290.22	32.4033	-0.6395
24-Nov-09	3439.88	3535.89	96.01	0.225	0.226	0.227	-0.8%	1301.31	740.41	290.22	744.22	285.22	32.4033	-0.6395
4-Dec-09	3536.05	3656.06	120.01	0.225	0.226	0.228	-1.2%	1629.84	741.17	283.00	742.70	278.55	32.3214	-0.6546
10-Dec-09	3656.07	3776.09	120.02	0.225	0.225	0.225	-0.1%	1620.93	742.70	278.55	746.51	280.22	32.3214	-0.6546
16-Dec-09	3776.10	3896.10	120.00	0.225	0.224	0.223	1.0%	1612.06	746.51	280.22	735.08	279.11	32.3214	-0.6546
22-Dec-09	3896.11	4016.16	120.05	0.225	0.219	0.214	5.1%	1580.37	735.08	279.11	740.41	281.88	32.3214	-0.6546

TO-9A PUF Field Data Summary (Jan 2009 - Dec 2009)

Met Station Pad (MSP)

Setup Date	Start Timer	Stop Timer	Elapsed Time	Set Point Flow	Average Flow	End Flow	% Diff	Volume	Start Pressure	Start Temperature	End Pressure	End Temperature	Slope	Intercept
5-Jan-09	1196.17	1318.15	121.98	0.225	0.224	0.223	1.0%	1638.54	756.92	282.00	774.70	287.60	32.5553	-0.9586
11-Jan-09	1318.15	1386.10	67.95	0.225	0.218	0.211	6.3%	889.48	774.70	287.60	767.08	294.80	31.9364	-0.8166
17-Jan-09	1386.10	1503.98	117.88	0.225	0.207	0.190	17.0%	1466.72	767.08	294.80	763.27	285.40	32.4801	-0.9415
23-Jan-09	1504.05	1609.45	105.40	0.225	0.224	0.223	0.7%	1418.08	763.27	285.40	773.43	280.22	33.4281	-1.0575
31-Jan-09	1609.57	1729.54	119.97	0.225	0.222	0.218	3.1%	1594.78	746.76	280.77	762.00	288.00	31.5502	-0.6857
6-Feb-09	1729.63	1849.62	119.99	0.225	0.226	0.226	-0.5%	1624.29	762.00	286.88	741.68	283.00	32.3216	-0.8211
12-Feb-09	1849.65	1969.67	120.02	0.225	0.224	0.222	1.2%	1610.55	741.68	283.00	745.49	289.66	31.2772	-0.5995
18-Feb-09	1969.74	2089.75	120.01	0.225	0.225	0.225	0.1%	1618.93	745.49	289.66	743.46	284.11	33.1331	-0.9975
6-Mar-09	2100.02	2220.09	120.07	0.225	0.224	0.223	0.7%	1614.99	739.65	286.33	741.17	289.11	32.1260	-0.7947
12-Mar-09	605.04	725.11	120.07	0.225	0.225	0.225	0.1%	1620.42	739.65	286.33	742.44	287.44	30.5631	-0.3502
18-Mar-09	725.19	824.45	99.26	0.225	0.223	0.222	1.5%	1330.27	742.44	287.44	742.44	290.22	30.7510	-0.3277
24-Mar-09	824.50	944.56	120.06	0.225	0.229	0.232	-3.2%	1646.92	742.44	290.22	742.70	280.22	31.7130	-0.6032
3-Apr-09	954.03	1074.03	120.00	0.225	0.223	0.220	2.2%	1602.73	736.60	289.66	739.65	294.80	30.9163	-0.3799
9-Apr-09	1074.13	1180.92	106.79	0.225	0.227	0.229	-1.7%	1453.82	739.65	294.80	741.17	285.40	30.9163	-0.3799
15-Apr-09	1180.94	1301.05	120.11	0.225	0.217	0.208	7.8%	1560.53	741.17	285.40	739.65	300.77	30.9163	-0.3799
21-Apr-09	1301.10	1421.12	120.02	0.225	0.228	0.231	-2.6%	1641.55	739.65	300.77	735.08	290.22	30.9163	-0.3799
1-May-09	1421.26	1538.92	117.66	0.225	0.225	0.225	0.1%	1587.38	735.84	298.55	737.36	293.55	28.8334	0.1783
7-May-09	1538.94	1659.06	120.12	0.225	0.220	0.216	4.3%	1587.57	737.36	293.55	735.08	289.11	28.8334	0.1783
13-May-09	1659.08	1779.09	120.01	0.225	0.212	0.200	11.8%	1529.70	735.08	289.11	732.79	305.22	28.8334	0.1783
19-May-09	1779.10	1899.11	120.01	0.225	0.227	0.229	-1.9%	1636.05	732.79	305.22	732.03	298.55	28.8334	0.1783
6-Jun-09	1907.18	2027.23	120.05	0.225	0.229	0.232	-3.2%	1646.77	732.79	290.22	738.12	296.33	30.2909	-0.1170
11-Jun-09	2027.24	2147.34	120.10	0.225	0.224	0.223	1.1%	1612.85	738.12	296.33	732.03	294.11	30.2909	-0.1170
17-Jun-09	2147.35	2267.45	120.10	0.225	0.220	0.215	4.6%	1585.05	732.03	294.11	732.28	298.55	30.2909	-0.1170
23-Jun-09	2267.46	2387.45	119.99	0.225	0.216	0.206	8.6%	1552.89	732.28	298.55	735.08	306.33	30.2909	-0.1170
3-Jul-09	2387.59	2507.71	120.12	0.225	0.215	0.205	9.1%	1551.00	735.08	312.04	738.12	300.77	33.4017	-0.6567
9-Jul-09	2507.73	2627.74	120.01	0.225	0.212	0.199	12.0%	1528.21	738.12	300.77	738.89	305.22	33.4017	-0.6567
15-Jul-09	2627.74	2747.43	119.69	0.225	0.217	0.209	7.5%	1557.60	738.89	305.22	737.87	315.37	33.4017	-0.6567
21-Jul-09	2747.96	2868.03	120.07	0.225	0.220	0.216	4.1%	1588.35	737.87	311.48	735.84	302.04	33.4017	-0.6567
7-Aug-09	2868.33	2988.39	120.06	0.225	0.209	0.193	15.1%	1506.91	737.36	298.55	736.60	304.11	31.0678	-0.4095
13-Aug-09	2988.40	3108.40	120.00	0.225	0.219	0.212	5.8%	1573.98	736.60	304.11	734.31	297.44	31.0678	-0.4095
19-Aug-09	3108.44	3228.44	120.00	0.225	0.216	0.208	8.0%	1557.65	734.31	297.44	741.17	302.44	31.0678	-0.4095
25-Aug-09	3228.44	3348.49	120.05	0.225	0.213	0.202	10.9%	1536.74	741.17	302.44	733.55	301.88	31.0678	-0.4095
4-Sep-09	3348.55	3409.59	61.04	0.225	0.220	0.215	4.6%	805.62	738.12	306.48	740.41	306.33	29.4594	0.0518
10-Sep-09	3409.60	3521.76	112.16	0.225	0.224	0.223	0.9%	1507.19	740.41	306.33	742.70	299.11	29.4594	0.0518
16-Sep-09	3521.78	3641.80	120.02	0.225	0.217	0.210	7.0%	1565.60	742.70	299.11	738.89	305.77	29.4594	0.0518
22-Sep-09	3641.81	3761.81	120.00	0.225	0.213	0.201	11.4%	1532.30	738.89	305.77	734.31	299.66	29.4594	0.0518
2-Oct-09	3761.81	3881.89	120.08	0.225	0.216	0.208	7.9%	1559.64	737.36	301.88	741.17	298.55	30.5626	-0.1939
8-Oct-09	3881.91	4002.12	120.21	0.225	0.224	0.223	1.0%	1614.50	741.17	299.11	739.65	291.88	30.5626	-0.1939
14-Oct-09	4002.13	4122.14	120.01	0.225	0.228	0.231	-2.6%	1641.43	739.65	291.88	740.41	289.66	30.5626	-0.1939
20-Oct-09	4122.15	4242.17	120.02	0.225	0.218	0.211	6.2%	1571.56	740.41	289.66	741.17	295.77	30.5626	-0.1939
6-Nov-09	4242.30	4338.12	95.82	0.225	--	--	--	--	742.70	288.00	738.89	285.22	30.7026	-0.2720
12-Nov-09	4338.19	4454.58	116.39	0.225	0.226	0.227	-1.0%	1578.91	736.60	286.88	739.65	284.66	31.2483	-0.4039
18-Nov-09	0.15	120.15	120.00	0.225	0.223	0.221	1.9%	1605.00	739.65	284.66	744.22	288.55	30.3068	-0.1755
24-Nov-09	120.16	120.28	0.12	0.225	0.225	0.225	0.2%	1.62	744.22	288.55	742.70	284.66	30.3068	-0.1755
4-Dec-09	120.38	240.39	120.01	0.225	0.225	0.225	0.0%	1620.01	745.74	281.88	742.70	278.55	31.3763	-0.3537
10-Dec-09	240.41	360.42	120.01	0.225	0.226	0.227	-0.9%	1627.38	742.70	278.55	744.22	280.22	31.3763	-0.3537
16-Dec-09	360.43	480.44	120.01	0.225	0.224	0.223	0.9%	1613.02	744.22	280.22	735.08	280.77	31.3763	-0.3537
22-Dec-09	480.45	600.51	120.06	0.225	0.221	0.217	3.8%	1590.79	735.08	280.77	743.46	280.77	31.3763	-0.3537

- Error

TO-9A PUF Field Data Summary (Jan 2009 - Dec 2009)

Mobile Station (DUP)

DUP Location	Setup Date	Start Timer	Stop Timer	Elapsed Time	Set Point Flow	Average Flow	End Flow	% Diff	Volume	Start Pressure	Start Temperature	End Pressure	End Temperature	Slope	Intercept
MSP ALT	3-Apr-09	2100.45	2220.46	120.01	0.225	0.215	0.205	9.3%	1548.36	735.84	290.22	740.41	295.40	30.5109	-0.2265
	9-Apr-09	2220.47	2340.42	119.95	0.225	0.219	0.213	5.3%	1577.17	740.41	295.40	740.41	287.00	30.5109	-0.2265
	15-Apr-09	2340.42	2460.52	120.10	0.225	0.210	0.194	14.7%	1510.47	740.41	297.00	739.65	303.55	30.5109	-0.2265
	21-Apr-09	2460.52	2580.56	120.04	0.225	0.225	0.224	0.3%	1618.44	739.65	303.55	737.36	290.22	30.5109	-0.2265
UMS1	1-May-09	2580.90	2698.66	117.76	0.225	0.218	0.211	6.6%	1539.05	735.84	290.22	738.12	299.11	30.3644	-0.2531
	7-May-09	2698.68	2818.72	120.04	0.225	0.216	0.206	8.6%	1553.41	738.12	299.11	734.31	294.66	30.3644	-0.2531
	13-May-09	2818.70	2934.29	115.59	0.225	0.211	0.197	13.0%	1464.93	734.31	294.66	732.03	304.66	30.3644	-0.2531
	19-May-09	2934.30	3054.31	120.01	0.225	0.217	0.209	7.4%	1562.11	732.03	304.66	732.03	301.88	30.3644	-0.2531
DMS1	6-Jun-09	3174.38	3294.61	120.23	0.225	0.221	0.216	3.9%	1592.20	732.79	291.88	735.08	301.33	32.8403	-0.6202
	11-Jun-09	3294.62	3414.78	120.16	0.225	0.216	0.206	8.7%	1554.46	735.08	301.33	732.03	295.77	32.8403	-0.6202
	17-Jun-09	3414.79	3542.55	127.76	0.225	0.214	0.203	10.4%	1639.22	732.03	295.77	730.00	298.55	32.8403	-0.6202
	23-Jun-09	3542.56	3662.66	120.10	0.225	0.218	0.210	6.8%	1568.35	730.00	298.55	732.28	305.22	32.8403	-0.6202
MSP	3-Jul-09	3662.75	3782.86	120.11	0.225	0.222	0.218	3.1%	1596.74	735.08	312.04	738.12	300.77	32.4726	-0.5764
	9-Jul-09	3782.88	3902.86	119.98	0.225	0.220	0.214	4.8%	1581.92	738.12	300.77	738.89	305.22	32.4726	-0.5764
	15-Jul-09	3902.86	4022.96	120.10	0.225	0.213	0.202	10.8%	1538.31	738.89	305.22	737.87	315.37	32.4726	-0.5764
	21-Jul-09	4023.30	4143.38	120.08	0.225	0.222	0.219	2.9%	1597.78	737.87	311.48	735.84	302.04	32.4726	-0.5764
Fresno	7-Aug-09	4143.56	4263.60	120.04	0.225	0.221	0.216	4.1%	1588.13	752.35	303.00	751.59	306.88	31.2483	-0.3988
	13-Aug-09	4263.62	4383.62	120.00	0.225	0.218	0.210	6.8%	1566.98	751.59	306.88	748.03	308.00	31.2483	-0.3988
	19-Aug-09	4383.63	4405.14	21.51	0.225	0.220	0.216	4.3%	284.29	748.03	308.00	752.35	308.55	31.2483	-0.3988
	25-Aug-09	4405.16	4405.90	0.74	0.225	0.221	0.216	3.9%	9.80	752.35	308.55	749.30	304.88	31.2483	-0.3988
Hanford	4-Sep-09	4406.05	4495.88	89.83	0.225	0.218	0.210	6.7%	1173.27	751.59	308.15	754.63	306.88	31.0457	-0.3207
	10-Sep-09	4495.90	4615.13	119.23	0.225	0.224	0.224	0.5%	1605.75	754.63	306.88	755.40	289.65	31.0457	-0.3207
	16-Sep-09	4615.15	4735.15	120.00	0.225	0.212	0.200	11.9%	1528.78	755.40	289.65	753.87	308.00	31.0457	-0.3207
	22-Sep-09	4735.17	4855.20	120.03	0.225	0.213	0.202	10.8%	1537.35	753.87	308.00	748.03	290.12	31.0457	-0.3207
Coalinga	2-Oct-09	4855.54	4975.66	120.12	0.225	0.218	0.210	6.8%	1568.39	736.60	296.88	737.36	294.66	30.7026	-0.2685
	8-Oct-09	4975.70	4975.70	0.00	0.225	0.226	0.226	-0.5%	0.00	737.36	294.66	733.55	290.77	30.7026	-0.2685
	14-Oct-09	4975.70	5095.91	120.21	0.225	0.228	0.232	-2.9%	1647.07	733.55	290.77	739.65	284.66	30.7026	-0.2685
	20-Oct-09	5095.92	5216.04	120.12	0.225	0.220	0.216	4.2%	1588.03	739.65	284.66	745.49	289.66	30.7026	-0.2685

- Error

APPENDIX D

FLAGGED DATA

Detailed Flagged TO-9A PUF Field Data (Jan 2009 - Dec 2009)

Sample Month	Setup Date	Location	Sampling Issue	Action	Comment
January-09	1/5/2009	UMS1	Timer Error	Timer Replaced/Flagged	Sample run-time more than 125 hours (128.5 hr)
	1/11/2009	UMS1	Timer Error	Timer Replaced/Flagged	Sample run-time more than 125 hours (128.2 hr)
		DMS1	Timer Error	Timer Replaced/Flagged	Sample run-time less than 115 hours (99.2 hr)
		MSP	Timer Error	Timer Replaced/Flagged	Sample run-time less than 115 hours (67.95 hr)
	1/17/2009	UMS1	Timer Error	Timer Replaced/Flagged	Sample run-time more than 125 hours (126.3 hr)
		DMS1	Data Recording Error	Flagged	Flow rate out +/- 10% range (22.5%)
		MSP	Data Recording Error	Flagged	Flow rate out +/- 10% range (17.0%)
	1/23/2009	MSP	Timer Error	Timer Replaced/Flagged	Sample run-time less than 115 hours (105.4 hr)
February-09	1/31/2009	UMS1	Timer Error	Flagged	Sample run-time less than 115 hours (86.1 hr)
March-09	3/18/2009	MSP	Motor Failure	Motor Replaced/Flagged	Sample run-time less than 115 hours (99.3 hr)/Motor failed during event. Final reading taken with new motor.
April-09	4/9/2009	UMS1	Power Failure	Flagged	Sample run-time less than 115 hours (106.8 hr)/Power failure approximately 20:00 on 04/10/09 to 10:00 on 04/11/09.
		DMS1	Power Failure	Flagged	Sample run-time less than 115 hours (106.8 hr)/Power failure approximately 20:00 on 04/10/09 to 10:00 on 04/11/09.
		MSP	Power Failure	Flagged	Sample run-time less than 115 hours (106.8 hr)/Power failure approximately 20:00 on 04/10/09 to 10:00 on 04/11/09.
	4/15/2009	UMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (14.6%)
		DMS1	Timer Error	Timer Replaced/Flagged	Sample run-time less than 115 hours (76.2 hr)/ Timer running intermittently so new timer installed.
		MSP ALT	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (14.7%)
May-09	5/13/2009	DMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (10.6%)
		MSP	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (11.8%)
		UMS1 DUP	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (13.0%)/ Circuit breaker tripped
	5/19/2009	DMS1	Power Failure	Flagged	Sample run-time less than 115 hours (83.9 hr) /Power loss to this station for approximately 36 hours due to bird strike on nearby power line
June-09	6/17/2009	DMS1 DUP	Timer Error	Flagged	Sample run-time more than 125 hours (127.8 hr)
	6/23/2009	UMS1	Motor Failure	Flagged	Motor found to be non-operational upon takedown. Final Pressure is estimated.
		MSP	Motor Failure	Flagged	Motor found to be non-operational upon takedown. Final Pressure is estimated.

Detailed Flagged TO-9A PUF Field Data (Jan 2009 - Dec 2009)

Sample Month	Setup Date	Location	Sampling Issue	Action	Comment
July-09	7/9/2009	MSP	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (12.0%)
	7/15/2009	UMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (10.3%)
		DMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (11.5%)
		MSP DUP	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (10.8%)
August-09	8/7/2009	UMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (12.3%)
		MSP	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (15.1%)
	8/13/2009	DMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (10.3%)
	8/19/2009	UMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (11.5%)
		Fresno	Power Failure	Flagged	Sample run-time less than 115 hours (21.5 hr) /Power loss due to GFI being tripped during run.
	8/25/2009	DMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (10.8%)
		MSP	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (10.9%)
		Fresno	Timer Error	Flagged	Sample run-time less than 115 hours (0.74 hr)
September-09	9/4/2009	DMS1	Timer Error	Flagged	Sample run-time more than 125 hours (132.01 hr)
		MSP	Timer Error	Flagged	Sample run-time less than 115 hours (61.04 hr)
		Hanford	Timer Error	Flagged	Sample run-time less than 115 hours (89.83 hr)
	9/10/2009	UMS1	Power Failure	Flagged	Sample run-time less than 115 hours (112.2 hr)/ Power outage on 9/14/09 from 0700 to 1600.
		DMS1	Power Failure	Flagged	Sample run-time less than 115 hours (112.1 hr)/ Power outage on 9/14/09 from 0700 to 1600.
		MSP	Power Failure	Flagged	Sample run-time less than 115 hours (112.2 hr)/ Power outage on 9/14/09 from 0700 to 1600.
	9/16/2009	DMS1	Timer Error	Flagged	Sample run-time less than 115 hours (108.1 hr)
		Hanford	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (11.9%)
	9/22/2009	DMS1	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (11.7%)
		MSP	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (11.4%)
		Hanford	Temperature Error	Flagged	Flow rate out +/- 10% range due to high temperatures during takedown (10.8%)

Detailed Flagged TO-9A PUF Field Data (Jan 2009 - Dec 2009)

Sample Month	Setup Date	Location	Sampling Issue	Action	Comment
October-09	10/8/2009	Coalinga		Flagged	No sample collecteddue to dead Battery.
	10/14/2009	DMS1	Timer Error	Flagged	Sample run-time more than 125 hours (132.01 hr)
November-09	11/6/2009	UMS1	Power Failure	Flagged	Sample run-time less than 115 hours (107.68 hr)/Power failure on 11/8/09.
		DMS1	Power Failure	Flagged	Sample run-time less than 115 hours (107.78 hr)/Power failure on 11/8/09.
		MSP	Power Failure	Motor Replaced/Flagged	Sample run-time less than 115 hours (195.82 hr)/Power failure on 11/8/09 cause motor to burn out. Filter, cartridge, and motor replaced.
	11/12/2009	UMS1	Motor Failure	Motor Replaced/Flagged	Sample run-time less than 115 hours (95.95 hr)/Motor bearings worn, motor changed.
	11/18/2009	UMS1	Timer Error	Flagged	Sample run-time less than 115 hours (0.27 hr)/Timer error, unit did not run.
	11/24/2009	UMS1	Timer Error	Flagged	Sample run-time less than 115 hours (104.63 hr)
		DMS1	Timer Error	Flagged	Sample run-time less than 115 hours (96.01 hr)
		MSP	Timer Error	Flagged	Sample run-time less than 115 hours (0.12 hr)/Timer error, unit did not run.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS in Air by EPA 1668A

SDG: G9A300234, G9B250206, G9C310247

PROJECT: Kettleman site - PCB Congener Validation, California for Wenck Assoc.

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 12 air samples including 3 field blanks

SAMPLING DATE (Month/Year): January, February, March 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: See List attached

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DLS 7/8/09

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1988; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1990; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The client has also referenced the EPA Region 3 Validation Guidance for PCB Congener Method 1668. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On request, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:

1. For method blank qualification, the DSA procedure and the Region 3 EPA guidance is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP Qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not significantly impacted.

2. For labeled compound recovery qualification, Region 3 and Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but subject to a potential small but unknown bias.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.

Yes ___ No __X__

Samples were received intact. All samples were received at < 6°C with the exception of SDG G9C310247, which was received at 7°C. The method specifically requires the sample temperature for solids to be < 6°, which is also consistent with 40CFR requirements. Since this is a PUF sample it is not specifically covered as a matrix in the method except as a solid. Because of this, because PCBs are very stable under most conditions, and because there is not likely to be mechanisms for degradation in PUF samples, professional judgment is that no qualifiers are required.

2. Samples were extracted and analyzed within the Method holding time limits.

Yes __X_ No ____

The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year. No specification is provided for air samples but since these are sorbent samples and are therefore solids, the assumption is made that the same provision applies.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.

Yes __X_ No ____

The FEDEX shipping number and/or receipt has not been provided in the data package. To complete the chain of custody, these documents should be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.

Yes __X___ No ____

Method blanks are free of contamination.

When contamination is present, results in associated samples are qualified as UB#, where # is the method blank level corrected for dilution, whenever the result in the sample is less than 5x the method blank level. Such results may be used as nondetected values, with the result considered to be less than the value measured in the sample. Thus if the sample result is 0.1 pg/g but the result is qualified as UB# due to an associated method blank, the result should be regarded as < 0.10 pg/g.

This approach is taken from the Region 3 and Region 10 validation SOPs for PCB Congener analysis. The factor of 5 provides a conservative estimate of a typical method blank control window that might be obtained by control charting.

Method	SDG	Batch	Analyte	Result	Qualifier
EPA-14 1668	G9A300234	9034255		All OK	OK
EPA-14 1668	G9B250206	9059081		All OK	OK
EPA-14 1668	G9C310247	9093277		All OK	OK

2. Field blanks were free of contamination.

Yes __X__ No ____ NA____

There is one field blank with each SDG, all in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.

Yes ____ No __X__

This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

We have qualified the results for associated samples (per the Region 3 and Region 10 SOP) as JI#, where # is the outlier observed for the associated congener. Outliers are shown in Table IV-A below and qualifiers added are provided in Table IV-B. The laboratory has discussed these outliers and their potential implications in the Case Narratives.

Table IV-A. Internal Standard Outliers Observed

SDG	Client Sample ID	Lab Sample ID	Batch	Analyte	Recov
G9A300234	JAN09-UMSI-TO9A	G9A300234001	9034255	13C12-PCB 126	165
G9B250206	FEB09-MPS-TO9A	G9B250206003	9059081	13C12-PCB 126	192
G9B250206	FEB09-MPS-TO9A	G9B250206003	9059081	13C12-PCB 169	152

Table IV-B. Internal Standard Qualifiers Added

SDG	Client Sample ID	Lab Sample ID	Analyte	IS Qualifier
G9A300234	JAN09-UMSI-TO9A	G9A300234001	PCB 126 (BZ)	JI165
G9B250206	FEB09-MPS-TO9A	G9B250206003	PCB 126 (BZ)	JI192
G9B250206	FEB09-MPS-TO9A	G9B250206003	PCB 169 (BZ)	JI152

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA_ X ___
MS and MSDs are not specified in the method, and it is not possible to conduct meaningful matrix spikes for air samples. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA__X_

4. The MS/MSD is a client sample
Yes ___ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the most narrow limits specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
None of the recoveries for targets or for internal standards/surrogates in the OPR results are outside of method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____
Limits are specified in the method. The verification standard is run every 12 hours. For target compounds, limits are 70-130 and there are a few cases where this has not been met, as shown below.

The area for HxCB-167 had to be manually integrated by the laboratory in a number of calibrations. The analyst has provided the reintegrations, with a note indicating that "peaks not separated." The initial calibrations show clearly that there are two peaks, but they are very poorly resolved. The reintegrations have been consistent throughout the data package. In some of the CCVs, the chromatography has degraded compared to the initial calibration and there is no clear separation of the two peaks. In such cases, the analyst has attempted to achieve approximately the same ratio as was observed in the initial calibration. Professional judgment is that this is acceptable practice but should have been discussed in the narrative.

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. The RSDs for the IC response factors met the 20% limit.
Yes __X__ No____

8. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. The width of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

9. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

10. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 43 minutes on the column used. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met.

The retention times of PCB 169 and PCB 157 are at 36 minutes and 34 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes _X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes _X__ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X__ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q". In addition, a number of congeners co-elute and are flagged as C.

No detected targets in this case fail to meet ion ratio criteria, hence are no Q flags are present. The detected targets in the air samples are limited to PCB 105 and PCB 118, which coelute with PCB 127 and PCB 106, respectively. The laboratory reports in the Case Narratives that these isomers were confirmed to consist only of PCB-105 and PCB-118 by analysis on a second column capable of separating the isomers that coelute on the DB-5 column. However, documentation of this reanalysis was not provided so the reviewer is not able to confirm that this is the case. We have not added qualifiers for these C-flagged data under the assumption that the laboratory is correct and that these are in fact the isomers reported.

All mass spectral identifications were reviewed for detected targets. The reviewer is in agreement with the laboratory decisions in all cases. Nonetheless, there are some specific observations that require some discussion.

SDG G9C310247: For lab sample 02 (MAR09-DMS1-T09A), the laboratory has pointed out that the PeCB-101 recovery standard did not meet ion ratio criteria. They attribute this to matrix effects, which conclusion is supported by the fact that the entire run required a number of manual integrations due to chromatographic patterns indicative of interference. The ratio observed is 0.72, and theoretical for this ratio is 0.61, which is typically very close to the value observed in most of these data. The laboratory has dealt with this by correcting the area for the recovery standard to be in accord with the theoretical ratio, which will have the effect of lowering its area, hence raising the calculated value of the internal standards quantified by it. A comparison of this result to the result obtained from the measured areas shows that the internal standards associated with this recovery standard would still be recovered in control in either case. Therefore the practice of the laboratory yields acceptable results and no qualifiers are added.

Also as reported in the Case Narrative, the 13C-PCB-81, 13C-PCB-123, 13C-PCB-114, & 13C-PCB-126 internal standards for this sample did not meet ion abundance ratio acceptance criteria. The laboratory has used the same approach (correcting using theoretical ratios) in order to compensate for this apparent matrix problem. Since this has not impacted detected targets, no qualifiers are added.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.

Yes ____ No ___ NA__X_

Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has complied substantially with the cited method. There are some differences between the method and specific laboratory practices. The reviewer does not believe that these represent significant changes to the method, and they should not cause any method performance issues.

Although qualifiers have been issued to the data for several reasons, no data have been rejected.

The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

<u>Deliverables</u>

On request, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Sample Condition

Samples were received intact. All samples were received at < 6°C with the exception of SDG G9C310247, which was received at 7°C. The method specifically requires the sample temperature for solids to be < 6°, which is also consistent with 40CFR requirements. Since this is a PUF sample it is not specifically covered as a matrix in the method except as a solid. Because of this, because PCBs are very stable under most conditions, and because there is not likely to be mechanisms for degradation in PUF samples, professional judgment is that no qualifiers are required.

Chain of Custody

The FEDEX shipping number and/or receipt has not been provided in the data package. To complete the chain of custody, these documents should be gathered and retained in the project file.

Field Blanks

There is one field blank with each SDG, all in control.

Surrogates/Internal Standards

This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

We have qualified the results for associated samples (per the Region 10 SOP) as JI#, where # is the outlier observed for the associated congener. Outliers are shown in Table IV-A in the body of this report and qualifiers added are provided in Table IV-B. The laboratory has discussed these outliers and their potential implications in the Case Narratives.

Continuing Calibrations

CCVs are in control, per limits specified in the method. The verification standard is run every 12 hours. For target compounds, limits are 70-130 and there are a few cases where this has not been met, as shown below.

The area for HxCB-167 had to be manually integrated by the laboratory in a number of calibrations. The analyst has provided the reintegrations, with a note indicating that "peaks not separated." The initial calibrations show clearly that there are two peaks, but they are very poorly resolved. The reintegrations have been consistent throughout the data package. In some of the CCVs, the chromatography has degraded compared to the initial calibration and there is no clear separation of the two peaks. In such cases, the analyst has attempted to achieve approximately the same ratio as was observed in the initial calibration. Professional judgment is that this is acceptable practice but should have been discussed in the narrative.

Compound Identification

Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q". In addition, a number of congeners co-elute and are flagged as C.

No detected targets in this case fail to meet ion ratio criteria, hence are no Q flags are present. The detected targets in the air samples are limited to PCB 105 and PCB 118, which coelute with PCB 127 and PCB 106, respectively. The laboratory reports in the Case Narratives that these isomers were confirmed to consist only of PCB-105 and PCB-118 by analysis on a second column capable of separating the isomers that coelute on the DB-5 column. However, documentation of this reanalysis was not provided so the reviewer is not able to confirm that this is the case. We have not added qualifiers for these C-flagged data under the assumption that the laboratory is correct and that these are in fact the isomers reported.

All mass spectral identifications were reviewed for detected targets. The reviewer is in agreement with the laboratory decisions in all cases. Nonetheless, there are some specific observations that require some discussion.

SDG G9C310247: For lab sample 02 (MAR09-DMS1-T09A), the laboratory has pointed out that the PeCB-101 recovery standard did not meet ion ratio criteria. They attribute this to matrix effects, which conclusion is supported by the fact that the entire run required a number of manual integrations due to chromatographic patterns indicative of interference. The ratio observed is 0.72, and theoretical for this ratio is 0.61, which is typically very close to the value observed in most of these data. The laboratory has dealt with this by correcting the area for the recovery standard to be in accord with the theoretical ratio, which will have the effect of lowering its area, hence raising the calculated value of the internal standards quantified by it. A comparison of this result to the result obtained from the measured areas shows that the internal standards associated with this recovery standard would still be recovered in control in either case. Therefore the practice of the laboratory yields acceptable results and no qualifiers are added.

Also as reported in the Case Narrative, the 13C-PCB-81, 13C-PCB-123, 13C-PCB-114, & 13C-PCB-126 internal standards for this sample did not meet ion abundance ratio acceptance criteria. The laboratory has used the same approach (correcting using theoretical ratios) in order to compensate for this apparent matrix problem. Since this has not impacted detected targets, no qualifiers are added.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS by EPA 1668A

SDG: G9D030338, G9D030340, G9D040182

PROJECT: Kettleman site - PCB Congener Validation, California for Wenck Assoc.

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 8 soils, 8 vegetation samples, 2 waters (rinse blanks)

SAMPLING DATE (Month/Year): March, April 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: See List attached

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DS 6/18/09

Telephone Logs included Yes____ No _X_

Contractual Violations Yes____ No _X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1999; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1996; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The client has also referenced the EPA Region 3 Validation Guidance for PCB Congener Method 1668. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On request, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:

1. For method blank qualification, the DSA and EPA Region 3 procedure is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP Qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not significantly impacted.

2. For labeled compound recovery qualification, EPA Region 3 and Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but subject to a potential small but unknown bias.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.

Yes _X__ No ____
A number of coolers were received with each shipment. The laboratory has documented the temperature of each to 1 significant figure. Some of the cooler temperatures are reported as 6°C. The method specifies that the temperature be kept < 6°C for all matrices once sampling has taken place.

Although technically some of these coolers may not be in strict compliance with method specifications, no qualifiers are added since any temperature impact would be expected to be negligible. This is particularly true of PCBs which have been shown to be very stable.

2. Samples were extracted and analyzed within the Method holding time limits.
Yes __X_ No ____
The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year. No specification is provided for air samples but since these are sorbent samples and are therefore solids, the assumption is made that the same provision applies.

IV. CHAIN-OF CUSTODY
The chains of custody were submitted and are complete with dates and signatures.
Yes __X_ No ____
There are some changes made to sample names that have not been properly initialed, although the original entry can be seen so that the change made is apparent.

The FEDEX number or receipt is not included in the data package. To ensure an unbroken chain of custody, these documents should be obtained and maintained in the project record.

V. BLANK
1. Method blanks were free of contamination.
Yes _____ No __X__
Method blanks are free of contamination except as shown in the table below. Only one congener was detected in any method blank.

Results in associated samples are qualified as UB#, where # is the method blank level corrected for dilution, whenever the result in the sample is less than 5x the method blank level. Such results may be used as nondetected values, with the result considered to be less than the value measured in the sample. Thus if the sample result is 0.1 pg/g but the result is qualified as UB# due to an associated method blank, the result should be regarded as < 0.10 pg/g.

This approach is taken from the EPA Region 3 and Region 10 validation SOPs for PCB Congener analysis. The factor of 5 provides a conservative estimate of a typical method blank control window that might be obtained by control charting.

Method	SDG	Batch	Analyte	Result	Qualifier
EPA-14 1668	G9D030338	9106484	PCB 118 (BZ)	2.3C	UMB# detects < 5x MB
EPA-14 1668	G9D030340	9117268		All OK	OK
EPA-14 1668	G9D030340	9117301	PCB 118 (BZ)	31C	OK, samples ND
EPA-14 1668	G9D040182	9117268		All OK	OK

Qualified results are shown in the table below:

SDG	Client Sample ID	Lab Sample ID	Analyte	Res	Qualifier
G9D030338	090331-SW-01-S TO 10-S-COMPOSITE	G9D030338001	PCB 118 (BZ)	15	UMB11.5
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	PCB 118 (BZ)	19	UMB11.5
G9D030338	090331-S-01-S TO 10-S-COMPOSITE	G9D030338004	PCB 118 (BZ)	29	UMB11.5
G9D030338	090401-NW-01-S TO 10-S-COMPOSITE	G9D030338005	PCB 118 (BZ)	18	UMB11.5
G9D030338	090401-W-01-S TO 10-S-COMPOSITE	G9D030338007	PCB 118 (BZ)	19	UMB11.5

2. Field blanks were free of contamination.
Yes __X__ No ____ NA____

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes ____ No __X__
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

We have qualified the results for associated samples (per the EPA Region 3 and Region 10 SOPs) as JI#, where # is the outlier observed for the associated congener. Outliers are shown in Table IV-A below and qualifiers added are provided in Table IV-B. These outliers have been noted by the laboratory in the Case Narrative and potential impacts to the data discussed.

Table IV-A. Internal Standard Outliers Observed

SDG	Client Sample ID	Lab Sample ID	Batch	Analyte	Recov
G9D030338	090331-SW-01-S TO 10-S-COMPOSITE	G9D030338001	9106484	13C12-PCB 169	151
G9D030338	090331-SW-01-S TO 10-S-COMPOSITE	G9D030338001	9106484	13C12-PCB 189	152
G9D030338	090331-NE-01-S TO 10-S COMPOSITE	G9D030338002	9106484	13C12-PCB 105	24
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	9106484	13C12-PCB 157	152
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	9106484	13C12-PCB 167	151
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	9106484	13C12-PCB 169	158
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	9106484	13C12-PCB 189	155
G9D030338	090331-S-01-S TO 10-S-COMPOSITE	G9D030338004	9106484	13C12-PCB 169	158
G9D030338	090401-NW-01-S TO 10-S-COMPOSITE	G9D030338005	9106484	13C12-PCB 156	155
G9D030338	090401-NW-01-S TO 10-S-COMPOSITE	G9D030338005	9106484	13C12-PCB 169	163
G9D030338	090401-NW-01-S TO 10-S-COMPOSITE	G9D030338005	9106484	13C12-PCB 189	161
G9D030338	090401-SE-01-S TO 10-S-COMPOSITE	G9D030338008	9106484	13C12-PCB 156	156
G9D030338	090401-SE-01-S TO 10-S-COMPOSITE	G9D030338008	9106484	13C12-PCB 157	157
G9D030338	090401-SE-01-S TO 10-S-COMPOSITE	G9D030338008	9106484	13C12-PCB 169	167
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	9117268	13C12-PCB 156	172
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	9117268	13C12-PCB 157	173
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	9117268	13C12-PCB 167	176
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	9117268	13C12-PCB 169	181
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	9117268	13C12-PCB 189	179
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	9117268	13C12-PCB 156	172
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	9117268	13C12-PCB 157	174
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	9117268	13C12-PCB 167	170
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	9117268	13C12-PCB 169	182
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	9117268	13C12-PCB 189	174
G9D030340	090401-B18-01 TO 10-VG-COMPOSITE	G9D030340003	9117268	13C12-PCB 156	156
G9D030340	090401-B18-01 TO 10-VG-COMPOSITE	G9D030340003	9117268	13C12-PCB 169	155
G9D030340	090401-B18-01 TO 10-VG-COMPOSITE	G9D030340003	9117268	13C12-PCB 189	161
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	9117268	13C12-PCB 156	168
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	9117268	13C12-PCB 157	168
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	9117268	13C12-PCB 167	166
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	9117268	13C12-PCB 169	183
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	9117268	13C12-PCB 189	183
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	9117268	13C12-PCB 156	158
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	9117268	13C12-PCB 157	152
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	9117268	13C12-PCB 167	153
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	9117268	13C12-PCB 169	164
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	9117268	13C12-PCB 189	172
G9D030340	090331-N-6-R	G9D030340006	9117301	13C12-PCB 169	151
G9D040182	090331-SW-01 TO 10-VG-COMPOSITE	G9D040182001	9117268	13C12-PCB 169	158
G9D040182	090331-NE-01 TO 10-VG-COMPOSITE	G9D040182002	9117268	13C12-PCB 157	152
G9D040182	090331-NE-01 TO 10-VG-COMPOSITE	G9D040182002	9117268	13C12-PCB 169	162
G9D040182	090331-NE-01 TO 10-VG-COMPOSITE	G9D040182002	9117268	13C12-PCB 189	160
G9D040182	090331-S-01 TO 10-VG-COMPOSITE	G9D040182003	9117268	13C12-PCB 169	152

Table IV-B. Internal Standard Qualifiers Added

SDG	Client Sample ID	Lab Sample ID	Analyte	IS Qualifier
G9D030338	090331-SW-01-S TO 10-S-COMPOSITE	G9D030338001	PCB 169 (BZ)	JI151
G9D030338	090331-SW-01-S TO 10-S-COMPOSITE	G9D030338001	PCB 189 (BZ)	JI152
G9D030338	090331-NE-01-S TO 10-S COMPOSITE	G9D030338002	PCB 105 (BZ)	JI24
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	PCB 157 (BZ)	JI152
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	PCB 167 (BZ)	JI151

SDG	Client Sample ID	Lab Sample ID	Analyte	IS Qualifier
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	PCB 169 (BZ)	JI158
G9D030338	090331-N-01-S TO 10-S-COMPOSITE	G9D030338003	PCB 189 (BZ)	JI155
G9D030338	090331-S-01-S TO 10-S-COMPOSITE	G9D030338004	PCB 169 (BZ)	JI158
G9D030338	090401-NW-01-S TO 10-S-COMPOSITE	G9D030338005	PCB 156 (BZ)	JI155
G9D030338	090401-NW-01-S TO 10-S-COMPOSITE	G9D030338005	PCB 169 (BZ)	JI163
G9D030338	090401-NW-01-S TO 10-S-COMPOSITE	G9D030338005	PCB 189 (BZ)	JI161
G9D030338	090401-SE-01-S TO 10-S-COMPOSITE	G9D030338008	PCB 156 (BZ)	JI156
G9D030338	090401-SE-01-S TO 10-S-COMPOSITE	G9D030338008	PCB 157 (BZ)	JI157
G9D030338	090401-SE-01-S TO 10-S-COMPOSITE	G9D030338008	PCB 169 (BZ)	JI167
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	PCB 156 (BZ)	JI172
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	PCB 157 (BZ)	JI173
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	PCB 167 (BZ)	JI176
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	PCB 169 (BZ)	JI181
G9D030340	090331-N-01 TO 10-VG-COMPOSITE	G9D030340001	PCB 189 (BZ)	JI179
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	PCB 156 (BZ)	JI172
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	PCB 157 (BZ)	JI174
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	PCB 167 (BZ)	JI170
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	PCB 169 (BZ)	JI182
G9D030340	090401-NW-01 TO 10-VG-COMPOSITE	G9D030340002	PCB 189 (BZ)	JI174
G9D030340	090401-B18-01 TO 10-VG-COMPOSITE	G9D030340003	PCB 156 (BZ)	JI156
G9D030340	090401-B18-01 TO 10-VG-COMPOSITE	G9D030340003	PCB 169 (BZ)	JI155
G9D030340	090401-B18-01 TO 10-VG-COMPOSITE	G9D030340003	PCB 189 (BZ)	JI161
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	PCB 156 (BZ)	JI168
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	PCB 157 (BZ)	JI168
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	PCB 167 (BZ)	JI166
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	PCB 169 (BZ)	JI183
G9D030340	090401-W-01 TO 10-VG-COMPOSITE	G9D030340004	PCB 189 (BZ)	JI183
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	PCB 156 (BZ)	JI158
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	PCB 157 (BZ)	JI152
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	PCB 167 (BZ)	JI153
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	PCB 169 (BZ)	JI164
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	G9D030340005	PCB 189 (BZ)	JI172
G9D030340	090331-N-6-R	G9D030340006	PCB 169 (BZ)	JI151
G9D040182	090331-SW-01 TO 10-VG-COMPOSITE	G9D040182001	PCB 169 (BZ)	JI158
G9D040182	090331-NE-01 TO 10-VG-COMPOSITE	G9D040182002	PCB 157 (BZ)	JI152
G9D040182	090331-NE-01 TO 10-VG-COMPOSITE	G9D040182002	PCB 169 (BZ)	JI162
G9D040182	090331-NE-01 TO 10-VG-COMPOSITE	G9D040182002	PCB 189 (BZ)	JI160
G9D040182	090331-S-01 TO 10-VG-COMPOSITE	G9D040182003	PCB 169 (BZ)	JI152

Use of cleanup standards is optional in the laboratory procedure, as is use of cleanup itself. The laboratory has not used cleanup standards in the case of the vegetation samples, and has used them but not reported recoveries in the case of the soil samples. The cleanup standard recoveries in the soil samples are in control.

The laboratory position on the use of cleanup standards is that they are only useful as diagnostic tools should there be problems in the cleanup step. The internal standards spiked at the initiation of the sample preparation will reveal any QC issues associated with the entire preparation/cleanup process. Professional judgment is that the laboratory argument is correct, and that not employing cleanup standards has no impact on the usability or validity of the data.

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes _X__ No____ NA____
MS and MSDs are not specified in the method. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

In this instance, one MS/MSD is provided for the soil matrix. This was conducted on sample 090401-B18-01-S TO 10-S-COMPOSITE, laboratory sample G9D030338-006.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes __X__ No ____ NA____
The laboratory has used a recovery window of 50-150 for the target congeners.

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes __X__ No ____
The laboratory has used an upper limit of 50% for the RPD on these samples. All RPDs observed are < 10%.

4. The MS/MSD is a client sample
Yes __X__ No____ NA ____

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the most narrow specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
None of the recoveries for targets or for internal standards/surrogates in the OPR results are outside of method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____
Limits are specified in the method. The verification standard is run every 12 hours. For target compounds, limits are 70-130 and there are a few cases where this has not been met, as shown below.

The area for HxCB-167 had to be manually integrated by the laboratory in a number of calibrations. The analyst has provided the reintegrations, with a note indicating that "peaks not separated." The initial calibrations show clearly that there are two peaks, but they are very poorly resolved. The reintegrations have been consistent throughout the data package. In some of the CCVs, the chromatography has degraded compared to the initial calibration and there is no clear separation of the two peaks. In such cases, the analyst has attempted to achieve approximately the same ratio as was observed in the initial calibration. Professional judgment is that this is acceptable practice but should have been discussed in the narrative.

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____
There are a few instances where mass ratio criteria are not met due to low level of analyte or due to matrix interference. These cases are discussed in the raw data review section of this report.

7. The RSDs for the IC response factors met the 20% limit.
Yes __X__ No____

8. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. The width of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

9. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

10. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 43 minutes on the column used. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met.

The retention times of PCB 169 and PCB 157 are at 36 minutes and 34 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes _X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes __X__ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X__ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q". In addition, a number of congeners co-elute and are flagged as C.

In the present case the Q flag has been applied in situations where the mass ratios are not met for a detected target. Such results are reported as the highest possible concentration of the congener, since the associated interference may mean that there is a high bias present. These results are qualified as "JQ."

SDG	Client Sample ID	Analyte	Result	PQL	Flag	Qualifier
G9D030338	090401-SE-01-S TO 10-S-COMPOSITE	PCB 189 (BZ)	2.6	2.2	Q	JQ
G9D030340	090401-B18-01 TO 10-VG-COMPOSITE	PCB 118 (BZ)	190	65	Q C	JQ
G9D030340	090401-SE-01 TO 10-VG-COMPOSITE	PCB 105 (BZ)	150	58	Q C	JQ

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively. The laboratory reports in the Case Narratives that these isomers were confirmed in the air samples associated with this project to consist only of PCB-105 and PCB-118 by analysis on a second column capable of separating the isomers that coelute on the DB-5 column. Documentation of this reanalysis was not provided so the reviewer is not able to confirm that this is the case, and apparently this was not done for the soil and vegetation samples. We have not added qualifiers for these C-flagged data under the assumption that these are in fact the isomers reported.

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases. However, there are some specific observations that deserve additional comment. These points have been discussed in the laboratory Narratives.

SDG G9D030340, SDG G9D040182– vegetation. Samples all have elevated reporting limits due to the fact that they were analyzed at a 10x dilution, and could not be concentrated to 20ul due to the presence of organics other than the target compounds. Despite the dilution, evident interferences remain visible in the chromatograms for some of these samples.

In particular, for SDG G9D030340 lab sample 2, the recovery standard 13C-PCB-202 did not meet ion abundance ratio criteria. A review of the raw data shows that the ratio observed is 0.76, which is just at the LCL for this labeled congener. The laboratory has used the theoretical ratio of 0.89 to adjust the integral for this recovery standard in calculating the recovery of the associated internal standards. If the measured area is used instead of the corrected area, no conclusions are altered, although recoveries of internal standards are elevated more than is the case with using the measured ratio. Professional judgment is that the laboratory practice is acceptable and no qualifiers are applied.

In the same sample, the 13C-PCB-81 internal standard did not meet ion abundance ratio acceptance criteria. Theoretical areas were used to quantitate the internal standard recoveries and related target analytes. Review of the raw data shows that the ratio is 0.65, just at the LCL for this labeled internal standard. The use of the measured area as opposed to the theoretical would not alter the fact that the internal standard recovery is in control, and since no congeners are detected associated with this internal standard, no qualifiers are required.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.

Yes ____ No __ NA _X__
Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has substantially complied with the cited method. There are some differences between the method and specific laboratory practices, which have been reflected in the SOP provided by the laboratory. The reviewer agrees with the laboratory that these modifications do not degrade method performance.

Although qualifiers have been issued to the data for several reasons, no data have been rejected.

The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Deliverables

On request, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Sample Condition

A number of coolers were received with each shipment. The laboratory has documented the temperature of each to 1 significant figure. Some of the cooler temperatures are reported as $6^{o}C$. The method specifies that the temperature be kept < $6^{o}C$ for all matrices once sampling has taken place.

Although technically some of these coolers may not be in strict compliance with method specifications, no qualifiers are added since any temperature impact would be expected to be negligible. This is particularly true of PCBs which have been shown to be very stable.

Method Blanks

Method blanks are free of contamination except as shown in the table within the body of this report. Only one congener was detected in any method blank, PCB 118.

Results in associated samples are qualified as UB#, where # is the method blank level corrected for dilution, whenever the result in the sample is less than 5x the method blank level. Such results may be used as nondetected values, with the result considered to be less than the value measured in the sample. Thus if the sample result is 0.1 pg/g but the result is qualified as UB# due to an associated method blank, the result should be regarded as < 0.10 pg/g.

This approach is taken from the Region 10 validation SOP for PCB Congener analysis. The factor of 5 provides a conservative estimate of a typical method blank control window that might be obtained by control charting.

Field Blanks
There are two rinse blanks, in control.

Continuing Calibrations
Limits are specified in the method. The verification standard is run every 12 hours. For target compounds, limits are 70-130 and there are a few cases where this has not been met, as shown below.

The area for HxCB-167 had to be manually integrated by the laboratory in a number of calibrations. The analyst has provided the reintegrations, with a note indicating that "peaks not separated." The initial calibrations show clearly that there are two peaks, but they are very poorly resolved. The reintegrations have been consistent throughout the data package. In some of the CCVs, the chromatography has degraded compared to the initial calibration and there is no clear separation of the two peaks. In such cases, the analyst has attempted to achieve approximately the same ratio as was observed in the initial calibration. Professional judgment is that this is acceptable practice but should have been discussed in the narrative.

Surrogates/Internal Standards
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

We have qualified the results for associated samples (per the Region 10 SOP) as JI#, where # is the outlier observed for the associated congener. Outliers are shown in Table IV-A in the body of this report and qualifiers added are provided in Table IV-B. These outliers have been noted by the laboratory in the Case Narrative and potential impacts to the data discussed.

Use of cleanup standards is optional in the laboratory procedure, as is use of cleanup itself. The laboratory has not used cleanup standards in the case of the vegetation samples, and has used them but not reported recoveries in the case of the soil samples. The cleanup standard recoveries in the soil samples are in control.

The laboratory position on the use of cleanup standards is that they are only useful as diagnostic tools should there be problems in the cleanup step. The internal standards spiked at the initiation of the sample preparation will reveal any QC issues associated with the entire preparation/cleanup process. Professional judgment is that the laboratory argument is correct, and that not employing cleanup standards has no impact on the usability or validity of the data.

MS/MSD

MS and MSDs are not specified in the method. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

In this instance, one MS/MSD is provided for the soil matrix. This was conducted on sample 090401-B18-01-S TO 10-S-COMPOSITE, laboratory sample G9D030338-006. Recoveries and RPDs are in control.

Compound Identification

Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q". In addition, a number of congeners co-elute and are flagged as C.

In the present case the Q flag has been applied in situations where the mass ratios are not met for a detected target. Such results are reported as the highest possible concentration of the congener, since the associated interference may mean that there is a high bias present. These results are qualified as "JQ."

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively. The laboratory reports in the Case Narratives that these isomers were confirmed in the air samples associated with this project to consist only of PCB-105 and PCB-118 by analysis on a second column capable of separating the isomers that coelute on the DB-5 column. Documentation of this reanalysis was not provided so the reviewer is not able to confirm that this is the case, and apparently this was not done for the soil and vegetation samples. We have not added qualifiers for these C-flagged data under the assumption that these are in fact the isomers reported.

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases. However, there are some specific observations that deserve additional comment. These points have been discussed in the laboratory Narratives.

SDG G9D030340, SDG G9D040182– vegetation. Samples all have elevated reporting limits due to the fact that they were analyzed at a 10x dilution, and could not be concentrated to 20ul due to the presence of organics other than the target compounds. Despite the dilution, evident interferences remain visible in the chromatograms for some of these samples.

In particular, for SDG G9D030340 lab sample 2, the recovery standard 13C-PCB-202 did not meet ion abundance ratio criteria. A review of the raw data shows that the ratio observed is 0.76, which is just at the LCL for this labeled congener. The laboratory has used the theoretical ratio of 0.89 to adjust the integral for this recovery standard in calculating the recovery of the associated internal standards. If the measured area is used instead of the corrected area, no conclusions are altered, although recoveries of internal standards are elevated more than is the case with using the measured ratio. Professional judgment is that the laboratory practice is acceptable and no qualifiers are applied.

In the same sample, the 13C-PCB-81 internal standard did not meet ion abundance ratio acceptance criteria. Theoretical areas were used to quantitate the internal standard recoveries and related target analytes. Review of the raw data shows that the ratio is 0.65, just at the LCL for this labeled internal standard. The use of the measured area as opposed to the theoretical would not alter the fact that the internal standard recovery is in control, and since no congeners are detected associated with this internal standard, no qualifiers are required.

DIANE SHORT & ASSOCIATES, INC.

ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS by EPA 1668A

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SDG: G9D300218

PROJECT: Kettleman Hills site, California. - PCB Congener Validation, for Wenck Assoc.

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 5 Air including 1 Air blank

SAMPLING DATE (Month/Year): April, 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: APR-09-BLANK-TO9A-MPS, APR-09-DMSI-TO9A, APR-09-MSP-ALT-TO9A, APR-09-MSP-TO9A, APR-09-UMSI-TO9A

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DLS 1/14/2010

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1999; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1994; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The client has also referenced the EPA Region 3 Validation Guidance for PCB Congener Method 1668. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On a prior review of data from this site, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in hardcopy, pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.

Yes _X__ No ____

The laboratory has documented the temperature to 1 significant figure.

2. Samples were extracted and analyzed within the Method holding time limits.

Yes __X_ No ____

The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.

Yes __X_ No ____

The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.

Yes __X___ No ____

2. Field blanks were free of contamination.

Yes __X__ No ____ NA____

There is one field blank, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes __X__ No ____

This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, which are 30-135% in the method.

Use of cleanup standards is optional in the laboratory procedure, as is use of cleanup itself. In this case cleanup standard recoveries have been reported and are in control for all analyses.

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA__X__

MS and MSDs are not specified in the method. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA __X_

4. The MS/MSD is a client sample
Yes ____ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the most narrow specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
All recoveries for targets or for internal standards/surrogates in the OPR results are within method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. The widths of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

8. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

9. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

It is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met. The retention times of PCB 169 and PCB 157 are at 42 minutes and 44 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met. Results for PCB 209 are not shown in this data set.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION
1. Single Ion Monitoring was performed as required.
Yes _X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes __X__ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X__ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in several instances. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. These include the following samples:

Client Sample ID	Analyte
APR-09-DMSI-TO9A	PCB 77 (BZ)
APR-09-MSP-ALT-TO9A	PCB 77 (BZ)

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.

Yes ____ No __ NA _X__

Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has substantially complied with the cited method. There are some differences between the method and specific laboratory practices, which have been reflected in the SOP provided by the laboratory. The reviewer agrees with the laboratory that these modifications do not degrade method performance.

Although qualifiers have been issued to the data for several reasons, no data have been rejected. The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Compound Identification

Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in several instances. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. See the report body for details.

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS in Air by EPA 1668A

SDG: G9E270196

PROJECT: Kettleman site - PCB Congener Validation, California for Wenck Assoc. MN

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 5 air samples including 1 field blank

SAMPLING DATE (Month/Year): May 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: MAY-09-BLANK-TO9A, MAY-09-DMSI-TO9A, MAY-09-MSP-TO9A, MAY-09-UMSI-TO9A, MAY-09-UMSI-TO9A-DUP

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DLS 8/19/09

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 2007 ; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1990; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On request, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:

1. For method blank qualification, the DSA procedure is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP Qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not significantly impacted.

In this case there are no method blank outliers, hence no qualifiers of either type.

2. For labeled compound recovery qualification, Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but subject to a potential small but unknown bias.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.
Yes _X__ No ____
Samples were received intact. All samples were received at < 6°C.

2. Samples were extracted and analyzed within the Method holding time limits.
Yes __X_ No ____
The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year. No specification is provided for air samples but since these are sorbent samples and are therefore solids, the assumption is made that the same provision applies.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.
Yes __X_ No ____
The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.
Yes __X___ No ____
Method blanks are free of contamination.

When contamination is present, results in associated samples are qualified as UB#, where # is the method blank level corrected for dilution, whenever the result in the sample is less than 5x the method blank level. Such results may be used as nondetected values, with the result considered to be less than the value measured in the sample. Thus if the sample result is 0.1 pg/g but the result is qualified as UB# due to an associated method blank, the result should be regarded as < 0.10 pg/g.

2. Field blanks were free of contamination.
Yes __X__ No ____ NA____
There is one field blank, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes ____ No __X__
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the

extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

We have qualified the results for associated samples (per the Region 10 SOP) as JI#, where # is the outlier observed for the associated congener. Outliers are shown in Table IV-A below and qualifiers added are provided in Table IV-B. The laboratory has discussed these outliers and their potential implications in the Case Narratives.

Table IV-A. Internal Standard Outliers Observed. Note that since the recovery is high and the associated unlabeled congener is ND, no QAPP qualifier is added. Per the Region 10 guidance, a DSA qualifier is applied.

Note also that the laboratory has not reported the recovery standard although it was included, and is within acceptance limits per the raw data review.

SDG	Lab Sample ID	Client Sample ID	Internal Standard	Recovery	Qualifiers
G9E270196	001	MAY-09-UMSI-TO9A	13C12-PCB 126	164	JI164

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA_ X ___
MS and MSDs are not specified in the method, and it is not possible to conduct meaningful matrix spikes for air samples. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA__X_

4. The MS/MSD is a client sample
Yes ___ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the most narrow limits specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
None of the recoveries for targets or for internal standards/surrogates in the OPR results are outside of method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____
Limits are specified in the method. The verification standard is run every 12 hours. For target compounds, limits are 70-130 and there are a few cases where this has not been met, as shown below.

The area for HxCB-167 had to be manually integrated by the laboratory in a number of calibrations. The analyst has provided the reintegrations, with a note indicating "poor chromatography" The initial calibrations show clearly that there are two peaks, but they are poorly resolved. The re-integrations have been consistent throughout the data package. It is recommended that the data user consider any detected reported results for this congener as estimated. No qualifier has been applied as one is not defined in the QAPP and for this data set, the compound is not detected.

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.

Yes __X___ No____

7. The RSDs for the IC response factors met the 20% limit.
Yes __X__ No____

8. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. The width of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

9. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

10. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 43 minutes on the column used. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met.

The retention times of PCB 169 and PCB 157 are at 36 minutes and 34 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes _X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes _X_ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X_ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q". In addition, a number of congeners co-elute and are flagged as C.

No detected targets in this case fail to meet ion ratio criteria, hence are no Q flags are present. The detected targets in the air samples are limited to PCB 105 and PCB 118, which coelute with PCB 127 and PCB 106, respectively. In a previous SDG, the laboratory indicated that they had analyzed the sample on a different column and had determined that the congeners present were PCB 105 and 118, so no qualifiers were added. In this case, the laboratory has not made this statement and the detected targets are qualified as JQ (DSA qualifiers) and J (QAPP qualifiers). These results could be biased.

All mass spectral identifications were reviewed for detected targets. The reviewer is in agreement with the laboratory decisions in all cases.

In the case of lab sample -002 (MAY-09-DMSI-TO9A), PCB-77 suffered an interference from a co-eluting peak. This has been documented in the raw data for this sample. The laboratory raised the reporting limit to the level of the apparent result. Some of the other samples also appear to suffer from this apparent interference, but the elevated result is less than the reporting limit in those cases. The nature of the interference has not been made clear by the laboratory, if it is known. This congener could be present in samples below the reporting limit provided by the laboratory.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.
Yes ____ No ___ NA _X_
Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has complied substantially with the cited method. There are some differences between the method and specific laboratory practices. The reviewer does not believe that these represent significant changes to the method, and they should not cause any method performance issues.
Although qualifiers have been issued to the data for several reasons, no data have been rejected.

The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Deliverables
On request, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:
1. For method blank qualification, the DSA procedure is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP Qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not significantly impacted.

In this case there are no method blank outliers, hence no qualifiers of either type.

2. For labeled compound recovery qualification, Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but

subject to a potential small but unknown bias.

Surrogates/Internal Standards
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

We have qualified the results for associated samples (per the Region 10 SOP) as JI#, where # is the outlier observed for the associated congener. Outliers are shown in Table IV-A below and qualifiers added are provided in Table IV-B. The laboratory has discussed these outliers and their potential implications in the Case Narratives.

Table IV-A. Internal Standard Outliers Observed. Note that since the recovery is high and the associated unlabeled congener is ND, no QAPP qualifier is added. Per the Region 10 guidance, a DSA qualifier is applied.

Note also that the laboratory has not reported the recovery standard although it was included, and is within acceptance limits per the raw data review.

Compound Identification
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q". In addition, a number of congeners co-elute and are flagged as C.

No detected targets in this case fail to meet ion ratio criteria, hence are no Q flags are present. The detected targets in the air samples are limited to PCB 105 and PCB 118, which coelute with

PCB 127 and PCB 106, respectively. In a previous SDG, the laboratory indicated that they had analyzed the sample on a different column and had determined that the congeners present were PCB 105 and 118, so no qualifiers were added. In this case, the laboratory has not made this statement and the detected targets are qualified as JQ (DSA qualifiers) and J (QAPP qualifiers). These results could be biased.

All mass spectral identifications were reviewed for detected targets. The reviewer is in agreement with the laboratory decisions in all cases.

In the case of lab sample -002 (MAY-09-DMSI-TO9A), PCB-77 suffered an interference from a co-eluting peak. This has been documented in the raw data for this sample. The laboratory raised the reporting limit to the level of the apparent result. Some of the other samples also appear to suffer from this apparent interference, but the elevated result is less than the reporting limit in those cases. The nature of the interference has not been made clear by the laboratory, if it is known. This congener could be present in samples below the reporting limit provided by the laboratory.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS in Air by EPA 1668A

SDG: G9F300243, G9G290227

PROJECT: Kettleman site - PCB Congener Validation, California for Wenck Assoc. MN

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 10 air samples including 2 field blanks

SAMPLING DATE (Month/Year): June, July 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: JUL09-BLANK-TO9A-MSP, JUL09-DMSI-TO9A, JUL09-MSP-TO9A, JUL09-MSP-TO9A-DUP, JUL09-UMSI-TO9A, JUN 09-BLANK-TO9A, JUN 09-DMSI-TO9A, JUN 09-MSP-TO9A, JUN 09-OMSI-DUP-TO9A, JUN 09-UMSI-TO9A

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DLS 9/1/09

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 2007 ; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1990; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On request during the validation of an earlier data set, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:

1. For method blank qualification, the DSA procedure is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP Qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not significantly impacted.

In this case there are no method blank outliers, hence no qualifiers of either type.

2. For labeled compound recovery qualification, Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but subject to a potential small but unknown bias.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.
Yes _X__ No ____
Samples were received intact. All samples were received at < 6°C.

2. Samples were extracted and analyzed within the Method holding time limits.
Yes __X_ No ____
The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year. No specification is provided for air samples but since these are sorbent samples and are therefore solids, the assumption is made that the same provision applies.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.
Yes ___ No __X__
G9F300243: One of the samples was not listed on the chain of custody. This was noted as received by the laboratory, sample JUN 09-OMSI-DUP-TO9A.

The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.
Yes __X___ No ____
Method blanks are free of contamination.

When contamination is present, results in associated samples are qualified as UB#, where # is the method blank level corrected for dilution, whenever the result in the sample is less than 5x the method blank level. Such results may be used as nondetected values, with the result considered to be less than the value measured in the sample. Thus if the sample result is 0.1 pg/g but the result is qualified as UB# due to an associated method blank, the result should be regarded as < 0.10 pg/g.

2. Field blanks were free of contamination.
Yes __X__ No ____ NA____
There are two field blanks, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes __X__ No ____
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified

against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

Note that the laboratory has not reported the recovery standard in the list of labeled standard recoveries. This standard was recovered within limits per the raw data.

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA_ X ___
MS and MSDs are not specified in the method, and it is not possible to conduct meaningful matrix spikes for air samples. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA__X_

4. The MS/MSD is a client sample
Yes ___ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the

narrowest limits specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
None of the recoveries for targets or for internal standards/surrogates in the OPR results are outside of method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____
Limits are specified in the method. The verification standard is run every 12 hours. For target compounds, limits are 70-130.

In SDG G8F300243, The area for HxCB-167 had to be manually integrated by the laboratory in calibrations. The analyst has provided the reintegrations, with a note indicating "poor chromatography" Two peaks are not resolvable in these chromatograms, and the analyst has split the combined peak consistently. The re-integrations have been consistent throughout the data package. It is recommended that the data user consider any detected reported results for this congener as estimated. No qualifier has been applied as one is not defined in the QAPP and for this data set, the compound is not detected.

In SDG G8E290227, the HxCB-167 peak is resolved and it does not appear that manual integrations were necessary.

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. The RSDs for the IC response factors met the 20% limit.
Yes __X__ No____

8. Mass Spectral Resolution was > 10,000.
Yes __X__ No____

Mass resolution plots from PFK are provided with the raw data for each analytical run. Resolution is > 10,000 in each case.

9. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is within specifications.

10. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 43 minutes on the column used. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met.

The retention times of PCB 169 and PCB 157 are at 36 minutes and 34 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria. and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes __X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes __X__ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X__ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q". In addition, a number of congeners co-elute and are flagged as C.

No detected targets in this case fail to meet ion ratio criteria, hence are no Q flags are present. The detected targets in the air samples are limited to PCB 105 and PCB 118, which coelute with PCB 127 and PCB 106, respectively. In a previous SDG, the laboratory indicated that they had analyzed the sample on a different column and had determined that the congeners present were PCB 105 and 118, so no qualifiers were added. In this case, the laboratory has not made this statement and the detected targets are qualified as JQ (DSA qualifiers) and J (QAPP qualifiers). These results could be biased.

All mass spectral identifications were reviewed for detected targets. The reviewer is in agreement with the laboratory decisions in all cases.

G9F300243: Sample JUN 09-DMSI-TO9A and sample JUN 09-OMSI-DUP-TO9A both had PCB-77 flagged by the laboratory with a "G" to indicate that there were interferences which caused the laboratory to raise the reporting limit for the congener (by approximately a factor of 2).

G9G290227: Sample JUL09-DMSI-TO9A had PCB-77 flagged by the laboratory with a "G" to indicate that there were interferences which caused the laboratory to raise the reporting limit for the congener (by approximately a factor of 2).

In both the above cases, the interference appears to be due to a coincident mass from a more highly-chlorinated congener resulting from mass spectral fragmentation. This is identified in the raw data by the laboratory. This is due to interferences inherent in the sample, and raising the reporting limit is the appropriate action to take.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.
Yes __X__ No ___ NA___
There are two field duplicates, one in each SDG. Both are in control.

XII. OVERALL ASSESSMNENT

The laboratory has complied substantially with the cited method. There are some differences

between the method and specific laboratory practices. The reviewer does not believe that these represent significant changes to the method, and they should not cause any method performance issues.
Although qualifiers have been issued to the data for several reasons, no data have been rejected.

The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Deliverables
On request during the validation of an earlier data set, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:
1. For method blank qualification, the DSA procedure is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP Qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not significantly impacted.

In this case there are no method blank outliers, hence no qualifiers of either type.

2. For labeled compound recovery qualification, Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but subject to a potential small but unknown bias.

Chain of Custody
G9F300243: One of the samples was not listed on the chain of custody. This was noted as received by the laboratory, sample JUN 09-OMSI-DUP-TO9A.

The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

Calibrations
Limits are specified in the method. The verification standard is run every 12 hours. For target compounds, limits are 70-130.

In SDG G8F300243, The area for HxCB-167 had to be manually integrated by the laboratory in calibrations. The analyst has provided the reintegrations, with a note indicating "poor chromatography" Two peaks are not resolvable in these chromatograms, and the analyst has split the combined peak consistently. The re-integrations have been consistent throughout the data package. It is recommended that the data user consider any detected reported results for this congener as estimated. No qualifier has been applied as one is not defined in the QAPP and for this data set, the compound is not detected.

In SDG G8E290227, the HxCB-167 peak is resolved and it does not appear that manual integrations were necessary.

Compound Identification
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q". In addition, a number of congeners co-elute and are flagged as C.

No detected targets in this case fail to meet ion ratio criteria, hence are no Q flags are present. The detected targets in the air samples are limited to PCB 105 and PCB 118, which coelute with PCB 127 and PCB 106, respectively. In a previous SDG, the laboratory indicated that they had analyzed the sample on a different column and had determined that the congeners present were PCB 105 and 118, so no qualifiers were added. In this case, the laboratory has not made this statement and the detected targets are qualified as JQ (DSA qualifiers) and J (QAPP qualifiers). These results could be biased.

All mass spectral identifications were reviewed for detected targets. The reviewer is in agreement with the laboratory decisions in all cases.

G9F300243: Sample JUN 09-DMSI-TO9A and sample JUN 09-OMSI-DUP-TO9A both had PCB-77 flagged by the laboratory with a "G" to indicate that there were interferences which caused the laboratory to raise the reporting limit for the congener (by approximately a factor of 2).

G9G290227: Sample JUL09-DMSI-TO9A had PCB-77 flagged by the laboratory with a "G" to indicate that there were interferences which caused the laboratory to raise the reporting limit for the congener (by approximately a factor of 2).

In both the above cases, the interference appears to be due to a coincident mass from a more highly-chlorinated congener resulting from mass spectral fragmentation. This is identified in the raw data by the laboratory. This is due to interferences inherent in the sample, and raising the reporting limit is the appropriate action to take.

Field Duplicates

There are two field duplicates, one in each SDG. Both are in control.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS in Air by EPA 1668A

SDG: G9I030266

PROJECT: Kettleman Hills, California site - PCB Congener Validation, for Wenck Assoc. MN

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 5 Air samples including one field blank

SAMPLING DATE (Month/Year): August, 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: AUG09-BLANK-TO9A-UMS1, AUG09-DMS1-TO9A, AUG09-FRESNO-TO9A, AUG09-MSP-TO9A, AUG09-UMS1-TO9A

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DLS 10/22/09

Telephone Logs included Yes____ No _X_

Contractual Violations Yes____ No _X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1999; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1994; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On request during the validation of an earlier data set, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in pdf and hardcopy format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:

1. If method blank qualification is required, the DSA procedure is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not statistically impacted.

   In this case there are no method blank outliers, hence no qualifiers of either type.

2. For labeled compound recovery qualification, Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but subject to a potential small but unknown bias.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.
Yes _X__ No ____
Samples were received intact. All samples were received at < 6^{o}C.

2. Samples were extracted and analyzed within the Method holding time limits.
Yes __X_ No ____
The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year. No specification is provided for air samples but since these are sorbent samples and are therefore solids, the assumption is made that the same provision applies.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.
Yes _X__ No ____
The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.
Yes __X___ No ____

2. Field blanks were free of contamination.
Yes __X__ No ____ NA____
There is one field blank, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes ____ No __X__
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

Note that the laboratory has not reported the recovery standard in the list of labeled standard recoveries. This standard was recovered within limits per the raw data.

Several high internal standard recoveries are observed in the samples, as shown below. When associated targets are detected, qualifiers are added as JI#, with # being the internal standard recovery. For non-detects, no qualifier is added (per the QAPP). Since this is an isotopic-dilution analysis, any bias created by internal standard behavior of the magnitude observed here is likely to be small.

Because the DSA procedure is slightly different for internal standards (see the deliverables section), for information purposes DSA qualifiers are also provided in the EDD. DSA qualifiers are added to all targets for outliers. This means that the DSA qualifiers will be present in cases where there are no QAPP qualifiers.

SDG	Lab Sample ID	Client Sample ID	Surrogate	Recovery	Qualifiers
G9I030266	002	AUG09-DMS1-TO9A	13C12-PCB 105	152	JI152 detected target
G9I030266	002	AUG09-DMS1-TO9A	13C12-PCB 126	183	None, targets ND
G9I030266	004	AUG09-FRESNO-TO9A	13C12-PCB 105	151	JI151 detected target
G9I030266	004	AUG09-FRESNO-TO9A	13C12-PCB 126	181	None, targets ND
G9I030266	003	AUG09-MSP-TO9A	13C12-PCB 126	167	None, targets ND
G9I030266	001	AUG09-UMS1-TO9A	13C12-PCB 126	167	None, targets ND

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA_ X ___
MS and MSDs are not specified in the method, and it is not possible to conduct meaningful matrix spikes for air samples. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA__X_

4. The MS/MSD is a client sample
Yes ___ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES
1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the narrowest limits specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
None of the recoveries for targets or for internal standards/surrogates in the OPR results are outside of method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION
1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____
Limits are specified in the method. The verification standard is run every 12 hours. For target compounds, limits are 70-130.

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. The RSDs for the IC response factors met the 20% limit.
Yes __X__ No____

8. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. Resolution is > 10,000 in each case.

9. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is within specifications.

10. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 43 minutes on the column used. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met.

The retention times of PCB 169 and PCB 157 are at 36 minutes and 34 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION
1. Single Ion Monitoring was performed as required.
Yes __X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes __X__ No____

Per the 10% review.

3. Spectral accuracy and quantitation are accurate.
Yes _X__ No_____
Per the QAPP, all detected targets have been individually reviewed.

The detected targets in the air samples are limited to PCB 105 and PCB 118, which coelute with PCB 127 and PCB 106, respectively. In a previous SDG, the laboratory indicated that they had analyzed the sample on a different column and had determined that the congeners present were PCB 105 and 118, so no qualifiers were added. In this case, the laboratory has not made this statement and the detected targets are qualified as JQ (DSA qualifiers) and J (QAPP qualifiers). These results could be biased high due to interference from the co-eluting isomers.

All mass spectral identifications were reviewed for detected targets. The reviewer is in agreement with the laboratory decisions in all cases.

Sample AUG09-DMS1-TO9A and sample AUG09-MSP-T09A both had PCB-77 flagged by the laboratory with a "G" to indicate that there were interferences which caused the laboratory to raise the reporting limit for the congener (by approximately a factor of 2). This is due to interferences inherent in the sample, and raising the reporting limit is the appropriate action to take.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.
Yes___ No___ NA_X__
Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has complied substantially with the cited method. There are some differences between the method and specific laboratory practices. The reviewer does not believe that these represent significant changes to the method, and they should not cause any method performance issues.
Although qualifiers have been issued to the data for several reasons, no data have been rejected.

The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Internal Standards

Several high internal standard recoveries are observed in the samples, as shown within the body of this report. When associated targets are detected, qualifiers are added as JI#, with # being the internal standard recovery. For non-detects, no qualifier is added (per the QAPP). Since this is an isotopic-dilution analysis, any bias created by internal standard behavior of the magnitude observed here is likely to be small.

Because the DSA procedure is slightly different for internal standards (see the deliverables section), for information purposes DSA qualifiers are also provided in the EDD. DSA qualifiers are added to all targets for outliers. This means that the DSA qualifiers will be present in cases where there are no QAPP qualifiers.

Field Blanks
There is one field blank, in control.

Target Identification
Per the QAPP, all detected targets have been individually reviewed.

The detected targets in the air samples are limited to PCB 105 and PCB 118, which coelute with PCB 127 and PCB 106, respectively. In a previous SDG, the laboratory indicated that they had analyzed the sample on a different column and had determined that the congeners present were PCB 105 and 118, so no qualifiers were added. In this case, the laboratory has not made this statement and the detected targets are qualified as JQ (DSA qualifiers) and J (QAPP qualifiers). These results could be biased high due to interference from the co-eluting isomers.

All mass spectral identifications were reviewed for detected targets. The reviewer is in agreement with the laboratory decisions in all cases.

Sample AUG09-DMS1-TO9A and sample AUG09-MSP-T09A both had PCB-77 flagged by the laboratory with a "G" to indicate that there were interferences which caused the laboratory to raise the reporting limit for the congener (by approximately a factor of 2). This is due to interferences inherent in the sample, and raising the reporting limit is the appropriate action to take.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS by EPA 1668A

SDG: G9H050321, G9I030266

PROJECT: Kettleman Hills site, California, - PCB Congener Validation, for Wenck Assoc.

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 10 soils, 1 water (rinse blank)

SAMPLING DATE (Month/Year): August, 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: 090803-NE-VD-SEH 10:1 COMPOSITE, 090803-N-VD-SEH 10:1 COMPOSITE, 090803-NW-VD-SEH 10:1 COMPOSITE, 090803-SW-VD-SEH 10:1 COMPOSITE, 090803-W-VD-SEH 10:1 COMPOSITE, 090804-B18-VD-SEH 10:1 COMPOSITE, 090804-SE-R-SHE (aqueous field blank), 090804-SE-VD-SEH 10:1 COMPOSITE, 090804-S-VD-SEH 10:1 COMPOSITE, AUG09-FRESNO-SOIL-1668A, AUG09-FRESNO-VD-1668A

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DS 10/22/09

Telephone Logs included Yes____ No _X_

Contractual Violations Yes____ No _X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1999 the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1994; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The client has also referenced the EPA Region 3 Validation Guidance for PCB Congener Method 1668. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On a prior review of data from this site, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in hardcopy, pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:

1. If method blank qualification is necessary, the DSA and EPA Region 3 procedure is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP Qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not statistically impacted.

2. For labeled compound recovery qualification, EPA Region 3 and Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but subject to a potential small but unknown bias.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.
Yes _X__ No ____
A number of coolers were received with each shipment. The laboratory has documented the temperature of each to 1 significant figure.

The laboratory notes that the temperature blank was at 7^{O}C for the cooler containing the samples used to create composite sample 090803-N-VD-SEH, although the samples themselves were measured at 6^{O}C or less.

Samples 090804-SE-VD-SEH were at 7^{O}C with the temperature blank at 8^{O}C.

No qualifiers are added since any temperature impact would be expected to be negligible. This is particularly true of PCBs which have been shown to be very stable.

2. Samples were extracted and analyzed within the Method holding time limits.
Yes __X_ No ____
The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.
Yes __X_ No ____
The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.
Yes __X___ No ____

2. Field blanks were free of contamination.
Yes __X__ No ____ NA____
There is one field blank, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes __X__ No ____
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against

the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

Use of cleanup standards is optional in the laboratory procedure, as is use of cleanup itself. The laboratory sample prep sheets indicate that the cleanup standard was added in SDG G9H050321, and not added in SDG G9I030266. However, it is not recovered in any of the samples or batch QC as judged from the raw data.

The laboratory position on the use of cleanup standards is that they are only useful as diagnostic tools should there be problems in the cleanup step. The internal standards spiked at the initiation of the sample preparation will reveal any QC issues associated with the entire preparation/cleanup process. Professional judgment is that the laboratory argument is correct, and that not employing cleanup standards has no impact on the usability or validity of the data as long as the internal standard recoveries are within limits. No qualifiers are added.

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA__X__
MS and MSDs are not specified in the method. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA __X_

4. The MS/MSD is a client sample
Yes ____ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the most narrow specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
None of the recoveries for targets or for internal standards/surrogates in the OPR results are outside of method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. The RSDs for the IC response factors met the 20% limit.
Yes __X__ No____

8. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. The width of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

9. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

10. The minimum retention time requirements are met.
Yes _X_ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 43 minutes on the column used. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met. The retention times of PCB 169 and PCB 157 are at 36 minutes and 34 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes _X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes _X_ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X_ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in several instances. There is no qualifier required for this, but the reporting limit is elevated for this congener due to matrix. These include the following samples:

SDG	Client Sample ID
G9H050321	090803-N-VD-SEH 10:1 COMPOSITE
G9H050321	090803-SW-VD-SEH 10:1 COMPOSITE
G9H050321	090803-NE-VD-SEH 10:1 COMPOSITE
G9H050321	090803-W-VD-SEH 10:1 COMPOSITE
G9H050321	090803-NW-VD-SEH 10:1 COMPOSITE
G9H050321	090804-S-VD-SEH 10:1 COMPOSITE
G9H050321	090804-S-VD-SEH 10:1 COMPOSITE
G9H050321	090804-B18-VD-SEH 10:1 COMPOSITE
G9H050321	090804-B18-VD-SEH 10:1 COMPOSITE
G9H050321	090804-SE-VD-SEH 10:1 COMPOSITE
G9H050321	090804-SE-VD-SEH 10:1 COMPOSITE
G9I030266	AUG09-FRESNO-SOIL-1668A

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.

Yes____ No __ NA _X__

Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has substantially complied with the cited method. There are some differences between the method and specific laboratory practices, which have been reflected in the SOP provided by the laboratory. The reviewer agrees with the laboratory that these modifications do not degrade method performance.

Although qualifiers have been issued to the data for several reasons, no data have been rejected.

The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Sample Condition
A number of coolers were received with each shipment. The laboratory has documented the temperature of each to 1 significant figure.

The laboratory notes that the temperature blank was at 7^{0}C for the cooler containing the samples used to create composite sample 090803-N-VD-SEH, although the samples themselves were measured at 6^{0}C or less.

Samples 090804-SE-VD-SEH were at 7^{0}C with the temperature blank at 8^{0}C.

No qualifiers are added since any temperature impact would be expected to be negligible. This is particularly true of PCBs which have been shown to be very stable.

Compound Identification

Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in several instances. There is no qualifier required for this, but the reporting limit is elevated for this congener due to matrix.

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS by EPA 1668A

SDG: G9I290159

PROJECT: Kettleman Hills site, California, - PCB Congener Validation, for Wenck Assoc.

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 5 Air, 2 solid, including 1 Air blank

SAMPLING DATE (Month/Year): September, 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: SEP09-BLANK-TO9A DMS1, SEP09-DMSI-TO9A, SEP09-HANFORD-SOIL-1668A, SEP09-HANFORD-TO9A, SEP09-HANFORD-VD-1668A, SEP09-MSP-TO9A, SEP09-UMSI-TO9A

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DLS 1/14/10

Telephone Logs included Yes____ No X

Contractual Violations Yes____ No X

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1999; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1994; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The client has also referenced the EPA Region 3 Validation Guidance for PCB Congener Method 1668. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On a prior review of data from this site, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in hardcopy, pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.

Yes _X__ No ____

The laboratory has documented the temperature to 1 significant figure.

2. Samples were extracted and analyzed within the Method holding time limits.

Yes __X_ No ____

The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.

Yes __X_ No ____

The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.

Yes __X___ No ____

2. Field blanks were free of contamination.

Yes __X__ No ____ NA____

There is one field blank, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes __X__ No ____
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

Use of cleanup standards is optional in the laboratory procedure, as is use of cleanup itself. In this case cleanup standard recoveries have not been reported. The laboratory is not consistent in its practice; some SDGs we have reviewed have all cleanup standards reported, some do not.

In this case, the raw data for soils do not show any detected levels of the cleanup standard. For the air samples, the raw data show normal recoveries of this standard. It appears that the laboratory has not spiked the soils in this case with the cleanup standard. No qualifiers are required, since the internal standards are recovered normally.

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA__X__
MS and MSDs are not specified in the method. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA __X_

4. The MS/MSD is a client sample
Yes ____ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the narrowest limits specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
All recoveries for targets or for internal standards/surrogates in the OPR results are within method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. Mass Spectral Resolution was > 10,000.
Yes __X__ No____

Mass resolution plots from PFK are provided with the raw data for each analytical run. The width of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

8. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

9. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 53.7 minutes on the column used in this set of data. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met. The retention times of PCB 169 and PCB 157 are at 46 minutes and 43 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes __X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.

Yes __X__ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X__ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in two of the air samples. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. These include the following samples:

Client Sample ID	Analyte
SEP09-DMSI-TO9A	PCB 77 (BZ)
SEP09-MSP-TO9A	PCB 77 (BZ)

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.
Yes ____ No __ NA _X__
Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has substantially complied with the cited method. There are some differences between the method and specific laboratory practices, which have been reflected in the SOP provided by the laboratory. The reviewer agrees with the laboratory that these modifications do not degrade method performance.
Although qualifiers have been issued to the data for several reasons, no data have been rejected. The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Compound Identification

Per the QAPP, all detected targets have been individually reviewed.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in two of the air samples. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. See the body of this report for details.

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS by EPA 1668A

SDG: G9J280227

PROJECT: Kettleman Hills site, California, - PCB Congener Validation, for Wenck Assoc.

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 5 Air, 2 solid, including 1 Air blank

SAMPLING DATE (Month/Year): October, 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: OCT 09-BLANK-TO9A-MSP, OCT 09-COALINGA-SOIL-1668A, OCT 09-COALINGA-T09A, OCT 09-COALINGA-VD-1668A, OCT 09-DMSI-T09A, OCT 09-MSP-T09A, OCT 09-UMSI-T09A

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DS 12/18/09

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1999; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1994; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The client has also referenced the EPA Region 3 Validation Guidance for PCB Congener Method 1668. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On a prior review of data from this site, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in hardcopy, pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes. There are some differences, as follows:

1. If method blank qualification is necessary, the DSA and EPA Region 3 procedure is not to qualify detected results where the sample result is > 5x the method blank level. These results are, however, qualified as J-3B using the QAPP specification. These additional qualifiers are present in the QAPP Qualifier field but not in the DSA qualifier field (DVAL). Our professional judgment (and that of most validation guidance we have available to us) is that no qualifier is necessary for results > 5x MB because the usability of the data is not statistically impacted.

2. For labeled compound recovery qualification, EPA Region 3 and Region 10 guidance specifies qualification if the recovery is out of limits. The QAPP specifies only qualifying for detected targets if the recovery is elevated. This difference is reflected in the qualifiers present in the EDD. Our professional judgment is that because this is an isotopic dilution method, any bias is probably small for these outliers, and there is no technical way to predict the direction of any such bias based on whether the labeled compound recovery is high or low. For this reason, we believe that the conservative approach of qualifying all internal standard outliers per the DSA qualification is appropriate. Unless otherwise indicated, these qualified results should not be regarded as severely biased, but subject to a potential small but unknown bias.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.
Yes _X__ No ____
A number of coolers were received with each shipment. The laboratory has documented the temperature of each to 1 significant figure.

2. Samples were extracted and analyzed within the Method holding time limits.
Yes __X_ No ____
The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.
Yes __X_ No ____
The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.
Yes __X___ No ____

2. Field blanks were free of contamination.
Yes __X__ No ____ NA____
There is one field blank, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes ____ No __X__
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

Use of cleanup standards is optional in the laboratory procedure, as is use of cleanup itself. In this case cleanup standard recoveries have been reported and are in control for all analyses.

For internal standards, one sample had a high recovery of 13C12-PCB 126 (159%). A DSA qualifier is added to the associated target of JI159. However, a final qualifier is not assigned for this outlier per the QAPP (See the deliverables section for a discussion of this).

SDG	Lab Sample ID	Client Sample ID	Surrogate	Recovery	Qualifiers
G9J280227	001	OCT 09-UMSI-T09A	13C12-PCB 126	159	JI159

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA__X__
MS and MSDs are not specified in the method. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA __X_

4. The MS/MSD is a client sample
Yes ____ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the most narrow specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.

Yes __X__ No___
None of the recoveries for targets or for internal standards/surrogates in the OPR results are outside of method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. The RSDs for the IC response factors met the 20% limit.
Yes __X__ No____

8. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. The width of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

9. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

10. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 53.7 minutes on the column used in this set of data. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met. The retention times of PCB 169 and PCB 157 are at 36 minutes and 34 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes __X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes __X__ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X__ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in several instances, and PCB 123 in one instance. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. These include the following samples:

SDG	Client Sample ID	Analyte
G9J280227	OCT 09-DMSI-T09A	PCB 77 (BZ)
G9J280227	OCT 09-MSP-T09A	PCB 77 (BZ)
G9J280227	OCT 09-COALINGA-VD-1668A	PCB 77 (BZ)
G9J280227	OCT 09-COALINGA-SOIL-1668A	PCB 123 (BZ)
G9J280227	OCT 09-COALINGA-SOIL-1668A	PCB 77 (BZ)

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.

Yes ____ No _X_ NA ____

Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has substantially complied with the cited method. There are some differences between the method and specific laboratory practices, which have been reflected in the SOP provided by the laboratory. The reviewer agrees with the laboratory that these modifications do not degrade method performance.

Although qualifiers have been issued to the data for several reasons, no data have been rejected.

The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Internal Standards:

For internal standards, one sample had a high recovery of 13C12-PCB 126 (159%). A DSA qualifier is added to the associated target of JI159. However, a final qualifier is not assigned for this outlier per the QAPP (See the deliverables section for a discussion of this).

Compound Identification

Due to interference, the laboratory has raised the reporting limit for PCB-77 in several instances, and PCB 123 in one instance. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS by EPA 1668A

SDG: G9L010507

PROJECT: Kettleman Hills site, California - PCB Congener Validation, for Wenck Assoc.

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 4 Air, including 1 Air blank

SAMPLING DATE (Month/Year): November, 2009

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: NOV09-BLANK-T09A-UMSI, NOV09-DMSI-T09A, NOV09-MSP-T09A, NOV09-UMSI-T09A

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DLS 1/14/10

Telephone Logs included Yes____ No _X_

Contractual Violations Yes____ No _X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1999; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1994; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The client has also referenced the EPA Region 3 Validation Guidance for PCB Congener Method 1668. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On a prior review of data from this site, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in hardcopy, pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.

Yes _X__ No ____

The laboratory has documented the temperature to 1 significant figure.

2. Samples were extracted and analyzed within the Method holding time limits.

Yes __X_ No ____

The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.

Yes __X_ No ____

The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.

Yes __X___ No ____

2. Field blanks were free of contamination.

Yes __X__ No ____ NA____

There is one field blank, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes __X__ No ____

This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

Use of cleanup standards is optional in the laboratory procedure, as is use of cleanup itself. In this case cleanup standard recoveries have been reported and are in control for all analyses.

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA__X__

MS and MSDs are not specified in the method. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA __X_

4. The MS/MSD is a client sample
Yes ____ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the most narrow specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
All recoveries for targets or for internal standards/surrogates in the OPR results are within method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__ No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. The width of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

8. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

9. The minimum retention time requirements are met.
Yes _X_ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 44 minutes on the column used in this set of data. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met. The retention times of PCB 169 and PCB 157 are at 37 minutes and 35 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes _X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes _X_ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X_ No_____
Per the QAPP, all detected targets have been individually reviewed. The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in one case. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. These include the following samples:

Client Sample ID	Analyte
NOV09-DMSI-T09A	PCB 77 (BZ)

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.
Yes ____ No __ NA _X__
Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has substantially complied with the cited method. There are some differences between the method and specific laboratory practices, which have been reflected in the SOP provided by the laboratory. The reviewer agrees with the laboratory that these modifications do not degrade method performance.

Although qualifiers have been issued to the data for several reasons, no data have been rejected. The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

Compound Identification

Per the QAPP, all detected targets have been individually reviewed. Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in one case. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. See the main body of this report for details.

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

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ORGANIC DATA QUALITY REVIEW REPORT
PCB CONGENERS by EPA 1668A

SDG: G9L290466

PROJECT: Kettleman Hills site, California - PCB Congener Validation, for Wenck Assoc.

LABORATORY: TestAmerica, Sacramento CA

SAMPLE MATRIX: 4 Air, including 1 Air blank

SAMPLING DATE (Month/Year): December, 2009 (received by lab 12/29/09)

ANALYSES REQUESTED: PCB CONGENERS by EPA 1668A

SAMPLE NO.: DEC09-BLANK-TO9-DMSI, DEC09-DMSI-TO9A, DEC09-MSP-TO9A, DEC09-UMSI-TO9A

DATA REVIEWER: John Huntington

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: DLS 2/9/10

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1999; the EPA SW 846 Methods for Evaluating Solid Waste, Physical/ Chemical Methods Third Edition, 1994; and current editions have been referenced by the reviewer to perform this data validation review. The EPA Region 10 SOP for the Validation of of Method 1668 Toxic, Dioxin-like, PCB Data has been followed as specified, and Methods 1668, 1668A and 1668B have been consulted. The client has also referenced the EPA Region 3 Validation Guidance for PCB Congener Method 1668. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA-approval. Per the Scope of Work, the data validation of these samples is Level IV.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.

Yes _X__ No___

On a prior review of data from this site, the laboratory provided the reviewer with their internal SOP for this method, which lists in detail a number of deviations from Method 1668A, including some of the labeled congeners used for cleanup and recovery standards. Deviations from the method are allowed since the method is performance-based, as long as these modifications do not degrade method performance. The reviewer has concluded based on a comparison of the SOP to the method that this condition has been met and the changes are acceptable. Some of these modifications will be described in the sections that follow. It is the reviewer's experience that most laboratories performing this method do modify it in some way.

Laboratory reports were provided in hardcopy, pdf format, and in the form of electronic deliverables (EDDs).

The project involves analysis for the World Health Organization (WHO) 12 most toxic congeners. Numerous other congeners exist but are not being reported for this work.

Note on data qualifiers added: Please note that there are two types of qualifiers added in the project EDD. Those described in this report are the DSA qualifiers. In addition to these, the EDD contains the QAPP-specified qualifiers and the QAPP-specified reason codes.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes __X__ No____

III. HOLDING TIME AND CASE INFORMATION

1. Samples were received intact, with the required preservation and temperature.

Yes _X__ No ____

A number of coolers were received with each shipment. The laboratory has documented the temperature of each to 1 significant figure.

2. Samples were extracted and analyzed within the Method holding time limits.

Yes __X_ No ____

The method specifies that PCB congener samples, both solids and liquids, may be stored for up to 1 year. We have also applied this to air samples.

IV. CHAIN-OF CUSTODY

The chains of custody were submitted and are complete with dates and signatures.

Yes __X_ No ____

The FEDEX shipping number and/or receipt has not been provided in the data package. The project manager is informed of this missing item and complete chain of custody will be gathered and retained in the project file.

V. BLANK

1. Method blanks were free of contamination.
Yes __X___ No ____

2. Field blanks were free of contamination.
Yes __X__ No ____ NA____
There is one field blank, in control.

VI. SURROGATES/INTERNAL STANDARDS

The surrogates were within limits of acceptance per method.
Yes _X___ No ____
This method is an isotopic dilution analysis. The method provides for the use of three isotopically-labeled "cleanup standards" (called cleanup or surrogate standards by the laboratory), five isotopically-labeled instrument internal standards (called recovery standards by the laboratory), and a number of isotopically-labeled "internal standards/surrogates", which are isotopic analogs of target congeners where such labeled analogs are available. The internal standards are added at the time of sample preparation. The target compounds are quantified against the internal standards/surrogates where possible, and they in turn are quantified against the instrument internal standards. Compounds for which there are no labeled analogs available are quantified against the instrument internal standards. The cleanup standard is spiked into the extract after the extraction is complete but before any cleanup steps and is quantified to enable an evaluation of the efficiency of extract cleanup.

As specified in the laboratory SOP, the specific compounds used for recovery standards and cleanup standards are not the same as recommended in the method. In this case the cleanup standard used is 13C-PeCB-111. There are two instrument standards used, 13C-PeCB-101 and 13C-OcCB-202. Each target has an internal standard labeled analog with the exception of 3 co-eluting congeners.

The internal standard recoveries are reported and serve much the same function as the surrogates used in other methods, but they are also used to quantify the targets, hence serve as internal standards. The laboratory uses the method limits, which are set at 25-150% except for the cleanup standards, set at 30-135%.

Use of cleanup standards is optional in the laboratory procedure, as is use of cleanup itself. In this case cleanup standard recoveries have been reported and are in control for all analyses.

VII. MATRIX SPIKE AND DUPLICATE

1. Matrix spike and matrix spike duplicates were performed at the required frequency
Yes ___ No____ NA__X__
MS and MSDs are not specified in the method. Because this is an isotopic dilution method, every analysis provides an opportunity to evaluate matrix bias from the recoveries of the internal standard/surrogate labeled compounds. Thus matrix spikes are not as necessary as they are with methods that do not use isotopic dilution. The isotopic dilution compensates for matrix bias unless the bias is extreme, so that analytical accuracy is better than it is with other types of analytical methods.

2. The MS/MSD recoveries were within the contractual or laboratory limits.
Yes ____ No ____ NA__X__

3. The MS/MSD RPD values were within contractual or laboratory limits.
Yes ___ No ____ NA __X_

4. The MS/MSD is a client sample
Yes ____ No____ NA __X__

VIII. LABORATORY CONTROL SAMPLES

1. Laboratory control samples were conducted at the prescribed frequency of 1/20 samples or one per preparation batch, whichever is most frequent.
Yes __X__ No___
In this method, ongoing precision and recovery samples (OPR) are evaluated. These are equivalent to LCSs. The laboratory has used 50-150% recovery windows, which are the most narrow specified in the method.

2. Laboratory control sample recoveries were within laboratory control acceptance windows.
Yes __X__ No___
None of the recoveries for targets or for internal standards/surrogates in the OPR results are outside of method limits.

IX. INITIAL CALIBRATION and CONTINUING CALIBRATION

1. Initial and Continuing Calibrations were performed at the required frequency.
Yes __X_ No____

2. Initial calibration %RSD values were within the acceptance limits of 20% as specified in the method.
Yes __X_ No____

3. Calibration verification (VER) %D values were within method limits.
Yes _X__ No____

4. Resolution Criteria were met where appropriate.
Yes __X__ No____

5. The signal to noise ratios for the target compounds were > 10
Yes __X__No____

6. The mass ratios were met for detected targets.
Yes __X___ No____

7. The RSDs for the IC response factors met the 20% limit.
Yes __X__No____

8. Mass Spectral Resolution was > 10,000.
Yes __X__ No____
Mass resolution plots from PFK are provided with the raw data for each analytical run. The width of the exact mass peaks are clearly indicative of a resolution > 10,000 in each case.

9. Mass deviation is less than 5ppm.
Yes __X__ No____
The same documentation clearly shows that the deviation between the measured and exact mass is well within specifications.

10. The minimum retention time requirements are met.
Yes __X__ No____
The method has three versions in use, the original Method 1668, 1668 Version A, and 1668 version B. Both Version A and B specify the following minimum retention times:

The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest. This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

The retention time of CB209 is 53.7 minutes on the column used in this set of data. However, it is worth noting that the example provided in Table A-1 of both methods does not meet the above criterion, having a retention time for CB209 of 46.55 minutes.

The original version of the method and the Region 10 validation guidance both specify the following criteria:

The absolute retention time of PCB 169 (Section 7.12) shall exceed 20 minutes on the SPB-Octyl column, and the retention time of PCB 157 shall exceed 25 minutes on the DB-1 column; otherwise, the GC temperature program shall be adjusted and this test repeated until the above-stated minimum retention time criteria are met. The retention times of PCB 169 and PCB 157 are at 36 minutes and 34 minutes, respectively. This meets the criterion established in the original version of the method (1997) and the Region 10 guidance. Since the laboratory is not citing Method 1668 or Method 1668B, the guidance associated with the original version of the method is appropriate and the criteria in that method are met.

Further, the laboratory has shown that the column used meets resolution criteria, and the laboratory practice as defined in the SOP is being followed.

X. TCL IDENTIFICATION

1. Single Ion Monitoring was performed as required.
Yes __X_ No___

2. Identification of the internal standards met the ion ratio, retention time and RIC requirements.
Yes _X_ No____

3. Spectral accuracy and quantitation are accurate.
Yes _X_ No_____
Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in one case. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. The sample is shown below.

SDG	Client Sample ID	Analyte
G9L290466	DEC09-MSP-TO9A	PCB 77 (BZ)

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

XI. FIELD QC

Field duplicates have been identified and meet a suggested guidance of 35% RPD for water or 50% RPD for soils. For low level values (< 5 x Reporting Limit, RL), a difference of 2 x RL is suggested for water and 4 x RL for soils. Final field precision will be determined by the project manager.
Yes ____ No __ NA _X__
Field duplicates have not been identified.

XII. OVERALL ASSESSMNENT

The laboratory has substantially complied with the cited method. There are some differences between the method and specific laboratory practices, which have been reflected in the SOP provided by the laboratory. The reviewer agrees with the laboratory that these modifications do not degrade method performance.

Although qualifiers have been issued to the data for several reasons, no data have been rejected.

The data are fully usable after consideration of qualifiers. A summary of pertinent observations is provided below.

<u>Compound Identification</u>

Per the QAPP, all detected targets have been individually reviewed.

The laboratory flags results where not all of the identification criteria are met with a "Q", and no such flags are present in this data set.

Detected targets PCB 105 and PCB 118 coelute with PCB 127 and PCB 106, respectively (not on the target list). The laboratory has flagged results for these congeners with a "C" qualifier. We have qualified these detected results as JQ to indicate that there could be a high bias because of the co-elution.

Due to interference, the laboratory has raised the reporting limit for PCB-77 in one case. There is no qualifier required for this, but the reporting limit is elevated in these cases due to matrix. The sample is shown in the body of this report.

All mass spectral identifications were reviewed and the reviewer agrees with the laboratory assignments in all cases.

TABLE K.1
Soil Results KHF and EPA Study

PCB	SW (KHF)	S (KHF)	B-18 (KHF)	SE (KHF)	SE DUP (KHF)	N (KHF)	NE (KHF)	W (KHF)	NW (KHF)
	KHF Results (pg/g - dry weight)								
77	-	-	-	-	-	-	-	-	-
81	-	-	-	-	-	-	-	-	-
105	11 C	21 C	62 C	33 C	28 C	12 C	65 C	10 C	-
114	-	-	-	-	-	-	-	-	-
118	15 C, B	29 C, B	85 C, B	46 C, B	51 C, B	19 C, B	100 C, B	19 C, B	18 C, B
123	-	-	-	-	-	-	-	-	-
126	-	-	-	-	-	-	-	-	-
156	-	-	31	10	13	-	29	-	-
157	-	-	-	-	-	-	-	-	-
167	-	-	13	2.7	5.2	-	16	-	-
169	-	-	-	-	-	-	-	-	-
189	-	-	-	2.6 Q, EMPC	4.3	-	-	-	-
	26	50	191	94	102	31	210	29	18

PCB	Fresno, CA	Hanford, CA	Coalinga, CA
	Other CA Results (pg/g - dry weight)		
77	-	-	-
81	-	-	-
105	14 C	2.5 C	39 C
114	-	-	-
118	22 C	5.0 C	73 C
123	-	-	-
126	-	-	-
156	4.4	-	15
157	-	-	4.2
167	3.1	-	7.4
169	-	-	-
189	-	-	-
	43.5	7.5	138.6

USEPA Pilot Survey of Rural Soils, April 2007 - Appendix E PCB Data (pg/g - dry weight)

PCB	Penn Nursery, PA	McNay Farm, IA	Lake Scott, KS	Lake Scott, KS DUP	Bennington, VT	Caldwell, OH	Dixon Springs, IL	Quincey, FL	Bay St. Louis, MS	Rancho Seco, CA	Rancho Seco, CA DUP	Marvel Ranch, OR
77	3.28	1.25	3.53	0.46	2.79	2.24	0.82	0.34 J	25.05	7.44	4.59	2.37
81	-	-	-	-	-	1.43	-	0.26 J	-	-	-	-
105	12.44	6.28	20.66	4.57	24.27	21.75	8.17	3.86	232.74	73.62	28.99	20.8
114	-	-	-	-	-	1.46	-	0.19 J	7.35	-	-	-
118	31.73	12.12	71.33	11.47	37.97	68.14	17.38	8.34	347.87	224.99	70.78	42.39
123/106*	4.42 C	2.17 C	7.53 C	1.21 C	9.03 C	6.21 C	3.11 C	0.94 C	38.38 C	14.91 C	8.03 C	4.85 C
126	-	-	-	-	1.8	-	0.41	-	1.28	-	-	-
156/157	8.38 C	2.88 C	7.2 C	1.68 C	17.36 C	4.72 C	4.58 C	1.78 C	57.78 C	30.86 C	15.64 C	7.14 C
167	6.45	1.35	3.09	0.97	8.38	1.92	2.31	0.8	20.47	10.06	6.22	3.18
169	0.42	0.76	-	-	1.42	-	0.29	0.22 J	1.39	-	0.86	-
189	1.71	0.5	0.84	-	3.61	0.26 J	0.52	0.28 J	3.92	1.79	1.94	1.05 J
	69	27	114	20	107	108	38	17	736	364	137	82

USEPA Pilot Survey of Rural Soils, April 2007 - Appendix E PCB Data (pg/g - dry weight)

PCB	Padre Island, TX	North Platte, NE	Ted Roosevelt, ND	Ted Roosevelt, ND Dup	Chiricahua, AZ	Clinton Crops, NC	Everglades, FL	Everglades, FL DUP	Lake Dubay, WI	Ozette Lake, WA	Trapper Creek, AK
77	0.5	2	1.04	1.04	0.76	0.69	4.88	5.38	1.89	4.82	2.84
81	-	-	-	-	-	-	-	-	-	-	-
105	4.28	9.08	7.23	7.72	7.13	3.4	32.76	37.48	13.85	18.45	12.32
114	0.2 J	-	-	0.19 J	-	-	-	1.69 J	-	-	-
118	9.57	18.62	14.99	17.09	16.63	7.55	43.03	45.52	45.4	49.92	34.05
123/106*	1.1 C	2.18 C	1.4 C	1.66 C	2.07 C	0.95 C	10.78 C	9.23 C	6.18	6.54 C	5.61 C
126	-	0.71	-	-	-	-	-	-	-	-	-
156/157	2.04 C	3.68 C	3.04 C	3.64 C	3.04 C	2.38 C	22.98 C	19.42 C	9.48 C	8.28 C	5.66 C
167	0.63	1.64	1.46	1.25	1.62	1.33	11.74	10.42	4.73	4.6	2.97
169	0.17 J	0.67	-	-	0.22 J	0.73	-	-	0.71	-	-
189	0.37	0.56	0.59	0.62	0.65	1.04	4.21	3.66	1.96	1.34 J	-
	19	39	30	33	32	18	130	133	84	94	63

USEPA Pilot Survey of Rural Soils, April 2007 - Appendix E PCB Data (pg/g - dry weight)

PCB	Monmouth, IL	Keystone State Park, OK	Arkadelphia, AR	Jasper, NY	Fond du Lac, MN	Fond du Lac, MN DUP	Goodwell, OK	Big Bend, TX	Grand Canyon, AZ
77	7.33	2.3	3.79	3.72	2.33	2.39	7.89	21.22	-
81	-	-	-	-	-	-	-	-	-
105	36.22	10.6	78.28	21.23	24.47	-	12.74	657.1	6.73
114	-	-	-	-	-	-	-	24.47	-
118	93.48	31.11	218.07	39.01	66.92	-	44.51	1917.27	19.96
123/106*	11.24 C	4.93 C	20.74 C	7.71 C	6.67 C	-	11.06 C	142.65 C	2.44 C
126	-	-	-	-	-	-	2.15	-	-
156/157	18.84 C	8.36 C	33.62 C	11.12 C	11.34 C	7.82 C	15.14 C	185.24 C	2.84 C
167	7.66	4.55	11.82	5.06	4.69	3.45	10.91	56.94	1.65
169	1.18	-	-	-	-	0.48	-	-	-
189	1.66	1.73	1.66	1.37	0.95	1.22	4.35	5.91	-
	178	64	368	89	117	15	109	3011	34

B = analyte present in blank at greater than reporting limit (lower calibration point)
C = co elutes with other isomers)
J = analyte present at concentration greater than the MDL (or EDL) but less than the RL
Q = analyte meets all criteria except for ion ratio
EMPC = Estimated Maximum Possible Concentration
"-" = not detected
"*" = concentrations reported as PCB 106

Table L5.3.1
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 105	3.3E+01	3.00E-05	9.90E-04
	PCB 118	5.1E+01	3.00E-05	1.53E-03
	PCB 156	1.3E+01	3.00E-05	3.90E-04
	PCB 167	5.2E+00	3.00E-05	1.56E-04
	PCB 189	4.3E+00	3.00E-05	1.29E-04
	PCB Total TEC	—	—	**3.20E-03**
South	PCB 105	2.1E+01	3.00E-05	6.30E-04
	PCB 118	2.9E+01	3.00E-05	8.70E-04
	PCB Total TEC	—	—	**1.50E-03**
Southwest	PCB 105	1.1E+01	3.00E-05	3.30E-04
	PCB 118	1.5E+01	3.00E-05	4.50E-04
	PCB Total TEC	—	—	**7.80E-04**

Notes:

The concentrations of the detected 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 detected 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 L5.3.2
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 105	1.5E+02	3.00E-05	4.50E-03
	PCB 118	2.7E+02	3.00E-05	8.10E-03
	PCB Total TEC	—	—	**1.26E-02**
South	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 156	2.1E+01	3.00E-05	6.30E-04
	PCB 157	4.8E+00	3.00E-05	1.44E-04
	PCB Total TEC	—	—	**1.02E-02**
Southwest	None Detected	—	—	—
	PCB Total TEC	—	—	**—**

Notes:

The concentrations of the detected 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 detected 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 L5.3.3
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 105	4.5E-10	—	3.00E-05	1.36E-14
		PCB 118	1.0E-09	—	3.00E-05	3.08E-14
	February	PCB 105	2.3E-10	—	3.00E-05	6.98E-15
		PCB 118	5.6E-10	—	3.00E-05	1.67E-14
	March	PCB 105	6.2E-10	—	3.00E-05	1.86E-14
		PCB 118	1.1E-09	—	3.00E-05	3.40E-14
	April	PCB 105	6.5E-10	—	3.00E-05	1.95E-14
		PCB 118	1.4E-09	—	3.00E-05	4.22E-14
	May	PCB 105	1.0E-09	—	3.00E-05	3.10E-14
		PCB 118	2.4E-09	—	3.00E-05	7.12E-14
	June	PCB 105	8.0E-10	—	3.00E-05	2.40E-14
		PCB 118	1.9E-09	—	3.00E-05	5.65E-14
	July	PCB 105	8.0E-10	—	3.00E-05	2.39E-14
		PCB 118	1.7E-09	—	3.00E-05	5.25E-14
	August	PCB 105	1.1E-09	—	3.00E-05	3.39E-14
		PCB 118	2.3E-09	—	3.00E-05	6.78E-14
	September	PCB 105	9.4E-10	—	3.00E-05	2.83E-14
		PCB 118	2.1E-09	—	3.00E-05	6.34E-14
	October	PCB 105	1.1E-09	—	3.00E-05	3.42E-14
		PCB 118	2.7E-09	—	3.00E-05	8.21E-14
	November	PCB 105	5.5E-10	—	3.00E-05	1.66E-14
		PCB 118	1.3E-09	—	3.00E-05	4.01E-14
	December	PCB 105	3.7E-10	—	3.00E-05	1.12E-14
		PCB 118	8.1E-10	—	3.00E-05	2.42E-14
		PCB Total TEC	—	—	—	**7.03E-14**
MSP	January	PCB 105	3.9E-10	2.05E+00	3.00E-05	2.39E-14
		PCB 118	1.0E-09	1.91E+00	3.00E-05	5.82E-14
	February	PCB 105	5.7E-10	2.05E+00	3.00E-05	3.53E-14
		PCB 118	1.3E-09	1.91E+00	3.00E-05	7.55E-14
	March	PCB 105	2.1E-10	2.05E+00	3.00E-05	1.29E-14
		PCB 118	5.2E-10	1.91E+00	3.00E-05	2.95E-14
	April (2)	PCB 105	6.2E-10	—	3.00E-05	1.87E-14
		PCB 118	1.3E-09	—	3.00E-05	3.93E-14
	May	PCB 105	3.2E-10	2.05E+00	3.00E-05	1.94E-14
		PCB 118	7.4E-10	1.91E+00	3.00E-05	4.25E-14
	June	PCB 105	4.8E-10	2.05E+00	3.00E-05	2.98E-14
		PCB 118	1.1E-09	1.91E+00	3.00E-05	6.27E-14
	July	PCB 105	3.3E-10	2.05E+00	3.00E-05	2.03E-14
		PCB 118	7.4E-10	1.91E+00	3.00E-05	4.24E-14
	August	PCB 105	5.0E-10	2.05E+00	3.00E-05	3.09E-14
		PCB 118	1.1E-09	1.91E+00	3.00E-05	6.12E-14
	September	PCB 105	8.3E-10	2.05E+00	3.00E-05	5.11E-14
		PCB 118	1.8E-09	1.91E+00	3.00E-05	1.04E-13
	October	PCB 105	6.9E-10	2.05E+00	3.00E-05	4.24E-14
		PCB 118	1.5E-09	1.91E+00	3.00E-05	8.88E-14
	November (3)					
	December	PCB 105	4.8E-10	2.05E+00	3.00E-05	2.96E-14
		PCB 118	1.1E-09	1.91E+00	3.00E-05	6.22E-14
		PCB Total TEC	—	—	—	**8.91E-14**

Table L5.3.3
Toxicity Equivalence Concentrations - Air
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

The concentrations of the detected 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 detected 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 L5.3.4
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 105	7.27E-01	6.79	2.83E-04	8.205E-05	298.1	-1.654	3.27E+07	3.36E+05
PCB 118	1.62E+00	7.12	2.88E-04	8.205E-05	298.1	-1.654	7.21E+07	7.43E+05
MSP								
PCB 105	9.52E-01	6.79	2.83E-04	8.205E-05	298.1	-1.654	3.27E+07	3.36E+05
PCB 118	2.02E+00	7.12	2.88E-04	8.205E-05	298.1	-1.654	7.21E+07	7.43E+05

Notes:

(1) Exposure Point Concentration. Average air concentration over the 12-month sampling period (See Table L5.3.3 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])

ρ_{air} - density of air (1.19 g/L)

ρ_{forage} - 770 g/L

f_{water} - 0.85 (fraction of forage that is water)

BTF - Biotransfer factor

Table L5.3.4
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
<u>DMS1</u>									
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 118	1.7E-04	8.97E-06	1.18E-08	3.50E-06	0.95	1.54E+00	0.01	1190	9.60E+00
<u>MSP</u>									
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 118	1.7E-04	8.97E-06	1.18E-08	3.50E-06	0.95	1.92E+00	0.01	1190	1.20E+01

<u>Notes:</u>

(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 L5.3.4
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 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 118	7.73E-02	315,360	0.39	0.147	0.3	5.00E+04	9.57E+03	18	2.24	2.37E-01
MSP										
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 118	9.66E-02	315,360	0.39	0.147	0.3	5.00E+04	1.20E+04	18	2.24	2.97E-01

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 x (V_d x I_j + RN x R_w x W_p x 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 x k_w x 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 L5.3.4
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 105	2.07E+00	0.00003	6.20E-05
PCB 118	9.84E+00	0.00003	2.95E-04
Total Congeners: (4)			**3.57E-04**
MSP			
PCB 105	2.71E+00	0.00003	8.12E-05
PCB 118	1.23E+01	0.00003	3.69E-04
Total Congeners: (4)			**4.50E-04**

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 L5.3.5
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
<u>Southeast</u>											
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 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 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 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 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	<u>2.60E-11</u>
Total Congeners: (13)											2.27E-10
<u>South</u>											
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 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	<u>6.23E-11</u>
Total Congeners: (13)											8.69E-11
<u>Southwest</u>											
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 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	<u>3.22E-11</u>
Total Congeners: (13)											4.51E-11

<u>Notes:</u>

(1) Congeners detected 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 L5.3.6
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 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 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 156	0.25	11.77	ND	0.5	1.3E-05	1	7.6	0.0136	1	2.20E-08	0.00003	6.61E-13
PCB 167	0.25	11.77	ND	0.5	5.2E-06	1	7.5	0.0150	1	9.73E-09	0.00003	2.92E-13
PCB 189	0.25	11.77	ND	0.5	4.3E-06	1	8.27	0.0063	1	3.37E-09	0.00003	1.01E-13
Total Congeners: [11]												8.53E-10
South												
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	ND	1	6.98	0.0231	1	3.67E-07	0.00003	1.10E-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 156	0.25	11.77	2.1E-05	0.5	ND	1	7.6	0.0136	1	8.38E-07	0.00003	2.52E-11
PCB 157	0.25	11.77	4.8E-06	0.5	ND	1	7.62	0.0133	1	1.88E-07	0.00003	5.63E-12
Total Congeners: [11]												6.79E-10
Southwest												
PCB 105	0.25	11.77	ND	0.5	1.1E-05	1	6.79	0.0263	1	3.61E-08	0.00003	1.08E-12
PCB 118	0.25	11.77	ND	0.5	1.5E-05	1	7.12	0.0208	1	3.90E-08	0.00003	1.17E-12
Total Congeners: [11]												2.26E-12

Table L5.3.6
Derivation of Exposure Point Concentrations in Beef Tissue
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Congeners detected 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.

(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
ND - not detected
PCB - polychlorinated biphenyl
TEF - toxicity equivalence factor
TEC - toxicity equivalence concentration

Table L5.3.7
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 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 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 156	0.25	20.3	ND	0.4	1.3E-05	1	7.6	0.0029	1	3.71E-09	0.00003	1.11E-13
PCB 167	0.25	20.3	ND	0.4	5.2E-06	1	7.5	0.0031	1	1.64E-09	0.00003	4.91E-14
PCB 189	0.25	20.3	ND	0.4	4.3E-06	1	8.27	0.0013	1	5.67E-10	0.00003	1.70E-14
Total Congeners: [11]												3.08E-10
South												
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	ND	1	6.98	0.0049	1	1.33E-07	0.00003	4.00E-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 156	0.25	20.3	2.1E-05	0.4	ND	1	7.6	0.0029	1	3.04E-07	0.00003	9.13E-12
PCB 157	0.25	20.3	4.8E-06	0.4	ND	1	7.62	0.0028	1	6.82E-08	0.00003	2.05E-12
Total Congeners: [11]												2.46E-10
Southwest												
PCB 105	0.25	20.3	ND	0.4	1.1E-05	1	6.79	0.0055	1	6.09E-09	0.00003	1.83E-13
PCB 118	0.25	20.3	ND	0.4	1.5E-05	1	7.12	0.0044	1	6.57E-09	0.00003	1.97E-13
Total Congeners: [11]												3.80E-13

Table L5.3.7
Derivation of Exposure Point Concentrations in Milk
Human Health Risk Assessment
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Notes:

(1) Congeners detected 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.

(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: 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 x Qp x P) + (Fs x Qs x Cs x Bs)] x Ba_{milk} x 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 L5.3.8
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 L5.3.9
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 L5.3.1	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 L5.3.10
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 L5.3.11
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 L5.3.11
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure - Soil (Future)
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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 L5.3.11
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure - Soil (Future)
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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 L5.3.12
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 L5.3.1	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 L5.3.1	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 L5.3.1	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 L5.3.13
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 L5.3.14
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 L5.3.4)	mg/kg	--	Chronic Daily Intake (mg/kg-day) for carcinogens =
				CPRODbg	Belowground Produce Exposure Point Concentration	Modeled From Sampling Data (See Table L5.3.5)	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 L5.3.4)	mg/kg	--	Chronic Daily Intake (mg/kg-day) for carcinogens =
				CPRODbg	Belowground Produce Exposure Point Concentration	Modeled From Sampling Data (See Table L5.3.5)	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 L5.3.15
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 L5.3.6)	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 L5.3.6)	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 L5.3.16
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 L5.3.7)	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 L5.3.17
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	3.20E-09	0.0001	1	70	4.56E-15
South	1.50E-09	0.0001	1	70	2.14E-15
Southwest	7.80E-10	0.0001	1	70	1.11E-15

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	3.20E-09	0.0001	1	70	4.56E-15
South	1.50E-09	0.0001	1	70	2.14E-15
Southwest	7.80E-10	0.0001	1	70	1.11E-15

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	3.20E-09	0.0001	1	70	4.56E-15
South	1.50E-09	0.0001	1	70	2.14E-15
Southwest	7.80E-10	0.0001	1	70	1.11E-15

Notes (Step 1):

(1) Exposure Point Concentration (See Table L5.3.1 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 L5.3.17
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	8.53E-10	0.00122	1	1.04E-12
South	6.79E-10	0.00122	1	8.28E-13
Southwest	2.26E-12	0.00122	1	2.75E-15

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 ($A_{prod\text{-}ag}$) (1) mg/kg	Consumption Rate of Exposed Aboveground Produce ($CR_{prod\text{-}ag}$) (2) kg/kg-day DW	Concentration in Belowground Produce ($A_{prod\text{-}bg}$) (1) mg/kg	Consumption Rate of Belowground Produce ($CR_{prod\text{-}bg}$) (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	8.53E-10	0.00122	1	1.04E-12	4.50E-10	0.00047	2.27E-10	0.00017	1	2.50E-13	3.08E-10	0.01367	1	4.21E-12
South	6.79E-10	0.00122	1	8.28E-13	4.50E-10	0.00047	8.69E-11	0.00017	1	2.26E-13	2.46E-10	0.01367	1	3.36E-12
Southwest	2.26E-12	0.00122	1	2.75E-15	4.50E-10	0.00047	4.51E-11	0.00017	1	2.19E-13	3.80E-13	0.01367	1	5.19E-15

FUTURE RESIDENT

Exposure Area	Concentration in Exposed Aboveground Produce ($A_{prod\text{-}ag}$) (1) mg/kg	Consumption Rate of Exposed Aboveground Produce ($CR_{prod\text{-}ag}$) (2) kg/kg-day DW	Concentration in Belowground Produce ($A_{prod\text{-}bg}$) (1) mg/kg	Consumption Rate of Belowground Produce ($CR_{prod\text{-}bg}$) (2) kg/kg-day DW	Fraction of Contaminated Produce (F_{prod}) (3)	Daily Intake from Produce (I_{prod}) (5) mg/kg-day
Southeast	4.50E-10	0.00032	2.27E-10	0.00014	1	1.76E-13
South	4.50E-10	0.00032	8.69E-11	0.00014	1	1.56E-13
Southwest	4.50E-10	0.00032	4.51E-11	0.00014	1	1.50E-13

Table L5.3.17
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

Notes (Step 2):

(1) Exposure Point Concentration (See Tables L5.3.4, L5.3.5, L5.3.6, and L5.3.7 for aboveground produce, belowground produce, beef, and milk concentrations, respectively).

Aboveground produce concentration is from sampling location MSP, the location with the higher 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: $I_{prod} = (A_{prod\text{-}ag} \times CR_{prod\text{-}ag} + A_{prod\text{-}bg} \times CR_{prod\text{-}bg\,)} \times F_{prod}$

where:

I_{prod} - daily intake from produce (mg/kg-day)

$A_{prod\text{-}ag}$ - concentration in exposed aboveground produce (mg/kg)

$A_{prod\text{-}bg}$ - concentration in belowground produce (mg/kg)

$CR_{prod\text{-}ag}$ - consumption rate of exposed aboveground produce (kg/kg-day DW)

$CR_{prod\text{-}bg}$ - 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 L5.3.17
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	8.69E-11	0.83	24	350	40	70	70	0.001	365	1.36E-14
South	8.42E-11	0.83	24	350	40	70	70	0.001	365	1.31E-14
Southwest	8.30E-11	0.83	24	350	40	70	70	0.001	365	1.29E-14

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	8.69E-11	0.83	24	350	40	70	70	0.001	365	1.36E-14
South	8.42E-11	0.83	24	350	40	70	70	0.001	365	1.31E-14
Southwest	8.30E-11	0.83	24	350	40	70	70	0.001	365	1.29E-14

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	8.69E-11	0.83	24	350	30	70	70	0.001	365	1.02E-14
South	8.42E-11	0.83	24	350	30	70	70	0.001	365	9.84E-15
Southwest	8.30E-11	0.83	24	350	30	70	70	0.001	365	9.70E-15

Table L5.3.17
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

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 higher concentration (see Table L5.3.3).

Modeled particulate concentration for each exposure area is the concentration in soil at that exposure area (see Table L5.3.1) 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 L5.3.17
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	1.36E-14	4.56E-15	1.04E-12	1.06E-12	1.00E+09	2555	0.9	0.3	0.693	1.17E+01
South	1.31E-14	2.14E-15	8.28E-13	8.43E-13	1.00E+09	2555	0.9	0.3	0.693	9.33E+00
Southwest	1.29E-14	1.11E-15	2.75E-15	1.68E-14	1.00E+09	2555	0.9	0.3	0.693	1.86E-01

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	1.36E-14	4.56E-15	1.04E-12	2.50E-13	4.21E-12	5.52E-12	1.00E+09	2555	0.9	0.3	0.693	6.10E+01
South	1.31E-14	2.14E-15	8.28E-13	2.26E-13	3.36E-12	4.43E-12	1.00E+09	2555	0.9	0.3	0.693	4.90E+01
Southwest	1.29E-14	1.11E-15	2.75E-15	2.19E-13	5.19E-15	2.41E-13	1.00E+09	2555	0.9	0.3	0.693	2.67E+00

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	1.02E-14	4.56E-15	1.76E-13	1.90E-13	1.00E+09	2555	0.9	0.3	0.693	2.11E+00
South	9.84E-15	2.14E-15	1.56E-13	1.68E-13	1.00E+09	2555	0.9	0.3	0.693	1.86E+00
Southwest	9.70E-15	1.11E-15	1.50E-13	1.61E-13	1.00E+09	2555	0.9	0.3	0.693	1.78E+00

Table L5.3.17
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

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 x (1 x $(10)^9$) x h x f_1] / [0.693 x 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 x 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 L5.3.17
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	1.17E+01	0.04	0.9	0.688	1	9.4	1	3.08E-02
South	9.33E+00	0.04	0.9	0.688	1	9.4	1	2.46E-02
Southwest	1.86E-01	0.04	0.9	0.688	1	9.4	1	4.90E-04

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	6.10E+01	0.04	0.9	0.688	1	9.4	1	1.61E-01
South	4.90E+01	0.04	0.9	0.688	1	9.4	1	1.29E-01
Southwest	2.67E+00	0.04	0.9	0.688	1	9.4	1	7.03E-03

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	2.11E+00	0.04	0.9	0.688	1	9.4	1	5.55E-03
South	1.86E+00	0.04	0.9	0.688	1	9.4	1	4.90E-03
Southwest	1.78E+00	0.04	0.9	0.688	1	9.4	1	4.70E-03

Table L5.3.17
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

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} = [$C_{milkfat}$ x f_3 x f_4 x IR_{milk} x ED] / [BW_{infant} x 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 L5.3.18
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 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	3.20E-09	mg/kg	8.5E-17	mg/kg-day	1.3E+05	kg-day/mg	1.1E-11	2.4E-16	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.1E-11					NA
			Dermal	PCB Total TEC	3.20E-09	mg/kg	2.7E-16	mg/kg-day	1.3E+05	kg-day/mg	3.5E-11	7.6E-16	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.5E-11					NA
		Exposure Point Total									4.6E-11					NA
	Exposure Medium Total										4.6E-11					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	5.23E-12	ug/m3	3.2E-14	ug/m3	3.8E+01	(ug/m3)-1	1.2E-12	9.1E-14	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.2E-12					NA
		Exposure Point Total									1.2E-12					NA
	Exposure Medium Total										1.2E-12					NA
Soil Total (Southeast)											4.7E-11					NA
Soil	Soil	South	Ingestion	PCB Total TEC	1.50E-09	mg/kg	4.0E-17	mg/kg-day	1.3E+05	kg-day/mg	5.2E-12	1.1E-16	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.2E-12					NA
			Dermal	PCB Total TEC	1.50E-09	mg/kg	1.3E-16	mg/kg-day	1.3E+05	kg-day/mg	1.7E-11	3.6E-16	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.7E-11					NA
		Exposure Point Total									2.2E-11					NA
	Exposure Medium Total										2.2E-11					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	2.45E-12	ug/m3	1.5E-14	ug/m3	3.8E+01	(ug/m3)-1	5.8E-13	4.3E-14	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.8E-13					NA
		Exposure Point Total									5.8E-13					NA
	Exposure Medium Total										5.8E-13					NA
Soil Total (South)											2.2E-11					NA
Soil	Soil	Southwest	Ingestion	PCB Total TEC	7.80E-10	mg/kg	2.1E-17	mg/kg-day	1.3E+05	kg-day/mg	2.7E-12	5.8E-17	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.7E-12					NA
			Dermal	PCB Total TEC	7.80E-10	mg/kg	6.6E-17	mg/kg-day	1.3E+05	kg-day/mg	8.6E-12	1.9E-16	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								8.6E-12					NA
		Exposure Point Total									1.1E-11					NA
	Exposure Medium Total										1.1E-11					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	1.28E-12	ug/m3	7.9E-15	ug/m3	3.8E+01	(ug/m3)-1	3.0E-13	2.2E-14	ug/m3	NA	ug/m3	NA
			Exp. Route Total								3.0E-13					NA
		Exposure Point Total									3.0E-13					NA
	Exposure Medium Total										3.0E-13					NA
Soil Total (Southwest)											1.2E-11					NA

Table L5.3.19
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 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	7.03E-11	ug/m3	4.4E-13	ug/m3	3.8E+01	(ug/m3)-1	1.7E-11	1.2E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.7E-11					NA
		Exposure Point Total									1.7E-11					NA
	Exposure Medium Total										1.7E-11					NA
Medium Total											1.7E-11					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	8.91E-11	ug/m3	5.5E-13	ug/m3	3.8E+01	(ug/m3)-1	2.1E-11	1.5E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.1E-11					NA
		Exposure Point Total									2.1E-11					NA
	Exposure Medium Total										2.1E-11					NA
Medium Total											2.1E-11					NA

Table L5.3.20
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				
	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	3.20E-09	mg/kg	5.6E-15	mg/kg-day	1.3E+05	kg-day/mg	7.3E-10	9.8E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.3E-10					NA
			Dermal	PCB Total TEC	3.20E-09	mg/kg	8.2E-15	mg/kg-day	1.3E+05	kg-day/mg	1.1E-09	1.4E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.1E-09					NA
		Exposure Point Total									1.8E-09					NA
	Exposure Medium Total										1.8E-09					NA
	Beef Tissue	Southeast	Ingestion	PCB Total TEC	8.53E-10	mg/kg	5.4E-13	mg/kg-day	1.3E+05	kg-day/mg	7.0E-08	9.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.0E-08					NA
		Exposure Point Total									7.0E-08					NA
	Exposure Medium Total										7.0E-08					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	5.23E-12	ug/m3	2.9E-12	ug/m3	3.8E+01	(ug/m3)-1	1.1E-10	5.0E-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 (Southeast)											7.2E-08					NA
Soil	Soil	South	Ingestion	PCB Total TEC	1.50E-09	mg/kg	2.6E-15	mg/kg-day	1.3E+05	kg-day/mg	3.4E-10	4.6E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.4E-10					NA
			Dermal	PCB Total TEC	1.50E-09	mg/kg	3.8E-15	mg/kg-day	1.3E+05	kg-day/mg	5.0E-10	6.7E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.0E-10					NA
		Exposure Point Total									8.4E-10					NA
	Exposure Medium Total										8.4E-10					NA
	Beef Tissue	South	Ingestion	PCB Total TEC	6.79E-10	mg/kg	4.3E-13	mg/kg-day	1.3E+05	kg-day/mg	5.6E-08	7.5E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.6E-08					NA
		Exposure Point Total									5.6E-08					NA
	Exposure Medium Total										5.6E-08					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	2.45E-12	ug/m3	1.3E-12	ug/m3	3.8E+01	(ug/m3)-1	5.1E-11	2.4E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.1E-11					NA
		Exposure Point Total									5.1E-11					NA
	Exposure Medium Total										5.1E-11					NA
Soil Total (South)											5.6E-08					NA

Table L5.3.20
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	Southwest	Ingestion	PCB Total TEC	7.80E-10	mg/kg	1.4E-15	mg/kg-day	1.3E+05	kg-day/mg	1.8E-10	2.4E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.8E-10					NA
			Dermal	PCB Total TEC	7.80E-10	mg/kg	2.0E-15	mg/kg-day	1.3E+05	kg-day/mg	2.6E-10	3.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.6E-10					NA
		Exposure Point Total									4.4E-10					NA
	Exposure Medium Total										4.4E-10					NA
	Beef Tissue	Southwest	Ingestion	PCB Total TEC	2.26E-12	mg/kg	1.4E-15	mg/kg-day	1.3E+05	kg-day/mg	1.8E-10	2.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.8E-10					NA
		Exposure Point Total									1.8E-10					NA
	Exposure Medium Total										1.8E-10					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	1.28E-12	ug/m3	7.0E-13	ug/m3	3.8E+01	(ug/m3)-1	2.7E-11	1.2E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.7E-11					NA
		Exposure Point Total									2.7E-11					NA
	Exposure Medium Total										2.7E-11					NA
Soil Total (Southwest)											6.5E-10					NA

Table L5.3.21
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: Intake/Exposure Concentration Value	Cancer: Intake/Exposure Concentration Units	Unit Risk Value	Unit Risk Units	Cancer Risk	Noncancer: Intake/Exposure Concentration Value	Noncancer: Intake/Exposure Concentration Units	RfC Value	RfC Units	Hazard Quotient
Ambient Air	Ambient Air	Particulates and Vapors at DMS1	Inhalation	PCB Total TEC	7.03E-11	ug/m3	3.9E-11	ug/m3	3.8E+01	(ug/m3)-1	1.5E-09	6.7E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.5E-09					NA
		Exposure Point Total									1.5E-09					NA
	Exposure Medium Total										1.5E-09					NA
Medium Total											1.5E-09					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	8.91E-11	ug/m3	4.9E-11	ug/m3	3.8E+01	(ug/m3)-1	1.9E-09	8.5E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.9E-09					NA
		Exposure Point Total									1.9E-09					NA
	Exposure Medium Total										1.9E-09					NA
Medium Total											1.9E-09					NA

Table L5.3.22
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	3.20E-09	mg/kg	5.6E-15	mg/kg-day	1.3E+05	kg-day/mg	7.3E-10	9.8E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.3E-10					NA
			Dermal	PCB Total TEC	3.20E-09	mg/kg	8.2E-15	mg/kg-day	1.3E+05	kg-day/mg	1.1E-09	1.4E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.1E-09					NA
		Exposure Point Total									1.8E-09					NA
	Exposure Medium Total										1.8E-09					NA
	Plant Tissue	Southeast	Ingestion	PCB Total TEC			1.6E-13	mg/kg-day	1.3E+05	kg-day/mg	2.1E-08	2.9E-13	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	4.50E-10	mg/kg										
				Belowground	2.27E-10	mg/kg										
			Exp. Route Total								2.1E-08					NA
		Exposure Point Total									2.1E-08					NA
	Exposure Medium Total										2.1E-08					NA
	Beef Tissue	Southeast	Ingestion	PCB Total TEC	8.53E-10	mg/kg	5.4E-13	mg/kg-day	1.3E+05	kg-day/mg	7.0E-08	9.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.0E-08					NA
		Exposure Point Total									7.0E-08					NA
	Exposure Medium Total										7.0E-08					NA
	Milk	Southeast	Ingestion	PCB Total TEC	3.08E-10	mg/kg	2.5E-12	mg/kg-day	1.3E+05	kg-day/mg	3.3E-07	4.4E-12	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.3E-07					NA
		Exposure Point Total									3.3E-07					NA
	Exposure Medium Total										3.3E-07					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	5.23E-12	ug/m3	2.9E-12	ug/m3	3.8E+01	(ug/m3)-1	1.1E-10	5.0E-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 (Southeast)											4.2E-07					NA

Table L5.3.22
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	South	Ingestion	PCB Total TEC	1.50E-09	mg/kg	2.6E-15	mg/kg-day	1.3E+05	kg-day/mg	3.4E-10	4.6E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.4E-10					NA
			Dermal	PCB Total TEC	1.50E-09	mg/kg	3.8E-15	mg/kg-day	1.3E+05	kg-day/mg	5.0E-10	6.7E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.0E-10					NA
		Exposure Point Total									8.4E-10					NA
	Exposure Medium Total										8.4E-10					NA
	Plant Tissue	South	Ingestion	PCB Total TEC			1.5E-13	mg/kg-day	1.3E+05	kg-day/mg	1.9E-08	2.6E-13	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	4.50E-10	mg/kg										
				Belowground	8.69E-11	mg/kg										
			Exp. Route Total								1.9E-08					NA
		Exposure Point Total									1.9E-08					NA
	Exposure Medium Total										1.9E-08					NA
	Beef Tissue	South	Ingestion	PCB Total TEC	6.79E-10	mg/kg	4.3E-13	mg/kg-day	1.3E+05	kg-day/mg	5.6E-08	7.5E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.6E-08					NA
		Exposure Point Total									5.6E-08					NA
	Exposure Medium Total										5.6E-08					NA
	Milk	South	Ingestion	PCB Total TEC	2.46E-10	mg/kg	2.0E-12	mg/kg-day	1.3E+05	kg-day/mg	2.6E-07	3.5E-12	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.6E-07					NA
		Exposure Point Total									2.6E-07					NA
	Exposure Medium Total										2.6E-07					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	2.45E-12	ug/m3	1.3E-12	ug/m3	3.8E+01	(ug/m3)-1	5.1E-11	2.4E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.1E-11					NA
		Exposure Point Total									5.1E-11					NA
	Exposure Medium Total										5.1E-11					NA
Soil Total (South)											3.4E-07					NA

Table L5.3.22
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				
	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	Southwest	Ingestion	PCB Total TEC	7.80E-10	mg/kg	1.4E-15	mg/kg-day	1.3E+05	kg-day/mg	1.8E-10	2.4E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.8E-10					NA
			Dermal	PCB Total TEC	7.80E-10	mg/kg	2.0E-15	mg/kg-day	1.3E+05	kg-day/mg	2.6E-10	3.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.6E-10					NA
		Exposure Point Total									4.4E-10					NA
	Exposure Medium Total										4.4E-10					NA
	Plant Tissue	Southwest	Ingestion	PCB Total TEC			1.4E-13	mg/kg-day	1.3E+05	kg-day/mg	1.9E-08	2.5E-13	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	4.50E-10	mg/kg										
				Belowground	4.51E-11	mg/kg										
			Exp. Route Total								1.9E-08					NA
		Exposure Point Total									1.9E-08					NA
	Exposure Medium Total										1.9E-08					NA
	Beef Tissue	Southwest	Ingestion	PCB Total TEC	2.26E-12	mg/kg	1.4E-15	mg/kg-day	1.3E+05	kg-day/mg	1.8E-10	2.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.8E-10					NA
		Exposure Point Total									1.8E-10					NA
	Exposure Medium Total										1.8E-10					NA
	Milk	Southwest	Ingestion	PCB Total TEC	3.80E-13	mg/kg	3.1E-15	mg/kg-day	1.3E+05	kg-day/mg	4.1E-10	5.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								4.1E-10					NA
		Exposure Point Total									4.1E-10					NA
	Exposure Medium Total										4.1E-10					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	1.28E-12	ug/m3	7.0E-13	ug/m3	3.8E+01	(ug/m3)-1	2.7E-11	1.2E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.7E-11					NA
		Exposure Point Total									2.7E-11					NA
	Exposure Medium Total										2.7E-11					NA
Soil Total (Southwest)											2.0E-08					NA

Table L5.3.23
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

							Cancer Risk Calculations					Noncancer Hazard Calculations				
	Exposure	Exposure	Exposure	Chemical of	EPC		Intake/Exposure Concentration		Unit Risk		Cancer	Intake/Exposure Concentration		RfC		Hazard
Medium	Medium	Point	Route	Potential Concern	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	7.03E-11	ug/m3	3.9E-11	ug/m3	3.8E+01	(ug/m3)-1	1.5E-09	6.7E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.5E-09					NA
		Exposure Point Total									1.5E-09					NA
	Exposure Medium Total										1.5E-09					NA
Medium Total											1.5E-09					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	8.91E-11	ug/m3	4.9E-11	ug/m3	3.8E+01	(ug/m3)-1	1.9E-09	8.5E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.9E-09					NA
		Exposure Point Total									1.9E-09					NA
	Exposure Medium Total										1.9E-09					NA
Medium Total											1.9E-09					NA

Table L5.3.24
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	Southeast	Ingestion	PCB Total TEC	3.20E-09	mg/kg	5.0E-15	mg/kg-day	1.3E+05	kg-day/mg	6.5E-10	1.2E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								6.5E-10					NA
			Dermal	PCB Total TEC	3.20E-09	mg/kg	2.2E-15	mg/kg-day	1.3E+05	kg-day/mg	2.9E-10	5.2E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.9E-10					NA
		Exposure Point Total									9.4E-10					NA
	Exposure Medium Total										9.4E-10					NA
	Plant Tissue	Southeast	Ingestion	PCB Total TEC			9.1E-14	mg/kg-day	1.3E+05	kg-day/mg	1.2E-08	2.1E-13	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	4.50E-10	mg/kg										
				Belowground	2.27E-10	mg/kg										
			Exp. Route Total								1.2E-08					NA
		Exposure Point Total									1.2E-08					NA
	Exposure Medium Total										1.2E-08					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	5.23E-12	ug/m3	2.1E-12	ug/m3	3.8E+01	(ug/m3)-1	8.2E-11	5.0E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								8.2E-11					NA
		Exposure Point Total									8.2E-11					NA
	Exposure Medium Total										8.2E-11					NA
Soil Total (Southeast)											1.3E-08					NA

Table L5.3.24
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	1.50E-09	mg/kg	2.3E-15	mg/kg-day	1.3E+05	kg-day/mg	3.1E-10	5.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.1E-10					NA
			Dermal	PCB Total TEC	1.50E-09	mg/kg	1.0E-15	mg/kg-day	1.3E+05	kg-day/mg	1.3E-10	2.4E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.3E-10					NA
		Exposure Point Total									4.4E-10					NA
	Exposure Medium Total										4.4E-10					NA
	Plant Tissue	South	Ingestion	PCB Total TEC			8.1E-14	mg/kg-day	1.3E+05	kg-day/mg	1.1E-08	1.9E-13	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	4.50E-10	mg/kg										
				Belowground	8.69E-11	mg/kg										
			Exp. Route Total								1.1E-08					NA
		Exposure Point Total									1.1E-08					NA
	Exposure Medium Total										1.1E-08					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	2.45E-12	ug/m3	1.0E-12	ug/m3	3.8E+01	(ug/m3)-1	3.8E-11	2.4E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								3.8E-11					NA
		Exposure Point Total									3.8E-11					NA
	Exposure Medium Total										3.8E-11					NA
Soil Total (South)											1.1E-08					NA

Table L5.3.24
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	Southwest	Ingestion	PCB Total TEC	7.80E-10	mg/kg	1.2E-15	mg/kg-day	1.3E+05	kg-day/mg	1.6E-10	2.8E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.6E-10					NA
			Dermal	PCB Total TEC	7.80E-10	mg/kg	5.4E-16	mg/kg-day	1.3E+05	kg-day/mg	7.0E-11	1.3E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.0E-11					NA
		Exposure Point Total									2.3E-10					NA
	Exposure Medium Total										2.3E-10					NA
	Plant Tissue	Southwest	Ingestion	PCB Total TEC			7.9E-14	mg/kg-day	1.3E+05	kg-day/mg	1.0E-08	1.8E-13	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	4.50E-10	mg/kg										
				Belowground	4.51E-11	mg/kg										
			Exp. Route Total								1.0E-08					NA
		Exposure Point Total									1.0E-08					NA
	Exposure Medium Total										1.0E-08					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	1.28E-12	ug/m3	5.2E-13	ug/m3	3.8E+01	(ug/m3)-1	2.0E-11	1.2E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.0E-11					NA
		Exposure Point Total									2.0E-11					NA
	Exposure Medium Total										2.0E-11					NA
Soil Total (Southwest)											1.0E-08					NA

Table L5.3.25
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 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	7.03E-11	ug/m3	2.9E-11	ug/m3	3.8E+01	(ug/m3)-1	1.1E-09	6.7E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.1E-09					NA
		Exposure Point Total									1.1E-09					NA
	Exposure Medium Total										1.1E-09					NA
Medium Total											1.1E-09					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	8.91E-11	ug/m3	3.7E-11	ug/m3	3.8E+01	(ug/m3)-1	1.4E-09	8.5E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.4E-09					NA
		Exposure Point Total									1.4E-09					NA
	Exposure Medium Total										1.4E-09					NA
Medium Total											1.4E-09					NA

Table L5.3.26
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	1E-11	--	4E-11	--	5E-11	--	--	--	--	--
			Chemical Total	1E-11	--	4E-11	--	5E-11		--	--	--	--
		Exposure Point Total						5E-11					--
	Exposure Medium Total							5E-11					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	1E-12	--	--	1E-12	--	--	--	--	--
			Chemical Total	--	1E-12	--	--	1E-12		--	--	--	--
		Exposure Point Total						1E-12					--
	Exposure Medium Total							1E-12					--
Soil Total (Southeast)								5E-11					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-11	--	--	2E-11	--	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Ambient Air Total (Southeast)								2E-11					--
Receptor Total (Soil and Ambient Air - Southeast)								7E-11					--
Soil	Soil	South	PCB Total TEC	5E-12	--	2E-11	--	2E-11	--	--	--	--	--
			Chemical Total	5E-12	--	2E-11	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
	Ambient Air	Particulates South	PCB Total TEC	--	6E-13	--	--	6E-13	--	--	--	--	--
			Chemical Total	--	6E-13	--	--	6E-13		--	--	--	--
		Exposure Point Total						6E-13					--
	Exposure Medium Total							6E-13					--
Soil Total (South)								2E-11					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-11	--	--	2E-11	--	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Ambient Air Total (South)								2E-11					--
Receptor Total (Soil and Ambient Air - South)								4E-11					--

Table L5.3.26
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	3E-12	--	9E-12	--	1E-11	--	--	--	--	--
			Chemical Total	3E-12	--	9E-12	--	1E-11		--	--	--	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
	Ambient Air	Particulates Southwest	PCB Total TEC	--	3E-13	--	--	3E-13	--	--	--	--	--
			Chemical Total	--	3E-13	--	--	3E-13		--	--	--	--
		Exposure Point Total						3E-13					--
	Exposure Medium Total							3E-13					--
Soil Total (Southwest)								1E-11					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-11	--	--	2E-11	--	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Ambient Air Total (Southwest)								2E-11					--
Receptor Total (Soil and Ambient Air - Southwest)								3E-11					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table L5.3.19).

Table L5.3.27
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	7E-10	--	1E-09	--	2E-09	--	--	--	--	--
			Chemical Total	7E-10	--	1E-09	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
	Beef Tissue	Southeast	PCB Total TEC	7E-08	--	--	--	7E-08	--	--	--	--	--
			Chemical Total	7E-08	--	--	--	7E-08		--	--	--	--
		Exposure Point Total						7E-08					--
	Exposure Medium Total							7E-08					--
	Ambient Air	Particulates Southeast	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 (Southeast)								7E-08					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (Southeast)								2E-09					--
Receptor Total (Soil and Ambient Air - Southeast)								7E-08					--
Soil	Soil	South	PCB Total TEC	3E-10	--	5E-10	--	8E-10	--	--	--	--	--
			Chemical Total	3E-10	--	5E-10	--	8E-10		--	--	--	--
		Exposure Point Total						8E-10					--
	Exposure Medium Total							8E-10					--
	Beef Tissue	South	PCB Total TEC	6E-08	--	--	--	6E-08	--	--	--	--	--
			Chemical Total	6E-08	--	--	--	6E-08		--	--	--	--
		Exposure Point Total						6E-08					--
	Exposure Medium Total							6E-08					--
	Ambient Air	Particulates South	PCB Total TEC	--	5E-11	--	--	5E-11	--	--	--	--	--
			Chemical Total	--	5E-11	--	--	5E-11		--	--	--	--
		Exposure Point Total						5E-11					--
	Exposure Medium Total							5E-11					--
Soil Total (South)								6E-08					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (South)								2E-09					--
Receptor Total (Soil and Ambient Air - South)								6E-08					--

Table L5.3.27
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	2E-10	--	3E-10	--	4E-10	--	--	--	--	--
			Chemical Total	2E-10	--	3E-10	--	4E-10		--	--	--	--
		Exposure Point Total						4E-10					--
	Exposure Medium Total							4E-10					--
	Beef Tissue	Southwest	PCB Total TEC	2E-10	--	--	--	2E-10	--	--	--	--	--
			Chemical Total	2E-10	--	--	--	2E-10		--	--	--	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
	Ambient Air	Particulates Southwest	PCB Total TEC	--	3E-11	--	--	3E-11	--	--	--	--	--
			Chemical Total	--	3E-11	--	--	3E-11		--	--	--	--
		Exposure Point Total						3E-11					--
	Exposure Medium Total							3E-11					--
Soil Total (Southwest)								6E-10					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (Southwest)								2E-09					--
Receptor Total (Soil and Ambient Air - Southwest)								3E-09					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table L5.3.21).

Table L5.3.28
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	7E-10	--	1E-09	--	2E-09	--	--	--	--	--
			Chemical Total	7E-10	--	1E-09	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
	Plant Tissue	Southeast	PCB Total TEC	2E-08	--	--	--	2E-08	--	--	--	--	--
			Chemical Total	2E-08	--	--	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
	Beef Tissue	Southeast	PCB Total TEC	7E-08	--	--	--	7E-08	--	--	--	--	--
			Chemical Total	7E-08	--	--	--	7E-08		--	--	--	--
		Exposure Point Total						7E-08					--
	Exposure Medium Total							7E-08					--
	Milk	Southeast	PCB Total TEC	3E-07	--	--	--	3E-07	--	--	--	--	--
			Chemical Total	3E-07	--	--	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Ambient Air	Particulates Southeast	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 (Southeast)								4E-07					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP [(1)]	PCB Total TEC	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (Southeast)								2E-09					--
Receptor Total (Soil and Ambient Air - Southeast)								4E-07					--

Table L5.3.28
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	3E-10	--	5E-10	--	8E-10	--	--	--	--	--
			Chemical Total	3E-10	--	5E-10	--	8E-10		--	--	--	--
		Exposure Point Total						8E-10					--
	Exposure Medium Total							8E-10					--
	Plant Tissue	South	PCB Total TEC	2E-08	--	--	--	2E-08	--	--	--	--	--
			Chemical Total	2E-08	--	--	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
	Beef Tissue	South	PCB Total TEC	6E-08	--	--	--	6E-08	--	--	--	--	--
			Chemical Total	6E-08	--	--	--	6E-08		--	--	--	--
		Exposure Point Total						6E-08					--
	Exposure Medium Total							6E-08					--
	Milk	South	PCB Total TEC	3E-07	--	--	--	3E-07	--	--	--	--	--
			Chemical Total	3E-07	--	--	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Ambient Air	Particulates South	PCB Total TEC	--	5E-11	--	--	5E-11	--	--	--	--	--
			Chemical Total	--	5E-11	--	--	5E-11		--	--	--	--
		Exposure Point Total						5E-11					--
	Exposure Medium Total							5E-11					--
Soil Total (South)								3E-07					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (South)								2E-09					--
Receptor Total (Soil and Ambient Air - South)								3E-07					--

Table L5.3.28
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	2E-10	--	3E-10	--	4E-10	--	--	--	--	--
			Chemical Total	2E-10	--	3E-10	--	4E-10		--	--	--	--
		Exposure Point Total						4E-10					--
	Exposure Medium Total							4E-10					--
	Plant Tissue	Southwest	PCB Total TEC	2E-08	--	--	--	2E-08	--	--	--	--	--
			Chemical Total	2E-08	--	--	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
	Beef Tissue	Southwest	PCB Total TEC	2E-10	--	--	--	2E-10	--	--	--	--	--
			Chemical Total	2E-10	--	--	--	2E-10		--	--	--	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
	Milk	Southwest	PCB Total TEC	4E-10	--	--	--	4E-10	--	--	--	--	--
			Chemical Total	4E-10	--	--	--	4E-10		--	--	--	--
		Exposure Point Total						4E-10					--
	Exposure Medium Total							4E-10					--
	Ambient Air	Particulates Southwest	PCB Total TEC	--	3E-11	--	--	3E-11	--	--	--	--	--
			Chemical Total	--	3E-11	--	--	3E-11		--	--	--	--
		Exposure Point Total						3E-11					--
	Exposure Medium Total							3E-11					--
Soil Total (Southwest)								2E-08					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (Southwest)								2E-09					--
Receptor Total (Soil and Ambient Air - Southwest)								2E-08					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table L5.3.23).

Table L5.3.29
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	7E-10	--	3E-10	--	9E-10	--	--	--	--	--
			Chemical Total	7E-10	--	3E-10	--	9E-10		--	--	--	--
		Exposure Point Total						9E-10					--
	Exposure Medium Total							9E-10					--
	Plant Tissue	Southeast	PCB Total TEC	1E-08	--	--	--	1E-08	--	--	--	--	--
			Chemical Total	1E-08	--	--	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	8E-11	--	--	8E-11	--	--	--	--	--
			Chemical Total	--	8E-11	--	--	8E-11		--	--	--	--
		Exposure Point Total						8E-11					--
	Exposure Medium Total							8E-11					--
Soil Total (Southeast)								1E-08					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP [1]	PCB Total TEC	--	1E-09	--	--	1E-09	--	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		--	--	--	--
		Exposure Point Total						1E-09					--
	Exposure Medium Total							1E-09					--
Ambient Air Total (Southeast)								1E-09					--
Receptor Total (Soil and Ambient Air - Southeast)								1E-08					--

Table L5.3.29
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	3E-10	--	1E-10	--	4E-10	--	--	--	--	--
			Chemical Total	3E-10	--	1E-10	--	4E-10		--	--	--	--
		Exposure Point Total						4E-10					--
	Exposure Medium Total							4E-10					--
	Plant Tissue	South	PCB Total TEC	1E-08	--	--	--	1E-08	--	--	--	--	--
			Chemical Total	1E-08	--	--	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Ambient Air	Particulates South	PCB Total TEC	--	4E-11	--	--	4E-11	--	--	--	--	--
			Chemical Total	--	4E-11	--	--	4E-11		--	--	--	--
		Exposure Point Total						4E-11					--
	Exposure Medium Total							4E-11					--
Soil Total (South)								1E-08					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	1E-09	--	--	1E-09	--	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		--	--	--	--
		Exposure Point Total						1E-09					--
	Exposure Medium Total							1E-09					--
Ambient Air Total (South)								1E-09					--
Receptor Total (Soil and Ambient Air - South)								1E-08					--

Table L5.3.29
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	2E-10	--	7E-11	--	2E-10	--	--	--	--	--
			Chemical Total	2E-10	--	7E-11	--	2E-10		--	--	--	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
	Plant Tissue	Southwest	PCB Total TEC	1E-08	--	--	--	1E-08	--	--	--	--	--
			Chemical Total	1E-08	--	--	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Ambient Air	Particulates Southwest	PCB Total TEC	--	2E-11	--	--	2E-11	--	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Soil Total (Southwest)								1E-08					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	1E-09	--	--	1E-09	--	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		--	--	--	--
		Exposure Point Total						1E-09					--
	Exposure Medium Total							1E-09					--
Ambient Air Total (Southwest)								1E-09					--
Receptor Total (Soil and Ambient Air - Southwest)								1E-08					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table L5.3.25).

Table L5.3.30
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	3.08E-02	2.60E+01	No
South	2.46E-02	2.60E+01	No
Southwest	4.90E-04	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	1.61E-01	2.60E+01	No
South	1.29E-01	2.60E+01	No
Southwest	7.03E-03	2.60E+01	No

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	5.55E-03	2.60E+01	No
South	4.90E-03	2.60E+01	No
Southwest	4.70E-03	2.60E+01	No

Table L5.3.30
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

Notes:

(1) Average daily intake for infant exposed to contaminated breast milk (See Table L5.3.17).

(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 L5.3.31
Overall Summary of Risks and Hazards for COPCs
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor Exposure Medium	**Carcinogenic Risk**	**Noncarcinogenic Hazard Index**
Current Rancher (Adult)		
Southeast Area		
Soil (Ingestion and Dermal)	5E-11	—
Ambient Air (Particulates from Soil)	1E-12	—
Ambient Air (Particulates and Vapors)	2E-11	—
Total	7E-11	
South Area		
Soil (Ingestion and Dermal)	2E-11	—
Ambient Air (Particulates from Soil)	6E-13	—
Ambient Air (Particulates and Vapors)	2E-11	—
Total	4E-11	
Southwest Area		
Soil (Ingestion and Dermal)	1E-11	—
Ambient Air (Particulates from Soil)	3E-13	—
Ambient Air (Particulates and Vapors)	2E-11	—
Total	3E-11	
Future Resident Rancher (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	2E-09	—
Beef Tissue	7E-08	—
Ambient Air (Particulates from Soil)	1E-10	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	7E-08	
South Area		
Soil (Ingestion and Dermal)	8E-10	—
Beef Tissue	6E-08	—
Ambient Air (Particulates from Soil)	5E-11	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	6E-08	
Southwest Area		
Soil (Ingestion and Dermal)	4E-10	—
Beef Tissue	2E-10	—
Ambient Air (Particulates from Soil)	3E-11	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	3E-09	

Table L5.3.31
Overall Summary of Risks and Hazards for COPCs
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor Exposure Medium	**Carcinogenic Risk**	**Noncarcinogenic Hazard Index**
Future Subsistence Resident Rancher (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	2E-09	—
Plant Tissue (Homegrown Produce)	2E-08	—
Beef Tissue	7E-08	—
Milk	3E-07	—
Ambient Air (Particulates from Soil)	1E-10	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	4E-07	
South Area		
Soil (Ingestion and Dermal)	8E-10	—
Plant Tissue (Homegrown Produce)	2E-08	—
Beef Tissue	6E-08	—
Milk	3E-07	—
Ambient Air (Particulates from Soil)	5E-11	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	3E-07	
Southwest Area		
Soil (Ingestion and Dermal)	4E-10	—
Plant Tissue (Homegrown Produce)	2E-08	—
Beef Tissue	2E-10	—
Milk	4E-10	—
Ambient Air (Particulates from Soil)	3E-11	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	2E-08	
Future Resident (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	9E-10	—
Plant Tissue (Homegrown Produce)	1E-08	—
Ambient Air (Particulates from Soil)	8E-11	—
Ambient Air (Particulates and Vapors)	1E-09	—
Total	1E-08	
South Area		
Soil (Ingestion and Dermal)	4E-10	—
Plant Tissue (Homegrown Produce)	1E-08	—
Ambient Air (Particulates from Soil)	4E-11	—
Ambient Air (Particulates and Vapors)	1E-09	—
Total	1E-08	
Southwest Area		
Soil (Ingestion and Dermal)	2E-10	—
Plant Tissue (Homegrown Produce)	1E-08	—
Ambient Air (Particulates from Soil)	2E-11	—
Ambient Air (Particulates and Vapors)	1E-09	—
Total	1E-08	

Table L5.3.31
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 higher calculated ambient air risk (see Tables L5.3.19, L5.3.21, L5.3.23, and L5.3.25.

— - Hazard indices were not calculated (toxicity data were not available).

Risk values are taken from Tables L5.3.26 through L5.3.29.

Risk calculations are shown on Tables L5.3.18 through L5.3.25.

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 L5.3.32
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**
0.0032	0.0015	0.00078	0.00087	0.00054	0.00093	0.0063	0.0020

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).
pg/g - picograms per gram (parts per trillion)
KHF - Kettleman Hills Facility
TEC - toxicity equivalence concentration
TEF - toxicity equivalence factor

Table L5.4.1
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 -- Measured PCB levels in vegetation -- Modeled PCB levels in invertebrates -- Calculated exposure doses and egg concentrations -- 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)* -- State species of special concern	-- Measured PCB levels in soil -- Measured PCB levels in vegetation -- Modeled PCB levels in rodents -- Calculated exposure doses and egg concentrations -- 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 -- Measured PCB levels in vegetation -- Calculated pocket mouse exposure doses -- 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)* --State species of special concern	-- Measured PCB levels in soil -- Modeled PCB levels in invertebrates -- Calculated grasshopper mouse exposure doses -- 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)* -- Federally endangered -- State threatened	-- Measured PCB levels in soil -- Measured PCB levels in vegetation -- Modeled PCB levels in rodents -- Calculated kit fox exposure doses -- 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*) -- Federally endangered -- State endangered	-- Measured PCB levels in soil -- Modeled PCB levels in invertebrates -- Calculated risks to carnivorous mammals and birds

Table L5.4.2
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 L5.4.2
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 L5.4.2
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 L5.4.2
Exposure Factors for Ecological Receptors
Ecological Risk Assessment
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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*): Mean food consumption rate per unit body weight for eight mice (four male, four female) = 0.076 g/g-day. Assuming same rate and using body weight of southern grasshopper mouse: (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: (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 L5.4.2
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: FIR = (FMR/ME) = (2.0 kJ/day) / (18 kJ/g) = 0.11 g/day = 0.00011 kg/day (dry weight) where: FMR = Field Metabolic Rate = 2.0 kJ/day (based on alligator lizard) 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 L5.4.2
Exposure Factors for Ecological Receptors
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

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Table L5.4.3
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 105	6.79	3.3E+01	1.50E+02	0.0069	9.88E-05	3.30E-02	1.65E-02	0.00003	4.96E-07
PCB 114	6.98	ND	3.50E+00	0.0061	2.02E-06	—	1.01E-06	0.00003	3.03E-11
PCB 118	7.12	5.1E+01	2.70E+02	0.0055	1.41E-04	5.10E-02	2.56E-02	0.00003	7.67E-07
PCB 156	7.60	1.3E+01	1.50E+01	0.0036	5.17E-06	1.30E-02	6.50E-03	0.00003	1.95E-07
PCB 157	7.62	ND	3.20E+00	0.0035	1.06E-06	—	5.30E-07	0.00003	1.59E-11
PCB 167	7.50	5.2E+00	9.00E+00	0.0039	3.40E-06	5.20E-03	2.60E-03	0.00003	7.81E-08
PCB 189	8.27	4.3E+00	ND	0.0016	1.53E-08	4.30E-03	2.15E-03	0.00003	<u>6.45E-08</u>
Congener total: [8]									1.60E-06
South									
PCB 105	6.79	2.1E+01	1.30E+02	0.0069	8.44E-05	2.10E-02	1.05E-02	0.00003	3.16E-07
PCB 114	6.98	ND	5.40E+00	0.0061	3.07E-06	—	1.54E-06	0.00003	4.61E-11
PCB 118	7.12	2.9E+01	1.80E+02	0.0055	9.26E-05	2.90E-02	1.45E-02	0.00003	4.36E-07
PCB 156	7.60	ND	2.10E+01	0.0036	7.01E-06	—	3.51E-06	0.00003	1.05E-10
PCB 157	7.62	ND	4.80E+00	0.0035	1.57E-06	—	7.86E-07	0.00003	2.36E-11
PCB 167	7.50	ND	1.20E+01	0.0039	4.42E-06	—	2.21E-06	0.00003	<u>6.63E-11</u>
Congener total: [8]									7.53E-07
Southwest									
PCB 105	6.79	1.1E+01	1.30E+01	0.0069	8.08E-06	1.10E-02	5.50E-03	0.00003	1.65E-07
PCB 118	7.12	1.5E+01	2.10E+01	0.0055	1.03E-05	1.50E-02	7.51E-03	0.00003	2.25E-07
PCB 156	7.60	ND	2.30E+00	0.0036	7.23E-07	—	3.61E-07	0.00003	<u>1.08E-11</u>
Congener total: [8]									3.90E-07
B-18 Landfill									
PCB 105	6.79	6.2E+01	3.10E+02	0.0069	1.89E-04	6.20E-02	3.11E-02	0.00003	9.33E-07
PCB 114	6.98	ND	2.10E+01	0.0061	1.12E-05	—	5.60E-06	0.00003	1.68E-10
PCB 118	7.12	8.5E+01	5.20E+02	0.0055	2.50E-04	8.50E-02	4.26E-02	0.00003	1.28E-06
PCB 156	7.60	3.1E+01	9.90E+01	0.0036	3.12E-05	3.10E-02	1.55E-02	0.00003	4.65E-07
PCB 157	7.62	ND	1.60E+01	0.0035	4.90E-06	—	2.45E-06	0.00003	7.36E-11
PCB 167	7.50	1.3E+01	6.30E+01	0.0039	2.18E-05	1.30E-02	6.51E-03	0.00003	1.95E-07
PCB 169	7.41	ND	3.20E+00	0.0043	1.20E-06	—	6.00E-07	0.03	<u>1.80E-08</u>
Congener total: [8]									2.89E-06

<u>Notes:</u>
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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$_{plants}$ x FIR$_{mouse}$ x CF$_{dw}$) + (C$_{soil}$ x SIR$_{mouse}$)) x BTF x FIR$_{fox}$] + (C$_{soil}$ x SIR$_{fox}$)} 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 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 L5.4.2 for basis/source.
SIR$_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table L5.4.2 for basis/source.
SIR$_{fox}$ = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table L5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 L5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table L5.4.2 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
ND = not detected

Table L5.4.4
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 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	ND	3.5E+00	0.0061	2.02E-06	—	1.68E-06	0.00003	5.04E-11
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 156	7.60	1.3E+01	1.5E+01	0.0036	5.17E-06	1.30E-02	1.08E-02	0.00003	3.25E-07
PCB 157	7.62	ND	3.2E+00	0.0035	1.06E-06	—	8.84E-07	0.00003	2.65E-11
PCB 167	7.50	5.2E+00	9.0E+00	0.0039	3.40E-06	5.20E-03	4.34E-03	0.00003	1.30E-07
PCB 189	8.27	4.3E+00	ND	0.0016	1.53E-08	4.30E-03	3.58E-03	0.00003	1.08E-07
Congener total: [8]									2.67E-06
South									
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	ND	5.4E+00	0.0061	3.07E-06	—	2.56E-06	0.00003	7.69E-11
PCB 118	7.12	2.9E+01	1.8E+02	0.0055	9.23E-05	2.90E-02	2.42E-02	0.00003	7.27E-07
PCB 156	7.60	ND	2.1E+01	0.0036	7.01E-06	—	5.85E-06	0.00003	1.75E-10
PCB 157	7.62	ND	4.8E+00	0.0035	1.57E-06	—	1.31E-06	0.00003	3.93E-11
PCB 167	7.50	ND	1.2E+01	0.0039	4.42E-06	—	3.68E-06	0.00003	1.11E-10
Congener total: [8]									1.25E-06
Southwest									
PCB 105	6.79	1.1E+01	1.3E+01	0.0069	8.08E-06	1.10E-02	9.17E-03	0.00003	2.75E-07
PCB 118	7.12	1.5E+01	2.1E+01	0.0055	1.01E-05	1.50E-02	1.25E-02	0.00003	3.75E-07
PCB 156	7.60	ND	2.3E+00	0.0036	7.23E-07	—	6.02E-07	0.00003	1.81E-11
Congener total: [8]									6.50E-07
B-18 Landfill									
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	ND	2.1E+01	0.0061	1.12E-05	—	9.33E-06	0.00003	2.80E-10
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 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	ND	1.6E+01	0.0035	4.90E-06	—	4.09E-06	0.00003	1.23E-10
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	ND	3.2E+00	0.0043	1.20E-06	—	1.00E-06	0.03	3.00E-08
Congener total: [8]									4.82E-06

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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$_{plants}$ x FIR$_{mouse}$ x CF$_{dw}$) + (C$_{soil}$ x SIR$_{mouse}$)) x BTF x FIR$_{fox}$] + (C$_{soil}$ x SIR$_{fox}$)} 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 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 L5.4.2 for basis/source.
SIR$_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table L5.4.2 for basis/source.
SIR$_{fox}$ = soil ingestion rate for fox (kg/day) = 0.001 kg/day See Table L5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 L5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table L5.4.2 for basis/source.
(6) Mammal TEFs are from USEPA (June 2008).
(7) 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
ND = not detected

Table L5.4.5
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 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 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 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 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 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)										1.60E-06
South										
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 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
Congener total: (10)										7.52E-07
Southwest										
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 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
Congener total: (10)										3.91E-07
B-18 Landfill										
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 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 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 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
Congener total: (10)										2.87E-06

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table L5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table L5.4.2 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 L5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table L5.4.2 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 L5.4.6
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 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 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 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 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 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)										2.67E-06
South										
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 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
Congener total: (10)										1.25E-06
Southwest										
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 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
Congener total: (10)										6.51E-07
B-18 Landfill										
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 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 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 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
Congener total: (10)										4.78E-06

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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): 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 L5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table L5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table L5.4.2 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 L5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table L5.4.2 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 L5.4.7
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 105	3.3E+01	0.20	7.92E-01	3.30E-02	4.13E-01	0.00003	1.24E-05
PCB 118	5.1E+01	0.20	1.22E+00	5.10E-02	6.38E-01	0.00003	1.91E-05
PCB 156	1.3E+01	0.20	3.12E-01	1.30E-02	1.63E-01	0.00003	4.88E-06
PCB 167	5.2E+00	0.20	1.25E-01	5.20E-03	6.50E-02	0.00003	1.95E-06
PCB 189	4.3E+00	0.20	1.03E-01	4.30E-03	5.38E-02	0.00003	1.61E-06
Congener total: [7]							3.99E-05
South							
PCB 105	2.1E+01	0.20	5.04E-01	2.10E-02	2.63E-01	0.00003	7.88E-06
PCB 118	2.9E+01	0.20	6.96E-01	2.90E-02	3.63E-01	0.00003	1.09E-05
Congener total: [7]							1.88E-05
Southwest							
PCB 105	1.1E+01	0.20	2.64E-01	1.10E-02	1.38E-01	0.00003	4.13E-06
PCB 118	1.5E+01	0.20	3.60E-01	1.50E-02	1.88E-01	0.00003	5.63E-06
Congener total: [7]							9.75E-06
B-18 Landfill							
PCB 105	6.2E+01	0.20	1.49E+00	6.20E-02	7.75E-01	0.00003	2.33E-05
PCB 118	8.5E+01	0.20	2.04E+00	8.50E-02	1.06E+00	0.00003	3.19E-05
PCB 156	3.1E+01	0.20	7.44E-01	3.10E-02	3.88E-01	0.00003	1.16E-05
PCB 167	1.3E+01	0.20	3.12E-01	1.30E-02	1.63E-01	0.00003	4.88E-06
Congener total: [7]							7.16E-05

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table L5.4.2 for basis/source.
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table L5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table L5.4.2 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 L5.4.8
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 105	3.3E+01	0.20	7.92E-01	3.30E-02	6.88E-01	0.00003	2.06E-05
PCB 118	5.1E+01	0.20	1.22E+00	5.10E-02	1.06E+00	0.00003	3.19E-05
PCB 156	1.3E+01	0.20	3.12E-01	1.30E-02	2.71E-01	0.00003	8.13E-06
PCB 167	5.2E+00	0.20	1.25E-01	5.20E-03	1.08E-01	0.00003	3.25E-06
PCB 189	4.3E+00	0.20	1.03E-01	4.30E-03	8.96E-02	0.00003	2.69E-06
Congener total: (7)							6.66E-05
South							
PCB 105	2.1E+01	0.20	5.04E-01	2.10E-02	4.38E-01	0.00003	1.31E-05
PCB 118	2.9E+01	0.20	6.96E-01	2.90E-02	6.04E-01	0.00003	1.81E-05
Congener total: (7)							3.13E-05
Southwest							
PCB 105	1.1E+01	0.20	2.64E-01	1.10E-02	2.29E-01	0.00003	6.88E-06
PCB 118	1.5E+01	0.20	3.60E-01	1.50E-02	3.13E-01	0.00003	9.38E-06
Congener total: (7)							1.63E-05
B-18 Landfill							
PCB 105	6.2E+01	0.20	1.49E+00	6.20E-02	1.29E+00	0.00003	3.88E-05
PCB 118	8.5E+01	0.20	2.04E+00	8.50E-02	1.77E+00	0.00003	5.31E-05
PCB 156	3.1E+01	0.20	7.44E-01	3.10E-02	6.46E-01	0.00003	1.94E-05
PCB 167	1.3E+01	0.20	3.12E-01	1.30E-02	2.71E-01	0.00003	8.13E-06
Congener total: (7)							1.19E-04

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table L5.4.2 for basis/source.
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table L5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table L5.4.2 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 L5.4.9
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 105	3.3E+01	1.50E+2	1.18E-01	5.94E-04	9.92E+00	0.00003	2.98E-04
PCB 114	ND	3.50E+0	2.76E-03	—	2.30E-01	0.00003	6.91E-06
PCB 118	5.1E+01	2.70E+2	2.13E-01	9.18E-04	1.78E+01	0.00003	5.35E-04
PCB 156	1.3E+01	1.50E+1	1.18E-02	2.34E-04	1.01E+00	0.00003	3.02E-05
PCB 157	ND	3.20E+0	2.53E-03	—	2.11E-01	0.00003	6.32E-06
PCB 167	5.2E+00	9.00E+0	7.10E-03	9.36E-05	6.00E-01	0.00003	1.80E-05
PCB 189	4.3E+00	ND	—	7.74E-05	6.45E-03	0.00003	1.94E-07
Congener total: [6]							8.94E-04
South							
PCB 105	2.1E+01	1.30E+2	1.01E-01	3.78E-04	8.48E+00	0.00003	2.54E-04
PCB 114	ND	5.40E+0	4.21E-03	—	3.51E-01	0.00003	1.05E-05
PCB 118	2.9E+01	1.80E+2	1.40E-01	5.22E-04	1.17E+01	0.00003	3.52E-04
PCB 156	ND	2.10E+1	1.64E-02	—	1.36E+00	0.00003	4.09E-05
PCB 157	ND	4.80E+0	3.74E-03	—	3.12E-01	0.00003	9.36E-06
PCB 167	ND	1.20E+1	9.36E-03	—	7.80E-01	0.00003	2.34E-05
Congener total: [6]							6.91E-04
Southwest							
PCB 105	1.1E+01	1.30E+1	9.53E-03	1.98E-04	8.11E-01	0.00003	2.43E-05
PCB 118	1.5E+01	2.10E+1	1.54E-02	2.70E-04	1.31E+00	0.00003	3.92E-05
PCB 156	ND	2.30E+0	1.69E-03	—	1.41E-01	0.00003	4.22E-06
Congener total: [6]							6.77E-05
B-18 Landfill							
PCB 105	6.2E+01	3.10E+2	2.26E-01	1.12E-03	1.89E+01	0.00003	5.68E-04
PCB 114	ND	2.10E+1	1.53E-02	—	1.28E+00	0.00003	3.83E-05
PCB 118	8.5E+01	5.20E+2	3.79E-01	1.53E-03	3.18E+01	0.00003	9.53E-04
PCB 156	3.1E+01	9.90E+1	7.23E-02	5.58E-04	6.07E+00	0.00003	1.82E-04
PCB 157	ND	1.60E+1	1.17E-02	—	9.73E-01	0.00003	2.92E-05
PCB 167	1.3E+01	6.30E+1	4.60E-02	2.34E-04	3.85E+00	0.00003	1.16E-04
PCB 169	ND	3.20E+0	2.34E-03	—	1.95E-01	0.03	5.84E-03
Congener total: [6]							7.72E-03

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse (kg/day) = 0.000018 kg/day. See Table L5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 L5.4.2 for home range.
BW = body weight (kg) = 0.012 kg. See Table L5.4.2 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
ND = not detected

Table L5.4.10
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 105	3.3E+01	1.5E+02	6.92E-02	3.63E-04	9.94E+00	0.00003	2.98E-04
PCB 114	ND	3.5E+00	1.61E-03	—	2.31E-01	0.00003	6.92E-06
PCB 118	5.1E+01	2.7E+02	1.25E-01	5.61E-04	1.79E+01	0.00003	5.36E-04
PCB 156	1.3E+01	1.5E+01	6.92E-03	1.43E-04	1.01E+00	0.00003	3.03E-05
PCB 157	ND	3.2E+00	1.48E-03	—	2.11E-01	0.00003	6.33E-06
PCB 167	5.2E+00	9.0E+00	4.15E-03	5.72E-05	6.01E-01	0.00003	1.80E-05
PCB 189	4.3E+00	ND	—	4.73E-05	6.76E-03	0.00003	2.03E-07
Congener total: [(6)]							8.96E-04
South							
PCB 105	2.1E+01	1.3E+02	5.92E-02	2.31E-04	8.49E+00	0.00003	2.55E-04
PCB 114	ND	5.4E+00	2.46E-03	—	3.51E-01	0.00003	1.05E-05
PCB 118	2.9E+01	1.8E+02	8.20E-02	3.19E-04	1.18E+01	0.00003	3.53E-04
PCB 156	ND	2.1E+01	9.57E-03	—	1.37E+00	0.00003	4.10E-05
PCB 157	ND	4.8E+00	2.19E-03	—	3.12E-01	0.00003	9.37E-06
PCB 167	ND	1.2E+01	5.47E-03	—	7.81E-01	0.00003	2.34E-05
Congener total: [(6)]							6.92E-04
Southwest							
PCB 105	1.1E+01	1.3E+01	5.57E-03	1.21E-04	8.13E-01	0.00003	2.44E-05
PCB 118	1.5E+01	2.1E+01	9.00E-03	1.65E-04	1.31E+00	0.00003	3.93E-05
PCB 156	ND	2.3E+00	9.86E-04	—	1.41E-01	0.00003	4.22E-06
Congener total: [(6)]							6.79E-05
B-18 Landfill							
PCB 105	6.2E+01	3.1E+02	1.32E-01	6.82E-04	1.90E+01	0.00003	5.69E-04
PCB 114	ND	2.1E+01	8.95E-03	—	1.28E+00	0.00003	3.84E-05
PCB 118	8.5E+01	5.2E+02	2.22E-01	9.35E-04	3.18E+01	0.00003	9.54E-04
PCB 156	3.1E+01	9.9E+01	4.22E-02	3.41E-04	6.08E+00	0.00003	1.82E-04
PCB 157	ND	1.6E+01	6.82E-03	—	9.75E-01	0.00003	2.92E-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	ND	3.2E+00	1.36E-03	—	1.95E-01	0.03	5.85E-03
Congener total: [(6)]							7.74E-03

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.

SIR_{mouse} = soil ingestion rate for mouse (kg/day) = 0.000011 kg/day. See Table L5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 L5.4.2 for home range.

BW = body weight (kg) = 0.007 kg. See Table L5.4.2 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
ND = not detected

Table L.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 105	6.79	3.3E+01	0.97	9.31E-02	6.60E-04	2.34E+00	0.00003	7.03E-05
PCB 118	7.12	5.1E+01	1.01	1.49E-01	1.02E-03	3.76E+00	0.00003	1.13E-04
PCB 156	7.60	1.3E+01	1.07	4.02E-02	2.60E-04	1.01E+00	0.00003	3.04E-05
PCB 167	7.50	5.2E+00	1.06	1.59E-02	1.04E-04	4.00E-01	0.00003	1.20E-05
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]								2.36E-04
South								
PCB 105	6.79	2.1E+01	0.97	5.92E-02	4.20E-04	1.49E+00	0.00003	4.47E-05
PCB 118	7.12	2.9E+01	1.01	8.49E-02	5.80E-04	2.14E+00	0.00003	6.41E-05
Congener total: [8]								1.09E-04
Southwest								
PCB 105	6.79	1.1E+01	0.97	3.10E-02	2.20E-04	7.81E-01	0.00003	2.34E-05
PCB 118	7.12	1.5E+01	1.01	4.39E-02	3.00E-04	1.11E+00	0.00003	3.32E-05
Congener total: [8]								5.66E-05
B-18 Landfill								
PCB 105	6.79	6.2E+01	0.97	1.75E-01	1.24E-03	4.40E+00	0.00003	1.32E-04
PCB 118	7.12	8.5E+01	1.01	2.49E-01	1.70E-03	6.27E+00	0.00003	1.88E-04
PCB 156	7.60	3.1E+01	1.07	9.60E-02	6.20E-04	2.41E+00	0.00003	7.24E-05
PCB 167	7.50	1.3E+01	1.06	3.98E-02	2.60E-04	1.00E+00	0.00003	3.00E-05
Congener total: [8]								4.23E-04

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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} x BAF_{inv} x FIR_{inv}) + (C_{soil} x SIR_{mouse})] x [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 L5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table L5.4.2 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 L5.4.2 for home range.
BW = body weight (kg) = 0.04 kg. See Table L5.4.2 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 L.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 105	6.79	3.3E+01	0.97	4.81E-02	3.30E-04	2.42E+00	0.00003	7.27E-05
PCB 118	7.12	5.1E+01	1.01	7.73E-02	5.10E-04	3.89E+00	0.00003	1.17E-04
PCB 156	7.60	1.3E+01	1.07	2.08E-02	1.30E-04	1.05E+00	0.00003	3.14E-05
PCB 167	7.50	5.2E+00	1.06	8.23E-03	5.20E-05	4.14E-01	0.00003	1.24E-05
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)								2.44E-04
South								
PCB 105	6.79	2.1E+01	0.97	3.06E-02	2.10E-04	1.54E+00	0.00003	4.63E-05
PCB 118	7.12	2.9E+01	1.01	4.39E-02	2.90E-04	2.21E+00	0.00003	6.63E-05
Congener total: (8)								1.13E-04
Southwest								
PCB 105	6.79	1.1E+01	0.97	1.60E-02	1.10E-04	8.08E-01	0.00003	2.42E-05
PCB 118	7.12	1.5E+01	1.01	2.27E-02	1.50E-04	1.14E+00	0.00003	3.43E-05
Congener total: (8)								5.85E-05
B-18 Landfill								
PCB 105	6.79	6.2E+01	0.97	9.04E-02	6.20E-04	4.55E+00	0.00003	1.37E-04
PCB 118	7.12	8.5E+01	1.01	1.29E-01	8.50E-04	6.48E+00	0.00003	1.94E-04
PCB 156	7.60	3.1E+01	1.07	4.96E-02	3.10E-04	2.50E+00	0.00003	7.49E-05
PCB 167	7.50	1.3E+01	1.06	2.06E-02	1.30E-04	1.04E+00	0.00003	3.11E-05
Congener total: (8)								4.37E-04

Notes:

(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.
 SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00001 kg/day. See Table L5.4.2 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 L5.4.2 for home range.
 BW = body weight (kg) = 0.02 kg. See Table L5.4.2 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 L5.4.13
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 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	ND	3.5E+00	0.0061	1.11E-06	—	6.45E-06	0.0001	6.45E-10
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 156	7.60	1.3E+01	1.5E+01	0.0036	2.85E-06	5.20E-03	3.02E-02	0.0001	3.02E-06
PCB 157	7.62	ND	3.2E+00	0.0035	5.83E-07	—	3.39E-06	0.0001	3.39E-10
PCB 167	7.50	5.2E+00	9.0E+00	0.0039	1.87E-06	2.08E-03	1.21E-02	0.00001	1.21E-07
PCB 189	8.27	4.3E+00	ND	0.0016	8.42E-09	1.72E-03	1.00E-02	0.00001	1.00E-07
Congener total: (8)									1.21E-05
South									
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	ND	5.4E+00	0.0061	1.69E-06	—	9.83E-06	0.0001	9.83E-10
PCB 118	7.12	2.9E+01	1.8E+02	0.0055	5.07E-05	1.16E-02	6.77E-02	0.00001	6.77E-07
PCB 156	7.60	ND	2.1E+01	0.0036	3.86E-06	—	2.24E-05	0.0001	2.24E-09
PCB 157	7.62	ND	4.8E+00	0.0035	8.64E-07	—	5.03E-06	0.0001	5.03E-10
PCB 167	7.50	ND	1.2E+01	0.0039	2.43E-06	—	1.41E-05	0.00001	1.41E-10
Congener total: (8)									5.59E-06
Southwest									
PCB 105	6.79	1.1E+01	1.3E+01	0.0069	4.44E-06	4.40E-03	2.56E-02	0.0001	2.56E-06
PCB 118	7.12	1.5E+01	2.1E+01	0.0055	5.57E-06	6.00E-03	3.49E-02	0.00001	3.49E-07
PCB 156	7.60	ND	2.3E+00	0.0036	3.97E-07	—	2.31E-06	0.0001	2.31E-10
Congener total: (8)									2.91E-06
B-18 Landfill									
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	ND	2.1E+01	0.0061	6.15E-06	—	3.58E-05	0.0001	3.58E-09
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 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	ND	1.6E+01	0.0035	2.70E-06	—	1.57E-05	0.0001	1.57E-09
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	ND	3.2E+00	0.0043	6.60E-07	—	3.84E-06	0.001	3.84E-09
Congener total: (8)									2.40E-05

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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 = $\{[((C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{owl}] + (C_{soil} \times SIR_{owl})\} \times \{AFF/BW\}$.
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 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 L5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table L5.4.2 for basis/source.
SIR_{owl} = soil ingestion rate for owl (kg/day) = 0.0004 kg/day. See Table L5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 L5.4.2 for home range.
BW = body weight (kg) = 0.172 kg. See Table L5.4.2 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
ND = not detected

Table L5.4.14
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 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	ND	3.5E+00	0.0061	8.74E-07	—	6.94E-06	0.0001	6.94E-10
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 156	7.60	1.3E+01	1.5E+01	0.0036	2.24E-06	3.90E-03	3.10E-02	0.0001	3.10E-06
PCB 157	7.62	ND	3.2E+00	0.0035	4.60E-07	—	3.65E-06	0.0001	3.65E-10
PCB 167	7.50	5.2E+00	9.0E+00	0.0039	1.47E-06	1.56E-03	1.24E-02	0.00001	1.24E-07
PCB 189	8.27	4.3E+00	ND	0.0016	6.63E-09	1.29E-03	1.02E-02	0.00001	1.02E-07
Congener total: (8)									1.24E-05
South									
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	ND	5.4E+00	0.0061	1.33E-06	—	1.06E-05	0.0001	1.06E-09
PCB 118	7.12	2.9E+01	1.8E+02	0.0055	4.00E-05	8.70E-03	6.94E-02	0.00001	6.94E-07
PCB 156	7.60	ND	2.1E+01	0.0036	3.04E-06	—	2.41E-05	0.0001	2.41E-09
PCB 157	7.62	ND	4.8E+00	0.0035	6.81E-07	—	5.40E-06	0.0001	5.40E-10
PCB 167	7.50	ND	1.2E+01	0.0039	1.92E-06	—	1.52E-05	0.00001	1.52E-10
Congener total: (8)									5.73E-06
Southwest									
PCB 105	6.79	1.1E+01	1.3E+01	0.0069	3.50E-06	3.30E-03	2.62E-02	0.0001	2.62E-06
PCB 118	7.12	1.5E+01	2.1E+01	0.0055	4.39E-06	4.50E-03	3.57E-02	0.00001	3.57E-07
PCB 156	7.60	ND	2.3E+00	0.0036	3.13E-07	—	2.49E-06	0.0001	2.49E-10
Congener total: (8)									2.98E-06
B-18 Landfill									
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	ND	2.1E+01	0.0061	4.85E-06	—	3.85E-05	0.0001	3.85E-09
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 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	ND	1.6E+01	0.0035	2.12E-06	—	1.69E-05	0.0001	1.69E-09
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	ND	3.2E+00	0.0043	5.20E-07	—	4.13E-06	0.001	4.13E-09
Congener total: (8)									2.46E-05

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.
SIR$_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table L5.4.2 for basis/source.
SIR$_{owl}$ = soil ingestion rate for owl (kg/day) = 0.0003 kg/day. See Table L5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 L5.4.2 for home range.
BW = body weight (kg) = 0.126 kg. See Table L5.4.2 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
ND = not detected

Table L5.4.15
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 105	3.3E+01	0.20	3.43E-01	9.90E-03	2.80E+00	0.0001	2.80E-04
PCB 118	5.1E+01	0.20	5.30E-01	1.53E-02	4.33E+00	0.00001	4.33E-05
PCB 156	1.3E+01	0.20	1.35E-01	3.90E-03	1.10E+00	0.0001	1.10E-04
PCB 167	5.2E+00	0.20	5.41E-02	1.56E-03	4.42E-01	0.00001	4.42E-06
PCB 189	4.3E+00	0.20	4.47E-02	1.29E-03	3.65E-01	0.00001	3.65E-06
Congener total: [7]							4.42E-04
South							
PCB 105	2.1E+01	0.20	2.18E-01	6.30E-03	1.78E+00	0.0001	1.78E-04
PCB 118	2.9E+01	0.20	3.02E-01	8.70E-03	2.46E+00	0.00001	2.46E-05
Congener total: [7]							2.03E-04
Southwest							
PCB 105	1.1E+01	0.20	1.14E-01	3.30E-03	9.34E-01	0.0001	9.34E-05
PCB 118	1.5E+01	0.20	1.56E-01	4.50E-03	1.27E+00	0.00001	1.27E-05
Congener total: [7]							1.06E-04
B-18 Landfill							
PCB 105	6.2E+01	0.20	6.45E-01	1.86E-02	5.27E+00	0.0001	5.27E-04
PCB 118	8.5E+01	0.20	8.84E-01	2.55E-02	7.22E+00	0.00001	7.22E-05
PCB 156	3.1E+01	0.20	3.22E-01	9.30E-03	2.63E+00	0.0001	2.63E-04
PCB 167	1.3E+01	0.20	1.35E-01	3.90E-03	1.10E+00	0.00001	1.10E-05
Congener total: [7]							8.73E-04

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
(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_{owl}) + (C_{soil} x SIR_{owl})] 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_{owl} = food ingestion rate (mice) for female owl (kg/day) = 0.052. See Table L5.4.2 for basis/source.
SIR_{owl} = soil ingestion rate for female owl (kg/day) = 0.0003 kg/day. See Table L5.4.2 for basis/source.
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table L5.4.2 for basis/source of home range.
BW = body weight (kg) = 0.126 kg. See Table L5.4.2 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 L5.4.16
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 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	ND	3.5E+00	0.99	—	1.52E-02	—	1.36E-01	0.0001	1.36E-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 156	7.60	1.3E+01	1.5E+01	1.07	3.61E-01	6.52E-02	1.95E-02	3.98E+00	0.0001	3.98E-04
PCB 157	7.62	ND	3.2E+00	1.07	—	1.39E-02	—	1.24E-01	0.0001	1.24E-05
PCB 167	7.50	5.2E+00	9.0E+00	1.06	1.43E-01	3.91E-02	7.80E-03	1.69E+00	0.00001	1.69E-05
PCB 189	8.27	4.3E+00	ND	1.15	1.29E-01	—	6.45E-03	1.21E+00	0.00001	1.21E-05
Congener total: [8]										2.06E-03
South										
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	ND	5.4E+00	0.99	—	2.32E-02	—	2.07E-01	0.0001	2.07E-05
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 156	7.60	ND	2.1E+01	1.07	—	9.01E-02	—	8.05E-01	0.0001	8.05E-05
PCB 157	7.62	ND	4.8E+00	1.07	—	2.06E-02	—	1.84E-01	0.0001	1.84E-05
PCB 167	7.50	ND	1.2E+01	1.06	—	5.15E-02	—	4.60E-01	0.00001	4.60E-06
Congener total: [8]										1.27E-03
Southwest										
PCB 105	6.79	1.1E+01	1.3E+01	0.97	2.78E-01	5.25E-02	1.65E-02	3.10E+00	0.0001	3.10E-04
PCB 118	7.12	1.5E+01	2.1E+01	1.01	3.94E-01	8.48E-02	2.25E-02	4.48E+00	0.00001	4.48E-05
PCB 156	7.60	ND	2.3E+00	1.07	—	9.29E-03	—	8.29E-02	0.0001	8.29E-06
Congener total: [8]										3.63E-04
B-18 Landfill										
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	ND	2.1E+01	0.99	—	8.44E-02	—	7.53E-01	0.0001	7.53E-05
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 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	ND	1.6E+01	1.07	—	6.43E-02	—	5.74E-01	0.0001	5.74E-05
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	ND	3.2E+00	1.04	—	1.29E-02	—	1.15E-01	0.001	1.15E-04
Congener total: [8]										4.46E-03

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.
FIR_{plant} = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0049. See Table L5.4.2 for basis/source.
SIR_{lark} = soil ingestion rate for meadowlark = 0.0015 kg/day. See Table L5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 L5.4.2 for home range.
BW = body weight (kg) = 0.112 kg. See Table L5.4.2 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
ND = not detected

Table L5.4.17
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 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	ND	3.5E+00	0.99	—	1.24E-02	—	1.39E-01	0.0001	1.39E-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 156	7.60	1.3E+01	1.5E+01	1.07	2.91E-01	5.32E-02	1.56E-02	4.03E+00	0.0001	4.03E-04
PCB 157	7.62	ND	3.2E+00	1.07	—	1.14E-02	—	1.27E-01	0.0001	1.27E-05
PCB 167	7.50	5.2E+00	9.0E+00	1.06	1.15E-01	3.19E-02	6.24E-03	1.72E+00	0.00001	1.72E-05
PCB 189	8.27	4.3E+00	ND	1.15	1.04E-01	—	5.16E-03	1.22E+00	0.00001	1.22E-05
Congener total: [8]										2.09E-03
South										
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	ND	5.4E+00	0.99	—	1.89E-02	—	2.12E-01	0.0001	2.12E-05
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 156	7.60	ND	2.1E+01	1.07	—	7.36E-02	—	8.23E-01	0.0001	8.23E-05
PCB 157	7.62	ND	4.8E+00	1.07	—	1.68E-02	—	1.88E-01	0.0001	1.88E-05
PCB 167	7.50	ND	1.2E+01	1.06	—	4.20E-02	—	4.70E-01	0.00001	4.70E-06
Congener total: [8]										1.29E-03
Southwest										
PCB 105	6.79	1.1E+01	1.3E+01	0.97	2.25E-01	4.28E-02	1.32E-02	3.14E+00	0.0001	3.14E-04
PCB 118	7.12	1.5E+01	2.1E+01	1.01	3.18E-01	6.92E-02	1.80E-02	4.53E+00	0.00001	4.53E-05
PCB 156	7.60	ND	2.3E+00	1.07	—	7.58E-03	—	8.48E-02	0.0001	8.48E-06
Congener total: [8]										3.68E-04
B-18 Landfill										
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	ND	2.1E+01	0.99	—	6.89E-02	—	7.70E-01	0.0001	7.70E-05
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 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	ND	1.6E+01	1.07	—	5.25E-02	—	5.87E-01	0.0001	5.87E-05
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	ND	3.2E+00	1.04	—	1.05E-02	—	1.17E-01	0.001	1.17E-04
Congener total: [8]										4.53E-03

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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 L5.4.2 for basis/source.
FIR_{plant} = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0040. See Table L5.4.2 for basis/source.
SIR_{lark} = soil ingestion rate for meadowlark = 0.0012 kg/day. See Table L5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 L5.4.2 for home range.
BW = body weight (kg) = 0.0894 kg. See Table L5.4.2 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
ND = not detected

Table L5.4.18
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 105	6.79	0.1384	0.0111	3.53E-01	3.91E-03	0.0001	3.91E-07
PCB 118	7.12	0.1096	0.0088	5.46E-01	4.78E-03	0.00001	4.78E-08
PCB 156	7.60	0.0714	0.0057	1.39E-01	7.95E-04	0.0001	7.95E-08
PCB 167	7.50	0.0787	0.0063	5.56E-02	3.51E-04	0.00001	3.51E-09
PCB 189	8.27	0.0330	0.0026	4.60E-02	1.21E-04	0.00001	1.21E-09
Congener total: (9)							5.23E-07
South							
PCB 105	6.79	0.1384	0.0111	2.25E-01	2.49E-03	0.0001	2.49E-07
PCB 118	7.12	0.1096	0.0088	3.10E-01	2.72E-03	0.00001	2.72E-08
Congener total: (9)							2.76E-07
Southwest							
PCB 105	6.79	0.1384	0.0111	1.18E-01	1.30E-03	0.0001	1.30E-07
PCB 118	7.12	0.1096	0.0088	1.61E-01	1.41E-03	0.00001	1.41E-08
Congener total: (9)							1.44E-07
B-18 Landfill							
PCB 105	6.79	0.1384	0.0111	6.63E-01	7.34E-03	0.0001	7.34E-07
PCB 118	7.12	0.1096	0.0088	9.10E-01	7.97E-03	0.00001	7.97E-08
PCB 156	7.60	0.0714	0.0057	3.32E-01	1.89E-03	0.0001	1.89E-07
PCB 167	7.50	0.0787	0.0063	1.39E-01	8.76E-04	0.00001	8.76E-09
Congener total: (9)							1.01E-06

Notes:

(1) Includes only congeners detected at or above the reporting limit.

(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 L5.4.15.

(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 L5.4.19
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 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	1.24E-02	1.21E-04	0.0001	1.21E-08
PCB 118	7.12	0.1096	0.0088	2.10E+00	1.84E-02	0.00001	1.84E-07
PCB 156	7.60	0.0714	0.0057	3.60E-01	2.06E-03	0.0001	2.06E-07
PCB 157	7.62	0.0700	0.0056	1.14E-02	6.36E-05	0.0001	6.36E-09
PCB 167	7.50	0.0787	0.0063	1.53E-01	9.66E-04	0.00001	9.66E-09
PCB 189	8.27	0.0330	0.0026	1.09E-01	2.88E-04	0.00001	2.88E-09
Congener total: (9)							1.80E-06
South							
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	1.89E-02	1.84E-04	0.0001	1.84E-08
PCB 118	7.12	0.1096	0.0088	1.28E+00	1.12E-02	0.00001	1.12E-07
PCB 156	7.60	0.0714	0.0057	7.36E-02	4.20E-04	0.0001	4.20E-08
PCB 157	7.62	0.0700	0.0056	1.68E-02	9.42E-05	0.0001	9.42E-09
PCB 167	7.50	0.0787	0.0063	4.20E-02	2.65E-04	0.00001	2.65E-09
Congener total: (9)							1.19E-06
Southwest							
PCB 105	6.79	0.1384	0.0111	2.81E-01	3.11E-03	0.0001	3.11E-07
PCB 118	7.12	0.1096	0.0088	4.05E-01	3.55E-03	0.00001	3.55E-08
PCB 156	7.60	0.0714	0.0057	7.58E-03	4.33E-05	0.0001	4.33E-09
Congener total: (9)							3.51E-07
B-18 Landfill							
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	6.89E-02	6.71E-04	0.0001	6.71E-08
PCB 118	7.12	0.1096	0.0088	3.61E+00	3.16E-02	0.00001	3.16E-07
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	5.25E-02	2.94E-04	0.0001	2.94E-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	1.05E-02	7.19E-05	0.001	7.19E-08
Congener total: (9)							3.73E-06

Notes:

(1) Includes only congeners detected at or above the reporting limit.

(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 L.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 L5.4.20
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 105	3.3E+01	1.26	4.16E+01	0.0001	4.16E-03
PCB 118	5.1E+01	1.26	6.43E+01	0.00001	6.43E-04
PCB 156	1.3E+01	1.26	1.64E+01	0.0001	1.64E-03
PCB 167	5.2E+00	1.26	6.55E+00	0.00001	6.55E-05
PCB 189	4.3E+00	1.26	5.42E+00	0.00001	5.42E-05
Congener total: [7]					6.56E-03
South					
PCB 105	2.1E+01	1.26	2.65E+01	0.0001	2.65E-03
PCB 118	2.9E+01	1.26	3.65E+01	0.00001	3.65E-04
Congener total: [7]					3.01E-03
Southwest					
PCB 105	1.1E+01	1.26	1.39E+01	0.0001	1.39E-03
PCB 118	1.5E+01	1.26	1.89E+01	0.00001	1.89E-04
Congener total: [7]					1.58E-03
B-18 Landfill					
PCB 105	6.2E+01	1.26	7.81E+01	0.0001	7.81E-03
PCB 118	8.5E+01	1.26	1.07E+02	0.00001	1.07E-03
PCB 156	3.1E+01	1.26	3.91E+01	0.0001	3.91E-03
PCB 167	1.3E+01	1.26	1.64E+01	0.00001	1.64E-04
Congener total: [7]					1.30E-02

Notes:
(1) Includes only congeners detected at or above the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
(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 L.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	1.60E-06	2.67E-06	1	10	2E-6	3E-6	2E-7	3E-7
South	7.53E-07	1.25E-06	1	10	8E-7	1E-6	8E-8	1E-7
Southwest	3.90E-07	6.50E-07	1	10	4E-7	7E-7	4E-8	7E-8
B-18 Landfill	2.89E-06	4.82E-06	1	10	3E-6	5E-6	3E-7	5E-7
Diet of Carnivorous Prey								
BTF Approach								
Southeast	1.60E-06	2.67E-06	1	10	2E-6	3E-6	2E-7	3E-7
South	7.52E-07	1.25E-06	1	10	8E-7	1E-6	8E-8	1E-7
Southwest	3.91E-07	6.51E-07	1	10	4E-7	7E-7	4E-8	7E-8
B-18 Landfill	2.87E-06	4.78E-06	1	10	3E-6	5E-6	3E-7	5E-7
BAF Approach								
Southeast	3.99E-05	6.66E-05	1	10	4E-5	7E-5	4E-6	7E-6
South	1.88E-05	3.13E-05	1	10	2E-5	3E-5	2E-6	3E-6
Southwest	9.75E-06	1.63E-05	1	10	1E-5	2E-5	1E-6	2E-6
B-18 Landfill	7.16E-05	1.19E-04	1	10	7E-5	1E-4	7E-6	1E-5

Notes:
(1) TEDs for adults from Table L5.4.3 for herbivorous prey,
and from Tables L5.4.5 and L5.4.7 for carnivorous prey (BTF and BAF approaches, respectively).
(2) TEDs for juveniles from Table L5.4.4 for herbivorous prey,
and from Tables L5.4.6 and L5.4.8 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 L5.4.22
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	8.94E-04	8.96E-04	1	10	9E-4	9E-4	9E-5	9E-5
South	6.91E-04	6.92E-04	1	10	7E-4	7E-4	7E-5	7E-5
Southwest	6.77E-05	6.79E-05	1	10	7E-5	7E-5	7E-6	7E-6
B-18 Landfill	7.72E-03	7.74E-03	1	10	8E-3	8E-3	8E-4	8E-4

Notes:
(1) TEDs from Table L5.4.9 for adult and Table L5.4.10 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 L5.4.23
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	2.36E-04	2.44E-04	1	10	2E-4	2E-4	2E-5	2E-5
South	1.09E-04	1.13E-04	1	10	1E-4	1E-4	1E-5	1E-5
Southwest	5.66E-05	5.85E-05	1	10	6E-5	6E-5	6E-6	6E-6
B-18 Landfill	4.23E-04	4.37E-04	1	10	4E-4	4E-4	4E-5	4E-5

Notes:
(1) TEDs from Table L5.4.11 for adult and Table L5.4.12 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 L5.4.24
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	1.21E-05	1.24E-05	10	100	1E-6	1E-6	1E-7	1E-7
South	5.59E-06	5.73E-06	10	100	6E-7	6E-7	6E-8	6E-8
Southwest	2.91E-06	2.98E-06	10	100	3E-7	3E-7	3E-8	3E-8
B-18 Landfill	2.40E-05	2.46E-05	10	100	2E-6	2E-6	2E-7	2E-7
Diet of Carnivorous Prey								
BAF Approach								
Southeast	NC	4.42E-04	10	100	NC	4E-5	NC	4E-6
South	NC	2.03E-04	10	100	NC	2E-5	NC	2E-6
Southwest	NC	1.06E-04	10	100	NC	1E-5	NC	1E-6
B-18 Landfill	NC	8.73E-04	10	100	NC	9E-5	NC	9E-6

Notes:
(1) TEDs for adults with a diet of herbivorous prey are from Table L5.4.13 for adult males and Table L5.4.14 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 L5.4.15 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).

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 L5.4.25
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	2.06E-03	2.09E-03	10	100	2E-4	2E-4	2E-5	2E-5
South	1.27E-03	1.29E-03	10	100	1E-4	1E-4	1E-5	1E-5
Southwest	3.63E-04	3.68E-04	10	100	4E-5	4E-5	4E-6	4E-6
B-18 Landfill	4.46E-03	4.53E-03	10	100	4E-4	5E-4	4E-5	5E-5

Notes:
(1) TEDs from Table L5.4.16 for adult male and Table L5.4.17 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 L.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 Exposure Area	TEC in Egg (ng/kg wet wt) (1)	TRV (ng/kg wet wt) Low (2)	TRV (ng/kg wet wt) High (2)	HQ_{low} (3) Egg/ Embryo	HQ_{high} (4) Egg/ Embryo
Burrowing Owl					
BTF Approach					
Southeast	5.23E-07	66	150	8E-9	3E-9
South	2.76E-07	66	150	4E-9	2E-9
Southwest	1.44E-07	66	150	2E-9	1E-9
B-18 Landfill	1.01E-06	66	150	2E-8	7E-9
BAF Approach					
Southeast	6.56E-03	66	150	1E-4	4E-5
South	3.01E-03	66	150	5E-5	2E-5
Southwest	1.58E-03	66	150	2E-5	1E-5
B-18 Landfill	1.30E-02	66	150	2E-4	9E-5
Western Meadowlark					
BTF Approach					
Southeast	1.80E-06	66	150	3E-8	1E-8
South	1.19E-06	66	150	2E-8	8E-9
Southwest	3.51E-07	66	150	5E-9	2E-9
B-18 Landfill	3.73E-06	66	150	6E-8	2E-8
BAF Approach					
Southeast	6.56E-03	66	150	1E-4	4E-5
South	3.01E-03	66	150	5E-5	2E-5
Southwest	1.58E-03	66	150	2E-5	1E-5
B-18 Landfill	1.30E-02	66	150	2E-4	9E-5

Notes:

(1) Egg TECs based on the BTF approach are from Table L5.4.18 for the burrowing owl, Table L5.4.19 for the meadowlark. Egg TECs based on the BAF approach are from Table L5.4.20 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

Table L5.4.27
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	2E-6	3E-6		2E-7	3E-7	
South	8E-7	1E-6		8E-8	1E-7	
Southwest	4E-7	7E-7		4E-8	7E-8	
B-18 Landfill	3E-6	5E-6		3E-7	5E-7	
Carnivorous prey						
Southeast	2E-6	3E-6		2E-7	3E-7	
South	8E-7	1E-6		8E-8	1E-7	
Southwest	4E-7	7E-7		4E-8	7E-8	
B-18 Landfill	3E-6	5E-6		3E-7	5E-7	
BAF Approach						
Carnivorous prey						
Southeast	4E-5	7E-5		4E-6	7E-6	
South	2E-5	3E-5		2E-6	3E-6	
Southwest	1E-5	2E-5		1E-6	2E-6	
B-18 Landfill	7E-5	1E-4		7E-6	1E-5	
San Joaquin Pocket Mouse	Adult	Juvenile		Adult	Juvenile	
Southeast	9E-4	9E-4		9E-5	9E-5	
South	7E-4	7E-4		7E-5	7E-5	
Southwest	7E-5	7E-5		7E-6	7E-6	
B-18 Landfill	8E-3	8E-3		8E-4	8E-4	
Tulare Grasshopper Mouse	Adult	Juvenile		Adult	Juvenile	
Southeast	2E-4	2E-4		2E-5	2E-5	
South	1E-4	1E-4		1E-5	1E-5	
Southwest	6E-5	6E-5		6E-6	6E-6	
B-18 Landfill	4E-4	4E-4		4E-5	4E-5	
Burrowing Owl	Adult Male	Female/Juvenile	Egg	Adult Male	Female/Juvenile	Egg
BTF Approach						
Herbivorous prey						
Southeast	1E-6	1E-6	8E-9	1E-7	1E-7	3E-9
South	6E-7	6E-7	4E-9	6E-8	6E-8	2E-9
Southwest	3E-7	3E-7	2E-9	3E-8	3E-8	1E-9
B-18 Landfill	2E-6	2E-6	2E-8	2E-7	2E-7	7E-9
BAF Approach						
Carnivorous prey (1)						
Southeast	NC	4E-5	1E-4	NC	4E-6	4E-5
South	NC	2E-5	5E-5	NC	2E-6	2E-5
Southwest	NC	1E-5	2E-5	NC	1E-6	1E-5
B-18 Landfill	NC	9E-5	2E-4	NC	9E-6	9E-5

Table L5.4.27
Summary of Hazard Quotients
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor / **Exposure Area**	**HQ_{low}**			**HQ_{high}**		
Western Meadowlark	Adult Male	Female/Juvenile	Egg	Adult Male	Female/Juvenile	Egg
BTF Approach						
Southeast	2E-4	2E-4	3E-8	2E-5	2E-5	1E-8
South	1E-4	1E-4	2E-8	1E-5	1E-5	8E-9
Southwest	4E-5	4E-5	5E-9	4E-6	4E-6	2E-9
B-18 Landfill	4E-4	5E-4	6E-8	4E-5	5E-5	2E-8
BAF Approach						
Southeast	NC	NC	1E-4	NC	NC	4E-5
South	NC	NC	5E-5	NC	NC	2E-5
Southwest	NC	NC	2E-5	NC	NC	1E-5
B-18 Landfill	NC	NC	2E-4	NC	NC	9E-5

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 0.008 (for the San Joaquin Pocket mouse in the B-18 Landfill exposure area).

HQ = hazard quotient
HQ_{low} = exposure dose / NOAEL-based TRV
HQ_{high} = exposure dose / LOAEL-based TRV
NC = not calculated

Table L5.4.28
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**
0.0032	0.00063	0.00033	0.00087	0.00054	0.00093	0.0063	0.0057	0.0023

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 M5.3.1
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 114	1.6E+00	3.00E-05	4.80E-05
	PCB 123	5.4E+00	3.00E-05	1.62E-04
	PCB 126	1.5E+00	1.00E-01	1.50E-01
	PCB 157	2.0E+00	3.00E-05	6.00E-05
	PCB Total TEC	—	—	**1.52E-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 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 189	1.6E+00	3.00E-05	4.80E-05
	PCB Total TEC	—	—	**1.21E-01**
Southwest	PCB 77	2.6E+00	1.00E-04	2.60E-04
	PCB 114	1.0E+00	3.00E-05	3.00E-05
	PCB 123	1.2E+00	3.00E-05	3.60E-05
	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 189	1.2E+00	3.00E-05	3.60E-05
	PCB Total TEC	—	—	**5.64E-04**

Notes:

The concentrations of the 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 M5.3.2
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 114	8.7E+00	3.00E-05	2.61E-04
	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	—	—	**1.30E+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 123	7.3E+00	3.00E-05	2.20E-04
	PCB 126	7.1E+00	1.00E-01	7.10E-01
	PCB 167	2.4E+01	3.00E-05	7.22E-04
	PCB 169	6.6E-01	3.00E-02	1.98E-02
	PCB Total TEC	—	—	**7.39E-01**
Southwest	PCB 77	9.2E+00	1.00E-04	9.23E-04
	PCB 105	1.9E+01	3.00E-05	5.77E-04
	PCB 118	2.9E+01	3.00E-05	8.74E-04
	PCB 123	1.6E+00	3.00E-05	4.85E-05
	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 Total TEC	—	—	**2.92E-03**

Notes:

The concentrations of the 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 M5.3.3
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 114	2.3E-11	—	3.00E-05	6.82E-16
		PCB 123	4.9E-11	—	3.00E-05	1.48E-15
		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
	February	PCB 77	9.5E-11	—	1.00E-04	9.46E-15
		PCB 81	2.6E-11	—	3.00E-04	7.85E-15
		PCB 114	1.5E-11	—	3.00E-05	4.56E-16
		PCB 123	3.8E-11	—	3.00E-05	1.13E-15
		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 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 114	5.6E-11	—	3.00E-05	1.68E-15
		PCB 123	1.3E-10	—	3.00E-05	4.00E-15
		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
	April	PCB 77	2.7E-10	—	1.00E-04	2.71E-14
		PCB 114	4.6E-11	—	3.00E-05	1.37E-15
		PCB 123	6.0E-11	—	3.00E-05	1.79E-15
		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
	May	PCB 77	4.9E-10	—	1.00E-04	4.85E-14
		PCB 123	8.9E-11	—	3.00E-05	2.68E-15
		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
	June	PCB 77	3.4E-10	—	1.00E-04	3.42E-14
		PCB 81	1.0E-10	—	3.00E-04	3.03E-14
		PCB 114	7.1E-11	—	3.00E-05	2.14E-15
		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 189	3.0E-12	—	3.00E-05	9.05E-17

Table M5.3.3
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 114	5.1E-11	—	3.00E-05	1.54E-15
		PCB 123	7.0E-11	—	3.00E-05	2.10E-15
		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
	August	PCB 77	5.2E-10	—	1.00E-04	5.22E-14
		PCB 81	8.3E-11	—	3.00E-04	2.50E-14
		PCB 114	7.6E-11	—	3.00E-05	2.27E-15
		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
	September	PCB 77	4.6E-10	—	1.00E-04	4.60E-14
		PCB 81	7.3E-11	—	3.00E-04	2.20E-14
		PCB 114	8.7E-11	—	3.00E-05	2.60E-15
		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 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 114	1.0E-10	—	3.00E-05	3.10E-15
		PCB 123	1.2E-10	—	3.00E-05	3.61E-15
		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 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 114	4.5E-11	—	3.00E-05	1.36E-15
		PCB 123	9.0E-11	—	3.00E-05	2.69E-15
		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 189	7.6E-12	—	3.00E-05	2.29E-16
	December	PCB 77	1.4E-10	—	1.00E-04	1.42E-14
		PCB 114	2.6E-11	—	3.00E-05	7.75E-16
		PCB 123	5.6E-11	—	3.00E-05	1.67E-15
		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 Total TEC	—	—	—	**4.14E-13**

Table M5.3.3
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 114	2.5E-11	—	3.00E-05	7.39E-16
		PCB 123	6.3E-11	1.79	3.00E-05	3.41E-15
		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 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 114	4.7E-11	—	3.00E-05	1.42E-15
		PCB 123	9.2E-11	1.79	3.00E-05	4.92E-15
		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 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 114	1.7E-11	—	3.00E-05	5.12E-16
		PCB 123	3.9E-11	1.79	3.00E-05	2.10E-15
		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
	April (2)	PCB 77	2.6E-10	—	1.00E-04	2.57E-14
		PCB 123	4.9E-11	—	3.00E-05	1.48E-15
		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
	May	PCB 77	1.3E-10	2.07	1.00E-04	2.76E-14
		PCB 123	3.1E-11	1.79	3.00E-05	1.67E-15
		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
	June	PCB 77	3.0E-11	2.07	1.00E-04	6.29E-15
		PCB 114	3.8E-11	—	3.00E-05	1.13E-15
		PCB 123	5.5E-11	1.79	3.00E-05	2.97E-15
		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 189	3.1E-12	—	3.00E-05	9.36E-17

Table M5.3.3
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 123	3.2E-11	1.79	3.00E-05	1.73E-15
		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
	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 114	3.3E-11	—	3.00E-05	9.87E-16
		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
	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 114	6.8E-11	—	3.00E-05	2.05E-15
		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 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 114	5.6E-11	—	3.00E-05	1.68E-15
		PCB 123	8.0E-11	1.79	3.00E-05	4.32E-15
		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
	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 114	3.6E-11	—	3.00E-05	1.07E-15
		PCB 123	9.2E-11	1.79	3.00E-05	4.96E-15
		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 Total TEC	—	—	—	**2.86E-13**

Table M5.3.3
Toxicity Equivalence Concentrations - Air
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

The concentrations of the 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 M5.3.4
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	6.48E-02	6.34	2.23E-04	8.205E-05	298.1	-1.654	1.37E+07	1.42E+05
PCB 114	5.45E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+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	1.26E-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	6.40E-03	7.41	1.62E-04	8.205E-05	298.1	-1.654	2.61E+08	2.69E+06
PCB 189	4.78E-03	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	4.47E-02	6.34	2.23E-04	8.205E-05	298.1	-1.654	1.37E+07	1.42E+05
PCB 114	4.00E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+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	9.13E-03	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	7.39E-02	7.50	1.62E-04	8.205E-05	298.1	-1.654	3.25E+08	3.35E+06
PCB 169	8.55E-03	7.41	1.62E-04	8.205E-05	298.1	-1.654	2.61E+08	2.69E+06
PCB 189	5.32E-03	8.27	1.38E-04	8.205E-05	298.1	-1.654	2.52E+09	2.60E+07

Table M5.3.4
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 M5.3.3 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])

ρ_{air} - density of air (1.19 g/L)

ρ_{forage} - 770 g/L

f_{water} - 0.85 (fraction of forage that is water)

BTF - Biotransfer factor

Table M5.3.4
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	6.15E-02	0.01	1190	7.32E-02
PCB 114	1.7E-04	5.47E-06	7.22E-09	3.50E-06	0.92	5.03E-02	0.01	1190	3.38E-01
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	1.05E-02	0.01	1190	7.02E-02
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	3.61E-03	0.01	1190	8.15E-02
PCB 189	1.7E-04	1.30E-07	1.72E-10	3.50E-06	0.22	1.07E-03	0.01	1190	2.34E-01
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	4.24E-02	0.01	1190	5.05E-02
PCB 114	1.7E-04	5.47E-06	7.22E-09	3.50E-06	0.92	3.69E-02	0.01	1190	2.48E-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	7.59E-03	0.01	1190	5.09E-02
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	4.16E-02	0.01	1190	1.17E+00
PCB 169	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.82E-03	0.01	1190	1.09E-01
PCB 189	1.7E-04	1.30E-07	1.72E-10	3.50E-06	0.22	1.19E-03	0.01	1190	2.60E-01

Table M5.3.4
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 M5.3.4
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	3.28E-03	315,360	0.39	0.147	0.3	5.00E+04	4.07E+02	18	2.24	1.01E-02
PCB 114	4.15E-03	315,360	0.39	0.147	0.3	5.00E+04	5.14E+02	18	2.24	1.27E-02
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	2.12E-03	315,360	0.39	0.147	0.3	5.00E+04	2.63E+02	18	2.24	6.52E-03
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	2.80E-03	315,360	0.39	0.147	0.3	5.00E+04	3.46E+02	18	2.24	8.59E-03
PCB 189	3.71E-03	315,360	0.39	0.147	0.3	5.00E+04	4.60E+02	18	2.24	1.14E-02
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	2.26E-03	315,360	0.39	0.147	0.3	5.00E+04	2.80E+02	18	2.24	6.95E-03
PCB 114	3.04E-03	315,360	0.39	0.147	0.3	5.00E+04	3.77E+02	18	2.24	9.34E-03
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	1.54E-03	315,360	0.39	0.147	0.3	5.00E+04	1.91E+02	18	2.24	4.73E-03
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	3.23E-02	315,360	0.39	0.147	0.3	5.00E+04	4.00E+03	18	2.24	9.92E-02
PCB 169	3.74E-03	315,360	0.39	0.147	0.3	5.00E+04	4.63E+02	18	2.24	1.15E-02
PCB 189	4.13E-03	315,360	0.39	0.147	0.3	5.00E+04	5.11E+02	18	2.24	1.27E-02

Table M5.3.4
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 M5.3.4
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	8.33E-02	0.0003	2.50E-05
PCB 114	3.51E-01	0.00003	1.05E-05
PCB 123	5.32E-01	0.00003	1.60E-05
PCB 126	7.67E-02	0.1	7.67E-03
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	9.01E-02	0.03	2.70E-03
PCB 189	2.45E-01	0.00003	7.36E-06
Total Congeners: (4)			**1.23E-02**
MSP			
PCB 77	1.87E+01	0.0001	1.87E-03
PCB 81	5.74E-02	0.0003	1.72E-05
PCB 114	2.57E-01	0.00003	7.71E-06
PCB 123	6.55E-01	0.00003	1.96E-05
PCB 126	5.57E-02	0.1	5.57E-03
PCB 156	2.69E+00	0.00003	8.06E-05
PCB 157	3.60E-01	0.00003	1.08E-05
PCB 167	1.27E+00	0.00003	3.82E-05
PCB 169	1.20E-01	0.03	3.61E-03
PCB 189	2.73E-01	0.00003	8.19E-06
Total Congeners: (4)			**1.12E-02**

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 M5.3.5
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
<u>Southeast</u>											
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 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 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 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	<u>6.24E-12</u>
Total Congeners: [13]											8.47E-09
<u>South</u>											
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 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 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	<u>9.66E-12</u>
Total Congeners: [13]											6.79E-09
<u>Southwest</u>											
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 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 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 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 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	<u>7.25E-12</u>
Total Congeners: [13]											4.32E-11

Table M5.3.5
Derivation of Exposure Point Concentration in Belowground Produce
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes congeners detected at or above the estimated detection limit and below the reporting limit.

(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 M5.3.6
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 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 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	7.6	0.0136	1	1.33E-06	0.00003	4.00E-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	—	1	7.5	0.0150	1	7.55E-07	0.00003	2.26E-11
PCB 169	0.25	11.77	7.5E-07	0.5	—	1	7.41	0.0163	1	3.58E-08	0.03	1.07E-09
PCB 189	0.25	11.77	8.6E-06	0.5	—	1	8.27	0.0063	1	1.59E-07	0.00003	4.78E-12
Total Congeners: [11]												8.83E-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 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	—	0.5	6.8E-06	1	7.6	0.0136	1	1.15E-08	0.00003	3.46E-13
PCB 157	0.25	11.77	—	0.5	1.8E-06	1	7.62	0.0133	1	2.99E-09	0.00003	8.98E-14
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	—	1	7.41	0.0163	1	3.16E-08	0.03	9.47E-10
PCB 189	0.25	11.77	—	0.5	1.6E-06	1	8.27	0.0063	1	1.25E-09	0.00003	3.76E-14
Total Congeners: [11]												5.04E-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 105	0.25	11.77	1.9E-05	0.5	—	1	6.79	0.0263	1	1.49E-06	0.00003	4.46E-11
PCB 114	0.25	11.77	—	0.5	1.0E-06	1	6.98	0.0231	1	2.89E-09	0.00003	8.67E-14
PCB 118	0.25	11.77	2.9E-05	0.5	—	1	7.12	0.0208	1	1.78E-06	0.00003	5.35E-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 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 189	0.25	11.77	—	0.5	1.2E-06	1	8.27	0.0063	1	9.39E-10	0.00003	2.82E-14
Total Congeners: [11]												2.03E-10

Table M5.3.6
Derivation of Exposure Point Concentrations in Beef Tissue
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes congeners in soil and vegetation detected at or above the estimated detection limit and below the reporting limit.

(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.

(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 M5.3.7
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 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 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	7.6	0.0029	1	4.84E-07	0.00003	1.45E-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	—	1	7.5	0.0031	1	2.74E-07	0.00003	8.22E-12
PCB 169	0.25	20.3	7.5E-07	0.4	—	1	7.41	0.0034	1	1.30E-08	0.03	3.90E-10
PCB 189	0.25	20.3	8.6E-06	0.4	—	1	8.27	0.0013	1	5.78E-08	0.00003	1.73E-12
Total Congeners: (11)												3.20E-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 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	—	0.4	6.8E-06	1	7.6	0.0029	1	1.94E-09	0.00003	5.83E-14
PCB 157	0.25	20.3	—	0.4	1.8E-06	1	7.62	0.0028	1	5.04E-10	0.00003	1.51E-14
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	—	1	7.41	0.0034	1	1.15E-08	0.03	3.44E-10
PCB 189	0.25	20.3	—	0.4	1.6E-06	1	8.27	0.0013	1	2.11E-10	0.00003	6.33E-15
Total Congeners: (11)												1.82E-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 105	0.25	20.3	1.9E-05	0.4	—	1	6.79	0.0055	1	5.40E-07	0.00003	1.62E-11
PCB 114	0.25	20.3	—	0.4	1.0E-06	1	6.98	0.0049	1	4.87E-10	0.00003	1.46E-14
PCB 118	0.25	20.3	2.9E-05	0.4	—	1	7.12	0.0044	1	6.48E-07	0.00003	1.94E-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 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 189	0.25	20.3	—	0.4	1.2E-06	1	8.27	0.0013	1	1.58E-10	0.00003	4.75E-15
Total Congeners: (11)												7.32E-11

Table M5.3.7
Derivation of Exposure Point Concentrations in Milk
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes congeners in soil and vegetation detected at or above the estimated detection limit and below the reporting limit.

(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.

(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: 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 M5.3.8
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 M5.3.9
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 M5.3.1	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 M5.3.10
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 M5.3.11
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 M5.3.11
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 M5.3.11
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 M5.3.12
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 M5.3.1	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 M5.3.1	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 M5.3.1	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 M5.3.13
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 M5.3.14
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 M5.3.4)	mg/kg	--	Chronic Daily Intake (mg/kg-day) for carcinogens =
				CPRODbg	Belowground Produce Exposure Point Concentration	Modeled From Sampling Data (See Table M5.3.5)	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 M5.3.4)	mg/kg	--	Chronic Daily Intake (mg/kg-day) for carcinogens =
				CPRODbg	Belowground Produce Exposure Point Concentration	Modeled From Sampling Data (See Table M5.3.5)	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 M5.3.15
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 M5.3.6)	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 M5.3.6)	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 M5.3.16
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 M5.3.7)	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 M5.3.17
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	1.52E-07	0.0001	1	70	2.17E-13
South	1.21E-07	0.0001	1	70	1.73E-13
Southwest	5.64E-10	0.0001	1	70	8.05E-16

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	1.52E-07	0.0001	1	70	2.17E-13
South	1.21E-07	0.0001	1	70	1.73E-13
Southwest	5.64E-10	0.0001	1	70	8.05E-16

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	1.52E-07	0.0001	1	70	2.17E-13
South	1.21E-07	0.0001	1	70	1.73E-13
Southwest	5.64E-10	0.0001	1	70	8.05E-16

Notes (Step 1):

(1) Exposure Point Concentration (See Table M5.3.1 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 M5.3.17
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	8.83E-08	0.00122	1	1.08E-10
South	5.04E-08	0.00122	1	6.15E-11
Southwest	2.03E-10	0.00122	1	2.47E-13

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 ($A_{prod\text{-}ag}$) (1) mg/kg	Consumption Rate of Exposed Aboveground Produce ($CR_{prod\text{-}ag}$) (2) kg/kg-day DW	Concentration in Belowground Produce ($A_{prod\text{-}bg}$) (1) mg/kg	Consumption Rate of Belowground Produce ($CR_{prod\text{-}bg}$) (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	8.83E-08	0.00122	1	1.08E-10	1.23E-08	0.00047	8.47E-09	0.00017	1	7.20E-12	3.20E-08	0.01367	1	4.37E-10
South	5.04E-08	0.00122	1	6.15E-11	1.23E-08	0.00047	6.79E-09	0.00017	1	6.91E-12	1.82E-08	0.01367	1	2.49E-10
Southwest	2.03E-10	0.00122	1	2.47E-13	1.23E-08	0.00047	4.32E-11	0.00017	1	5.77E-12	7.32E-11	0.01367	1	1.00E-12

FUTURE RESIDENT

Exposure Area	Concentration in Exposed Aboveground Produce ($A_{prod\text{-}ag}$) (1) mg/kg	Consumption Rate of Exposed Aboveground Produce ($CR_{prod\text{-}ag}$) (2) kg/kg-day DW	Concentration in Belowground Produce ($A_{prod\text{-}bg}$) (1) mg/kg	Consumption Rate of Belowground Produce ($CR_{prod\text{-}bg}$) (2) kg/kg-day DW	Fraction of Contaminated Produce (F_{prod}) (3)	Daily Intake from Produce (I_{prod}) (5) mg/kg-day
Southeast	1.23E-08	0.00032	8.47E-09	0.00014	1	5.11E-12
South	1.23E-08	0.00032	6.79E-09	0.00014	1	4.87E-12
Southwest	1.23E-08	0.00032	4.32E-11	0.00014	1	3.93E-12

Table M5.3.17
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

Notes (Step 2):

(1) Exposure Point Concentration (See Tables M5.3.4, M5.3.5, M5.3.6, and M5.3.7 for aboveground produce, belowground produce, beef, and milk concentrations, respectively).
Aboveground produce concentration is from sampling location DMS1, the location with the higher 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: $I_{prod} = (A_{prod\text{-}ag} \times CR_{prod\text{-}ag} + A_{prod\text{-}bg} \times CR_{prod\text{-}bg\,)} \times F_{prod}$

where:

I_{prod} - daily intake from produce (mg/kg-day)

$A_{prod\text{-}ag}$ - concentration in exposed aboveground produce (mg/kg)

$A_{prod\text{-}bg}$ - concentration in belowground produce (mg/kg)

$CR_{prod\text{-}ag}$ - consumption rate of exposed aboveground produce (kg/kg-day DW)

$CR_{prod\text{-}bg}$ - 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 M5.3.17
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	6.62E-10	0.83	24	350	40	70	70	0.001	365	1.03E-13
South	6.12E-10	0.83	24	350	40	70	70	0.001	365	9.55E-14
Southwest	4.15E-10	0.83	24	350	40	70	70	0.001	365	6.47E-14

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	6.62E-10	0.83	24	350	40	70	70	0.001	365	1.03E-13
South	6.12E-10	0.83	24	350	40	70	70	0.001	365	9.55E-14
Southwest	4.15E-10	0.83	24	350	40	70	70	0.001	365	6.47E-14

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	6.62E-10	0.83	24	350	30	70	70	0.001	365	7.75E-14
South	6.12E-10	0.83	24	350	30	70	70	0.001	365	7.16E-14
Southwest	4.15E-10	0.83	24	350	30	70	70	0.001	365	4.85E-14

Table M5.3.17
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

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 DMS1, the sampling location containing the higher concentration (see Table M5.3.3).

Modeled particulate concentration for each exposure area is the concentration in soil at that exposure area (see Table M5.3.1) 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 M5.3.17
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	1.03E-13	2.17E-13	1.08E-10	1.08E-10	1.00E+09	2555	0.9	0.3	0.693	1.20E+03
South	9.55E-14	1.73E-13	6.15E-11	6.18E-11	1.00E+09	2555	0.9	0.3	0.693	6.83E+02
Southwest	6.47E-14	8.05E-16	2.47E-13	3.13E-13	1.00E+09	2555	0.9	0.3	0.693	3.46E+00

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	1.03E-13	2.17E-13	1.08E-10	7.20E-12	4.37E-10	5.53E-10	1.00E+09	2555	0.9	0.3	0.693	6.11E+03
South	9.55E-14	1.73E-13	6.15E-11	6.91E-12	2.49E-10	3.18E-10	1.00E+09	2555	0.9	0.3	0.693	3.52E+03
Southwest	6.47E-14	8.05E-16	2.47E-13	5.77E-12	1.00E-12	7.08E-12	1.00E+09	2555	0.9	0.3	0.693	7.83E+01

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	7.75E-14	2.17E-13	5.11E-12	5.40E-12	1.00E+09	2555	0.9	0.3	0.693	5.97E+01
South	7.16E-14	1.73E-13	4.87E-12	5.12E-12	1.00E+09	2555	0.9	0.3	0.693	5.66E+01
Southwest	4.85E-14	8.05E-16	3.93E-12	3.98E-12	1.00E+09	2555	0.9	0.3	0.693	4.40E+01

Table M5.3.17
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

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 x (1 x $(10)^9$) x h x f_1] / [0.693 x 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 x 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 M5.3.17
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	1.20E+03	0.04	0.9	0.688	1	9.4	1	3.15E+00
South	6.83E+02	0.04	0.9	0.688	1	9.4	1	1.80E+00
Southwest	3.46E+00	0.04	0.9	0.688	1	9.4	1	9.11E-03

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	6.11E+03	0.04	0.9	0.688	1	9.4	1	1.61E+01
South	3.52E+03	0.04	0.9	0.688	1	9.4	1	9.27E+00
Southwest	7.83E+01	0.04	0.9	0.688	1	9.4	1	2.06E-01

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	5.97E+01	0.04	0.9	0.688	1	9.4	1	1.57E-01
South	5.66E+01	0.04	0.9	0.688	1	9.4	1	1.49E-01
Southwest	4.40E+01	0.04	0.9	0.688	1	9.4	1	1.16E-01

Table M5.3.17
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

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} = [$C_{milkfat}$ x f_3 x f_4 x IR_{milk} x ED] / [BW_{infant} x 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 M5.3.18
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	Southeast	Ingestion	PCB Total TEC	1.52E-07	mg/kg	4.0E-15	mg/kg-day	1.3E+05	kg-day/mg	5.2E-10	1.1E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.2E-10					NA
			Dermal	PCB Total TEC	1.52E-07	mg/kg	1.3E-14	mg/kg-day	1.3E+05	kg-day/mg	1.7E-09	3.6E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.7E-09					NA
		Exposure Point Total									2.2E-09					NA
	Exposure Medium Total										2.2E-09					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	2.48E-10	ug/m3	1.5E-12	ug/m3	3.8E+01	(ug/m3)-1	5.8E-11	4.3E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.8E-11					NA
		Exposure Point Total									5.8E-11					NA
	Exposure Medium Total										5.8E-11					NA
Soil Total (Southeast)											2.3E-09					NA
Soil	Soil	South	Ingestion	PCB Total TEC	1.21E-07	mg/kg	3.2E-15	mg/kg-day	1.3E+05	kg-day/mg	4.2E-10	9.0E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								4.2E-10					NA
			Dermal	PCB Total TEC	1.21E-07	mg/kg	1.0E-14	mg/kg-day	1.3E+05	kg-day/mg	1.3E-09	2.9E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.3E-09					NA
		Exposure Point Total									1.8E-09					NA
	Exposure Medium Total										1.8E-09					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	1.98E-10	ug/m3	1.2E-12	ug/m3	3.8E+01	(ug/m3)-1	4.7E-11	3.4E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								4.7E-11					NA
		Exposure Point Total									4.7E-11					NA
	Exposure Medium Total										4.7E-11					NA
Soil Total (South)											1.8E-09					NA
Soil	Soil	Southwest	Ingestion	PCB Total TEC	5.64E-10	mg/kg	1.5E-17	mg/kg-day	1.3E+05	kg-day/mg	1.9E-12	4.2E-17	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.9E-12					NA
			Dermal	PCB Total TEC	5.64E-10	mg/kg	4.8E-17	mg/kg-day	1.3E+05	kg-day/mg	6.2E-12	1.3E-16	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								6.2E-12					NA
		Exposure Point Total									8.2E-12					NA
	Exposure Medium Total										8.2E-12					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	9.22E-13	ug/m3	5.7E-15	ug/m3	3.8E+01	(ug/m3)-1	2.2E-13	1.6E-14	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.2E-13					NA
		Exposure Point Total									2.2E-13					NA
	Exposure Medium Total										2.2E-13					NA
Soil Total (Southwest)											8.4E-12					NA

Table M5.3.19
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 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	4.14E-10	ug/m3	2.6E-12	ug/m3	3.8E+01	(ug/m3)-1	9.7E-11	7.2E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								9.7E-11					NA
		Exposure Point Total									9.7E-11					NA
	Exposure Medium Total										9.7E-11					NA
Medium Total											9.7E-11					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	2.86E-10	ug/m3	1.8E-12	ug/m3	3.8E+01	(ug/m3)-1	6.7E-11	5.0E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								6.7E-11					NA
		Exposure Point Total									6.7E-11					NA
	Exposure Medium Total										6.7E-11					NA
Medium Total											6.7E-11					NA

Table M5.3.20
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	1.52E-07	mg/kg	2.7E-13	mg/kg-day	1.3E+05	kg-day/mg	3.5E-08	4.7E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.5E-08					NA
			Dermal	PCB Total TEC	1.52E-07	mg/kg	3.9E-13	mg/kg-day	1.3E+05	kg-day/mg	5.0E-08	6.8E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.0E-08					NA
		Exposure Point Total									8.5E-08					NA
	Exposure Medium Total										8.5E-08					NA
	Beef Tissue	Southeast	Ingestion	PCB Total TEC	8.83E-08	mg/kg	5.6E-11	mg/kg-day	1.3E+05	kg-day/mg	7.2E-06	9.7E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.2E-06					NA
		Exposure Point Total									7.2E-06					NA
	Exposure Medium Total										7.2E-06					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	2.48E-10	ug/m3	1.4E-10	ug/m3	3.8E+01	(ug/m3)-1	5.2E-09	2.4E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.2E-09					NA
		Exposure Point Total									5.2E-09					NA
	Exposure Medium Total										5.2E-09					NA
Soil Total (Southeast)											7.3E-06					NA
Soil	Soil	South	Ingestion	PCB Total TEC	1.21E-07	mg/kg	2.1E-13	mg/kg-day	1.3E+05	kg-day/mg	2.8E-08	3.7E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.8E-08					NA
			Dermal	PCB Total TEC	1.21E-07	mg/kg	3.1E-13	mg/kg-day	1.3E+05	kg-day/mg	4.0E-08	5.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								4.0E-08					NA
		Exposure Point Total									6.8E-08					NA
	Exposure Medium Total										6.8E-08					NA
	Beef Tissue	South	Ingestion	PCB Total TEC	5.04E-08	mg/kg	3.2E-11	mg/kg-day	1.3E+05	kg-day/mg	4.1E-06	5.6E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								4.1E-06					NA
		Exposure Point Total									4.1E-06					NA
	Exposure Medium Total										4.1E-06					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	1.98E-10	ug/m3	1.1E-10	ug/m3	3.8E+01	(ug/m3)-1	4.1E-09	1.9E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								4.1E-09					NA
		Exposure Point Total									4.1E-09					NA
	Exposure Medium Total										4.1E-09					NA
Soil Total (South)											4.2E-06					NA

Table M5.3.20
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	Southwest	Ingestion	PCB Total TEC	5.64E-10	mg/kg	9.9E-16	mg/kg-day	1.3E+05	kg-day/mg	1.3E-10	1.7E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.3E-10					NA
			Dermal	PCB Total TEC	5.64E-10	mg/kg	1.4E-15	mg/kg-day	1.3E+05	kg-day/mg	1.9E-10	2.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.9E-10					NA
		Exposure Point Total									3.2E-10					NA
	Exposure Medium Total										3.2E-10					NA
	Beef Tissue	Southwest	Ingestion	PCB Total TEC	2.03E-10	mg/kg	1.3E-13	mg/kg-day	1.3E+05	kg-day/mg	1.7E-08	2.2E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.7E-08					NA
		Exposure Point Total									1.7E-08					NA
	Exposure Medium Total										1.7E-08					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	9.22E-13	ug/m3	5.1E-13	ug/m3	3.8E+01	(ug/m3)-1	1.9E-11	8.8E-13	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.9E-11					NA
		Exposure Point Total									1.9E-11					NA
	Exposure Medium Total										1.9E-11					NA
Soil Total (Southwest)											1.7E-08					NA

Table M5.3.21
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

							Cancer Risk Calculations					Noncancer Hazard Calculations				
	Exposure	Exposure	Exposure	Chemical of	EPC		Intake/Exposure Concentration		Unit Risk		Cancer	Intake/Exposure Concentration		RfC		Hazard
Medium	Medium	Point	Route	Potential Concern	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	4.14E-10	ug/m3	2.3E-10	ug/m3	3.8E+01	(ug/m3)-1	8.6E-09	4.0E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								8.6E-09					NA
		Exposure Point Total									8.6E-09					NA
	Exposure Medium Total										8.6E-09					NA
Medium Total											8.6E-09					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	2.86E-10	ug/m3	1.6E-10	ug/m3	3.8E+01	(ug/m3)-1	5.9E-09	2.7E-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
Medium Total											5.9E-09					NA

Table M5.3.22
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				
	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	1.52E-07	mg/kg	2.7E-13	mg/kg-day	1.3E+05	kg-day/mg	3.5E-08	4.7E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.5E-08					NA
			Dermal	PCB Total TEC	1.52E-07	mg/kg	3.9E-13	mg/kg-day	1.3E+05	kg-day/mg	5.0E-08	6.8E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.0E-08					NA
		Exposure Point Total									8.5E-08					NA
	Exposure Medium Total										8.5E-08					NA
	Plant Tissue	Southeast	Ingestion	PCB Total TEC			4.7E-12	mg/kg-day	1.3E+05	kg-day/mg	6.1E-07	8.2E-12	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	1.23E-08	mg/kg										
				Belowground	8.47E-09	mg/kg										
			Exp. Route Total								6.1E-07					NA
		Exposure Point Total									6.1E-07					NA
	Exposure Medium Total										6.1E-07					NA
	Beef Tissue	Southeast	Ingestion	PCB Total TEC	8.83E-08	mg/kg	5.6E-11	mg/kg-day	1.3E+05	kg-day/mg	7.2E-06	9.7E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.2E-06					NA
		Exposure Point Total									7.2E-06					NA
	Exposure Medium Total										7.2E-06					NA
	Milk	Southeast	Ingestion	PCB Total TEC	3.20E-08	mg/kg	2.6E-10	mg/kg-day	1.3E+05	kg-day/mg	3.4E-05	4.6E-10	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.4E-05					NA
		Exposure Point Total									3.4E-05					NA
	Exposure Medium Total										3.4E-05					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	2.48E-10	ug/m3	1.4E-10	ug/m3	3.8E+01	(ug/m3)-1	5.2E-09	2.4E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.2E-09					NA
		Exposure Point Total									5.2E-09					NA
	Exposure Medium Total										5.2E-09					NA
Soil Total (Southeast)											4.2E-05					NA

Table M5.3.22
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	1.21E-07	mg/kg	2.1E-13	mg/kg-day	1.3E+05	kg-day/mg	2.8E-08	3.7E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.8E-08					NA
			Dermal	PCB Total TEC	1.21E-07	mg/kg	3.1E-13	mg/kg-day	1.3E+05	kg-day/mg	4.0E-08	5.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								4.0E-08					NA
		Exposure Point Total									6.8E-08					NA
	Exposure Medium Total										6.8E-08					NA
	Plant Tissue	South	Ingestion	PCB Total TEC			4.5E-12	mg/kg-day	1.3E+05	kg-day/mg	5.9E-07	7.9E-12	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	1.23E-08	mg/kg										
				Belowground	6.79E-09	mg/kg										
			Exp. Route Total								5.9E-07					NA
		Exposure Point Total									5.9E-07					NA
	Exposure Medium Total										5.9E-07					NA
	Beef Tissue	South	Ingestion	PCB Total TEC	5.04E-08	mg/kg	3.2E-11	mg/kg-day	1.3E+05	kg-day/mg	4.1E-06	5.6E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								4.1E-06					NA
		Exposure Point Total									4.1E-06					NA
	Exposure Medium Total										4.1E-06					NA
	Milk	South	Ingestion	PCB Total TEC	1.82E-08	mg/kg	1.5E-10	mg/kg-day	1.3E+05	kg-day/mg	2.0E-05	2.6E-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	1.98E-10	ug/m3	1.1E-10	ug/m3	3.8E+01	(ug/m3)-1	4.1E-09	1.9E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								4.1E-09					NA
		Exposure Point Total									4.1E-09					NA
	Exposure Medium Total										4.1E-09					NA
Soil Total (South)											2.4E-05					NA

Table M5.3.22
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	Southwest	Ingestion	PCB Total TEC	5.64E-10	mg/kg	9.9E-16	mg/kg-day	1.3E+05	kg-day/mg	1.3E-10	1.7E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.3E-10					NA
			Dermal	PCB Total TEC	5.64E-10	mg/kg	1.4E-15	mg/kg-day	1.3E+05	kg-day/mg	1.9E-10	2.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.9E-10					NA
		Exposure Point Total									3.2E-10					NA
	Exposure Medium Total										3.2E-10					NA
	Plant Tissue	Southwest	Ingestion	PCB Total TEC			3.8E-12	mg/kg-day	1.3E+05	kg-day/mg	5.0E-07	6.7E-12	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	1.23E-08	mg/kg										
				Belowground	4.32E-11	mg/kg										
			Exp. Route Total								5.0E-07					NA
		Exposure Point Total									5.0E-07					NA
	Exposure Medium Total										5.0E-07					NA
	Beef Tissue	Southwest	Ingestion	PCB Total TEC	2.03E-10	mg/kg	1.3E-13	mg/kg-day	1.3E+05	kg-day/mg	1.7E-08	2.2E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.7E-08					NA
		Exposure Point Total									1.7E-08					NA
	Exposure Medium Total										1.7E-08					NA
	Milk	Southwest	Ingestion	PCB Total TEC	7.32E-11	mg/kg	6.0E-13	mg/kg-day	1.3E+05	kg-day/mg	7.8E-08	1.1E-12	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.8E-08					NA
		Exposure Point Total									7.8E-08					NA
	Exposure Medium Total										7.8E-08					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	9.22E-13	ug/m3	5.1E-13	ug/m3	3.8E+01	(ug/m3)-1	1.9E-11	8.8E-13	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.9E-11					NA
		Exposure Point Total									1.9E-11					NA
	Exposure Medium Total										1.9E-11					NA
Soil Total (Southwest)											5.9E-07					NA

Table M5.3.23
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	4.14E-10	ug/m3	2.3E-10	ug/m3	3.8E+01	(ug/m3)-1	8.6E-09	4.0E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								8.6E-09					NA
		Exposure Point Total									8.6E-09					NA
	Exposure Medium Total										8.6E-09					NA
Medium Total											8.6E-09					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	2.86E-10	ug/m3	1.6E-10	ug/m3	3.8E+01	(ug/m3)-1	5.9E-09	2.7E-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
Medium Total											5.9E-09					NA

Table M5.3.24
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	Southeast	Ingestion	PCB Total TEC	1.52E-07	mg/kg	2.4E-13	mg/kg-day	1.3E+05	kg-day/mg	3.1E-08	5.5E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.1E-08					NA
			Dermal	PCB Total TEC	1.52E-07	mg/kg	1.1E-13	mg/kg-day	1.3E+05	kg-day/mg	1.4E-08	2.5E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.4E-08					NA
		Exposure Point Total									4.5E-08					NA
	Exposure Medium Total										4.5E-08					NA
	Plant Tissue	Southeast	Ingestion	PCB Total TEC			2.6E-12	mg/kg-day	1.3E+05	kg-day/mg	3.4E-07	6.1E-12	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	1.23E-08	mg/kg										
				Belowground	8.47E-09	mg/kg										
			Exp. Route Total								3.4E-07					NA
		Exposure Point Total									3.4E-07					NA
	Exposure Medium Total										3.4E-07					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	2.48E-10	ug/m3	1.0E-10	ug/m3	3.8E+01	(ug/m3)-1	3.9E-09	2.4E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								3.9E-09					NA
		Exposure Point Total									3.9E-09					NA
	Exposure Medium Total										3.9E-09					NA
Soil Total (Southeast)											3.9E-07					NA

Table M5.3.24
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	1.21E-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
			Dermal	PCB Total TEC	1.21E-07	mg/kg	8.4E-14	mg/kg-day	1.3E+05	kg-day/mg	1.1E-08	2.0E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.1E-08					NA
		Exposure Point Total									3.6E-08					NA
	Exposure Medium Total										3.6E-08					NA
	Plant Tissue	South	Ingestion	PCB Total TEC			2.5E-12	mg/kg-day	1.3E+05	kg-day/mg	3.3E-07	5.8E-12	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	1.23E-08	mg/kg										
				Belowground	6.79E-09	mg/kg										
			Exp. Route Total								3.3E-07					NA
		Exposure Point Total									3.3E-07					NA
	Exposure Medium Total										3.3E-07					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	1.98E-10	ug/m3	8.1E-11	ug/m3	3.8E+01	(ug/m3)-1	3.1E-09	1.9E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								3.1E-09					NA
		Exposure Point Total									3.1E-09					NA
	Exposure Medium Total										3.1E-09					NA
Soil Total (South)											3.6E-07					NA

Table M5.3.24
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	Southwest	Ingestion	PCB Total TEC	5.64E-10	mg/kg	8.8E-16	mg/kg-day	1.3E+05	kg-day/mg	1.1E-10	2.1E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.1E-10					NA
			Dermal	PCB Total TEC	5.64E-10	mg/kg	3.9E-16	mg/kg-day	1.3E+05	kg-day/mg	5.1E-11	9.1E-16	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.1E-11					NA
		Exposure Point Total									1.7E-10					NA
	Exposure Medium Total										1.7E-10					NA
	Plant Tissue	Southwest	Ingestion	PCB Total TEC			2.1E-12	mg/kg-day	1.3E+05	kg-day/mg	2.7E-07	4.8E-12	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	1.23E-08	mg/kg										
				Belowground	4.32E-11	mg/kg										
			Exp. Route Total								2.7E-07					NA
		Exposure Point Total									2.7E-07					NA
	Exposure Medium Total										2.7E-07					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	9.22E-13	ug/m3	3.8E-13	ug/m3	3.8E+01	(ug/m3)-1	1.4E-11	8.8E-13	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.4E-11					NA
		Exposure Point Total									1.4E-11					NA
	Exposure Medium Total										1.4E-11					NA
Soil Total (Southwest)											2.7E-07					NA

Table M5.3.25
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 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	4.14E-10	ug/m3	1.7E-10	ug/m3	3.8E+01	(ug/m3)-1	6.5E-09	4.0E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								6.5E-09					NA
		Exposure Point Total									6.5E-09					NA
	Exposure Medium Total										6.5E-09					NA
Medium Total											6.5E-09					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	2.86E-10	ug/m3	1.2E-10	ug/m3	3.8E+01	(ug/m3)-1	4.5E-09	2.7E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								4.5E-09					NA
		Exposure Point Total									4.5E-09					NA
	Exposure Medium Total										4.5E-09					NA
Medium Total											4.5E-09					NA

Table M5.3.26
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	5E-10	--	2E-09	--	2E-09	--	--	--	--	--
			Chemical Total	5E-10	--	2E-09	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	6E-11	--	--	6E-11	--	--	--	--	--
			Chemical Total	--	6E-11	--	--	6E-11		--	--	--	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Soil Total (Southeast)								2E-09					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	1E-10	--	--	1E-10	--	--	--	--	--
			Chemical Total	--	1E-10	--	--	1E-10		--	--	--	--
		Exposure Point Total						1E-10					--
	Exposure Medium Total							1E-10					--
Ambient Air Total (Southeast)								1E-10					--
Receptor Total (Soil and Ambient Air - Southeast)								2E-09					--
Soil	Soil	South	PCB Total TEC	4E-10	--	1E-09	--	2E-09	--	--	--	--	--
			Chemical Total	4E-10	--	1E-09	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
	Ambient Air	Particulates South	PCB Total TEC	--	5E-11	--	--	5E-11	--	--	--	--	--
			Chemical Total	--	5E-11	--	--	5E-11		--	--	--	--
		Exposure Point Total						5E-11					--
	Exposure Medium Total							5E-11					--
Soil Total (South)								2E-09					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	1E-10	--	--	1E-10	--	--	--	--	--
			Chemical Total	--	1E-10	--	--	1E-10		--	--	--	--
		Exposure Point Total						1E-10					--
	Exposure Medium Total							1E-10					--
Ambient Air Total (South)								1E-10					--
Receptor Total (Soil and Ambient Air - South)								2E-09					--

Table M5.3.26
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-12	--	6E-12	--	8E-12	--	--	--	--	--
			Chemical Total	2E-12	--	6E-12	--	8E-12		--	--	--	--
		Exposure Point Total						8E-12					--
	Exposure Medium Total							8E-12					--
	Ambient Air	Particulates Southwest	PCB Total TEC	--	2E-13	--	--	2E-13	--	--	--	--	--
			Chemical Total	--	2E-13	--	--	2E-13		--	--	--	--
		Exposure Point Total						2E-13					--
	Exposure Medium Total							2E-13					--
Soil Total (Southwest)								8E-12					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	1E-10	--	--	1E-10	--	--	--	--	--
			Chemical Total	--	1E-10	--	--	1E-10		--	--	--	--
		Exposure Point Total						1E-10					--
	Exposure Medium Total							1E-10					--
Ambient Air Total (Southwest)								1E-10					--
Receptor Total (Soil and Ambient Air - Southwest)								1E-10					--

(1) Carcinogenic risk from inhalation is from sampling location DMS1, the sampling location with the higher calculated inhalation risk (see Table M5.3.19).

Table M5.3.27
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	3E-08	--	5E-08	--	9E-08	--	--	--	--	--
			Chemical Total	3E-08	--	5E-08	--	9E-08		--	--	--	--
		Exposure Point Total						9E-08					--
	Exposure Medium Total							9E-08					--
	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	--	5E-09	--	--	5E-09	--	--	--	--	--
			Chemical Total	--	5E-09	--	--	5E-09		--	--	--	--
		Exposure Point Total						5E-09					--
	Exposure Medium Total							5E-09					--
Soil Total (Southeast)								7E-06					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 [1]	PCB Total TEC	--	9E-09	--	--	9E-09	--	--	--	--	--
			Chemical Total	--	9E-09	--	--	9E-09		--	--	--	--
		Exposure Point Total						9E-09					--
	Exposure Medium Total							9E-09					--
Ambient Air Total (Southeast)								9E-09					--
Receptor Total (Soil and Ambient Air - Southeast)								7E-06					--
Soil	Soil	South	PCB Total TEC	3E-08	--	4E-08	--	7E-08	--	--	--	--	--
			Chemical Total	3E-08	--	4E-08	--	7E-08		--	--	--	--
		Exposure Point Total						7E-08					--
	Exposure Medium Total							7E-08					--
	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	--	4E-09	--	--	4E-09	--	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		--	--	--	--
		Exposure Point Total						4E-09					--
	Exposure Medium Total							4E-09					--
Soil Total (South)								4E-06					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 [1]	PCB Total TEC	--	9E-09	--	--	9E-09	--	--	--	--	--
			Chemical Total	--	9E-09	--	--	9E-09		--	--	--	--
		Exposure Point Total						9E-09					--
	Exposure Medium Total							9E-09					--
Ambient Air Total (South)								9E-09					--
Receptor Total (Soil and Ambient Air - South)								4E-06					--

Table M5.3.27
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-10	--	2E-10	--	3E-10	--	--	--	--	--
			Chemical Total	1E-10	--	2E-10	--	3E-10		--	--	--	--
		Exposure Point Total						3E-10					--
	Exposure Medium Total							3E-10					--
	Beef Tissue	Southwest	PCB Total TEC	2E-08	--	--	--	2E-08	--	--	--	--	--
			Chemical Total	2E-08	--	--	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
	Ambient Air	Particulates Southwest	PCB Total TEC	--	2E-11	--	--	2E-11	--	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Soil Total (Southwest)								2E-08					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	9E-09	--	--	9E-09	--	--	--	--	--
			Chemical Total	--	9E-09	--	--	9E-09		--	--	--	--
		Exposure Point Total						9E-09					--
	Exposure Medium Total							9E-09					--
Ambient Air Total (Southwest)								9E-09					--
Receptor Total (Soil and Ambient Air - Southwest)								3E-08					--

(1) Carcinogenic risk from inhalation is from sampling location DMS1, the sampling location with the higher calculated inhalation risk (see Table M5.3.21).

Table M5.3.28
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	3E-08	--	5E-08	--	9E-08	--	--	--	--	--
			Chemical Total	3E-08	--	5E-08	--	9E-08		--	--	--	--
		Exposure Point Total						9E-08					--
	Exposure Medium Total							9E-08					--
	Plant Tissue	Southeast	PCB Total TEC	6E-07	--	--	--	6E-07	--	--	--	--	--
			Chemical Total	6E-07	--	--	--	6E-07		--	--	--	--
		Exposure Point Total						6E-07					--
	Exposure Medium Total							6E-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					--
	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	--	5E-09	--	--	5E-09	--	--	--	--	--
			Chemical Total	--	5E-09	--	--	5E-09		--	--	--	--
		Exposure Point Total						5E-09					--
	Exposure Medium Total							5E-09					--
Soil Total (Southeast)								4E-05					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	9E-09	--	--	9E-09	--	--	--	--	--
			Chemical Total	--	9E-09	--	--	9E-09		--	--	--	--
		Exposure Point Total						9E-09					--
	Exposure Medium Total							9E-09					--
Ambient Air Total (Southeast)								9E-09					--
Receptor Total (Soil and Ambient Air - Southeast)								4E-05					--

Table M5.3.28
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	3E-08	--	4E-08	--	7E-08	--	--	--	--	--
			Chemical Total	3E-08	--	4E-08	--	7E-08		--	--	--	--
		Exposure Point Total						7E-08					--
	Exposure Medium Total							7E-08					--
	Plant Tissue	South	PCB Total TEC	6E-07	--	--	--	6E-07	--	--	--	--	--
			Chemical Total	6E-07	--	--	--	6E-07		--	--	--	--
		Exposure Point Total						6E-07					--
	Exposure Medium Total							6E-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					--
	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	--	4E-09	--	--	4E-09	--	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		--	--	--	--
		Exposure Point Total						4E-09					--
	Exposure Medium Total							4E-09					--
Soil Total (South)								2E-05					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	9E-09	--	--	9E-09	--	--	--	--	--
			Chemical Total	--	9E-09	--	--	9E-09		--	--	--	--
		Exposure Point Total						9E-09					--
	Exposure Medium Total							9E-09					--
Ambient Air Total (South)								9E-09					--
Receptor Total (Soil and Ambient Air - South)								2E-05					--

Table M5.3.28
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-10	--	2E-10	--	3E-10	--	--	--	--	--
			Chemical Total	1E-10	--	2E-10	--	3E-10		--	--	--	--
		Exposure Point Total						3E-10					--
	Exposure Medium Total							3E-10					--
	Plant Tissue	Southwest	PCB Total TEC	5E-07	--	--	--	5E-07	--	--	--	--	--
			Chemical Total	5E-07	--	--	--	5E-07		--	--	--	--
		Exposure Point Total						5E-07					--
	Exposure Medium Total							5E-07					--
	Beef Tissue	Southwest	PCB Total TEC	2E-08	--	--	--	2E-08	--	--	--	--	--
			Chemical Total	2E-08	--	--	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
	Milk	Southwest	PCB Total TEC	8E-08	--	--	--	8E-08	--	--	--	--	--
			Chemical Total	8E-08	--	--	--	8E-08		--	--	--	--
		Exposure Point Total						8E-08					--
	Exposure Medium Total							8E-08					--
	Ambient Air	Particulates Southwest	PCB Total TEC	--	2E-11	--	--	2E-11	--	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Soil Total (Southwest)								6E-07					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	9E-09	--	--	9E-09	--	--	--	--	--
			Chemical Total	--	9E-09	--	--	9E-09		--	--	--	--
		Exposure Point Total						9E-09					--
	Exposure Medium Total							9E-09					--
Ambient Air Total (Southwest)								9E-09					--
Receptor Total (Soil and Ambient Air - Southwest)								6E-07					--

(1) Carcinogenic risk from inhalation is from sampling location DMS1, the sampling location with the higher calculated inhalation risk (see Table M5.3.23).

Table M5.3.29
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	3E-08	--	1E-08	--	4E-08	--	--	--	--	--
			Chemical Total	3E-08	--	1E-08	--	4E-08		--	--	--	--
		Exposure Point Total						4E-08					--
	Exposure Medium Total							4E-08					--
	Plant Tissue	Southeast	PCB Total TEC	3E-07	--	--	--	3E-07	--	--	--	--	--
			Chemical Total	3E-07	--	--	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	4E-09	--	--	4E-09	--	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		--	--	--	--
		Exposure Point Total						4E-09					--
	Exposure Medium Total							4E-09					--
Soil Total (Southeast)								4E-07					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	6E-09	--	--	6E-09	--	--	--	--	--
			Chemical Total	--	6E-09	--	--	6E-09		--	--	--	--
		Exposure Point Total						6E-09					--
	Exposure Medium Total							6E-09					--
Ambient Air Total (Southeast)								6E-09					--
Receptor Total (Soil and Ambient Air - Southeast)								4E-07					--

Table M5.3.29
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	2E-08	--	1E-08	--	4E-08	--	--	--	--	--
			Chemical Total	2E-08	--	1E-08	--	4E-08		--	--	--	--
		Exposure Point Total						4E-08					--
	Exposure Medium Total							4E-08					--
	Plant Tissue	South	PCB Total TEC	3E-07	--	--	--	3E-07	--	--	--	--	--
			Chemical Total	3E-07	--	--	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Ambient Air	Particulates South	PCB Total TEC	--	3E-09	--	--	3E-09	--	--	--	--	--
			Chemical Total	--	3E-09	--	--	3E-09		--	--	--	--
		Exposure Point Total						3E-09					--
	Exposure Medium Total							3E-09					--
Soil Total (South)								4E-07					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	6E-09	--	--	6E-09	--	--	--	--	--
			Chemical Total	--	6E-09	--	--	6E-09		--	--	--	--
		Exposure Point Total						6E-09					--
	Exposure Medium Total							6E-09					--
Ambient Air Total (South)								6E-09					--
Receptor Total (Soil and Ambient Air - South)								4E-07					--

Table M5.3.29
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-10	--	5E-11	--	2E-10	--	--	--	--	--
			Chemical Total	1E-10	--	5E-11	--	2E-10		--	--	--	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
	Plant Tissue	Southwest	PCB Total TEC	3E-07	--	--	--	3E-07	--	--	--	--	--
			Chemical Total	3E-07	--	--	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Ambient Air	Particulates Southwest	PCB Total TEC	--	1E-11	--	--	1E-11	--	--	--	--	--
			Chemical Total	--	1E-11	--	--	1E-11		--	--	--	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Soil Total (Southwest)								3E-07					--
Ambient Air	Ambient Air	Particulates and Vapors at DMS1 (1)	PCB Total TEC	--	6E-09	--	--	6E-09	--	--	--	--	--
			Chemical Total	--	6E-09	--	--	6E-09		--	--	--	--
		Exposure Point Total						6E-09					--
	Exposure Medium Total							6E-09					--
Ambient Air Total (Southwest)								6E-09					--
Receptor Total (Soil and Ambient Air - Southwest)								3E-07					--

(1) Carcinogenic risk from inhalation is from sampling location DMS1, the sampling location with the higher calculated inhalation risk (see Table M5.3.25).

Table M5.3.30
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	3.15E+00	2.60E+01	No
South	1.80E+00	2.60E+01	No
Southwest	9.11E-03	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	1.61E+01	2.60E+01	No
South	9.27E+00	2.60E+01	No
Southwest	2.06E-01	2.60E+01	No

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	1.57E-01	2.60E+01	No
South	1.49E-01	2.60E+01	No
Southwest	1.16E-01	2.60E+01	No

Table M5.3.30
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

Notes:

(1) Average daily intake for infant exposed to contaminated breast milk (See Table M5.3.17).

(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 M5.3.31
Overall Summary of Risks and Hazards for COPCs
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor Exposure Medium	**Carcinogenic Risk**	**Noncarcinogenic Hazard Index**
Current Rancher (Adult)		
Southeast Area		
Soil (Ingestion and Dermal)	2E-09	—
Ambient Air (Particulates from Soil)	6E-11	—
Ambient Air (Particulates and Vapors)	1E-10	—
Total	2E-09	
South Area		
Soil (Ingestion and Dermal)	2E-09	—
Ambient Air (Particulates from Soil)	5E-11	—
Ambient Air (Particulates and Vapors)	1E-10	—
Total	2E-09	
Southwest Area		
Soil (Ingestion and Dermal)	8E-12	—
Ambient Air (Particulates from Soil)	2E-13	—
Ambient Air (Particulates and Vapors)	1E-10	—
Total	1E-10	
Future Resident Rancher (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	9E-08	—
Beef Tissue	7E-06	—
Ambient Air (Particulates from Soil)	5E-09	—
Ambient Air (Particulates and Vapors)	9E-09	—
Total	7E-06	
South Area		
Soil (Ingestion and Dermal)	7E-08	—
Beef Tissue	4E-06	—
Ambient Air (Particulates from Soil)	4E-09	—
Ambient Air (Particulates and Vapors)	9E-09	—
Total	4E-06	
Southwest Area		
Soil (Ingestion and Dermal)	3E-10	—
Beef Tissue	2E-08	—
Ambient Air (Particulates from Soil)	2E-11	—
Ambient Air (Particulates and Vapors)	9E-09	—
Total	3E-08	

Table M5.3.31
Overall Summary of Risks and Hazards for COPCs
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor Exposure Medium	**Carcinogenic Risk**	**Noncarcinogenic Hazard Index**
Future Subsistence Resident Rancher (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	9E-08	—
Plant Tissue (Homegrown Produce)	6E-07	—
Beef Tissue	7E-06	—
Milk	3E-05	—
Ambient Air (Particulates from Soil)	5E-09	—
Ambient Air (Particulates and Vapors)	9E-09	—
Total	4E-05	
South Area		
Soil (Ingestion and Dermal)	7E-08	—
Plant Tissue (Homegrown Produce)	6E-07	—
Beef Tissue	4E-06	—
Milk	2E-05	—
Ambient Air (Particulates from Soil)	4E-09	—
Ambient Air (Particulates and Vapors)	9E-09	—
Total	2E-05	
Southwest Area		
Soil (Ingestion and Dermal)	3E-10	—
Plant Tissue (Homegrown Produce)	5E-07	—
Beef Tissue	2E-08	—
Milk	8E-08	—
Ambient Air (Particulates from Soil)	2E-11	—
Ambient Air (Particulates and Vapors)	9E-09	—
Total	6E-07	
Future Resident (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	4E-08	—
Plant Tissue (Homegrown Produce)	3E-07	—
Ambient Air (Particulates from Soil)	4E-09	—
Ambient Air (Particulates and Vapors)	6E-09	—
Total	4E-07	
South Area		
Soil (Ingestion and Dermal)	4E-08	—
Plant Tissue (Homegrown Produce)	3E-07	—
Ambient Air (Particulates from Soil)	3E-09	—
Ambient Air (Particulates and Vapors)	6E-09	—
Total	4E-07	
Southwest Area		
Soil (Ingestion and Dermal)	2E-10	—
Plant Tissue (Homegrown Produce)	3E-07	—
Ambient Air (Particulates from Soil)	1E-11	—
Ambient Air (Particulates and Vapors)	6E-09	—
Total	3E-07	

Table M5.3.31
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 DMS1, the sampling location with the higher calculated ambient air risk (see Tables M5.3.19, M5.3.21, M5.3.23, and M5.3.25.

— - Hazard indices were not calculated (toxicity data were not available).

Risk values are taken from Tables M5.3.26 through M5.3.29.

Risk calculations are shown on Tables M5.3.18 through M5.3.25.

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 M5.3.32
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**
0.15	0.12	0.00056	0.081	0.12	0.071	0.59	0.16

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).

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

KHF - Kettleman Hills Facility

TEC - toxicity equivalence concentration

TEF - toxicity equivalence factor

Table M5.4.1
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 -- Measured PCB levels in vegetation -- Modeled PCB levels in invertebrates -- Calculated exposure doses and egg concentrations -- 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)* -- State species of special concern	-- Measured PCB levels in soil -- Measured PCB levels in vegetation -- Modeled PCB levels in rodents -- Calculated exposure doses and egg concentrations -- 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 -- Measured PCB levels in vegetation -- Calculated pocket mouse exposure doses -- 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)* --State species of special concern	-- Measured PCB levels in soil -- Modeled PCB levels in invertebrates -- Calculated grasshopper mouse exposure doses -- 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)* -- Federally endangered -- State threatened	-- Measured PCB levels in soil -- Measured PCB levels in vegetation -- Modeled PCB levels in rodents -- Calculated kit fox exposure doses -- 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*) -- Federally endangered -- State endangered	-- Measured PCB levels in soil -- Modeled PCB levels in invertebrates -- Calculated risks to carnivorous mammals and birds

Table M5.4.2
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 M5.4.2
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 M5.4.2
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 M5.4.2
Exposure Factors for Ecological Receptors
Ecological Risk Assessment
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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*): Mean food consumption rate per unit body weight for eight mice (four male, four female) = 0.076 g/g-day. Assuming same rate and using body weight of southern grasshopper mouse: (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: (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 M5.4.2
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: FIR = (FMR/ME) = (2.0 kJ/day) / (18 kJ/g) = 0.11 g/day = 0.00011 kg/day (dry weight) where: FMR = Field Metabolic Rate = 2.0 kJ/day (based on alligator lizard) 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 M5.4.2
Exposure Factors for Ecological Receptors
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Kings County, California

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Table M5.4.3
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 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 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	—	3.3E+01	0.003571	1.1287E-05	—	5.6433E-06	0.00003	1.69E-10
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	—	1.7E+01	0.0039	6.3956E-06	—	3.20E-06	0.00003	9.59E-11
PCB 169	7.41	—	7.5E-01	0.0043	3.03E-07	—	1.52E-07	0.03	4.55E-09
PCB 189	8.27	—	8.6E+00	0.0016	1.35E-06	—	6.75E-07	0.00003	2.02E-11
Congener total: [(8)]									7.63E-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 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	—	0.0036	5.24E-08	6.80E-03	3.40E-03	0.00003	1.02E-07
PCB 157	7.62	1.8E+00	—	0.0035	1.36E-08	1.80E-03	9.00E-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	—	6.6E-01	0.0043	2.64E-07	—	1.32E-07	0.03	3.96E-09
PCB 189	8.27	1.6E+00	—	0.0016	5.70E-09	1.60E-03	8.00E-04	0.00003	2.40E-08
Congener total: [(8)]									6.08E-05
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 105	6.79	—	1.9E+01	0.0069	1.17E-05	—	5.85E-06	0.00003	1.76E-10
PCB 114	6.98	1.0E+00	—	0.0061	1.31E-08	1.00E-03	5.00E-04	0.00003	1.50E-08
PCB 118	7.12	—	2.9E+01	0.0055	1.40E-05	—	7.02E-06	0.00003	2.11E-10
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 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 189	8.27	1.2E+00	—	0.0016	4.27E-09	1.20E-03	6.00E-04	0.00003	1.80E-08
Congener total: [(8)]									2.83E-07
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 114	6.98	2.3E+00	—	0.0061	3.02E-08	2.30E-03	1.15E-03	0.00003	3.45E-08
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 157	7.62	4.8E+00	—	0.0035	3.63E-08	4.80E-03	2.40E-03	0.00003	7.20E-08
PCB 189	8.27	8.2E+00	—	0.0016	2.92E-08	8.20E-03	4.10E-03	0.00003	1.23E-07
Congener total: [(8)]									1.77E-04

Table M5.4.3
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 congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in composite of ten samples from each exposure area. "—" indicates the congener was not detected or was detected above the reporting limit.

(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} x FIR_{mouse} x CF_{dw}) + (C_{soil} x SIR_{mouse})) x BTF x FIR_{fox}] + (C_{soil} x SIR_{fox})} 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 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 M5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table M5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table M5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 M5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table M5.4.2 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 M5.4.4
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 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 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	—	3.3E+01	0.0036	1.13E-05	—	9.41E-06	0.00003	2.82E-10
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	—	1.7E+01	0.0039	6.40E-06	—	5.33E-06	0.00003	1.60E-10
PCB 169	7.41	—	7.5E-01	0.0043	3.03E-07	—	2.53E-07	0.03	7.58E-09
PCB 189	8.27	—	8.6E+00	0.0016	1.35E-06	—	1.12E-06	0.00003	<u>3.37E-11</u>
Congener total: [(8)]									1.27E-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 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	—	0.0036	5.24E-08	6.80E-03	5.67E-03	0.00003	1.70E-07
PCB 157	7.62	1.8E+00	—	0.0035	1.36E-08	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	—	6.6E-01	0.0043	2.64E-07	—	2.20E-07	0.03	6.60E-09
PCB 189	8.27	1.6E+00	—	0.0016	5.70E-09	1.60E-03	1.33E-03	0.00003	<u>4.00E-08</u>
Congener total: [(8)]									1.01E-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 105	6.79	—	1.9E+01	0.0069	1.17E-05	—	9.75E-06	0.00003	2.93E-10
PCB 114	6.98	1.0E+00	—	0.0061	1.31E-08	1.00E-03	8.33E-04	0.00003	2.50E-08
PCB 118	7.12	—	2.9E+01	0.0055	1.40E-05	—	1.17E-05	0.00003	3.51E-10
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 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 189	8.27	1.2E+00	—	0.0016	4.27E-09	1.20E-03	1.00E-03	0.00003	<u>3.00E-08</u>
Congener total: [(8)]									4.71E-07
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 114	6.98	2.3E+00	—	0.0061	3.02E-08	2.30E-03	1.92E-03	0.00003	5.75E-08
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 157	7.62	4.8E+00	—	0.0035	3.63E-08	4.80E-03	4.00E-03	0.00003	1.20E-07
PCB 189	8.27	8.2E+00	—	0.0016	2.92E-08	8.20E-03	6.83E-03	0.00003	<u>2.05E-07</u>
Congener total: [(8)]									2.95E-04

Table M5.4.4
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 congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in composite of ten samples from each exposure area. "—" indicates the congener was not detected or was detected above the reporting limit.

(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 M5.4.2 for basis/source.

SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table M5.4.2 for basis/source.

SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day See Table M5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 M5.4.2 for basis/source of home range.

BW = body weight (kg) = 1.2 kg. See Table M5.4.2 for basis/source.

(6) Mammal TEFs are from USEPA (June 2008).

(7) 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 M5.4.5
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 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 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 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
Congener total: (10)										7.60E-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 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 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)										6.07E-05
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 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 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 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 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)										2.82E-07
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 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 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 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 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)										1.77E-04

Table M5.4.5
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 congeners detected at or above the estimated detection limit and below the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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) = $C_{soil} \times BAF_{inv}$
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 M5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table M5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table M5.4.2 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 M5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table M5.4.2 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 M5.4.6
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 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 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 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
Congener total: (10)										1.27E-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 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 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)										1.01E-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 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 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 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 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)										4.71E-07
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 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 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 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 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)										2.95E-04

Table M5.4.6
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 congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in composite of ten samples from each exposure area.

(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) = $C_{soil} \times BAF_{inv}$
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 M5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table M5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table M5.4.2 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 M5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table M5.4.2 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 M5.4.7
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 114	1.6E+00	0.20	3.84E-02	1.60E-03	2.00E-02	0.00003	6.00E-07
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 157	2.0E+00	0.20	4.80E-02	2.00E-03	2.50E-02	0.00003	7.50E-07
Congener total: (7)							1.90E-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 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 189	1.6E+00	0.20	3.84E-02	1.60E-03	2.00E-02	0.00003	6.00E-07
Congener total: (7)							1.51E-03
Southwest							
PCB 77	2.6E+00	0.20	6.24E-02	2.60E-03	3.25E-02	0.0001	3.25E-06
PCB 114	1.0E+00	0.20	2.40E-02	1.00E-03	1.25E-02	0.00003	3.75E-07
PCB 123	1.2E+00	0.20	2.88E-02	1.20E-03	1.50E-02	0.00003	4.50E-07
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 189	1.2E+00	0.20	2.88E-02	1.20E-03	1.50E-02	0.00003	4.50E-07
Congener total: (7)							7.05E-06
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 114	2.3E+00	0.20	5.52E-02	2.30E-03	2.88E-02	0.00003	8.63E-07
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 157	4.8E+00	0.20	1.15E-01	4.80E-03	6.00E-02	0.00003	1.80E-06
PCB 189	8.2E+00	0.20	1.97E-01	8.20E-03	1.03E-01	0.00003	3.08E-06
Congener total: (7)							4.42E-03

Table M5.4.7
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 congeners detected at or above the estimated detection limit and below the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
(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 M5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table M5.4.2 for basis/source.
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table M5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table M5.4.2 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 M5.4.8
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 114	1.6E+00	0.20	3.84E-02	1.60E-03	3.33E-02	0.00003	1.00E-06
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 157	2.0E+00	0.20	4.80E-02	2.00E-03	4.17E-02	0.00003	1.25E-06
Congener total: [7]							3.16E-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 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 189	1.6E+00	0.20	3.84E-02	1.60E-03	3.33E-02	0.00003	1.00E-06
Congener total: [7]							2.52E-03
Southwest							
PCB 77	2.6E+00	0.20	6.24E-02	2.60E-03	5.42E-02	0.0001	5.42E-06
PCB 114	1.0E+00	0.20	2.40E-02	1.00E-03	2.08E-02	0.00003	6.25E-07
PCB 123	1.2E+00	0.20	2.88E-02	1.20E-03	2.50E-02	0.00003	7.50E-07
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 189	1.2E+00	0.20	2.88E-02	1.20E-03	2.50E-02	0.00003	7.50E-07
Congener total: [7]							1.17E-05
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 114	2.3E+00	0.20	5.52E-02	2.30E-03	4.79E-02	0.00003	1.44E-06
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 157	4.8E+00	0.20	1.15E-01	4.80E-03	1.00E-01	0.00003	3.00E-06
PCB 189	8.2E+00	0.20	1.97E-01	8.20E-03	1.71E-01	0.00003	5.13E-06
Congener total: [7]							7.36E-03

Table M5.4.8
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 congeners detected at or above the estimated detection limit and below the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
(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 M5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table M5.4.2 for basis/source.
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table M5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table M5.4.2 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 M5.4.9
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 114	1.6E+00	8.7E+00	6.86E-03	2.88E-05	5.74E-01	0.00003	1.72E-05
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	—	3.3E+01	2.63E-02	—	2.20E+00	0.00003	6.59E-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	—	1.7E+01	1.35E-02	—	1.13E+00	0.00003	3.38E-05
PCB 169	—	7.5E-01	5.90E-04	—	4.92E-02	0.03	1.48E-03
PCB 189	—	8.6E+00	6.82E-03	—	5.69E-01	0.00003	1.71E-05
Congener total: [6]							8.54E-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 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	—	—	1.22E-04	1.02E-02	0.00003	3.06E-07
PCB 157	1.8E+00	—	—	3.24E-05	2.70E-03	0.00003	8.10E-08
PCB 167	3.0E+00	2.4E+01	1.88E-02	5.40E-05	1.57E+00	0.00003	4.70E-05
PCB 169	—	6.6E-01	5.14E-04	—	4.28E-02	0.03	1.28E-03
PCB 189	1.6E+00	—	—	2.88E-05	2.40E-03	0.00003	7.20E-08
Congener total: [6]							4.82E-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 105	—	1.9E+01	1.41E-02	—	1.17E+00	0.00003	3.52E-05
PCB 114	1.0E+00	—	—	1.80E-05	1.50E-03	0.00003	4.50E-08
PCB 118	—	2.9E+01	2.14E-02	—	1.78E+00	0.00003	5.34E-05
PCB 123	1.2E+00	1.6E+00	1.19E-03	2.16E-05	1.01E-01	0.00003	3.02E-06
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 189	1.2E+00	—	—	2.16E-05	1.80E-03	0.00003	5.40E-08
Congener total: [6]							1.79E-04
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 114	2.3E+00	—	—	4.14E-05	3.45E-03	0.00003	1.04E-07
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 157	4.8E+00	—	—	8.64E-05	7.20E-03	0.00003	2.16E-07
PCB 189	8.2E+00	—	—	1.48E-04	1.23E-02	0.00003	3.69E-07
Congener total: [6]							6.54E-02

Table M5.4.9
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 congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Concentration detected in composite of ten samples from each exposure area.
"—" indicates the congener was not detected or was detected above the reporting limit.

(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 M5.4.2 for basis/source.

SIR_{mouse} = soil ingestion rate for mouse (kg/day) = 0.000018 kg/day. See Table M5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 M5.4.2 for home range.

BW = body weight (kg) = 0.012 kg. See Table M5.4.2 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 M5.4.10
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 114	1.6E+00	8.7E+00	4.01E-03	1.76E-05	5.75E-01	0.00003	1.73E-05
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	—	3.3E+01	1.54E-02	—	2.20E+00	0.00003	6.60E-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	—	1.7E+01	7.91E-03	—	1.13E+00	0.00003	3.39E-05
PCB 169	—	7.5E-01	3.45E-04	—	4.93E-02	0.03	1.48E-03
PCB 189	—	8.6E+00	3.99E-03	—	5.70E-01	0.00003	1.71E-05
Congener total: [6]							8.56E-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 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	—	—	7.48E-05	1.07E-02	0.00003	3.21E-07
PCB 157	1.8E+00	—	—	1.98E-05	2.83E-03	0.00003	8.49E-08
PCB 167	3.0E+00	2.4E+01	1.10E-02	3.30E-05	1.57E+00	0.00003	4.71E-05
PCB 169	—	6.6E-01	3.00E-04	—	4.29E-02	0.03	1.29E-03
PCB 189	1.6E+00	—	—	1.76E-05	2.51E-03	0.00003	7.54E-08
Congener total: [6]							4.83E-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 105	—	1.9E+01	8.24E-03	—	1.18E+00	0.00003	3.53E-05
PCB 114	1.0E+00	—	—	1.10E-05	1.57E-03	0.00003	4.71E-08
PCB 118	—	2.9E+01	1.25E-02	—	1.78E+00	0.00003	5.35E-05
PCB 123	1.2E+00	1.6E+00	6.92E-04	1.32E-05	1.01E-01	0.00003	3.02E-06
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 189	1.2E+00	—	—	1.32E-05	1.89E-03	0.00003	5.66E-08
Congener total: [6]							1.80E-04
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 114	2.3E+00	—	—	2.53E-05	3.61E-03	0.00003	1.08E-07
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 157	4.8E+00	—	—	5.28E-05	7.54E-03	0.00003	2.26E-07
PCB 189	8.2E+00	—	—	9.02E-05	1.29E-02	0.00003	3.87E-07
Congener total: [6]							6.55E-02

Table M5.4.10
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 congeners detected at or above the estimated detection limit and below the reporting limit.
(2) Concentration detected in composite of ten samples from each exposure area.
"—" indicates the congener was not detected or was detected above the reporting limit.
(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 M5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse (kg/day) = 0.000011 kg/day. See Table M5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 M5.4.2 for home range.
BW = body weight (kg) = 0.007 kg. See Table M5.4.2 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 M5.4.11
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 114	6.98	1.6E+00	0.99	4.61E-03	3.20E-05	1.16E-01	0.00003	3.48E-06
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 157	7.62	2.0E+00	1.07	6.21E-03	4.00E-05	1.56E-01	0.00003	4.68E-06
Congener total: [8]								1.10E-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 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 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]								8.79E-03
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 114	6.98	1.0E+00	0.99	2.88E-03	2.00E-05	7.26E-02	0.00003	2.18E-06
PCB 123	6.98	1.2E+00	0.99	3.46E-03	2.40E-05	8.71E-02	0.00003	2.61E-06
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 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]								4.16E-05
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 114	6.98	2.3E+00	0.99	6.63E-03	4.60E-05	1.67E-01	0.00003	5.01E-06
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 157	7.62	4.8E+00	1.07	1.49E-02	9.60E-05	3.75E-01	0.00003	1.12E-05
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]								2.56E-02

Table M5.4.11
Exposure Calculation for the Tulare Grasshopper Mouse - Adult
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes congeners detected at or above the estimated detection limit and below the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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} x BAF_{inv} x FIR_{inv}) + (C_{soil} x SIR_{mouse})] x [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 M5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table M5.4.2 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 M5.4.2 for home range.
BW = body weight (kg) = 0.04 kg. See Table M5.4.2 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 M5.4.12
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 114	6.98	1.6E+00	0.99	2.39E-03	1.60E-05	1.20E-01	0.00003	3.60E-06
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 157	7.62	2.0E+00	1.07	3.21E-03	2.00E-05	1.61E-01	0.00003	4.84E-06
Congener total: [8]								1.14E-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 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 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]								9.09E-03
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 114	6.98	1.0E+00	0.99	1.49E-03	1.00E-05	7.50E-02	0.00003	2.25E-06
PCB 123	6.98	1.2E+00	0.99	1.79E-03	1.20E-05	9.01E-02	0.00003	2.70E-06
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 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]								4.30E-05
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 114	6.98	2.3E+00	0.99	3.43E-03	2.30E-05	1.73E-01	0.00003	5.18E-06
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 157	7.62	4.8E+00	1.07	7.70E-03	4.80E-05	3.88E-01	0.00003	1.16E-05
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]								2.65E-02

Table M5.4.12
Exposure Calculation for the Tulare Grasshopper Mouse - Juvenile
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:
(1) Includes congeners detected at or above the estimated detection limit and below the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area.
(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 M5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00001 kg/day. See Table M5.4.2 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 M5.4.2 for home range.
BW = body weight (kg) = 0.02 kg. See Table M5.4.2 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 M5.4.13
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 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 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	—	3.3E+01	0.0036	6.21E-06	—	3.61E-05	0.0001	3.61E-09
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	—	1.7E+01	0.0039	3.52E-06	—	2.05E-05	0.00001	2.05E-10
PCB 169	7.41	—	7.5E-01	0.0043	1.67E-07	—	9.70E-07	0.001	9.70E-10
PCB 189	8.27	—	8.6E+00	0.0016	7.42E-07	—	4.31E-06	0.00001	4.31E-11
Congener total: [8]									1.95E-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 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	—	0.0036	2.88E-08	2.72E-03	1.58E-02	0.0001	1.58E-06
PCB 157	7.62	1.8E+00	—	0.0035	7.48E-09	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	—	6.6E-01	0.0043	1.45E-07	—	8.44E-07	0.001	8.44E-10
PCB 189	8.27	1.6E+00	—	0.0016	3.13E-09	6.40E-04	3.72E-03	0.00001	3.72E-08
Congener total: [8]									1.05E-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 105	6.79	—	1.9E+01	0.0069	6.44E-06	—	3.74E-05	0.0001	3.74E-09
PCB 114	6.98	1.0E+00	—	0.0061	7.23E-09	4.00E-04	2.33E-03	0.0001	2.33E-07
PCB 118	7.12	—	2.9E+01	0.0055	7.72E-06	—	4.49E-05	0.00001	4.49E-10
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 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 189	8.27	1.2E+00	—	0.0016	2.35E-09	4.80E-04	2.79E-03	0.00001	2.79E-08
Congener total: [8]									3.05E-04
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 114	6.98	2.3E+00	—	0.0061	1.66E-08	9.20E-04	5.35E-03	0.0001	5.35E-07
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 157	7.62	4.8E+00	—	0.0035	2.00E-08	1.92E-03	1.12E-02	0.0001	1.12E-06
PCB 189	8.27	8.2E+00	—	0.0016	1.61E-08	3.28E-03	1.91E-02	0.00001	1.91E-07
Congener total: [8]									3.49E-03

Table M5.4.13
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 congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in composite of ten samples from each exposure area. "—" indicates the congener was not detected or was detected above the reporting limit.

(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 = $\{[((C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{owl}] + (C_{soil} \times SIR_{owl})\} \times \{AFF/BW\}$.
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 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 M5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table M5.4.2 for basis/source.
SIR_{owl} = soil ingestion rate for owl (kg/day) = 0.0004 kg/day. See Table M5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 M5.4.2 for home range.
BW = body weight (kg) = 0.172 kg. See Table M5.4.2 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 M5.4.14
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 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 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	—	3.3E+01	0.0036	4.89E-06	—	3.88E-05	0.0001	3.88E-09
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	—	1.7E+01	0.0039	2.77E-06	—	2.20E-05	0.00001	2.20E-10
PCB 169	7.41	—	7.5E-01	0.0043	1.31E-07	—	1.04E-06	0.001	1.04E-09
PCB 189	8.27	—	8.6E+00	0.0016	5.85E-07	—	4.64E-06	0.00001	4.64E-11
Congener total: [8]									2.00E-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 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	—	0.0036	2.27E-08	2.04E-03	1.62E-02	0.0001	1.62E-06
PCB 157	7.62	1.8E+00	—	0.0035	5.90E-09	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	—	6.6E-01	0.0043	1.14E-07	—	9.08E-07	0.001	9.08E-10
PCB 189	8.27	1.6E+00	—	0.0016	2.47E-09	4.80E-04	3.81E-03	0.00001	3.81E-08
Congener total: [8]									1.07E-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 105	6.79	—	1.9E+01	0.0069	5.07E-06	—	4.03E-05	0.0001	4.03E-09
PCB 114	6.98	1.0E+00	—	0.0061	5.70E-09	3.00E-04	2.38E-03	0.0001	2.38E-07
PCB 118	7.12	—	2.9E+01	0.0055	6.09E-06	—	4.83E-05	0.00001	4.83E-10
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 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 189	8.27	1.2E+00	—	0.0016	1.85E-09	3.60E-04	2.86E-03	0.00001	2.86E-08
Congener total: [8]									3.12E-04
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 114	6.98	2.3E+00	—	0.0061	1.31E-08	6.90E-04	5.48E-03	0.0001	5.48E-07
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 157	7.62	4.8E+00	—	0.0035	1.57E-08	1.44E-03	1.14E-02	0.0001	1.14E-06
PCB 189	8.27	8.2E+00	—	0.0016	1.26E-08	2.46E-03	1.95E-02	0.00001	1.95E-07
Congener total: [8]									3.57E-03

Table M5.4.14
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 congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in composite of ten samples from each exposure area. "—" indicates the congener was not detected or was detected above the reporting limit.

(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 M5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table M5.4.2 for basis/source.
SIR_{owl} = soil ingestion rate for owl (kg/day) = 0.0003 kg/day. See Table M5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 M5.4.2 for home range.
BW = body weight (kg) = 0.126 kg. See Table M5.4.2 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 M5.4.15
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 114	1.6E+00	0.20	1.66E-02	4.80E-04	1.36E-01	0.0001	1.36E-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 157	2.0E+00	0.20	2.08E-02	6.00E-04	1.70E-01	0.0001	1.70E-05
Congener total: (7)							7.05E-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 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 189	1.6E+00	0.20	1.66E-02	4.80E-04	1.36E-01	0.00001	1.36E-06
Congener total: (7)							3.79E-02
Southwest							
PCB 77	2.6E+00	0.20	2.70E-02	7.80E-04	2.21E-01	0.05	1.10E-02
PCB 114	1.0E+00	0.20	1.04E-02	3.00E-04	8.49E-02	0.0001	8.49E-06
PCB 123	1.2E+00	0.20	1.25E-02	3.60E-04	1.02E-01	0.00001	1.02E-06
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 189	1.2E+00	0.20	1.25E-02	3.60E-04	1.02E-01	0.00001	1.02E-06
Congener total: (7)							1.11E-02
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 114	2.3E+00	0.20	2.39E-02	6.90E-04	1.95E-01	0.0001	1.95E-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 157	4.8E+00	0.20	4.99E-02	1.44E-03	4.08E-01	0.0001	4.08E-05
PCB 189	8.2E+00	0.20	8.53E-02	2.46E-03	6.96E-01	0.00001	6.96E-06
Congener total: (7)							1.27E-01

Table M5.4.15
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 congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Concentration detected in composite of ten samples from each exposure area.

(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_{owl}) + (C_{soil} x SIR_{owl})] 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_{owl} = food ingestion rate (mice) for female owl (kg/day) = 0.052. See Table M5.4.2 for basis/source.

SIR_{owl} = soil ingestion rate for female owl (kg/day) = 0.0003 kg/day. See Table M5.4.2 for basis/source.

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table M5.4.2 for basis/source of home range.

BW = body weight (kg) = 0.126 kg. See Table M5.4.2 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 M5.4.16
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 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 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	—	3.3E+01	1.07	—	1.45E-01	—	1.29E+00	0.0001	1.29E-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	—	1.7E+01	1.06	—	7.45E-02	—	6.65E-01	0.00001	6.65E-06
PCB 169	7.41	—	7.5E-01	1.04	—	3.25E-03	—	2.90E-02	0.001	2.90E-05
PCB 189	8.27	—	8.6E+00	1.15	—	3.76E-02	—	3.35E-01	0.00001	3.35E-06
Congener total: (8)										4.86E-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 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	—	1.07	1.89E-01	—	1.02E-02	1.78E+00	0.0001	1.78E-04
PCB 157	7.62	1.8E+00	—	1.07	5.01E-02	—	2.70E-03	4.71E-01	0.0001	4.71E-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	—	6.6E-01	1.04	—	2.83E-03	—	2.53E-02	0.001	2.53E-05
PCB 189	8.27	1.6E+00	—	1.15	4.80E-02	—	2.40E-03	4.50E-01	0.00001	4.50E-06
Congener total: (8)										2.92E-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 105	6.79	—	1.9E+01	0.97	—	7.76E-02	—	6.93E-01	0.0001	6.93E-05
PCB 114	6.98	1.0E+00	—	0.99	2.58E-02	—	1.50E-03	2.44E-01	0.0001	2.44E-05
PCB 118	7.12	—	2.9E+01	1.01	—	1.18E-01	—	1.05E+00	0.00001	1.05E-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 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 189	8.27	1.2E+00	—	1.15	3.60E-02	—	1.80E-03	3.37E-01	0.00001	3.37E-06
Congener total: (8)										4.75E-02
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 114	6.98	2.3E+00	—	0.99	5.94E-02	—	3.45E-03	5.61E-01	0.0001	5.61E-05
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 157	7.62	4.8E+00	—	1.07	1.34E-01	—	7.20E-03	1.26E+00	0.0001	1.26E-04
PCB 189	8.27	8.2E+00	—	1.15	2.46E-01	—	1.23E-02	2.30E+00	0.00001	2.30E-05
Congener total: (8)										7.36E-01

Table M5.4.16
Exposure Calculation for the Western Meadowlark - Adult Male
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration detected in composite of ten samples from each exposure area. "—" indicates the congener was not detected or was detected above the reporting limit.

(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 M5.4.2 for basis/source.

FIR_{plant} = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0049. See Table M5.4.2 for basis/source.

SIR_{lark} = soil ingestion rate for meadowlark = 0.0015 kg/day. See Table M5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 M5.4.2 for home range.

BW = body weight (kg) = 0.112 kg. See Table M5.4.2 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 M5.4.17
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 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 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	—	3.3E+01	1.07	—	1.18E-01	—	1.32E+00	0.0001	1.32E-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	—	1.7E+01	1.06	—	6.08E-02	—	6.80E-01	0.00001	6.80E-06
PCB 169	7.41	—	7.5E-01	1.04	—	2.65E-03	—	2.97E-02	0.001	2.97E-05
PCB 189	8.27	—	8.6E+00	1.15	—	3.07E-02	—	3.43E-01	0.00001	3.43E-06
Congener total: (8)										4.95E-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 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	—	1.07	1.52E-01	—	8.16E-03	1.80E+00	0.0001	1.80E-04
PCB 157	7.62	1.8E+00	—	1.07	4.04E-02	—	2.16E-03	4.77E-01	0.0001	4.77E-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	—	6.6E-01	1.04	—	2.31E-03	—	2.58E-02	0.001	2.58E-05
PCB 189	8.27	1.6E+00	—	1.15	3.87E-02	—	1.92E-03	4.55E-01	0.00001	4.55E-06
Congener total: (8)										2.98E-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 105	6.79	—	1.9E+01	0.97	—	6.34E-02	—	7.09E-01	0.0001	7.09E-05
PCB 114	6.98	1.0E+00	—	0.99	2.09E-02	—	1.20E-03	2.47E-01	0.0001	2.47E-05
PCB 118	7.12	—	2.9E+01	1.01	—	9.60E-02	—	1.07E+00	0.00001	1.07E-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 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 189	8.27	1.2E+00	—	1.15	2.91E-02	—	1.44E-03	3.41E-01	0.00001	3.41E-06
Congener total: (8)										4.82E-02
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 114	6.98	2.3E+00	—	0.99	4.80E-02	—	2.76E-03	5.68E-01	0.0001	5.68E-05
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 157	7.62	4.8E+00	—	1.07	1.08E-01	—	5.76E-03	1.27E+00	0.0001	1.27E-04
PCB 189	8.27	8.2E+00	—	1.15	1.99E-01	—	9.84E-03	2.33E+00	0.00001	2.33E-05
Congener total: (8)										7.48E-01

Table M5.4.17
Exposure Calculation for the Western Meadowlark - Female/Juvenile
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:
(1) Includes congeners detected at or above the estimated detection limit and below the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration detected in composite of ten samples from each exposure area. "—" indicates the congener was not detected or was detected above the reporting limit.
(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 M5.4.2 for basis/source.
FIR_{plant} = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0040. See Table M5.4.2 for basis/source.
SIR_{lark} = soil ingestion rate for meadowlark = 0.0012 kg/day. See Table M5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 M5.4.2 for home range.
BW = body weight (kg) = 0.0894 kg. See Table M5.4.2 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 M5.4.18
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 114	6.98	0.1217	0.0097	1.71E-02	1.67E-04	0.0001	1.67E-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 157	7.62	0.0700	0.0056	2.14E-02	1.20E-04	0.0001	1.20E-08
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 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 189	8.27	0.0330	0.0026	1.71E-02	4.51E-05	0.00001	4.51E-10
Congener total: (9)							5.61E-05
Southwest							
PCB 77	6.63	0.1522	0.0122	2.78E-02	3.39E-04	0.05	1.69E-05
PCB 114	6.98	0.1217	0.0097	1.07E-02	1.04E-04	0.0001	1.04E-08
PCB 123	6.98	0.1217	0.0097	1.28E-02	1.25E-04	0.00001	1.25E-09
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 189	8.27	0.0330	0.0026	1.28E-02	3.39E-05	0.00001	3.39E-10
Congener total: (9)							1.70E-05
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 114	6.98	0.1217	0.0097	2.46E-02	2.40E-04	0.0001	2.40E-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 157	7.62	0.0700	0.0056	5.14E-02	2.88E-04	0.0001	2.88E-08
PCB 189	8.27	0.0330	0.0026	8.77E-02	2.31E-04	0.00001	2.31E-09
Congener total: (9)							1.90E-04

Notes:
(1) Includes congeners detected at or above the estimated detection limit and below the reporting limit.
(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 M5.4.15.
(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 M5.4.19
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 114	6.98	0.1217	0.0097	6.61E-02	6.44E-04	0.0001	6.44E-08
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	1.18E-01	6.76E-04	0.0001	6.76E-08
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	6.08E-02	3.83E-04	0.00001	3.83E-09
PCB 169	7.41	0.0857	0.0069	2.65E-03	1.82E-05	0.001	1.82E-08
PCB 189	8.27	0.0330	0.0026	3.07E-02	8.09E-05	0.00001	8.09E-10
Congener total: [(9)]							5.34E-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 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	1.61E-01	9.17E-04	0.0001	9.17E-08
PCB 157	7.62	0.0700	0.0056	4.26E-02	2.39E-04	0.0001	2.39E-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	2.31E-03	1.58E-05	0.001	1.58E-08
PCB 189	8.27	0.0330	0.0026	4.07E-02	1.07E-04	0.00001	1.07E-09
Congener total: [(9)]							3.18E-04
Southwest							
PCB 77	6.63	0.1522	0.0122	8.57E-02	1.04E-03	0.05	5.21E-05
PCB 105	6.79	0.1384	0.0111	6.34E-02	7.01E-04	0.0001	7.01E-08
PCB 114	6.98	0.1217	0.0097	2.21E-02	2.15E-04	0.0001	2.15E-08
PCB 118	7.12	0.1096	0.0088	9.60E-02	8.42E-04	0.00001	8.42E-09
PCB 123	6.98	0.1217	0.0097	3.18E-02	3.10E-04	0.00001	3.10E-09
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 189	8.27	0.0330	0.0026	3.05E-02	8.04E-05	0.00001	8.04E-10
Congener total: [(9)]							5.23E-05
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 114	6.98	0.1217	0.0097	5.08E-02	4.94E-04	0.0001	4.94E-08
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 157	7.62	0.0700	0.0056	1.14E-01	6.36E-04	0.0001	6.36E-08
PCB 189	8.27	0.0330	0.0026	2.08E-01	5.50E-04	0.00001	5.50E-09
Congener total: [(9)]							8.03E-04

Notes:

(1) Includes congeners detected at or above the estimated detection limit and below the reporting limit.
(2) Log Kow source: ORNL (2009).
(3) Basis for BTF (biotransfer factor from diet to fat): diet-to-fat transfer equation from RTI (2005): $\text{Log BTF} = -0.099(\text{log Kow})^2 + 1.07(\text{log Kow}) - 3.56$
(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 M5.4.17.
(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 M5.4.20
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 114	1.6E+00	1.26	2.02E+00	0.0001	2.02E-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 157	2.0E+00	1.26	2.52E+00	0.0001	2.52E-04
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 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 189	1.6E+00	1.26	2.02E+00	0.00001	2.02E-05
Congener total: (7)					5.62E-01
Southwest					
PCB 77	2.6E+00	1.26	3.28E+00	0.05	1.64E-01
PCB 114	1.0E+00	1.26	1.26E+00	0.0001	1.26E-04
PCB 123	1.2E+00	1.26	1.51E+00	0.00001	1.51E-05
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 189	1.2E+00	1.26	1.51E+00	0.00001	1.51E-05
Congener total: (7)					1.65E-01
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 114	2.3E+00	1.26	2.90E+00	0.0001	2.90E-04
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 157	4.8E+00	1.26	6.05E+00	0.0001	6.05E-04
PCB 189	8.2E+00	1.26	1.03E+01	0.00001	1.03E-04
Congener total: (7)					1.88E+00

Table M5.4.20
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 congeners detected at or above the estimated detection limit and below the reporting limit.

(2) Concentration detected in composite of ten samples from each exposure area.

(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 M5.4.21
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	7.63E-05	1.27E-04	1	10	8E-5	1E-4	8E-6	1E-5
South	6.08E-05	1.01E-04	1	10	6E-5	1E-4	6E-6	1E-5
Southwest	2.83E-07	4.71E-07	1	10	3E-7	5E-7	3E-8	5E-8
B-18 Landfill	1.77E-04	2.95E-04	1	10	2E-4	3E-4	2E-5	3E-5
Diet of Carnivorous Prey								
BTF Approach								
Southeast	7.60E-05	1.27E-04	1	10	8E-5	1E-4	8E-6	1E-5
South	6.07E-05	1.01E-04	1	10	6E-5	1E-4	6E-6	1E-5
Southwest	2.82E-07	4.71E-07	1	10	3E-7	5E-7	3E-8	5E-8
B-18 Landfill	1.77E-04	2.95E-04	1	10	2E-4	3E-4	2E-5	3E-5
BAF Approach								
Southeast	1.90E-03	3.16E-03	1	10	2E-3	3E-3	2E-4	3E-4
South	1.51E-03	2.52E-03	1	10	2E-3	3E-3	2E-4	3E-4
Southwest	7.05E-06	1.17E-05	1	10	7E-6	1E-5	7E-7	1E-6
B-18 Landfill	4.42E-03	7.36E-03	1	10	4E-3	7E-3	4E-4	7E-4

Notes:
(1) TEDs for adults from Table M5.4.3 for herbivorous prey,
and from Tables M5.4.5 and M5.4.7 for carnivorous prey (BTF and BAF approaches, respectively).
(2) TEDs for juveniles from Table M5.4.4 for herbivorous prey,
and from Tables M5.4.6 and M5.4.8 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 M5.4.22
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	8.54E-02	8.56E-02	1	10	9E-2	9E-2	9E-3	9E-3
South	4.82E-02	4.83E-02	1	10	5E-2	5E-2	5E-3	5E-3
Southwest	1.79E-04	1.80E-04	1	10	2E-4	2E-4	2E-5	2E-5
B-18 Landfill	6.54E-02	6.55E-02	1	10	7E-2	7E-2	7E-3	7E-3

Notes:
(1) TEDs from Table M5.4.9 for adult and Table M5.4.10 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 M5.4.23
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	1.10E-02	1.14E-02	1	10	1E-2	1E-2	1E-3	1E-3
South	8.79E-03	9.09E-03	1	10	9E-3	9E-3	9E-4	9E-4
Southwest	4.16E-05	4.30E-05	1	10	4E-5	4E-5	4E-6	4E-6
B-18 Landfill	2.56E-02	2.65E-02	1	10	3E-2	3E-2	3E-3	3E-3

Notes:
(1) TEDs from Table M5.4.11 for adult and Table M5.4.12 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 M5.4.24
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	1.95E-03	2.00E-03	10	100	2E-4	2E-4	2E-5	2E-5
South	1.05E-03	1.07E-03	10	100	1E-4	1E-4	1E-5	1E-5
Southwest	3.05E-04	3.12E-04	10	100	3E-5	3E-5	3E-6	3E-6
B-18 Landfill	3.49E-03	3.57E-03	10	100	3E-4	4E-4	3E-5	4E-5
Diet of Carnivorous Prey								
BAF Approach								
Southeast	NC	7.05E-02	10	100	NC	7E-3	NC	7E-4
South	NC	3.79E-02	10	100	NC	4E-3	NC	4E-4
Southwest	NC	1.11E-02	10	100	NC	1E-3	NC	1E-4
B-18 Landfill	NC	1.27E-01	10	100	NC	1E-2	NC	1E-3

Notes:
(1) TEDs for adults with a diet of herbivorous prey are from Table M5.4.13 for adult males and Table M5.4.14 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 M5.4.15 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 M5.4.25
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	4.86E-01	4.95E-01	10	100	5E-2	5E-2	5E-3	5E-3
South	2.92E-01	2.98E-01	10	100	3E-2	3E-2	3E-3	3E-3
Southwest	4.75E-02	4.82E-02	10	100	5E-3	5E-3	5E-4	5E-4
B-18 Landfill	7.36E-01	7.48E-01	10	100	7E-2	7E-2	7E-3	7E-3

Notes:
(1) TEDs from Table M5.4.16 for adult male and Table M5.4.17 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 M5.4.26
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 Exposure Area	TEC in Egg (ng/kg wet wt) (1)	TRV (ng/kg wet wt)		HQ_{low} (3)	HQ_{high} (4)
		Low (2)	High (2)	Egg/ Embryo	Egg/ Embryo
Burrowing Owl					
BTF Approach					
Southeast	1.07E-04	66	150	2E-6	7E-7
South	5.61E-05	66	150	8E-7	4E-7
Southwest	1.70E-05	66	150	3E-7	1E-7
B-18 Landfill	1.90E-04	66	150	3E-6	1E-6
BAF Approach					
Southeast	1.05E+00	66	150	2E-2	7E-3
South	5.62E-01	66	150	9E-3	4E-3
Southwest	1.65E-01	66	150	2E-3	1E-3
B-18 Landfill	1.88E+00	66	150	3E-2	1E-2
Western Meadowlark					
BTF Approach					
Southeast	5.34E-04	66	150	8E-6	4E-6
South	3.18E-04	66	150	5E-6	2E-6
Southwest	5.23E-05	66	150	8E-7	3E-7
B-18 Landfill	8.03E-04	66	150	1E-5	5E-6
BAF Approach					
Southeast	1.05E+00	66	150	2E-2	7E-3
South	5.62E-01	66	150	9E-3	4E-3
Southwest	1.65E-01	66	150	2E-3	1E-3
B-18 Landfill	1.88E+00	66	150	3E-2	1E-2

Notes:
(1) Egg TECs based on the BTF approach are from Table M5.4.18 for the burrowing owl, Table M5.4.19 for the meadowlark. Egg TECs based on the BAF approach are from Table M5.4.20 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 M5.4.27
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	8E-5	1E-4		8E-6	1E-5	
South	6E-5	1E-4		6E-6	1E-5	
Southwest	3E-7	5E-7		3E-8	5E-8	
B-18 Landfill	2E-4	3E-4		2E-5	3E-5	
Carnivorous prey						
Southeast	8E-5	1E-4		8E-6	1E-5	
South	6E-5	1E-4		6E-6	1E-5	
Southwest	3E-7	5E-7		3E-8	5E-8	
B-18 Landfill	2E-4	3E-4		2E-5	3E-5	
BAF Approach						
Carnivorous prey						
Southeast	2E-3	3E-3		2E-4	3E-4	
South	2E-3	3E-3		2E-4	3E-4	
Southwest	7E-6	1E-5		7E-7	1E-6	
B-18 Landfill	4E-3	7E-3		4E-4	7E-4	
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	2E-4	2E-4		2E-5	2E-5	
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	9E-3	9E-3		9E-4	9E-4	
Southwest	4E-5	4E-5		4E-6	4E-6	
B-18 Landfill	3E-2	3E-2		3E-3	3E-3	
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	8E-7	1E-5	1E-5	4E-7
Southwest	3E-5	3E-5	3E-7	3E-6	3E-6	1E-7
B-18 Landfill	3E-4	4E-4	3E-6	3E-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-3	2E-3	NC	1E-4	1E-3
B-18 Landfill	NC	1E-2	3E-2	NC	1E-3	1E-2

Table M5.4.27
Summary of Hazard Quotients
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor **Exposure Area**	**HQ_{low}**			**HQ_{high}**		
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	5E-3	5E-3	8E-7	5E-4	5E-4	3E-7
B-18 Landfill	7E-2	7E-2	1E-5	7E-3	7E-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-3	NC	NC	1E-3
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 M5.4.28
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**
0.15	0.12	0.00056	0.081	0.12	0.071	0.59	0.35	0.19

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 N5.3.1
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 169	1.1E+00	3.00E-02	3.30E-02
	PCB Total TEC	—	—	**3.30E-02**
South	PCB 114	5.0E+00	3.00E-05	1.50E-04
	PCB 169	5.0E+00	3.00E-02	1.50E-01
	PCB Total TEC	—	—	**1.50E-01**
Southwest	PCB 81	5.0E+00	3.00E-04	1.50E-03
	PCB 126	5.0E+00	1.00E-01	5.00E-01
	PCB 169	5.0E+00	3.00E-02	1.50E-01
	PCB Total TEC	—	—	**6.52E-01**

Notes:

The concentrations of the 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 N5.3.2
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	None	—	—	—
	PCB Total TEC	—	—	**—**
South	PCB 189	1.2E+00	3.00E-05	3.45E-05
	PCB Total TEC	—	—	**3.45E-05**
Southwest	PCB 81	1.1E+00	3.00E-04	3.15E-04
	PCB 114	1.1E+00	3.00E-05	3.15E-05
	PCB 126	1.1E+00	1.00E-01	1.05E-01
	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	—	—	**1.37E-01**

Notes:

The concentrations of the 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 N5.3.3
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 126	8.4E-11	—	1.00E-01	8.43E-12
		PCB 169	8.4E-11	—	3.00E-02	2.53E-12
		PCB 189	8.4E-11	—	3.00E-05	2.53E-15
	February	PCB 126	7.8E-11	—	1.00E-01	7.75E-12
		PCB 169	7.8E-11	—	3.00E-02	2.33E-12
	March	PCB 126	7.8E-11	—	1.00E-01	7.76E-12
		PCB 169	7.8E-11	—	3.00E-02	2.33E-12
		PCB 189	7.8E-11	—	3.00E-05	2.33E-15
	April	PCB 81	8.8E-11	—	3.00E-04	2.64E-14
		PCB 126	8.8E-11	—	1.00E-01	8.79E-12
		PCB 189	8.8E-11	—	3.00E-05	2.64E-15
	May	PCB 81	8.5E-11	—	3.00E-04	2.54E-14
		PCB 114	8.5E-11	—	3.00E-05	2.54E-15
		PCB 126	8.5E-11	—	1.00E-01	8.48E-12
		PCB 189	8.5E-11	—	3.00E-05	2.54E-15
	June	PCB 169	7.9E-11	—	3.00E-02	2.36E-12
	July	PCB 81	8.0E-11	—	3.00E-04	2.39E-14
		PCB 126	8.0E-11	—	1.00E-01	7.95E-12
		PCB 169	8.0E-11	—	3.00E-02	2.39E-12
		PCB 189	8.0E-11	—	3.00E-05	2.39E-15
	August	PCB 189	8.1E-11	—	3.00E-05	2.42E-15
	September	PCB 169	8.1E-11	—	3.00E-02	2.44E-12
	October	PCB 126	7.6E-11	—	1.00E-01	7.61E-12
		PCB 169	7.6E-11	—	3.00E-02	2.28E-12
	November	PCB 126	8.4E-11	—	1.00E-01	8.37E-12
		PCB 169	8.4E-11	—	3.00E-02	2.51E-12
	December	PCB 81	7.8E-11	—	3.00E-04	2.33E-14
		PCB 126	7.8E-11	—	1.00E-01	7.76E-12
		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	—	—	—	**7.87E-12**

Table N5.3.3
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 81	9.2E-11	—	3.00E-04	2.77E-14
		PCB 126	9.2E-11	—	1.00E-01	9.24E-12
		PCB 167	9.2E-11	—	3.00E-05	2.77E-15
		PCB 169	9.2E-11	—	3.00E-02	2.77E-12
	February	PCB 126	7.8E-11	—	1.00E-01	7.75E-12
		PCB 169	7.8E-11	—	3.00E-02	2.33E-12
	March	PCB 126	8.0E-11	—	1.00E-01	8.05E-12
		PCB 169	8.0E-11	—	3.00E-02	2.41E-12
		PCB 189	8.0E-11	—	3.00E-05	2.41E-15
	April (2)	PCB 81	8.0E-11	—	3.00E-04	2.40E-14
		PCB 114	8.0E-11	—	3.00E-05	2.40E-15
		PCB 126	8.0E-11	—	1.00E-01	7.99E-12
		PCB 189	8.0E-11	—	3.00E-05	2.40E-15
	May	PCB 81	7.9E-11	—	3.00E-04	2.37E-14
		PCB 114	7.9E-11	—	3.00E-05	2.37E-15
		PCB 126	7.9E-11	—	1.00E-01	7.89E-12
		PCB 189	7.9E-11	—	3.00E-05	2.37E-15
	June	PCB 81	7.8E-11	—	3.00E-04	2.34E-14
		PCB 126	7.8E-11	—	1.00E-01	7.82E-12
		PCB 169	7.8E-11	—	3.00E-02	2.34E-12
	July	PCB 81	7.8E-11	—	3.00E-04	2.34E-14
		PCB 114	7.8E-11	—	3.00E-05	2.34E-15
		PCB 126	7.8E-11	—	1.00E-01	7.82E-12
		PCB 169	7.8E-11	—	3.00E-02	2.34E-12
		PCB 189	7.8E-11	—	3.00E-05	2.34E-15
	August	PCB 189	8.1E-11	—	3.00E-05	2.43E-15
	September	PCB 169	9.2E-11	—	3.00E-02	2.77E-12
	October	PCB 126	7.8E-11	—	1.00E-01	7.83E-12
		PCB 169	7.8E-11	—	3.00E-02	2.35E-12
		PCB 189	7.8E-11	—	3.00E-05	2.35E-15
	November (3)					
	December	PCB 126	7.8E-11	—	1.00E-01	7.75E-12
		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**

Notes:

The concentrations of the 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. This data set includes only non-detected concentrations; therefore, no scaling factors are used.

(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 N5.3.4
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 81	8.25E-02	6.34	2.23E-04	8.205E-05	298.1	-1.654	1.37E+07	1.42E+05
PCB 114	8.48E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 126	8.10E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 169	7.96E-02	7.41	1.62E-04	8.205E-05	298.1	-1.654	2.61E+08	2.69E+06
PCB 189	8.18E-02	8.27	1.38E-04	8.205E-05	298.1	-1.654	2.52E+09	2.60E+07
MSP								
PCB 81	8.15E-02	6.34	2.23E-04	8.205E-05	298.1	-1.654	1.37E+07	1.42E+05
PCB 114	7.90E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 126	8.01E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 167	9.24E-02	7.50	1.62E-04	8.205E-05	298.1	-1.654	3.25E+08	3.35E+06
PCB 169	8.19E-02	7.41	1.62E-04	8.205E-05	298.1	-1.654	2.61E+08	2.69E+06
PCB 189	7.92E-02	8.27	1.38E-04	8.205E-05	298.1	-1.654	2.52E+09	2.60E+07

Table N5.3.4
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 N5.3.3 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])

ρ_{air} - density of air (1.19 g/L)

ρ_{forage} - 770 g/L

f_{water} - 0.85 (fraction of forage that is water)

BTF - Biotransfer factor

Table N5.3.4
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 81	1.7E-04	8.45E-06	1.12E-08	3.50E-06	0.95	7.83E-02	0.01	1190	9.32E-02
PCB 114	1.7E-04	5.47E-06	7.22E-09	3.50E-06	0.92	7.83E-02	0.01	1190	5.25E-01
PCB 126	1.7E-04	2.22E-06	2.93E-09	3.50E-06	0.83	6.73E-02	0.01	1190	4.52E-01
PCB 169	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.48E-02	0.01	1190	1.01E+00
PCB 189	1.7E-04	1.30E-07	1.72E-10	3.50E-06	0.22	1.83E-02	0.01	1190	4.00E+00
MSP									
PCB 81	1.7E-04	8.45E-06	1.12E-08	3.50E-06	0.95	7.74E-02	0.01	1190	9.21E-02
PCB 114	1.7E-04	5.47E-06	7.22E-09	3.50E-06	0.92	7.30E-02	0.01	1190	4.90E-01
PCB 126	1.7E-04	2.22E-06	2.93E-09	3.50E-06	0.83	6.66E-02	0.01	1190	4.47E-01
PCB 167	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	5.20E-02	0.01	1190	1.47E+00
PCB 169	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.61E-02	0.01	1190	1.04E+00
PCB 189	1.7E-04	1.30E-07	1.72E-10	3.50E-06	0.22	1.77E-02	0.01	1190	3.87E+00

Table N5.3.4
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 N5.3.4
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 81	4.18E-03	315,360	0.39	0.147	0.3	5.00E+04	5.17E+02	18	2.24	1.28E-02
PCB 114	6.45E-03	315,360	0.39	0.147	0.3	5.00E+04	7.99E+02	18	2.24	1.98E-02
PCB 126	1.37E-02	315,360	0.39	0.147	0.3	5.00E+04	1.69E+03	18	2.24	4.20E-02
PCB 169	3.48E-02	315,360	0.39	0.147	0.3	5.00E+04	4.30E+03	18	2.24	1.07E-01
PCB 189	6.35E-02	315,360	0.39	0.147	0.3	5.00E+04	7.86E+03	18	2.24	1.95E-01
MSP										
PCB 81	4.13E-03	315,360	0.39	0.147	0.3	5.00E+04	5.11E+02	18	2.24	1.27E-02
PCB 114	6.01E-03	315,360	0.39	0.147	0.3	5.00E+04	7.45E+02	18	2.24	1.85E-02
PCB 126	1.35E-02	315,360	0.39	0.147	0.3	5.00E+04	1.68E+03	18	2.24	4.15E-02
PCB 167	4.04E-02	315,360	0.39	0.147	0.3	5.00E+04	5.00E+03	18	2.24	1.24E-01
PCB 169	3.58E-02	315,360	0.39	0.147	0.3	5.00E+04	4.43E+03	18	2.24	1.10E-01
PCB 189	6.14E-02	315,360	0.39	0.147	0.3	5.00E+04	7.61E+03	18	2.24	1.89E-01

Table N5.3.4
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 x (V_d x I_j + RN x R_w x W_p x 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 x k_w x 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 N5.3.4
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 81	1.06E-01	0.0003	3.18E-05
PCB 114	5.45E-01	0.00003	1.64E-05
PCB 126	4.94E-01	0.1	4.94E-02
PCB 169	1.12E+00	0.03	3.36E-02
PCB 189	4.19E+00	0.00003	1.26E-04
Total Congeners: [4]			**8.31E-02**
MSP			
PCB 81	1.05E-01	0.0003	3.14E-05
PCB 114	5.08E-01	0.00003	1.52E-05
PCB 126	4.89E-01	0.1	4.89E-02
PCB 167	1.59E+00	0.00003	4.77E-05
PCB 169	1.15E+00	0.03	3.45E-02
PCB 189	4.06E+00	0.00003	1.22E-04
Total Congeners: [4]			**8.36E-02**

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 N5.3.5
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 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
Total Congeners: (13)											2.42E-09
South											
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 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
Total Congeners: (13)											1.10E-08
Southwest											
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 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 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
Total Congeners: (13)											3.90E-08

Notes:

(1) Includes only congeners in surface soil and vegetation which were not detected at or above the estimated detection limit.

(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 N5.3.6
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 169	0.25	11.77	—	0.5	1.1E-06	1	7.41	0.0163	1	2.24E-09	0.03	6.71E-11
Total Congeners: (11)												6.71E-11
South												
PCB 114	0.25	11.77	—	0.5	5.0E-06	1	6.98	0.0231	1	1.45E-08	0.00003	4.34E-13
PCB 169	0.25	11.77	—	0.5	5.0E-06	1	7.41	0.0163	1	1.02E-08	0.03	3.05E-10
PCB 189	0.25	11.77	1.2E-06	0.5	—	1	8.27	0.0063	1	2.12E-08	0.00003	6.36E-13
Total Congeners: (11)												3.06E-10
Southwest												
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 114	0.25	11.77	1.1E-06	0.5	—	1	6.98	0.0231	1	7.14E-08	0.00003	2.14E-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 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	8.27	0.0063	1	1.93E-08	0.00003	5.80E-13
Total Congeners: (11)												1.04E-08

Notes:
(1) Includes only congeners in surface soil and vegetation which were not detected at or above the estimated detection limit.
(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.
(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: $\text{Log BTF} = -0.099(\log Kow)^2 + 1.07(\log Kow) - 3.56$
Equation output in (mg/kg fat)/(mg/day) was multiplied by fat composition of beef (0.19 kg fat/kg BW) to convert transfer factor to whole body basis.
(8) Concentration in beef equation from USEPA 2005: $A_{beef} = [(Fp \times Qp \times P) + (Fs \times Qs \times Cs \times Bs)] \times Ba_{beef} \times MF$
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 N5.3.7
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 169	0.25	20.3	—	0.4	1.1E-06	1	7.41	0.0034	1	3.77E-10	0.03	1.13E-11
Total Congeners: (11)												1.13E-11
South												
PCB 114	0.25	20.3	—	0.4	5.0E-06	1	6.98	0.0049	1	2.43E-09	0.00003	7.30E-14
PCB 169	0.25	20.3	—	0.4	5.0E-06	1	7.41	0.0034	1	1.71E-09	0.03	5.14E-11
PCB 189	0.25	20.3	1.2E-06	0.4	—	1	8.27	0.0013	1	7.69E-09	0.00003	2.31E-13
Total Congeners: (11)												5.17E-11
Southwest												
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 114	0.25	20.3	1.1E-06	0.4	—	1	6.98	0.0049	1	2.59E-08	0.00003	7.78E-13
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 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	8.27	0.0013	1	7.03E-09	0.00003	2.11E-13
Total Congeners: (11)												3.45E-09

Notes:

(1) Includes only congeners in surface soil and vegetation which were not detected at or above the estimated detection limit.

(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.

(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: 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 x Qp x P) + (Fs x Qs x Cs x Bs)] x Ba_{milk} x 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 N5.3.8
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 = (DA-event x EV x EF x ED x SA x 1/BW x 1/ATC)
				SA	Skin surface area for contact - Adult	5700	cm^2/day	USEPA 2004 (Head, Hands, Forearms, Lower Legs)	
				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 N5.3.9
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 N5.3.1	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 N5.3.10
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 N5.3.11
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 N5.3.11
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 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	

Table N5.3.11
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 N5.3.12
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 N5.3.1	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 N5.3.1	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 N5.3.1	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 N5.3.13
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 N5.3.14
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 N5.3.4)	mg/kg	--	Chronic Daily Intake (mg/kg-day) for carcinogens =
				CPRODbg	Belowground Produce Exposure Point Concentration	Modeled From Sampling Data (See Table N5.3.5)	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 N5.3.4)	mg/kg	--	Chronic Daily Intake (mg/kg-day) for carcinogens =
				CPRODbg	Belowground Produce Exposure Point Concentration	Modeled From Sampling Data (See Table N5.3.5)	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 N5.3.15
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 N5.3.6)	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 N5.3.6)	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 N5.3.16
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 N5.3.7)	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 N5.3.17
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	3.30E-08	0.0001	1	70	4.71E-14
South	1.50E-07	0.0001	1	70	2.15E-13
Southwest	6.52E-07	0.0001	1	70	9.31E-13

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	3.30E-08	0.0001	1	70	4.71E-14
South	1.50E-07	0.0001	1	70	2.15E-13
Southwest	6.52E-07	0.0001	1	70	9.31E-13

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	3.30E-08	0.0001	1	70	4.71E-14
South	1.50E-07	0.0001	1	70	2.15E-13
Southwest	6.52E-07	0.0001	1	70	9.31E-13

Notes (Step 1):

(1) Exposure Point Concentration (See Table N5.3.1 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 N5.3.17
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	6.71E-11	0.00122	1	8.19E-14
South	3.06E-10	0.00122	1	3.74E-13
Southwest	1.04E-08	0.00122	1	1.27E-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 ($A_{prod\text{-}ag}$) (1) mg/kg	Consumption Rate of Exposed Aboveground Produce ($CR_{prod\text{-}ag}$) (2) kg/kg-day DW	Concentration in Belowground Produce ($A_{prod\text{-}bg}$) (1) mg/kg	Consumption Rate of Belowground Produce ($CR_{prod\text{-}bg}$) (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	6.71E-11	0.00122	1	8.19E-14	8.36E-08	0.00047	2.42E-09	0.00017	1	3.97E-11	1.13E-11	0.01367	1	1.55E-13
South	3.06E-10	0.00122	1	3.74E-13	8.36E-08	0.00047	1.10E-08	0.00017	1	4.12E-11	5.17E-11	0.01367	1	7.07E-13
Southwest	1.04E-08	0.00122	1	1.27E-11	8.36E-08	0.00047	3.90E-08	0.00017	1	4.59E-11	3.45E-09	0.01367	1	4.72E-11

FUTURE RESIDENT

Exposure Area	Concentration in Exposed Aboveground Produce ($A_{prod\text{-}ag}$) (1) mg/kg	Consumption Rate of Exposed Aboveground Produce ($CR_{prod\text{-}ag}$) (2) kg/kg-day DW	Concentration in Belowground Produce ($A_{prod\text{-}bg}$) (1) mg/kg	Consumption Rate of Belowground Produce ($CR_{prod\text{-}bg}$) (2) kg/kg-day DW	Fraction of Contaminated Produce (F_{prod}) (3)	Daily Intake from Produce (I_{prod}) (5) mg/kg-day
Southeast	8.36E-08	0.00032	2.42E-09	0.00014	1	2.71E-11
South	8.36E-08	0.00032	1.10E-08	0.00014	1	2.83E-11
Southwest	8.36E-08	0.00032	3.90E-08	0.00014	1	3.22E-11

Table N5.3.17
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

Notes (Step 2):

(1) Exposure Point Concentration (See Tables N5.3.4, N5.3.5, N5.3.6, and N5.3.7 for aboveground produce, belowground produce, beef, and milk concentrations, respectively).

Aboveground produce concentration is from sampling location MSP, the location with the higher 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: $I_{prod} = (A_{prod\text{-}ag} \times CR_{prod\text{-}ag} + A_{prod\text{-}bg} \times CR_{prod\text{-}bg}) \times F_{prod}$

where:

I_{prod} - daily intake from produce (mg/kg-day)

$A_{prod\text{-}ag}$ - concentration in exposed aboveground produce (mg/kg)

$A_{prod\text{-}bg}$ - concentration in belowground produce (mg/kg)

$CR_{prod\text{-}ag}$ - consumption rate of exposed aboveground produce (kg/kg-day DW)

$CR_{prod\text{-}bg}$ - 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 N5.3.17
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	8.41E-09	0.83	24	350	40	70	70	0.001	365	1.31E-12
South	8.60E-09	0.83	24	350	40	70	70	0.001	365	1.34E-12
Southwest	9.42E-09	0.83	24	350	40	70	70	0.001	365	1.47E-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	8.41E-09	0.83	24	350	40	70	70	0.001	365	1.31E-12
South	8.60E-09	0.83	24	350	40	70	70	0.001	365	1.34E-12
Southwest	9.42E-09	0.83	24	350	40	70	70	0.001	365	1.47E-12

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	8.41E-09	0.83	24	350	30	70	70	0.001	365	9.84E-13
South	8.60E-09	0.83	24	350	30	70	70	0.001	365	1.01E-12
Southwest	9.42E-09	0.83	24	350	30	70	70	0.001	365	1.10E-12

Table N5.3.17
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

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 higher concentration (see Table N5.3.3).

Modeled particulate concentration for each exposure area is the concentration in soil at that exposure area (see Table N5.3.1) 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 N5.3.17
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	1.31E-12	4.71E-14	8.19E-14	1.44E-12	1.00E+09	2555	0.9	0.3	0.693	1.59E+01
South	1.34E-12	2.15E-13	3.74E-13	1.93E-12	1.00E+09	2555	0.9	0.3	0.693	2.13E+01
Southwest	1.47E-12	9.31E-13	1.27E-11	1.51E-11	1.00E+09	2555	0.9	0.3	0.693	1.67E+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	1.31E-12	4.71E-14	8.19E-14	3.97E-11	1.55E-13	4.13E-11	1.00E+09	2555	0.9	0.3	0.693	4.57E+02
South	1.34E-12	2.15E-13	3.74E-13	4.12E-11	7.07E-13	4.38E-11	1.00E+09	2555	0.9	0.3	0.693	4.85E+02
Southwest	1.47E-12	9.31E-13	1.27E-11	4.59E-11	4.72E-11	1.08E-10	1.00E+09	2555	0.9	0.3	0.693	1.20E+03

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	9.84E-13	4.71E-14	2.71E-11	2.81E-11	1.00E+09	2555	0.9	0.3	0.693	3.11E+02
South	1.01E-12	2.15E-13	2.83E-11	2.95E-11	1.00E+09	2555	0.9	0.3	0.693	3.27E+02
Southwest	1.10E-12	9.31E-13	3.22E-11	3.43E-11	1.00E+09	2555	0.9	0.3	0.693	3.79E+02

Table N5.3.17
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

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 x (1 x $(10)^9$) x h x f_1] / [0.693 x 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 x 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 N5.3.17
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	1.59E+01	0.04	0.9	0.688	1	9.4	1	4.20E-02
South	2.13E+01	0.04	0.9	0.688	1	9.4	1	5.62E-02
Southwest	1.67E+02	0.04	0.9	0.688	1	9.4	1	4.41E-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	4.57E+02	0.04	0.9	0.688	1	9.4	1	1.20E+00
South	4.85E+02	0.04	0.9	0.688	1	9.4	1	1.28E+00
Southwest	1.20E+03	0.04	0.9	0.688	1	9.4	1	3.15E+00

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	3.11E+02	0.04	0.9	0.688	1	9.4	1	8.20E-01
South	3.27E+02	0.04	0.9	0.688	1	9.4	1	8.60E-01
Southwest	3.79E+02	0.04	0.9	0.688	1	9.4	1	9.98E-01

Table N5.3.17
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

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} = [$C_{milkfat}$ x f_3 x f_4 x IR_{milk} x ED] / [BW_{infant} x 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 N5.3.18
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 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	3.30E-08	mg/kg	8.8E-16	mg/kg-day	1.3E+05	kg-day/mg	1.1E-10	2.5E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.1E-10					NA
			Dermal	PCB Total TEC	3.30E-08	mg/kg	2.8E-15	mg/kg-day	1.3E+05	kg-day/mg	3.6E-10	7.8E-15	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.6E-10					NA
		Exposure Point Total									4.8E-10					NA
	Exposure Medium Total										4.8E-10					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	5.40E-11	ug/m3	3.3E-13	ug/m3	3.8E+01	(ug/m3)-1	1.3E-11	9.4E-13	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.3E-11					NA
		Exposure Point Total									1.3E-11					NA
	Exposure Medium Total										1.3E-11					NA
Soil Total (Southeast)											4.9E-10					NA
Soil	Soil	South	Ingestion	PCB Total TEC	1.50E-07	mg/kg	4.0E-15	mg/kg-day	1.3E+05	kg-day/mg	5.2E-10	1.1E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.2E-10					NA
			Dermal	PCB Total TEC	1.50E-07	mg/kg	1.3E-14	mg/kg-day	1.3E+05	kg-day/mg	1.7E-09	3.6E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.7E-09					NA
		Exposure Point Total									2.2E-09					NA
	Exposure Medium Total										2.2E-09					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	2.46E-10	ug/m3	1.5E-12	ug/m3	3.8E+01	(ug/m3)-1	5.8E-11	4.3E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.8E-11					NA
		Exposure Point Total									5.8E-11					NA
	Exposure Medium Total										5.8E-11					NA
Soil Total (South)											2.2E-09					NA
Soil	Soil	Southwest	Ingestion	PCB Total TEC	6.52E-07	mg/kg	1.7E-14	mg/kg-day	1.3E+05	kg-day/mg	2.2E-09	4.8E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.2E-09					NA
			Dermal	PCB Total TEC	6.52E-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 N5.3.19
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 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	7.87E-09	ug/m3	4.9E-11	ug/m3	3.8E+01	(ug/m3)-1	1.9E-09	1.4E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.9E-09					NA
		Exposure Point Total									1.9E-09					NA
	Exposure Medium Total										1.9E-09					NA
Medium Total											1.9E-09					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	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

Table N5.3.20
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				
	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	3.30E-08	mg/kg	5.8E-14	mg/kg-day	1.3E+05	kg-day/mg	7.6E-09	1.0E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.6E-09					NA
			Dermal	PCB Total TEC	3.30E-08	mg/kg	8.4E-14	mg/kg-day	1.3E+05	kg-day/mg	1.1E-08	1.5E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.1E-08					NA
		Exposure Point Total									1.9E-08					NA
	Exposure Medium Total										1.9E-08					NA
	Beef Tissue	Southeast	Ingestion	PCB Total TEC	6.71E-11	mg/kg	4.2E-14	mg/kg-day	1.3E+05	kg-day/mg	5.5E-09	7.4E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.5E-09					NA
		Exposure Point Total									5.5E-09					NA
	Exposure Medium Total										5.5E-09					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	5.40E-11	ug/m3	3.0E-11	ug/m3	3.8E+01	(ug/m3)-1	1.1E-09	5.2E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.1E-09					NA
		Exposure Point Total									1.1E-09					NA
	Exposure Medium Total										1.1E-09					NA
Soil Total (Southeast)											2.5E-08					NA
Soil	Soil	South	Ingestion	PCB Total TEC	1.50E-07	mg/kg	2.6E-13	mg/kg-day	1.3E+05	kg-day/mg	3.4E-08	4.6E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.4E-08					NA
			Dermal	PCB Total TEC	1.50E-07	mg/kg	3.8E-13	mg/kg-day	1.3E+05	kg-day/mg	5.0E-08	6.7E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.0E-08					NA
		Exposure Point Total									8.4E-08					NA
	Exposure Medium Total										8.4E-08					NA
	Beef Tissue	South	Ingestion	PCB Total TEC	3.06E-10	mg/kg	1.9E-13	mg/kg-day	1.3E+05	kg-day/mg	2.5E-08	3.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.5E-08					NA
		Exposure Point Total									2.5E-08					NA
	Exposure Medium Total										2.5E-08					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	2.46E-10	ug/m3	1.3E-10	ug/m3	3.8E+01	(ug/m3)-1	5.1E-09	2.4E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.1E-09					NA
		Exposure Point Total									5.1E-09					NA
	Exposure Medium Total										5.1E-09					NA
Soil Total (South)											1.1E-07					NA

Table N5.3.20
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	6.52E-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	6.52E-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	1.04E-08	mg/kg	6.6E-12	mg/kg-day	1.3E+05	kg-day/mg	8.6E-07	1.2E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								8.6E-07					NA
		Exposure Point Total									8.6E-07					NA
	Exposure Medium Total										8.6E-07					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	1.07E-09	ug/m3	5.8E-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)											1.2E-06					NA

Table N5.3.21
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	7.87E-09	ug/m3	4.3E-09	ug/m3	3.8E+01	(ug/m3)-1	1.6E-07	7.6E-09	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.6E-07					NA
		Exposure Point Total									1.6E-07					NA
	Exposure Medium Total										1.6E-07					NA
Medium Total											1.6E-07					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	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

Table N5.3.22
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	3.30E-08	mg/kg	5.8E-14	mg/kg-day	1.3E+05	kg-day/mg	7.6E-09	1.0E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.6E-09					NA
			Dermal	PCB Total TEC	3.30E-08	mg/kg	8.4E-14	mg/kg-day	1.3E+05	kg-day/mg	1.1E-08	1.5E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.1E-08					NA
		Exposure Point Total									1.9E-08					NA
	Exposure Medium Total										1.9E-08					NA
	Plant Tissue	Southeast	Ingestion	PCB Total TEC			2.6E-11	mg/kg-day	1.3E+05	kg-day/mg	3.4E-06	4.6E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.36E-08	mg/kg										
				Belowground	2.42E-09	mg/kg										
			Exp. Route Total								3.4E-06					NA
		Exposure Point Total									3.4E-06					NA
	Exposure Medium Total										3.4E-06					NA
	Beef Tissue	Southeast	Ingestion	PCB Total TEC	6.71E-11	mg/kg	4.2E-14	mg/kg-day	1.3E+05	kg-day/mg	5.5E-09	7.4E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.5E-09					NA
		Exposure Point Total									5.5E-09					NA
	Exposure Medium Total										5.5E-09					NA
	Milk	Southeast	Ingestion	PCB Total TEC	1.13E-11	mg/kg	9.3E-14	mg/kg-day	1.3E+05	kg-day/mg	1.2E-08	1.6E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.2E-08					NA
		Exposure Point Total									1.2E-08					NA
	Exposure Medium Total										1.2E-08					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	5.40E-11	ug/m3	3.0E-11	ug/m3	3.8E+01	(ug/m3)-1	1.1E-09	5.2E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.1E-09					NA
		Exposure Point Total									1.1E-09					NA
	Exposure Medium Total										1.1E-09					NA
Soil Total (Southeast)											3.5E-06					NA

Table N5.3.22
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	South	Ingestion	PCB Total TEC	1.50E-07	mg/kg	2.6E-13	mg/kg-day	1.3E+05	kg-day/mg	3.4E-08	4.6E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.4E-08					NA
			Dermal	PCB Total TEC	1.50E-07	mg/kg	3.8E-13	mg/kg-day	1.3E+05	kg-day/mg	5.0E-08	6.7E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.0E-08					NA
		Exposure Point Total									8.4E-08					NA
	Exposure Medium Total										8.4E-08					NA
	Plant Tissue	South	Ingestion	PCB Total TEC			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
				Aboveground	8.36E-08	mg/kg										
				Belowground	1.10E-08	mg/kg										
			Exp. Route Total								3.5E-06					NA
		Exposure Point Total									3.5E-06					NA
	Exposure Medium Total										3.5E-06					NA
	Beef Tissue	South	Ingestion	PCB Total TEC	3.06E-10	mg/kg	1.9E-13	mg/kg-day	1.3E+05	kg-day/mg	2.5E-08	3.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.5E-08					NA
		Exposure Point Total									2.5E-08					NA
	Exposure Medium Total										2.5E-08					NA
	Milk	South	Ingestion	PCB Total TEC	5.17E-11	mg/kg	4.3E-13	mg/kg-day	1.3E+05	kg-day/mg	5.5E-08	7.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.5E-08					NA
		Exposure Point Total									5.5E-08					NA
	Exposure Medium Total										5.5E-08					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	2.46E-10	ug/m3	1.3E-10	ug/m3	3.8E+01	(ug/m3)-1	5.1E-09	2.4E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.1E-09					NA
		Exposure Point Total									5.1E-09					NA
	Exposure Medium Total										5.1E-09					NA
Soil Total (South)											3.7E-06					NA

Table N5.3.22
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	6.52E-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	6.52E-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			3.0E-11	mg/kg-day	1.3E+05	kg-day/mg	3.9E-06	5.3E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.36E-08	mg/kg										
				Belowground	3.90E-08	mg/kg										
			Exp. Route Total								3.9E-06					NA
		Exposure Point Total									3.9E-06					NA
	Exposure Medium Total										3.9E-06					NA
	Beef Tissue	Southwest	Ingestion	PCB Total TEC	1.04E-08	mg/kg	6.6E-12	mg/kg-day	1.3E+05	kg-day/mg	8.6E-07	1.2E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								8.6E-07					NA
		Exposure Point Total									8.6E-07					NA
	Exposure Medium Total										8.6E-07					NA
	Milk	Southwest	Ingestion	PCB Total TEC	3.45E-09	mg/kg	2.8E-11	mg/kg-day	1.3E+05	kg-day/mg	3.7E-06	5.0E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.7E-06					NA
		Exposure Point Total									3.7E-06					NA
	Exposure Medium Total										3.7E-06					NA
	Ambient Air	Particulates Southwest	Inhalation	PCB Total TEC	1.07E-09	ug/m3	5.8E-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)											8.8E-06					NA

Table N5.3.23
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	7.87E-09	ug/m3	4.3E-09	ug/m3	3.8E+01	(ug/m3)-1	1.6E-07	7.6E-09	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.6E-07					NA
		Exposure Point Total									1.6E-07					NA
	Exposure Medium Total										1.6E-07					NA
Medium Total											1.6E-07					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	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

Table N5.3.24
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					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	3.30E-08	mg/kg	5.2E-14	mg/kg-day	1.3E+05	kg-day/mg	6.7E-09	1.2E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								6.7E-09					NA
			Dermal	PCB Total TEC	3.30E-08	mg/kg	2.3E-14	mg/kg-day	1.3E+05	kg-day/mg	3.0E-09	5.3E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.0E-09					NA
		Exposure Point Total									9.7E-09					NA
	Exposure Medium Total										9.7E-09					NA
	Plant Tissue	Southeast	Ingestion	PCB Total TEC			1.4E-11	mg/kg-day	1.3E+05	kg-day/mg	1.9E-06	3.3E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.36E-08	mg/kg										
				Belowground	2.42E-09	mg/kg										
			Exp. Route Total								1.9E-06					NA
		Exposure Point Total									1.9E-06					NA
	Exposure Medium Total										1.9E-06					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	5.40E-11	ug/m3	2.2E-11	ug/m3	3.8E+01	(ug/m3)-1	8.4E-10	5.2E-11	ug/m3	NA	ug/m3	NA
			Exp. Route Total								8.4E-10					NA
		Exposure Point Total									8.4E-10					NA
	Exposure Medium Total										8.4E-10					NA
Soil Total (Southeast)											1.9E-06					NA

Table N5.3.24
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	South	Ingestion	PCB Total TEC	1.50E-07	mg/kg	2.4E-13	mg/kg-day	1.3E+05	kg-day/mg	3.1E-08	5.5E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.1E-08					NA
			Dermal	PCB Total TEC	1.50E-07	mg/kg	1.0E-13	mg/kg-day	1.3E+05	kg-day/mg	1.4E-08	2.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.4E-08					NA
		Exposure Point Total									4.4E-08					NA
	Exposure Medium Total										4.4E-08					NA
	Plant Tissue	South	Ingestion	PCB Total TEC			1.5E-11	mg/kg-day	1.3E+05	kg-day/mg	1.9E-06	3.5E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.36E-08	mg/kg										
				Belowground	1.10E-08	mg/kg										
			Exp. Route Total								1.9E-06					NA
		Exposure Point Total									1.9E-06					NA
	Exposure Medium Total										1.9E-06					NA
	Ambient Air	Particulates South	Inhalation	PCB Total TEC	2.46E-10	ug/m3	1.0E-10	ug/m3	3.8E+01	(ug/m3)-1	3.8E-09	2.4E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								3.8E-09					NA
		Exposure Point Total									3.8E-09					NA
	Exposure Medium Total										3.8E-09					NA
Soil Total (South)											2.0E-06					NA

Table N5.3.24
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: Intake/Exposure Concentration Value	Cancer: Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer: Intake/Exposure Concentration Value	Non-Cancer: Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
Soil	Soil	Southwest	Ingestion	PCB Total TEC	6.52E-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	6.52E-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			1.7E-11	mg/kg-day	1.3E+05	kg-day/mg	2.2E-06	3.9E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.36E-08	mg/kg										
				Belowground	3.90E-08	mg/kg										
			Exp. Route Total								2.2E-06					NA
		Exposure Point Total									2.2E-06					NA
	Exposure Medium Total										2.2E-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)											2.4E-06					NA

Table N5.3.25
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 Value	EPC Units	Cancer: Intake/Exposure Concentration Value	Cancer: Intake/Exposure Concentration Units	Unit Risk Value	Unit Risk Units	Cancer Risk	Noncancer: Intake/Exposure Concentration Value	Noncancer: Intake/Exposure Concentration Units	RfC Value	RfC Units	Hazard Quotient
Ambient Air	Ambient Air	Particulates and Vapors at DMS1	Inhalation	PCB Total TEC	7.87E-09	ug/m3	3.2E-09	ug/m3	3.8E+01	(ug/m3)-1	1.2E-07	7.6E-09	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.2E-07					NA
		Exposure Point Total									1.2E-07					NA
	Exposure Medium Total										1.2E-07					NA
Medium Total											1.2E-07					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	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

Table N5.3.26
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	1E-10	--	4E-10	--	5E-10	--	--	--	--	--
			Chemical Total	1E-10	--	4E-10	--	5E-10		--	--	--	--
		Exposure Point Total						5E-10					--
	Exposure Medium Total							5E-10					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	1E-11	--	--	1E-11	--	--	--	--	--
			Chemical Total	--	1E-11	--	--	1E-11		--	--	--	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Soil Total (Southeast)								5E-10					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (Southeast)								2E-09					--
Receptor Total (Soil and Ambient Air - Southeast)								2E-09					--
Soil	Soil	South	PCB Total TEC	5E-10	--	2E-09	--	2E-09	--	--	--	--	--
			Chemical Total	5E-10	--	2E-09	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
	Ambient Air	Particulates South	PCB Total TEC	--	6E-11	--	--	6E-11	--	--	--	--	--
			Chemical Total	--	6E-11	--	--	6E-11		--	--	--	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Soil Total (South)								2E-09					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (South)								2E-09					--
Receptor Total (Soil and Ambient Air - South)								4E-09					--

Table N5.3.26
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	--	2E-09	--	--	2E-09	--	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Ambient Air Total (Southwest)								2E-09					--
Receptor Total (Soil and Ambient Air - Southwest)								1E-08					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table N5.3.19).

Table N5.3.27
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	8E-09	--	1E-08	--	2E-08	--	--	--	--	--
			Chemical Total	8E-09	--	1E-08	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
	Beef Tissue	Southeast	PCB Total TEC	5E-09	--	--	--	5E-09	--	--	--	--	--
			Chemical Total	5E-09	--	--	--	5E-09		--	--	--	--
		Exposure Point Total						5E-09					--
	Exposure Medium Total							5E-09					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	1E-09	--	--	1E-09	--	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		--	--	--	--
		Exposure Point Total						1E-09					--
	Exposure Medium Total							1E-09					--
Soil Total (Southeast)								3E-08					--
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)								2E-07					--
Soil	Soil	South	PCB Total TEC	3E-08	--	5E-08	--	8E-08	--	--	--	--	--
			Chemical Total	3E-08	--	5E-08	--	8E-08		--	--	--	--
		Exposure Point Total						8E-08					--
	Exposure Medium Total							8E-08					--
	Beef Tissue	South	PCB Total TEC	3E-08	--	--	--	3E-08	--	--	--	--	--
			Chemical Total	3E-08	--	--	--	3E-08		--	--	--	--
		Exposure Point Total						3E-08					--
	Exposure Medium Total							3E-08					--
	Ambient Air	Particulates South	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 (South)								1E-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 (South)								2E-07					--
Receptor Total (Soil and Ambient Air - South)								3E-07					--

Table N5.3.27
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)								1E-06					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table N5.3.21).

Table N5.3.28
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	8E-09	--	1E-08	--	2E-08	--	--	--	--	--
			Chemical Total	8E-09	--	1E-08	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-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					--
	Beef Tissue	Southeast	PCB Total TEC	5E-09	--	--	--	5E-09	--	--	--	--	--
			Chemical Total	5E-09	--	--	--	5E-09		--	--	--	--
		Exposure Point Total						5E-09					--
	Exposure Medium Total							5E-09					--
	Milk	Southeast	PCB Total TEC	1E-08	--	--	--	1E-08	--	--	--	--	--
			Chemical Total	1E-08	--	--	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	1E-09	--	--	1E-09	--	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		--	--	--	--
		Exposure Point Total						1E-09					--
	Exposure Medium Total							1E-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)								4E-06					--

Table N5.3.28
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	3E-08	--	5E-08	--	8E-08	--	--	--	--	--
			Chemical Total	3E-08	--	5E-08	--	8E-08		--	--	--	--
		Exposure Point Total						8E-08					--
	Exposure Medium Total							8E-08					--
	Plant 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					--
	Beef Tissue	South	PCB Total TEC	3E-08	--	--	--	3E-08	--	--	--	--	--
			Chemical Total	3E-08	--	--	--	3E-08		--	--	--	--
		Exposure Point Total						3E-08					--
	Exposure Medium Total							3E-08					--
	Milk	South	PCB Total TEC	6E-08	--	--	--	6E-08	--	--	--	--	--
			Chemical Total	6E-08	--	--	--	6E-08		--	--	--	--
		Exposure Point Total						6E-08					--
	Exposure Medium Total							6E-08					--
	Ambient Air	Particulates South	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 (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)								4E-06					--

Table N5.3.28
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	4E-06	--	--	--	4E-06	--	--	--	--	--
			Chemical Total	4E-06	--	--	--	4E-06		--	--	--	--
		Exposure Point Total						4E-06					--
	Exposure Medium Total							4E-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)								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 (Southwest)								2E-07					--
Receptor Total (Soil and Ambient Air - Southwest)								9E-06					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table N5.3.23).

Table N5.3.29
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	7E-09	--	3E-09	--	1E-08	--	--	--	--	--
			Chemical Total	7E-09	--	3E-09	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Plant Tissue	Southeast	PCB Total TEC	2E-06	--	--	--	2E-06	--	--	--	--	--
			Chemical Total	2E-06	--	--	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	8E-10	--	--	8E-10	--	--	--	--	--
			Chemical Total	--	8E-10	--	--	8E-10		--	--	--	--
		Exposure Point Total						8E-10					--
	Exposure Medium Total							8E-10					--
Soil Total (Southeast)								2E-06					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP [1]	PCB Total TEC	--	1E-07	--	--	1E-07	--	--	--	--	--
			Chemical Total	--	1E-07	--	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
Ambient Air Total (Southeast)								1E-07					--
Receptor Total (Soil and Ambient Air - Southeast)								2E-06					--

Table N5.3.29
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	3E-08	--	1E-08	--	4E-08	--	--	--	--	--
			Chemical Total	3E-08	--	1E-08	--	4E-08		--	--	--	--
		Exposure Point Total						4E-08					--
	Exposure Medium Total							4E-08					--
	Plant Tissue	South	PCB Total TEC	2E-06	--	--	--	2E-06	--	--	--	--	--
			Chemical Total	2E-06	--	--	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Ambient Air	Particulates South	PCB Total TEC	--	4E-09	--	--	4E-09	--	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		--	--	--	--
		Exposure Point Total						4E-09					--
	Exposure Medium Total							4E-09					--
Soil Total (South)								2E-06					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP (1)	PCB Total TEC	--	1E-07	--	--	1E-07	--	--	--	--	--
			Chemical Total	--	1E-07	--	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
Ambient Air Total (South)								1E-07					--
Receptor Total (Soil and Ambient Air - South)								2E-06					--

Table N5.3.29
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	2E-06	--	--	--	2E-06	--	--	--	--	--
			Chemical Total	2E-06	--	--	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-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)								2E-06					--
Ambient Air	Ambient Air	Particulates and Vapors at MSP [1]	PCB Total TEC	--	1E-07	--	--	1E-07	--	--	--	--	--
			Chemical Total	--	1E-07	--	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
Ambient Air Total (Southwest)								1E-07					--
Receptor Total (Soil and Ambient Air - Southwest)								2E-06					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table N5.3.25).

Table N5.3.30
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	4.20E-02	2.60E+01	No
South	5.62E-02	2.60E+01	No
Southwest	4.41E-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	1.20E+00	2.60E+01	No
South	1.28E+00	2.60E+01	No
Southwest	3.15E+00	2.60E+01	No

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	8.20E-01	2.60E+01	No
South	8.60E-01	2.60E+01	No
Southwest	9.98E-01	2.60E+01	No

Table N5.3.30
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

Notes:

(1) Average daily intake for infant exposed to contaminated breast milk (See Table N5.3.17).

(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 N5.3.31
Overall Summary of Risks and Hazards for COPCs
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor Exposure Medium	**Carcinogenic Risk**	**Noncarcinogenic Hazard Index**
Current Rancher (Adult)		
Southeast Area		
Soil (Ingestion and Dermal)	5E-10	—
Ambient Air (Particulates from Soil)	1E-11	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	2E-09	
South Area		
Soil (Ingestion and Dermal)	2E-09	—
Ambient Air (Particulates from Soil)	6E-11	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	4E-09	
Southwest Area		
Soil (Ingestion and Dermal)	9E-09	—
Ambient Air (Particulates from Soil)	3E-10	—
Ambient Air (Particulates and Vapors)	2E-09	—
Total	1E-08	
Future Resident Rancher (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	2E-08	—
Beef Tissue	5E-09	—
Ambient Air (Particulates from Soil)	1E-09	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	2E-07	
South Area		
Soil (Ingestion and Dermal)	8E-08	—
Beef Tissue	3E-08	—
Ambient Air (Particulates from Soil)	5E-09	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	3E-07	
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	1E-06	

Table N5.3.31
Overall Summary of Risks and Hazards for COPCs
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor Exposure Medium	**Carcinogenic Risk**	**Noncarcinogenic Hazard Index**
Future Subsistence Resident Rancher (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	2E-08	—
Plant Tissue (Homegrown Produce)	3E-06	—
Beef Tissue	5E-09	—
Milk	1E-08	—
Ambient Air (Particulates from Soil)	1E-09	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	4E-06	
South Area		
Soil (Ingestion and Dermal)	8E-08	—
Plant Tissue (Homegrown Produce)	4E-06	—
Beef Tissue	3E-08	—
Milk	6E-08	—
Ambient Air (Particulates from Soil)	5E-09	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	4E-06	
Southwest Area		
Soil (Ingestion and Dermal)	4E-07	—
Plant Tissue (Homegrown Produce)	4E-06	—
Beef Tissue	9E-07	—
Milk	4E-06	—
Ambient Air (Particulates from Soil)	2E-08	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	9E-06	
Future Resident (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	1E-08	—
Plant Tissue (Homegrown Produce)	2E-06	—
Ambient Air (Particulates from Soil)	8E-10	—
Ambient Air (Particulates and Vapors)	1E-07	—
Total	2E-06	
South Area		
Soil (Ingestion and Dermal)	4E-08	—
Plant Tissue (Homegrown Produce)	2E-06	—
Ambient Air (Particulates from Soil)	4E-09	—
Ambient Air (Particulates and Vapors)	1E-07	—
Total	2E-06	
Southwest Area		
Soil (Ingestion and Dermal)	2E-07	—
Plant Tissue (Homegrown Produce)	2E-06	—
Ambient Air (Particulates from Soil)	2E-08	—
Ambient Air (Particulates and Vapors)	1E-07	—
Total	2E-06	

Table N5.3.31
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 higher calculated ambient air risk (see Tables N5.3.19, N5.3.21, N5.3.23, and N5.3.25.

— - Hazard indices were not calculated (toxicity data were not available).

Risk values are taken from Tables N5.3.26 through N5.3.29.

Risk calculations are shown on Tables N5.3.18 through N5.3.25.

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 N5.3.32
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**
0.033	0.15	0.65	0.15	0.15	0.15	0.15	0.21

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).
pg/g - picograms per gram (parts per trillion)
KHF - Kettleman Hills Facility
TEC - toxicity equivalence concentration
TEF - toxicity equivalence factor

Table N5.4.1
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 -- Measured PCB levels in vegetation -- Modeled PCB levels in invertebrates -- Calculated exposure doses and egg concentrations -- 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)* -- State species of special concern	-- Measured PCB levels in soil -- Measured PCB levels in vegetation -- Modeled PCB levels in rodents -- Calculated exposure doses and egg concentrations -- 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 -- Measured PCB levels in vegetation -- Calculated pocket mouse exposure doses -- 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)* --State species of special concern	-- Measured PCB levels in soil -- Modeled PCB levels in invertebrates -- Calculated grasshopper mouse exposure doses -- 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)* -- Federally endangered -- State threatened	-- Measured PCB levels in soil -- Measured PCB levels in vegetation -- Modeled PCB levels in rodents -- Calculated kit fox exposure doses -- 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*) -- Federally endangered -- State endangered	-- Measured PCB levels in soil -- Modeled PCB levels in invertebrates -- Calculated risks to carnivorous mammals and birds

Table N5.4.2
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 N5.4.2
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 N5.4.2
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 N5.4.2
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*): Mean food consumption rate per unit body weight for eight mice (four male, four female) = 0.076 g/g-day. Assuming same rate and using body weight of southern grasshopper mouse: (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: (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 N5.4.2
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: FIR = (FMR/ME) = (2.0 kJ/day) / (18 kJ/g) = 0.11 g/day = 0.00011 kg/day (dry weight) where: FMR = Field Metabolic Rate = 2.0 kJ/day (based on alligator lizard) 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 N5.4.2
Exposure Factors for Ecological Receptors
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

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Table N5.4.3
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 169	7.41	1.1E+00	—	0.0043	1.02E-08	1.10E-03	5.50E-04	0.03	1.65E-05
Congener total: [8]									1.65E-05
South									
PCB 114	6.98	5.0E+00	—	0.0061	6.57E-08	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 169	7.41	5.0E+00	—	0.0043	4.63E-08	5.00E-03	2.50E-03	0.03	7.50E-05
PCB 189	8.27	—	1.2E+00	0.0016	1.77E-07	—	8.87E-08	0.00003	2.66E-12
Congener total: [8]									7.51E-05
Southwest									
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 114	6.98	—	1.1E+00	0.0061	5.62E-07	—	2.81E-07	0.00003	8.43E-12
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 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	—	1.1E+00	0.0016	1.52E-07	—	7.61E-08	0.00003	2.28E-12
Congener total: [8]									3.26E-04
B-18 Landfill									
PCB 169	7.41	5.0E+00	—	0.0043	4.63E-08	5.00E-03	2.50E-03	0.03	7.50E-05
PCB 189	8.27	—	1.1E+00	0.0016	1.59E-07	—	7.94E-08	0.00003	2.38E-12
Congener total: [8]									7.50E-05

Notes:

(1) Includes only congeners which were not detected at or above the estimated detection limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit. "—" indicates the congener was detected at or above the estimated detection limit.

(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} x FIR_{mouse} x CF_{dw}) + (C_{soil} x SIR_{mouse})) x BTF x FIR_{fox}] + (C_{soil} x SIR_{fox})} 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 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 N5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table N5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table N5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 N5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table N5.4.2 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 N5.4.4
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 169	7.41	1.1E+00	—	0.0043	1.02E-08	1.10E-03	9.17E-04	0.03	2.75E-05
Congener total: [8]									2.75E-05
South									
PCB 114	6.98	5.0E+00	—	0.0061	6.57E-08	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 169	7.41	5.0E+00	—	0.0043	4.63E-08	5.00E-03	4.17E-03	0.03	1.25E-04
PCB 189	8.27	—	1.2E+00	0.0016	1.77E-07	—	1.48E-07	0.00003	4.43E-12
Congener total: [8]									1.25E-04
Southwest									
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 114	6.98	—	1.1E+00	0.0061	5.62E-07	—	4.69E-07	0.00003	1.41E-11
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 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	—	1.1E+00	0.0016	1.52E-07	—	1.27E-07	0.00003	3.81E-12
Congener total: [8]									5.43E-04
B-18 Landfill									
PCB 169	7.41	5.0E+00	—	0.0043	4.63E-08	5.00E-03	4.17E-03	0.03	1.25E-04
PCB 189	8.27	—	1.1E+00	0.0016	1.59E-07	—	1.32E-07	0.00003	3.97E-12
Congener total: [8]									1.25E-04

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit. "—" indicates the congener was detected at or above the estimated detection limit.
(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} x FIR_{mouse} x CF_{dw}) + (C_{soil} x SIR_{mouse})) x BTF x FIR_{fox}] + (C_{soil} x SIR_{fox})} 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 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 N5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table N5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day See Table N5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 N5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table N5.4.2 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 N5.4.5
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 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
Congener total: (10)										1.65E-05
South										
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 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
Congener total: (10)										7.52E-05
Southwest										
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 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 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
Congener total: (10)										3.26E-04
B-18 Landfill										
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
Congener total: (10)										7.51E-05

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit.
(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 N5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table N5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table N5.4.2 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 N5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table N5.4.2 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 N5.4.6
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 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
Congener total: [10]										2.75E-05
South										
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 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
Congener total: [10]										1.25E-04
Southwest										
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 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 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
Congener total: [10]										5.44E-04
B-18 Landfill										
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
Congener total: [10]										1.25E-04

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit.
(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): 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 N5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table N5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table N5.4.2 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 N5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table N5.4.2 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 N5.4.7
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 169	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.03	4.13E-04
Congener total: [7]							4.13E-04
South							
PCB 114	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.03	1.88E-03
Congener total: [7]							1.88E-03
Southwest							
PCB 81	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.0003	1.88E-05
PCB 126	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.1	6.25E-03
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.03	1.88E-03
Congener total: [7]							8.14E-03
B-18 Landfill							
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.03	1.88E-03
Congener total: [7]							1.88E-03

Notes:

(1) Includes only congeners which were not detected at or above the estimated detection limit.

(2) Concentration shown is 1/2 reporting limit.

(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 N5.4.2 for basis/source.

SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table N5.4.2 for basis/source.

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table N5.4.2 for basis/source of home range.

BW = body weight (kg) = 2 kg. See Table N5.4.2 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 N5.4.8
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 169	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.03	6.88E-04
Congener total: [7]							6.88E-04
South							
PCB 114	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.03	3.13E-03
Congener total: [7]							3.13E-03
Southwest							
PCB 81	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.0003	3.13E-05
PCB 126	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.1	1.04E-02
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.03	3.13E-03
Congener total: [7]							1.36E-02
B-18 Landfill							
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.03	3.13E-03
Congener total: [7]							3.13E-03

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Concentration shown is 1/2 reporting limit.
(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 N5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table N5.4.2 for basis/source.
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table N5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table N5.4.2 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 N5.4.9
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 169	1.1E+00	—	—	1.98E-05	1.65E-03	0.03	4.95E-05
Congener total: [6]							4.95E-05
South							
PCB 114	5.0E+00	—	—	9.00E-05	7.50E-03	0.00003	2.25E-07
PCB 169	5.0E+00	—	—	9.00E-05	7.50E-03	0.03	2.25E-04
PCB 189	—	1.2E+00	8.97E-04	—	7.47E-02	0.00003	2.24E-06
Congener total: [6]							2.27E-04
Southwest							
PCB 81	5.0E+00	1.1E+00	7.70E-04	9.00E-05	7.17E-02	0.0003	2.15E-05
PCB 114	—	1.1E+00	7.70E-04	—	6.42E-02	0.00003	1.93E-06
PCB 126	5.0E+00	1.1E+00	7.70E-04	9.00E-05	7.17E-02	0.1	7.17E-03
PCB 169	5.0E+00	1.1E+00	7.70E-04	9.00E-05	7.17E-02	0.03	2.15E-03
PCB 189	—	1.1E+00	7.70E-04	—	6.42E-02	0.00003	1.93E-06
Congener total: [6]							9.34E-03
B-18 Landfill							
PCB 169	5.0E+00	—	—	9.00E-05	7.50E-03	0.03	2.25E-04
PCB 189	—	1.1E+00	8.03E-04	—	6.69E-02	0.00003	2.01E-06
Congener total: [6]							2.27E-04

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Concentration shown is 1/2 reporting limit. "—" indicates the congener was detected at or above the estimated detection limit.
(3) Exposure dose (ED) calculation:

ED = [(intake from plant ingestion) + (intake from soil ingestion)] / body weight.

$ED = [(C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})] \times (AFF/BW)$.

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 mouse = 0.00089 kg/day. See Table N5.4.2 for basis/source.

SIR_{mouse} = soil ingestion rate for mouse (kg/day) = 0.000018 kg/day. See Table N5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 N5.4.2 for home range.

BW = body weight (kg) = 0.012 kg. See Table N5.4.2 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 N5.4.10
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 169	1.1E+00	—	—	1.21E-05	1.73E-03	0.03	5.19E-05
Congener total: [6]							5.19E-05
South							
PCB 114	5.0E+00	—	—	5.50E-05	7.86E-03	0.00003	2.36E-07
PCB 169	5.0E+00	—	—	5.50E-05	7.86E-03	0.03	2.36E-04
PCB 189	—	1.2E+00	5.24E-04	—	7.48E-02	0.00003	2.25E-06
Congener total: [6]							2.38E-04
Southwest							
PCB 81	5.0E+00	1.1E+00	4.50E-04	5.50E-05	7.21E-02	0.0003	2.16E-05
PCB 114	—	1.1E+00	4.50E-04	—	6.43E-02	0.00003	1.93E-06
PCB 126	5.0E+00	1.1E+00	4.50E-04	5.50E-05	7.21E-02	0.1	7.21E-03
PCB 169	5.0E+00	1.1E+00	4.50E-04	5.50E-05	7.21E-02	0.03	2.16E-03
PCB 189	—	1.1E+00	4.50E-04	—	6.43E-02	0.00003	1.93E-06
Congener total: [6]							9.40E-03
B-18 Landfill							
PCB 169	5.0E+00	—	—	5.50E-05	7.86E-03	0.03	2.36E-04
PCB 189	—	1.1E+00	4.69E-04	—	6.70E-02	0.00003	2.01E-06
Congener total: [6]							2.38E-04

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Concentration shown is 1/2 reporting limit. "—" indicates the congener was detected at or above the estimated detection limit.
(3) Exposure dose (ED) calculation:
ED = [(intake from plant ingestion) + (intake from soil ingestion)] / body weight.
ED = $[(C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})] \times (AFF/BW)$.
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 mouse = 0.00052 kg/day. See Table N5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse (kg/day) = 0.000011 kg/day. See Table N5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 N5.4.2 for home range.
BW = body weight (kg) = 0.007 kg. See Table N5.4.2 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 N5.4.11
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 169	7.41	1.1E+00	1.04	3.33E-03	2.20E-05	8.38E-02	0.03	2.52E-03
Congener total: [8]								2.52E-03
South								
PCB 114	6.98	5.0E+00	0.99	1.44E-02	1.00E-04	3.63E-01	0.00003	1.09E-05
PCB 169	7.41	5.0E+00	1.04	1.51E-02	1.00E-04	3.81E-01	0.03	1.14E-02
Congener total: [8]								1.14E-02
Southwest								
PCB 81	6.34	5.0E+00	0.92	1.34E-02	1.00E-04	3.37E-01	0.0003	1.01E-04
PCB 126	6.98	5.0E+00	0.99	1.44E-02	1.00E-04	3.63E-01	0.1	3.63E-02
PCB 169	7.41	5.0E+00	1.04	1.51E-02	1.00E-04	3.81E-01	0.03	1.14E-02
Congener total: [8]								4.78E-02
B-18 Landfill								
PCB 169	7.41	5.0E+00	1.04	1.51E-02	1.00E-04	3.81E-01	0.03	1.14E-02
Congener total: [8]								1.14E-02

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit.
(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 N5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table N5.4.2 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 N5.4.2 for home range.
BW = body weight (kg) = 0.04 kg. See Table N5.4.2 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 N5.4.12
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 169	7.41	1.1E+00	1.04	1.72E-03	1.10E-05	8.67E-02	0.03	2.60E-03
Congener total: [8]								2.60E-03
South								
PCB 114	6.98	5.0E+00	0.99	7.45E-03	5.00E-05	3.75E-01	0.00003	1.13E-05
PCB 169	7.41	5.0E+00	1.04	7.83E-03	5.00E-05	3.94E-01	0.03	1.18E-02
Congener total: [8]								1.18E-02
Southwest								
PCB 81	6.34	5.0E+00	0.92	6.93E-03	5.00E-05	3.49E-01	0.0003	1.05E-04
PCB 126	6.98	5.0E+00	0.99	7.45E-03	5.00E-05	3.75E-01	0.1	3.75E-02
PCB 169	7.41	5.0E+00	1.04	7.83E-03	5.00E-05	3.94E-01	0.03	1.18E-02
Congener total: [8]								4.95E-02
B-18 Landfill								
PCB 169	7.41	5.0E+00	1.04	7.83E-03	5.00E-05	3.94E-01	0.03	1.18E-02
Congener total: [8]								1.18E-02

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit.
(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 N5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00001 kg/day. See Table N5.4.2 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 N5.4.2 for home range.
BW = body weight (kg) = 0.02 kg. See Table N5.4.2 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 N5.4.13
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 169	7.41	1.1E+00	—	0.0043	5.60E-09	4.40E-04	2.56E-03	0.001	2.56E-06
Congener total: (8)									2.56E-06
South									
PCB 114	6.98	5.0E+00	—	0.0061	3.61E-08	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 169	7.41	5.0E+00	—	0.0043	2.54E-08	2.00E-03	1.16E-02	0.001	1.16E-05
PCB 189	8.27	—	1.2E+00	0.0016	9.75E-08	—	5.67E-07	0.00001	5.67E-12
Congener total: (8)									1.28E-05
Southwest									
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 114	6.98	—	1.1E+00	0.0061	3.09E-07	—	1.80E-06	0.0001	1.80E-10
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 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	—	1.1E+00	0.0016	8.38E-08	—	4.87E-07	0.00001	4.87E-12
Congener total: (8)									2.34E-03
B-18 Landfill									
PCB 169	7.41	5.0E+00	—	0.0043	2.54E-08	2.00E-03	1.16E-02	0.001	1.16E-05
PCB 189	8.27	—	1.1E+00	0.0016	8.73E-08	—	5.08E-07	0.00001	5.08E-12
Congener total: (8)									1.16E-05

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit. "—" indicates the congener was detected at or above the estimated detection limit.
(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 N5.4.2 for basis/source.
SIR$_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table N5.4.2 for basis/source.
SIR$_{owl}$ = soil ingestion rate for owl (kg/day) = 0.0004 kg/day. See Table N5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 N5.4.2 for home range.
BW = body weight (kg) = 0.172 kg. See Table N5.4.2 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 N5.4.14
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 169	7.41	1.1E+00	—	0.0043	4.41E-09	3.30E-04	2.62E-03	0.001	2.62E-06
Congener total: [8]									2.62E-06
South									
PCB 114	6.98	5.0E+00	—	0.0061	2.85E-08	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 169	7.41	5.0E+00	—	0.0043	2.00E-08	1.50E-03	1.19E-02	0.001	1.19E-05
PCB 189	8.27	—	1.2E+00	0.0016	7.68E-08	—	6.10E-07	0.00001	6.10E-12
Congener total: [8]									1.31E-05
Southwest									
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 114	6.98	—	1.1E+00	0.0061	2.44E-07	—	1.93E-06	0.0001	1.93E-10
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 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	—	1.1E+00	0.0016	6.60E-08	—	5.24E-07	0.00001	5.24E-12
Congener total: [8]									2.39E-03
B-18 Landfill									
PCB 169	7.41	5.0E+00	—	0.0043	2.00E-08	1.50E-03	1.19E-02	0.001	1.19E-05
PCB 189	8.27	—	1.1E+00	0.0016	6.88E-08	—	5.46E-07	0.00001	5.46E-12
Congener total: [8]									1.19E-05

Notes:

(1) Includes only congeners which were not detected at or above the estimated detection limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit. "—" indicates the congener was detected at or above the estimated detection limit.

(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 = $\{[((C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{owl}] + (C_{soil} \times SIR_{owl})\} \times \{AFF/BW\}$.
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 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 N5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table N5.4.2 for basis/source.
SIR_{owl} = soil ingestion rate for owl (kg/day) = 0.0003 kg/day. See Table N5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 N5.4.2 for home range.
BW = body weight (kg) = 0.126 kg. See Table N5.4.2 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 N5.4.15
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 169	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.001	9.34E-05
Congener total: [7]							9.34E-05
South							
PCB 114	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 169	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.001	4.25E-04
Congener total: [7]							4.67E-04
Southwest							
PCB 81	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.1	4.25E-02
PCB 126	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.1	4.25E-02
PCB 169	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.001	4.25E-04
Congener total: [7]							8.53E-02
B-18 Landfill							
PCB 169	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.001	4.25E-04
Congener total: [7]							4.25E-04

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Concentration shown is 1/2 reporting limit.
(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_{owl}) + (C_{soil} x SIR_{owl})] 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_{owl} = food ingestion rate (mice) for female owl (kg/day) = 0.052. See Table N5.4.2 for basis/source.
SIR_{owl} = soil ingestion rate for female owl (kg/day) = 0.0003 kg/day. See Table N5.4.2 for basis/source.
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table N5.4.2 for basis/source of home range.
BW = body weight (kg) = 0.126 kg. See Table N5.4.2 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 N5.4.16
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 169	7.41	1.1E+00	—	1.04	2.99E-02	—	1.65E-03	2.81E-01	0.001	2.81E-04
Congener total: [8]										2.81E-04
South										
PCB 114	6.98	5.0E+00	—	0.99	1.29E-01	—	7.50E-03	1.22E+00	0.0001	1.22E-04
PCB 169	7.41	5.0E+00	—	1.04	1.36E-01	—	7.50E-03	1.28E+00	0.001	1.28E-03
PCB 189	8.27	—	1.2E+00	1.15	—	4.94E-03	—	4.41E-02	0.00001	4.41E-07
Congener total: [8]										1.40E-03
Southwest										
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 114	6.98	—	1.1E+00	0.99	—	4.24E-03	—	3.79E-02	0.0001	3.79E-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 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	—	1.1E+00	1.15	—	4.24E-03	—	3.79E-02	0.00001	3.79E-07
Congener total: [8]										2.45E-01
B-18 Landfill										
PCB 169	7.41	5.0E+00	—	1.04	1.36E-01	—	7.50E-03	1.28E+00	0.001	1.28E-03
PCB 189	8.27	—	1.1E+00	1.15	—	4.42E-03	—	3.95E-02	0.00001	3.95E-07
Congener total: [8]										1.28E-03

Notes:

(1) Includes only congeners which were not detected at or above the estimated detection limit.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit. "—" indicates the congener was detected at or above the estimated detection limit.

(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 N5.4.2 for basis/source.

FIR_{plant} = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0049. See Table N5.4.2 for basis/source.

SIR_{lark} = soil ingestion rate for meadowlark = 0.0015 kg/day. See Table N5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 N5.4.2 for home range.

BW = body weight (kg) = 0.112 kg. See Table N5.4.2 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 N5.4.17
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 169	7.41	1.1E+00	—	1.04	2.41E-02	—	1.32E-03	2.85E-01	0.001	2.85E-04
Congener total: [8]										2.85E-04
South										
PCB 114	6.98	5.0E+00	—	0.99	1.04E-01	—	6.00E-03	1.23E+00	0.0001	1.23E-04
PCB 169	7.41	5.0E+00	—	1.04	1.10E-01	—	6.00E-03	1.29E+00	0.001	1.29E-03
PCB 189	8.27	—	1.2E+00	1.15	—	4.03E-03	—	4.51E-02	0.00001	4.51E-07
Congener total: [8]										1.42E-03
Southwest										
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 114	6.98	—	1.1E+00	0.99	—	3.46E-03	—	3.87E-02	0.0001	3.87E-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 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	—	1.1E+00	1.15	—	3.46E-03	—	3.87E-02	0.00001	3.87E-07
Congener total: [8]										2.48E-01
B-18 Landfill										
PCB 169	7.41	5.0E+00	—	1.04	1.10E-01	—	6.00E-03	1.29E+00	0.001	1.29E-03
PCB 189	8.27	—	1.1E+00	1.15	—	3.61E-03	—	4.04E-02	0.00001	4.04E-07
Congener total: [8]										1.29E-03

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit. "—" indicates the congener was detected at or above the estimated detection limit.
(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 N5.4.2 for basis/source.
FIR_{plant} = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0040. See Table N5.4.2 for basis/source.
SIR_{lark} = soil ingestion rate for meadowlark = 0.0012 kg/day. See Table N5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 N5.4.2 for home range.
BW = body weight (kg) = 0.0894 kg. See Table N5.4.2 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 N5.4.18
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 169	7.41	0.0857	0.0069	1.18E-02	8.07E-05	0.001	8.07E-08
Congener total: [9]							8.07E-08
South							
PCB 114	6.98	0.1217	0.0097	5.35E-02	5.21E-04	0.0001	5.21E-08
PCB 169	7.41	0.0857	0.0069	5.35E-02	3.67E-04	0.001	3.67E-07
Congener total: [9]							4.19E-07
Southwest							
PCB 81	6.34	0.1756	0.0140	5.35E-02	7.51E-04	0.1	7.51E-05
PCB 126	6.98	0.1217	0.0097	5.35E-02	5.21E-04	0.1	5.21E-05
PCB 169	7.41	0.0857	0.0069	5.35E-02	3.67E-04	0.001	3.67E-07
Congener total: [9]							1.28E-04
B-18 Landfill							
PCB 169	7.41	0.0857	0.0069	5.35E-02	3.67E-04	0.001	3.67E-07
Congener total: [9]							3.67E-07

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(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 N5.4.15.
(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 N5.4.19
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 169	7.41	0.0857	0.0069	2.54E-02	1.74E-04	0.001	1.74E-07
Congener total: [9]							1.74E-07
South							
PCB 114	6.98	0.1217	0.0097	1.10E-01	1.07E-03	0.0001	1.07E-07
PCB 169	7.41	0.0857	0.0069	1.16E-01	7.93E-04	0.001	7.93E-07
PCB 189	8.27	0.0330	0.0026	4.03E-03	1.06E-05	0.00001	1.06E-10
Congener total: [9]							9.00E-07
Southwest							
PCB 81	6.34	0.1756	0.0140	1.06E-01	1.49E-03	0.1	1.49E-04
PCB 114	6.98	0.1217	0.0097	3.46E-03	3.37E-05	0.0001	3.37E-09
PCB 126	6.98	0.1217	0.0097	1.14E-01	1.11E-03	0.1	1.11E-04
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	3.46E-03	9.13E-06	0.00001	9.13E-11
Congener total: [9]							2.61E-04
B-18 Landfill							
PCB 169	7.41	0.0857	0.0069	1.16E-01	7.93E-04	0.001	7.93E-07
PCB 189	8.27	0.0330	0.0026	3.61E-03	9.51E-06	0.00001	9.51E-11
Congener total: [9]							7.93E-07

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(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 N5.4.17.
(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 N5.4.20
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 169	1.1E+00	1.26	1.39E+00	0.001	1.39E-03
Congener total: (7)					1.39E-03
South					
PCB 114	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 169	5.0E+00	1.26	6.30E+00	0.001	6.30E-03
Congener total: (7)					6.93E-03
Southwest					
PCB 81	5.0E+00	1.26	6.30E+00	0.1	6.30E-01
PCB 126	5.0E+00	1.26	6.30E+00	0.1	6.30E-01
PCB 169	5.0E+00	1.26	6.30E+00	0.001	6.30E-03
Congener total: (7)					1.27E+00
B-18 Landfill					
PCB 169	5.0E+00	1.26	6.30E+00	0.001	6.30E-03
Congener total: (7)					6.30E-03

Notes:
(1) Includes only congeners which were not detected at or above the estimated detection limit.
(2) Concentration shown is 1/2 reporting limit.
(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 N5.4.21
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	1.65E-05	2.75E-05	1	10	2E-5	3E-5	2E-6	3E-6
South	7.51E-05	1.25E-04	1	10	8E-5	1E-4	8E-6	1E-5
Southwest	3.26E-04	5.43E-04	1	10	3E-4	5E-4	3E-5	5E-5
B-18 Landfill	7.50E-05	1.25E-04	1	10	8E-5	1E-4	8E-6	1E-5
Diet of Carnivorous Prey								
BTF Approach								
Southeast	1.65E-05	2.75E-05	1	10	2E-5	3E-5	2E-6	3E-6
South	7.52E-05	1.25E-04	1	10	8E-5	1E-4	8E-6	1E-5
Southwest	3.26E-04	5.44E-04	1	10	3E-4	5E-4	3E-5	5E-5
B-18 Landfill	7.51E-05	1.25E-04	1	10	8E-5	1E-4	8E-6	1E-5
BAF Approach								
Southeast	4.13E-04	6.88E-04	1	10	4E-4	7E-4	4E-5	7E-5
South	1.88E-03	3.13E-03	1	10	2E-3	3E-3	2E-4	3E-4
Southwest	8.14E-03	1.36E-02	1	10	8E-3	1E-2	8E-4	1E-3
B-18 Landfill	1.88E-03	3.13E-03	1	10	2E-3	3E-3	2E-4	3E-4

Notes:
(1) TEDs for adults from Table N5.4.3 for herbivorous prey,
and from Tables N5.4.5 and N5.4.7 for carnivorous prey (BTF and BAF approaches, respectively).
(2) TEDs for juveniles from Table N5.4.4 for herbivorous prey,
and from Tables N5.4.6 and N5.4.8 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 N5.4.22
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	4.95E-05	5.19E-05	1	10	5E-5	5E-5	5E-6	5E-6
South	2.27E-04	2.38E-04	1	10	2E-4	2E-4	2E-5	2E-5
Southwest	9.34E-03	9.40E-03	1	10	9E-3	9E-3	9E-4	9E-4
B-18 Landfill	2.27E-04	2.38E-04	1	10	2E-4	2E-4	2E-5	2E-5

Notes:
(1) TEDs from Table N5.4.9 for adult and Table N5.4.10 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 N5.4.23
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	2.52E-03	2.60E-03	1	10	3E-3	3E-3	3E-4	3E-4
South	1.14E-02	1.18E-02	1	10	1E-2	1E-2	1E-3	1E-3
Southwest	4.78E-02	4.95E-02	1	10	5E-2	5E-2	5E-3	5E-3
B-18 Landfill	1.14E-02	1.18E-02	1	10	1E-2	1E-2	1E-3	1E-3

Notes:
(1) TEDs from Table N5.4.11 for adult and Table N5.4.12 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 N5.4.24
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	2.56E-06	2.62E-06	10	100	3E-7	3E-7	3E-8	3E-8
South	1.28E-05	1.31E-05	10	100	1E-6	1E-6	1E-7	1E-7
Southwest	2.34E-03	2.39E-03	10	100	2E-4	2E-4	2E-5	2E-5
B-18 Landfill	1.16E-05	1.19E-05	10	100	1E-6	1E-6	1E-7	1E-7
Diet of Carnivorous Prey								
BAF Approach								
Southeast	NC	9.34E-05	10	100	NC	9E-6	NC	9E-7
South	NC	4.67E-04	10	100	NC	5E-5	NC	5E-6
Southwest	NC	8.53E-02	10	100	NC	9E-3	NC	9E-4
B-18 Landfill	NC	4.25E-04	10	100	NC	4E-5	NC	4E-6

Notes:

(1) TEDs for adults with a diet of herbivorous prey are from Table N5.4.13 for adult males and Table N5.4.14 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 N5.4.15 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 N5.4.25
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	2.81E-04	2.85E-04	10	100	3E-5	3E-5	3E-6	3E-6
South	1.40E-03	1.42E-03	10	100	1E-4	1E-4	1E-5	1E-5
Southwest	2.45E-01	2.48E-01	10	100	2E-2	2E-2	2E-3	2E-3
B-18 Landfill	1.28E-03	1.29E-03	10	100	1E-4	1E-4	1E-5	1E-5

Notes:
(1) TEDs from Table N5.4.16 for adult male and Table N5.4.17 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 N5.4.26
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 Exposure Area	TEC in Egg (ng/kg wet wt) (1)	TRV (ng/kg wet wt) Low (2)	TRV (ng/kg wet wt) High (2)	HQ_{low} (3) Egg/ Embryo	HQ_{high} (4) Egg/ Embryo
Burrowing Owl					
BTF Approach					
Southeast	8.07E-08	66	150	1E-9	5E-10
South	4.19E-07	66	150	6E-9	3E-9
Southwest	1.28E-04	66	150	2E-6	9E-7
B-18 Landfill	3.67E-07	66	150	6E-9	2E-9
BAF Approach					
Southeast	1.39E-03	66	150	2E-5	9E-6
South	6.93E-03	66	150	1E-4	5E-5
Southwest	1.27E+00	66	150	2E-2	8E-3
B-18 Landfill	6.30E-03	66	150	1E-4	4E-5
Western Meadowlark					
BTF Approach					
Southeast	1.74E-07	66	150	3E-9	1E-9
South	9.00E-07	66	150	1E-8	6E-9
Southwest	2.61E-04	66	150	4E-6	2E-6
B-18 Landfill	7.93E-07	66	150	1E-8	5E-9
BAF Approach					
Southeast	1.39E-03	66	150	2E-5	9E-6
South	6.93E-03	66	150	1E-4	5E-5
Southwest	1.27E+00	66	150	2E-2	8E-3
B-18 Landfill	6.30E-03	66	150	1E-4	4E-5

Notes:
(1) Egg TECs based on the BTF approach are from Table N5.4.18 for the burrowing owl, Table N5.4.19 for the meadowlark. Egg TECs based on the BAF approach are from Table N5.4.20 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 N5.4.27
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	2E-5	3E-5		2E-6	3E-6	
South	8E-5	1E-4		8E-6	1E-5	
Southwest	3E-4	5E-4		3E-5	5E-5	
B-18 Landfill	8E-5	1E-4		8E-6	1E-5	
Carnivorous prey						
Southeast	2E-5	3E-5		2E-6	3E-6	
South	8E-5	1E-4		8E-6	1E-5	
Southwest	3E-4	5E-4		3E-5	5E-5	
B-18 Landfill	8E-5	1E-4		8E-6	1E-5	
BAF Approach						
Carnivorous prey						
Southeast	4E-4	7E-4		4E-5	7E-5	
South	2E-3	3E-3		2E-4	3E-4	
Southwest	8E-3	1E-2		8E-4	1E-3	
B-18 Landfill	2E-3	3E-3		2E-4	3E-4	
San Joaquin Pocket Mouse	Adult	Juvenile		Adult	Juvenile	
Southeast	5E-5	5E-5		5E-6	5E-6	
South	2E-4	2E-4		2E-5	2E-5	
Southwest	9E-3	9E-3		9E-4	9E-4	
B-18 Landfill	2E-4	2E-4		2E-5	2E-5	
Tulare Grasshopper Mouse	Adult	Juvenile		Adult	Juvenile	
Southeast	3E-3	3E-3		3E-4	3E-4	
South	1E-2	1E-2		1E-3	1E-3	
Southwest	5E-2	5E-2		5E-3	5E-3	
B-18 Landfill	1E-2	1E-2		1E-3	1E-3	
Burrowing Owl	Adult Male	Female/Juvenile	Egg	Adult Male	Female/Juvenile	Egg
BTF Approach						
Herbivorous prey						
Southeast	3E-7	3E-7	1E-9	3E-8	3E-8	5E-10
South	1E-6	1E-6	6E-9	1E-7	1E-7	3E-9
Southwest	2E-4	2E-4	2E-6	2E-5	2E-5	9E-7
B-18 Landfill	1E-6	1E-6	6E-9	1E-7	1E-7	2E-9
BAF Approach						
Carnivorous prey (1)						
Southeast	NC	9E-6	2E-5	NC	9E-7	9E-6
South	NC	5E-5	1E-4	NC	5E-6	5E-5
Southwest	NC	9E-3	2E-2	NC	9E-4	8E-3
B-18 Landfill	NC	4E-5	1E-4	NC	4E-6	4E-5

Table N5.4.27
Summary of Hazard Quotients
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor / **Exposure Area**	**HQ_{low}**			**HQ_{high}**		
Western Meadowlark	Adult Male	Female/Juvenile	Egg	Adult Male	Female/Juvenile	Egg
BTF Approach						
Southeast	3E-5	3E-5	3E-9	3E-6	3E-6	1E-9
South	1E-4	1E-4	1E-8	1E-5	1E-5	6E-9
Southwest	2E-2	2E-2	4E-6	2E-3	2E-3	2E-6
B-18 Landfill	1E-4	1E-4	1E-8	1E-5	1E-5	5E-9
BAF Approach						
Southeast	NC	NC	2E-5	NC	NC	9E-6
South	NC	NC	1E-4	NC	NC	5E-5
Southwest	NC	NC	2E-2	NC	NC	8E-3
B-18 Landfill	NC	NC	1E-4	NC	NC	4E-5

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 0.05 (for the Tulare Grasshopper mouse in the Southwest exposure area).

HQ = hazard quotient
HQ_{low} = exposure dose / NOAEL-based TRV
HQ_{high} = exposure dose / LOAEL-based TRV
NC = not calculated

Table N5.4.28
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**
0.033	0.15	0.65	0.15	0.15	0.15	0.15	0.15	0.20

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 O5.3.1
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	5.5E+00	1.00E-04	5.50E-04
	PCB 81	1.1E+00	3.00E-04	3.30E-04
	PCB 105	1.1E+00	3.00E-05	3.30E-05
	PCB 114	1.1E+00	3.00E-05	3.30E-05
	PCB 118	1.1E+00	3.00E-05	3.30E-05
	PCB 123	2.7E+00	3.00E-05	8.10E-05
	PCB 126	1.1E+00	1.00E-01	1.10E-01
	PCB 156	1.1E+00	3.00E-05	3.30E-05
	PCB 157	1.1E+00	3.00E-05	3.30E-05
	PCB 167	1.1E+00	3.00E-05	3.30E-05
	PCB 169	1.1E+00	3.00E-02	3.30E-02
	PCB 189	1.1E+00	3.00E-05	3.30E-05
	PCB Total TEC	—	—	**1.44E-01**
South	PCB 77	5.0E+00	1.00E-04	5.00E-04
	PCB 81	5.0E+00	3.00E-04	1.50E-03
	PCB 105	5.0E+00	3.00E-05	1.50E-04
	PCB 114	5.0E+00	3.00E-05	1.50E-04
	PCB 118	5.0E+00	3.00E-05	1.50E-04
	PCB 123	5.0E+00	3.00E-05	1.50E-04
	PCB 126	5.0E+00	1.00E-01	5.00E-01
	PCB 156	5.0E+00	3.00E-05	1.50E-04
	PCB 157	5.0E+00	3.00E-05	1.50E-04
	PCB 167	5.0E+00	3.00E-05	1.50E-04
	PCB 169	5.0E+00	3.00E-02	1.50E-01
	PCB 189	5.0E+00	3.00E-05	1.50E-04
	PCB Total TEC	—	—	**6.53E-01**
Southwest	PCB 77	5.0E+00	1.00E-04	5.00E-04
	PCB 81	5.0E+00	3.00E-04	1.50E-03
	PCB 105	5.0E+00	3.00E-05	1.50E-04
	PCB 114	5.0E+00	3.00E-05	1.50E-04
	PCB 118	5.0E+00	3.00E-05	1.50E-04
	PCB 123	5.0E+00	3.00E-05	1.50E-04
	PCB 126	5.0E+00	1.00E-01	5.00E-01
	PCB 156	5.0E+00	3.00E-05	1.50E-04
	PCB 157	5.0E+00	3.00E-05	1.50E-04
	PCB 167	5.0E+00	3.00E-05	1.50E-04
	PCB 169	5.0E+00	3.00E-02	1.50E-01
	PCB 189	5.0E+00	3.00E-05	1.50E-04
	PCB Total TEC	—	—	**6.53E-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 O5.3.2
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	4.9E+01	1.00E-04	4.85E-03
	PCB 81	2.9E+01	3.00E-04	8.70E-03
	PCB 105	2.9E+01	3.00E-05	8.70E-04
	PCB 114	2.9E+01	3.00E-05	8.70E-04
	PCB 118	2.9E+01	3.00E-05	8.70E-04
	PCB 123	2.9E+01	3.00E-05	8.70E-04
	PCB 126	2.9E+01	1.00E-01	2.90E+00
	PCB 156	2.9E+01	3.00E-05	8.70E-04
	PCB 157	2.9E+01	3.00E-05	8.70E-04
	PCB 167	2.9E+01	3.00E-05	8.70E-04
	PCB 169	1.1E+00	3.00E-02	3.15E-02
	PCB 189	2.9E+01	3.00E-05	8.70E-04
	PCB Total TEC	—	—	**2.95E+00**
South	PCB 77	3.5E+01	1.00E-04	3.50E-03
	PCB 81	2.9E+01	3.00E-04	8.55E-03
	PCB 105	1.2E+00	3.00E-05	3.45E-05
	PCB 114	1.2E+00	3.00E-05	3.45E-05
	PCB 118	1.2E+00	3.00E-05	3.45E-05
	PCB 123	2.9E+01	3.00E-05	8.55E-04
	PCB 126	2.9E+01	1.00E-01	2.85E+00
	PCB 156	1.2E+00	3.00E-05	3.45E-05
	PCB 157	1.2E+00	3.00E-05	3.45E-05
	PCB 167	2.9E+01	3.00E-05	8.55E-04
	PCB 169	1.2E+00	3.00E-02	3.45E-02
	PCB 189	1.2E+00	3.00E-05	3.45E-05
	PCB Total TEC	—	—	**2.90E+00**
Southwest	PCB 77	3.5E+01	1.00E-04	3.45E-03
	PCB 81	1.1E+00	3.00E-04	3.15E-04
	PCB 105	3.5E+01	3.00E-05	1.04E-03
	PCB 114	1.1E+00	3.00E-05	3.15E-05
	PCB 118	3.5E+01	3.00E-05	1.04E-03
	PCB 123	3.5E+01	3.00E-05	1.04E-03
	PCB 126	1.1E+00	1.00E-01	1.05E-01
	PCB 156	3.5E+01	3.00E-05	1.04E-03
	PCB 157	3.5E+01	3.00E-05	1.04E-03
	PCB 167	3.5E+01	3.00E-05	1.04E-03
	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	—	—	**1.47E-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 O5.3.3
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	8.4E-11	—	1.00E-04	8.43E-15
		PCB 81	8.4E-11	—	3.00E-04	2.53E-14
		PCB 105	8.4E-11	—	3.00E-05	2.53E-15
		PCB 114	8.4E-11	—	3.00E-05	2.53E-15
		PCB 118	8.4E-11	—	3.00E-05	2.53E-15
		PCB 123	8.4E-11	—	3.00E-05	2.53E-15
		PCB 126	8.4E-11	—	1.00E-01	8.43E-12
		PCB 156	8.4E-11	—	3.00E-05	2.53E-15
		PCB 157	8.4E-11	—	3.00E-05	2.53E-15
		PCB 167	8.4E-11	—	3.00E-05	2.53E-15
		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	7.8E-11	—	1.00E-04	7.75E-15
		PCB 81	7.8E-11	—	3.00E-04	2.33E-14
		PCB 105	7.8E-11	—	3.00E-05	2.33E-15
		PCB 114	7.8E-11	—	3.00E-05	2.33E-15
		PCB 118	7.8E-11	—	3.00E-05	2.33E-15
		PCB 123	7.8E-11	—	3.00E-05	2.33E-15
		PCB 126	7.8E-11	—	1.00E-01	7.75E-12
		PCB 156	7.8E-11	—	3.00E-05	2.33E-15
		PCB 157	7.8E-11	—	3.00E-05	2.33E-15
		PCB 167	7.8E-11	—	3.00E-05	2.33E-15
		PCB 169	7.8E-11	—	3.00E-02	2.33E-12
		PCB 189	7.8E-11	—	3.00E-05	2.33E-15
	March	PCB 77	8.5E-11	—	1.00E-04	8.53E-15
		PCB 81	7.8E-11	—	3.00E-04	2.33E-14
		PCB 105	7.8E-11	—	3.00E-05	2.33E-15
		PCB 114	7.8E-11	—	3.00E-05	2.33E-15
		PCB 118	7.8E-11	—	3.00E-05	2.33E-15
		PCB 123	7.8E-11	—	3.00E-05	2.33E-15
		PCB 126	7.8E-11	—	1.00E-01	7.76E-12
		PCB 156	7.8E-11	—	3.00E-05	2.33E-15
		PCB 157	7.8E-11	—	3.00E-05	2.33E-15
		PCB 167	7.8E-11	—	3.00E-05	2.33E-15
		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	1.3E-10	—	1.00E-04	1.32E-14
		PCB 81	8.8E-11	—	3.00E-04	2.64E-14
		PCB 105	8.8E-11	—	3.00E-05	2.64E-15
		PCB 114	8.8E-11	—	3.00E-05	2.64E-15
		PCB 118	8.8E-11	—	3.00E-05	2.64E-15
		PCB 123	8.8E-11	—	3.00E-05	2.64E-15
		PCB 126	8.8E-11	—	1.00E-01	8.79E-12
		PCB 156	8.8E-11	—	3.00E-05	2.64E-15
		PCB 157	8.8E-11	—	3.00E-05	2.64E-15
		PCB 167	8.8E-11	—	3.00E-05	2.64E-15
		PCB 169	8.8E-11	—	3.00E-02	2.64E-12
		PCB 189	8.8E-11	—	3.00E-05	2.64E-15
	May	PCB 77	2.5E-10	—	1.00E-04	2.46E-14
		PCB 81	8.5E-11	—	3.00E-04	2.54E-14
		PCB 105	8.5E-11	—	3.00E-05	2.54E-15
		PCB 114	8.5E-11	—	3.00E-05	2.54E-15
		PCB 118	8.5E-11	—	3.00E-05	2.54E-15
		PCB 123	8.5E-11	—	3.00E-05	2.54E-15
		PCB 126	8.5E-11	—	1.00E-01	8.48E-12
		PCB 156	8.5E-11	—	3.00E-05	2.54E-15
		PCB 157	8.5E-11	—	3.00E-05	2.54E-15
		PCB 167	8.5E-11	—	3.00E-05	2.54E-15
		PCB 169	8.5E-11	—	3.00E-02	2.54E-12
		PCB 189	8.5E-11	—	3.00E-05	2.54E-15
	June	PCB 77	1.7E-10	—	1.00E-04	1.73E-14
		PCB 81	7.9E-11	—	3.00E-04	2.36E-14
		PCB 105	7.9E-11	—	3.00E-05	2.36E-15
		PCB 114	7.9E-11	—	3.00E-05	2.36E-15
		PCB 118	7.9E-11	—	3.00E-05	2.36E-15
		PCB 123	7.9E-11	—	3.00E-05	2.36E-15
		PCB 126	7.9E-11	—	1.00E-01	7.85E-12
		PCB 156	7.9E-11	—	3.00E-05	2.36E-15
		PCB 157	7.9E-11	—	3.00E-05	2.36E-15
		PCB 167	7.9E-11	—	3.00E-05	2.36E-15
		PCB 169	7.9E-11	—	3.00E-02	2.36E-12
		PCB 189	7.9E-11	—	3.00E-05	2.36E-15

Table O5.3.3
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	1.8E-10	—	1.00E-04	1.83E-14
		PCB 81	8.0E-11	—	3.00E-04	2.39E-14
		PCB 105	8.0E-11	—	3.00E-05	2.39E-15
		PCB 114	8.0E-11	—	3.00E-05	2.39E-15
		PCB 118	8.0E-11	—	3.00E-05	2.39E-15
		PCB 123	8.0E-11	—	3.00E-05	2.39E-15
		PCB 126	8.0E-11	—	1.00E-01	7.95E-12
		PCB 156	8.0E-11	—	3.00E-05	2.39E-15
		PCB 157	8.0E-11	—	3.00E-05	2.39E-15
		PCB 167	8.0E-11	—	3.00E-05	2.39E-15
		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	2.6E-10	—	1.00E-04	2.58E-14
		PCB 81	8.1E-11	—	3.00E-04	2.42E-14
		PCB 105	8.1E-11	—	3.00E-05	2.42E-15
		PCB 114	8.1E-11	—	3.00E-05	2.42E-15
		PCB 118	8.1E-11	—	3.00E-05	2.42E-15
		PCB 123	8.1E-11	—	3.00E-05	2.42E-15
		PCB 126	8.1E-11	—	1.00E-01	8.07E-12
		PCB 156	8.1E-11	—	3.00E-05	2.42E-15
		PCB 157	8.1E-11	—	3.00E-05	2.42E-15
		PCB 167	8.1E-11	—	3.00E-05	2.42E-15
		PCB 169	8.1E-11	—	3.00E-02	2.42E-12
		PCB 189	8.1E-11	—	3.00E-05	2.42E-15
	September	PCB 77	2.3E-10	—	1.00E-04	2.28E-14
		PCB 81	8.1E-11	—	3.00E-04	2.44E-14
		PCB 105	8.1E-11	—	3.00E-05	2.44E-15
		PCB 114	8.1E-11	—	3.00E-05	2.44E-15
		PCB 118	8.1E-11	—	3.00E-05	2.44E-15
		PCB 123	8.1E-11	—	3.00E-05	2.44E-15
		PCB 126	8.1E-11	—	1.00E-01	8.13E-12
		PCB 156	8.1E-11	—	3.00E-05	2.44E-15
		PCB 157	8.1E-11	—	3.00E-05	2.44E-15
		PCB 167	8.1E-11	—	3.00E-05	2.44E-15
		PCB 169	8.1E-11	—	3.00E-02	2.44E-12
		PCB 189	8.1E-11	—	3.00E-05	2.44E-15
	October	PCB 77	2.4E-10	—	1.00E-04	2.36E-14
		PCB 81	7.6E-11	—	3.00E-04	2.28E-14
		PCB 105	7.6E-11	—	3.00E-05	2.28E-15
		PCB 114	7.6E-11	—	3.00E-05	2.28E-15
		PCB 118	7.6E-11	—	3.00E-05	2.28E-15
		PCB 123	7.6E-11	—	3.00E-05	2.28E-15
		PCB 126	7.6E-11	—	1.00E-01	7.61E-12
		PCB 156	7.6E-11	—	3.00E-05	2.28E-15
		PCB 157	7.6E-11	—	3.00E-05	2.28E-15
		PCB 167	7.6E-11	—	3.00E-05	2.28E-15
		PCB 169	7.6E-11	—	3.00E-02	2.28E-12
		PCB 189	7.6E-11	—	3.00E-05	2.28E-15
	November	PCB 77	1.1E-10	—	1.00E-04	1.09E-14
		PCB 81	8.4E-11	—	3.00E-04	2.51E-14
		PCB 105	8.4E-11	—	3.00E-05	2.51E-15
		PCB 114	8.4E-11	—	3.00E-05	2.51E-15
		PCB 118	8.4E-11	—	3.00E-05	2.51E-15
		PCB 123	8.4E-11	—	3.00E-05	2.51E-15
		PCB 126	8.4E-11	—	1.00E-01	8.37E-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	8.4E-11	—	3.00E-05	2.51E-15
		PCB 169	8.4E-11	—	3.00E-02	2.51E-12
		PCB 189	8.4E-11	—	3.00E-05	2.51E-15
	December	PCB 77	7.8E-11	—	1.00E-04	7.76E-15
		PCB 81	7.8E-11	—	3.00E-04	2.33E-14
		PCB 105	7.8E-11	—	3.00E-05	2.33E-15
		PCB 114	7.8E-11	—	3.00E-05	2.33E-15
		PCB 118	7.8E-11	—	3.00E-05	2.33E-15
		PCB 123	7.8E-11	—	3.00E-05	2.33E-15
		PCB 126	7.8E-11	—	1.00E-01	7.76E-12
		PCB 156	7.8E-11	—	3.00E-05	2.33E-15
		PCB 157	7.8E-11	—	3.00E-05	2.33E-15
		PCB 167	7.8E-11	—	3.00E-05	2.33E-15
		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	—	—	—	**1.06E-11**

Table O5.3.3
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	9.2E-11	—	1.00E-04	9.24E-15
		PCB 81	9.2E-11	—	3.00E-04	2.77E-14
		PCB 105	9.2E-11	—	3.00E-05	2.77E-15
		PCB 114	9.2E-11	—	3.00E-05	2.77E-15
		PCB 118	9.2E-11	—	3.00E-05	2.77E-15
		PCB 123	9.2E-11	—	3.00E-05	2.77E-15
		PCB 126	9.2E-11	—	1.00E-01	9.24E-12
		PCB 156	9.2E-11	—	3.00E-05	2.77E-15
		PCB 157	9.2E-11	—	3.00E-05	2.77E-15
		PCB 167	9.2E-11	—	3.00E-05	2.77E-15
		PCB 169	9.2E-11	—	3.00E-02	2.77E-12
		PCB 189	9.2E-11	—	3.00E-05	2.77E-15
	February	PCB 77	7.8E-11	—	1.00E-04	7.75E-15
		PCB 81	7.8E-11	—	3.00E-04	2.33E-14
		PCB 105	7.8E-11	—	3.00E-05	2.33E-15
		PCB 114	7.8E-11	—	3.00E-05	2.33E-15
		PCB 118	7.8E-11	—	3.00E-05	2.33E-15
		PCB 123	7.8E-11	—	3.00E-05	2.33E-15
		PCB 126	7.8E-11	—	1.00E-01	7.75E-12
		PCB 156	7.8E-11	—	3.00E-05	2.33E-15
		PCB 157	7.8E-11	—	3.00E-05	2.33E-15
		PCB 167	7.8E-11	—	3.00E-05	2.33E-15
		PCB 169	7.8E-11	—	3.00E-02	2.33E-12
		PCB 189	7.8E-11	—	3.00E-05	2.33E-15
	March	PCB 77	8.0E-11	—	1.00E-04	8.05E-15
		PCB 81	8.0E-11	—	3.00E-04	2.41E-14
		PCB 105	8.0E-11	—	3.00E-05	2.41E-15
		PCB 114	8.0E-11	—	3.00E-05	2.41E-15
		PCB 118	8.0E-11	—	3.00E-05	2.41E-15
		PCB 123	8.0E-11	—	3.00E-05	2.41E-15
		PCB 126	8.0E-11	—	1.00E-01	8.05E-12
		PCB 156	8.0E-11	—	3.00E-05	2.41E-15
		PCB 157	8.0E-11	—	3.00E-05	2.41E-15
		PCB 167	8.0E-11	—	3.00E-05	2.41E-15
		PCB 169	8.0E-11	—	3.00E-02	2.41E-12
		PCB 189	8.0E-11	—	3.00E-05	2.41E-15
	April (2)	PCB 77	1.3E-10	—	1.00E-04	1.28E-14
		PCB 81	8.0E-11	—	3.00E-04	2.40E-14
		PCB 105	8.0E-11	—	3.00E-05	2.40E-15
		PCB 114	8.0E-11	—	3.00E-05	2.40E-15
		PCB 118	8.0E-11	—	3.00E-05	2.40E-15
		PCB 123	8.0E-11	—	3.00E-05	2.40E-15
		PCB 126	8.0E-11	—	1.00E-01	7.99E-12
		PCB 156	8.0E-11	—	3.00E-05	2.40E-15
		PCB 157	8.0E-11	—	3.00E-05	2.40E-15
		PCB 167	8.0E-11	—	3.00E-05	2.40E-15
		PCB 169	8.0E-11	—	3.00E-02	2.40E-12
		PCB 189	8.0E-11	—	3.00E-05	2.40E-15
	May	PCB 77	7.9E-11	—	1.00E-04	7.89E-15
		PCB 81	7.9E-11	—	3.00E-04	2.37E-14
		PCB 105	7.9E-11	—	3.00E-05	2.37E-15
		PCB 114	7.9E-11	—	3.00E-05	2.37E-15
		PCB 118	7.9E-11	—	3.00E-05	2.37E-15
		PCB 123	7.9E-11	—	3.00E-05	2.37E-15
		PCB 126	7.9E-11	—	1.00E-01	7.89E-12
		PCB 156	7.9E-11	—	3.00E-05	2.37E-15
		PCB 157	7.9E-11	—	3.00E-05	2.37E-15
		PCB 167	7.9E-11	—	3.00E-05	2.37E-15
		PCB 169	7.9E-11	—	3.00E-02	2.37E-12
		PCB 189	7.9E-11	—	3.00E-05	2.37E-15
	June	PCB 77	7.8E-11	—	1.00E-04	7.82E-15
		PCB 81	7.8E-11	—	3.00E-04	2.34E-14
		PCB 105	7.8E-11	—	3.00E-05	2.34E-15
		PCB 114	7.8E-11	—	3.00E-05	2.34E-15
		PCB 118	7.8E-11	—	3.00E-05	2.34E-15
		PCB 123	7.8E-11	—	3.00E-05	2.34E-15
		PCB 126	7.8E-11	—	1.00E-01	7.82E-12
		PCB 156	7.8E-11	—	3.00E-05	2.34E-15
		PCB 157	7.8E-11	—	3.00E-05	2.34E-15
		PCB 167	7.8E-11	—	3.00E-05	2.34E-15
		PCB 169	7.8E-11	—	3.00E-02	2.34E-12
		PCB 189	7.8E-11	—	3.00E-05	2.34E-15

Table O5.3.3
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	7.9E-11	—	1.00E-04	7.87E-15
		PCB 81	7.8E-11	—	3.00E-04	2.34E-14
		PCB 105	7.9E-11	—	3.00E-05	2.36E-15
		PCB 114	7.8E-11	—	3.00E-05	2.34E-15
		PCB 118	7.9E-11	—	3.00E-05	2.36E-15
		PCB 123	7.9E-11	—	3.00E-05	2.36E-15
		PCB 126	7.8E-11	—	1.00E-01	7.82E-12
		PCB 156	7.9E-11	—	3.00E-05	2.36E-15
		PCB 157	7.9E-11	—	3.00E-05	2.36E-15
		PCB 167	7.9E-11	—	3.00E-05	2.36E-15
		PCB 169	7.8E-11	—	3.00E-02	2.34E-12
		PCB 189	7.8E-11	—	3.00E-05	2.34E-15
	August	PCB 77	1.1E-10	—	1.00E-04	1.05E-14
		PCB 81	8.1E-11	—	3.00E-04	2.43E-14
		PCB 105	8.1E-11	—	3.00E-05	2.43E-15
		PCB 114	8.1E-11	—	3.00E-05	2.43E-15
		PCB 118	8.1E-11	—	3.00E-05	2.43E-15
		PCB 123	8.1E-11	—	3.00E-05	2.43E-15
		PCB 126	8.1E-11	—	1.00E-01	8.10E-12
		PCB 156	8.1E-11	—	3.00E-05	2.43E-15
		PCB 157	8.1E-11	—	3.00E-05	2.43E-15
		PCB 167	8.1E-11	—	3.00E-05	2.43E-15
		PCB 169	8.1E-11	—	3.00E-02	2.43E-12
		PCB 189	8.1E-11	—	3.00E-05	2.43E-15
	September	PCB 77	1.9E-10	—	1.00E-04	1.94E-14
		PCB 81	9.2E-11	—	3.00E-04	2.77E-14
		PCB 105	9.2E-11	—	3.00E-05	2.77E-15
		PCB 114	9.2E-11	—	3.00E-05	2.77E-15
		PCB 118	9.2E-11	—	3.00E-05	2.77E-15
		PCB 123	9.2E-11	—	3.00E-05	2.77E-15
		PCB 126	9.2E-11	—	1.00E-01	9.24E-12
		PCB 156	9.2E-11	—	3.00E-05	2.77E-15
		PCB 157	9.2E-11	—	3.00E-05	2.77E-15
		PCB 167	9.2E-11	—	3.00E-05	2.77E-15
		PCB 169	9.2E-11	—	3.00E-02	2.77E-12
		PCB 189	9.2E-11	—	3.00E-05	2.77E-15
	October	PCB 77	1.4E-10	—	1.00E-04	1.41E-14
		PCB 81	7.8E-11	—	3.00E-04	2.35E-14
		PCB 105	7.8E-11	—	3.00E-05	2.35E-15
		PCB 114	7.8E-11	—	3.00E-05	2.35E-15
		PCB 118	7.8E-11	—	3.00E-05	2.35E-15
		PCB 123	7.8E-11	—	3.00E-05	2.35E-15
		PCB 126	7.8E-11	—	1.00E-01	7.83E-12
		PCB 156	7.8E-11	—	3.00E-05	2.35E-15
		PCB 157	7.8E-11	—	3.00E-05	2.35E-15
		PCB 167	7.8E-11	—	3.00E-05	2.35E-15
		PCB 169	7.8E-11	—	3.00E-02	2.35E-12
		PCB 189	7.8E-11	—	3.00E-05	2.35E-15
	November [(3)]					
	December	PCB 77	1.0E-10	—	1.00E-04	1.01E-14
		PCB 81	7.8E-11	—	3.00E-04	2.33E-14
		PCB 105	7.8E-11	—	3.00E-05	2.33E-15
		PCB 114	7.8E-11	—	3.00E-05	2.33E-15
		PCB 118	7.8E-11	—	3.00E-05	2.33E-15
		PCB 123	7.8E-11	—	3.00E-05	2.33E-15
		PCB 126	7.8E-11	—	1.00E-01	7.75E-12
		PCB 156	7.8E-11	—	3.00E-05	2.33E-15
		PCB 157	7.8E-11	—	3.00E-05	2.33E-15
		PCB 167	7.8E-11	—	3.00E-05	2.33E-15
		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	—	—	—	**1.06E-11**

Table O5.3.3
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. This data set considers all concentrations as non detects; therefore, no scaling factors are used.

(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 O5.3.4
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	1.57E-01	6.63	9.40E-06	8.205E-05	298.1	-1.654	6.64E+08	6.84E+06
PCB 81	8.08E-02	6.34	2.23E-04	8.205E-05	298.1	-1.654	1.37E+07	1.42E+05
PCB 105	8.08E-02	6.79	2.83E-04	8.205E-05	298.1	-1.654	3.27E+07	3.36E+05
PCB 114	8.08E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 118	8.08E-02	7.12	2.88E-04	8.205E-05	298.1	-1.654	7.21E+07	7.43E+05
PCB 123	8.08E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 126	8.08E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 156	8.08E-02	7.60	1.43E-04	8.205E-05	298.1	-1.654	4.71E+08	4.85E+06
PCB 157	8.08E-02	7.62	1.62E-04	8.205E-05	298.1	-1.654	4.37E+08	4.50E+06
PCB 167	8.08E-02	7.50	1.62E-04	8.205E-05	298.1	-1.654	3.25E+08	3.35E+06
PCB 169	8.08E-02	7.41	1.62E-04	8.205E-05	298.1	-1.654	2.61E+08	2.69E+06
PCB 189	8.08E-02	8.27	1.38E-04	8.205E-05	298.1	-1.654	2.52E+09	2.60E+07
MSP								
PCB 77	1.05E-01	6.63	9.40E-06	8.205E-05	298.1	-1.654	6.64E+08	6.84E+06
PCB 81	8.13E-02	6.34	2.23E-04	8.205E-05	298.1	-1.654	1.37E+07	1.42E+05
PCB 105	8.14E-02	6.79	2.83E-04	8.205E-05	298.1	-1.654	3.27E+07	3.36E+05
PCB 114	8.13E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 118	8.14E-02	7.12	2.88E-04	8.205E-05	298.1	-1.654	7.21E+07	7.43E+05
PCB 123	8.14E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 126	8.13E-02	6.98	1.90E-04	8.205E-05	298.1	-1.654	7.75E+07	7.99E+05
PCB 156	8.14E-02	7.60	1.43E-04	8.205E-05	298.1	-1.654	4.71E+08	4.85E+06
PCB 157	8.14E-02	7.62	1.62E-04	8.205E-05	298.1	-1.654	4.37E+08	4.50E+06
PCB 167	8.14E-02	7.50	1.62E-04	8.205E-05	298.1	-1.654	3.25E+08	3.35E+06
PCB 169	8.13E-02	7.41	1.62E-04	8.205E-05	298.1	-1.654	2.61E+08	2.69E+06
PCB 189	8.13E-02	8.27	1.38E-04	8.205E-05	298.1	-1.654	2.52E+09	2.60E+07

Table O5.3.4
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 O5.3.3 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])

ρ_{air} - density of air (1.19 g/L)

ρ_{forage} - 770 g/L

f_{water} - 0.85 (fraction of forage that is water)

BTF - Biotransfer factor

Table O5.3.4
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	1.53E-01	0.01	1190	8.81E+00
PCB 81	1.7E-04	8.45E-06	1.12E-08	3.50E-06	0.95	7.67E-02	0.01	1190	9.13E-02
PCB 105	1.7E-04	6.53E-06	8.62E-09	3.50E-06	0.94	7.56E-02	0.01	1190	2.14E-01
PCB 114	1.7E-04	5.47E-06	7.22E-09	3.50E-06	0.92	7.46E-02	0.01	1190	5.01E-01
PCB 118	1.7E-04	8.97E-06	1.18E-08	3.50E-06	0.95	7.69E-02	0.01	1190	4.80E-01
PCB 123	1.7E-04	5.47E-06	7.22E-09	3.50E-06	0.92	7.46E-02	0.01	1190	5.01E-01
PCB 126	1.7E-04	2.22E-06	2.93E-09	3.50E-06	0.83	6.71E-02	0.01	1190	4.51E-01
PCB 156	1.7E-04	1.61E-06	2.13E-09	3.50E-06	0.78	6.31E-02	0.01	1190	2.57E+00
PCB 157	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.55E-02	0.01	1190	1.72E+00
PCB 167	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.55E-02	0.01	1190	1.28E+00
PCB 169	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.55E-02	0.01	1190	1.03E+00
PCB 189	1.7E-04	1.30E-07	1.72E-10	3.50E-06	0.22	1.81E-02	0.01	1190	3.95E+00
MSP									
PCB 77	1.7E-04	1.64E-05	2.16E-08	3.50E-06	0.97	1.02E-01	0.01	1190	5.88E+00
PCB 81	1.7E-04	8.45E-06	1.12E-08	3.50E-06	0.95	7.72E-02	0.01	1190	9.19E-02
PCB 105	1.7E-04	6.53E-06	8.62E-09	3.50E-06	0.94	7.61E-02	0.01	1190	2.15E-01
PCB 114	1.7E-04	5.47E-06	7.22E-09	3.50E-06	0.92	7.51E-02	0.01	1190	5.04E-01
PCB 118	1.7E-04	8.97E-06	1.18E-08	3.50E-06	0.95	7.75E-02	0.01	1190	4.84E-01
PCB 123	1.7E-04	5.47E-06	7.22E-09	3.50E-06	0.92	7.52E-02	0.01	1190	5.05E-01
PCB 126	1.7E-04	2.22E-06	2.93E-09	3.50E-06	0.83	6.76E-02	0.01	1190	4.54E-01
PCB 156	1.7E-04	1.61E-06	2.13E-09	3.50E-06	0.78	6.36E-02	0.01	1190	2.59E+00
PCB 157	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.58E-02	0.01	1190	1.73E+00
PCB 167	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.58E-02	0.01	1190	1.29E+00
PCB 169	1.7E-04	5.81E-07	7.67E-10	3.50E-06	0.56	4.58E-02	0.01	1190	1.03E+00
PCB 189	1.7E-04	1.30E-07	1.72E-10	3.50E-06	0.22	1.82E-02	0.01	1190	3.98E+00

Table O5.3.4
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 O5.3.4
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	4.21E-03	315,360	0.39	0.147	0.3	5.00E+04	5.21E+02	18	2.24	1.29E-02
PCB 81	4.09E-03	315,360	0.39	0.147	0.3	5.00E+04	5.07E+02	18	2.24	1.26E-02
PCB 105	5.22E-03	315,360	0.39	0.147	0.3	5.00E+04	6.46E+02	18	2.24	1.60E-02
PCB 114	6.15E-03	315,360	0.39	0.147	0.3	5.00E+04	7.62E+02	18	2.24	1.89E-02
PCB 118	3.87E-03	315,360	0.39	0.147	0.3	5.00E+04	4.79E+02	18	2.24	1.19E-02
PCB 123	6.15E-03	315,360	0.39	0.147	0.3	5.00E+04	7.62E+02	18	2.24	1.89E-02
PCB 126	1.36E-02	315,360	0.39	0.147	0.3	5.00E+04	1.69E+03	18	2.24	4.19E-02
PCB 156	1.77E-02	315,360	0.39	0.147	0.3	5.00E+04	2.19E+03	18	2.24	5.43E-02
PCB 157	3.53E-02	315,360	0.39	0.147	0.3	5.00E+04	4.37E+03	18	2.24	1.08E-01
PCB 167	3.53E-02	315,360	0.39	0.147	0.3	5.00E+04	4.37E+03	18	2.24	1.08E-01
PCB 169	3.53E-02	315,360	0.39	0.147	0.3	5.00E+04	4.37E+03	18	2.24	1.08E-01
PCB 189	6.27E-02	315,360	0.39	0.147	0.3	5.00E+04	7.77E+03	18	2.24	1.93E-01
MSP										
PCB 77	2.81E-03	315,360	0.39	0.147	0.3	5.00E+04	3.48E+02	18	2.24	8.63E-03
PCB 81	4.12E-03	315,360	0.39	0.147	0.3	5.00E+04	5.10E+02	18	2.24	1.27E-02
PCB 105	5.25E-03	315,360	0.39	0.147	0.3	5.00E+04	6.51E+02	18	2.24	1.61E-02
PCB 114	6.19E-03	315,360	0.39	0.147	0.3	5.00E+04	7.67E+02	18	2.24	1.90E-02
PCB 118	3.89E-03	315,360	0.39	0.147	0.3	5.00E+04	4.82E+02	18	2.24	1.20E-02
PCB 123	6.20E-03	315,360	0.39	0.147	0.3	5.00E+04	7.67E+02	18	2.24	1.90E-02
PCB 126	1.37E-02	315,360	0.39	0.147	0.3	5.00E+04	1.70E+03	18	2.24	4.22E-02
PCB 156	1.78E-02	315,360	0.39	0.147	0.3	5.00E+04	2.20E+03	18	2.24	5.47E-02
PCB 157	3.56E-02	315,360	0.39	0.147	0.3	5.00E+04	4.40E+03	18	2.24	1.09E-01
PCB 167	3.56E-02	315,360	0.39	0.147	0.3	5.00E+04	4.40E+03	18	2.24	1.09E-01
PCB 169	3.55E-02	315,360	0.39	0.147	0.3	5.00E+04	4.40E+03	18	2.24	1.09E-01
PCB 189	6.31E-02	315,360	0.39	0.147	0.3	5.00E+04	7.82E+03	18	2.24	1.94E-01

Table O5.3.4
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 O5.3.4
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	8.82E+00	0.0001	8.82E-04
PCB 81	1.04E-01	0.0003	3.12E-05
PCB 105	2.30E-01	0.00003	6.89E-06
PCB 114	5.20E-01	0.00003	1.56E-05
PCB 118	4.92E-01	0.00003	1.48E-05
PCB 123	5.20E-01	0.00003	1.56E-05
PCB 126	4.93E-01	0.1	4.93E-02
PCB 156	2.63E+00	0.00003	7.89E-05
PCB 157	1.83E+00	0.00003	5.49E-05
PCB 167	1.39E+00	0.00003	4.17E-05
PCB 169	1.14E+00	0.03	3.41E-02
PCB 189	4.15E+00	0.00003	1.24E-04
Total Congeners: (4)			**8.46E-02**
MSP			
PCB 77	5.88E+00	0.0001	5.88E-04
PCB 81	1.05E-01	0.0003	3.14E-05
PCB 105	2.31E-01	0.00003	6.94E-06
PCB 114	5.23E-01	0.00003	1.57E-05
PCB 118	4.96E-01	0.00003	1.49E-05
PCB 123	5.24E-01	0.00003	1.57E-05
PCB 126	4.96E-01	0.1	4.96E-02
PCB 156	2.65E+00	0.00003	7.94E-05
PCB 157	1.84E+00	0.00003	5.53E-05
PCB 167	1.40E+00	0.00003	4.20E-05
PCB 169	1.14E+00	0.03	3.43E-02
PCB 189	4.17E+00	0.00003	1.25E-04
Total Congeners: (4)			**8.49E-02**

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 O5.3.5
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	5.5E-06	0.01	2.71E-07	0.0001	2.71E-11
PCB 81	6.34	0.01	7.81E+04	7.81E+02	2.30E+03	2.95E+00	1.1E-06	0.01	3.24E-08	0.0003	9.72E-12
PCB 105	6.79	0.01	1.31E+05	1.31E+03	5.11E+03	3.90E+00	1.1E-06	0.01	4.29E-08	0.00003	1.29E-12
PCB 114	6.98	0.01	1.31E+05	1.31E+03	7.15E+03	5.46E+00	1.1E-06	0.01	6.01E-08	0.00003	1.80E-12
PCB 118	7.12	0.01	1.28E+05	1.28E+03	9.17E+03	7.16E+00	1.1E-06	0.01	7.88E-08	0.00003	2.36E-12
PCB 123	6.98	0.01	1.31E+05	1.31E+03	7.15E+03	5.46E+00	2.7E-06	0.01	1.47E-07	0.00003	4.42E-12
PCB 126	6.98	0.01	1.28E+05	1.28E+03	7.15E+03	5.59E+00	1.1E-06	0.01	6.15E-08	0.1	6.15E-09
PCB 156	7.60	0.01	2.14E+05	2.14E+03	2.15E+04	1.00E+01	1.1E-06	0.01	1.10E-07	0.00003	3.31E-12
PCB 157	7.62	0.01	2.14E+05	2.14E+03	2.23E+04	1.04E+01	1.1E-06	0.01	1.14E-07	0.00003	3.43E-12
PCB 167	7.50	0.01	2.09E+05	2.09E+03	1.80E+04	8.61E+00	1.1E-06	0.01	9.47E-08	0.00003	2.84E-12
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	1.1E-06	0.01	2.21E-07	0.00003	6.64E-12
Total Congeners: [13]											8.63E-09
South											
PCB 77	6.63	0.01	7.81E+04	7.81E+02	3.85E+03	4.93E+00	5.0E-06	0.01	2.46E-07	0.0001	2.46E-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	5.0E-06	0.01	1.95E-07	0.00003	5.85E-12
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	5.0E-06	0.01	3.58E-07	0.00003	1.07E-11
PCB 123	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 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	5.0E-06	0.01	5.02E-07	0.00003	1.51E-11
PCB 157	7.62	0.01	2.14E+05	2.14E+03	2.23E+04	1.04E+01	5.0E-06	0.01	5.20E-07	0.00003	1.56E-11
PCB 167	7.50	0.01	2.09E+05	2.09E+03	1.80E+04	8.61E+00	5.0E-06	0.01	4.30E-07	0.00003	1.29E-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	5.0E-06	0.01	1.01E-06	0.00003	3.02E-11
Total Congeners: [13]											3.91E-08

Table O5.3.5
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	5.0E-06	0.01	2.46E-07	0.0001	2.46E-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	5.0E-06	0.01	1.95E-07	0.00003	5.85E-12
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	5.0E-06	0.01	3.58E-07	0.00003	1.07E-11
PCB 123	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 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	5.0E-06	0.01	5.02E-07	0.00003	1.51E-11
PCB 157	7.62	0.01	2.14E+05	2.14E+03	2.23E+04	1.04E+01	5.0E-06	0.01	5.20E-07	0.00003	1.56E-11
PCB 167	7.50	0.01	2.09E+05	2.09E+03	1.80E+04	8.61E+00	5.0E-06	0.01	4.30E-07	0.00003	1.29E-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	5.0E-06	0.01	1.01E-06	0.00003	3.02E-11
Total Congeners: [13]											3.91E-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 O5.3.6
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	4.9E-05	0.5	5.5E-06	1	6.63	0.0289	1	4.15E-06	0.0001	4.15E-10
PCB 81	0.25	11.77	2.9E-05	0.5	1.1E-06	1	6.34	0.0334	1	2.85E-06	0.0003	8.55E-10
PCB 105	0.25	11.77	2.9E-05	0.5	1.1E-06	1	6.79	0.0263	1	2.25E-06	0.00003	6.74E-11
PCB 114	0.25	11.77	2.9E-05	0.5	1.1E-06	1	6.98	0.0231	1	1.98E-06	0.00003	5.93E-11
PCB 118	0.25	11.77	2.9E-05	0.5	1.1E-06	1	7.12	0.0208	1	1.78E-06	0.00003	5.34E-11
PCB 123	0.25	11.77	2.9E-05	0.5	2.7E-06	1	6.98	0.0231	1	1.98E-06	0.00003	5.94E-11
PCB 126	0.25	11.77	2.9E-05	0.5	1.1E-06	1	6.98	0.0231	1	1.98E-06	0.1	1.98E-07
PCB 156	0.25	11.77	2.9E-05	0.5	1.1E-06	1	7.6	0.0136	1	1.16E-06	0.00003	3.48E-11
PCB 157	0.25	11.77	2.9E-05	0.5	1.1E-06	1	7.62	0.0133	1	1.14E-06	0.00003	3.41E-11
PCB 167	0.25	11.77	2.9E-05	0.5	1.1E-06	1	7.5	0.0150	1	1.28E-06	0.00003	3.84E-11
PCB 169	0.25	11.77	1.1E-06	0.5	1.1E-06	1	7.41	0.0163	1	5.25E-08	0.03	1.58E-09
PCB 189	0.25	11.77	2.9E-05	0.5	1.1E-06	1	8.27	0.0063	1	5.35E-07	0.00003	1.61E-11
Total Congeners: [11]												2.01E-07
South												
PCB 77	0.25	11.77	3.5E-05	0.5	5.0E-06	1	6.63	0.0289	1	3.00E-06	0.0001	3.00E-10
PCB 81	0.25	11.77	2.9E-05	0.5	5.0E-06	1	6.34	0.0334	1	2.82E-06	0.0003	8.45E-10
PCB 105	0.25	11.77	1.2E-06	0.5	5.0E-06	1	6.79	0.0263	1	1.05E-07	0.00003	3.16E-12
PCB 114	0.25	11.77	1.2E-06	0.5	5.0E-06	1	6.98	0.0231	1	9.27E-08	0.00003	2.78E-12
PCB 118	0.25	11.77	1.2E-06	0.5	5.0E-06	1	7.12	0.0208	1	8.35E-08	0.00003	2.50E-12
PCB 123	0.25	11.77	2.9E-05	0.5	5.0E-06	1	6.98	0.0231	1	1.95E-06	0.00003	5.86E-11
PCB 126	0.25	11.77	2.9E-05	0.5	5.0E-06	1	6.98	0.0231	1	1.95E-06	0.1	1.95E-07
PCB 156	0.25	11.77	1.2E-06	0.5	5.0E-06	1	7.6	0.0136	1	5.44E-08	0.00003	1.63E-12
PCB 157	0.25	11.77	1.2E-06	0.5	5.0E-06	1	7.62	0.0133	1	5.33E-08	0.00003	1.60E-12
PCB 167	0.25	11.77	2.9E-05	0.5	5.0E-06	1	7.5	0.0150	1	1.26E-06	0.00003	3.79E-11
PCB 169	0.25	11.77	1.2E-06	0.5	5.0E-06	1	7.41	0.0163	1	6.52E-08	0.03	1.96E-09
PCB 189	0.25	11.77	1.2E-06	0.5	5.0E-06	1	8.27	0.0063	1	2.51E-08	0.00003	7.53E-13
Total Congeners: [11]												1.99E-07
Southwest												
PCB 77	0.25	11.77	3.5E-05	0.5	5.0E-06	1	6.63	0.0289	1	2.95E-06	0.0001	2.95E-10
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	3.5E-05	0.5	5.0E-06	1	6.79	0.0263	1	2.69E-06	0.00003	8.06E-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	3.5E-05	0.5	5.0E-06	1	7.12	0.0208	1	2.13E-06	0.00003	6.38E-11
PCB 123	0.25	11.77	3.5E-05	0.5	5.0E-06	1	6.98	0.0231	1	2.36E-06	0.00003	7.09E-11
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	3.5E-05	0.5	5.0E-06	1	7.6	0.0136	1	1.39E-06	0.00003	4.16E-11
PCB 157	0.25	11.77	3.5E-05	0.5	5.0E-06	1	7.62	0.0133	1	1.36E-06	0.00003	4.07E-11
PCB 167	0.25	11.77	3.5E-05	0.5	5.0E-06	1	7.5	0.0150	1	1.53E-06	0.00003	4.58E-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	5.0E-06	1	8.27	0.0063	1	2.33E-08	0.00003	6.98E-13
Total Congeners: [11]												1.11E-08

Table O5.3.6
Derivation of Exposure Point Concentrations in Beef Tissue
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

<u>Notes:</u>

(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 reporting limit 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

ND - not detected

PCB - polychlorinated biphenyl

TEF - toxicity equivalence factor

TEC - toxicity equivalence concentration

Table O5.3.7
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	4.9E-05	0.4	5.5E-06	1	6.63	0.0061	1	1.50E-06	0.0001	1.50E-10
PCB 81	0.25	20.3	2.9E-05	0.4	1.1E-06	1	6.34	0.0070	1	1.03E-06	0.0003	3.10E-10
PCB 105	0.25	20.3	2.9E-05	0.4	1.1E-06	1	6.79	0.0055	1	8.15E-07	0.00003	2.45E-11
PCB 114	0.25	20.3	2.9E-05	0.4	1.1E-06	1	6.98	0.0049	1	7.17E-07	0.00003	2.15E-11
PCB 118	0.25	20.3	2.9E-05	0.4	1.1E-06	1	7.12	0.0044	1	6.45E-07	0.00003	1.94E-11
PCB 123	0.25	20.3	2.9E-05	0.4	2.7E-06	1	6.98	0.0049	1	7.18E-07	0.00003	2.15E-11
PCB 126	0.25	20.3	2.9E-05	0.4	1.1E-06	1	6.98	0.0049	1	7.17E-07	0.1	7.17E-08
PCB 156	0.25	20.3	2.9E-05	0.4	1.1E-06	1	7.6	0.0029	1	4.21E-07	0.00003	1.26E-11
PCB 157	0.25	20.3	2.9E-05	0.4	1.1E-06	1	7.62	0.0028	1	4.12E-07	0.00003	1.24E-11
PCB 167	0.25	20.3	2.9E-05	0.4	1.1E-06	1	7.5	0.0031	1	4.64E-07	0.00003	1.39E-11
PCB 169	0.25	20.3	1.1E-06	0.4	1.1E-06	1	7.41	0.0034	1	1.86E-08	0.03	5.59E-10
PCB 189	0.25	20.3	2.9E-05	0.4	1.1E-06	1	8.27	0.0013	1	1.94E-07	0.00003	5.83E-12
Total Congeners: (11)												7.28E-08
South												
PCB 77	0.25	20.3	3.5E-05	0.4	5.0E-06	1	6.63	0.0061	1	1.08E-06	0.0001	1.08E-10
PCB 81	0.25	20.3	2.9E-05	0.4	5.0E-06	1	6.34	0.0070	1	1.02E-06	0.0003	3.06E-10
PCB 105	0.25	20.3	1.2E-06	0.4	5.0E-06	1	6.79	0.0055	1	3.51E-08	0.00003	1.05E-12
PCB 114	0.25	20.3	1.2E-06	0.4	5.0E-06	1	6.98	0.0049	1	3.08E-08	0.00003	9.25E-13
PCB 118	0.25	20.3	1.2E-06	0.4	5.0E-06	1	7.12	0.0044	1	2.78E-08	0.00003	8.33E-13
PCB 123	0.25	20.3	2.9E-05	0.4	5.0E-06	1	6.98	0.0049	1	7.07E-07	0.00003	2.12E-11
PCB 126	0.25	20.3	2.9E-05	0.4	5.0E-06	1	6.98	0.0049	1	7.07E-07	0.1	7.07E-08
PCB 156	0.25	20.3	1.2E-06	0.4	5.0E-06	1	7.6	0.0029	1	1.81E-08	0.00003	5.43E-13
PCB 157	0.25	20.3	1.2E-06	0.4	5.0E-06	1	7.62	0.0028	1	1.77E-08	0.00003	5.32E-13
PCB 167	0.25	20.3	2.9E-05	0.4	5.0E-06	1	7.5	0.0031	1	4.57E-07	0.00003	1.37E-11
PCB 169	0.25	20.3	1.2E-06	0.4	5.0E-06	1	7.41	0.0034	1	2.17E-08	0.03	6.51E-10
PCB 189	0.25	20.3	1.2E-06	0.4	5.0E-06	1	8.27	0.0013	1	8.35E-09	0.00003	2.51E-13
Total Congeners: (11)												7.18E-08
Southwest												
PCB 77	0.25	20.3	3.5E-05	0.4	5.0E-06	1	6.63	0.0061	1	1.07E-06	0.0001	1.07E-10
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	3.5E-05	0.4	5.0E-06	1	6.79	0.0055	1	9.72E-07	0.00003	2.92E-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	3.5E-05	0.4	5.0E-06	1	7.12	0.0044	1	7.69E-07	0.00003	2.31E-11
PCB 123	0.25	20.3	3.5E-05	0.4	5.0E-06	1	6.98	0.0049	1	8.55E-07	0.00003	2.56E-11
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	3.5E-05	0.4	5.0E-06	1	7.6	0.0029	1	5.02E-07	0.00003	1.50E-11
PCB 157	0.25	20.3	3.5E-05	0.4	5.0E-06	1	7.62	0.0028	1	4.92E-07	0.00003	1.47E-11
PCB 167	0.25	20.3	3.5E-05	0.4	5.0E-06	1	7.5	0.0031	1	5.53E-07	0.00003	1.66E-11
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	5.0E-06	1	8.27	0.0013	1	7.68E-09	0.00003	2.31E-13
Total Congeners: (11)												3.68E-09

Table O5.3.7
Derivation of Exposure Point Concentrations in Milk
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

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 reporting limit 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: 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 x Qp x P) + (Fs x Qs x Cs x Bs)] x Ba_{milk} x 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 O5.3.8
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 O5.3.9
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 O5.3.1	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 O5.3.10
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	--	Exposure Concentration (ug/m3) for carcinogens = CAIR x ET x EF x ED x 1/ATC
				CAIR	Air Exposure Point Concentration	From Monitoring Data	ug/m3	--	
				ET	Exposure Time	8	hr/day	USEPA 1991	
				EF	Exposure Frequency	19	days/year	Site-Specific	
				ED	Exposure Duration	25	years	USEPA 1991	Exposure Concentration (ug/m3) for noncarcinogens = CAIR x ET x EF x ED x 1/ATN
				ATC	Averaging Time, carcinogens	613,200	hours	70 y x 365 d/y x 24 hr/d	
				ATN	Averaging Time, noncarcinogens	219,000	hours	ED x 365 d/y x 24 hr/d	

Table O5.3.11
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 O5.3.11
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 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	

Table O5.3.11
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 O5.3.12
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 O5.3.1	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 O5.3.1	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 O5.3.1	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 O5.3.13
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 O5.3.14
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 O5.3.4)	mg/kg	--	Chronic Daily Intake (mg/kg-day) for carcinogens =
				CPRODbg	Belowground Produce Exposure Point Concentration	Modeled From Sampling Data (See Table O5.3.5)	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 O5.3.4)	mg/kg	--	Chronic Daily Intake (mg/kg-day) for carcinogens =
				CPRODbg	Belowground Produce Exposure Point Concentration	Modeled From Sampling Data (See Table O5.3.5)	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 O5.3.15
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 O5.3.6)	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 O5.3.6)	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 O5.3.16
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 O5.3.7)	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 O5.3.17
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	1.44E-07	0.0001	1	70	2.06E-13
South	6.53E-07	0.0001	1	70	9.33E-13
Southwest	6.53E-07	0.0001	1	70	9.33E-13

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	1.44E-07	0.0001	1	70	2.06E-13
South	6.53E-07	0.0001	1	70	9.33E-13
Southwest	6.53E-07	0.0001	1	70	9.33E-13

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	1.44E-07	0.0001	1	70	2.06E-13
South	6.53E-07	0.0001	1	70	9.33E-13
Southwest	6.53E-07	0.0001	1	70	9.33E-13

Notes (Step 1):

(1) Exposure Point Concentration (See Table O5.3.1 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 O5.3.17
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	2.01E-07	0.00122	1	2.45E-10
South	1.99E-07	0.00122	1	2.42E-10
Southwest	1.11E-08	0.00122	1	1.35E-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 ($A_{prod\text{-}ag}$) (1) mg/kg	Consumption Rate of Exposed Aboveground Produce ($CR_{prod\text{-}ag}$) (2) kg/kg-day DW	Concentration in Belowground Produce ($A_{prod\text{-}bg}$) (1) mg/kg	Consumption Rate of Belowground Produce ($CR_{prod\text{-}bg}$) (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	2.01E-07	0.00122	1	2.45E-10	8.49E-08	0.00047	8.63E-09	0.00017	1	4.14E-11	7.28E-08	0.01367	1	9.96E-10
South	1.99E-07	0.00122	1	2.42E-10	8.49E-08	0.00047	3.91E-08	0.00017	1	4.65E-11	7.18E-08	0.01367	1	9.81E-10
Southwest	1.11E-08	0.00122	1	1.35E-11	8.49E-08	0.00047	3.91E-08	0.00017	1	4.65E-11	3.68E-09	0.01367	1	5.03E-11

FUTURE RESIDENT

Exposure Area	Concentration in Exposed Aboveground Produce ($A_{prod\text{-}ag}$) (1) mg/kg	Consumption Rate of Exposed Aboveground Produce ($CR_{prod\text{-}ag}$) (2) kg/kg-day DW	Concentration in Belowground Produce ($A_{prod\text{-}bg}$) (1) mg/kg	Consumption Rate of Belowground Produce ($CR_{prod\text{-}bg}$) (2) kg/kg-day DW	Fraction of Contaminated Produce (F_{prod}) (3)	Daily Intake from Produce (I_{prod}) (5) mg/kg-day
Southeast	8.49E-08	0.00032	8.63E-09	0.00014	1	2.84E-11
South	8.49E-08	0.00032	3.91E-08	0.00014	1	3.26E-11
Southwest	8.49E-08	0.00032	3.91E-08	0.00014	1	3.26E-11

Table O5.3.17
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

Notes (Step 2):

(1) Exposure Point Concentration (See Tables O5.3.4, O5.3.5, O5.3.6, and O5.3.7 for aboveground produce, belowground produce, beef, and milk concentrations, respectively).

Aboveground produce concentration is from sampling location MSP, the location with the higher 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: $I_{prod} = (A_{prod\text{-}ag} \times CR_{prod\text{-}ag} + A_{prod\text{-}bg} \times CR_{prod\text{-}bg\,)} \times F_{prod}$

where:

I_{prod} - daily intake from produce (mg/kg-day)

$A_{prod\text{-}ag}$ - concentration in exposed aboveground produce (mg/kg)

$A_{prod\text{-}bg}$ - concentration in belowground produce (mg/kg)

$CR_{prod\text{-}ag}$ - consumption rate of exposed aboveground produce (kg/kg-day DW)

$CR_{prod\text{-}bg}$ - 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 O5.3.17
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	1.09E-08	0.83	24	350	40	70	70	0.001	365	1.69E-12
South	1.17E-08	0.83	24	350	40	70	70	0.001	365	1.82E-12
Southwest	1.17E-08	0.83	24	350	40	70	70	0.001	365	1.82E-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	1.09E-08	0.83	24	350	40	70	70	0.001	365	1.69E-12
South	1.17E-08	0.83	24	350	40	70	70	0.001	365	1.82E-12
Southwest	1.17E-08	0.83	24	350	40	70	70	0.001	365	1.82E-12

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	1.09E-08	0.83	24	350	30	70	70	0.001	365	1.27E-12
South	1.17E-08	0.83	24	350	30	70	70	0.001	365	1.37E-12
Southwest	1.17E-08	0.83	24	350	30	70	70	0.001	365	1.37E-12

Table O5.3.17
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

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 higher concentration (see Table O5.3.3).

Modeled particulate concentration for each exposure area is the concentration in soil at that exposure area (see Table O5.3.1) 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 O5.3.17
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	1.69E-12	2.06E-13	2.45E-10	2.47E-10	1.00E+09	2555	0.9	0.3	0.693	2.73E+03
South	1.82E-12	9.33E-13	2.42E-10	2.45E-10	1.00E+09	2555	0.9	0.3	0.693	2.71E+03
Southwest	1.82E-12	9.33E-13	1.35E-11	1.63E-11	1.00E+09	2555	0.9	0.3	0.693	1.80E+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	1.69E-12	2.06E-13	2.45E-10	4.14E-11	9.96E-10	1.28E-09	1.00E+09	2555	0.9	0.3	0.693	1.42E+04
South	1.82E-12	9.33E-13	2.42E-10	4.65E-11	9.81E-10	1.27E-09	1.00E+09	2555	0.9	0.3	0.693	1.41E+04
Southwest	1.82E-12	9.33E-13	1.35E-11	4.65E-11	5.03E-11	1.13E-10	1.00E+09	2555	0.9	0.3	0.693	1.25E+03

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	1.27E-12	2.06E-13	2.84E-11	2.98E-11	1.00E+09	2555	0.9	0.3	0.693	3.30E+02
South	1.37E-12	9.33E-13	3.26E-11	3.49E-11	1.00E+09	2555	0.9	0.3	0.693	3.86E+02
Southwest	1.37E-12	9.33E-13	3.26E-11	3.49E-11	1.00E+09	2555	0.9	0.3	0.693	3.86E+02

Table O5.3.17
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

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 x (1 x $(10)^9$) x h x f_1] / [0.693 x 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 x 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 O5.3.17
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	2.73E+03	0.04	0.9	0.688	1	9.4	1	7.20E+00
South	2.71E+03	0.04	0.9	0.688	1	9.4	1	7.14E+00
Southwest	1.80E+02	0.04	0.9	0.688	1	9.4	1	4.74E-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	1.42E+04	0.04	0.9	0.688	1	9.4	1	3.74E+01
South	1.41E+04	0.04	0.9	0.688	1	9.4	1	3.71E+01
Southwest	1.25E+03	0.04	0.9	0.688	1	9.4	1	3.30E+00

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	3.30E+02	0.04	0.9	0.688	1	9.4	1	8.70E-01
South	3.86E+02	0.04	0.9	0.688	1	9.4	1	1.02E+00
Southwest	3.86E+02	0.04	0.9	0.688	1	9.4	1	1.02E+00

Table O5.3.17
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

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} = [$C_{milkfat}$ x f_3 x f_4 x IR_{milk} x ED] / [BW_{infant} x 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 O5.3.18
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	Southeast	Ingestion	PCB Total TEC	1.44E-07	mg/kg	3.8E-15	mg/kg-day	1.3E+05	kg-day/mg	5.0E-10	1.1E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								5.0E-10					NA
			Dermal	PCB Total TEC	1.44E-07	mg/kg	1.2E-14	mg/kg-day	1.3E+05	kg-day/mg	1.6E-09	3.4E-14	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.6E-09					NA
		Exposure Point Total									2.1E-09					NA
	Exposure Medium Total										2.1E-09					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	2.36E-10	ug/m3	1.5E-12	ug/m3	3.8E+01	(ug/m3)-1	5.6E-11	4.1E-12	ug/m3	NA	ug/m3	NA
			Exp. Route Total								5.6E-11					NA
		Exposure Point Total									5.6E-11					NA
	Exposure Medium Total										5.6E-11					NA
Soil Total (Southeast)											2.1E-09					NA
Soil	Soil	South	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	1.6E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.2E-09					NA
		Exposure Point Total									9.5E-09					NA
	Exposure Medium Total										9.5E-09					NA
	Ambient Air	Particulates South	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 (South)											9.7E-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	1.6E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.2E-09					NA
		Exposure Point Total									9.5E-09					NA
	Exposure Medium Total										9.5E-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 O5.3.19
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 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	1.06E-08	ug/m3	6.5E-11	ug/m3	3.8E+01	(ug/m3)-1	2.5E-09	1.8E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.5E-09					NA
		Exposure Point Total									2.5E-09					NA
	Exposure Medium Total										2.5E-09					NA
Medium Total											2.5E-09					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	1.06E-08	ug/m3	6.6E-11	ug/m3	3.8E+01	(ug/m3)-1	2.5E-09	1.8E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.5E-09					NA
		Exposure Point Total									2.5E-09					NA
	Exposure Medium Total										2.5E-09					NA
Medium Total											2.5E-09					NA

Table O5.3.20
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				
	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	1.44E-07	mg/kg	2.5E-13	mg/kg-day	1.3E+05	kg-day/mg	3.3E-08	4.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.3E-08					NA
			Dermal	PCB Total TEC	1.44E-07	mg/kg	3.7E-13	mg/kg-day	1.3E+05	kg-day/mg	4.8E-08	6.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								4.8E-08					NA
		Exposure Point Total									8.1E-08					NA
	Exposure Medium Total										8.1E-08					NA
	Beef Tissue	Southeast	Ingestion	PCB Total TEC	2.01E-07	mg/kg	1.3E-10	mg/kg-day	1.3E+05	kg-day/mg	1.6E-05	2.2E-10	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.6E-05					NA
		Exposure Point Total									1.6E-05					NA
	Exposure Medium Total										1.6E-05					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	2.36E-10	ug/m3	1.3E-10	ug/m3	3.8E+01	(ug/m3)-1	4.9E-09	2.3E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								4.9E-09					NA
		Exposure Point Total									4.9E-09					NA
	Exposure Medium Total										4.9E-09					NA
Soil Total (Southeast)											1.7E-05					NA
Soil	Soil	South	Ingestion	PCB Total TEC	6.53E-07	mg/kg	1.2E-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	South	Ingestion	PCB Total TEC	1.99E-07	mg/kg	1.3E-10	mg/kg-day	1.3E+05	kg-day/mg	1.6E-05	2.2E-10	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.6E-05					NA
		Exposure Point Total									1.6E-05					NA
	Exposure Medium Total										1.6E-05					NA
	Ambient Air	Particulates South	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 (South)											1.7E-05					NA

US EPA ARCHIVE DOCUMENT

Table O5.3.20
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	1.2E-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	1.11E-08	mg/kg	7.0E-12	mg/kg-day	1.3E+05	kg-day/mg	9.1E-07	1.2E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								9.1E-07					NA
		Exposure Point Total									9.1E-07					NA
	Exposure Medium Total										9.1E-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

Table O5.3.21
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

							Cancer Risk Calculations					Noncancer Hazard Calculations				
	Exposure	Exposure	Exposure	Chemical of	EPC		Intake/Exposure Concentration		Unit Risk		Cancer	Intake/Exposure Concentration		RfC		Hazard
Medium	Medium	Point	Route	Potential Concern	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	1.06E-08	ug/m3	5.8E-09	ug/m3	3.8E+01	(ug/m3)-1	2.2E-07	1.0E-08	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.2E-07					NA
		Exposure Point Total									2.2E-07					NA
	Exposure Medium Total										2.2E-07					NA
Medium Total											2.2E-07					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	1.06E-08	ug/m3	5.8E-09	ug/m3	3.8E+01	(ug/m3)-1	2.2E-07	1.0E-08	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.2E-07					NA
		Exposure Point Total									2.2E-07					NA
	Exposure Medium Total										2.2E-07					NA
Medium Total											2.2E-07					NA

Table O5.3.22
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	1.44E-07	mg/kg	2.5E-13	mg/kg-day	1.3E+05	kg-day/mg	3.3E-08	4.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.3E-08					NA
			Dermal	PCB Total TEC	1.44E-07	mg/kg	3.7E-13	mg/kg-day	1.3E+05	kg-day/mg	4.8E-08	6.4E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								4.8E-08					NA
		Exposure Point Total									8.1E-08					NA
	Exposure Medium Total										8.1E-08					NA
	Plant Tissue	Southeast	Ingestion	PCB Total TEC			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
				Aboveground	8.49E-08	mg/kg										
				Belowground	8.63E-09	mg/kg										
			Exp. Route Total								3.6E-06					NA
		Exposure Point Total									3.6E-06					NA
	Exposure Medium Total										3.6E-06					NA
	Beef Tissue	Southeast	Ingestion	PCB Total TEC	2.01E-07	mg/kg	1.3E-10	mg/kg-day	1.3E+05	kg-day/mg	1.6E-05	2.2E-10	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.6E-05					NA
		Exposure Point Total									1.6E-05					NA
	Exposure Medium Total										1.6E-05					NA
	Milk	Southeast	Ingestion	PCB Total TEC	7.28E-08	mg/kg	6.0E-10	mg/kg-day	1.3E+05	kg-day/mg	7.8E-05	1.0E-09	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.8E-05					NA
		Exposure Point Total									7.8E-05					NA
	Exposure Medium Total										7.8E-05					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	2.36E-10	ug/m3	1.3E-10	ug/m3	3.8E+01	(ug/m3)-1	4.9E-09	2.3E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								4.9E-09					NA
		Exposure Point Total									4.9E-09					NA
	Exposure Medium Total										4.9E-09					NA
Soil Total (Southeast)											9.8E-05					NA

Table O5.3.22
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	South	Ingestion	PCB Total TEC	6.53E-07	mg/kg	1.2E-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	South	Ingestion	PCB Total TEC			3.0E-11	mg/kg-day	1.3E+05	kg-day/mg	4.0E-06	5.3E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.49E-08	mg/kg										
				Belowground	3.91E-08	mg/kg										
			Exp. Route Total								4.0E-06					NA
		Exposure Point Total									4.0E-06					NA
	Exposure Medium Total										4.0E-06					NA
	Beef Tissue	South	Ingestion	PCB Total TEC	1.99E-07	mg/kg	1.3E-10	mg/kg-day	1.3E+05	kg-day/mg	1.6E-05	2.2E-10	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.6E-05					NA
		Exposure Point Total									1.6E-05					NA
	Exposure Medium Total										1.6E-05					NA
	Milk	South	Ingestion	PCB Total TEC	7.18E-08	mg/kg	5.9E-10	mg/kg-day	1.3E+05	kg-day/mg	7.7E-05	1.0E-09	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								7.7E-05					NA
		Exposure Point Total									7.7E-05					NA
	Exposure Medium Total										7.7E-05					NA
	Ambient Air	Particulates South	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 (South)											9.7E-05					NA

Table O5.3.22
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	Southwest	Ingestion	PCB Total TEC	6.53E-07	mg/kg	1.2E-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			3.0E-11	mg/kg-day	1.3E+05	kg-day/mg	4.0E-06	5.3E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.49E-08	mg/kg										
				Belowground	3.91E-08	mg/kg										
			Exp. Route Total								4.0E-06					NA
		Exposure Point Total									4.0E-06					NA
	Exposure Medium Total										4.0E-06					NA
	Beef Tissue	Southwest	Ingestion	PCB Total TEC	1.11E-08	mg/kg	7.0E-12	mg/kg-day	1.3E+05	kg-day/mg	9.1E-07	1.2E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								9.1E-07					NA
		Exposure Point Total									9.1E-07					NA
	Exposure Medium Total										9.1E-07					NA
	Milk	Southwest	Ingestion	PCB Total TEC	3.68E-09	mg/kg	3.0E-11	mg/kg-day	1.3E+05	kg-day/mg	3.9E-06	5.3E-11	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								3.9E-06					NA
		Exposure Point Total									3.9E-06					NA
	Exposure Medium Total										3.9E-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)											9.2E-06					NA

Table O5.3.23
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

							Cancer Risk Calculations					Noncancer Hazard Calculations				
	Exposure	Exposure	Exposure	Chemical of	EPC		Intake/Exposure Concentration		Unit Risk		Cancer	Intake/Exposure Concentration		RfC		Hazard
Medium	Medium	Point	Route	Potential Concern	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	1.06E-08	ug/m3	5.8E-09	ug/m3	3.8E+01	(ug/m3)-1	2.2E-07	1.0E-08	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.2E-07					NA
		Exposure Point Total									2.2E-07					NA
	Exposure Medium Total										2.2E-07					NA
Medium Total											2.2E-07					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	1.06E-08	ug/m3	5.8E-09	ug/m3	3.8E+01	(ug/m3)-1	2.2E-07	1.0E-08	ug/m3	NA	ug/m3	NA
			Exp. Route Total								2.2E-07					NA
		Exposure Point Total									2.2E-07					NA
	Exposure Medium Total										2.2E-07					NA
Medium Total											2.2E-07					NA

Table O5.3.24
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	Southeast	Ingestion	PCB Total TEC	1.44E-07	mg/kg	2.3E-13	mg/kg-day	1.3E+05	kg-day/mg	2.9E-08	5.3E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								2.9E-08					NA
			Dermal	PCB Total TEC	1.44E-07	mg/kg	1.0E-13	mg/kg-day	1.3E+05	kg-day/mg	1.3E-08	2.3E-13	mg/kg-day	NA	mg/kg-day	NA
			Exp. Route Total								1.3E-08					NA
		Exposure Point Total									4.2E-08					NA
	Exposure Medium Total										4.2E-08					NA
	Plant Tissue	Southeast	Ingestion	PCB Total TEC			1.5E-11	mg/kg-day	1.3E+05	kg-day/mg	1.9E-06	3.5E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.49E-08	mg/kg										
				Belowground	8.63E-09	mg/kg										
			Exp. Route Total								1.9E-06					NA
		Exposure Point Total									1.9E-06					NA
	Exposure Medium Total										1.9E-06					NA
	Ambient Air	Particulates Southeast	Inhalation	PCB Total TEC	2.36E-10	ug/m3	9.7E-11	ug/m3	3.8E+01	(ug/m3)-1	3.7E-09	2.3E-10	ug/m3	NA	ug/m3	NA
			Exp. Route Total								3.7E-09					NA
		Exposure Point Total									3.7E-09					NA
	Exposure Medium Total										3.7E-09					NA
Soil Total (Southeast)											2.0E-06					NA

Table O5.3.24
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	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	South	Ingestion	PCB Total TEC			1.7E-11	mg/kg-day	1.3E+05	kg-day/mg	2.2E-06	3.9E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.49E-08	mg/kg										
				Belowground	3.91E-08	mg/kg										
			Exp. Route Total								2.2E-06					NA
		Exposure Point Total									2.2E-06					NA
	Exposure Medium Total										2.2E-06					NA
	Ambient Air	Particulates South	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 (South)											2.4E-06					NA

Table O5.3.24
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	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			1.7E-11	mg/kg-day	1.3E+05	kg-day/mg	2.2E-06	3.9E-11	mg/kg-day	NA	mg/kg-day	NA
				Aboveground	8.49E-08	mg/kg										
				Belowground	3.91E-08	mg/kg										
			Exp. Route Total								2.2E-06					NA
		Exposure Point Total									2.2E-06					NA
	Exposure Medium Total										2.2E-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)											2.4E-06					NA

Table O5.3.25
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 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	1.06E-08	ug/m3	4.3E-09	ug/m3	3.8E+01	(ug/m3)-1	1.6E-07	1.0E-08	ug/m3	NA	ug/m3	NA
			Exp. Route Total								1.6E-07					NA
		Exposure Point Total									1.6E-07					NA
	Exposure Medium Total										1.6E-07					NA
Medium Total											1.6E-07					NA
Ambient Air	Ambient Air	Particulates and Vapors at MSP	Inhalation	PCB Total TEC	1.06E-08	ug/m3	4.4E-09	ug/m3	3.8E+01	(ug/m3)-1	1.7E-07	1.0E-08	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

Table O5.3.26
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	5E-10	--	2E-09	--	2E-09	--	--	--	--	--
			Chemical Total	5E-10	--	2E-09	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	6E-11	--	--	6E-11	--	--	--	--	--
			Chemical Total	--	6E-11	--	--	6E-11		--	--	--	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Soil Total (Southeast)								2E-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)								5E-09					--
Soil	Soil	South	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 South	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 (South)								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 (South)								3E-09					--
Receptor Total (Soil and Ambient Air - South)								1E-08					--

Table O5.3.26
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					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table O5.3.19).

Table O5.3.27
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	3E-08	--	5E-08	--	8E-08	--	--	--	--	--
			Chemical Total	3E-08	--	5E-08	--	8E-08		--	--	--	--
		Exposure Point Total						8E-08					--
	Exposure Medium Total							8E-08					--
	Beef Tissue	Southeast	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 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)								2E-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)								2E-05					--
Soil	Soil	South	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	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	--	2E-08	--	--	2E-08	--	--	--	--	--
			Chemical Total	--	2E-08	--	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
Soil Total (South)								2E-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)								2E-05					--

Table O5.3.27
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					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table O5.3.21).

Table O5.3.28
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	3E-08	--	5E-08	--	8E-08	--	--	--	--	--
			Chemical Total	3E-08	--	5E-08	--	8E-08		--	--	--	--
		Exposure Point Total						8E-08					--
	Exposure Medium Total							8E-08					--
	Plant Tissue	Southeast	PCB Total TEC	4E-06	--	--	--	4E-06	--	--	--	--	--
			Chemical Total	4E-06	--	--	--	4E-06		--	--	--	--
		Exposure Point Total						4E-06					--
	Exposure Medium Total							4E-06					--
	Beef Tissue	Southeast	PCB Total TEC	2E-05	--	--	--	2E-05	--	--	--	--	--
			Chemical Total	2E-05	--	--	--	2E-05		--	--	--	--
		Exposure Point Total						2E-05					--
	Exposure Medium Total							2E-05					--
	Milk	Southeast	PCB Total TEC	8E-05	--	--	--	8E-05	--	--	--	--	--
			Chemical Total	8E-05	--	--	--	8E-05		--	--	--	--
		Exposure Point Total						8E-05					--
	Exposure Medium Total							8E-05					--
	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)								1E-04					--
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)								1E-04					--

Table O5.3.28
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	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	South	PCB Total TEC	4E-06	--	--	--	4E-06	--	--	--	--	--
			Chemical Total	4E-06	--	--	--	4E-06		--	--	--	--
		Exposure Point Total						4E-06					--
	Exposure Medium Total							4E-06					--
	Beef Tissue	South	PCB Total TEC	2E-05	--	--	--	2E-05	--	--	--	--	--
			Chemical Total	2E-05	--	--	--	2E-05		--	--	--	--
		Exposure Point Total						2E-05					--
	Exposure Medium Total							2E-05					--
	Milk	South	PCB Total TEC	8E-05	--	--	--	8E-05	--	--	--	--	--
			Chemical Total	8E-05	--	--	--	8E-05		--	--	--	--
		Exposure Point Total						8E-05					--
	Exposure Medium Total							8E-05					--
	Ambient Air	Particulates South	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 (South)								1E-04					--
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)								1E-04					--

Table O5.3.28
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	4E-06	--	--	--	4E-06	--	--	--	--	--
			Chemical Total	4E-06	--	--	--	4E-06		--	--	--	--
		Exposure Point Total						4E-06					--
	Exposure Medium Total							4E-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)								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 (Southwest)								2E-07					--
Receptor Total (Soil and Ambient Air - Southwest)								9E-06					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table O5.3.23).

Table O5.3.29
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	3E-08	--	1E-08	--	4E-08	--	--	--	--	--
			Chemical Total	3E-08	--	1E-08	--	4E-08		--	--	--	--
		Exposure Point Total						4E-08					--
	Exposure Medium Total							4E-08					--
	Plant Tissue	Southeast	PCB Total TEC	2E-06	--	--	--	2E-06	--	--	--	--	--
			Chemical Total	2E-06	--	--	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Ambient Air	Particulates Southeast	PCB Total TEC	--	4E-09	--	--	4E-09	--	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		--	--	--	--
		Exposure Point Total						4E-09					--
	Exposure Medium Total							4E-09					--
Soil Total (Southeast)								2E-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)								2E-06					--

Table O5.3.29
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	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	South	PCB Total TEC	2E-06	--	--	--	2E-06	--	--	--	--	--
			Chemical Total	2E-06	--	--	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Ambient Air	Particulates South	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 (South)								2E-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 O5.3.29
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	2E-06	--	--	--	2E-06	--	--	--	--	--
			Chemical Total	2E-06	--	--	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-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)								2E-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					--

(1) Carcinogenic risk from inhalation is from sampling location MSP, the sampling location with the higher calculated inhalation risk (see Table O5.3.25).

Table O5.3.30
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	7.20E+00	2.60E+01	No
South	7.14E+00	2.60E+01	No
Southwest	4.74E-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	3.74E+01	2.60E+01	Yes
South	3.71E+01	2.60E+01	Yes
Southwest	3.30E+00	2.60E+01	No

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	8.70E-01	2.60E+01	No
South	1.02E+00	2.60E+01	No
Southwest	1.02E+00	2.60E+01	No

Table O5.3.30
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

Notes:

(1) Average daily intake for infant exposed to contaminated breast milk (See Table O5.3.17).

(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 O5.3.31
Overall Summary of Risks and Hazards for COPCs
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor Exposure Medium	**Carcinogenic Risk**	**Noncarcinogenic Hazard Index**
Current Rancher (Adult)		
Southeast Area		
Soil (Ingestion and Dermal)	2E-09	—
Ambient Air (Particulates from Soil)	6E-11	—
Ambient Air (Particulates and Vapors)	3E-09	—
Total	5E-09	
South Area		
Soil (Ingestion and Dermal)	9E-09	—
Ambient Air (Particulates from Soil)	3E-10	—
Ambient Air (Particulates and Vapors)	3E-09	—
Total	1E-08	
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	
Future Resident Rancher (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	8E-08	—
Beef Tissue	2E-05	—
Ambient Air (Particulates from Soil)	5E-09	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	2E-05	
South Area		
Soil (Ingestion and Dermal)	4E-07	—
Beef Tissue	2E-05	—
Ambient Air (Particulates from Soil)	2E-08	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	2E-05	
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	

Table O5.3.31
Overall Summary of Risks and Hazards for COPCs
Human Health Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor Exposure Medium	**Carcinogenic Risk**	**Noncarcinogenic Hazard Index**
Future Subsistence Resident Rancher (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	8E-08	—
Plant Tissue (Homegrown Produce)	4E-06	—
Beef Tissue	2E-05	—
Milk	8E-05	—
Ambient Air (Particulates from Soil)	5E-09	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	1E-04	
South Area		
Soil (Ingestion and Dermal)	4E-07	—
Plant Tissue (Homegrown Produce)	4E-06	—
Beef Tissue	2E-05	—
Milk	8E-05	—
Ambient Air (Particulates from Soil)	2E-08	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	1E-04	
Southwest Area		
Soil (Ingestion and Dermal)	4E-07	—
Plant Tissue (Homegrown Produce)	4E-06	—
Beef Tissue	9E-07	—
Milk	4E-06	—
Ambient Air (Particulates from Soil)	2E-08	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	9E-06	
Future Resident (Adult and Child)		
Southeast Area		
Soil (Ingestion and Dermal)	4E-08	—
Plant Tissue (Homegrown Produce)	2E-06	—
Ambient Air (Particulates from Soil)	4E-09	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	2E-06	
South Area		
Soil (Ingestion and Dermal)	2E-07	—
Plant Tissue (Homegrown Produce)	2E-06	—
Ambient Air (Particulates from Soil)	2E-08	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	3E-06	
Southwest Area		
Soil (Ingestion and Dermal)	2E-07	—
Plant Tissue (Homegrown Produce)	2E-06	—
Ambient Air (Particulates from Soil)	2E-08	—
Ambient Air (Particulates and Vapors)	2E-07	—
Total	3E-06	

Table O5.3.31
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 higher calculated ambient air risk (see Tables O5.3.19, O5.3.21, O5.3.23, and O5.3.25.

— - Hazard indices were not calculated (toxicity data were not available).

Risk values are taken from Tables O5.3.26 through O5.3.29.

Risk calculations are shown on Tables O5.3.18 through O5.3.25.

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 O5.3.32
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**
0.14	0.65	0.65	0.65	0.65	0.65	0.65	0.58

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).

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

KHF - Kettleman Hills Facility

TEC - toxicity equivalence concentration

TEF - toxicity equivalence factor

Table O5.4.1
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 -- Measured PCB levels in vegetation -- Modeled PCB levels in invertebrates -- Calculated exposure doses and egg concentrations -- 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)* -- State species of special concern	-- Measured PCB levels in soil -- Measured PCB levels in vegetation -- Modeled PCB levels in rodents -- Calculated exposure doses and egg concentrations -- 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 -- Measured PCB levels in vegetation -- Calculated pocket mouse exposure doses -- 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)* --State species of special concern	-- Measured PCB levels in soil -- Modeled PCB levels in invertebrates -- Calculated grasshopper mouse exposure doses -- 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)* -- Federally endangered -- State threatened	-- Measured PCB levels in soil -- Measured PCB levels in vegetation -- Modeled PCB levels in rodents -- Calculated kit fox exposure doses -- 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*) -- Federally endangered -- State endangered	-- Measured PCB levels in soil -- Modeled PCB levels in invertebrates -- Calculated risks to carnivorous mammals and birds

Table O5.4.2
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 O5.4.2
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 O5.4.2
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 O5.4.2
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*): Mean food consumption rate per unit body weight for eight mice (four male, four female) = 0.076 g/g-day. Assuming same rate and using body weight of southern grasshopper mouse: (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: (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 O5.4.2
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: FIR = (FMR/ME) = (2.0 kJ/day) / (18 kJ/g) = 0.11 g/day = 0.00011 kg/day (dry weight) where: FMR = Field Metabolic Rate = 2.0 kJ/day (based on alligator lizard) 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 O5.4.2
Exposure Factors for Ecological Receptors
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

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Table O5.4.3
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	5.5E+00	4.9E+01	0.0076	3.51E-05	5.50E-03	2.77E-03	0.0001	2.77E-07
PCB 81	6.34	1.1E+00	2.9E+01	0.0088	2.41E-05	1.10E-03	5.62E-04	0.0003	1.69E-07
PCB 105	6.79	1.1E+00	2.9E+01	0.0069	1.90E-05	1.10E-03	5.60E-04	0.00003	1.68E-08
PCB 114	6.98	1.1E+00	2.9E+01	0.0061	1.67E-05	1.10E-03	5.58E-04	0.00003	1.68E-08
PCB 118	7.12	1.1E+00	2.9E+01	0.0055	1.51E-05	1.10E-03	5.58E-04	0.00003	1.67E-08
PCB 123	6.98	2.7E+00	2.9E+01	0.0061	1.68E-05	2.70E-03	1.36E-03	0.00003	4.08E-08
PCB 126	6.98	1.1E+00	2.9E+01	0.0061	1.67E-05	1.10E-03	5.58E-04	0.1	5.58E-05
PCB 156	7.60	1.1E+00	2.9E+01	0.0036	9.82E-06	1.10E-03	5.55E-04	0.00003	1.66E-08
PCB 157	7.62	1.1E+00	2.9E+01	0.0035	9.62E-06	1.10E-03	5.55E-04	0.00003	1.66E-08
PCB 167	7.50	1.1E+00	2.9E+01	0.0039	1.08E-05	1.10E-03	5.55E-04	0.00003	1.67E-08
PCB 169	7.41	1.1E+00	1.1E+00	0.0043	4.36E-07	1.10E-03	5.50E-04	0.03	1.65E-05
PCB 189	8.27	1.1E+00	2.9E+01	0.0016	4.53E-06	1.10E-03	5.52E-04	0.00003	1.66E-08
Congener total: [8]									7.29E-05
South									
PCB 77	6.63	5.0E+00	3.5E+01	0.0076	2.50E-05	5.00E-03	2.51E-03	0.0001	2.51E-07
PCB 81	6.34	5.0E+00	2.9E+01	0.0088	2.35E-05	5.00E-03	2.51E-03	0.0003	7.54E-07
PCB 105	6.79	5.0E+00	1.2E+00	0.0069	8.19E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 114	6.98	5.0E+00	1.2E+00	0.0061	7.20E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 118	7.12	5.0E+00	1.2E+00	0.0055	6.49E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 123	6.98	5.0E+00	2.9E+01	0.0061	1.63E-05	5.00E-03	2.51E-03	0.00003	7.52E-08
PCB 126	6.98	5.0E+00	2.9E+01	0.0061	1.63E-05	5.00E-03	2.51E-03	0.1	2.51E-04
PCB 156	7.60	5.0E+00	1.2E+00	0.0036	4.23E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 157	7.62	5.0E+00	1.2E+00	0.0035	4.14E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 167	7.50	5.0E+00	2.9E+01	0.0039	1.05E-05	5.00E-03	2.51E-03	0.00003	7.52E-08
PCB 169	7.41	5.0E+00	1.2E+00	0.0043	5.07E-07	5.00E-03	2.50E-03	0.03	7.50E-05
PCB 189	8.27	5.0E+00	1.2E+00	0.0016	1.95E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
Congener total: [8]									3.27E-04
Southwest									
PCB 77	6.63	5.0E+00	3.5E+01	0.0076	2.32E-05	5.00E-03	2.51E-03	0.0001	2.51E-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	5.0E+00	3.5E+01	0.0069	2.11E-05	5.00E-03	2.51E-03	0.00003	7.53E-08
PCB 114	6.98	5.0E+00	1.1E+00	0.0061	6.28E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 118	7.12	5.0E+00	3.5E+01	0.0055	1.67E-05	5.00E-03	2.51E-03	0.00003	7.53E-08
PCB 123	6.98	5.0E+00	3.5E+01	0.0061	1.85E-05	5.00E-03	2.51E-03	0.00003	7.53E-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	5.0E+00	3.5E+01	0.0036	1.09E-05	5.00E-03	2.51E-03	0.00003	7.52E-08
PCB 157	7.62	5.0E+00	3.5E+01	0.0035	1.07E-05	5.00E-03	2.51E-03	0.00003	7.52E-08
PCB 167	7.50	5.0E+00	3.5E+01	0.0039	1.20E-05	5.00E-03	2.51E-03	0.00003	7.52E-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	5.0E+00	1.1E+00	0.0016	1.70E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
Congener total: [8]									3.27E-04
B-18 Landfill									
PCB 77	6.63	9.0E+00	8.5E+01	0.0076	5.68E-05	9.00E-03	4.53E-03	0.0001	4.53E-07
PCB 81	6.34	5.0E+00	3.3E+01	0.0088	2.51E-05	5.00E-03	2.51E-03	0.0003	7.54E-07
PCB 105	6.79	5.0E+00	1.1E+00	0.0069	7.41E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 114	6.98	5.0E+00	1.1E+00	0.0061	6.52E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 118	7.12	5.0E+00	1.1E+00	0.0055	5.87E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 123	6.98	7.5E+00	1.6E+01	0.0061	8.36E-06	7.50E-03	3.75E-03	0.00003	1.13E-07
PCB 126	6.98	5.0E+00	3.3E+01	0.0061	1.74E-05	5.00E-03	2.51E-03	0.1	2.51E-04
PCB 156	7.60	5.0E+00	1.1E+00	0.0036	3.83E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 157	7.62	5.0E+00	1.1E+00	0.0035	3.75E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 167	7.50	5.0E+00	1.1E+00	0.0039	4.22E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
PCB 169	7.41	5.0E+00	1.1E+00	0.0043	4.59E-07	5.00E-03	2.50E-03	0.03	7.50E-05
PCB 189	8.27	5.0E+00	1.1E+00	0.0016	1.77E-07	5.00E-03	2.50E-03	0.00003	7.50E-08
Congener total: [8]									3.28E-04

Table O5.4.3
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 all 12 dioxin-like congeners analyzed.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table O5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table O5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 O5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table O5.4.2 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 O5.4.4
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	5.5E+00	4.9E+01	0.0076	3.51E-05	5.50E-03	4.61E-03	0.0001	4.61E-07
PCB 81	6.34	1.1E+00	2.9E+01	0.0088	2.41E-05	1.10E-03	9.37E-04	0.0003	2.81E-07
PCB 105	6.79	1.1E+00	2.9E+01	0.0069	1.90E-05	1.10E-03	9.33E-04	0.00003	2.80E-08
PCB 114	6.98	1.1E+00	2.9E+01	0.0061	1.67E-05	1.10E-03	9.31E-04	0.00003	2.79E-08
PCB 118	7.12	1.1E+00	2.9E+01	0.0055	1.51E-05	1.10E-03	9.29E-04	0.00003	2.79E-08
PCB 123	6.98	2.7E+00	2.9E+01	0.0061	1.68E-05	2.70E-03	2.26E-03	0.00003	6.79E-08
PCB 126	6.98	1.1E+00	2.9E+01	0.0061	1.67E-05	1.10E-03	9.31E-04	0.1	9.31E-05
PCB 156	7.60	1.1E+00	2.9E+01	0.0036	9.82E-06	1.10E-03	9.25E-04	0.00003	2.77E-08
PCB 157	7.62	1.1E+00	2.9E+01	0.0035	9.62E-06	1.10E-03	9.25E-04	0.00003	2.77E-08
PCB 167	7.50	1.1E+00	2.9E+01	0.0039	1.08E-05	1.10E-03	9.26E-04	0.00003	2.78E-08
PCB 169	7.41	1.1E+00	1.1E+00	0.0043	4.36E-07	1.10E-03	9.17E-04	0.03	2.75E-05
PCB 189	8.27	1.1E+00	2.9E+01	0.0016	4.53E-06	1.10E-03	9.20E-04	0.00003	2.76E-08
Congener total: (8)									1.22E-04
South									
PCB 77	6.63	5.0E+00	3.5E+01	0.0076	2.50E-05	5.00E-03	4.19E-03	0.0001	4.19E-07
PCB 81	6.34	5.0E+00	2.9E+01	0.0088	2.35E-05	5.00E-03	4.19E-03	0.0003	1.26E-06
PCB 105	6.79	5.0E+00	1.2E+00	0.0069	8.19E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 114	6.98	5.0E+00	1.2E+00	0.0061	7.20E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 118	7.12	5.0E+00	1.2E+00	0.0055	6.49E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 123	6.98	5.0E+00	2.9E+01	0.0061	1.63E-05	5.00E-03	4.18E-03	0.00003	1.25E-07
PCB 126	6.98	5.0E+00	2.9E+01	0.0061	1.63E-05	5.00E-03	4.18E-03	0.1	4.18E-04
PCB 156	7.60	5.0E+00	1.2E+00	0.0036	4.23E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 157	7.62	5.0E+00	1.2E+00	0.0035	4.14E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 167	7.50	5.0E+00	2.9E+01	0.0039	1.05E-05	5.00E-03	4.18E-03	0.00003	1.25E-07
PCB 169	7.41	5.0E+00	1.2E+00	0.0043	5.07E-07	5.00E-03	4.17E-03	0.03	1.25E-04
PCB 189	8.27	5.0E+00	1.2E+00	0.0016	1.95E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
Congener total: (8)									5.46E-04
Southwest									
PCB 77	6.63	5.0E+00	3.5E+01	0.0076	2.32E-05	5.00E-03	4.19E-03	0.0001	4.19E-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	5.0E+00	3.5E+01	0.0069	2.11E-05	5.00E-03	4.18E-03	0.00003	1.26E-07
PCB 114	6.98	5.0E+00	1.1E+00	0.0061	6.28E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 118	7.12	5.0E+00	3.5E+01	0.0055	1.67E-05	5.00E-03	4.18E-03	0.00003	1.25E-07
PCB 123	6.98	5.0E+00	3.5E+01	0.0061	1.85E-05	5.00E-03	4.18E-03	0.00003	1.25E-07
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	5.0E+00	3.5E+01	0.0036	1.09E-05	5.00E-03	4.18E-03	0.00003	1.25E-07
PCB 157	7.62	5.0E+00	3.5E+01	0.0035	1.07E-05	5.00E-03	4.18E-03	0.00003	1.25E-07
PCB 167	7.50	5.0E+00	3.5E+01	0.0039	1.20E-05	5.00E-03	4.18E-03	0.00003	1.25E-07
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	5.0E+00	1.1E+00	0.0016	1.70E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
Congener total: (8)									5.44E-04
B-18 Landfill									
PCB 77	6.63	9.0E+00	8.5E+01	0.0076	5.68E-05	9.00E-03	7.55E-03	0.0001	7.55E-07
PCB 81	6.34	5.0E+00	3.3E+01	0.0088	2.51E-05	5.00E-03	4.19E-03	0.0003	1.26E-06
PCB 105	6.79	5.0E+00	1.1E+00	0.0069	7.41E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 114	6.98	5.0E+00	1.1E+00	0.0061	6.52E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 118	7.12	5.0E+00	1.1E+00	0.0055	5.87E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 123	6.98	7.5E+00	1.6E+01	0.0061	8.36E-06	7.50E-03	6.26E-03	0.00003	1.88E-07
PCB 126	6.98	5.0E+00	3.3E+01	0.0061	1.74E-05	5.00E-03	4.18E-03	0.1	4.18E-04
PCB 156	7.60	5.0E+00	1.1E+00	0.0036	3.83E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 157	7.62	5.0E+00	1.1E+00	0.0035	3.75E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 167	7.50	5.0E+00	1.1E+00	0.0039	4.22E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 169	7.41	5.0E+00	1.1E+00	0.0043	4.59E-07	5.00E-03	4.17E-03	0.03	1.25E-04
PCB 189	8.27	5.0E+00	1.1E+00	0.0016	1.77E-07	5.00E-03	4.17E-03	0.00003	1.25E-07
Congener total: (8)									5.46E-04

Table O5.4.4
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 all 12 dioxin-like congeners analyzed.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table O5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day See Table O5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 O5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table O5.4.2 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 O5.4.5
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	5.5E+00	0.95	5.25E+0	0.0076	1.40E-05	5.50E-03	2.76E-03	0.0001	2.76E-07
PCB 81	6.34	1.1E+00	0.92	1.02E+0	0.0088	3.13E-06	1.10E-03	5.52E-04	0.0003	1.65E-07
PCB 105	6.79	1.1E+00	0.97	1.07E+0	0.0069	2.59E-06	1.10E-03	5.51E-04	0.00003	1.65E-08
PCB 114	6.98	1.1E+00	0.99	1.09E+0	0.0061	2.33E-06	1.10E-03	5.51E-04	0.00003	1.65E-08
PCB 118	7.12	1.1E+00	1.01	1.11E+0	0.0055	2.13E-06	1.10E-03	5.51E-04	0.00003	1.65E-08
PCB 123	6.98	2.7E+00	0.99	2.68E+0	0.0061	5.72E-06	2.70E-03	1.35E-03	0.00003	4.06E-08
PCB 126	6.98	1.1E+00	0.99	1.09E+0	0.0061	2.33E-06	1.10E-03	5.51E-04	0.1	5.51E-05
PCB 156	7.60	1.1E+00	1.07	1.17E+0	0.0036	1.47E-06	1.10E-03	5.51E-04	0.00003	1.65E-08
PCB 157	7.62	1.1E+00	1.07	1.18E+0	0.0035	1.44E-06	1.10E-03	5.51E-04	0.00003	1.65E-08
PCB 167	7.50	1.1E+00	1.06	1.16E+0	0.0039	1.60E-06	1.10E-03	5.51E-04	0.00003	1.65E-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	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]										7.22E-05
South										
PCB 77	6.63	5.0E+00	0.95	4.77E+0	0.0076	1.27E-05	5.00E-03	2.51E-03	0.0001	2.51E-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	5.0E+00	0.97	4.86E+0	0.0069	1.18E-05	5.00E-03	2.51E-03	0.00003	7.52E-08
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	5.0E+00	1.01	5.05E+0	0.0055	9.69E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 123	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 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	5.0E+00	1.07	5.34E+0	0.0036	6.67E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 157	7.62	5.0E+00	1.07	5.35E+0	0.0035	6.56E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 167	7.50	5.0E+00	1.06	5.28E+0	0.0039	7.28E-06	5.00E-03	2.50E-03	0.00003	7.51E-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	5.0E+00	1.15	5.77E+0	0.0016	3.33E-06	5.00E-03	2.50E-03	0.00003	7.50E-08
Congener total: [10]										3.27E-04
Southwest										
PCB 77	6.63	5.0E+00	0.95	4.77E+0	0.0076	1.27E-05	5.00E-03	2.51E-03	0.0001	2.51E-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	5.0E+00	0.97	4.86E+0	0.0069	1.18E-05	5.00E-03	2.51E-03	0.00003	7.52E-08
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	5.0E+00	1.01	5.05E+0	0.0055	9.69E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 123	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 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	5.0E+00	1.07	5.34E+0	0.0036	6.67E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 157	7.62	5.0E+00	1.07	5.35E+0	0.0035	6.56E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 167	7.50	5.0E+00	1.06	5.28E+0	0.0039	7.28E-06	5.00E-03	2.50E-03	0.00003	7.51E-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	5.0E+00	1.15	5.77E+0	0.0016	3.33E-06	5.00E-03	2.50E-03	0.00003	7.50E-08
Congener total: [10]										3.27E-04
B-18 Landfill										
PCB 77	6.63	9.0E+00	0.95	8.59E+0	0.0076	2.29E-05	9.00E-03	4.51E-03	0.0001	4.51E-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	5.0E+00	0.97	4.86E+0	0.0069	1.18E-05	5.00E-03	2.51E-03	0.00003	7.52E-08
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	5.0E+00	1.01	5.05E+0	0.0055	9.69E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 123	6.98	7.5E+00	0.99	7.45E+0	0.0061	1.59E-05	7.50E-03	3.76E-03	0.00003	1.13E-07
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	5.0E+00	1.07	5.34E+0	0.0036	6.67E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 157	7.62	5.0E+00	1.07	5.35E+0	0.0035	6.56E-06	5.00E-03	2.50E-03	0.00003	7.51E-08
PCB 167	7.50	5.0E+00	1.06	5.28E+0	0.0039	7.28E-06	5.00E-03	2.50E-03	0.00003	7.51E-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	5.0E+00	1.15	5.77E+0	0.0016	3.33E-06	5.00E-03	2.50E-03	0.00003	7.50E-08
Congener total: [10]										3.27E-04

Table O5.4.5
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 all 12 dioxin-like congeners analyzed.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.
(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 O5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table O5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table O5.4.2 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 O5.4.2 for basis/source of home range.
BW = body weight (kg) = 2 kg. See Table O5.4.2 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 O5.4.6
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	5.5E+00	0.95	5.25E+00	0.0076	1.40E-05	5.50E-03	4.60E-03	0.0001	4.60E-07
PCB 81	6.34	1.1E+00	0.92	1.02E+00	0.0088	3.13E-06	1.10E-03	9.19E-04	0.0003	2.76E-07
PCB 105	6.79	1.1E+00	0.97	1.07E+00	0.0069	2.59E-06	1.10E-03	9.19E-04	0.00003	2.76E-08
PCB 114	6.98	1.1E+00	0.99	1.09E+00	0.0061	2.33E-06	1.10E-03	9.19E-04	0.00003	2.76E-08
PCB 118	7.12	1.1E+00	1.01	1.11E+00	0.0055	2.13E-06	1.10E-03	9.18E-04	0.00003	2.76E-08
PCB 123	6.98	2.7E+00	0.99	2.68E+00	0.0061	5.72E-06	2.70E-03	2.25E-03	0.00003	6.76E-08
PCB 126	6.98	1.1E+00	0.99	1.09E+00	0.0061	2.33E-06	1.10E-03	9.19E-04	0.1	9.19E-05
PCB 156	7.60	1.1E+00	1.07	1.17E+00	0.0036	1.47E-06	1.10E-03	9.18E-04	0.00003	2.75E-08
PCB 157	7.62	1.1E+00	1.07	1.18E+00	0.0035	1.44E-06	1.10E-03	9.18E-04	0.00003	2.75E-08
PCB 167	7.50	1.1E+00	1.06	1.16E+00	0.0039	1.60E-06	1.10E-03	9.18E-04	0.00003	2.75E-08
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	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]										1.20E-04
South										
PCB 77	6.63	5.0E+00	0.95	4.77E+00	0.0076	1.27E-05	5.00E-03	4.18E-03	0.0001	4.18E-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	5.0E+00	0.97	4.86E+00	0.0069	1.18E-05	5.00E-03	4.18E-03	0.00003	1.25E-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	5.0E+00	1.01	5.05E+00	0.0055	9.69E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 123	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 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	5.0E+00	1.07	5.34E+00	0.0036	6.67E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 157	7.62	5.0E+00	1.07	5.35E+00	0.0035	6.56E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 167	7.50	5.0E+00	1.06	5.28E+00	0.0039	7.28E-06	5.00E-03	4.17E-03	0.00003	1.25E-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	5.0E+00	1.15	5.77E+00	0.0016	3.33E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
Congener total: [10]										5.45E-04
Southwest										
PCB 77	6.63	5.0E+00	0.95	4.77E+00	0.0076	1.27E-05	5.00E-03	4.18E-03	0.0001	4.18E-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	5.0E+00	0.97	4.86E+00	0.0069	1.18E-05	5.00E-03	4.18E-03	0.00003	1.25E-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	5.0E+00	1.01	5.05E+00	0.0055	9.69E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 123	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 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	5.0E+00	1.07	5.34E+00	0.0036	6.67E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 157	7.62	5.0E+00	1.07	5.35E+00	0.0035	6.56E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 167	7.50	5.0E+00	1.06	5.28E+00	0.0039	7.28E-06	5.00E-03	4.17E-03	0.00003	1.25E-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	5.0E+00	1.15	5.77E+00	0.0016	3.33E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
Congener total: [10]										5.45E-04
B-18 Landfill										
PCB 77	6.63	9.0E+00	0.95	8.59E+00	0.0076	2.29E-05	9.00E-03	7.52E-03	0.0001	7.52E-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	5.0E+00	0.97	4.86E+00	0.0069	1.18E-05	5.00E-03	4.18E-03	0.00003	1.25E-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	5.0E+00	1.01	5.05E+00	0.0055	9.69E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 123	6.98	7.5E+00	0.99	7.45E+00	0.0061	1.59E-05	7.50E-03	6.26E-03	0.00003	1.88E-07
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	5.0E+00	1.07	5.34E+00	0.0036	6.67E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 157	7.62	5.0E+00	1.07	5.35E+00	0.0035	6.56E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
PCB 167	7.50	5.0E+00	1.06	5.28E+00	0.0039	7.28E-06	5.00E-03	4.17E-03	0.00003	1.25E-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	5.0E+00	1.15	5.77E+00	0.0016	3.33E-06	5.00E-03	4.17E-03	0.00003	1.25E-07
Congener total: [10]										5.46E-04

Table O5.4.6
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 all 12 dioxin-like congeners analyzed.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.
(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 O5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table O5.4.2 for basis/source.
SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table O5.4.2 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 O5.4.2 for basis/source of home range.
BW = body weight (kg) = 1.2 kg. See Table O5.4.2 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 O5.4.7
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	5.5E+00	0.20	1.32E-01	5.50E-03	6.88E-02	0.0001	6.88E-06
PCB 81	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.0003	4.13E-06
PCB 105	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.00003	4.13E-07
PCB 114	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.00003	4.13E-07
PCB 118	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.00003	4.13E-07
PCB 123	2.7E+00	0.20	6.48E-02	2.70E-03	3.38E-02	0.00003	1.01E-06
PCB 126	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.1	1.38E-03
PCB 156	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.00003	4.13E-07
PCB 157	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.00003	4.13E-07
PCB 167	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.00003	4.13E-07
PCB 169	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.03	4.13E-04
PCB 189	1.1E+00	0.20	2.64E-02	1.10E-03	1.38E-02	0.00003	4.13E-07
Congener total: (7)							1.80E-03
South							
PCB 77	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.0001	6.25E-06
PCB 81	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.0003	1.88E-05
PCB 105	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 114	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 118	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 123	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 126	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.1	6.25E-03
PCB 156	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 157	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 167	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.03	1.88E-03
PCB 189	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
Congener total: (7)							8.17E-03
Southwest							
PCB 77	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.0001	6.25E-06
PCB 81	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.0003	1.88E-05
PCB 105	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 114	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 118	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 123	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 126	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.1	6.25E-03
PCB 156	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 157	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 167	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.03	1.88E-03
PCB 189	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
Congener total: (7)							8.17E-03
B-18 Landfill							
PCB 77	9.0E+00	0.20	2.16E-01	9.00E-03	1.13E-01	0.0001	1.13E-05
PCB 81	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.0003	1.88E-05
PCB 105	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 114	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 118	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 123	7.5E+00	0.20	1.80E-01	7.50E-03	9.38E-02	0.00003	2.81E-06
PCB 126	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.1	6.25E-03
PCB 156	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 157	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 167	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.03	1.88E-03
PCB 189	5.0E+00	0.20	1.20E-01	5.00E-03	6.25E-02	0.00003	1.88E-06
Congener total: (7)							8.17E-03

Table O5.4.7
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 all 12 dioxin-like congeners analyzed.

(2) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.2 for basis/source.

SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table O5.4.2 for basis/source.

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table O5.4.2 for basis/source of home range.

BW = body weight (kg) = 2 kg. See Table O5.4.2 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 O5.4.8
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	5.5E+00	0.20	1.32E-01	5.50E-03	1.15E-01	0.0001	1.15E-05
PCB 81	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.0003	6.88E-06
PCB 105	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.00003	6.88E-07
PCB 114	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.00003	6.88E-07
PCB 118	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.00003	6.88E-07
PCB 123	2.7E+00	0.20	6.48E-02	2.70E-03	5.63E-02	0.00003	1.69E-06
PCB 126	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.1	2.29E-03
PCB 156	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.00003	6.88E-07
PCB 157	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.00003	6.88E-07
PCB 167	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.00003	6.88E-07
PCB 169	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.03	6.88E-04
PCB 189	1.1E+00	0.20	2.64E-02	1.10E-03	2.29E-02	0.00003	6.88E-07
Congener total: [7]							3.00E-03
South							
PCB 77	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.0001	1.04E-05
PCB 81	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.0003	3.13E-05
PCB 105	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 114	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 118	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 123	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 126	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.1	1.04E-02
PCB 156	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 157	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 167	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.03	3.13E-03
PCB 189	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
Congener total: [7]							1.36E-02
Southwest							
PCB 77	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.0001	1.04E-05
PCB 81	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.0003	3.13E-05
PCB 105	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 114	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 118	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 123	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 126	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.1	1.04E-02
PCB 156	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 157	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 167	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.03	3.13E-03
PCB 189	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
Congener total: [7]							1.36E-02
B-18 Landfill							
PCB 77	9.0E+00	0.20	2.16E-01	9.00E-03	1.88E-01	0.0001	1.88E-05
PCB 81	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.0003	3.13E-05
PCB 105	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 114	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 118	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 123	7.5E+00	0.20	1.80E-01	7.50E-03	1.56E-01	0.00003	4.69E-06
PCB 126	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.1	1.04E-02
PCB 156	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 157	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 167	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
PCB 169	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.03	3.13E-03
PCB 189	5.0E+00	0.20	1.20E-01	5.00E-03	1.04E-01	0.00003	3.13E-06
Congener total: [7]							1.36E-02

Table O5.4.8
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 all 12 dioxin-like congeners analyzed.

(2) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.2 for basis/source.

SIR_{fox} = soil ingestion rate for fox (kg/day) = 0.001 kg/day. See Table O5.4.2 for basis/source.

AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table O5.4.2 for basis/source of home range.

BW = body weight (kg) = 1.2 kg. See Table O5.4.2 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 O5.4.9
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	5.5E+00	4.9E+01	3.83E-02	9.90E-05	3.20E+00	0.0001	3.20E-04
PCB 81	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.0003	5.73E-04
PCB 105	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.00003	5.73E-05
PCB 114	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.00003	5.73E-05
PCB 118	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.00003	5.73E-05
PCB 123	2.7E+00	2.9E+01	2.29E-02	4.86E-05	1.91E+00	0.00003	5.74E-05
PCB 126	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.1	1.91E-01
PCB 156	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.00003	5.73E-05
PCB 157	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.00003	5.73E-05
PCB 167	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.00003	5.73E-05
PCB 169	1.1E+00	1.1E+00	8.29E-04	1.98E-05	7.07E-02	0.03	2.12E-03
PCB 189	1.1E+00	2.9E+01	2.29E-02	1.98E-05	1.91E+00	0.00003	5.73E-05
Congener total: [6]							1.94E-01
South							
PCB 77	5.0E+00	3.5E+01	2.73E-02	9.00E-05	2.28E+00	0.0001	2.28E-04
PCB 81	5.0E+00	2.9E+01	2.22E-02	9.00E-05	1.86E+00	0.0003	5.58E-04
PCB 105	5.0E+00	1.2E+00	8.97E-04	9.00E-05	8.22E-02	0.00003	2.47E-06
PCB 114	5.0E+00	1.2E+00	8.97E-04	9.00E-05	8.22E-02	0.00003	2.47E-06
PCB 118	5.0E+00	1.2E+00	8.97E-04	9.00E-05	8.22E-02	0.00003	2.47E-06
PCB 123	5.0E+00	2.9E+01	2.22E-02	9.00E-05	1.86E+00	0.00003	5.58E-05
PCB 126	5.0E+00	2.9E+01	2.22E-02	9.00E-05	1.86E+00	0.1	1.86E-01
PCB 156	5.0E+00	1.2E+00	8.97E-04	9.00E-05	8.22E-02	0.00003	2.47E-06
PCB 157	5.0E+00	1.2E+00	8.97E-04	9.00E-05	8.22E-02	0.00003	2.47E-06
PCB 167	5.0E+00	2.9E+01	2.22E-02	9.00E-05	1.86E+00	0.00003	5.58E-05
PCB 169	5.0E+00	1.2E+00	8.97E-04	9.00E-05	8.22E-02	0.03	2.47E-03
PCB 189	5.0E+00	1.2E+00	8.97E-04	9.00E-05	8.22E-02	0.00003	2.47E-06
Congener total: [6]							1.89E-01
Southwest							
PCB 77	5.0E+00	3.5E+01	2.53E-02	9.00E-05	2.12E+00	0.0001	2.12E-04
PCB 81	5.0E+00	1.1E+00	7.70E-04	9.00E-05	7.17E-02	0.0003	2.15E-05
PCB 105	5.0E+00	3.5E+01	2.53E-02	9.00E-05	2.12E+00	0.00003	6.35E-05
PCB 114	5.0E+00	1.1E+00	7.70E-04	9.00E-05	7.17E-02	0.00003	2.15E-06
PCB 118	5.0E+00	3.5E+01	2.53E-02	9.00E-05	2.12E+00	0.00003	6.35E-05
PCB 123	5.0E+00	3.5E+01	2.53E-02	9.00E-05	2.12E+00	0.00003	6.35E-05
PCB 126	5.0E+00	1.1E+00	7.70E-04	9.00E-05	7.17E-02	0.1	7.17E-03
PCB 156	5.0E+00	3.5E+01	2.53E-02	9.00E-05	2.12E+00	0.00003	6.35E-05
PCB 157	5.0E+00	3.5E+01	2.53E-02	9.00E-05	2.12E+00	0.00003	6.35E-05
PCB 167	5.0E+00	3.5E+01	2.53E-02	9.00E-05	2.12E+00	0.00003	6.35E-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	5.0E+00	1.1E+00	7.70E-04	9.00E-05	7.17E-02	0.00003	2.15E-06
Congener total: [6]							9.94E-03
B-18 Landfill							
PCB 77	9.0E+00	8.5E+01	6.20E-02	1.62E-04	5.18E+00	0.0001	5.18E-04
PCB 81	5.0E+00	3.3E+01	2.37E-02	9.00E-05	1.98E+00	0.0003	5.95E-04
PCB 105	5.0E+00	1.1E+00	8.03E-04	9.00E-05	7.44E-02	0.00003	2.23E-06
PCB 114	5.0E+00	1.1E+00	8.03E-04	9.00E-05	7.44E-02	0.00003	2.23E-06
PCB 118	5.0E+00	1.1E+00	8.03E-04	9.00E-05	7.44E-02	0.00003	2.23E-06
PCB 123	7.5E+00	1.6E+01	1.13E-02	1.35E-04	9.54E-01	0.00003	2.86E-05
PCB 126	5.0E+00	3.3E+01	2.37E-02	9.00E-05	1.98E+00	0.1	1.98E-01
PCB 156	5.0E+00	1.1E+00	8.03E-04	9.00E-05	7.44E-02	0.00003	2.23E-06
PCB 157	5.0E+00	1.1E+00	8.03E-04	9.00E-05	7.44E-02	0.00003	2.23E-06
PCB 167	5.0E+00	1.1E+00	8.03E-04	9.00E-05	7.44E-02	0.00003	2.23E-06
PCB 169	5.0E+00	1.1E+00	8.03E-04	9.00E-05	7.44E-02	0.03	2.23E-03
PCB 189	5.0E+00	1.1E+00	8.03E-04	9.00E-05	7.44E-02	0.00003	2.23E-06
Congener total: [6]							2.02E-01

Table O5.4.9
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 all 12 dioxin-like congeners analyzed.

(2) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(3) Exposure dose (ED) calculation:

ED = [(intake from plant ingestion) + (intake from soil ingestion)] / body weight.

ED = $[(C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})] \times (AFF/BW)$.

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 mouse = 0.00089 kg/day. See Table O5.4.2 for basis/source.

SIR_{mouse} = soil ingestion rate for mouse (kg/day) = 0.000018 kg/day. See Table O5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.82 fc

AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table O5.4.2 for home range.

BW = body weight (kg) = 0.012 kg. See Table O5.4.2 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 O5.4.10
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	5.5E+00	4.9E+01	2.24E-02	6.05E-05	3.20E+00	0.0001	3.20E-04
PCB 81	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.0003	5.74E-04
PCB 105	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.00003	5.74E-05
PCB 114	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.00003	5.74E-05
PCB 118	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.00003	5.74E-05
PCB 123	2.7E+00	2.9E+01	1.34E-02	2.97E-05	1.92E+00	0.00003	5.75E-05
PCB 126	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.1	1.91E-01
PCB 156	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.00003	5.74E-05
PCB 157	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.00003	5.74E-05
PCB 167	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.00003	5.74E-05
PCB 169	1.1E+00	1.1E+00	4.84E-04	1.21E-05	7.09E-02	0.03	2.13E-03
PCB 189	1.1E+00	2.9E+01	1.34E-02	1.21E-05	1.91E+00	0.00003	5.74E-05
Congener total: [6]							1.95E-01
South							
PCB 77	5.0E+00	3.5E+01	1.59E-02	5.50E-05	2.29E+00	0.0001	2.29E-04
PCB 81	5.0E+00	2.9E+01	1.30E-02	5.50E-05	1.86E+00	0.0003	5.59E-04
PCB 105	5.0E+00	1.2E+00	5.24E-04	5.50E-05	8.27E-02	0.00003	2.48E-06
PCB 114	5.0E+00	1.2E+00	5.24E-04	5.50E-05	8.27E-02	0.00003	2.48E-06
PCB 118	5.0E+00	1.2E+00	5.24E-04	5.50E-05	8.27E-02	0.00003	2.48E-06
PCB 123	5.0E+00	2.9E+01	1.30E-02	5.50E-05	1.86E+00	0.00003	5.59E-05
PCB 126	5.0E+00	2.9E+01	1.30E-02	5.50E-05	1.86E+00	0.1	1.86E-01
PCB 156	5.0E+00	1.2E+00	5.24E-04	5.50E-05	8.27E-02	0.00003	2.48E-06
PCB 157	5.0E+00	1.2E+00	5.24E-04	5.50E-05	8.27E-02	0.00003	2.48E-06
PCB 167	5.0E+00	2.9E+01	1.30E-02	5.50E-05	1.86E+00	0.00003	5.59E-05
PCB 169	5.0E+00	1.2E+00	5.24E-04	5.50E-05	8.27E-02	0.03	2.48E-03
PCB 189	5.0E+00	1.2E+00	5.24E-04	5.50E-05	8.27E-02	0.00003	2.48E-06
Congener total: [6]							1.90E-01
Southwest							
PCB 77	5.0E+00	3.5E+01	1.48E-02	5.50E-05	2.12E+00	0.0001	2.12E-04
PCB 81	5.0E+00	1.1E+00	4.50E-04	5.50E-05	7.21E-02	0.0003	2.16E-05
PCB 105	5.0E+00	3.5E+01	1.48E-02	5.50E-05	2.12E+00	0.00003	6.36E-05
PCB 114	5.0E+00	1.1E+00	4.50E-04	5.50E-05	7.21E-02	0.00003	2.16E-06
PCB 118	5.0E+00	3.5E+01	1.48E-02	5.50E-05	2.12E+00	0.00003	6.36E-05
PCB 123	5.0E+00	3.5E+01	1.48E-02	5.50E-05	2.12E+00	0.00003	6.36E-05
PCB 126	5.0E+00	1.1E+00	4.50E-04	5.50E-05	7.21E-02	0.1	7.21E-03
PCB 156	5.0E+00	3.5E+01	1.48E-02	5.50E-05	2.12E+00	0.00003	6.36E-05
PCB 157	5.0E+00	3.5E+01	1.48E-02	5.50E-05	2.12E+00	0.00003	6.36E-05
PCB 167	5.0E+00	3.5E+01	1.48E-02	5.50E-05	2.12E+00	0.00003	6.36E-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	5.0E+00	1.1E+00	4.50E-04	5.50E-05	7.21E-02	0.00003	2.16E-06
Congener total: [6]							1.00E-02
B-18 Landfill							
PCB 77	9.0E+00	8.5E+01	3.62E-02	9.90E-05	5.19E+00	0.0001	5.19E-04
PCB 81	5.0E+00	3.3E+01	1.39E-02	5.50E-05	1.99E+00	0.0003	5.96E-04
PCB 105	5.0E+00	1.1E+00	4.69E-04	5.50E-05	7.49E-02	0.00003	2.25E-06
PCB 114	5.0E+00	1.1E+00	4.69E-04	5.50E-05	7.49E-02	0.00003	2.25E-06
PCB 118	5.0E+00	1.1E+00	4.69E-04	5.50E-05	7.49E-02	0.00003	2.25E-06
PCB 123	7.5E+00	1.6E+01	6.61E-03	8.25E-05	9.56E-01	0.00003	2.87E-05
PCB 126	5.0E+00	3.3E+01	1.39E-02	5.50E-05	1.99E+00	0.1	1.99E-01
PCB 156	5.0E+00	1.1E+00	4.69E-04	5.50E-05	7.49E-02	0.00003	2.25E-06
PCB 157	5.0E+00	1.1E+00	4.69E-04	5.50E-05	7.49E-02	0.00003	2.25E-06
PCB 167	5.0E+00	1.1E+00	4.69E-04	5.50E-05	7.49E-02	0.00003	2.25E-06
PCB 169	5.0E+00	1.1E+00	4.69E-04	5.50E-05	7.49E-02	0.03	2.25E-03
PCB 189	5.0E+00	1.1E+00	4.69E-04	5.50E-05	7.49E-02	0.00003	2.25E-06
Congener total: [6]							2.02E-01

Table O5.4.10
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 all 12 dioxin-like congeners analyzed.
(2) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.
(3) Exposure dose (ED) calculation:
ED = [(intake from plant ingestion) + (intake from soil ingestion)] / body weight.
ED = $[(C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})] \times (AFF/BW)$.
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 mouse = 0.00052 kg/day. See Table O5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for mouse (kg/day) = 0.000011 kg/day. See Table O5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 0.82 fc
AFF = area foraging factor (unitless) = exposure area / home range = 1.0 (i.e., exposure area > home range). See Table O5.4.2 for home range.
BW = body weight (kg) = 0.007 kg. See Table O5.4.2 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 O5.4.11
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	5.5E+00	0.95	1.52E-02	1.10E-04	3.83E-01	0.0001	3.83E-05
PCB 81	6.34	1.1E+00	0.92	2.95E-03	2.20E-05	7.42E-02	0.0003	2.23E-05
PCB 105	6.79	1.1E+00	0.97	3.10E-03	2.20E-05	7.81E-02	0.00003	2.34E-06
PCB 114	6.98	1.1E+00	0.99	3.17E-03	2.20E-05	7.98E-02	0.00003	2.39E-06
PCB 118	7.12	1.1E+00	1.01	3.22E-03	2.20E-05	8.11E-02	0.00003	2.43E-06
PCB 123	6.98	2.7E+00	0.99	7.78E-03	5.40E-05	1.96E-01	0.00003	5.88E-06
PCB 126	6.98	1.1E+00	0.99	3.17E-03	2.20E-05	7.98E-02	0.1	7.98E-03
PCB 156	7.60	1.1E+00	1.07	3.41E-03	2.20E-05	8.57E-02	0.00003	2.57E-06
PCB 157	7.62	1.1E+00	1.07	3.41E-03	2.20E-05	8.59E-02	0.00003	2.58E-06
PCB 167	7.50	1.1E+00	1.06	3.37E-03	2.20E-05	8.47E-02	0.00003	2.54E-06
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	1.1E+00	1.15	3.68E-03	2.20E-05	9.25E-02	0.00003	2.78E-06
Congener total: [8]								1.06E-02
South								
PCB 77	6.63	5.0E+00	0.95	1.38E-02	1.00E-04	3.49E-01	0.0001	3.49E-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	5.0E+00	0.97	1.41E-02	1.00E-04	3.55E-01	0.00003	1.07E-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	5.0E+00	1.01	1.46E-02	1.00E-04	3.69E-01	0.00003	1.11E-05
PCB 123	6.98	5.0E+00	0.99	1.44E-02	1.00E-04	3.63E-01	0.00003	1.09E-05
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	5.0E+00	1.07	1.55E-02	1.00E-04	3.89E-01	0.00003	1.17E-05
PCB 157	7.62	5.0E+00	1.07	1.55E-02	1.00E-04	3.90E-01	0.00003	1.17E-05
PCB 167	7.50	5.0E+00	1.06	1.53E-02	1.00E-04	3.85E-01	0.00003	1.16E-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	5.0E+00	1.15	1.67E-02	1.00E-04	4.20E-01	0.00003	1.26E-05
Congener total: [8]								4.79E-02
Southwest								
PCB 77	6.63	5.0E+00	0.95	1.38E-02	1.00E-04	3.49E-01	0.0001	3.49E-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	5.0E+00	0.97	1.41E-02	1.00E-04	3.55E-01	0.00003	1.07E-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	5.0E+00	1.01	1.46E-02	1.00E-04	3.69E-01	0.00003	1.11E-05
PCB 123	6.98	5.0E+00	0.99	1.44E-02	1.00E-04	3.63E-01	0.00003	1.09E-05
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	5.0E+00	1.07	1.55E-02	1.00E-04	3.89E-01	0.00003	1.17E-05
PCB 157	7.62	5.0E+00	1.07	1.55E-02	1.00E-04	3.90E-01	0.00003	1.17E-05
PCB 167	7.50	5.0E+00	1.06	1.53E-02	1.00E-04	3.85E-01	0.00003	1.16E-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	5.0E+00	1.15	1.67E-02	1.00E-04	4.20E-01	0.00003	1.26E-05
Congener total: [8]								4.79E-02
B-18 Landfill								
PCB 77	6.63	9.0E+00	0.95	2.49E-02	1.80E-04	6.27E-01	0.0001	6.27E-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	5.0E+00	0.97	1.41E-02	1.00E-04	3.55E-01	0.00003	1.07E-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	5.0E+00	1.01	1.46E-02	1.00E-04	3.69E-01	0.00003	1.11E-05
PCB 123	6.98	7.5E+00	0.99	2.16E-02	1.50E-04	5.44E-01	0.00003	1.63E-05
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	5.0E+00	1.07	1.55E-02	1.00E-04	3.89E-01	0.00003	1.17E-05
PCB 157	7.62	5.0E+00	1.07	1.55E-02	1.00E-04	3.90E-01	0.00003	1.17E-05
PCB 167	7.50	5.0E+00	1.06	1.53E-02	1.00E-04	3.85E-01	0.00003	1.16E-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	5.0E+00	1.15	1.67E-02	1.00E-04	4.20E-01	0.00003	1.26E-05
Congener total: [8]								4.80E-02

Table O5.4.11
Exposure Calculation for the Tulare Grasshopper Mouse - Adult
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes all 12 dioxin-like congeners analyzed.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00002 kg/day. See Table O5.4.2 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 O5.4.2 for home range.
BW = body weight (kg) = 0.04 kg. See Table O5.4.2 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 O5.4.12
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	5.5E+00	0.95	7.88E-03	5.50E-05	3.97E-01	0.0001	3.97E-05
PCB 81	6.34	1.1E+00	0.92	1.52E-03	1.10E-05	7.67E-02	0.0003	2.30E-05
PCB 105	6.79	1.1E+00	0.97	1.60E-03	1.10E-05	8.08E-02	0.00003	2.42E-06
PCB 114	6.98	1.1E+00	0.99	1.64E-03	1.10E-05	8.26E-02	0.00003	2.48E-06
PCB 118	7.12	1.1E+00	1.01	1.67E-03	1.10E-05	8.39E-02	0.00003	2.52E-06
PCB 123	6.98	2.7E+00	0.99	4.03E-03	2.70E-05	2.03E-01	0.00003	6.08E-06
PCB 126	6.98	1.1E+00	0.99	1.64E-03	1.10E-05	8.26E-02	0.1	8.26E-03
PCB 156	7.60	1.1E+00	1.07	1.76E-03	1.10E-05	8.86E-02	0.00003	2.66E-06
PCB 157	7.62	1.1E+00	1.07	1.77E-03	1.10E-05	8.88E-02	0.00003	2.66E-06
PCB 167	7.50	1.1E+00	1.06	1.74E-03	1.10E-05	8.76E-02	0.00003	2.63E-06
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	1.1E+00	1.15	1.90E-03	1.10E-05	9.57E-02	0.00003	2.87E-06
Congener total: (8)								1.09E-02
South								
PCB 77	6.63	5.0E+00	0.95	7.16E-03	5.00E-05	3.61E-01	0.0001	3.61E-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	5.0E+00	0.97	7.29E-03	5.00E-05	3.67E-01	0.00003	1.10E-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	5.0E+00	1.01	7.58E-03	5.00E-05	3.81E-01	0.00003	1.14E-05
PCB 123	6.98	5.0E+00	0.99	7.45E-03	5.00E-05	3.75E-01	0.00003	1.13E-05
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	5.0E+00	1.07	8.01E-03	5.00E-05	4.03E-01	0.00003	1.21E-05
PCB 157	7.62	5.0E+00	1.07	8.02E-03	5.00E-05	4.04E-01	0.00003	1.21E-05
PCB 167	7.50	5.0E+00	1.06	7.91E-03	5.00E-05	3.98E-01	0.00003	1.19E-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	5.0E+00	1.15	8.65E-03	5.00E-05	4.35E-01	0.00003	1.30E-05
Congener total: (8)								4.96E-02
Southwest								
PCB 77	6.63	5.0E+00	0.95	7.16E-03	5.00E-05	3.61E-01	0.0001	3.61E-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	5.0E+00	0.97	7.29E-03	5.00E-05	3.67E-01	0.00003	1.10E-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	5.0E+00	1.01	7.58E-03	5.00E-05	3.81E-01	0.00003	1.14E-05
PCB 123	6.98	5.0E+00	0.99	7.45E-03	5.00E-05	3.75E-01	0.00003	1.13E-05
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	5.0E+00	1.07	8.01E-03	5.00E-05	4.03E-01	0.00003	1.21E-05
PCB 157	7.62	5.0E+00	1.07	8.02E-03	5.00E-05	4.04E-01	0.00003	1.21E-05
PCB 167	7.50	5.0E+00	1.06	7.91E-03	5.00E-05	3.98E-01	0.00003	1.19E-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	5.0E+00	1.15	8.65E-03	5.00E-05	4.35E-01	0.00003	1.30E-05
Congener total: (8)								4.96E-02
B-18 Landfill								
PCB 77	6.63	9.0E+00	0.95	1.29E-02	9.00E-05	6.49E-01	0.0001	6.49E-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	5.0E+00	0.97	7.29E-03	5.00E-05	3.67E-01	0.00003	1.10E-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	5.0E+00	1.01	7.58E-03	5.00E-05	3.81E-01	0.00003	1.14E-05
PCB 123	6.98	7.5E+00	0.99	1.12E-02	7.50E-05	5.63E-01	0.00003	1.69E-05
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	5.0E+00	1.07	8.01E-03	5.00E-05	4.03E-01	0.00003	1.21E-05
PCB 157	7.62	5.0E+00	1.07	8.02E-03	5.00E-05	4.04E-01	0.00003	1.21E-05
PCB 167	7.50	5.0E+00	1.06	7.91E-03	5.00E-05	3.98E-01	0.00003	1.19E-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	5.0E+00	1.15	8.65E-03	5.00E-05	4.35E-01	0.00003	1.30E-05
Congener total: (8)								4.96E-02

Table O5.4.12
Exposure Calculation for the Tulare Grasshopper Mouse - Juvenile
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes all 12 dioxin-like congeners analyzed.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.2 for basis/source.
SIR_{mouse} = soil ingestion rate for grasshopper mouse = 0.00001 kg/day. See Table O5.4.2 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 O5.4.2 for home range.
BW = body weight (kg) = 0.02 kg. See Table O5.4.2 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 O5.4.13
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	5.5E+00	4.9E+01	0.0076	1.93E-05	2.20E-03	1.29E-02	0.05	6.45E-04
PCB 81	6.34	1.1E+00	2.9E+01	0.0088	1.33E-05	4.40E-04	2.64E-03	0.1	2.64E-04
PCB 105	6.79	1.1E+00	2.9E+01	0.0069	1.05E-05	4.40E-04	2.62E-03	0.0001	2.62E-07
PCB 114	6.98	1.1E+00	2.9E+01	0.0061	9.20E-06	4.40E-04	2.61E-03	0.0001	2.61E-07
PCB 118	7.12	1.1E+00	2.9E+01	0.0055	8.28E-06	4.40E-04	2.61E-03	0.00001	2.61E-08
PCB 123	6.98	2.7E+00	2.9E+01	0.0061	9.21E-06	1.08E-03	6.33E-03	0.00001	6.33E-08
PCB 126	6.98	1.1E+00	2.9E+01	0.0061	9.20E-06	4.40E-04	2.61E-03	0.1	2.61E-04
PCB 156	7.60	1.1E+00	2.9E+01	0.0036	5.40E-06	4.40E-04	2.59E-03	0.0001	2.59E-07
PCB 157	7.62	1.1E+00	2.9E+01	0.0035	5.29E-06	4.40E-04	2.59E-03	0.0001	2.59E-07
PCB 167	7.50	1.1E+00	2.9E+01	0.0039	5.95E-06	4.40E-04	2.59E-03	0.00001	2.59E-08
PCB 169	7.41	1.1E+00	1.1E+00	0.0043	2.40E-07	4.40E-04	2.56E-03	0.001	2.56E-06
PCB 189	8.27	1.1E+00	2.9E+01	0.0016	2.49E-06	4.40E-04	2.57E-03	0.00001	2.57E-08
Congener total: [8]									1.17E-03
South									
PCB 77	6.63	5.0E+00	3.5E+01	0.0076	1.37E-05	2.00E-03	1.17E-02	0.05	5.85E-04
PCB 81	6.34	5.0E+00	2.9E+01	0.0088	1.29E-05	2.00E-03	1.17E-02	0.1	1.17E-03
PCB 105	6.79	5.0E+00	1.2E+00	0.0069	4.50E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 114	6.98	5.0E+00	1.2E+00	0.0061	3.96E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 118	7.12	5.0E+00	1.2E+00	0.0055	3.57E-07	2.00E-03	1.16E-02	0.00001	1.16E-07
PCB 123	6.98	5.0E+00	2.9E+01	0.0061	8.96E-06	2.00E-03	1.17E-02	0.00001	1.17E-07
PCB 126	6.98	5.0E+00	2.9E+01	0.0061	8.96E-06	2.00E-03	1.17E-02	0.1	1.17E-03
PCB 156	7.60	5.0E+00	1.2E+00	0.0036	2.32E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 157	7.62	5.0E+00	1.2E+00	0.0035	2.28E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 167	7.50	5.0E+00	2.9E+01	0.0039	5.80E-06	2.00E-03	1.17E-02	0.00001	1.17E-07
PCB 169	7.41	5.0E+00	1.2E+00	0.0043	2.79E-07	2.00E-03	1.16E-02	0.001	1.16E-05
PCB 189	8.27	5.0E+00	1.2E+00	0.0016	1.07E-07	2.00E-03	1.16E-02	0.00001	1.16E-07
Congener total: [8]									2.94E-03
Southwest									
PCB 77	6.63	5.0E+00	3.5E+01	0.0076	1.28E-05	2.00E-03	1.17E-02	0.05	5.85E-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	5.0E+00	3.5E+01	0.0069	1.16E-05	2.00E-03	1.17E-02	0.0001	1.17E-06
PCB 114	6.98	5.0E+00	1.1E+00	0.0061	3.45E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 118	7.12	5.0E+00	3.5E+01	0.0055	9.18E-06	2.00E-03	1.17E-02	0.00001	1.17E-07
PCB 123	6.98	5.0E+00	3.5E+01	0.0061	1.02E-05	2.00E-03	1.17E-02	0.00001	1.17E-07
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	5.0E+00	3.5E+01	0.0036	5.98E-06	2.00E-03	1.17E-02	0.0001	1.17E-06
PCB 157	7.62	5.0E+00	3.5E+01	0.0035	5.86E-06	2.00E-03	1.17E-02	0.0001	1.17E-06
PCB 167	7.50	5.0E+00	3.5E+01	0.0039	6.60E-06	2.00E-03	1.17E-02	0.00001	1.17E-07
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	5.0E+00	1.1E+00	0.0016	9.35E-08	2.00E-03	1.16E-02	0.00001	1.16E-07
Congener total: [8]									2.93E-03
B-18 Landfill									
PCB 77	6.63	9.0E+00	8.5E+01	0.0076	3.12E-05	3.60E-03	2.11E-02	0.05	1.06E-03
PCB 81	6.34	5.0E+00	3.3E+01	0.0088	1.38E-05	2.00E-03	1.17E-02	0.1	1.17E-03
PCB 105	6.79	5.0E+00	1.1E+00	0.0069	4.08E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 114	6.98	5.0E+00	1.1E+00	0.0061	3.59E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 118	7.12	5.0E+00	1.1E+00	0.0055	3.23E-07	2.00E-03	1.16E-02	0.00001	1.16E-07
PCB 123	6.98	7.5E+00	1.6E+01	0.0061	4.60E-06	3.00E-03	1.75E-02	0.00001	1.75E-07
PCB 126	6.98	5.0E+00	3.3E+01	0.0061	9.56E-06	2.00E-03	1.17E-02	0.1	1.17E-03
PCB 156	7.60	5.0E+00	1.1E+00	0.0036	2.10E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 157	7.62	5.0E+00	1.1E+00	0.0035	2.06E-07	2.00E-03	1.16E-02	0.0001	1.16E-06
PCB 167	7.50	5.0E+00	1.1E+00	0.0039	2.32E-07	2.00E-03	1.16E-02	0.00001	1.16E-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	5.0E+00	1.1E+00	0.0016	9.71E-08	2.00E-03	1.16E-02	0.00001	1.16E-07
Congener total: [8]									3.41E-03

Table O5.4.13
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 all 12 dioxin-like congeners analyzed.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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).

$ED = \{[((C_{plants} \times FIR_{mouse} \times CF_{dw}) + (C_{soil} \times SIR_{mouse})) \times BTF \times FIR_{owl}] + (C_{soil} \times SIR_{owl})\} \times \{AFF/BW\}$.

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 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 O5.4.2 for basis/source.

SIR_{mouse} = soil ingestion rate for mouse = 0.000018 kg/day. See Table O5.4.2 for basis/source.

SIR_{owl} = soil ingestion rate for owl (kg/day) = 0.0004 kg/day. See Table O5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 O5.4.2 for home range.

BW = body weight (kg) = 0.172 kg. See Table O5.4.2 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 O5.4.14
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	5.5E+00	4.9E+01	0.0076	1.52E-05	1.65E-03	1.32E-02	0.05	6.61E-04
PCB 81	6.34	1.1E+00	2.9E+01	0.0088	1.05E-05	3.30E-04	2.70E-03	0.1	2.70E-04
PCB 105	6.79	1.1E+00	2.9E+01	0.0069	8.24E-06	3.30E-04	2.68E-03	0.0001	2.68E-07
PCB 114	6.98	1.1E+00	2.9E+01	0.0061	7.25E-06	3.30E-04	2.68E-03	0.0001	2.68E-07
PCB 118	7.12	1.1E+00	2.9E+01	0.0055	6.53E-06	3.30E-04	2.67E-03	0.00001	2.67E-08
PCB 123	6.98	2.7E+00	2.9E+01	0.0061	7.26E-06	8.10E-04	6.49E-03	0.00001	6.49E-08
PCB 126	6.98	1.1E+00	2.9E+01	0.0061	7.25E-06	3.30E-04	2.68E-03	0.1	2.68E-04
PCB 156	7.60	1.1E+00	2.9E+01	0.0036	4.25E-06	3.30E-04	2.65E-03	0.0001	2.65E-07
PCB 157	7.62	1.1E+00	2.9E+01	0.0035	4.17E-06	3.30E-04	2.65E-03	0.0001	2.65E-07
PCB 167	7.50	1.1E+00	2.9E+01	0.0039	4.69E-06	3.30E-04	2.66E-03	0.00001	2.66E-08
PCB 169	7.41	1.1E+00	1.1E+00	0.0043	1.89E-07	3.30E-04	2.62E-03	0.001	2.62E-06
PCB 189	8.27	1.1E+00	2.9E+01	0.0016	1.96E-06	3.30E-04	2.63E-03	0.00001	2.63E-08
Congener total: [8]									1.20E-03
South									
PCB 77	6.63	5.0E+00	3.5E+01	0.0076	1.08E-05	1.50E-03	1.20E-02	0.05	6.00E-04
PCB 81	6.34	5.0E+00	2.9E+01	0.0088	1.02E-05	1.50E-03	1.20E-02	0.1	1.20E-03
PCB 105	6.79	5.0E+00	1.2E+00	0.0069	3.55E-07	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 114	6.98	5.0E+00	1.2E+00	0.0061	3.12E-07	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 118	7.12	5.0E+00	1.2E+00	0.0055	2.81E-07	1.50E-03	1.19E-02	0.00001	1.19E-07
PCB 123	6.98	5.0E+00	2.9E+01	0.0061	7.06E-06	1.50E-03	1.20E-02	0.00001	1.20E-07
PCB 126	6.98	5.0E+00	2.9E+01	0.0061	7.06E-06	1.50E-03	1.20E-02	0.1	1.20E-03
PCB 156	7.60	5.0E+00	1.2E+00	0.0036	1.83E-07	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 157	7.62	5.0E+00	1.2E+00	0.0035	1.80E-07	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 167	7.50	5.0E+00	2.9E+01	0.0039	4.57E-06	1.50E-03	1.19E-02	0.00001	1.19E-07
PCB 169	7.41	5.0E+00	1.2E+00	0.0043	2.20E-07	1.50E-03	1.19E-02	0.001	1.19E-05
PCB 189	8.27	5.0E+00	1.2E+00	0.0016	8.45E-08	1.50E-03	1.19E-02	0.00001	1.19E-07
Congener total: [8]									3.01E-03
Southwest									
PCB 77	6.63	5.0E+00	3.5E+01	0.0076	1.00E-05	1.50E-03	1.20E-02	0.05	5.99E-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	5.0E+00	3.5E+01	0.0069	9.13E-06	1.50E-03	1.20E-02	0.0001	1.20E-06
PCB 114	6.98	5.0E+00	1.1E+00	0.0061	2.72E-07	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 118	7.12	5.0E+00	3.5E+01	0.0055	7.23E-06	1.50E-03	1.20E-02	0.00001	1.20E-07
PCB 123	6.98	5.0E+00	3.5E+01	0.0061	8.03E-06	1.50E-03	1.20E-02	0.00001	1.20E-07
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	5.0E+00	3.5E+01	0.0036	4.71E-06	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 157	7.62	5.0E+00	3.5E+01	0.0035	4.62E-06	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 167	7.50	5.0E+00	3.5E+01	0.0039	5.20E-06	1.50E-03	1.19E-02	0.00001	1.19E-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	5.0E+00	1.1E+00	0.0016	7.37E-08	1.50E-03	1.19E-02	0.00001	1.19E-07
Congener total: [8]									3.00E-03
B-18 Landfill									
PCB 77	6.63	9.0E+00	8.5E+01	0.0076	2.46E-05	2.70E-03	2.16E-02	0.05	1.08E-03
PCB 81	6.34	5.0E+00	3.3E+01	0.0088	1.09E-05	1.50E-03	1.20E-02	0.1	1.20E-03
PCB 105	6.79	5.0E+00	1.1E+00	0.0069	3.21E-07	1.50E-03	1.19E-02	0.0001	1.19E-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	5.0E+00	1.1E+00	0.0055	2.54E-07	1.50E-03	1.19E-02	0.00001	1.19E-07
PCB 123	6.98	7.5E+00	1.6E+01	0.0061	3.62E-06	2.25E-03	1.79E-02	0.00001	1.79E-07
PCB 126	6.98	5.0E+00	3.3E+01	0.0061	7.53E-06	1.50E-03	1.20E-02	0.1	1.20E-03
PCB 156	7.60	5.0E+00	1.1E+00	0.0036	1.66E-07	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 157	7.62	5.0E+00	1.1E+00	0.0035	1.62E-07	1.50E-03	1.19E-02	0.0001	1.19E-06
PCB 167	7.50	5.0E+00	1.1E+00	0.0039	1.83E-07	1.50E-03	1.19E-02	0.00001	1.19E-07
PCB 169	7.41	5.0E+00	1.1E+00	0.0043	1.99E-07	1.50E-03	1.19E-02	0.001	1.19E-05
PCB 189	8.27	5.0E+00	1.1E+00	0.0016	7.65E-08	1.50E-03	1.19E-02	0.00001	1.19E-07
Congener total: [8]									3.49E-03

Table O5.4.14
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 all 12 dioxin-like congeners analyzed.
(2) Log Kow source: ORNL (2009).
(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.
(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 O5.4.2 for basis/source.
SIR$_{mouse}$ = soil ingestion rate for mouse = 0.000018 kg/day. See Table O5.4.2 for basis/source.
SIR$_{owl}$ = soil ingestion rate for owl (kg/day) = 0.0003 kg/day. See Table O5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 O5.4.2 for home range.
BW = body weight (kg) = 0.126 kg. See Table O5.4.2 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 O5.4.15
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	5.5E+00	0.20	5.72E-02	1.65E-03	4.67E-01	0.05	2.34E-02
PCB 81	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.1	9.34E-03
PCB 105	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.0001	9.34E-06
PCB 114	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.0001	9.34E-06
PCB 118	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.00001	9.34E-07
PCB 123	2.7E+00	0.20	2.81E-02	8.10E-04	2.29E-01	0.00001	2.29E-06
PCB 126	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.1	9.34E-03
PCB 156	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.0001	9.34E-06
PCB 157	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.0001	9.34E-06
PCB 167	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.00001	9.34E-07
PCB 169	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.001	9.34E-05
PCB 189	1.1E+00	0.20	1.14E-02	3.30E-04	9.34E-02	0.00001	9.34E-07
Congener total: [7]							4.22E-02
South							
PCB 77	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.05	2.12E-02
PCB 81	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.1	4.25E-02
PCB 105	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 114	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 118	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
PCB 123	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
PCB 126	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.1	4.25E-02
PCB 156	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 157	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 167	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
PCB 169	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.001	4.25E-04
PCB 189	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
Congener total: [7]							1.07E-01
Southwest							
PCB 77	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.05	2.12E-02
PCB 81	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.1	4.25E-02
PCB 105	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 114	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 118	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
PCB 123	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
PCB 126	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.1	4.25E-02
PCB 156	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 157	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 167	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
PCB 169	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.001	4.25E-04
PCB 189	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
Congener total: [7]							1.07E-01
B-18 Landfill							
PCB 77	9.0E+00	0.20	9.36E-02	2.70E-03	7.64E-01	0.05	3.82E-02
PCB 81	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.1	4.25E-02
PCB 105	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 114	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 118	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
PCB 123	7.5E+00	0.20	7.80E-02	2.25E-03	6.37E-01	0.00001	6.37E-06
PCB 126	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.1	4.25E-02
PCB 156	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 157	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.0001	4.25E-05
PCB 167	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
PCB 169	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.001	4.25E-04
PCB 189	5.0E+00	0.20	5.20E-02	1.50E-03	4.25E-01	0.00001	4.25E-06
Congener total: [7]							1.24E-01

Table O5.4.15
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 all 12 dioxin-like congeners analyzed.
(2) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.
(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_{owl}) + (C_{soil} x SIR_{owl})] 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_{owl} = food ingestion rate (mice) for female owl (kg/day) = 0.052. See Table O5.4.2 for basis/source.
SIR_{owl} = soil ingestion rate for female owl (kg/day) = 0.0003 kg/day. See Table O5.4.2 for basis/source.
AFF = area foraging factor (unitless) = (exposure area) / (home range) = assumed value of 1.0. See Table O5.4.2 for basis/source of home range.
BW = body weight (kg) = 0.126 kg. See Table O5.4.2 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 O5.4.16
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	5.5E+00	4.9E+01	0.95	1.37E-01	2.11E-01	8.25E-03	3.17E+00	0.05	1.59E-01
PCB 81	6.34	1.1E+00	2.9E+01	0.92	2.64E-02	1.26E-01	1.65E-03	1.38E+00	0.1	1.38E-01
PCB 105	6.79	1.1E+00	2.9E+01	0.97	2.78E-02	1.26E-01	1.65E-03	1.39E+00	0.0001	1.39E-04
PCB 114	6.98	1.1E+00	2.9E+01	0.99	2.84E-02	1.26E-01	1.65E-03	1.39E+00	0.0001	1.39E-04
PCB 118	7.12	1.1E+00	2.9E+01	1.01	2.89E-02	1.26E-01	1.65E-03	1.40E+00	0.00001	1.40E-05
PCB 123	6.98	2.7E+00	2.9E+01	0.99	6.98E-02	1.26E-01	4.05E-03	1.78E+00	0.00001	1.78E-05
PCB 126	6.98	1.1E+00	2.9E+01	0.99	2.84E-02	1.26E-01	1.65E-03	1.39E+00	0.1	1.39E-01
PCB 156	7.60	1.1E+00	2.9E+01	1.07	3.05E-02	1.26E-01	1.65E-03	1.41E+00	0.0001	1.41E-04
PCB 157	7.62	1.1E+00	2.9E+01	1.07	3.06E-02	1.26E-01	1.65E-03	1.41E+00	0.0001	1.41E-04
PCB 167	7.50	1.1E+00	2.9E+01	1.06	3.02E-02	1.26E-01	1.65E-03	1.41E+00	0.00001	1.41E-05
PCB 169	7.41	1.1E+00	1.1E+00	1.04	2.99E-02	4.56E-03	1.65E-03	3.22E-01	0.001	3.22E-04
PCB 189	8.27	1.1E+00	2.9E+01	1.15	3.30E-02	1.26E-01	1.65E-03	1.43E+00	0.00001	1.43E-05
Congener total: [8]										4.37E-01
South										
PCB 77	6.63	5.0E+00	3.5E+01	0.95	1.24E-01	1.50E-01	7.50E-03	2.52E+00	0.05	1.26E-01
PCB 81	6.34	5.0E+00	2.9E+01	0.92	1.20E-01	1.22E-01	7.50E-03	2.23E+00	0.1	2.23E-01
PCB 105	6.79	5.0E+00	1.2E+00	0.97	1.26E-01	4.94E-03	7.50E-03	1.24E+00	0.0001	1.24E-04
PCB 114	6.98	5.0E+00	1.2E+00	0.99	1.29E-01	4.94E-03	7.50E-03	1.26E+00	0.0001	1.26E-04
PCB 118	7.12	5.0E+00	1.2E+00	1.01	1.31E-01	4.94E-03	7.50E-03	1.28E+00	0.00001	1.28E-05
PCB 123	6.98	5.0E+00	2.9E+01	0.99	1.29E-01	1.22E-01	7.50E-03	2.31E+00	0.00001	2.31E-05
PCB 126	6.98	5.0E+00	2.9E+01	0.99	1.29E-01	1.22E-01	7.50E-03	2.31E+00	0.1	2.31E-01
PCB 156	7.60	5.0E+00	1.2E+00	1.07	1.39E-01	4.94E-03	7.50E-03	1.35E+00	0.0001	1.35E-04
PCB 157	7.62	5.0E+00	1.2E+00	1.07	1.39E-01	4.94E-03	7.50E-03	1.35E+00	0.0001	1.35E-04
PCB 167	7.50	5.0E+00	2.9E+01	1.06	1.37E-01	1.22E-01	7.50E-03	2.38E+00	0.00001	2.38E-05
PCB 169	7.41	5.0E+00	1.2E+00	1.04	1.36E-01	4.94E-03	7.50E-03	1.32E+00	0.001	1.32E-03
PCB 189	8.27	5.0E+00	1.2E+00	1.15	1.50E-01	4.94E-03	7.50E-03	1.45E+00	0.00001	1.45E-05
Congener total: [8]										5.82E-01
Southwest										
PCB 77	6.63	5.0E+00	3.5E+01	0.95	1.24E-01	1.39E-01	7.50E-03	2.42E+00	0.05	1.21E-01
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	5.0E+00	3.5E+01	0.97	1.26E-01	1.39E-01	7.50E-03	2.44E+00	0.0001	2.44E-04
PCB 114	6.98	5.0E+00	1.1E+00	0.99	1.29E-01	4.24E-03	7.50E-03	1.26E+00	0.0001	1.26E-04
PCB 118	7.12	5.0E+00	3.5E+01	1.01	1.31E-01	1.39E-01	7.50E-03	2.48E+00	0.00001	2.48E-05
PCB 123	6.98	5.0E+00	3.5E+01	0.99	1.29E-01	1.39E-01	7.50E-03	2.46E+00	0.00001	2.46E-05
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	5.0E+00	3.5E+01	1.07	1.39E-01	1.39E-01	7.50E-03	2.55E+00	0.0001	2.55E-04
PCB 157	7.62	5.0E+00	3.5E+01	1.07	1.39E-01	1.39E-01	7.50E-03	2.55E+00	0.0001	2.55E-04
PCB 167	7.50	5.0E+00	3.5E+01	1.06	1.37E-01	1.39E-01	7.50E-03	2.54E+00	0.00001	2.54E-05
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	5.0E+00	1.1E+00	1.15	1.50E-01	4.24E-03	7.50E-03	1.44E+00	0.00001	1.44E-05
Congener total: [8]										3.67E-01
B-18 Landfill										
PCB 77	6.63	9.0E+00	8.5E+01	0.95	2.23E-01	3.42E-01	1.35E-02	5.16E+00	0.05	2.58E-01
PCB 81	6.34	5.0E+00	3.3E+01	0.92	1.20E-01	1.31E-01	7.50E-03	2.30E+00	0.1	2.30E-01
PCB 105	6.79	5.0E+00	1.1E+00	0.97	1.26E-01	4.42E-03	7.50E-03	1.24E+00	0.0001	1.24E-04
PCB 114	6.98	5.0E+00	1.1E+00	0.99	1.29E-01	4.42E-03	7.50E-03	1.26E+00	0.0001	1.26E-04
PCB 118	7.12	5.0E+00	1.1E+00	1.01	1.31E-01	4.42E-03	7.50E-03	1.28E+00	0.00001	1.28E-05
PCB 123	6.98	7.5E+00	1.6E+01	0.99	1.94E-01	6.23E-02	1.13E-02	2.39E+00	0.00001	2.39E-05
PCB 126	6.98	5.0E+00	3.3E+01	0.99	1.29E-01	1.31E-01	7.50E-03	2.39E+00	0.1	2.39E-01
PCB 156	7.60	5.0E+00	1.1E+00	1.07	1.39E-01	4.42E-03	7.50E-03	1.35E+00	0.0001	1.35E-04
PCB 157	7.62	5.0E+00	1.1E+00	1.07	1.39E-01	4.42E-03	7.50E-03	1.35E+00	0.0001	1.35E-04
PCB 167	7.50	5.0E+00	1.1E+00	1.06	1.37E-01	4.42E-03	7.50E-03	1.33E+00	0.00001	1.33E-05
PCB 169	7.41	5.0E+00	1.1E+00	1.04	1.36E-01	4.42E-03	7.50E-03	1.32E+00	0.001	1.32E-03
PCB 189	8.27	5.0E+00	1.1E+00	1.15	1.50E-01	4.42E-03	7.50E-03	1.44E+00	0.00001	1.44E-05
Congener total: [8]										7.29E-01

Table O5.4.16
Exposure Calculation for the Western Meadowlark - Adult Male
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes all 12 dioxin-like congeners analyzed.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.2 for basis/source.

FIR_{plant} = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0049. See Table O5.4.2 for basis/source.

SIR_{lark} = soil ingestion rate for meadowlark = 0.0015 kg/day. See Table O5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 O5.4.2 for home range.

BW = body weight (kg) = 0.112 kg. See Table O5.4.2 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 O5.4.17
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	5.5E+00	4.9E+01	0.95	1.10E-01	1.72E-01	6.60E-03	3.23E+00	0.05	1.62E-01
PCB 81	6.34	1.1E+00	2.9E+01	0.92	2.13E-02	1.03E-01	1.32E-03	1.40E+00	0.1	1.40E-01
PCB 105	6.79	1.1E+00	2.9E+01	0.97	2.25E-02	1.03E-01	1.32E-03	1.42E+00	0.0001	1.42E-04
PCB 114	6.98	1.1E+00	2.9E+01	0.99	2.30E-02	1.03E-01	1.32E-03	1.42E+00	0.0001	1.42E-04
PCB 118	7.12	1.1E+00	2.9E+01	1.01	2.33E-02	1.03E-01	1.32E-03	1.43E+00	0.00001	1.43E-05
PCB 123	6.98	2.7E+00	2.9E+01	0.99	5.64E-02	1.03E-01	3.24E-03	1.82E+00	0.00001	1.82E-05
PCB 126	6.98	1.1E+00	2.9E+01	0.99	2.30E-02	1.03E-01	1.32E-03	1.42E+00	0.1	1.42E-01
PCB 156	7.60	1.1E+00	2.9E+01	1.07	2.47E-02	1.03E-01	1.32E-03	1.44E+00	0.0001	1.44E-04
PCB 157	7.62	1.1E+00	2.9E+01	1.07	2.47E-02	1.03E-01	1.32E-03	1.44E+00	0.0001	1.44E-04
PCB 167	7.50	1.1E+00	2.9E+01	1.06	2.44E-02	1.03E-01	1.32E-03	1.44E+00	0.00001	1.44E-05
PCB 169	7.41	1.1E+00	1.1E+00	1.04	2.41E-02	3.73E-03	1.32E-03	3.26E-01	0.001	3.26E-04
PCB 189	8.27	1.1E+00	2.9E+01	1.15	2.66E-02	1.03E-01	1.32E-03	1.46E+00	0.00001	1.46E-05
Congener total: (8)										4.45E-01
South										
PCB 77	6.63	5.0E+00	3.5E+01	0.95	1.00E-01	1.23E-01	6.00E-03	2.56E+00	0.05	1.28E-01
PCB 81	6.34	5.0E+00	2.9E+01	0.92	9.70E-02	9.99E-02	6.00E-03	2.27E+00	0.1	2.27E-01
PCB 105	6.79	5.0E+00	1.2E+00	0.97	1.02E-01	4.03E-03	6.00E-03	1.25E+00	0.0001	1.25E-04
PCB 114	6.98	5.0E+00	1.2E+00	0.99	1.04E-01	4.03E-03	6.00E-03	1.28E+00	0.0001	1.28E-04
PCB 118	7.12	5.0E+00	1.2E+00	1.01	1.06E-01	4.03E-03	6.00E-03	1.30E+00	0.00001	1.30E-05
PCB 123	6.98	5.0E+00	2.9E+01	0.99	1.04E-01	9.99E-02	6.00E-03	2.35E+00	0.00001	2.35E-05
PCB 126	6.98	5.0E+00	2.9E+01	0.99	1.04E-01	9.99E-02	6.00E-03	2.35E+00	0.1	2.35E-01
PCB 156	7.60	5.0E+00	1.2E+00	1.07	1.12E-01	4.03E-03	6.00E-03	1.37E+00	0.0001	1.37E-04
PCB 157	7.62	5.0E+00	1.2E+00	1.07	1.12E-01	4.03E-03	6.00E-03	1.37E+00	0.0001	1.37E-04
PCB 167	7.50	5.0E+00	2.9E+01	1.06	1.11E-01	9.99E-02	6.00E-03	2.42E+00	0.00001	2.42E-05
PCB 169	7.41	5.0E+00	1.2E+00	1.04	1.10E-01	4.03E-03	6.00E-03	1.34E+00	0.001	1.34E-03
PCB 189	8.27	5.0E+00	1.2E+00	1.15	1.21E-01	4.03E-03	6.00E-03	1.47E+00	0.00001	1.47E-05
Congener total: (8)										5.92E-01
Southwest										
PCB 77	6.63	5.0E+00	3.5E+01	0.95	1.00E-01	1.14E-01	6.00E-03	2.46E+00	0.05	1.23E-01
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	5.0E+00	3.5E+01	0.97	1.02E-01	1.14E-01	6.00E-03	2.48E+00	0.0001	2.48E-04
PCB 114	6.98	5.0E+00	1.1E+00	0.99	1.04E-01	3.46E-03	6.00E-03	1.27E+00	0.0001	1.27E-04
PCB 118	7.12	5.0E+00	3.5E+01	1.01	1.06E-01	1.14E-01	6.00E-03	2.53E+00	0.00001	2.53E-05
PCB 123	6.98	5.0E+00	3.5E+01	0.99	1.04E-01	1.14E-01	6.00E-03	2.51E+00	0.00001	2.51E-05
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	5.0E+00	3.5E+01	1.07	1.12E-01	1.14E-01	6.00E-03	2.59E+00	0.0001	2.59E-04
PCB 157	7.62	5.0E+00	3.5E+01	1.07	1.12E-01	1.14E-01	6.00E-03	2.60E+00	0.0001	2.60E-04
PCB 167	7.50	5.0E+00	3.5E+01	1.06	1.11E-01	1.14E-01	6.00E-03	2.58E+00	0.00001	2.58E-05
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	5.0E+00	1.1E+00	1.15	1.21E-01	3.46E-03	6.00E-03	1.46E+00	0.00001	1.46E-05
Congener total: (8)										3.72E-01
B-18 Landfill										
PCB 77	6.63	9.0E+00	8.5E+01	0.95	1.80E-01	2.79E-01	1.08E-02	5.26E+00	0.05	2.63E-01
PCB 81	6.34	5.0E+00	3.3E+01	0.92	9.70E-02	1.07E-01	6.00E-03	2.34E+00	0.1	2.34E-01
PCB 105	6.79	5.0E+00	1.1E+00	0.97	1.02E-01	3.61E-03	6.00E-03	1.25E+00	0.0001	1.25E-04
PCB 114	6.98	5.0E+00	1.1E+00	0.99	1.04E-01	3.61E-03	6.00E-03	1.27E+00	0.0001	1.27E-04
PCB 118	7.12	5.0E+00	1.1E+00	1.01	1.06E-01	3.61E-03	6.00E-03	1.29E+00	0.00001	1.29E-05
PCB 123	6.98	7.5E+00	1.6E+01	0.99	1.57E-01	5.08E-02	9.00E-03	2.42E+00	0.00001	2.42E-05
PCB 126	6.98	5.0E+00	3.3E+01	0.99	1.04E-01	1.07E-01	6.00E-03	2.43E+00	0.1	2.43E-01
PCB 156	7.60	5.0E+00	1.1E+00	1.07	1.12E-01	3.61E-03	6.00E-03	1.36E+00	0.0001	1.36E-04
PCB 157	7.62	5.0E+00	1.1E+00	1.07	1.12E-01	3.61E-03	6.00E-03	1.36E+00	0.0001	1.36E-04
PCB 167	7.50	5.0E+00	1.1E+00	1.06	1.11E-01	3.61E-03	6.00E-03	1.35E+00	0.00001	1.35E-05
PCB 169	7.41	5.0E+00	1.1E+00	1.04	1.10E-01	3.61E-03	6.00E-03	1.33E+00	0.001	1.33E-03
PCB 189	8.27	5.0E+00	1.1E+00	1.15	1.21E-01	3.61E-03	6.00E-03	1.46E+00	0.00001	1.46E-05
Congener total: (8)										7.42E-01

Table O5.4.17
Exposure Calculation for the Western Meadowlark - Female/Juvenile
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Notes:

(1) Includes all 12 dioxin-like congeners analyzed.

(2) Log Kow source: ORNL (2009).

(3) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.2 for basis/source.

FIR_{plant} = food ingestion rate (plant material) for meadowlark (kg/day) = 0.0040. See Table O5.4.2 for basis/source.

SIR_{lark} = soil ingestion rate for meadowlark = 0.0012 kg/day. See Table O5.4.2 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%, B-18 18%) = 1- fraction moisture = 0.887 for southeast, 0.876 for south, 0.824 for southwest, 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 O5.4.2 for home range.

BW = body weight (kg) = 0.0894 kg. See Table O5.4.2 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 O5.4.18
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	5.89E-02	7.16E-04	0.05	3.58E-05
PCB 81	6.34	0.1756	0.0140	1.18E-02	1.65E-04	0.1	1.65E-05
PCB 105	6.79	0.1384	0.0111	1.18E-02	1.30E-04	0.0001	1.30E-08
PCB 114	6.98	0.1217	0.0097	1.18E-02	1.15E-04	0.0001	1.15E-08
PCB 118	7.12	0.1096	0.0088	1.18E-02	1.03E-04	0.00001	1.03E-09
PCB 123	6.98	0.1217	0.0097	2.89E-02	2.81E-04	0.00001	2.81E-09
PCB 126	6.98	0.1217	0.0097	1.18E-02	1.15E-04	0.1	1.15E-05
PCB 156	7.60	0.0714	0.0057	1.18E-02	6.72E-05	0.0001	6.72E-09
PCB 157	7.62	0.0700	0.0056	1.18E-02	6.59E-05	0.0001	6.59E-09
PCB 167	7.50	0.0787	0.0063	1.18E-02	7.42E-05	0.00001	7.42E-10
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	1.18E-02	3.10E-05	0.00001	3.10E-10
Congener total: (9)							6.39E-05
South							
PCB 77	6.63	0.1522	0.0122	5.35E-02	6.51E-04	0.05	3.26E-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	5.35E-02	5.92E-04	0.0001	5.92E-08
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	5.35E-02	4.69E-04	0.00001	4.69E-09
PCB 123	6.98	0.1217	0.0097	5.35E-02	5.21E-04	0.00001	5.21E-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	5.35E-02	3.06E-04	0.0001	3.06E-08
PCB 157	7.62	0.0700	0.0056	5.35E-02	3.00E-04	0.0001	3.00E-08
PCB 167	7.50	0.0787	0.0063	5.35E-02	3.37E-04	0.00001	3.37E-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	5.35E-02	1.41E-04	0.00001	1.41E-09
Congener total: (9)							1.60E-04
Southwest							
PCB 77	6.63	0.1522	0.0122	5.35E-02	6.51E-04	0.05	3.26E-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	5.35E-02	5.92E-04	0.0001	5.92E-08
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	5.35E-02	4.69E-04	0.00001	4.69E-09
PCB 123	6.98	0.1217	0.0097	5.35E-02	5.21E-04	0.00001	5.21E-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	5.35E-02	3.06E-04	0.0001	3.06E-08
PCB 157	7.62	0.0700	0.0056	5.35E-02	3.00E-04	0.0001	3.00E-08
PCB 167	7.50	0.0787	0.0063	5.35E-02	3.37E-04	0.00001	3.37E-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	5.35E-02	1.41E-04	0.00001	1.41E-09
Congener total: (9)							1.60E-04
B-18 Landfill							
PCB 77	6.63	0.1522	0.0122	9.63E-02	1.17E-03	0.05	5.86E-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	5.35E-02	5.92E-04	0.0001	5.92E-08
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	5.35E-02	4.69E-04	0.00001	4.69E-09
PCB 123	6.98	0.1217	0.0097	8.03E-02	7.81E-04	0.00001	7.81E-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	5.35E-02	3.06E-04	0.0001	3.06E-08
PCB 157	7.62	0.0700	0.0056	5.35E-02	3.00E-04	0.0001	3.00E-08
PCB 167	7.50	0.0787	0.0063	5.35E-02	3.37E-04	0.00001	3.37E-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	5.35E-02	1.41E-04	0.00001	1.41E-09
Congener total: (9)							1.86E-04

Notes:
(1) Includes all 12 dioxin-like congeners analyzed.
(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 O5.4.15.
(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 O5.4.19
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	2.89E-01	3.52E-03	0.05	1.76E-04
PCB 81	6.34	0.1756	0.0140	1.26E-01	1.76E-03	0.1	1.76E-04
PCB 105	6.79	0.1384	0.0111	1.27E-01	1.40E-03	0.0001	1.40E-07
PCB 114	6.98	0.1217	0.0097	1.27E-01	1.24E-03	0.0001	1.24E-07
PCB 118	7.12	0.1096	0.0088	1.28E-01	1.12E-03	0.00001	1.12E-08
PCB 123	6.98	0.1217	0.0097	1.62E-01	1.58E-03	0.00001	1.58E-08
PCB 126	6.98	0.1217	0.0097	1.27E-01	1.24E-03	0.1	1.24E-04
PCB 156	7.60	0.0714	0.0057	1.29E-01	7.36E-04	0.0001	7.36E-08
PCB 157	7.62	0.0700	0.0056	1.29E-01	7.22E-04	0.0001	7.22E-08
PCB 167	7.50	0.0787	0.0063	1.29E-01	8.10E-04	0.00001	8.10E-09
PCB 169	7.41	0.0857	0.0069	2.92E-02	2.00E-04	0.001	2.00E-07
PCB 189	8.27	0.0330	0.0026	1.31E-01	3.45E-04	0.00001	3.45E-09
Congener total: [(9)]							4.77E-04
South							
PCB 77	6.63	0.1522	0.0122	2.29E-01	2.79E-03	0.05	1.39E-04
PCB 81	6.34	0.1756	0.0140	2.03E-01	2.85E-03	0.1	2.85E-04
PCB 105	6.79	0.1384	0.0111	1.12E-01	1.24E-03	0.0001	1.24E-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	1.16E-01	1.02E-03	0.00001	1.02E-08
PCB 123	6.98	0.1217	0.0097	2.10E-01	2.05E-03	0.00001	2.05E-08
PCB 126	6.98	0.1217	0.0097	2.10E-01	2.05E-03	0.1	2.05E-04
PCB 156	7.60	0.0714	0.0057	1.22E-01	6.98E-04	0.0001	6.98E-08
PCB 157	7.62	0.0700	0.0056	1.22E-01	6.85E-04	0.0001	6.85E-08
PCB 167	7.50	0.0787	0.0063	2.17E-01	1.36E-03	0.00001	1.36E-08
PCB 169	7.41	0.0857	0.0069	1.20E-01	8.20E-04	0.001	8.20E-07
PCB 189	8.27	0.0330	0.0026	1.31E-01	3.46E-04	0.00001	3.46E-09
Congener total: [(9)]							6.30E-04
Southwest							
PCB 77	6.63	0.1522	0.0122	2.20E-01	2.68E-03	0.05	1.34E-04
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	2.22E-01	2.46E-03	0.0001	2.46E-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	2.26E-01	1.98E-03	0.00001	1.98E-08
PCB 123	6.98	0.1217	0.0097	2.24E-01	2.18E-03	0.00001	2.18E-08
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	2.32E-01	1.32E-03	0.0001	1.32E-07
PCB 157	7.62	0.0700	0.0056	2.32E-01	1.30E-03	0.0001	1.30E-07
PCB 167	7.50	0.0787	0.0063	2.31E-01	1.45E-03	0.00001	1.45E-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	1.31E-01	3.44E-04	0.00001	3.44E-09
Congener total: [(9)]							3.96E-04
B-18 Landfill							
PCB 77	6.63	0.1522	0.0122	4.70E-01	5.72E-03	0.05	2.86E-04
PCB 81	6.34	0.1756	0.0140	2.10E-01	2.94E-03	0.1	2.94E-04
PCB 105	6.79	0.1384	0.0111	1.12E-01	1.24E-03	0.0001	1.24E-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	1.16E-01	1.01E-03	0.00001	1.01E-08
PCB 123	6.98	0.1217	0.0097	2.16E-01	2.11E-03	0.00001	2.11E-08
PCB 126	6.98	0.1217	0.0097	2.17E-01	2.11E-03	0.1	2.11E-04
PCB 156	7.60	0.0714	0.0057	1.22E-01	6.95E-04	0.0001	6.95E-08
PCB 157	7.62	0.0700	0.0056	1.22E-01	6.83E-04	0.0001	6.83E-08
PCB 167	7.50	0.0787	0.0063	1.20E-01	7.59E-04	0.00001	7.59E-09
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	1.31E-01	3.45E-04	0.00001	3.45E-09
Congener total: [(9)]							7.93E-04

Notes:

(1) Includes all 12 dioxin-like congeners analyzed.

(2) Log Kow source: ORNL (2009).

(3) Basis for BTF (biotransfer factor from diet to fat): diet-to-fat transfer equation from RTI (2005): $\text{Log BTF} = -0.099(\text{log Kow})^2 + 1.07(\text{log Kow}) - 3.56$

(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 O5.4.17.

(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 O5.4.20
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	5.5E+00	1.26	6.93E+00	0.05	3.47E-01
PCB 81	1.1E+00	1.26	1.39E+00	0.1	1.39E-01
PCB 105	1.1E+00	1.26	1.39E+00	0.0001	1.39E-04
PCB 114	1.1E+00	1.26	1.39E+00	0.0001	1.39E-04
PCB 118	1.1E+00	1.26	1.39E+00	0.00001	1.39E-05
PCB 123	2.7E+00	1.26	3.40E+00	0.00001	3.40E-05
PCB 126	1.1E+00	1.26	1.39E+00	0.1	1.39E-01
PCB 156	1.1E+00	1.26	1.39E+00	0.0001	1.39E-04
PCB 157	1.1E+00	1.26	1.39E+00	0.0001	1.39E-04
PCB 167	1.1E+00	1.26	1.39E+00	0.00001	1.39E-05
PCB 169	1.1E+00	1.26	1.39E+00	0.001	1.39E-03
PCB 189	1.1E+00	1.26	1.39E+00	0.00001	1.39E-05
Congener total: [7]					6.26E-01
South					
PCB 77	5.0E+00	1.26	6.30E+00	0.05	3.15E-01
PCB 81	5.0E+00	1.26	6.30E+00	0.1	6.30E-01
PCB 105	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 114	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 118	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
PCB 123	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
PCB 126	5.0E+00	1.26	6.30E+00	0.1	6.30E-01
PCB 156	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 157	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 167	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
PCB 169	5.0E+00	1.26	6.30E+00	0.001	6.30E-03
PCB 189	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
Congener total: [7]					1.58E+00
Southwest					
PCB 77	5.0E+00	1.26	6.30E+00	0.05	3.15E-01
PCB 81	5.0E+00	1.26	6.30E+00	0.1	6.30E-01
PCB 105	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 114	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 118	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
PCB 123	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
PCB 126	5.0E+00	1.26	6.30E+00	0.1	6.30E-01
PCB 156	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 157	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 167	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
PCB 169	5.0E+00	1.26	6.30E+00	0.001	6.30E-03
PCB 189	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
Congener total: [7]					1.58E+00
B-18 Landfill					
PCB 77	9.0E+00	1.26	1.13E+01	0.05	5.67E-01
PCB 81	5.0E+00	1.26	6.30E+00	0.1	6.30E-01
PCB 105	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 114	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 118	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
PCB 123	7.5E+00	1.26	9.45E+00	0.00001	9.45E-05
PCB 126	5.0E+00	1.26	6.30E+00	0.1	6.30E-01
PCB 156	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 157	5.0E+00	1.26	6.30E+00	0.0001	6.30E-04
PCB 167	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
PCB 169	5.0E+00	1.26	6.30E+00	0.001	6.30E-03
PCB 189	5.0E+00	1.26	6.30E+00	0.00001	6.30E-05
Congener total: [7]					1.84E+00

Table O5.4.20
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 all 12 dioxin-like congeners analyzed.

(2) Concentration shown is 1/2 reporting limit for both detected and non-detected congeners.

(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 O5.4.21
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	7.29E-05	1.22E-04	1	10	7E-5	1E-4	7E-6	1E-5
South	3.27E-04	5.46E-04	1	10	3E-4	5E-4	3E-5	5E-5
Southwest	3.27E-04	5.44E-04	1	10	3E-4	5E-4	3E-5	5E-5
B-18 Landfill	3.28E-04	5.46E-04	1	10	3E-4	5E-4	3E-5	5E-5
Diet of Carnivorous Prey								
BTF Approach								
Southeast	7.22E-05	1.20E-04	1	10	7E-5	1E-4	7E-6	1E-5
South	3.27E-04	5.45E-04	1	10	3E-4	5E-4	3E-5	5E-5
Southwest	3.27E-04	5.45E-04	1	10	3E-4	5E-4	3E-5	5E-5
B-18 Landfill	3.27E-04	5.46E-04	1	10	3E-4	5E-4	3E-5	5E-5
BAF Approach								
Southeast	1.80E-03	3.00E-03	1	10	2E-3	3E-3	2E-4	3E-4
South	8.17E-03	1.36E-02	1	10	8E-3	1E-2	8E-4	1E-3
Southwest	8.17E-03	1.36E-02	1	10	8E-3	1E-2	8E-4	1E-3
B-18 Landfill	8.17E-03	1.36E-02	1	10	8E-3	1E-2	8E-4	1E-3

Notes:
(1) TEDs for adults from Table O5.4.3 for herbivorous prey,
and from Tables O5.4.5 and O5.4.7 for carnivorous prey (BTF and BAF approaches, respectively).
(2) TEDs for juveniles from Table O5.4.4 for herbivorous prey,
and from Tables O5.4.6 and O5.4.8 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 O5.4.22
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	1.94E-01	1.95E-01	1	10	2E-1	2E-1	2E-2	2E-2
South	1.89E-01	1.90E-01	1	10	2E-1	2E-1	2E-2	2E-2
Southwest	9.94E-03	1.00E-02	1	10	1E-2	1E-2	1E-3	1E-3
B-18 Landfill	2.02E-01	2.02E-01	1	10	2E-1	2E-1	2E-2	2E-2

Notes:

(1) TEDs from Table O5.4.9 for adult and Table O5.4.10 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 O5.4.23
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	1.06E-02	1.09E-02	1	10	1E-2	1E-2	1E-3	1E-3
South	4.79E-02	4.96E-02	1	10	5E-2	5E-2	5E-3	5E-3
Southwest	4.79E-02	4.96E-02	1	10	5E-2	5E-2	5E-3	5E-3
B-18 Landfill	4.80E-02	4.96E-02	1	10	5E-2	5E-2	5E-3	5E-3

Notes:

(1) TEDs from Table O5.4.11 for adult and Table O5.4.12 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 O5.4.24
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	1.17E-03	1.20E-03	10	100	1E-4	1E-4	1E-5	1E-5
South	2.94E-03	3.01E-03	10	100	3E-4	3E-4	3E-5	3E-5
Southwest	2.93E-03	3.00E-03	10	100	3E-4	3E-4	3E-5	3E-5
B-18 Landfill	3.41E-03	3.49E-03	10	100	3E-4	3E-4	3E-5	3E-5
Diet of Carnivorous Prey								
BAF Approach								
Southeast	NC	4.22E-02	10	100	NC	4E-3	NC	4E-4
South	NC	1.07E-01	10	100	NC	1E-2	NC	1E-3
Southwest	NC	1.07E-01	10	100	NC	1E-2	NC	1E-3
B-18 Landfill	NC	1.24E-01	10	100	NC	1E-2	NC	1E-3

Notes:

(1) TEDs for adults with a diet of herbivorous prey are from Table O5.4.13 for adult males and Table O5.4.14 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 O5.4.15 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 O5.4.25
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	4.37E-01	4.45E-01	10	100	4E-2	4E-2	4E-3	4E-3
South	5.82E-01	5.92E-01	10	100	6E-2	6E-2	6E-3	6E-3
Southwest	3.67E-01	3.72E-01	10	100	4E-2	4E-2	4E-3	4E-3
B-18 Landfill	7.29E-01	7.42E-01	10	100	7E-2	7E-2	7E-3	7E-3

Notes:

(1) TEDs from Table O5.4.16 for adult male and Table O5.4.17 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 O5.4.26
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 Exposure Area	TEC in Egg (ng/kg wet wt) (1)	TRV (ng/kg wet wt)		HQ_{low} (3)	HQ_{high} (4)
		Low (2)	High (2)	Egg/ Embryo	Egg/ Embryo
Burrowing Owl					
BTF Approach					
Southeast	6.39E-05	66	150	1E-6	4E-7
South	1.60E-04	66	150	2E-6	1E-6
Southwest	1.60E-04	66	150	2E-6	1E-6
B-18 Landfill	1.86E-04	66	150	3E-6	1E-6
BAF Approach					
Southeast	6.26E-01	66	150	9E-3	4E-3
South	1.58E+00	66	150	2E-2	1E-2
Southwest	1.58E+00	66	150	2E-2	1E-2
B-18 Landfill	1.84E+00	66	150	3E-2	1E-2
Western Meadowlark					
BTF Approach					
Southeast	4.77E-04	66	150	7E-6	3E-6
South	6.30E-04	66	150	1E-5	4E-6
Southwest	3.96E-04	66	150	6E-6	3E-6
B-18 Landfill	7.93E-04	66	150	1E-5	5E-6
BAF Approach					
Southeast	6.26E-01	66	150	9E-3	4E-3
South	1.58E+00	66	150	2E-2	1E-2
Southwest	1.58E+00	66	150	2E-2	1E-2
B-18 Landfill	1.84E+00	66	150	3E-2	1E-2

Notes:
(1) Egg TECs based on the BTF approach are from Table O5.4.18 for the burrowing owl, Table O5.4.19 for the meadowlark. Egg TECs based on the BAF approach are from Table O5.4.20 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 O5.4.27
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	7E-5	1E-4		7E-6	1E-5	
South	3E-4	5E-4		3E-5	5E-5	
Southwest	3E-4	5E-4		3E-5	5E-5	
B-18 Landfill	3E-4	5E-4		3E-5	5E-5	
Carnivorous prey						
Southeast	7E-5	1E-4		7E-6	1E-5	
South	3E-4	5E-4		3E-5	5E-5	
Southwest	3E-4	5E-4		3E-5	5E-5	
B-18 Landfill	3E-4	5E-4		3E-5	5E-5	
BAF Approach						
Carnivorous prey						
Southeast	2E-3	3E-3		2E-4	3E-4	
South	8E-3	1E-2		8E-4	1E-3	
Southwest	8E-3	1E-2		8E-4	1E-3	
B-18 Landfill	8E-3	1E-2		8E-4	1E-3	
San Joaquin Pocket Mouse	Adult	Juvenile		Adult	Juvenile	
Southeast	2E-1	2E-1		2E-2	2E-2	
South	2E-1	2E-1		2E-2	2E-2	
Southwest	1E-2	1E-2		1E-3	1E-3	
B-18 Landfill	2E-1	2E-1		2E-2	2E-2	
Tulare Grasshopper Mouse	Adult	Juvenile		Adult	Juvenile	
Southeast	1E-2	1E-2		1E-3	1E-3	
South	5E-2	5E-2		5E-3	5E-3	
Southwest	5E-2	5E-2		5E-3	5E-3	
B-18 Landfill	5E-2	5E-2		5E-3	5E-3	
Burrowing Owl	Adult Male	Female/Juvenile	Egg	Adult Male	Female/Juvenile	Egg
BTF Approach						
Herbivorous prey						
Southeast	1E-4	1E-4	1E-6	1E-5	1E-5	4E-7
South	3E-4	3E-4	2E-6	3E-5	3E-5	1E-6
Southwest	3E-4	3E-4	2E-6	3E-5	3E-5	1E-6
B-18 Landfill	3E-4	3E-4	3E-6	3E-5	3E-5	1E-6
BAF Approach						
Carnivorous prey (1)						
Southeast	NC	4E-3	9E-3	NC	4E-4	4E-3
South	NC	1E-2	2E-2	NC	1E-3	1E-2
Southwest	NC	1E-2	2E-2	NC	1E-3	1E-2
B-18 Landfill	NC	1E-2	3E-2	NC	1E-3	1E-2

Table O5.4.27
Summary of Hazard Quotients
Ecological Risk Assessment
PCB Congener Study for Kettleman Hills Facility
Kings County, California

Receptor / **Exposure Area**	**HQ_{low}**			**HQ_{high}**		
Western Meadowlark	Adult Male	Female/Juvenile	Egg	Adult Male	Female/Juvenile	Egg
BTF Approach						
Southeast	4E-2	4E-2	7E-6	4E-3	4E-3	3E-6
South	6E-2	6E-2	1E-5	6E-3	6E-3	4E-6
Southwest	4E-2	4E-2	6E-6	4E-3	4E-3	3E-6
B-18 Landfill	7E-2	7E-2	1E-5	7E-3	7E-3	5E-6
BAF Approach						
Southeast	NC	NC	9E-3	NC	NC	4E-3
South	NC	NC	2E-2	NC	NC	1E-2
Southwest	NC	NC	2E-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 0.2 (for the San Joaquin Pocket mouse in the Southeast, South, and B-18 Landfill exposure areas).

HQ = hazard quotient
HQ_{low} = exposure dose / NOAEL-based TRV
HQ_{high} = exposure dose / LOAEL-based TRV
NC = not calculated

Table O5.4.28
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**
0.14	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.59

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