

Appendix D—Chemical Toxicological Profiles

This appendix provides background information from toxicological profiles published by the Agency for Toxic Substances and Disease Registry (ATSDR) and information developed by the U.S. Environmental Protection Agency (USEPA) and the Office of Environmental Health Hazard Assessment (OEHHA). It highlights the toxicological effects of the primary contaminants that contribute to the air exposure pathway.

Acrolein (37)

- Used in the manufacture of many other chemicals, as pesticide in irrigation waters, water treatment ponds, recirculating process water system, and in military poison gas mixtures.
- Produced from combustion sources like forest fires, fireplaces and cigarette smoke, when gasoline or oil are burned at a car or power plant, and when fat burns.
- Enters body easily after breathing it.
- Causes eye, nose, and throat irritation.
- Decreased bactericidal activity of respiratory tract probably due to damage to epithelium.
- ATSDR acute (<14 days) inhalation minimal risk level (MRL) = 0.00005 ppm (eye irritation in humans).
- ATSDR intermediate (15-364 days) inhalation minimal risk level (MRL) = 0.000009 ppm (damage to epithelial of the bronchi and lungs in rats).
- USEPA reference concentration (RfC) = 0.02 $\mu\text{g}/\text{m}^3$ (nasal lesions in rats).
- ATSDR chronic (>365 days) oral minimal risk level (MRL) = 0.0005 mg/kg/day (decreased monocytes in female rats).
- Carcinogenicity: US Environmental Protection Agency (USEPA)—not classifiable; U.S. Department of Health and Human Services (DHHS)—not classified; International Agency for Research on Cancer (IARC)—not classifiable.

Benzene (39)

- Naturally-occurring chemical, also in top 20 (by volume) of chemicals produced in the U.S.; used in a very wide range of products and industrial processes; found in environment as a result of both human and natural processes.
- Degrades relatively quickly in air, slowly in soil and water; does not bioaccumulate.
- Enters body through inhalation, ingestion, and dermal absorption.
- Adverse health effects due to intermediate or chronic exposures include disruption of blood production and possible reproductive problems in women.
- USEPA reference dose (RfD) = 0.004 mg/kg/day (decreased lymphocyte count in humans).
- USEPA reference concentration (RfC) = 30 $\mu\text{g}/\text{m}^3$ (decreased lymphocyte count in humans).
- OEHHA reference exposure level (REL) = 60 $\mu\text{g}/\text{m}^3$ (blood system, developmental and nervous system effects).
- ATSDR intermediate inhalation minimal risk level (MRL) = 4 ppb (13 $\mu\text{g}/\text{m}^3$) (neurological effects in mice).
- USEPA oral slope factor = $5.5 \times 10^{-2} (\text{mg}/\text{kg}/\text{day})^{-1}$.
- OEHHA inhalation unit risk = $2.9 \times 10^{-5} (\mu\text{g}/\text{m}^3)^{-1}$.
- USEPA inhalation unit risk = $7.8 \times 10^{-6} (\mu\text{g}/\text{m}^3)^{-1}$.

- Carcinogenicity: U.S. Environmental Protection Agency (USEPA)—human carcinogen (due to its ability to cause leukemia); U.S. Department of Health and Human Services (DHHS)—known human carcinogen; International Agency for Research on Cancer (IARC)—human carcinogen (sufficient human evidence).

Dichlorodifluoromethane (40)

- Colorless gas with an ether-like odor belonging to a class of chemicals known as chlorofluorocarbons.
- Common in refrigerants (freon).
- Manmade chemical; no naturally-occurring sources.
- Exposure to high levels is known to cause dizziness, tremors, asphyxia, cardiac arrhythmias.
- Target organs: cardiovascular, peripheral nervous system.
- Chronic exposure in animals has been associated with decreased body weights.
- USEPA ambient air preliminary remedial goal (PGR) = 210 $\mu\text{g}/\text{m}^3$ (42.5 ppbv).
- USEPA reference dose (RfD) = 0.2 mg/kg/day (decreased body weights in rats).
- Carcinogenicity: U.S. Environmental Protection Agency (USEPA)—not classifiable; U.S. Department of Health and Human Services (DHHS)—not classified; International Agency for Research on Cancer (IARC)—not classifiable.

c-1,3-Dichloropropylene (41)

- Manufactured chemical; does not occur naturally in the environment; colorless liquid with a sweet smell.
- Two forms of 1,3-dichloropropylene: cis-1,3-dichloropropylene and trans-1,3-dichloropropylene. Both are very similar to each other and are usually present in different amounts in mixtures.
- Mainly used in farming to kill nematodes, which are pests that eat the roots of crops. Often sprayed undiluted directly on the soils of vegetable and tobacco crops.
- People may be exposed to 1,3-dichloropropylene by breathing contaminated air, touching contaminated surfaces, and drinking contaminated water.
- Workers exposed to high levels of 1,3-dichloropropylene have been known to have irritated skin, eyes, nose and throats, coughs, nausea, headaches, and fatigue. Short-term exposure to 1,3-dichloropropylene in animals have shown damage to the nose and lung tissues.
- ATSDR chronic inhalation minimal risk level (MRL) = 9.1 $\mu\text{g}/\text{m}^3$ (2.0 ppbv) (nasal respiratory effects in mice).
- USEPA reference dose (RfD) = 0.03 mg/kg/day (chronic irritation of the forestomach in rats).
- Carcinogenicity: U.S. Environmental Protection Agency (USEPA)—likely a human carcinogen (inadequate human, sufficient animal studies); U.S. Department of Health and Human Services (DHHS)—reasonably anticipated to be a carcinogen; International Agency for Research on Cancer (IARC)—possibly carcinogenic to humans (sufficient evidence in animal studies).

Hydrogen Sulfide (42)

- Naturally-occurring chemical; colorless, flammable gas. Often a gaseous off-gas product of petroleum chemicals. Also produced from manmade processes.
- Enters body through breathing.
- Adverse health effects due to short term exposure include burning/irritation of mucousal lined passages (i.e., nasal, lungs), cough, and fluid in lungs. Higher acute concentrations can lead to death.
- Chronic low level exposures have been found to produce fatigue, loss of appetite, poor memory, and dizziness.
- ATSDR acute inhalation minimal risk level (MRL) = $97.6 \mu\text{g}/\text{m}^3$ (70 ppbv) (changes in pulmonary functions in asthmatics).
- ATSDR intermediate inhalation minimal risk level (MRL) = $41.8 \mu\text{g}/\text{m}^3$ (30 ppbv) (inflammation of nasal mucosa in mice).
- USEPA reference concentration (RfC) = $2 \mu\text{g}/\text{m}^3$ (1.43 ppbv) (lesions in the nasal mucosa in rats).
- Carcinogenicity: U.S. Environmental Protection Agency (USEPA)—not classifiable; U.S. Department of Health and Human Services (DHHS)—not classified; International Agency for Research on Cancer (IARC)—not classifiable.

Methylene Chloride (Dichloromethane) (39)

- Synthetic chemical, widely used in solvents, paint strippers, and other products.
- Evaporates easily, but does not easily dissolve in water.
- Enters the body most commonly through breathing, but also through ingestion and dermal absorption.
- Breaks down slowly in air.
- ATSDR chronic oral minimal risk level (MRL) = 0.06 mg/kg/day (liver effects in rats).
- ATSDR acute inhalation minimal risk level (MRL) = $2,085 \mu\text{g}/\text{m}^3$ (600 ppbv) (liver effects in rats).
- ATSDR chronic inhalation minimal risk level (MRL) = $1,042 \mu\text{g}/\text{m}^3$ (300 ppbv) (liver effects in rats).
- USEPA reference dose (RfD) = 0.06 mg/kg/day (liver effects in rats).
- USEPA oral cancer slope factor = $0.0075 (\text{mg}/\text{kg}/\text{day})^{-1}$.
- Carcinogenicity: U.S. Environmental Protection Agency (USEPA)—probable human carcinogen (inadequate human, sufficient animal studies); U.S. Department of Health and Human Services (DHHS)—reasonably anticipated to be a carcinogen; International Agency for Research on Cancer (IARC)—possibly carcinogenic to humans (inadequate evidence in humans, sufficient evidence in animal studies).

Tetrachloroethylene (Perchloroethylene (PCE)) (43)

- Synthetic chemical used as a dry cleaning fluid, a degreaser, and as a starting material for other products.
- Evaporates quickly, but breaks down very slowly.

- Can travel easily through soils to reach groundwater.
- Inhalation most common way to enter body, also ingestion if drinking water is contaminated;
- Adverse health effects due to chronic inhalation exposure possibly include reproductive effects in women.
- Higher levels of exposure in animals may cause liver and kidney damage.
- ATSDR chronic inhalation minimal risk level (MRL) = 27 $\mu\text{g}/\text{m}^3$ (40 ppbv) (neurological effects in humans);
- USEPA reference dose (RfD) = 0.01 mg/kg/day (liver effects in mice).
- OEHHA cancer slope factor = $0.021 (\text{mg}/\text{kg}/\text{day})^{-1}$.
- Carcinogenicity: U.S. Environmental Protection Agency (USEPA)—under review; U.S. Department of Health and Human Services (DHHS)—reasonably anticipated to be a carcinogen (inadequate human, sufficient animal studies); International Agency for Research on Cancer (IARC)—probably carcinogenic to humans (limited human, sufficient animal studies).

Tetrahydrofuran (THF) (44)

- Tetrahydrofuran is a synthetic solvent used in the production of resins.
- People may be exposed to tetrahydrofuran through breathing vapors, skin contact, and through ingestion of contaminated water and food.
- Data concerning the toxicity of tetrahydrofuran in humans is quite limited.
- Reports of animal studies document irritation of the skin and mucous membranes, including the eyes, nose, and upper respiratory tract, as the predominant effect from lower exposures (about 100-200 ppm). High acute doses (about 25,000 ppm) produced anesthesia with delayed induction and recovery periods, accompanied by a fall in blood pressure and strong respiratory stimulation. The margin of safety between anesthesia and death is small.
- Two cases of occupational exposure to THF were reported. The symptoms included irritation of mucous membranes, nausea, headache, dizziness, and possible cytolytic hepatitis. The effects on mucous membranes and the central nervous system resolved within a few hours after cessation of exposure.
- USEPA preliminary remedial goal (PRG) = 0.99 $\mu\text{g}/\text{m}^3$ (0.34 ppbv) (kidney and liver carcinomas in animals).
- Carcinogenicity: U.S. Environmental Protection Agency (USEPA)—probable carcinogen (inadequate human, sufficient animal studies); U.S. Department of Health and Human Services (DHHS)—reasonably anticipated to be a carcinogen (inadequate human, sufficient animal studies); International Agency for Research on Cancer (IARC)—probably carcinogenic to humans (limited human, sufficient animal studies).

Toluene (19)

- Naturally-occurring chemical, also occurs as a result of industrial processes.
- Widely used solvent in many industrial processes and products.
- Enters body through ingestion, breathing, and dermal absorption.
- Adverse health effects due to intermediate and chronic exposures include tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, and loss of appetite.

- ATSDR chronic inhalation minimal risk level (MRL) = 0.08 ppm (0.30 mg/m³) (neurological effects in humans).
- ATSDR intermediate oral minimal risk level (MRL) = 0.02 mg/kg/day (neurological effects in mice).
- USEPA reference dose (RfD) = 0.2 mg/kg/day (increased organ weight in rats).
- USEPA reference concentration (RfC) = 400 µg/m³ (neurological effects in humans).
- USEPA maximum contaminant level (MCL) for drinking water = 1000 ppb.
- Carcinogenicity: U.S. Environmental Protection Agency (USEPA)—not classifiable; U.S. Department of Health and Human Services (DHHS)—not classified; International Agency for Research on Cancer (IARC)—not classifiable.

**Appendix E—Public Comments and Responses from the California
Department of Health Services**

On March 17, 2005, this public health assessment (PHA) for the Casmalia Resources Superfund Site was released in draft for public comment. The PHA was mailed to all of the residents in the town of Casmalia and other interested parties. The comment period ended on May 13, 2005.

The California Department of Health Services (CDHS) received comments from the U.S. Environmental Protection Agency (USEPA) and the Department of Toxic Substances Control (DTSC). The comments are provided in the following pages. CDHS responses are provided in *italics*.

Comments Submitted by the USEPA

1) Summary, General Comment: It would be helpful to add a paragraph to describe the Remedial Investigation (RI) that the CSC is currently implementing under an EPA approved RI/FS Work Plan and under EPA oversight. The RI/FS process seeks to identify the nature and extent of contamination, assess contaminant fate and transport, conduct a baseline risk assessment, and identify a final remedy. The RI is being performed under an EPA- approved RI/FS Work Plan, which provides detailed descriptions of the Site background, setting and the work to be performed as part of the RI. The RI field investigations began in 2004 and are targeted for completion in late 2005. The RI will help quantify the current and future exposures to human health from site-related contaminants via potential air, surface water, sediment, soil, and groundwater pathways.

CDHS Response: *The summary discusses the RI/FS process underway at the site, in detail appropriate for a “summary.” The purpose of the summary is to provide the audience (community) with the main conclusions and recommendations of the PHA, using lay terminology. CDHS has expanded the discussion about the RI/FS process in the main body of the PHA.*

2) Summary, Page 1, Paragraph 2: Site location with respect to town of Casmalia: Please add some additional language describing the geographic relationship between the Site and the town of Casmalia. A brief discussion of topography and meteorological conditions (e.g., wind directions) seems pertinent in order to set the stage for later discussions concerning exposure routes and possible site-related impacts.

CDHS Response: *The summary provides a discussion of the geographical relationship between the town of Casmalia and the Site in detail appropriate for a “summary.” No changes have been made to the summary.*

3) Site Description and History, Page 4, Paragraph 2: Again, please expand on the geographic relationship between the Site and the town of Casmalia with respect to topography and meteorological conditions. This is pertinent with respect to later discussions regarding exposure pathways.

CDHS Response: *The geographic relationship, topography, and meteorological conditions are discussed in the “Background,” “Geologic Setting,” and “Environmental Contamination/Pathways Analysis/Public Health Implications” sections of the PHA. In an*

effort to make the PHA more accessible to the public we try to avoid unnecessary repetition, which results in shorter documents that are more likely to engage the community. No changes have been made to the summary.

4) Summary, Page 2, last Paragraph: The Draft Report states that no site-related contaminants have been detected in the municipal water supply drawn from the local groundwater basin. It is not clear from the report whether the groundwater basin is located underneath the town of Casmalia or whether it is in another area. Please clarify that the municipal water supply for the town of Casmalia is withdrawn from a well (Casmite Well) located within the Santa Maria Groundwater Basin (the “local groundwater basin”). Please clarify that the source of the town's water supply (Santa Maria Groundwater Basin) is located to the north of both the Site and the town of Casmalia and is not directly related to groundwater underlying the Site or the town of Casmalia.

CDHS Response: *As indicated in CDHS’ responses to comments 1-3 above, the appropriate level of detail is provided in the summary. A detailed discussion of the local groundwater basin and the municipal water supply for the town of Casmalia is provided in the main body of the PHA. No changes have been made to the summary.*

5) Site Description and History, Page 5, Paragraph 2: The Draft Report describes the Site air monitoring system currently in place as consisting of two photoionization detectors (PIDs) that were installed in November 2003. Please note that the system is just concluding its start-up phase, and EPA and the CSC are developing an action plan to address any potential releases. This could include potential chemical-specific sampling and additional air monitoring closer to the town of Casmalia. EPA will coordinate with the community as these protocols are developed and implemented.

CDHS Response: *The text has been modified to reflect the comment.*

6) Site Description and History and PID, Page 5, Paragraph 2, PIDs: The PID instrumentation at the southern Site perimeter may provide an indication of releases from the Site, when used in conjunction with other information. The PIDs, however, are not intended to provide quantitative estimates of potential exposures at receptor points within the community, located approximately 1.4 miles south of the Site.

CDHS Response: *The text has been modified to reflect the comment.*

7) Agency History, Consent Decree Related to Clean Up, Page 6: The Consent Decree was filed under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA), Section 7003. Please see the Consent Decree for the full citations.

CDHS Response: *The text has been modified to reflect the comment.*

8) Consent Decree Related to Cleanup, Page 6, Last Paragraph: The Casmalia Steering Committee (CSC) is implementing the remedial investigation (RI) under an EPA approved work plan and under EPA oversight as specified in the Consent Decree.

CDHS Response: *The text has been modified to reflect the comment.*

9) Consent Decree Related to Cleanup, Page 6, Last Paragraph: The Draft Report document includes one sentence that notes that EPA is currently conducting a Remedial Investigation/feasibility Study (RI/FS). Please elaborate. The CSC is currently in the process of undertaking a Remedial Investigation (RI) as part of the RI/FS process. As specified in the Consent Decree, the CSC is responsible for undertaking the RI and FS work activities under EPA oversight. The sampling and monitoring activities associated with the RI will assess informational needs identified in the ATSDR public health assessment.

CDHS Response: *The text has been modified to reflect the comment.*

10) Overview of Casmalia Site Features, Page 7, Last Paragraph: The Draft Report states that a single final cover system (a cap) was constructed over four of the six landfills. The report should identify these as multiple final cover systems that were installed as discrete capping projects for individual landfills. The Draft Report also states that corrective action was performed beginning in the summer of 2001 and was completed in January 2002 for the final cover system that was constructed for the four landfills (Pesticide/Solvent, Acid, Heavy Metals, Caustics/Cyanide) between 1999 and 2002. Please note that it is not clear for which of these landfill(s) corrective action was performed. It should be clarified that the corrective action was only performed for the Pesticide/Solvent Landfill, which was constructed in 1999. The other three landfills were constructed in 2001 and 2002. Please contact EPA for further details.

CDHS Response: *The text has been modified to reflect the comment.*

11) Overview of Casmalia Site Features, Page 8, Paragraph 1: The Draft Report states that the RCRA canyon landfill will likely be excavated and placed in the PCB landfill as part of the RI/FS work at the Site. This action has not yet been determined because the RI/FS process is not complete. It should be clarified that the RCRA Canyon Landfill was originally intended to receive RCRA wastes but never did so. This landfill received wastes from other onsite areas in late 1983 to early 1984 that were subsequently removed in 1989 (1,300 cubic yards of waste and interim cover material along with 1,500 cubic yards of underlying soil and rock) and placed in the Pesticides/Solvents landfill in June 1989. The RI/FS work will characterize the RCRA Canyon Landfill and assess potential needs for remediation.

CDHS Response: *The text has been modified to reflect the comment.*

12) Overview of Casmalia Site Features, Page 8, Bullet 1: The Draft Report states that subsurface containment structures include subsurface barriers and containment trenches downgradient of the PCB Landfill and Pesticide/Solvent Landfill. This is not entirely correct; it should be clarified that the PCB Landfill only has a clay barrier but does not have a containment trench.

CDHS Response: The text has been modified to reflect the comment.

13) Overview of Casmalia Site Features, Page 8, Last Paragraph: The Draft Report states that extracted liquids from the Gallery Well and Sump 9B were sent offsite for disposal and placed untreated in the Pesticides/Solvents landfill until 1995. This is not entirely correct; no extracted liquids from the Gallery Well or Sump 9B were placed into the Pesticides/Solvents Landfill from 1992 to 1996 during EPA's onsite actions. These liquids were only sent offsite for disposal until the onsite treatment system was constructed.

CDHS Response: The text has been modified to reflect the comment.

14) Overview of Casmalia Site Features, Page 9, Paragraph 0: The Draft Report states that liquids from the sumps and the Perimeter Source Control Trench (PSCT) are currently being treated onsite and released to one of three ponds. Not all of these liquids are treated. Liquids extracted from the PSCT sumps are discharged to Pond 18 after treatment using granular activated carbon (GAC) and liquids extracted from the Plume Capture Trench (PCT) sumps are discharged to the Runoff Control Facility (RCF) and A-Series Pond with no treatment.

CDHS Response: The text has been modified to reflect the comment.

15) Overview of Casmalia Site Features, Page 9, Paragraph 1: The Draft Report notes that other subsurface features include approximately 40 monitoring wells onsite and approximately 20 monitoring wells offsite, and that monitoring wells are sampled quarterly to continually evaluate the potential migration of site related contaminants and monitor changes in the water table. These numbers are incorrect. The size of the groundwater monitoring network and the number of locations of monitoring wells and piezometers is substantially larger than this. The following should be clarified:

- Before the RI/FS field work began in 2004, there were over 300 monitoring wells and piezometers located both onsite and offsite. The routine groundwater monitoring program included the following:
 - Semiannual sampling and laboratory analysis of 57 groundwater monitoring wells/piezometers, 9 extraction wells, and 5 ponds.
 - Quarterly water levels measurements of 255 wells/ piezometers and extraction wells.
- During RI/FS field work, which began in 2004, the groundwater monitoring program included the following:
 - semiannual sampling and laboratory analysis of 90 groundwater monitoring wells/piezometers, 11 extraction wells, 5 ponds, and 4 offsite water supply wells.
 - Quarterly water levels measurements of 321 wells/piezometers and extraction wells (including 40 that have been installed as part of RI/FS activities).
- After RI/FS field work, which is planned to conclude in late 2005, the groundwater monitoring program will include the following, which is subject to change pending the findings of the RI/FS work:

- Semiannual sampling and laboratory analysis of 60 groundwater monitoring wells/piezometers, 9 extraction wells, S ponds.
- Quarterly water levels measurements of 321 wells and piezometers.

The number and locations of onsite and offsite wells monitored has been adjusted since the current groundwater monitoring program began in 1997 in order to optimize the data collection program. In addition to perimeter groundwater monitoring at the south part of the Site, there are approximately 1-dozen groundwater monitoring wells currently being monitored for groundwater in the A-, B-, and C-Drainages between the Site and the town of Casmalia to help assess whether contaminants are migrating from the Site to the town.

CDHS Response: The text has been modified to reflect the comment.

16) Site Visits. Page 15, Paragraph 1: The Draft Report states that CDHS observed “a thick black liquid oozing from the ground” of the PCB Landfill and that the Site Operations Manager said that this liquid was very common in that area. Please note that this black liquid does not occur at the PCB Landfill. It should be clarified that this liquid occurs at ground surface in a localized area over the Burial Trench Area.

CDHS Response: The text has been modified to reflect the comment.

17) Site Visits. Page 15, Paragraph 2: The Draft Report states that CDHS toured the well head for the Casmite well, which provides the town of Casmalia with drinking water. As commented above, it should be clarified that this source well is located in the Santa Maria Groundwater Basin north of both the Site and the town of Casmalia.

CDHS Response: A detailed discussion on the town of Casmalia’s municipal water supply is provided in the “Environmental Contamination/Pathways Analysis/Public Health Implications” section. We have added additional language to the text as suggested by the comment.

18) Community Health Concerns, Page 18, Paragraph 1: The Draft Report states that Unocal operates the municipal drinking water well for the town of Casmalia. As commented above, it should be clarified that this well is located in the Santa Maria Groundwater Basins north of the Site and the town of Casmalia.

CDHS Response: A detailed discussion on the town of Casmalia’s municipal water supply is provided in the “Environmental Contamination/Pathways Analysis/Public Health Implications” section, as well as the “Site Visit” section (see above comment and response).

19) Future Exposure to Groundwater if it were to be Used as Drinking Water, Page 22, Paragraph 1 (Summary Paragraph): The Draft Report recommends the installation of additional offsite groundwater monitoring wells in order to fully characterize the migration of contaminants from groundwater beneath the Site. A detailed evaluation of groundwater flow currently is being conducted as part of the RI, which includes extensive groundwater flow modeling, to assist in assessing the fate and transport of contaminants from the Site. EPA will determine the need for

and locations of additional onsite and offsite groundwater monitoring wells as part of the RI/FS and ultimate remedy selection processes.

CDHS Response: Comment noted.

20) Future Exposure to Groundwater if it were to be used as Drinking Water, Page 22, Paragraph 3: The Draft Report inaccurately summarizes the numbers and locations of monitoring wells and piezometers in the groundwater monitoring network. The groundwater monitoring network is actually much more extensive than described in the draft report. Please see prior EPA comment regarding an overview of the groundwater monitoring network.

CDHS Response: The text has been modified to reflect the comment.

21) Future Exposure to Groundwater if it were to be used as Drinking Water, Page 22, Paragraph 4: The Draft Report states that a number of chemicals detected beneath the Site in groundwater have also been detected in offsite monitoring wells and provides Table 5 to demonstrate this relationship. Table 5 provides examples of offsite detections in groundwater of chemicals known to exist onsite. As commented above, EPA will assess these offsite/detections and determine the need for additional onsite and offsite groundwater monitoring wells as part of the RI/FS and ultimate remedy selection processes. Some of the offsite detections that led to the data in Table 5 may not in fact be site-related, but instead may be artifacts of sampling and analysis procedures.

CDHS Response: Comment noted.

22) Exposure of Residents, Ranchers, and Recreationists to Contaminated Sediment and Surface Water in Streams and Seeps, Page 23, Paragraph 1 (Summary Paragraph): The Draft Report states that CDHS recommends that the surface water, sediments in Casmalia Creek, and seeps in the area be tested for PCBs, as well as for other contaminants that may have migrated into the local surface waters. As part of the 2004 RI field work, EPA has taken surface water and sediment surface soil samples along each of the drainages neighboring the Site (A-Drainage, B-Drainage, C-Drainage, North Drainage, and Casmalia Creek). These data are being evaluated and additional data will be collected to characterize potential offsite contamination in these media.

Regarding seeps, they are ephemeral (e.g., they occur during wet periods, but not dry periods). In general, seeps occur where the water table intersects ground surface and consequently, the potential for contaminants to be found in seeps can be monitored with existing groundwater monitoring wells. As commented above, there is an extensive groundwater monitoring network at the Site. This network, in addition to the groundwater modeling that will be performed as part of the RI/FS (described below), allows an understanding for the nature and extent of contamination in both onsite and offsite groundwater and potential seeps. One notable onsite seep immediately south of the Pesticides/Solvents Landfill is being controlled by groundwater extraction at Sump 9B. Groundwater extraction keeps this seep from occurring (ground surface is dry). The chemistry of this seep (before being controlled as it is today) was consistent with groundwater chemistry. EPA is currently not aware of offsite seeps that would have the potential to be impacted by site-related contaminants. An analysis for the potential for

contaminated offsite (and onsite) seeps will be performed as part of evaluating data from the groundwater monitoring network and performing the groundwater flow modeling.

CDHS Response: *Comments noted. Additional language has been added to the text.*

23) Exposure of Residents, Ranchers, and Recreationists to Contaminated Sediment and Surface Water in Streams and Seeps, Page 24, Paragraph 4: The Draft Report recommends that water and sediment for Casmalia Creek be sampled for site-related contaminants. As noted above, EPA has performed surface water and sediment surface soil sampling along each of the drainages neighboring the Site as part of the RI work. These data are being evaluated as part of the overall RI/FS process and additional data will be collected, if necessary, to characterize potential offsite contamination in these media.

CDHS Response: *Comments noted. Additional language has been added to the text.*

24) Exposure of Residents, Ranchers, and Recreationists to Contaminated Sediment and Surface Water in Streams and Seeps, Page 24, Paragraph 5: This paragraph contains speculative language and is somewhat unclear. The Draft Report states that there have been reports of active seeps directly adjacent to the Site, for which water analyses are not available, and that if seeps are found to be actively "spewing" water. Please describe the sources of the reports concerning the seeps. As commented above, seeps in the vicinity of the Site are ephemeral and occur during wet periods, but not dry periods. In general, these seeps "seep" and do not "spew" (a hyperbole) due to low-permeability geology, which is characteristic of the Site. An analysis for the potential for contaminated onsite and offsite seeps will be performed as part of evaluating data from the groundwater monitoring network and performing the groundwater flow modeling. Areas indicating a potential for contaminated offsite seeps will be further investigated, if warranted based on results of the RI. This further investigation could include field reconnaissance in targeted areas and potential sampling if seeps are found with sufficient water in the targeted area(s).

CDHS Response: *The text has been modified to reflect the comment.*

25) Potential Exposure to Vapor Emanating from Site Material Area After the Ponds were Closed and the Landfills Capped (2002- Present), Page 29, Paragraph 1 (Summary Paragraph): The Draft Report recommends that the two remaining landfills should be addressed as part of future remedial work. EPA currently is assessing these two landfills as part of the RI/FS process. The Draft Report also states that the remaining three onsite ponds receive only stormwater runoff that has been treated to remove most of the VOCs and SVOCs. This is not correct; none of the stormwater that flows into any of the five onsite ponds is treated. However, runoff from the capped areas is considered to be free of contaminants.

CDHS Response: *The text has been modified to reflect the comment.*

26) Potential Exposure to Vapor Emanating from Site Material After the Ponds Were Closed and the Landfills Capped (2002- Present), Page 30, Paragraph 1: At the request of the community, two PID systems have been installed on the southern Site perimeter to monitor for indications of

releases, when evaluated in conjunction with other information. The PIDs are not intended to monitor potential community exposures at receptor points within the town of Casmalia, nearly a mile and a half from the Site. As mentioned, EPA and CSC are developing an action plan to establish action levels and response actions to address indications of potential releases from the Site.

CDHS Response: Comment noted.

27) Potential Exposure to Vapor Emanating from Site Material Area After the Ponds were Closed and the Landfills Capped (2002- Present), Page 30, Paragraph 1: The Draft Report recommends that chemical-specific sampling take place when spills or releases are detected and a protocol be developed to assess the need for additional monitoring closer to the town of Casmalia. As commented above, two PID systems have been installed on the southern Site perimeter to monitor for indications of potential significant releases, when used in conjunction with additional information. The perimeter PID monitoring system is concluding the start-up phase and EPA and CSC are developing a plan to respond to potential releases. This could include (1) development of interim action levels and (2) identification of appropriate response actions that could be implemented in response to exceedances of certain action levels. EPA will consider the potential merits of requiring CSC to implement potential chemical-specific sampling and additional air monitoring closer to the town of Casmalia as part of the universe of potential response actions. EPA will coordinate with the town as these protocols are developed.

CDHS Response: CDHS supports the USEPA's commitment to coordinate with community members in the town of Casmalia in the development of a protocol.

28) Potential Exposure to Vapor Emanating from Site Material Area After the Ponds were Closed and the Landfills Capped (2002- Present), Page 30, Paragraph 1: There are substantial technical challenges associated with installation of monitoring systems within the town of Casmalia to (1) monitor and detect any site-related impacts, and (2) distinguish site-related impacts from potential more localized sources of contamination within the town. This PHA has referenced the significant distance from the Site (1.4 miles) and complex meteorological conditions that can create dispersion. Although EPA will continue to evaluate ambient air monitoring needs, initial monitoring efforts will emphasize onsite monitoring for potential Site releases.

CDHS Response: Comment noted. Additional language has been added to the text.

29) Exposure to Surface Soils in the Vicinity of the Site, Page 30, Paragraph 1: The Draft Report recommends testing of the surface soils for site-related contaminants. This issue is being addressed through the RI/FS process by sampling offsite surface water, surface soil, and sediment.

CDHS Response: Comment noted.

30) Exposure to Surface Soils in the Vicinity of the Site, Page 30, Paragraph 3: Same comment as above.

CDHS Response: Comment noted.

31) Conclusions, Page 34, Bullet 2. The Draft Report states that the extensive groundwater monitoring conducted at the Site, on-going investigations, addition of more offsite monitoring wells, combined with monitoring of the municipal drinking water supply will identify potential migration of contamination and allow for mitigation prior to any contaminated water being served to the public. As commented above, EPA agrees that these measures are important to assuring a safe drinking water supply to the community. EPA will determine the need for and locations of additional onsite and offsite groundwater monitoring wells as part of the RI/FS process.

CDHS Response: Comment noted.

32) Recommendations, Page 34, Item 1. The Draft Report recommends that chemical specific air sampling be conducted by the USEPA when an unintentional release is discovered onsite, or when the PIDs around the perimeter of the Site indicate a release. Please see previous comments regarding current efforts to develop a plan that includes action levels and response actions.

CDHS Response: Comment noted.

33) Recommendations, Page 34, Item 2. The Draft Report recommends that (1) Casmalia Creek and the sediments in the creek be sampled for PCBs and other site-related contaminants and (2) land within 0.5 miles of the Site be surveyed for active seeps and any seeps identified be sampled for all site-related contaminants. This issue is being assessed through the RI/FS process.

CDHS Response: Comment noted.

34) Recommendations, Page 34, Item 3. The Draft Report recommends offsite sampling of surface soil near the town of Casmalia to ensure the community is not currently being exposed from the landfill. Same comment. This issue is being assessed through the RI/FS process.

CDHS Response: Comment noted.

35) Recommendations, Page 34, Item 4. The Draft Report recommends that several monitoring wells north and south of the Site be installed to allow better characterization/identification of migration of contaminants offsite, toward the town of Casmalia and the Santa Maria Water Basin. As commented above, the Site has an extensive groundwater monitoring network that was in place before the RI/FS work began and has been supplemented with additional monitoring wells and piezometers as part of the RI/FS work. EPA and the responsible parties are currently conducting a detailed evaluation of groundwater flow, which includes groundwater modeling, to assess the fate and transport of contaminants from the Site. EPA will determine the need for and locations of any additional onsite and offsite groundwater monitoring wells as part of this RI/FS process in coordination with DTSC, the community, and an interagency committee of environmental agencies.

CDHS Response: Comment noted.

Comments Submitted by DTSC

DTSC's review focused on scientific content only and how the March 2005 revised PHA was revised to consider DTSC's prior comments. Comments are arranged from general to specific with the latter citing pages and paragraphs where appropriate. Review and comment to the PHA are provided by Dr. Gerald Chernoff and Ms. Caroline Rudolph for DTSC.

A PHA is required for each site placed on the federal National Priority List. The purpose of a PHA is to investigate past and current practices associated with the facility and determine whether adverse health effects are likely on the basis of exposure to site contaminants. DTSC found the revised PHA an improvement over the earlier version, and addresses many of the concerns raised by DTSC in its comments of July 2004. DTSC shares ATSDR's and the CDHS's concern about potential exposure to contaminants that are associated with closed landfills and generally agrees with the recommendations in the revised PHA, some of which are being addressed in the RI/FS. At the same time, DTSC feels that information regarding risks and hazards associated with the contaminants must be based on the best available science, and presented in a tone that encourages appropriate action without causing unnecessary alarm. Similarly, DTSC recommends articulating more clearly in the revised PHA the assumptions used for the "potential exposure to nearby ranchers from vapors emanating from the site when ponds received wastes (1973 – 1988)" exposure scenario. See the below comments for more detail on these manners.

General Comments

1. DTSC feels that information regarding risks and hazards associated with the contaminants must be based on the best available science, and presented in a tone that encourages appropriate action without causing unnecessary alarm.
 - **Ground Water Issues:** Throughout the text, it is noted that while there is a remote possibility that a continuous chain of fractures could exist that would allow the migration of contaminants from the site to the lower water basin, the existence of such a continuous chain of fissures has not been shown, and is highly improbable (pages 2, 10, and 22). In contrast, the concluding statement on page 23 that "...the extensive groundwater monitoring on site, investigations currently underway, the installation of additional off-site monitoring wells, and monitoring of the municipal drinking water supply *will identify potential migration of contaminants and allow for mitigation measures prior to the contaminated water being served to the public...*" (italics added) seems to assume that contaminants will reach the water supply, and that mitigation will be necessary. DTSC recommends that this conclusion be revised to reflect the improbability of contaminants reaching the drinking water aquifer.

CDHS Response: As stated by the comment, there is language throughout the text discussing the remote possibility of contaminants from Casmalia reaching the municipal water supply. The sentence prior to the sentence referenced in the comment states that it is "unlikely that

site-related contaminants will reach the local groundwater basin because of the geology underlying the site.” It is important not to take a single sentence out of context, but to read the paragraph in its entirety. The statement referred to in the comment provides an added level of assurance that contaminated drinking water would not be served to the public. We have added language (repetitious) to the text to reflect the comment.

- **Surface Water, Sediments, and Seeps:** DTSC shares the concern that sediments along the creeks and water drainages may be contaminated with polychlorinated biphenyls (PCBs) and had requested that sampling to evaluate this concern be conducted in the RI/FS. At the same time, DTSC is concerned that the description of “...seeps spewing water...” (pgs. 24 and 33) may be alarmist given the statement on page 11 that “...Most of the seeps in the area produce only minimally measurable discharge in the wet season and are dry during the summer months...” DTSC is not aware of any “...seeps spewing water...” and would be appreciative of the reference to detections of such seeps (pg. 33). If data are not available to support the presence of “...spewing seeps...” DTSC recommends that this language be removed from the document.

CDHS Response: *The text has been modified to reflect the comment.*

- **Health Effects of Past Vapor Exposures:** DTSC appreciates the concern the citizens of the area had in 1984 and 1985 when odors from the facility migrated to the community of Casmalia resulting in the closure of the elementary school. It is clear that the community was exposed to odiferous vapors during this period. Unclear are the acute health consequences of the exposures. As discussed on pages 12 to 14, community claims of adverse health effects from the exposures could not be substantiated in spite of studies conducted to specifically investigate the association between the exposures and reactive airway diseases, acute lymphocytic leukemia in children, and cleft palate, a relatively common birth defect. Given this lack of association, DTSC does not think it is correct to conclude on page 31 that, “...CDHS cannot rule out the possibility that some of these health outcomes were a result of breathing the vapors emanating from the site during the time the facility was accepting wastes...” DTSC would prefer to see a modified version of this conclusion along the lines, “...There is no data to support an association between known exposures to odiferous vapors emanating from the site during the time the facility was accepting wastes and health effects anecdotally reported from the community. If acute health effects were the result of such exposures, they were not of sufficient magnitude to be detected in studies specifically designed to investigate such associations...”

CDHS Response: *The PHA provides a discussion on the difficulties in linking disease with exposure and the ubiquitous nature of many of the health outcomes reported. While studies were conducted to investigate associations between health outcomes and exposure, these studies are limited in their ability to show an association due to limitations with the data. The text recommended by DTSC over states the precision of the studies conducted. The statements/conclusions in the PHA are accurate as currently written. No changes have been made to the text.*

2. In completing the assessment for past exposure to vapors from the site, a dilution factor of 10 was used based on the results of a gaseous tracer studies conducted in 1989. This 10-fold dilution factor was used in a risk assessment that found the risk to Casmalia residents from vapors at the site to be between 1.5E-03 and 8.2E-06 using the maximum and average vapor concentrations, respectively. DTSC would like to note that this dilution factor:
 - was based on a one-time study of seven tests during a nine day period which focused on a short-term, worst-case envisioned meteorological scenario of low wind, night-time drainage from the site to the town of Casmalia;
 - included the assumption that all of the vapors would be carried at the same rate as the tracers used in the study; and
 - that the short-term, worst-case meteorological conditions, which prompted the exposure would be continuous over a 30-year period.

DTSC recommends that these points be included in the discussion on past exposure to vapors.

CDHS Response: The text has been modified to reflect the comment (see Potential Exposure to Nearby Residents and Ranchers from Vapors Emanating From the Site When Ponds Received Wastes (1973 – 1988) section and footnote Table 4).

3. DTSC agrees with the majority of the recommendations but feels that a prioritization of the recommendations would be of value when it comes time to taking action. DTSC also recommends that the CDHS communicate with the U.S. EPA, DTSC, and the Central Coast Regional Water Quality Control Board so that remedial work being conducted at the site can be included in the report. An example is the planned sampling for contaminants in the creek beds.

CDHS Response: Comment noted.

4. In many locations the term “to date” is used in reference to media sampling (e.g., pages 10, 20, 22, 23, 30, etc). Use of the term should be avoided as it leads to ambiguity. For example, at the beginning of the paragraph on page 30, it is stated “...To date, no surface soil samples have been taken in the direction of Casmalia...” While such a statement was true when the PHA was initially drafted in the spring of 2004, since then, extensive sampling has been conducted between July and November 2004 as part of the site’s remedial investigation, including that of surface sampling in the direction of Casmalia.

CDHS Response: According to USEPA, sampling data (surface soils, sediment, etc.) collected as part of the RI/FS is still under review. There is language in the PHA describing the sampling activities ongoing at the site and an estimated time for completion.

Specific Comments

1. Page 5, Paragraph 3: The paragraph discusses general site operations since 1991 including the management of contaminated groundwater and installation of a perimeter air monitoring

system in November 2003. DTSC recommends for completeness, inclusion of the four landfill covers which were constructed between 1998 and 2002 in this paragraph.

CDHS Response: The text has been modified to reflect the comment.

2. Page 6, Third line: The PHA states "...In April 1979, the Toxic Substance Control Program of CDHS issued CR a State Hazardous Waste Permit..." The date of the permit issuance should be changed to May 3, 1979 (number 42-001-78).

CDHS Response: The text has been modified to reflect the comment.

3. Page 6, Paragraph 2: "Federal Permits for Operation of the Facility:" The paragraph summarizes the facility's operation under the federal "RCRA" interim status and multiple applications of a "Part B permit," and U.S. EPA issuing a Notice to Deny Permit for the facility in July 1988. It is true that a notice was issued by U.S. EPA and the hearing was cancelled when the facility withdrew its appeal. However, U.S. EPA also withdrew its notice. The facility continued to revise the Part B permit application until September 1991 when DTSC denied the permit application and U.S. EPA revoked the facility's interim status authorization to operate.

CDHS Response: The text has been modified to reflect the comment.

4. Page 7, Last Paragraph: The paragraph would be more accurately read if the following text were added: "...After the construction of the **Pesticides/Solvents landfill cap portion in 2000**, U.S. EPA deemed the cover system in its initial configuration...The CSC also placed permanent and temporary erosion control measures at and around the **Pesticides/Solvents** landfill area to prevent any potential damage from occurring during the **intervening** winter season of **2000**. Additional caps have also..."

CDHS Response: The text has been modified to reflect the comment.

5. Page 8, Paragraph 1: Since the paragraph discusses the waste placed in the RCRA landfill, the paragraph should also include that the 1300 cubic yards of waste and interim cover material, along with 1500 cubic yards of underlying soil and rock, were relocated to the Pesticides/Solvents landfill in June 1989 (Page 7 of the "Section 14.14 of the Part B Permit Application, RCRA Landfill Closure Plan, Casmalia Resources Hazardous Waste Management Facility," dated June 7, 1991 and prepared by Woodard-Clyde Consultants).

CDHS Response: Comment noted. This information is already included in the PHA.

6. Page 8, Paragraph 5: The paragraph discusses the site's subsurface containment features and concludes with a statement regarding the capture and treatment of "liquids from these extraction points."
 - a. It would be more accurate to state "capture and treatment of liquids from extraction points **to the interior of the site**" as the containment structures on the southern border of

the site (Perimeter Control Trenches) are pumped without treatment into the RCF and A-Series ponds.

- b. The correct name of the “Gallery well” is the ”Gallery **Collection Well**”
- c. The last bullet should read “Perimeter Control Trenches” (i.e., delete the word “Source”) and include a statement that liquids from these extraction structures are not treated prior to being pumped into the RCF and A-Series ponds.

CDHS Response: The text has been modified to reflect comments submitted by DTSC and USEPA, where appropriate.

7. Page 8, Last Paragraph: The PHA states “...Extracted liquids from the Gallery Well and Sump 9B were sent off site for disposal until 1995...” This is not entirely accurate:
 - a. Extracted liquid from the Gallery Collection Well and Sump 9B were sent off-site until **1985**;
 - b. Between 1980 and 1988, extracted liquids from the Gallery Collection Well were placed in the Pesticides/Solvents landfill without any prior treatment;
 - c. Between 1989 and 1991, liquids from Sump 9B were solidified and then placed in the Pesticides/Solvents landfill;
 - d. In 1998, the CSC dismantled the biological treatment portion of the treatment plant built by USEPA in 1995, while granulated activated carbon portion is still in operation;
 - e. Liquids from both the Gallery Collection Well and Sump 9B are currently sent off site for treatment and disposal; and
 - f. Liquids from the Perimeter Source Control Trench are placed on Pond 18, one of the **five** ponds on-site.

Please refer to Table 2-19 of the EPA approved Final RI/FS Work Plan for a chronology of the contaminated liquids extraction, treatment, and disposal of the Gallery Well and Sump 9B.

CDHS Response: The level of detail provided in the comment is not necessary for the intended audience (community members). We strive to provide information that is the most useful for community members in understanding potential exposure concerns related to the site. The text has been modified to reflect comments submitted by DTSC and USEPA, where appropriate.

8. Page 9, Paragraph 2: The paragraph notes other subsurface features included approximately 40 monitoring wells on-site and approximately 20 wells off-site and send wells are sampled quarterly. The paragraph should also note the total approximate 60 wells are part of the ground water chemical quality program for which monitoring occurs semi-annually. The 60 wells are also part of the ground water level program which totals approximately 320 wells on and around the site for which monitoring is conducted quarterly (*Semiannual Monitoring Report, RGMEW 12th SA Event, October 2003 – March 2004, Casmalia Waste Management Facility, Casmalia, California*, dated September 8, 2004 and prepared by MACTEC Engineering and Consulting, Inc.).

CDHS Response: The text has been modified to reflect comments submitted by DTSC and USEPA.

9. Page 11, Paragraph 4: The last sentence states that based on Reference 11, between 1984 and 1988 several thousand odor complaints were filed. The correct time period was between 1984 and **1986**. Reference 11 was written in January 1987.

CDHS Response: The text has been modified to reflect the comment.

10. Page 15, Paragraph 2: DTSC understands that the thick black liquid oozing from the ground of the PCB landfill was in fact tar that was located in the Burial Trench Area to the south and outside the PCB landfill boundary. Please clarify and correct as necessary.

CDHS Response: The text has been modified to reflect the comment.

11. Page 12, Paragraph 2: All claims were investigated by CDHS to determine if an imminent threat to the health of the surrounding community existed. But, the actual report signed by the then CDHS Director, Kenneth W. Kizer, MD., M.P.H., was published on January 21, 1987.

CDHS Response: The text has been modified to reflect the comment.

12. Page 17, Paragraph 3: The first sentence notes community health concerns first coming to the attention of CDHS in December 1985. The correct year was **1984**.

CDHS Response: The text has been modified to reflect the comment.

13. Page 24, Paragraph 3: The paragraph notes waters from the runoff ponds were “pre-treated for organics constituents.” This is incorrect. No waters were pre-treated prior to the emergency discharge which commenced on November 15, 1995 (Section 2.2.2, Release Monitoring of “*Final Report, Casmalia Resources, Santa Maria, CA,*” dated July 1996 and prepared by David W. Charters, U.S. EPA Environmental Response Team and Nancy J. Finley ERT/U.S. Fish and Wildlife Service).

CDHS Response: The text has been modified to reflect the comment.

14. Page 26, Last Paragraph: The referred meteorological study by Tracer Technologies was conducted under contract to the **California Air Resources Board**, not U.S. EPA. Why is there no mention made of the enhanced air monitoring system installed at the site and town of Casmalia during the surface impoundment closure periods of 1987 – 1989? The results of that extensive monitoring are available from DTSC and could be of significant use by CDHS in this exposure scenario. Please also see General Comment 2 regarding articulation of assumptions used.

CDHS Response: CDHS focused on data for the time periods when odor and health complaints were the most prevalent, prior to corrective/response actions taking place at the site. The data collected in 1987 – 1989 may provide additional information as it relates to estimating theoretical increased cancer risk, but it would not alter our conclusion regarding the potential for noncancer health effects to have occurred during the time period evaluated.

As discussed in the PHA, the data used to evaluate potential air exposures uses high-end assumptions, which may present an overestimation of the theoretical cancer risk. As you are aware, cancer risk estimates are a tool to help determine if further action is needed and should not be interpreted as an accurate prediction of the exact number of cancer cases that actually occur (the actual risk is unknown and may be as low as zero). We have added language discussing the intent of estimating theoretical cancer risks to the PHA for clarity. Taking these facts into account, we are moving forward and finalizing the PHA as written.

15. Page 29, Scenario Summary Paragraph: The paragraph should be corrected to read that the site quit accepting liquids for disposal in 1987 and there are five remaining ponds on-site, of which three received **untreated** storm water runoff.

CDHS Response: The text has been modified to reflect the comment.

16. Page 29, Paragraph 4: The landfills noted in the first sentence should read "...capped four (pesticides/solvents **landfill**, acids **landfill**, heavy metals..."

CDHS Response: The text has been modified to reflect the comment.

17. Page 30, Paragraph 1: The phrase "one could speculate" should be deleted and the paragraph rephrased: "speculation" should not be a factor in a professional assessment of the effect hazardous contaminants may potentially have on public health.

CDHS Response: One could argue that without data, any interpretation drawn is based on speculation. To be responsive to the comment, we have modified the statement which now reads, "it is possible that at this level, several chemicals may have exceeded their short-term exposure...".

Conclusion and Recommendations

DTSC's main concern with this report is the ambiguity of the term "indeterminate public health hazard." As discussed above, DTSC feels that a discussion on the uncertainty, or a qualitative assessment of the probability of the public health hazard, would be useful for risk communications purposes. Similarly, DTSC recommends that the assumptions that went into the past vapor exposure also be clearly laid out.

CDHS Response: The rationale for the "indeterminate public health hazard" determination is discussed for each pathway. The likelihood for certain scenarios to occur is discussed where appropriate. In situations where data gaps exist, CDHS will not make "qualitative" statements about potential health hazards given the magnitude of waste and complex geology at this site. CDHS visited Casmalia in April 2004, when the PHA was released for public comment. Staff went door-to-door and spoke with a number of community members, describing the PHA and conclusions (public health hazard determinations). All of the community members spoken to understood the language/terms and were not alarmed.

The assumptions used in vapor exposure pathway are discussed in the PHA.