

# **Health Consultation**

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**CONOCO SERVICE STATION SOIL CONTAMINATION  
REVIEW OF RISK ASSESSMENTS FOR GROUNDWATER  
AND SOIL TREATMENT SYSTEMS  
SACRAMENTO, SACRAMENTO COUNTY, CALIFORNIA**

**APRIL 24, 1997**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Agency for Toxic Substances and Disease Registry  
Division of Health Assessment and Consultation  
Atlanta, Georgia**

## **Health Consultation: A Note of Explanation**

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

**HEALTH CONSULTATION**

**CONOCO SERVICE STATION SOIL CONTAMINATION  
REVIEW OF RISK ASSESSMENTS FOR GROUNDWATER  
AND SOIL TREATMENT SYSTEMS  
SACRAMENTO, SACRAMENTO COUNTY, CALIFORNIA**

**Prepared by  
California Department of Health Services  
Under Cooperative Agreement with the  
Agency for Toxic Substance and Disease Registry**

## **BACKGROUND AND STATEMENT OF ISSUES**

The Agency for Toxic Substances and Disease Registry (ATSDR) has requested that the California Department of Health Services (CDHS) further review site data as a follow-up to a previous 1995 ATSDR Health Consultation. This current Health Consultation will discuss the risk assessments submitted as part of the permitting process for the soil and groundwater remediation activities. An evaluation of the petitioners medical history will be reviewed separately.

The Conoco site, formerly the location of two adjacent gasoline service stations, Conoco and Shell, is located at entrance of a residential area, 2520 Northgate Boulevard, Sacramento, California. Conoco reported the discovery of soil contamination in March of 1985 and groundwater contamination in April of 1985 to Sacramento County Environmental Management Department, Hazardous Materials Division, which is the regulatory authority for site investigation and remedial action. Investigations of the former Shell station revealed evidence of soil and groundwater contamination during that same time period (1). Soil and groundwater contaminants found at the site include gasoline total petroleum hydrocarbons (TPH), benzene, toluene, xylene, ethylbenzene, ethylene dibromide, tetraethyl lead, perchloroethylene and 1,4-dichlorobenzene (1, 2).

In June, 1987, remediation of the groundwater for Conoco began and consisted of one recovery well with a submersible pump and an air stripping unit. In September, 1988, remediation of the groundwater, for the Northgate Shell, began and consisted of two recovery wells with pneumatic pumps and a compressed air stripping unit. Remediation of the soil began in December, 1991 and consisted of twenty one vapor extraction wells, a vacuum blower, and a thermal oxidizer (3). Sacramento Metropolitan Air Quality Management District (SMAQMD), the responsible agency for oversight of operations related to the soil vapor treatment system and the groundwater treatment system, determined that air emissions of these chemicals were not at levels to pose an unacceptable health risk to the public (2). In July, 1994 the thermal oxidizer was replaced with a catalytic oxidizer. Remediation activities to the soil and groundwater were shut down in January, 1996 pending evaluation of current regulatory changes (4).

In 1992, ATSDR was petitioned by a resident and his family who were experiencing health problems which they believe to be the result of the soil and groundwater remediation activities that were taking place approximately 20 feet from their residence. Symptoms included dizziness, nausea, diarrhea, fatigue, muscle cramps, skin rashes, growths on various parts of the body, neurological disorders, shakiness, loss of body hair, and joint pain. The petitioner's pets (two dogs) also reportedly suffered abnormal hair loss. ATSDR concluded that a review of the site data was prudent.

In 1995, ATSDR completed a Health Consultation which discussed the potential for health impact posed by remediation activities and ambient air quality on- and off-site (1). Based on the limited available data, ATSDR concluded that there was insufficient

evidence to determine the site's contribution to the air quality surrounding the site and the petitioner's residence. Because of this, ATSDR recommended additional air sampling to determine if the emissions from the site pose any acute or chronic health threat to persons living in the immediate area. To our knowledge, additional air sampling was not performed.

The following discussion is based on the review of the risk assessments completed for the soil vapor extraction system (thermal oxidizer) and the air stripping tower, by Sacramento Metropolitan Air Quality Management District (SMAQMD) and DuPont Environmental Remediation Services (DERS).

As part of the original permitting of the air stripper and the thermal oxidizer, in 1991, SMAQMD used a SCREEN model to estimate the dose that the maximum exposed individual would receive. This dose is then used to calculate a theoretical cancer risk to the public, due to benzene emissions from the air stripper and the thermal oxidizer (5). The SCREEN model utilizes a normal distribution or Gaussian technique which estimates the time averaged contaminant concentration, in ambient air, down wind of the emission source. The normal distribution of pollutants will result in concentration estimates horizontally and vertically through the plume (6). In 1991, as part of SMAQMD's permit requirements, DuPont submitted equipment and emission rate parameters which were used in the development of a risk assessment

The input parameters SMAQMD used in the model were; physical stack height 18 feet (actual height 16 feet 3 inches), stack diameter 1 ft. (actual 2 ft.), and an emission rate of 0.09 lb./day (0.0046 g/sec). The model predicted the worst case benzene concentration to be 0.6300 ug/m<sup>3</sup>, at 90 meters (300 feet) from the source, based on a simple terrain configuration. Simple terrain is considered to be an area where terrain features are lower in elevation than the top of the source stack. SMAQMD used this concentration to derive a "health based risk factor" (carcinogenic risk through air exposure) for benzene of (1.3 x 10<sup>-7</sup>), which fell below the permit limit of (1.0 x 10<sup>-6</sup>) (4). SMAQMD issued a permit to construct (# 10126/10127) based on compliance to conditions stated in the permit (5).

To ensure permit compliance, DuPont performed influent and effluent vapor sampling at intervals specified in the permit (5). Laboratory analysis of effluent vapor samples were used in the SCREEN and PTPLU dispersion models to derive health based risk factors for benzene. Documentation by SMAQMD and DuPont indicate that health based risk factors for benzene ranged from (0.2 x 10<sup>-6</sup>) to (3.14 x 10<sup>-7</sup>) (7,8). In 1992, SMAQMD used the SCREEN model to derive health based risk factors for perchloroethylene (3.09 x 10<sup>-9</sup>) and 1,4, dichlorobenzene (6.8 x 10<sup>-9</sup>) (8).

CDHS staff visited the site in January, 1997. The Northgate Blvd. / Peralta Ave. neighborhood is a well established residential track consisting mostly of single story detached homes. According to 1990 census track data, 411 families, approximately 1692 people live within a 0.5 mile radius of the intersection of Northgate and Peralta. As stated earlier, remediation activities have been shut down pending reevaluation of regulatory changes, therefore, at the time of the site visit the two units were not operational. Our

observations focused mainly on the physical location of the two units with regard to the neighborhood. Observations included (Figure 1):

- 1) Close proximity of air emission units to nearest receptor (former residence of petitioner) ( 20 feet).
- 2) Heating / air conditioning unit on roof of nearest receptor.
  - a. Air intake on unit directly downwind of stacks.
  - b. Air intake potential elevated receptor.
- 3) Tall tree (>50 feet) located between the two units and the nearest receptor.
- 4) Service station building directly upwind and other structures surrounding the stacks.

## DISCUSSION

In reviewing the permit documentation of these two units and visiting the site, CDHS has several concerns regarding the potential health impact of the two units on the neighboring community. The primary concern is the appropriateness of using a model with a receptor located in such close proximity of the stacks. Gaussian distribution modeling offers a good mathematical approximation of plume behavior. However, site specific characteristics are important factors to consider when evaluating the appropriateness of using a model. The characteristics at this site, close proximity of residence, tall tree, air stripping tower, heating / air conditioning unit, and the short stack height present potential problems which neither the SCREEN nor the PTPLU model has the ability to adequately assess.

Downwash caused by physical structures near the thermal oxidizer such as a very tall tree, service station building, the air stripper, and the nearby residence may cause a building wake effect, where higher concentrations will occur closer to the source (9). The Code of Federal Regulations [CFR51.100 (jj)(1)] states sources located within five building lengths of a structure are considered close enough to be of concern in determining downwash potential. The stack height (16 feet 3 inches) of the thermal oxidizer was not adequate to allow the plume to escape the wake of the building (9). EPA states the "Good Engineering Practice" equation  $H_b + 1.5L$  ( $H_b$  = structure height,  $L$  = lesser of structure height or width, m) should be used in the determination of stack heights (9). According to CDHS files, downwash and wake effects were not taken into account in the permitting of this unit (5,8). In June 1992, SMAQMD performed additional modeling in an attempt to address building downwash for the tall tree adjacent to the stack (8). CDHS has reviewed SMAQMD model account for downwash, and due to the fact that there are multiple structures which may influence plume behavior, it seems the model does not have the capability to adequately assess downwash occurring at the site.

SCREEN and PTPLU model calculations are based on a simple flat terrain parameter. The specific characteristics at this site such as the tall tree, air stripping tower, and the heating / air conditioning unit intake on top of petitioners residence, appear to be more conducive of a complex terrain situation. Complex terrain is defined as terrain exceeding the height of the stack being modeled (9). The United States Environmental Protection Agency

(USEPA), Guidelines on Air Quality Models, suggests that there may not be an applicable model for complex terrain locations, therefore, actual measured data may need to be used (9).

The following is a list of some of the other concerns that we are raising;

- 1) The model does not account for fugitive emissions, such as leaks from the soil vapor treatment system or soil gas migration from the subsurface soils.
- 2) High levels of chemical compounds such as carbon monoxide and nitrogen dioxide may have been formed during the combustion process of the thermal oxidizer. The risk assessment was derived from analysis and evaluation of only a few chemical constituents of gasoline.
- 3) Cumulative impact of compounds on area from multiple stacks.  
As stated, the nearest residence is located within 20 feet of two emission sources. Thus, this unit should not have been permitted to operate so close to a residence based on exposure point concentration obtained from a model. To ensure protectiveness for the nearby neighbors, backyard and indoor sampling should have been required for permitting.

## CONCLUSIONS

In this health consultation we have shown that the risk assessment, based on exposure point concentrations derived from a model, was inappropriate for this site. On and off-site ambient air data are insufficient to determine the extent of the sites' contribution to the air quality surrounding the site and the petitioner's residence. Thus, it is not clear if the nearest residence (petitioner) or the neighboring community was being impacted by emissions from the site.

### Public Health Actions

The Public Health Action Plan for the Conoco site contains a description of actions that have been taken or will be taken by ATSDR and CDHS. These will address the recommendations listed in this public health consultation.

#### A. Actions Completed:

- 1) In March 1993, ATSDR responded to formal petition and began the initial review of the site.
- 2) In June 1995, ATSDR completed a Public Health Consultation which reviewed the available environmental data and discussed the potential for health impact posed by remediation activities at the site.
- 3) Based on ATSDR Regional Representative request, CDHS reviewed the site data and wrote a Public Health Consultation which reviewed the risk assessment for the groundwater and soil treatment systems.
- 4) CDHS attempted to retrieve Medical / HAZ-MAT assist records from the Sacramento Fire Department to determine if additional residents in the neighborhood were being impacted by emissions from the site.

**B. Actions Planned:**

- 1) CDHS physician review of the medical history of the petitioner and the family for possible association with air stripper / thermal oxidizer emissions.

**C. Recommendations for Further Action:**

- 1) CDHS recommends that SMAQMD perform backyard and indoor sampling, under typical wind conditions, prior and during the reinitialization phase of soil and groundwater remediation systems at the Northgate /Peralta site.
- 2) Exposure to nearby residents from soil gas migration from contaminated soil and groundwater needs to be examined, especially in light of the decision not to actively remediate gasoline petroleum releases such as this.
- 3) CDHS recommends that SMAQMD review similar sites, which have been permitted under the same guidelines. These sites should be reevaluated to ensure protectiveness to the neighboring community. CDHS is aware of such a facility operating at the corners of Mariposa and Greenback Lane, Sacramento. There may be others that also need reviewing.

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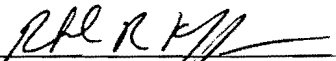
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CERTIFICATION

This Conoco Site Health Consultation was prepared by the California Department of Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.



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The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.

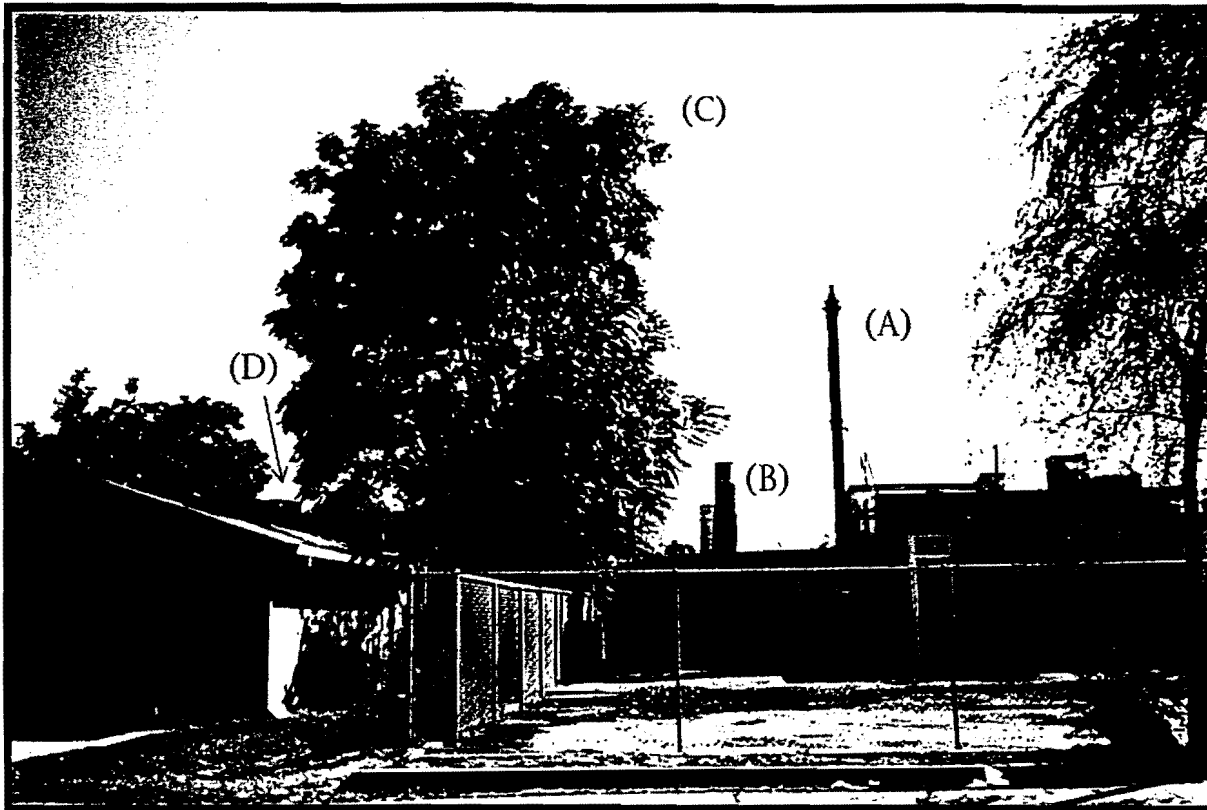


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2. Sacramento Metropolitan Air Quality Management District memorandum to Catherine M. Spinelli, Deputy County Counsel, RE: former Econo (Conoco) Gas Station. February 23, 1993.
3. Sacramento Metropolitan Air Quality Management District Authority to Construct Evaluation for a Soil Vapor Extraction System at 2520 Northgate Blvd. July 17, 1991.
4. As discussed with Susan Betts, Hazardous Materials Specialist, County of Sacramento Hazardous Materials Division. November 18, 1996.
5. Sacramento Metropolitan Air Quality Management District Authority to Construct Evaluation. July 17, 1991.
6. Stern, A.C., R.W. Boubel, D.B. Turner, and D.L. Fox. Fundamentals of Air6 Pollution. 2nd ed. Academic Press, Inc. 1984.
7. DuPont Environmental Remediation Services. Application Numbers 10126/10127, Laboratory Results, Emission Rate Calculations and PTPLU Results. November 15, 1991 - January 15, 1992..
8. Sacramento Metropolitan Air Quality Management District. Risk Calculations Based on Screen Modeling. June 11, 1992 - September 3, 1992.
9. U.S. Environmental Protection Agency. Guidelines on Air Quality Models. Office of Air Quality Planning and Standards. July 1986.

**FIGURE 1**



(Photograph taken by ATSDR in 1993)

- A) Air stripping tower
- B) Thermal oxidizer after 2 foot section had been added; approximate height 18 ft.
- C) Tall tree
- D) Air conditioning/heating unit