DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date November 6, 1991

From Toxicologist, TSS, ERCB, DHAC, (E-32)

Subject Health Consultation: Noble Oil Company (2# NJ)
Tabernacle, Burlington County,
New Jersey

To Arthur Block
ATSDR Regional Representative
EPA Region II
Through: Director, DHAC (E-32) for Rcd HC
Chief, ERCB, DHAC (E-32) HC
Chief, TSS, ERCB, DHAC (E-32) /W for A.S.

BACKGROUND AND STATEMENT OF ISSUES

The Agency for Toxic Substances and Disease Registry (ATSDR) received a private citizen's request to comment on the threat posed to human health from on- and off-site contaminants and chemical fumes released from Noble Oil Company [1].

The Noble Oil Company is an active waste oil treatment facility located in Tabernacle, Burlington County, New Jersey. It is situated on 1.58 acres in a rural/residential neighborhood. The company opened in the 1950s and currently employs about 15 persons. A population of about 12,000 persons live within 4 miles of the site.

The Noble Oil Company stores and processes waste crankcase oil, diesel lubricating oils and other oils. Sedimentation and heat removal of solids and removal of water from the oils are a part of the treatment procedure. There are six underground storage tanks and ten above ground back-up tanks on-site. Reportedly, the above ground back-up tanks are in varying degrees of deterioration. No information concerning the condition of the underground tanks was provided. All incoming oil is tested for flashpoint and routinely transferred from a tanker truck to the above ground thermal treatment tank for processing and subsequently pumped into the underground storage tanks. The load/unload area where oil transfer occurs is unpaved and has no barriers to restrict oil spills from entering directly into the sandy soil. Reportedly, all of the drained off solids and water are stored in drums and then transferred off-site in less than ninety days for disposal.

The Cohansey Sand aquifer is one of the primary aquifers in Burlington County, and depth to groundwater is about 14.5 feet. This aquifer is the water source for many purposes. Agricultural

wells that draw from the Cohansey Sand aquifer are located approximately one mile southeast of the site and are about 60 feet deep. These wells irrigate approximately 130 acres of corn, peaches, and other vegetable crops. No information was provided in regards to the domestic wells.

Hampton Lakes Water Company owns 3 wells about 3 miles north of the site. The depths of those wells are approximately 268, 280, and 348 feet deep. Allenwood Mobile Estates owns 2 wells located about 1.5 miles west of the site. The wells are about 381 and 400 feet deep and draw from Mount Laurel and Wenoah Sands aquifer.

On March 12th and 13th, 1990, six monitoring wells were installed on-site to determine the direction of groundwater flow and groundwater quality. Two of the monitoring wells were installed within the upgradient portion of the site. The direction of groundwater flow was determined to be eastward across the site. Tentatively identified volatile organic compounds (VOCs) were detected in those monitoring wells.

The potential for off-site contamination via surface run-off is believed to be minimal because the site is graded or inclined toward an on-site retention pond. Reportedly, neighbors have complained of odors emanating from Noble Oil Company [1]. However, no air sampling has been conducted.

Groundwater sampling of on-site potable and off-site private residential wells revealed low levels of VOCs. Sampling results from a residential well located about 600 feet southeast of the site, and two on-site potable wells showed levels of chloroform at 0.6, 0.9 and 2 parts per billion (ppb), respectively. Trichloroethene (TCE) was detected at 0.7 ppb in one residential well located about 650 feet northeast of the site. Additionally, 1,2-dichlorobenzene and bromofluorobenzene were detected in residential well water at 9.0 and 8.0 ppb, respectively. These contaminant levels were below the Environmental Protection Agency's Maximum Contaminant Level for safe drinking water. In 1989 the New Jersey Department of Environmental Protection (NJDEP) conducted an investigation at a private well about 0.5 mile south of the site. The well had a visible petroleum hydrocarbon (PHC) sheen and PHC was detected at 4.3 parts per million (ppm).

On-site soil sampling indicated that PHCs were found in various concentrations (see table 1). Low levels of VOCs found in on-site soil samples included tetrachloroethane (81 ppb), toluene (110 ppb), ethyl benzene (180 ppb) and xylene (1,300 ppb) [2]. Polychlorinated biphenyls (PCBs), pesticides and base neutral

compounds were also found in on-site soil samples in low concentrations. The off-site background sample as well as the sample taken near the retention pond showed the lowest levels of PHC contamination of 22 and 45 ppm, respectively. All soil samples were subsurface samples except three samples collected from 0 to 1 foot.

Table 1. Petroleum Hydrocarbons Levels in Soil Samples

SAMPLE	PHC (ppm)
S-1	11,300
**S-2	45
S-3	786
S-4	21,000
S-5	17,000
***S-6	25,000
S-7	27,000
***S-8	5,500
*S-9	22
***S-10	20,000

PHC = Petroleum Hydrocarbons
ppm = parts per million
* = Background soil sample
** = Sample taken near the retention pond
*** = 0-1 foot soil samples

DISCUSSION

From the data evaluated, there is clear indication of on-site soil contamination with various chemicals. The PHCs are the most widely distributed on-site contaminants. They are by-products of crude oil and consist of many hydrocarbons. Some of these hydrocarbons are volatile and are not likely to adsorb strongly to the soil. Thus, they may volatilize into the air or migrate vertically through the soil possibly carrying PCBs and pesticides with them into the groundwater table.

The load/unload and storage areas at this site are unpaved and have no secondary containment or barriers [2]. Therefore, soil contaminants have a potential to migrate downward through the soil and into the Cohansey Sand aquifer.

Recently, studies of volatilization of VOCs from indoor water uses have shown that often 50% or more of common contaminants of water supplies, such as chloroform and TCE, will volatilize. Upon volatilization of these compounds, exposures can occur both

at the point of water use in the home or via inhalation of indoor air [3,4].

At the site, constituents of crankcase oils migrating to off-site potable wells may be relatively more volatile in water because of their low water solubility [5]. In addition, skin contact has also been shown to be a potentially significant route of exposure to VOCs [6]. These non-ingestion exposures have been estimated to be comparable to those from direct ingestion of the contaminated water source [6].

Since the data do not present the PHCs as specific compounds, it is difficult to discuss any toxicological endpoints as a result of specific PHC exposure. However, groundwater contamination due to continuous or large spills of crankcase oil may be a significant exposure pathway. Exposures may occur through the direct use of groundwater as drinking water supplies or indirectly through the discharge to surface water or through dermal contact and inhalation. Although crankcase oils are expected to be highly immobile in the soil/groundwater system [5], bulk quantities of oil from a spill or continuous release onto soil might be carried downward slowly to the top of the groundwater table. Furthermore, transport and subsequent fate of dissolved constituents of these oils will vary depending on the physicochemical properties of the constituents [5]. Some components will dissolve more quickly in the percolating groundwater, because they are adsorbed less strongly to soils (thus being transported more rapidly) some may be more or less susceptible to degradation by chemical or biological action [5].

Studies have shown that rats receiving 15 milliliters crankcase oil per kilogram (ml/kg) or 25 ml/kg crankcase oil by oral gavage developed diarrhea lasting for 3 days [7]. Other studies revealed little lung damage in rats, rabbits and mice after administration of 132 milligrams per cubic meter (mg/m^3) motor oil vapor continuously for 30 minute intervals for 100-343 days [8]. Mice treated with 50 milligrams of used or unused samples of composite motor oil by dermal application to shaved areas developed papillomas, squamous cell carcinomas and fibrosarcomas [9].

CONCLUSIONS

Based on the data provided the ATSDR concludes that the contaminants on-site may pose a threat to human health because of the potential for contaminants to migrate off-site via

groundwater and enter potable water supplies. A potential health threat may exist to workers that inhale or come in dermal contact with these contaminants on a daily basis. There are insufficient data available to draw any conclusions in regards to off-site soil contamination.

RECOMMENDATIONS

1. Continue to monitor residential well water periodically for contamination.

2. Conduct off-site air and soil sampling.

If any additional information becomes available, or if there is a need for clarification of this document please do not hesitate to contact this office at (404) 639-0616.

Robert L. Williams

Robert L. Williams, Ph.D.

REFERENCES

1. Verbal Communication from Robert L. Williams, ATSDR, ERCB, to Mrs. Patricia Luzar (private citizen) in Tabernacle, New Jersey, September 18, 1991.

2. Site Description by Andrew Cyr, New Jersey Department of Environmental Preservation, February 9, 1990.

3. Andleman, J.B., "Human Exposures to Volatile Halogenated Organic Chemicals in Indoor and Outdoor Air," Environ. Health Pers. 62:313-318, (1985).

4. Mckonem, T.E., "Human Exposure to Volatile Organic Compounds in Household Tap Water: The Indoor Inhalation Pathway," Environ. Sci. Technol. 21:1194-1201 (1985).

5. The Installation Restoration Program Toxicology Guide Volume 4, Biomedical and Environmental Information Analysis Health and Safety Research Division Oak Ridge National Laboratory Oak Ridge, Tennessee (1989).

6. Andleman, J.B., Significance and Treatment of Volatile Organic Compounds in Water Supplies, Total Exposure to Volatile Organic Compounds in Potable Water, Lewis Publishers, Inc. Chelsea, Michigan, 485-503 (1990).

7. Elars Bioresearch Laboratories, Inc. Acute toxicity tests. API #78-1. New composite motor oil. Submitted to the American Petroleum Institute. API Med. Res. Publ. No. 27-32131, (1980).

8. Lushbaugh, C.C.; Green, J.W.; Redemann, C.E., Effects of prolonged inhalation of oil fogs on experimental animals. Arch. Ind. Hyg. 1:237, (195).

9. Kettering Laboratory, The carcinogenicity of new and used lubricants. Submitted to the American Petroleum Institute.API Project No. PS-36. API Med. Res. Publ. No. 30-32847 (1983).