SITE SPECIFIC HEALTH ASSESSMENT FOR THE TORREY HILLS GAS STATION LOCATION

Prepared for:

City of San Diego
Office of Planning and Development Review

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Attachment 15
Site Specific Health
Risk Assessment

EXECUTIVE SUMMARY

ADVANCED CHEMICAL SAFETY was retained by the City of San Diego to prepare a site specific health assessment for the Torrey Hills Gas Station location. The assessment was limited to potential public health impacts (if any) associated with human exposure to hydrocarbon fuel emissions and in particular, the "ionization of benzene molecules". To accomplish this assignment, all relevant documents were examined. The scientific publications from the University of Bristol related to electrical discharge from high voltage power lines were taken into consideration.

Using standard risk assessment methods the following conclusions were reached:

- The published reports of the University of Bristol scientist do not apply to the Torrey Hills gas station.

- If a benzene - corona ion species is assumed to exist, its total contribution to the health risk impact of the station would be insignificant.

- The overall cancer risk of the station is estimated to be less than 10 per million.

The applicable scientific publications from the University of Bristol address the interaction of corona ions, produced by electrical discharge from high voltage power lines with aerosol particles produced by various sources of airborne pollution. Significant differences between the published work and the Torrey Hills location make the application of these reports to the Torrey Hills site incorrect. The most important differences are:

- the power lines are more than 100 meters higher above the Torrey Hills site than were the power lines examined in England; and

- benzene is released to the atmosphere as a vapor, not an aerosol.

Both of these differences are highly significant. The corona ions produced from power lines will drift away from the power lines in a manner based on local conditions. Because the power lines are located on a bluff, high above the site, the interaction with any emission from the site will be completely different than the interaction modeled by the Bristol scientists. The Bristol reports are very careful to limit their claims only to aerosols. There is no suggestion that the physical model they propose is applicable to a vapor, such as benzene.

The previous conclusion not withstanding, ACSafety assumed that a corona ion - benzene interaction would occur, and that it would occur in a manner to produce the

number of ionized species suggested by the Bristol reports. Using this assumption, and other reasonable assumptions required, the concentration of the assumed benzene - corona ion species was estimated to be between 5.69 x 10^{-10} ppb (0.000000000569 ppb) and 5.69 x 10^{-9} ppb (0.00000000569 ppb). This value may be compared to the California Air Resources Board reported ambient benzene concentration in San Diego of 2 ppb. Thus, the hypothetical species provides an insignificant change in the total airborne benzene concentration and the health impact of these hypothetical species is insignificant, compared to ambient benzene.

Each of the factors that contribute to a site-specific health risk assessment were evaluated for this study, assuming that the corona ion - benzene species exists. For each of these, the hazard assessment, the dose-response analysis, and the exposure assessment, it was found that the assumption of the hypothetical species does not change the baseline parameters used by the California Air Pollution Control Officers Association (CAPCOA) guidelines for performing this type of health assessment. Thus, the data provided by CAPCOA may be directly applied to the Torrey Hills site for estimating the cancer risk. The cancer risk was estimated to be less than 10 per million.

Based on the examination of the site and all applicable information, ACSafety has not identified any basis to conclude that the presence of the high voltage power lines causes a significant increase in the excess cancer risk of the Torrey Hills gas station site.

I. INTRODUCTION

A. Scope-of-Work

In accordance with the specific recommendations of the City Council on April 17, 2001, **ADVANCED CHEMICAL SAFETY (ACSafety)** was retained by the City of San Diego to prepare a "site specific health risk assessment" for the proposed gas station use on this site. Specifically, it was the Council's intention that this assessment evaluate the project's potential public health impacts (if any) associated with human exposure to hydrocarbon fuel emissions and in particular, the "ionization of benzene molecules", which, as claimed by the scientific studies referenced by the Torrey Hills Community Coalition (THCC) in their appeal, may occur as a result of contact, and subsequent ionization of benzene particulates emitted into the air from the proposed Chevron gas station with SDG&E's existing power lines located adjacent to the station site.

B. Qualifications

The Principal Scientist preparing this report is Dr. Neal Langerman. Dr. Langerman holds Ph.D. in Physical Chemistry from Northwestern University and a B.S. in Chemistry from Franklin and Marshall College. He was on the faculty of Utah State University, Chemistry Department, and Tufts University School of Medicine, Biochemistry and Pharmacology Department. He currently is the Principal Scientist of Advanced Chemical Safety. A complete copy of his resume, and a statement of the qualifications of his company are included in Appendix 1, to this report.

In addition to Dr. Langerman, other members of the team included Terry Pitzen and the staff of Targhee, Inc. Mr. Pitzen contributed research and technical comment. His resume is included in Appendix 1. Targhee is an environmental consulting firm in Long Beach, with whom ACSafety works jointly on many projects. They reviewed and commented on early drafts of this report. A statement of their qualifications is located in Appendix 1. A letter stating their opinion of this report is also located in Appendix 1.

C. Methodology

The opinions and hazard assessment presented in this report were developed by studying all relevant documents, visiting the site in question, and examining, in detail the physical and chemical issues raised by the Torrey Hills Citizen Coalition (THCC). The risk assessment methods recommended by the U.S. EPA and the California Air Pollution Control Officers Association (CAPCOA) were generally

followed.

II. BACKGROUND

For clarity, the positions of various parties will be briefly reviewed. This will assist with understanding the context in which this Site specific Health Risk Assessment was prepared.

A. Position of Regulatory Agencies

1. San Diego Air Quality Management District

San Diego Air Quality Management District (AQMD) reviewed the Chevron application to construct the Torrey Hills station and issued an "Authorization to Construct". The authorization required the installation of Phase I and Phase II emissions controls. Based on AQMD rules and procedures, no site-specific health risk assessment was required.

2. Land Development Review Division

The City appeared ready[1] to issue a Conditional Use Permit (CUP) to Chevron for the station. Based on the extraordinary appeal on the part of the Torrey Hills Citizen Coalition, the City Council delayed approval of the CUP and requested this focused Site-Specific Health Risk Assessment. The City issued a Mitigated Negative Declaration[2] (MND) which reviewed the issues associated with the gas station location. The MND addresses the various concerns, and concludes that there was "no negative impact."

B. Citizen's Groups

ACSafety was provided with a collection of documents submitted to the City by citizens who live in the vicinity of the site that is the subject of this study. Many of the issues addressed in those documents have no bearing on the question of benzene and corona ions. In this section, only those comments that reflect directly on this issue will be discussed.

Letter from Richard Kiy and Guy Ravad, dated April 10, 2001.

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1 The City of San Diego Manager's Report # 01-066, dated April 11, 2001

2 Mitigated Negative Declaration # 99-1200

The authors of this letter state "... as research from the University of Bristol has shown that there is an increased risk of childhood leukemia and lung cancer among residents living within 400 meters of high voltage power lines of over 100 kV where pollution sources are also nearby." They continue to discuss the "... ionization of stationary source emissions like benzene (when combined with other airborne molecules) ...".

The authors of this letter have produced a spectrum of the benzene cation, $C_6H_6^+$, and claim that this spectrum (they refer to it as a "table") provides evidence that benzene does ionize, as they claim the University of Bristol publications assert. Note that the Fews publications address negatively charged species, not the positively charged species cited by the THCC proponents. Further, the University of Bristol publications do not suggest that benzene, per se becomes ionized; rather that a physical interaction occurs between a corona ion and an aerosol. The University of Bristol authors do not suggest that a charge transfer occurs in any way to raise the aerosol to a higher energy, charged electronic state.

Kiy and Rivad point out that there is not sufficient information to assess the potential health impact of benzene attached to an aerosol. They quote Professor Charles Perrin of UCSD who (they state) claims that we "cannot rule this out".

Letter from Denis L. Henshaw of the University of Bristol, dated February 13, 2001

Professor Henshaw summarizes some observations about the production of corona ions from high voltage wires. He then refers to the simulacrum studies on charged ion deposition reported by the Cohen research group. He points out that Cohen studied 20 and 125 nm aerosols. He refers to a 1983 study that observed increased deposition of charged particles in the lungs of human volunteers. Henshaw cites a relation between outdoor pollution and increased lung cancer. Henshaw then cites a "careful risk estimate of the health effects of living near high voltage power lines." He states: "This estimate is in no way speculative, rather it follows a standard risk assessment procedure. We estimate a 30% increase in both cancer and non-cancer illnesses associated with air pollution in people living within 400 meters of high voltage power lines." Since Professor Henshaw has given no citation for this risk assessment, it is difficult to evaluate the relevance of his statements to the Torrey Hills site. Henshaw states that he has no details of the Torrey Hills gas station site, but calls for a "proper health assessment" before building a gas station near power lines.

C. Chevron

Patrick Beatty, Ph.D. and toxicologist for Chevron wrote to the City on behalf of his employer. Dr. Beatty stated that the Bristol study was not applicable to the

Torrey Hills site since the study dealt with aerosols, and benzene was released from service stations as a vapor.

III. ANALYSIS of CITED SCIENTIFIC PUBLICATIONS

A. "Increased Exposure to Pollutant Aerosols Under High Voltage Power Lines[3]"

The purpose of this research is to develop a theoretical model of the deposition of aerosols on surfaces mimicking the human head, under the influence of high voltage overhead transmission lines (132 kV - 400 kV). The research uses the term "aerosols" correctly to mean "an airborne dispersion of solid or liquid microscopic particles. When solid, the aerosol will be referred to as a "dust", fume" or "smoke". When liquid, it is called a "mist" or "fog". A "vapor" is the gaseous phase of a material that is normally a liquid or solid at normal temperature and pressure. When gasoline evaporates, a true vapor is produced. A "gas" is a formless fluid that completely occupies the volume of an enclosure at normal temperature and pressure. Air and its components are true gases.

It is important to recognize that this scientific report specifically addresses only aerosols. It does not address vapors or gases. The Bristol group used a radioactive isotope in an aerosol form as a marker for measurement purposes. The marker attaches itself to atmospheric aerosols and the resulting particle, which is actually studied is assumed to be about 200 nm in diameter. During the study, which included both theoretical modeling and limited model-verification experimental work, the outdoor air was reported to contain between 7,000 and 70,000 particles/cm^3 with an average of 16,000.

Much of the content of this report is based on theoretical modeling of the assumed behavior of a 200 nm particle in the presence of various strength electric fields. The modeling results suggest that a 200 nm particle will exhibit an enhanced deposition of approximately 2. Thirty percent of that, the report states, will be due to the effect of gravity on the mass of the particle. The report addresses field measurements of aerosol particle deposition. Figure 10 of the report suggests that an increased deposition of charged particles does occur in the vicinity of "directly under the power lines." Examination of Figure 10 suggests that the observed effect falls to zero at distances greater than 50 meters. No indication of the height of the power lines above ground level is given in this report.

Fews, A.P., Henshaw, D.L., Keitch, P.A., Close, J.J., and Wilding, R.J. Intern. J. of Radiation Biology 75 #12, 1505 (1999)

In the discussion section of this report, the authors observe that their modeling gives very different results for outdoor versus indoor conditions. This is to be expected since the parameters used for modeling are different. The authors present the modeling results in terms of the velocity at which particles settle out of the air. They report calculated velocities of 6 - 60 miles per hour, which are unusually high for particles of 200 nm diameter. The authors speculate that these high velocities contribute to an "increased exposure on the human head and face." Indoors, the authors do not demonstrate an enhanced rate of deposition for the 200 nm particles.

The authors speculate that their model "could be used to estimate increased mass deposition of pollutant aerosols under power lines." The observed increased deposition for the lowest voltage lines (132 kV in this study) was not significant.

The authors offer speculation that these modeling studies might offer a mechanism for "reported epidemiological associations between high voltage power lines and childhood and adult leukemia." They speculate that their model offers "one of several" mechanisms for increased exposure to pollutants near power lines. However, their model is not appropriate for the Torrey Hills site.

B. "Corona Ions from Power Lines and Increased Exposure to Pollutant Aerosols[4]"

The purpose of this research is to examine the relationship, if any, between the corona ions produced from high voltage power lines and exposure to environmental pollutant aerosols. Corona discharges are a common phenomena at high voltage power lines. These discharges commonly occur on sharp points, such as the edges of bolts, or small imperfections in the transmission cable. When the discharge voltage is sufficient, ionization of air occurs and corona ions are formed. Corona ions are, in the simplest sense, "ionized air molecules" produced by a corona discharge. The authors estimate that the corona ions are 1 - 4 nm in size and may remain as spatially isolated ions for 3 to 30 minutes. These estimates are based on a variety of assumptions used by the authors.

The basic model being proposed by Fews, et al. is that "corona ions, once produced, can attach to the pool of pollutant aerosols in air." It is estimated that power lines can lose up to 1 mA per meter of length. This corresponds to a potential number of corona ions of 6.25×10^{15} ions per meter of power line per second. The authors assume that many of these ions "may be absorbed (removed from the

[4] A.P. Fews, D. L. Henshaw, R.J. Wilding and P.A. Keitch, Intern. J. of Radiation Biology, 75#12, 1523, (1999)

environment) by the line and tower, but (they assume) "a substantial flux of ions can be continuously emitted into the atmosphere. No estimate of the number of corona ions that actually leave the immediate vicinity of the tower and power lines is given. Fews and co-workers cite the work of Chalmers[5] who suggests that the observed modification of the natural DC field of Earth near, and down wind from power lines is "consistent with the production of mainly negative ions..." Muhleisen[6] points out that "in conditions other than mist and fog, there appeared to be a preponderance of positive charges."

The authors measure the DC field superimposed at ground level on earth's intrinsic DC field at eight locations near power lines in Bristol, England. Based on their observations, they report negative modification of the DC Field in excess of 100 volts/meter (Vm^{-1}) downwind of the power line location. One the upwind side of the power lines, they report a positive modification, but offer no explanation for this observation. The authors compare their observations with their theory, and conclude that "the upwind field is flat and close to Earth's DC field and the downwind field decays to the Earth's field over (the distance studied, about 500 m)." Figure 3 of this publication appears to suggest that the upwind field have a maximum concentration *about 100 meters from the power lines* and then decrease to the Earth's field.

The authors further conclude that the DC field modification is easy to measure but does not occur all of the time. The extent of field modification appears to be very dependent on local weather conditions. The authors conclude that the corona ions combine with aerosol particulates to form charged species of approximately 200 nm diameter.

Fews and co-workers assume that charged particulates result in increased lung deposition. Their assumption is based on the work of Cohen[7] et al. who used a simulacrum of the human tracheobronchial tree to mimic the actual *in vivo* situation. Based upon the Cohen suggestions, Fews and co-workers state " The question of whether increased lung deposition of inhaled aerosols occurs near power lines that have been charged by corona ions therefore arises. This needs to be addressed in future work ...". Their final conclusion is "... the results presented in this paper raise the possibility that corona ions from power lines result in increased lung deposition

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5 Chalmers, J.A., J. Atmosph. Terrestrial Physics, 2, 155, (1952). Chalmers, J.A., "Atmospheric Electricity", Oxford Pergammon Press, (1967).

6 Muhleisen, R. Z. Geophysik, 29, 142, (1953).

7 Cohen, B.S., Xiong, J.Q., Fang, Ching-Ping, and Li, W., Health Physics, 74(5), 554, (1998).

of inhaled pollutants by people living nearby." This publication does not claim to prove that a relation between corona ions and lung cancer actually exists.

C. "Lung Cancer Risk Estimate in People Living Near High Voltage Power Lines[8]"

This is an abstract of a paper to be presented at a meeting after this health risk assessment report is submitted to the City. It appears that the abstract, and related presentation is not peer-reviewed and will not be subjected to peer comment in a time frame that would allow peer comments to be incorporated into the considerations of this report to the City of San Diego.

Based on the abstract, this appears to be the cancer risk assessment Professor Henshaw referred to in his letter to the THCC. The abstract reviews a number of studies that are relied upon for the relation of cancer risk to power line. The abstract then cites the previous work of Fews, et al. The abstract reports spatial charge density measurements in general agreement with earlier work of this research group. Based on the (to be) reported studies, Fews et al estimate that a 34 to 57% increased lung cancer risk within 400 meters, downwind of power line.

This abstract deals only with aerosols, not vapors and not benzene. Further, the abstract does not report firm conclusions, rather couches the conclusions in suggestive terms, acknowledging the need for further substantive and corrobative research.

D. Applicability to Torrey Hills Gas Station

A number of points in the Fews, et al. publications discussed in this section with respect to the Torrey Hills Gas Station should be noted. Fews, et al. specifically address the interaction of corona ions with aerosols, not with vapors or gases. The emissions from gasoline, including benzene, ethylbenzene, toluene, xylene, hexane, heptane and octane are released to the atmosphere as true vapors. Thus, there is no way to scientifically link the conclusions of Fews et al. with this site, regardless of the merit of the conclusions.

The Fews et al. work was done at ground level, below power lines. While the authors did not report the height to the power lines, the Torrey Hills site would appear well below their mean ground level, since the base of the Torrey Hills towers are

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[8] A.P. Fews,, R.J. Wilding, P.A. Keitch, and D. L. Henshaw 23rd Annual Bioelectromagnetism Meeting, June 10 -14, 2001.

approximately 125 meters above the station ground level. If the towers studied by Fews et al are similar to the tower above the Torrey Hills location, then the power lines are only 16 to 25 meters above the ground. Given this, the proposed gas station site is approximately 100 meters below the ground level established by the Fews et al studies. Thus, there is no scientifically valid method to relate the Fews et al observations with the Torrey Hills gas station site.

The corona ion phenomena is highly dependent on local meteorological conditions. In the absence of a detailed DC field determination, it is difficult to do more than speculate as to the shape of the DC field near the intersection of East Ocean Air Drive and Carmel Mountain Road. In the absence of this information, no scientifically valid application of the proposed theory can be done.

The scientific work upon which Fews et al base their claim of increased deposition has not been shown to be applicable to corona ion particulates. The authors themselves point out that this point must be investigated. Thus, there is no specific science to support the hypothesis that corona ion particulates of atmospheric aerosol pollutants will demonstrate increased lung deposition down wind.

E. The Site

The intersection of East Ocean Air Drive and Carmel Valley Road is well described in the Land Development Review document. In addition to the information provided therein, several additional facts are relevant to this study. Figures 1 and 2 are views of the proposed site. Figure 1 is taken from approximately the center of the site, looking toward the nearest power line tower. Figure 2 is a view from this tower toward the proposed site. Table 1 presents relevant distances, in meters.

TABLE 1 VARIOUS DISTANCES AT THE SITE

SIGHTING DESCRIPTION	DISTANCE, m
Center of site to nearest house across Carmel Mountain Rd.	90
Center of site to electrical box across East Ocean Air Dr.	66
Center of site to base of tower	121
Center of site to lowest insulators on tower	125
Center of site to highest insulators	130
Height of lowest insulators above tower base	16
Height of highest insulators above tower base	25

The prevailing wind is generally from the west. However, the local topography influences the wind, and the prevailing wind seems to blow along East Ocean Air Drive. There are no wind velocity data specifically for this site available. The power lines located on the nearby towers are 69, 138 and 230 KV lines. Only the 230 KV line is expected to cause any perturbation of Earth's electric field, based on the published results from the University of Bristol.

This proposed location does not set a precedent with respect to the relation of a gas station to high voltage power lines in San Diego. At least one other location shares a similar relationship. Figure 3 was taken behind a 76 station on the northwest corner of El Cajon Boulevard and I-805. The view is to the south and it shows the presence of a SDG&E substation, approximately 27 meters from the gas station.

IV. SITE SPECIFIC HEALTH RISK ASSESSMENT ANALYSIS

Even though it is the finding of this study that the Fews publications are not applicable to the Torrey Hills Chevron Station proposed site, the following health risk assessment has been performed, as if the Fews reports were applicable. In this health risk assessment, the existence of a benzene - corona ion species is assumed. This critical assumption is not supported by the Fews publications.

The procedures of the CAPCOA Guidelines are followed. In addition to the assumption above, additional assumptions were made and are explained as they are introduced.

A. Hazard Assessment

The health hazards of benzene are well documented. The CAPCOA guidelines contain all of the essential information and will not be repeated here. In addition, the U.S. EPA has proposed a set of guidelines for cancer risk assessment.[9] These guidelines are incorporated into this site specific risk assessment. A significant assumption of this risk assessment is that the cancer risk of benzene in a ionized aerosol is the same as the benzene molecule. There is currently no valid method for testing this assumption. Since benzene is not changed chemically or physically by the interaction with the corona ion, and since the corona ion will likely be rapidly discharged in the moist environment of the human respiratory system, were it to actually enter the respiratory system, this assumption is realistic.

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9 Proposed Guidelines for Carcinogen Risk Assessment (April 23, 1996) Federal Register 61(79) 17960-18011.

Based on these facts and assumptions, the hazard assessment and its associated parameters listed in the CAPCOA Guidelines is accepted for purposes of this study.

B. Dose Response Analysis

A dose-response assessment requires that the concentration of the contaminant in question, in this case the benzene - corona ion species and the health response based on this concentration be estimated.

The toxicity of benzene is best characterized using the standard parameter set of the U.S. EPA. These are:

Unit Risk Value	2.95×10^{-5} $(\mu g/m^3)^{-1}$
Chronic Reference Exposure Level	71 $\mu g/m^3$

For the same arguments stated in the previous section, these values are accepted for this study.

In order to calculate the potential dose, the concentration of benzene - corona ion must be estimated. In spite of the fact that the Fews hypothesis is not applicable to vapors, it is possible to estimate the concentration of ionized particles using information from the Fews publications and a number of assumptions. The assumptions are stated as they are introduced.

Fews reports that the number of aerosol particles is between 7000 and 70,000 per cubic centimeter. For the lower value:

$$N_{aerosol} = 7000 \text{ particles/cm}^3$$
$$= 7 \times 10^9 \text{ particles/m}^3$$

This number represents the total number of benzene - corona ion species in the air. It is further assumed that this is a steady-state concentration, present 8760 hours per year. This is an extremely stringent assumption and over-represents the actual case. In reality, this number will fluctuate based on local meteorological conditions, gas station activity, and voltage in the power lines. As such, this number represents a worst-case estimate.

From basic chemical thermodynamics, the total number of gas molecules in a cubic meter of air at 25°C and 1 atmosphere pressure is:

$$N_{air} = 6.023 \times 10^{23} \text{ molecules/mole} * 20.5 \times 10^3 \text{ moles/m}^3$$
$$= 1.23 \times 10^{28} \text{ air molecules/m}^3.$$

Given the difference in these numbers, the assumption that the benzene - corona ion species are included in the total number of air molecules does not introduce a significant error. With this assumption, it is possible to calculate the number of ionized particles per one billion air molecules, or to express the concentration of ionized particles in air in the unit of "ppb".

Concentration ionized particles $= (7 \times 10^{9} * 10^{9}) / 1.23 \times 10^{28}$
$= \mathbf{5.69 \times 10^{-10}\ ppb.}$

Repeating this calculation for the higher concentration value give an estimated concentration of ionized particles of **5.69×10^{-9} ppb**.

The concentration of benzene in the air of San Diego, according to the California Air Resources Board[10] is approximately 2 ppb. For purposes of this study, this is assumed to be the concentration from the Torrey Hills gas station emissions. The incremental increase in total benzene concentration then becomes (in parts per billion):

benzene due to background	2.0
benzene - corona ions	0.000000000569 or 0.00000000569
total benzene	2.000000000569 or 2.00000000569 for

the range of ionized aerosol reported by Fews, et al.

For practical purposes then, the concentration of benzene remains unchanged from background.

Given the mechanism of benzene - corona ion species formation assumed in this study, that is a steady state of corona ions interact with ambient benzene, then the formation of the charged species results in no net change in benzene concentration. The formation of the charged species simply results in the transfer of a benzene molecule from the ambient air reservoir to the charged species pool.

Since the CAPCOA dose-response model is based on benzene emissions from a service station in units of one millions gallons of gasoline throughput at the station, and since the analysis just presented concludes that the presence of the charged species does not change (to any practical amount) the emissions of benzene from a station, or the toxicity of the emitted benzene, then the dose - response estimates used in the CAPCOA guidelines may be used for this study.

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[10] California Air Resources Board Annual Toxics Summary El- Cajon - Redwood Avenue

C. Exposure Assessment

The exposure assessment must address the sources of emissions, the duration of those emissions and the routes of exposure of the receptor population. Each of these is well characterized.

Sources of Emissions

The sources of emissions from a service station are explained in the CAPCOA guidelines. The major sources of emissions include loading, fueling, storage tank breathing and spillage. Since the production of the benzene - corona ion species does not affect any of these sources of emissions, the parameters contained in the CAPCOA guidelines for these emissions may be used as given.

Duration of Emissions

In arriving at the concentration estimate for the benzene - corona ion species, this study assumed a steady state concentration of both corona ions and benzene. The Torrey Hills service station will only operate 16 hours per day. Thus, any estimate of the actual exposure will reflect a maximum of 5843 hours of operation per year. Using the CAPCOA guideline data will over-estimate, by a factor of 33%, the actual exposure. The most reasonable model is an annualized model that assumes exposures are constant over the course of the day. One could argue that some other model may be more applicable, but given the extremely low estimated concentration of the benzene - corona ion species, such a refinement is unwarranted.

Route of Entry

The only route of entry into the human body of concern for this study is inhalation. Ingestion and dermal penetration have not been considered since there is no evidence that benzene - corona ion particle will settle out of the air and deposit on the ground. The aerosols studied by Fews and coworkers had masses several orders of magnitude greater than the species assumed to exist for this report. If one assumes that a person breathes 10 m^3 of air per day, then the total mass of benzene - corona ion species inhaled is estimated at 9×10^{-12} g per day. This corresponds to 9×10^{-7} $\mu g/m^3$ or approximately 80 million times smaller than the U.S. EPA Chronic Reference Exposure Level. This suggests that the potential impact of the alleged benzene - corona ion species, if it were to actually exist, would be 80 million times lower that the impact of benzene at a level considered acceptable by the U.S. EPA.

D. Risk Characterization

Based on the analysis given in the preceding sections, a risk assessment for the Torrey Hills site may be generated from the CAPCOA guidelines. The proposed service station is best described as meeting the scenario model 6B, that is a station with Phase I and Phase II vapor emissions controls, underground storage tanks and vent valves. There is some disagreement as to the proposed gasoline throughput. For purposes of this study, the 4.8 million gallons per year[11] has been assumed. ACSafety estimated that the distance from the center of the gas station site to the nearest residence (receptor) is 90 meters. From Figure Appendix E, Page 98 of the CAPCOA guidance document, a cancer risk per million gallons of gasoline of approximately 2 is estimated. This corresponds to a total cancer risk for this station, of 9.6 per million of exposed population.

V. OPINIONS

The opinions developed in this report are:

- The published reports of the University of Bristol scientist do not apply to the Torrey Hills gas station.
- If a benzene - corona ion species is assumed to exist, its total contribution to the health risk impact of the station would be insignificant.
- The overall cancer risk of the station is estimated to be less than 10 per *million*.

A. Discussion and Conclusions

ACSafety has examined the specific chemistry suggested by the University of Bristol and has concluded that these publications do not apply the proposed gas station site. The basis of this conclusion is that the Fews et al reports address an interaction between corona ions and aerosols. Benzene, which is the primary chemical of concern for cancer risk related to gas stations and is also the chemical cited by THCC does not form aerosols under gas station conditions. It forms vapors which are different physical species from aerosols. Thus, conclusions about aerosols cannot be extrapolated to vapors in a scientifically valid manner.

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11 Supplemental form Fee Schedules 26, A, B, C, and D, submitted by RHL Design Group on behalf of Chevron, dated 10/20/2000.

ACSafety has assumed that a benzene - corona ion species does exist, as has further assumed a steady state concentration at a concentration suggested by Fews, et al. Thus, using worst case estimates, the maximum concentration of the species in question is approximately 80 million time lower than the EPA Chronic Exposure Reference Level and is about a factor of one million lower than the estimated ambient benzene concentration in San Diego air. Thus, any contribution of this postulated species is not significant.

It is beyond the scope of this report to challenge the parameters used by CAPCOA or SDAPCD for estimating cancer risk. However, it is totally within the scope of this report to use those established parameters for the purposes of this report. Since the parameters are applicable to the proposed site, they were used, and an estimated cancer risk of just under 10 per million exposed was established. This is under the levels needed to warrant further action prior to issuing a Authorization to Construct by APCD.

Based on the information presented in this report, ACSafety has not found any scientifically valid basis for applying the University of Bristol work to benzene emissions from the proposed Torrey Hills gas station.

FIGURES

Figure 1: View looking toward power lines

Figure 2: View from Tower toward Site

Figure 3: View across El Cajon Blvd

APPENDIX 1

Resumes of Neal Langerman and Terry Pitzen
Expertise of Advanced Chemical Safety
Statement of Qualifications of Targhee, Inc.
Peer review letter from Targhee, Inc.

CURRICULUM VITA

February 8, 2001

NEAL RICHARD LANGERMAN

BORN: Philadelphia, PA, 1943

EDUCATION:

Atlantic City High School
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Franklin and Marshall College
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1961-1965, A.B. June, 1965
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N.I.H. Postdoctoral Fellow, December 1970

PROFESSIONAL EXPERIENCE:

Tufts University School of Medicine
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Associate Professor
1977-1983

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San Diego, CA
President
1982-1997

Advanced Chemical Safety
San Diego, CA
President
1997 - present

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City of Torrance, California
Chairman, 1989

Editorial Board
Occupational Hazards
1999 - present

Editorial Board
J. Chemical Health and Safety
1999 - present

Editorial Advisory Board
Laboratory Safety and Environmental
Management
1999 - present

CURRICULUM VITA

NEAL RICHARD LANGERMAN

AREAS OF SPECIALIZATION:

Environmental Regulations
OSHA Regulations
Work Place Safety
Hazardous Waste and Hazardous Chemical Management
Hazardous Material Safety
Reactive and Explosive Chemical Safety
Hazardous Material Spill Response
Compressed Gas Emergency Response
Hazardous Materials Regulations
Industrial Emergency Response
Biophysical Chemistry
Physical Chemistry of Proteins
Ultracentrifugation
Chemical Thermodynamics

CERTIFICATIONS

Registered Environmental Assessor (California), 1990
Certified Environmental Inspector, 1991

PROFESSIONAL MEETINGS ATTENDED:

VII International Flavin Conference, March 30, 1975, San Francisco, California

27th International Calorimetry Society, July 26-30, 1975, Seattle Washington

Scripps Institute of Oceanography (visiting Scientist and Lecturer), June, 1975, La Jolla, California

American Society of Biological Chemists, June 1976, San Francisco, California

28th International Calorimetry Conference, September, 1976, Argonne, Illinois

International Calorimetry Conference, July 1977, Montreal, Canada

Biophysical Society, March, 1978, Washington, D.C.

International Calorimetry Conference, July 1980, Eutola, Alabama

Japanese Thermal Analysis Society, (invited paper), November, 1981, Hamamatsu, Japan

American Chemical Society, (invited paper), March, 1982, Las Vegas, Nevada

American Society of Safety Engineers (local chapter), (invited paper), April, 1984, San Diego, California

Oklahoma Safety Council, (invited paper), August, 1984, Oklahoma City, Oklahoma

American Chemical Society, (Invited paper), April, 1985, San Diego, California

Semiconductor Safety Association Conference, May 1985, Phoenix, Arizona

American Society of Safety Engineers Conference, June, 1985, San Diego, California

Semiconductor Safety Association Conference, (Invited paper), May 1986, Phoenix, Arizona

SEMI Conference on Gallium - Arsenide Safety, San Jose, February, 1988

American Chemical Society, Conference on Chemical Entrepreneurship, Las Vegas, March, 1988

HAZCAT, Los Angeles, June, 1988

American Society of Safety Engineers Conference, October, 1988, San Diego, California

Semiconductor Safety Association Conference, (Invited paper), April 1990, Phoenix, Arizona

American Society of Safety Engineers Conference, (Invited paper), April 1990, San Diego, California

AMOCO Corporation Health & Safety Conference, (2 Invited Papers), May, 1990, Chicago, Illinois

ACS Meeting, June 1997, San Francisco (Invited Paper)

Laboratory Safety & Environmental Management, June, 1998, Durham, NC

PUBLIC TALKS AND PAPERS READ:

Enthalpy of Oxidation of FMN, September, 1974, A.C.S. Meeting, Chicago, Illinois

Calorimetric Studies of Bacterial Bioluminescence, December, 1975, Gillette Medical Research Center

Calorimetric Studies of Bacterial Bioluminescence, December, 1975, Brandeis University, Massachusetts

Calorimetric Studies of Bacterial Bioluminescence, December, 1975, Naval Medical Research Institute, Bethesda, Maryland

Calorimetric Studies of Bacterial Bioluminescence, December, 1975, N.I.H., Bethesda, Maryland

The Binding of Deoxy-uridylate and Fluoro-desoxyuridylate to Thymidylate Synthetase, September, 1976, International Calorimetry Conference, Montreal, Canada

Nucleotide Binding to Thymidylate Synthetase, July, 1977, Biophysical Society, Washington, D.C.

Properties of Glycoluciferase Isolated from Photobacterium Leiognathi, Strain 51, March, 1978, Biophysical Society Annual Meeting

Biology Department Seminar, March, 1978, Utah State University

Physics Department Seminar, April, 1978, Utah State University

Thermodynamic Description of Iron-Siderochrome Interaction, July, International Calorimetry Conference

CURRICULUM VITA

NEAL RICHARD LANGERMAN

Thermodynamic Parameters of Iron Binding to Desferrisiderophores, July, 1979, International Calorimetry Conference

Thermodynamic Studies of Flavin Binding, February, 1981, University of Georgia

Thermodynamic Studies of Flavin Binding, February, 1981, Emory University

Thermodynamic Studies of Flavin Binding, February, 1981, Duke University

Thermodynamic Studies of Flavin Binding, February, 1981, Kumanoto University

Biological Application of Reaction Calorimetry, November, 1981, Tokyo Kenki University

Thermodynamic Studies of Flavin Binding, November, 1981, Osaka University

Thermodynamic Studies of Flavin Binding, November, 1981, Nagoya University

Thermodynamic Studies of Flavin Binding, November, 1981, Tokyo University

Biological Application of Reaction Calorimetry, November, 1981, Gifu University

Biological Application of Reaction Calorimetry, November, 1981, Nagoya University

Thermodynamic Studies of Nucleotide Binding (invited lecture at the 16th meeting of the Japanese Society of Thermal Analysis and Calorimetry), November, 1981

My World, Below and Above, (Invited lecture to the general public as part of the Japanese Conference), November, 1981, Hamamatsu University

Industrial Applications of Reaction Calorimetry, November, 1981, Tukibo Company

Biochemical Thermodynamics (invited paper), March, 1982, Las Vegas, Nevada

Industry's Public Perception and Perspectives on Hazardous Waste Management, 1982, Leihigh University

The OSHA Hazard Communication Standard in the Workplace (OSHA 1910.1200), August, 1984, Oklahoma Safety Council

90 Days: The Responsibilities of the Hazardous Waste Generators, October, 1984, National Safety Council

Hazardous Materials: Where We Are-Where We Are Headed, April, 1985, American Society of Safety Engineers

Hazardous Material Emergencies: What We Have Learned from Disaster Review, April, 1985, American Society of Safety Engineers, San Diego, California

New Techniques and Materials: Hazardous Material Clean-up in the Semiconductor Clean Room, May, 1985, Phoenix, Arizona

Chemical Safety: Protect Your Company from Liability, American Chemical Society, March 1988, Las Vegas, Nevada

Chemistry of Hazardous Materials, American Society of Safety Engineers, October, 1985, San Diego, California

Hazardous Materials Management, Industrial Environmental Association of San Diego, August, 1989

OSHA's New Emergency Response Team Standards (OSHA 1910.120), April 1990, Semiconductor Safety Association, Phoenix, Arizona

CURRICULUM VITA

NEAL RICHARD LANGERMAN

Chemical Hazard Management, December, 1991, Eastern Analytical Symposium, Newark, NJ

"Options for the Management of MSDSs", American Chemical Society Meeting, Spring, 1997, San Francisco.

"Establishing a Small Spill Response Program in Laboratories", Laboratory Safety & Environmental Management Conference, June, 1998, Durham, NC.

"Spill Response in Academic and Research Laboratories", American Chemical Society Conference, Boston, 1998. Symposium on Small Spil's.

"Using a Consultant for EH&S Projects" American Chemical Society, New Orleans 1999 Division of Chemical Safety and Health

"Spill Response" Organized a 15-paper symposium on chemical spill response for the San Francisco American Chemical Society meeting, April, 2000.

"Spill Risk Assessment Tools" American Chemical Society, Washington DC, August, 2000 Division of Chemical Health and Safety

"Public Policy and its Impact on Laboratories" Laboratory Safety and Environmental Management, Alexandria, VA, July, 2000

"Considerations for In-House Training for Emergency Response Teams", American Chemical Society, Div. Chemical Health and Safety, San Diego, April, 2001.

"Laboratory Risk Assessment Tools", American Chemical Society, Div. Chemical Health and Safety, San Diego, April, 2001.

"Safety Engineering during the Design of the IRORI Autowash 10K", American Chemical Society, Div. Chemical Health and Safety, San Diego, April, 2001.

PUBLICATIONS:

1. F.H. Suydam, W.E. Greth and N.R. Langerman, "The Synthesis of Imidate Hydrochlorides by Reaction of Ethyl Chloroformate with Amides and Thioamides". J. Org. Chem., 34, 292, (1969)

2. N.R. Langerman and I.M. Klotz, "Free Energy of Subunit Interactions: Hemerythrin". Biochemistry, 8, 4746 (1969)

3. I.M. Klotz, N.R. Langerman, and D.E. Darnall, "Quaternary Structure of Proteins". Annual Reviews of Biochemistry, 39, 25 (1970)

4. N.R. Langerman and J.M. Sturtevant, "Calorimetric Studies of Quaternary Structure and Ligand Binding: Hemerythrin". Biochemistry, 10, 2809 (1971)

5. I.M. Klotz, D.E. Darnall, N.R. Langerman, "Quaternary Structure of Proteins", The Proteins (1975) 3rd Ed., 1 284-412

6. N.R. Langerman, "Physical Properties of Protein". A Table. Biology Data Book, 2nd Ed., Vol. 1, p. 370. (Federation of American Societies for Experimental Biology, Bethesda, Maryland, (1972)

7. S.W. Rothman, R.L. Kisliuk and N.R. Langerman, "Calorimetric Studies of Thymidylate Synthesis". J. Biol. Chem., 248, 7845

8. N.V. Beaudette and N.R. Langerman, "Enthalpy of Oxidation and Flavin Mononucleotide". Arch. Biocham. Biophys., 161, 25 (1974)

9. A. Ohkubo, N.R. Langerman, A.B.B Righetti and M.M. Kaplan, "Isolation and Physical Properties of Rat Liver Alkaline

Phosphatase". J. Bio. Chem. 249, 7174 (1974)

10. A. Mangold and N.R. Langerman, "Enthalpy of Oxidation of Flavin Mononucleotide II. Temperature Dependence of In Vitro Bacterial Luciferase Bioluminescence". Arch. Biochem. Biophys., 169, 126-133 (1975)

11. N.R. Langerman, "Calorimetric Study of the Binding of FMN to Bacterial Luciferase" in Flavine and Flavoproteins (S.J. Singer, Ed.) 77 82 (1976)

12. N.V Beaudette and N.R. Langerman, A Review of Oxidases and Related Redox Systems, Vol. 1 and 2". The Quarterly Review of Biology, 50, 445-446

13. N.R. Langerman, A Review of "Subunits in Biological Systems", Amer. Sci. (1976)

14. N.R. Langerman, "Enthalpy, Entropy ,and Free Energy Values for Biochemical Redox Reactions", Handbook of Biochemistry and Molecular Biology, p. 121 (1976)

15. P. McIlvaine and N.R. Langerman, "A Calorimetric Investigation of the Growth of the Luminescent Bacteria Beneckea harveyi and Photobacterium fischeri". Biophys. J., 17, 16 25 (1977)

16. N.V. Beaudette, N.R. Langerman, R.L. Kisliuk and Y. Gaumont. "A Calorimetric Study of the Binding of 2'-Deoxyuridine-5'-Phosphate and 5'-Fluoro-2'-Deoxyuridine 5'-Phosphate to Thymidylate Synthetase", Arch. Biochem. Biophys. 272-278 (1977)

17. M.J. Gonzales and N.R. Langerman, "A Thermodynamic Description of the Self Association of Flavin Mononucleotide", Arch. Biochem. Biophys., 180 75-81 (1977)

18. C.V. Balakrishnan and N.R. Langerman, "The Isolation of a Bacterial Glycoprotein with Luciferase Activity", Arch. Biochem. Biophys., 181, 680-682 (1977)

19. N.R. Langerman and R.L. Biltonen, "Microcalorimetry for Biological Chemistry: Applications, Instrumentation, and Experimental Design". Methods in Enzymology, 61, 287-311 (1978)

20. R.L. Biltonen and N.R. Langerman, "Microcalorimetry for Biological Chemistry: Experimental Design, Data Analysis and Interpretation: Methods in Enzymology, 61, 261-285 (1978)

21 N.R. Langerman, "The Simultaneous Determination of Heat Changes and Light Production". Methods in Enzymology, Chapters 13 and 14, 61, 261 (1978)

22. N.V. Beaudette, and N.R. Langerman, "An Improved Method for Obtaining Thermal Titration Curves Using Submicromolar Quantities for Proteins". Analyt. Biochem., 90, 693-704 (1978)

23. N.V. Beaudette, N.R. Langerman, and R.L. Kisliuk, "A Calorimetric Study of the Binding of 2'Deoxyuridine-5' Phosphate and its Analogs to Thymidylate Synthetase". Arch. Biochem. Biophys., 200, 410-417 (1980)

24. N.V. Beaudette and N.R. Langerman, "Thermodynamics of Nucleotide Binding to Proteins". Critical Reviews of Biochemistry, pp. 145-170 (1980)

25. N.R. Langerman, "Biological Microcalorimetry" a review. Analytic. Biochem., 111, 401-402

26. H. Nowak and N.R. Langerman, "Calorimetric Studies of Protein-Ligand Reactions: Flavin Binding Proteins". Arch. Biochem. Biophys., (1982)

27. B Gould and N.R. Langerman, "A Thermodynamic Description of the Binding of Iron to Ferrioxamine in Aqueous Solutions", Arch. Biochem. Biophys. (1983)

28. N.R. Langerman, "Biochemical Thermodynamics", J. Chem. in Two Year Colleges, (1982)

29. N.R. Langerman, "Thermodynamic Studies of Nucleotide Binding", Calorimetry, Thermometry and Thermal Analysis. (1983)

30. N.R. Langerman, "Hazardous Waste Management at Academic Institution" American Chemical Society Forum on Hazardous Waste, (1984)

31. N.R. Langerman, "Management of Hazardous Waste: Responsibilities of Generators" National Safety Congress, (1984)

32. N.R. Langerman, "Chemical Spill Response Workshop", written and developed for the J.T. Baker Chemical Company Office of Training Services, (1984)

33. N.R. Langerman, "Hazardous Chemical Safety" Seminar and manual written and developed for Chemical Safety Associates, Inc. (1985)

34. N.R. Langerman, "Management of Chemical Releases" Seminar and manual written and developed for Chemical Safety Associates, Inc. (1985).

35. N.R. Langerman, "Emergency Response in the Work Place" Seminar and manual written and developed for Chemical Safety Associates, Inc. (1986).

36. N.R. Langerman, "Chemicals in the Work Place: Trends and Solutions" Seminar and manual written and developed for Chemical Safety Associates, Inc. (1986).

37. N.R. Langerman and A. Mossman "Compressed Gas Safety and Emergency Response" Seminar and manual written and developed for Chemical Safety Associates, Inc. (1987).

38. N. Langerman "Fire Clean-up Operations Lead to Second Emergency At Laboratory", Occupational Health and Safety, August, 1988.

39. N. Langerman "Emergency Response Team Development and Training (in compliance with OSHA 1910.120)", SemiConductor Safety Association Journal, February, 1989

40. N. Langerman "Hazardous Waste Operations and Emergency Response: Summary and Interpretation", SemiConductor Safety Association Journal, September, 1989.

41. N. Langerman "Hazardous Materials Management in the SemiConductor Industry: Part 1", Solid State Technology, July, 1989.

42. L. Putnam and N. Langerman "OSHA Bloodborne Pathogen Exposure Control Plan", Lewis Publishers, March, 1992.

43. N. Langerman, "Precautionary Labels for Chemical Containers", Lewis Publishing, May, 1994.

44. N. Langerman, "Material Safety Data Sheets - Who Uses Them?" Chemical Health & Safety, 2,#6, 1995.

45. N. Langerman, MSDS Management: Options and Limitations" Chemical Health & Safety, 4,#4, 1997.

46. N. Langerman, "Clean-up of Small Spills in Laboratories and Production Areas", Chemical Health & Safety, 6,#1, 1999.

47. N. Langerman and H. Elston, "Regulations and Standards for the Chemical Hygiene Officer (III: A Quick Look at Environmental Management Regulations", Chemical Health & Safety, 6 #2, 11-14, 1999.

48. N. Langerman "Review of the Chemical Safety and Investigation Board Report on the Sturra Chemicals, Inc. Explosion" submitted Chemical Health & Safety, 1999.

49. Elston, H and Langerman, N (eds) J. Chemical Health and Safety, Spill Response. Jan-Feb, 2001

NEAL RICHARD LANGERMAN

REACTIVE and EXPLOSIVE CHEMICAL PROJECTS

CLIENT	APPROXIMATE DATE	PROJECT & OUTCOME
UTAH STATE UNIVERSITY	1978-82	Removal and destruction of various amounts of diethyl ether or picrates from laboratories. (1) Two one-pound bottles of picric acid were removed and "shot". One bottle detonated, the other broke. (2) Large amounts of red and white phosphorous, sodium and potassium metal, Thermite™, and poly-nitro compounds were removed from various campus buildings and thermally destroyed. (3) Several gallons of diethyl ether were removed from a cold-room and thermally destroyed. (4) Six, aged, five-gallon pails of diethyl ether were removed from the biology building and thermally destroyed. This project was particularly high profile since the cans were "discovered" three days before Graduation Weekend, and the maximum explosive potential was sufficient to destroy the entire three story building in which the chemicals were discovered.
AMOCO Tulsa Research Center	1982 - 84	Removal and disposal of aged diisopropyl ether, tetrahydrofuran, picric acid, and potassium metal from various buildings. Destruction was done by building and using a remote container puncture device. All work was supervised by CSA. The actual manipulations were done variously by AMOCO and CSA employees.
Cities Service Corporation - OXY Chemicals	1984	Removal and thermal destruction of four one-gallon bottles of diethyl ether, which had been placed in a 55-gallon 17H drum and left in the weather for at least two years.
Tulsa, OK, Police Department	1984	Removal of aged diethyl ether from a crime laboratory. Thermal destruction was performed by the city Police Department.
Hughes Research Facility	1985	Design of a protocol to treat silicon tetrachloride. This project was not authorized at that time, but was ultimately performed in 1990 by Chemical Waste Management, using the protocol designed previously.
Ohio Highway Patrol	1986	Telephone consulting for incident management of a leaking tank car of silicon trichloride on the Ohio Turnpike. The shipper was a CSA client, who advised the Highway Patrol to use CSA's services. All information was provided by phone, working from our San Diego offices on a Saturday morning.
Sola Barnes-Hind	1990	Design of a protocol for the removal and thermal destruction of aged cumene hydroperoxide from a manufacturing facility in a major metropolitan location. The work was performed by Broco.

CURRICULUM VITA

NEAL RICHARD LANGERMAN

CLIENT	APPROXIMATE DATE	PROJECT & OUTCOME
Beckman Instruments, Inc.	1990	Response to and mitigation of a smoking container of an organic peroxide. The materia· was water reactive and was destroyed by controlled reaction with cold water.
AMOCO Research Facility	1993	Inspection of and recommendations for disposal, of a one pound bottle of picric acid. CSA did the actual soaking of the material and used a remote opening device to open the containe· under water. Chemical Waste Management handled the d sposal of the resulting solution.
AMOCO Research Facility	1993	Removal and chemical destruction of a one-gallon bottle of diethyl ether. The bottle was opened using a *remote opening device*.
The following highly reactive material incidents have been investigated by Dr. Langerman.	1975 - 93	1. Explosion of 8.5 million pounds of ammonium perchlorate oxidizer. 2. Explosion of a unique titanium silver nitrate complex. 3. Fire involving trichlorotriazine. 4. Explosion of a mixture of nitrous oxide and silane. 5. Explosion of a truck-load of zinc, zinc chloride, and steel. 6. Explosion of Liquid Explosive Manufacturing Facility in Utah. 7. Explosion of Solid Explosive Manufacturing Facility in Utah.
Joint Consulting Project with New Mexico Technological University School of Explosive Technology	1990-91	Stability of Ammonium Perchlorate and Ammonium Perchlorate Propellants in contact with High Density Poly Ethylene

Curriculum

Terrence J. Pitzen
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April 1, 2000

RESUME

Chemical Consultant
recent projects

- Provided litigation support in the form of library research on industrial activities on a property in downtown Emeryville, CA called the Shellmound site for the law firm of Berg & Parker representing Elementis Pigments Company in a federal CERCLA case involving contamination of the site with Lead and Arsenic over a period of approximately 75 years by several companies using these elements in production.

- Performed site safety audit, review of Hazardous Materials Management Business Plan, Risk Management and Prevention Plan, Emergency Response Plan, evaluation of proposed Silane mega-gram storage facility for Matheson Gas Products, Newark CA, in conjunction with ENVIRON International Corp and Kelley Drye & Warren LLP environmental legal department. Wrote report for review by the City Of Newark CA HazMat Emergency Response department/District Attorney, Alameda Co., CA.

- Wrote training manual, established training program and trained seven 6-person emergency response teams per OSHA 29CFR 1910.120(q) for Airgas Specialty Gases, Pacific Airgas and Cascade Airgas, to the 24-Hour level of certification.

- Wrote National Emergency Response Plan for Airgas, Inc., Radnor, PA, for use in coordinating hazardous materials incident response at 44 company "hubs" in the U. S. and Canada.

- Monitored on-going Material Safety Data Sheet generation program for Airgas/Safecor (approximately 250 MSDS's compliant with ANSI Z400.1 and Canadian WHMIS standards). Wrote all orders for new MSDS's, and proofread all completed MSDS's for technical accuracy before issuing to Airgas, Inc. Compiled databases in MS Access for identifying 506 gases & vapors used in making specialty gas mixtures by MSDS number, as well as by physical, chemical and hazardous properties, and regulatory classification (US EPA, OSHA & DOT).

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RESUME

- Performed independent audit of IGP, Inc. (Colorado Springs, CO) for regulatory compliance in safety, health and environmental affairs prior to acquisition by Airgas Corp.

- Served as Airgas Specialty Gases representative to the Compressed Gas Association committee, COMPGEAP. (Compressed Gases Emergency Action Program, 5/96-5/99)

Additional Projects:
1991 - 1996

- Designed and installed specialty gases scrubbing system for SoCal Airgas consisting of 2,000 cfm Venturi unit, 22 foot packed scrubber tower (both Croll-Reynolds), 600 gallon sump system with 2 pumps and associated plumbing, emergency response leaking cylinder cabinet per 1994 UFC (section 8003.3.3.3) specifications, plus assorted activated carbon traps for specific gases such as Chlorine, Hydrogen Sulfide, and hydrocarbons. Hazardous waste volume minimization was a major priority in this project, and was accomplished by appropriate selection of scrubbing agents.

- Wrote operating manual and scrubber permit application per South Coast Air Quality Management regulations to permit SoCal Airgas to operate above scrubber system.

- Designed and installed IST 21-point toxic/flammable gas monitoring system in Airgas Specialty Gases laboratory at SoCal Airgas Facility for use in plant industrial hygiene program, and response to hazardous materials incidents on-site. The system monitors the plant to the LEL for Hydrogen, and the TLV's for Chlorine, Ammonia, Sulfur Dioxide, Benzene, Nitric Oxide, and Hydrogen Sulfide.

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RESUME

- Developed procedures and equipment (lecture bottle guillotine, devalving chamber) for processing out-of-service lecture bottles as well as larger cylinders prior to scrapping as part of a site remediation project at SoCal Airgas facility involving 1,100 lecture bottles and 450 larger cylinders containing approximately 85 different specialty gases. Coordinated efforts with Earth Resources Corporation during this project for identification of material in unlabeled cylinders and containers.

- Assisted in instruction per OSHA 29CFR 1910.120 for Hazardous Materials Technician/Specialist 24 & 40 Hour Training seminars (approximately 30 seminars) at Chemical Safety Associates, Inc. San Diego, CA.

- Assisted in the compilation and writing of the "OSHA Bloodborn Pathogens Control Plan" manual for Chemical Safety Associates, Inc., San Diego, CA.

R & D Chemist
1986 - 1990

- Assisted in Arsine/Phosphine gas scrubber development (engineering, testing and operation), plant decommissioning, and site remediation, including hazardous waste recycling process development. Phoenix Research Corporation, La Mesa, CA.

- Developed Arsine/Phosphine scrubber stoichiometries and processes, Arsine co-generation product (saturated Zinc Sulfate solution) purification and recycling process, Arsine purification and analytical procedures. Phoenix Research Corporation, La Mesa, CA.. The scrubber developed during field work in Fort Worth, TX was tested in March, 1989 with representatives of the US EPA and the San Diego Air Pollution Control District present, and was demonstrated to perform to the 99.9% efficiency level. The scrubber was then scaled up 15:1 and installed at the Phoenix Research plant in La Mesa, CA.

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RESUME

Plant Manager
1978 - 1986

- Manager of a specialty gases plant which filled and analyzed Arsine, Phosphine, Diborane, Silane and other electronics gases for semi-conductor wafer fabrication. Major customers: Intel (sole supplier of electronics gases, 1978 - 1986), Texas Instruments Corp., Hewlett-Packard, Motorola, Signetics. Also supplied a full line of ultra-high purity gas handling apparatus for use with the above gases. Union Carbide Corporation/Linde Division, Santa Clara, CA.. Designed and installed first Arsine/Phosphine 10 point area monitoring system in Silicon Valley for plant industrial hygiene program.

Special Projects Chemist
1976 - 1977

- Gas purification and analytical procedures, gas scrubber processes and equipment. Established industrial hygiene program for Ethylene Oxide. Ran off-site analytical services program, main condenser analytical program. Union Carbide Corporation/Linde Division, E. Chicago, IN.

Analytical Chemist
1972 - 1975

- Illinois Department of Public Health, Chicago, IL. Performed pesticide/polychlorinated biphenyls analyses per FDA Pesticide Analytical Manual, as well as mercury analyses by AAS on raw fish and dairy products. Also performed water analyses for potability per "Standard Methods of Water and Wastewater Analyses" for certification for the northern third of Illinois of all potable water supplies, public and private.

Professional Activities:
Member, Compressed Gas Association Committee on COMPGEAP. (5/96 - 5/99)
(Compressed Gas Emergency Action Program, subcommitee on specialized ER equipment)
Served as UCC/Linde CHEMTREC representative (on-call 7/24, 1976 -1989).
Holder of US Patent Number 4,955,404: Method and Apparatus for Sealing Leaking Valves on Compressed Gas Tanks

Education:
B.S., Chemistry, Michigan State University, E. Lansing, Michigan, 1969.

ADVANCED CHEMICAL SAFETY

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TECHNICAL EXPERTISE

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CHEMICAL SAFETY SERVICES

Site Surveys - Detailed audits of your procedures for using and storing chemicals. Assessments of Personal protective Equipment use in compliance with OSHA. Risk assessments and evaluations of potential workplace hazards; recommendations for corrective action.

Exposure Monitoring - Industrial Hygiene surveys of potential chemical exposures in your work place. Monitoring studies are performed using current NIOSH recommended procedures. All studies are customized for your workplace. Fully documented reports, signed by our Board-certified Industrial hygienist are provided in a timely manner.

Safety Consulting - Regular visits by safety professionals to assist your Company with all areas of chemical and occupational safety Our safety and environmental professionals become an important addition to your company safety program, providing effective solutions to environmental, health, or safety issues.

Accident Investigation - Critical evaluation of the cause of accidents with recommendations for prevention of recurrence. When an accident occurs, it is important to perform a thorough investigation, to identify the cause and to prevent repetition. Our professionals will join, or lead, your accident investigation team and develop effective corrective actions to protect your employees and your facility.

PROCESS SAFETY REVIEWS

Review of proposed or installed equipment and processes for safety and technical operation. OSHA requires periodic reviews of certain installations. These reviews are performed by teams, which include experts, such as the professionals from ACSafety. For those processes not covered by the OSHA Standard, a scaled-down review can be performed. Process safety reviews prevent accidents, protect your employees, and save you money. Particular expertise related to compressed gas use, distribution and manufacturing.

PRODUCT TECHNICAL RESOURCE SERVICES

ACSafety provides technical assistance to a variety of manufacturers of chemical and related products. ACSafety will field chemical compatibility questions, regulatory concerns and other questions from your staff and clients related to your products. ACSafety can also review existing product handling procedures and shipping procedures of your chemical products for overall safety, and regulatory compliance. This can be especially useful if you ship to many different states where regulations can vary. ACSafety's trained scientists can participate in your product development cycle to help identify possible problems, before production. ACSafety's broad experience is a valuable tool for your Product Stewardship Program.

HAZARDOUS WASTE SERVICES

ACSafety can provide all levels of Hazardous Waste service, from a review of your existing program to complete "turn-key" management of your entire program. ACSafety can provide regulatory intervention, as needed, provide all documentation required, and assist you in remaining in compliance with various hazardous waste regulations.

ACSafety will also manage all aspects of the accumulation, transportation, and disposal of your waste chemicals. ACSafety's knowledgeable staff selects TSDF's which are most protective of your liability, and are cost-effective. ACSafety's recordkeeping serves as a back-up to your facility records If you have questions about compatibility, packaging, accumulation, waste minimization, or any of the other "regulatory traps" generated by RCRA, ACSafety is your solution.

INDUSTRIAL HYGIENE SERVICES

Plant Surveys - Industrial hygiene audits of your facility for OSHA compliance and potential worker exposures. Lead and other metals, solvents, non-ionizing radiation, noise, and ergonomics are all potential causes of employee illness and injury. Only careful, periodic monitoring can really protect your employees. ACSafety's years of experience are your edge to preventing illness and injury.

Toxicological Consultation - Professional experience in toxicology and related disciplines is provided to assist your Company with employee health maintenance, product liability, and employee relations.

Asbestos and Lead Abatement Monitoring - Our trained Industrial Hygiene staff will represent your Company to observe and monitor asbestos abatement. We will assure that contractors meet specifications and follow OSHA required procedures. Continual, on-site monitoring will prevent costly building contamination and assure workers that your Company is doing everything necessary to protect them from potential asbestos exposure.

Respirator Training & Qualitative or Quantitative Fit-Testing.

CUSTOMIZED TRAINING PROGRAMS

ACSafety's trained professional chemists, environmental engineers, and industrial hygienists present one or more day customized seminars to your employees, on your site. We offer standard seminars covering all areas of chemical handling and regulations. Our staff will prepare a customized program specifically tailored to your needs. All participants receive specially prepared manuals and certificates of participation. On-going and follow-up training is available to improve the learning process.

ACSafety has a national reputation for its high quality **Hazardous Waste Operations and Emergency Response training programs.** ACSafety's programs, and technical training manuals, are the cornerstone of many emergency-response programs. ACSafety's hand-on training prepares your employees for the potential hazards of a waste site. ACSafety updates its Annual **Refresher** program every year, to ensure challenging, fresh training for your employees.

ACSafety's national reputation in providing technically sophisticated training in complex fields in an understandable format is ACSafety's hallmark of excellence. Our staff of skilled trainers can explain complex regulations or detailed operating procedures to your employees in a manner which enhances learning and retention. ACSafety is skilled at "hands-on" training.

Today quality training is more important than ever; it is required by many regulations and training is known to improve productivity, reduce accidents, and have a direct, positive impact on Corporate profits

TECHNICAL DOCUMENT PREPARATION SERVICES

ACSafety is highly experienced in preparing technical documents such as:

RCRA Part B Permit Applications
Preparedness & Prevention Plans
Waste Minimization Plans
TSCA Premanufacture Notifications
National Sanitary Foundation Certification Applications
Contingency Plans
Emergency Planning Manuals
Chemical Hygiene Plans
Safety & Health Plans
Injury and Illness Prevention Plans
OSHA Hazard Communication Plans
OSHA Laboratory Standard Plans
Bloodborne Pathogen Protection Plans
Product Label Preparation for Regulatory Compliance

LITIGATION SUPPORT

ACSafety's experienced scientists support defense and plaintiff litigators in toxic tort, regulatory, and product liability litigation.

ENVIRONMENTAL MANAGEMENT SYSTEMS

ACSafety can assist in compliance with the U.S. EPA Project XL and ISO 14000 which require a written Plan and third party audits. All aspects of development and compliance are supported.

COMPRESSED GAS SAFETY

ACSafety staff have particular expertise related to the use, distribution and production of compressed gases. End user safety evaluations, engineering studies, process design and review are all available. Plant compliance consulting, product management and customer service consulting are available to the compressed gas industry.

STATEMENT OF QUALIFICATIONS

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1.0 INTRODUCTION

1.0 INTRODUCTION

Established in 1987, Targhee, Incorporated provides a wide range of technical and consulting services in chemistry, engineering, geoscience, environmental science, and regulatory compliance. Targhee specializes in issues involving air emissions, hazardous materials, water quality, and hazardous wastes. We provide environmental assessments of properties in real estate transactions, investigations and feasibility studies for contaminated sites, and evaluation and/or management of remedial actions.

Targhee's members and associates possess education, experience, and/or professional certificates in the following disciplines: chemistry, engineering, geology, hydrology, facility operations, environmental science, industrial health and safety, and environmental law. Targhee's professionals are experienced in conducting hazardous waste management and environmental quality assessments. Studies include:

- Record searches and historical data assessments
- Site investigations and assessments
- Evaluation of remedial action alternatives
- Design of containment and abatement systems
- Facilities siting
- Regulatory compliance analysis
- Construction monitoring and supervision.

Targhee's staff is highly qualified in dealing with complex local, state and federal regulations and effectively interfacing with regulatory officials. Our extensive experience in the important regulatory, technical, and management aspects of environmental projects enables Targhee to complete projects with efficiency and economy.

Targhee established its reputation as a specialized environmental consulting firm through effective project management and conscious application of technical and regulatory expertise. Project experience involving environmental assessment, investigation, and remediation have included small-scale projects as well as multimillion-dollar programs.

2.0 CAPABILITIES

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In the assessment and resolution of hazardous chemical investigation and environmental remediation issues, Targhee utilizes its breadth of experience. This experience is focused on field investigations, siting studies, permitting assistance, and the monitoring, planning and design of remedial systems.

Targhee's approach to these services is multi-disciplinary, utilizing the capabilities of specialists in areas of geology, hydrology, environmental science, chemistry, and engineering. Table 1 summarizes the services we offer, from initial site surveys to remediation implementation. Key capabilities within these disciplines are discussed in the following sections.

Environmental Assessments

Environmental assessments are conducted by our multi-disciplined team of specialists. These studies emphasize continual interaction with the client to ensure unambiguous communication of regulatory requirements, risk assessment, and engineering and design requirements for cost-effective mitigation.

Soils and Groundwater Investigations

Our professional staff is experienced in the collection and evaluation of site data. Tests and investigations used in evaluating and solving a variety of geological, hydrogeological, and hazardous/solid waste management problems are performed.

Targhee's environmental staff specializes in hazardous waste contamination and remedial action investigations. Our staff routinely conducts sampling and analysis of soils, sludges and groundwater, coordinates underground storage tank testing, and evaluates site baseline geologic conditions to assist in groundwater monitoring well design and installation.

Chemistry

To properly provide effective remediation of contaminated property, the nature and scope of contamination must be accurately assessed. Targhee's capabilities in the chemistry of hazardous wastes are comprehensive, including the design of sample collection programs and procedures, interpretation of analytical results, and the development of treatment and abatement programs. Targhee is experienced in EPA and

state required procedures and protocols for collecting samples of surface and subsurface soil, groundwater, and surface water. Interpretation of analytical data includes standard graphical and statistical techniques and applied chemical modeling.

Air Quality

Targhee's staff is trained in air quality monitoring during site investigations and in assessing the atmospheric implications of hazardous waste management alternatives. In the management of hazardous substances, our engineers and scientists assist clients with strategies for minimizing hazardous emissions through modification in production processes or suggestions for improved treatment technologies. These strategies are developed in close coordination with the client to support its corporate asset redeployment goals.

Source Reduction and Waste Minimization Programs

Targhee engineers can assist plant engineers in developing a comprehensive waste reduction program by identifying specific industrial processes known to produce bulk hazardous wastes. Alternative procedures can be developed to minimize waste and reduce toxicity, volume and disposal/treatment costs in such processes such as degreasing, solvent cleaning, paint stripping, and metal and circuit board plating.

Environmental Audits

Targhee can perform compliance audits of facility operations with respect to state and federal hazardous waste and chemical reporting regulations (RCRA and SARA), air quality regulations, sanitation district and water quality control board discharge requirements, and hazardous material storage regulations.

Preparation of Agency-Required Environmental Reports

Targhee staff can efficiently compile data and formulate responses to agency requests for information. The submittal of annual reports pursuant to the requirements of SARA Title III, state and local hazardous waste agencies, RCRA, and local air districts can also be prepared.

Environmental Staff Support

Targhee can provide support to organizations with a limited environmental staff by furnishing assistance in understanding and complying with legislation and regulations which may affect business operations. Targhee will complete forms and reports required by regulatory agencies, obtain necessary permits, and conduct environmental inspections of operating facilities.

Table 1

- Siting and permitting of hazardous and non-hazardous waste treatment, storage, and disposal facilities.

- Air, water, and hazardous waste planning, strategy development, permitting, and representation before regulatory agencies.

- Environmental inspections and investigations in real property transactions to meet due diligence, liability prevention, and risk assessment requirements.

- Environmental audits to attain and maintain compliance with federal, state, and local air, water, hazardous materials, and hazardous waste laws and regulations.

- Source reduction and waste minimization programs.

- Development and regulatory approval of mitigation and remediation plans for soil and groundwater contamination from tanks and other sources as well as management of operations implementing approved plans.

- Preparation of agency-required environmental reports, hazardous substance management plans, employee training programs, and facility operations procedures.

- Litigation consulting, investigative review, and expert assistance in civil and criminal cases involving Superfund liability, toxic torts, environmental damage claims, and regulatory agency enforcement actions.

- Client protection through third-party evaluation of prior reports and oversight of ongoing environmental investigation or remediation activities.

3.0 RELEVANT EXPERIENCE

3.0 RELEVANT EXPERIENCE

Targhee professionals have completed numerous projects, ranging from environmental assessments to remedial action investigations. Our experience spans site characterizations and assessments, groundwater investigations, leaking underground tank remediation, regulatory negotiations, permitting procedures, and remedial alternatives for site cleanup. A partial client list is presented below.

Partial Client List

BFM Transport Dynamics, Santa Ana, California

Dinamation, Irvine, California

George Rice & Sons, Los Angeles, California

Downey Land, Downey, California

Diversified Shopping Centers, Costa Mesa, California

Forum Properties, Indianapolis, Indiana

ESCO Electronics Corporation, St. Louis, Missouri

Magma Power Company, Imperial County, California

Sakioka Farms, Santa Ana, California

Aerochem, Orange, California

Ducommun Incorporated, Los Angeles, California

National Gypsum, Charlotte, North Carolina

Trammell Crow, Carson, California

County of Orange, Santa Ana, California

Time Oil, San Pedro, California
Hancock, Rothert & Bunshoft

Gibson, Dunn & Crutcher

Cozen & O'Connor

Lewis, D'Amato, Brisbois & Bisgaard

4.0 PERSONNEL

4.0 PERSONNEL

Targhee's staff of professional and support personnel includes specialists in chemistry, engineering, environmental sciences, geology, hydrology, industrial hygiene, and environmental law. This comprehensive professional resource base allows us to provide a full range of environmental services for client projects.

Summary of Professional Qualifications

- David L. Bauer, President

  Mr. Bauer is a Certified Professional Chemist with over 25 years of direct experience in environmental management. Before forming Targhee in 1987, Mr. Bauer was Vice President of Environmental Affairs at International Technology Corporation. Prior to that position he was Manager of Environmental Control/Utilities for the Dow Chemical Company, Western Division.

  Mr. Bauer has authored several patents and numerous technical papers. He is a member of the Hazardous and Toxic Substances and Air Quality Management Advisory Board at the University of California Irvine, and he serves as an instructor in the Hazardous and Toxic Substances Certification Program at that University. He served as a member of the Technical Advisory Council of the California Office of Appropriate Technology and was a member of the Technology Subcommittee of the Governor's Task Force on Toxics, Waste and Technology. He is past chair of the California Manufacturer's Association Environmental Quality Committee. He is a California Registered Environmental Assessor.

  His background includes over two decades of continuous experience in the regulatory process. This involves interface in the statute and rule-making process, as well as practical interpretation and application of the complex regulatory process as applied in the field.

  He has successfully dealt with the environmental assessment and permitting of a number of major manufacturing and waste management facilities.

He has frequently served as a consultant and expert in the evaluation of difficult environmental problems that have reached legal impasse. This experience includes environmental evaluation and audit of industrial processes and operations, as well as environmental evaluation, assessment and recommendation in real property siting decisions.

- Debra Bechtold

Ms. Bechtold is a project manager and land use specialist with over 10 years of professional experience. She is responsible for conducting Phase I & II environmental assessments which have included site remediation. Ms. Bechtold also assists clients in preparation of regulatory agency required permitting and reports, and reviews and evaluates technical documents in environmental liability litigation cases. Prior to joining Targhee, she served as the project manager for property transfer assessments with a nationwide waste management firm. In addition to her work in performance of environmental site inspections and research, her other areas of technical responsibility have encompassed employee safety, training and medical surveillance. Ms. Bechtold is a California Registered Environmental Assessor. She has completed the Certificate in Hazardous Materials Management from the University of California, Irvine.

- David Broadbent

Mr. Broadbent is a project manager, chemist, and environmental specialist with over 15 years experience in hazardous waste management and regulatory affairs and over eight years experience in responding to chemical spill emergencies.

Mr. Broadbent previously was responsible for all regulatory interaction for a nationwide waste management firm involving treatment, transportation and disposal facilities. He has performed over 200 environmental audits of waste management facilities and was a principal in the design and permitting team for a 600,000 cubic yard industrial waste landfill. He has also completed over 10 Part B Permit Applications for hazardous waste treatment/storage and disposal facilities, along with assisting major aerospace firms with updating their compliance activities. Mr. Broadbent is a team leader for Targhee's litigation support team, assisting clients in document discovery and litigation support. He has performed and designed numerous environmental investigations of contaminated properties. Mr. Broadbent is a California Registered Environmental Assessor.

- Howard Culver

  Mr. Culver has over 25 years of education and experience in administrative proceedings and government regulation of business. He investigates historical hazardous chemical handling and waste disposal practices and contamination causation in federal and state Superfund liability litigation. He also conducts environmental audits and inspection programs to determine compliance with government regulations on air pollution, water quality, hazardous materials and hazardous wastes.

  Mr. Culver has been responsible for permit strategy development and permit application preparation and processing before regulatory agencies for treatment, storage and disposal facilities for a large hazardous waste management firm located in Southern California. He also directed agency permitting and regulatory compliance, including environmental affairs and Superfund negotiation, for a major domestic and international airline. Mr. Culver is a member of the Bar in California and the District of Columbia and is a California Registered Environmental Assessor.

- Joan Greenwood

  Ms. Greenwood is an analytical chemist with over 30 years of professional experience. She is the former director of a commercial laboratory whose staff of 35 specialists analyzed over 1,000 environmental samples per week. Her responsibilities encompassed a wide range of tasks including implementation of a Total Quality Management ("TQM") program, technical oversight of a plan to improve its database management system for laboratory project files, and compliance with the company's national QA/QC protocols.

  From 1974 through 1990 as a technical manager for several manufacturers of scientific instrumentation, she developed and revised analytical methods, made recommendations for new products to software and hardware development personnel, critiqued and recommended changes to user interfaces, wrote numerous workshops and training courses throughout the world. She is an expert in Standard Methods for Drinking Water, EPA SW-846 Test Methods for Solid Wastes (soils, wastewater, surface and groundwaters), and field measurement techniques including immunoassays.

  Since joining Targhee, Ms. Greenwood has focused on emerging environmental issues such as watershed management, stormwater and urban runoff Best Management Practices ("BMPs"), metal ecotoxicity, industrial ecology, healthy

community initiatives, phytoremediation, and Brownfield assessments. She advises Targhee staff on a wide range of pending technical issues that may have major impact on clients.

Her most recent Targhee project experience involves litigation support for cases related to sources of toxic metals in drinking water systems and marine sediments.

- Charles F. Lindeman

Mr. Lindeman is a chemist with a certificate in Environmental Studies and a degree in Business Management. He has participated in the technical review of environmental reports and internal quality assurance projects. He has also participated in Targhee's litigation support function with study focusing on the nature and extent of contamination and the cause of chemical contamination as a function of business management practices and hazardous waste disposal practices.

Prior to joining Targhee, Mr. Lindeman was a project manager for a subcontractor specializing in high-rise, institutional and manufacturing construction. He has over 10 years' experience in contract management, construction and related industries. Mr. Lindeman is a California Registered Environmental Assessor.

- Paul McCarter

Mr. McCarter is a geologist with over 15 years of professional experience. He is involved in property transfer assessments and site soil and groundwater investigations. He has served as project manager for minerals exploration and pre-development programs within the mining industry and has worked in many different types of geologic environments. Prior to joining Targhee, Mr. McCarter served on the staff of an environmental consulting firm in the Los Angeles area. His duties included permitting and installation of groundwater monitoring wells and site-specific geologic analysis. Mr. McCarter is a Registered Geologist in the States of California and Arizona and a Certified Environmental Assessor in the State of California.

- Mitsuye Morrissey

Ms. Morrissey is responsible for reviewing all available agency documents on contaminated sites and making necessary inquiries to identify potentially hazardous sites. Prior to joining Targhee, Ms. Morrissey worked for a major nation-wide hazardous waste management company. She also has had experience working as a legislative assistant for elected public officials. She has had over 15 years' experience working at various levels in city, county and state public agencies.

- Linda D. Norwood

  Ms. Norwood possesses a Master of Science degree in Health Science and has over 12 years of regulatory and investigative experience. She is a California Registered Environmental Assessor and provides consulting services to various clients from large corporations to small business owners. She provides property transfer assessments, compliance audits, underground tank removals, subsurface investigations, and soil/groundwater remediations.

  Prior to joining Targhee, Ms. Norwood served with a major aerospace corporation. She was responsible for hazardous waste generator audits, regulatory compliance issues and management of a hazardous waste storage facility. Ms. Norwood has also served with the California Department of Health Services, Toxic Substances Control Division, where she was involved with preliminary assessment of potentially contaminated sites. Before joining DHS, Ms. Norwood was employed by Ventura County Environmental Health. Her duties included inspection of underground tank installations and abandonments, preliminary assessment of potentially contaminated sites and assistance with regulatory environmental workshops.

- B. Richard Sacks

  Mr. Sacks is a chemical engineer with over 25 years of technical experience. He has functioned as project manager on numerous water and wastewater engineering projects worldwide and has designed and supervised the construction of landfills in California.

  He has eight years of direct experience in groundwater remediation projects and has developed and designed numerous groundwater-treating processes for industry in Southern California. He also has performed environmental audits primarily of chemical process and petrochemical facilities; this work included both Phase I and Phase II activities.

  His background includes two decades of continuous environmental engineering-related projects for industrial water and wastewater treatment process design, and he is the holder of an aerosol- phase hexavalent chromium reduction process patent. Mr. Sacks has served as a consultant and expert witness in the evaluation of petroleum and petrochemical-related legal matters especially in "Superfund" litigation.

- Victoria H. Sawtelle

  Ms. Sawtelle is a corporate assistant with over 25 years of experience in administrative support including over 15 years of professional experience in the environmental field.

  Before joining Targhee, Ms. Sawtelle was the Administrative Assistant for Environmental Affairs at IT Corporation. Prior to joining IT, she held several administrative positions in the West Coast Headquarters of Sears, Roebuck & Co.

  She performs environmental research and federal, state and local regulatory agency records investigation. She prepares litigation studies and performs report editing.

- Able Shiang, Professional Engineer

  Mr. Shiang is a Registered Professional Engineer in the State of California, and he has over 15 years of professional experience in the chemical processing industry, specializing in air quality and emissions control, process hazard/risk assessment, source testing, air toxics inventory reporting, permitting, and waste minimization. He is involved in human health risk assessment, property transfer assessments, site soil investigations, remediation projects, permit application preparation, air toxics inventory plans and reports, and assists industrial firms with their regulatory compliance, waste minimization, and air emissions control activities. Prior to joining Targhee, Mr. Shiang worked in process engineering positions for manufacturers of composite plastic materials and chemical adhesives. Mr. Shiang is a California Registered Environmental Assessor.

TARGHEE, INC.

ENVIRONMENTAL CONSULTING

June 4, 2001

Neal Langerman, Ph.D.
Advanced Chemical Safety
7563 Convoy Court
San Diego, CA 92111

Re: Proposed Torrey Hills Gas Station
Site Specific Health Assessment Review

Dear Dr. Langerman:

As you requested, I have reviewed your draft Site Specific Health Assessment Report for the Torrey Hills Gas Station. Aside from the editorial comments we discussed, I find your report and its conclusions to be consistent with generally accepted scientific principles.

Sincerely,

David Broadbent, R.E.A. 00122
Director of Technical Services