

Health Consultation
SOUTH SCOTLANDVILLE 1,3-BUTADIENE EVALUATION
BATON ROUGE, LOUISIANA



Prepared by

Louisiana Department of Health and Hospitals
Office of Public Health
Section of Environmental Epidemiology and Toxicology
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Table of Contents

Table of Contents	i
List of Acronyms	ii
Summary and Statement of Issues	1
Background	1
Site Description and History	1
1,3 Butadiene Background	1
Demographics	4
Discussion	4
Exposure Pathways	4
Evaluation Process	4
Health Effects Evaluation	4
Cancer Health Effects Evaluation	5
Child Health Considerations	5
Conclusions	6
Recommendations	6
Public Health Action Plan	6
Actions Planned:	6
Preparers of this Report	7
References	8
Appendix A: Evaluation Process	10
Noncancer Health Effects	10
Calculation of Carcinogenic Risk	10

List of Acronyms

ATSDR	Agency for Toxic Substances and Disease Registry
DHAC	Division of Health Assessment and Consultation
LDEQ	Louisiana Department of Environmental Quality
LDHH	Louisiana Department of Health and Hospitals
mg/m ³	Milligrams per Cubic Meter
OPH	Office of Public Health
ppb	Parts per Billion
ppbv	Parts per Billion by Volume
ppm	Parts per Million
RfC	Reference Concentration
SEET	Section of Environmental Epidemiology and Toxicology
µg/m ³	Micrograms per Cubic Meter
U.S. EPA	United States Environmental Protection Agency

Summary and Statement of Issues

On October 18, 2004, the Louisiana Department of Environmental Quality (LDEQ) issued a press release stating that air monitors at their South Scotlandville and Port Allen sites in Baton Rouge, LA, had recorded levels of 1,3-butadiene exceeding the Louisiana toxic air pollutant ambient air standard for this compound. Louisiana's ambient air standard for 1,3-butadiene is 0.42 parts per billion by volume (ppbv). The 2004 data for the South Scotlandville site yielded a mean annual average of 0.80 ppbv. The LDEQ is reviewing the permitted limits and any non-routine releases from area industries which may be responsible for these elevated levels [1].

The LDEQ provided mean annual 1,3-butadiene concentrations averaged from the regular sampling schedules of 1999 to 2004 to the Louisiana Department of Health and Hospitals/Office of Public Health/Section of Environmental Epidemiology and Toxicology (LDHH/OPH/SEET). The LDEQ requested that SEET review these averages to estimate whether exposure to 1,3-butadiene at these concentrations poses a threat to human health and to determine what further public health actions, if any, may be needed.

Background

Site Description and History

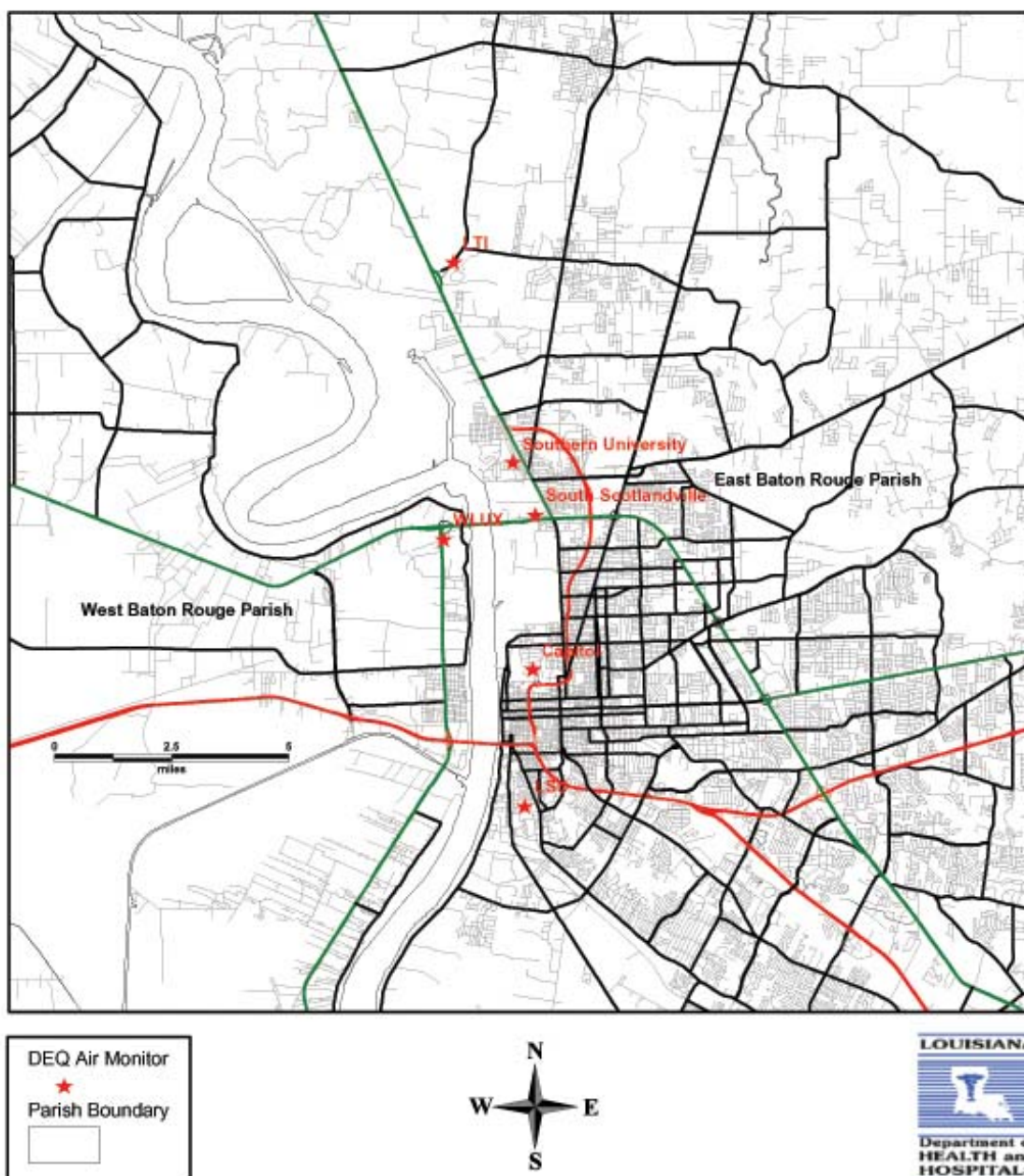
The South Scotlandville air monitor is part of a network of toxic air pollutant ambient air monitors that LDEQ operates throughout the state of Louisiana. This particular monitor is located on U.S. Highway 190 (Airline Highway) near the old Mississippi River Bridge (see Figures 1-2). The monitor's air intake is positioned 12 feet above ground level. Set into place in 1999, it was formerly referred to as the Rhodia site in reference to an investigation unrelated to current activities. The monitor regularly measures total non-methane hydrocarbons within ambient air. When the total concentration of these hydrocarbons rises over a certain level, the monitor is triggered to catch an air sample (M. Oubre, Louisiana Department of Environmental Quality, personal communication, 2004). The captured air sample can then be analyzed to determine which of these hydrocarbons was present in higher than acceptable concentrations.

1,3 Butadiene

1,3 Butadiene is a colorless gas with a gasoline-like odor. Production of this contaminant occurs during the refining of petroleum and the manufacture of rubber and from the exhaust of automobiles and trucks. 1,3-butadiene can also be a byproduct of cigarette smoke and the smoke of wood fires. This compound is almost always present at low levels in urban air samples but is broken down quickly by sunlight. Once inhaled, it is eliminated from the body through urine and in exhaled air [2]

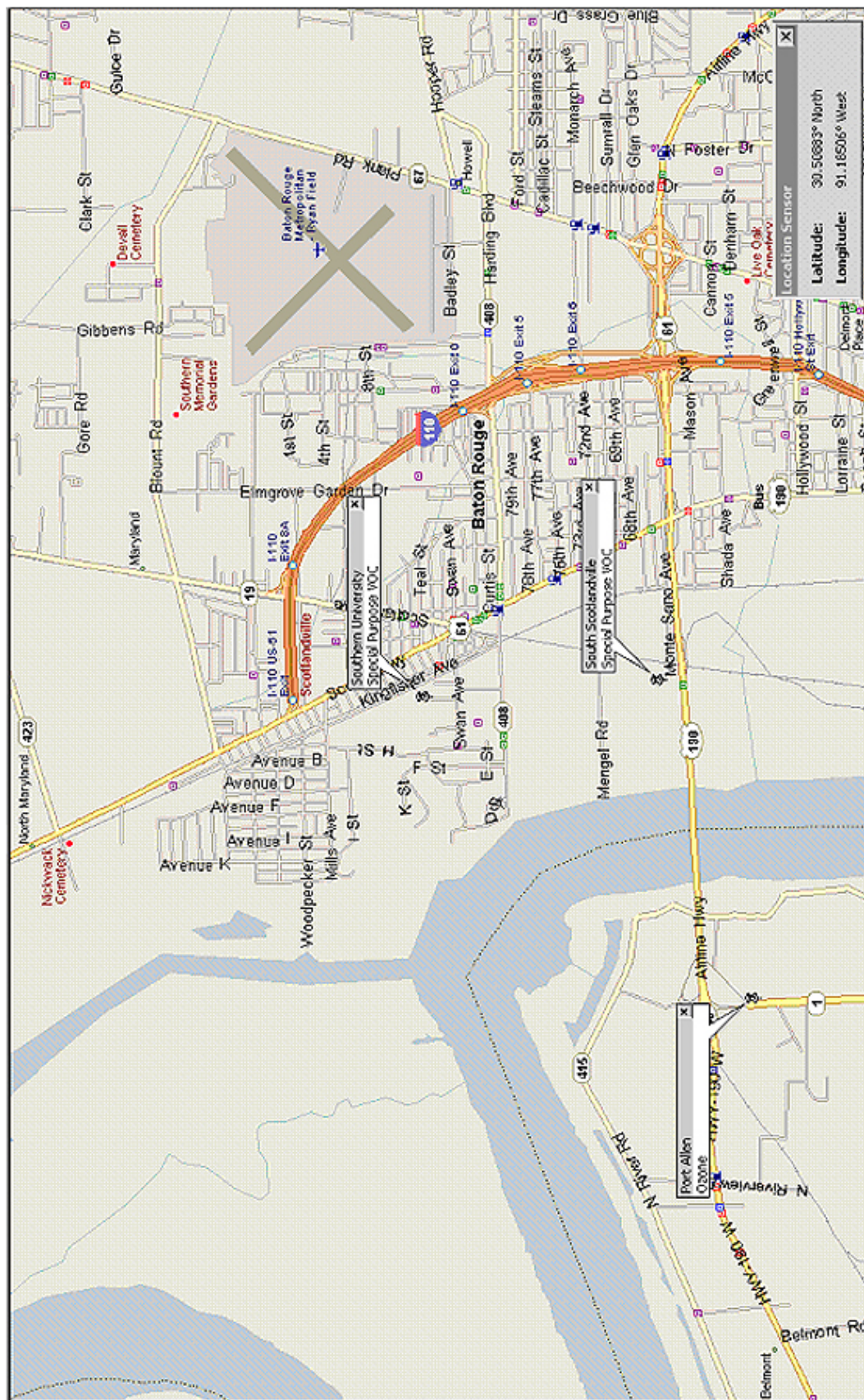
Figure 1: Louisiana Department of Environmental Quality Air Monitoring Stations

Locations of Monitors Obtained from LDEQ in 2004



Prepared on 10/21/2004 by: Louisiana Department of Health & Hospitals,
Office of Public Health, Section of Environmental Epidemiology & Toxicology

Figure 2: Detailed Map of South Scotlandville Air Monitoring Station Location



Map Adapted from information provided by the Louisiana Department of Environmental Quality

Demographics

South Scotlandville is located in East Baton Rouge Parish, Louisiana. Census 2000 results record a parish population of 412,852. The largest ethnic group in the parish at that time was Caucasian (56.2%), followed by African-American (40.1%), Asian (2.1%), and American Indian or Alaska Native (0.2%), with 0.5% of the population reporting as Other. 83.9% of the population age 25 or older in 2000 had earned at least a high school diploma. The median household income in 1999 was \$37,224, with 17.9% of persons living below the poverty level [3]. The largest employers were the construction industry; the retail trade industry; health care and social assistance; administrative, support, waste management, and remediation services; and accommodation and food services [4].

Discussion

Exposure Pathways

An exposure pathway contains the following five elements: a source of contamination, transport through some kind of environmental medium, a point of exposure, a route of exposure, and a receptor population. The source of the elevated 1,3-butadiene levels detected at the South Scotlandville air monitor has not yet been specified. Ambient air in the vicinity of the monitor serves as both the transport medium and point of exposure for the contamination. The route of exposure to 1,3-butadiene in the South Scotlandville area is through previous or current inhalation of contaminated ambient air. The exposed population encompasses residents living within the South Scotlandville neighborhoods of East Baton Rouge parish.

Evaluation Process

Assessment of the health effects of 1,3-butadiene concentrations measured in South Scotlandville's ambient air samples is summarized in Appendix A. To determine the possible health impact of exposure to these concentrations, each concentration was compared to the reference concentration (RfC) for 1,3-butadiene. The cancer risk was also estimated for each year's averaged exposure to this air contaminant. The U.S. Environmental Protection Agency's (U.S. EPA's) range of acceptable cancer risk levels is from 1 excess cancer per 10,000 people to 1 excess cancer per 1,000,000 people exposed for a lifetime (1×10^{-4} to 1×10^{-6}) [5]. If the cancer risk for South Scotlandville's ambient 1,3-butadiene concentrations exceeds 1×10^{-4} , the residents of South Scotlandville would be potentially exposed to cancer levels higher than those ordinarily found in an unexposed population.

Health Effects Evaluation

Except for the year 2000, the mean annual average concentrations of 1,3-butadiene in ambient air sampled from South Scotlandville were all lower than the RfC for 1,3-butadiene. The year 2000 mean annual average concentration of 1.08 parts per billion (ppb) exceeds the RfC of 9×10^{-1} ppb for 1,3-butadiene. However, all health effects observed following 1,3-butadiene inhalation

have been the result of exposures to concentrations in the part per million (ppm) range, which is more than 100 times higher than the year 2000's mean annual average concentration [2]. There are no apparent noncancer health risks associated with the concentrations of 1,3-butadiene monitored in ambient air samples from South Scotlandville.

Table 1: Cancer Risks for Ambient 1,3-Butadiene Air Concentrations in South Scotlandville

Year	Concentration (ppb*)	Cancer Risk
1999	0.66	4.38×10^{-5}
2000	1.08	7.16×10^{-5}
2001	0.43	2.85×10^{-5}
2002	0.46	3.05×10^{-5}
2003	0.68	4.51×10^{-5}
2004	0.80	5.30×10^{-5}

*parts per billion

Cancer Health Effects Evaluation

Estimation of lifetime cancer risks is described in Appendix A and summarized in Table 1. The estimated lifetime cancer risks for residential exposure to the mean annual average concentrations of 1,3-butadiene measured by the South Scotlandville air monitor do not exceed the U.S. EPA's upper limit of acceptable cancer risk levels of 1 excess cancer per 10,000 people exposed for a lifetime (1.00×10^{-4}).

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

The mean annual average concentrations of 1,3-butadiene sampled by the South Scotlandville air monitor are more than 100 times lower than concentrations that have been observed to cause adverse health effects. These 1,3-butadiene concentrations should have no adverse effect on the health of children.

Conclusions

Though present in levels that exceed the LDEQ's RECAP screening standards, the mean annual average concentrations of 1,3-butadiene measured by the South Scotlandville air monitor were below levels likely to cause adverse health effects in the surrounding community. There is no apparent public health hazard involved with inhalation of these concentrations of 1,3-butadiene.

Recommendations

- Attempts should be continued by the LDEQ to identify the source(s) of elevated 1,3-butadiene release levels and to effect a reduction in the emission of this contaminant at the source(s).

Public Health Action Plan

The information produced within this health consultation should be disseminated to the community members and stakeholders within East Baton Rouge Parish, Louisiana.

Actions Planned:

- Raw data gathered by the South Scotlandville air monitor from its establishment until the present will be examined by the LADHH/OPH/SEET to determine whether any trends in the 1,3-butadiene data sampled by this monitor during each year can be identified.

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References

1. Louisiana Department of Environmental Quality. Press Release: “Toxic air standard for butadiene exceeds annual standard.” Released 18 October, 2004.
2. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,3-Butadiene; July 1992.
3. U.S. Census Bureau. State and County Quickfacts. Louisiana Quickfacts. East Baton Rouge, Louisiana. <<http://quickfacts.census.gov/qfd/states/22/22033.html>>; Accessed 19 October, 2004.
4. U.S. Census Bureau. 2000 County Business Patterns for East Baton Rouge, LA. <<http://www.census.gov/epcd/cbp/map/00data/22/033.txt>>; Accessed 19 October, 2004.
5. U.S. Environmental Protection Agency. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001A. Washington, DC: Risk Assessment Forum, US Environmental Protection Agency, February 2003.

Certification

This South Scotlandville 1,3-Butadiene Evaluation health consultation was prepared by the Louisiana Department of Health and Hospitals under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures at the time the health consultation was begun.

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

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Appendix A: Evaluation Process

Noncancer Health Effects

Ambient air concentrations of 1,3-butadiene recorded for each air sample from South Scotlandville were compared to the reference concentration (RfC) for 1,3-butadiene, which is an estimate of a continuous inhalation exposure to 1,3-butadiene that is likely to be without risk of noncancer health effects during a lifetime. If the concentration at the point of exposure was higher than the reference concentration, then the exposure concentration was evaluated in comparison with concentrations of 1,3-butadiene known to cause adverse health effects.

Calculation of Carcinogenic Risk

Because of the uncertainties involved in estimating carcinogenic risk, the ATSDR employs a weight-of-evidence approach in evaluating all relevant carcinogenic data, describing carcinogenic risk in words as well as in numerical terms.^{*} The estimated risks of developing cancer resulting from residential exposures to the air concentrations of 1,3-butadiene sampled from South Scotlandville were calculated by multiplying each exposure volume over a 70-year (lifetime) period by an *inhalation unit risk* (IUR; retrieved for 1,3-butadiene from the Integrated Risk Information System website[†]) of 3×10^{-5} per $\mu\text{g}/\text{m}^3$. In order to perform this calculation, the air concentrations expressed in parts per billion by volume (ppbv) were converted to micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) using the following equation[‡]:

$$\text{X ppm} = (\text{Y mg}/\text{m}^3)(24.45)/(\text{molecular weight})$$

The results of the carcinogenic risk calculation estimate the worst-case maximum increase in the risk of developing cancer after exposure to the contaminant. This estimation is accurate within one order of magnitude; a calculated cancer risk of 2 excess cancers per 10,000 people might actually be 2 excess cancers per 1,000 people or 2 excess cancers per 100,000 people.

^{*} Agency for Toxic Substances and Disease Registry. 1993. Cancer policy framework. Atlanta, Georgia: US Department of Health and Human Services.

[†] <http://www.epa.gov/iris/subst/0139.htm>

[‡] Retrieved from the Conversion Calculator webpage at <http://www.cdc.gov/niosh/docs/2004-101/calc.htm>