



DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
3000 MARINE CORPS PENTAGON
WASHINGTON, DC 20350-3000

Page 1 of 1
Rec'd 1.25.2022

IN REPLY REFER TO:
5090.6
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NOV 22 2021

Dear Sir or Madam:

As a registrant in the Camp Lejeune Historic Drinking Water (CLHDW) Notification Database, we want to keep you informed of public health activities being conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) and benefits that may be available to you from the U. S. Department of Veterans Affairs (VA). All case-specific requests concerning claims, medical benefits, disability, and personal records should be made directly to the organization that handles those matters.

ATSDR is currently conducting two public health activities as part of their ongoing efforts to increase scientific knowledge on potential connections between past exposure to contaminated drinking water at Camp Lejeune and adverse health effects. The ongoing Cancer Incidence Study is investigating whether residential or workplace exposure to drinking water contaminants that were present in years past are associated with increased risks of specific cancers. Additionally, the Vapor Intrusion Public Health Assessment is evaluating whether people's health might be harmed from exposure to indoor air contamination that may have resulted from vapor intrusion on Camp Lejeune. Vapor intrusion can occur when contaminants in shallow groundwater evaporate, and the vapors move upward into the indoor air in overlying buildings.

Completion dates for these two studies have yet to be confirmed, but ATSDR estimates that information on remaining public health activities may be available to the public as early as 2023. For more information about these and other ATSDR public health activities, visit <http://www.atsdr.cdc.gov/sites/lejeune/> or call (800) 232-4636.

The enclosed CLHDW Benefits & Resources fact sheet provides detailed information about benefits offered by the VA. This includes a list of eligible conditions for health care and disability benefits, as well as instructions for applying through the VA.

A CLHDW Resource Guide is also enclosed that provides information on potential benefits, support organizations, completed and ongoing studies, and other resources for those who may have been affected by past exposure to contaminated drinking water at Camp Lejeune. The Guide consolidates information from the Marine Corps, VA, and ATSDR as a convenient reference for individuals to find further information on CLHDW.

The health and welfare of our Marines, Sailors, their families, and our civilian workers are top priorities for the Marine Corps. We continue to work diligently to identify and notify individuals who may have been exposed to chemicals in the drinking water while at Camp Lejeune and keep them informed about this important issue. For more information about these efforts, or to update your contact information, please visit <http://www.marines.mil/clwater/>, contact the CLHDW Call Center at (877) 261-9782, or e-mail clwater@usmc.mil. Please share this information with anyone who may have been at Camp Lejeune in 1987 or prior years and encourage them to register with us.

There are
59
Pages

Semper Fidelis,

D. B. CONLEY
Brigadier General, USMC
Assistant Deputy Commandant
Installations and Logistics (Facilities)

Enclosure:

- (1) CLHDW Benefits & Resources Fact Sheet
- (2) CLHDW Resource Guide

The Camp Lejeune Historic Drinking Water (CLHDW) program remains ready to support Marines, their families, and the civilian workforce. Individuals who may have been impacted can register to receive updates, information, and direction on available resources. Inquiries related to benefits are commonly raised, and the following information may assist you or your family members in identifying and applying for those available services.

Who may be eligible for benefits?

U.S. Marine Corps Veterans, National Guard, and reservists – and their families – who lived on the base for at least 30 days between August 1, 1953 and December 31, 1987.

Health Care for Veterans and Family Members

Per the Camp Lejeune Act of 2012, Veterans and family members who lived on Camp Lejeune for the designated times and dates may be eligible for health care and health care funding assistance.

Qualifying Health Conditions

- Bladder cancer
- Breast cancer
- Esophageal cancer
- Female infertility
- Hepatic steatosis
- Kidney cancer
- Leukemia
- Lung cancer
- Miscarriage
- Multiple myeloma
- Myelodysplastic syndromes
- Neurobehavioral effects
- Non-Hodgkin's lymphoma
- Renal toxicity
- Scleroderma

Veterans eligible for health care for any of the 15 listed conditions may enroll for health care through Veterans Affairs at www.va.gov/healthbenefits/apply/ or by calling **1-877-222-8387**.

Dependent family members can learn more and apply for medical reimbursement at www.clfamilymembers.fsc.va.gov/ or by calling **1-866-372-1144**.

Veterans Disability Compensation

Active duty, reserve, and National Guard members who were exposed to contaminants at Camp Lejeune may be eligible for disability benefits. Veterans with the following conditions may qualify for disability compensation:

- Adult leukemia
- Aplastic anemia and other myelodysplastic syndromes
- Bladder cancer
- Kidney cancer
- Liver cancer
- Multiple myeloma
- Non-Hodgkin's lymphoma
- Parkinson's disease

Eligible veterans may apply for disability benefits through the VA using eBenefits, located at www.ebenefits.va.gov/ebenefits/, calling **1-800-827-1000**, or by coordinating through their nearest regional VA office.

What about civilians?

Civilian employees who believe they may have been impacted by past exposure to contaminated drinking water at Camp Lejeune should work through the Department of Labor Office of Workers Compensation Programs. For more information, visit <https://www.dol.gov/owcp/>.

For additional resources and information...

The Camp Lejeune Historic Drinking Water Notification Database and Call Center support Marines, their families, and others with information and guidance on all pertinent CLHDW inquiries. Although these programs and services maintain partnerships with the VA and the Agency for Toxic Substances and Disease Registry, the Notification Database and Call Center do not directly manage medical claims, scientific studies, housing records, or other sensitive information related to CLHDW. Information on the appropriate organizations, methods, and contact information for these and other topics can be found by contacting the CLHDW Call Center.

The CLHDW Call Center can be reached Monday through Friday, from 8:30 A.M. to 5:00 P.M. Eastern at **(877) 261-9782** or clwater@usmc.mil.



Benefits Qualification & Eligibility

Per the Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012, Veterans who served at Camp Lejeune or MCAS New River for at least 30 cumulative days from August 1953 through December 1987, and their family members, are eligible for health care benefits. The VA may pay you back for your out-of-pocket health care costs that were related to 15 qualifying health conditions. Active duty, reserve, and National Guard members diagnosed with one or more of eight presumptive conditions are also eligible for disability compensation. Learn more at: <https://www.publichealth.va.gov/exposures/camp-lejeune/>.

Civilian employees who believe they may have been impacted by past exposure to contaminated drinking water at Camp Lejeune should work through the Department of Labor Office of Workers Compensation Programs. For more information, visit <https://www.dol.gov/owcp/>.



ATSDR Health Activities and Community Involvement

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency supporting ongoing efforts to increase scientific knowledge on potential connections between past exposure to contaminated drinking water at Camp Lejeune and adverse health effects. These activities include public health assessments, health studies, and water modeling. Information on ATSDR's findings, ongoing studies, and opportunities for community involvement can be found at <https://www.atsdr.cdc.gov/sites/lejeune/>.



CLHDW Call Center

For questions, please contact the CLHDW Call Center, available Monday through Friday, from 8:30 A.M. to 5:00 P.M. Eastern. The Call Center can be reached at **(877) 261-9782** or by email at clwater@usmc.mil.

Other Resources

The CLHDW Notification Database and Call Center provide a wealth of information for registrants and other interested parties. Partnerships with USMC, Veteran, and health organizations help to meet the needs of affected individuals. In addition to the resources available through those tools, the following organizations and programs are frequently useful to those seeking further information.



- **Agency for Toxic Substances and Disease Registry** ♦ (800) 232-4636
- **National Personnel Records Center** (for military record requests) ♦ (314) 801-0800
- **Office of the Judge Advocate General** ♦ (202) 685-4600
- **VA Healthcare** ♦ (877) 222-8387
- **VA Benefits** ♦ (800) 827-1000
- **Camp Lejeune Family Member Program** ♦ (866) 372-1144
- **Base Housing Records** ♦ (910) 451-0600
- **Civilian Employees/Department of Labor** ♦ (904) 366-0100
- **Veteran Crisis Line** ♦ (800) 273-8255



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Dear Sir or Madam:

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ATSDR is currently conducting two public health activities as part of their ongoing efforts to increase scientific knowledge on potential connections between past exposure to contaminated drinking water at Camp Lejeune and adverse health effects.

1. Cancer Incidence Study: This study is investigating whether the contaminants that were present in the drinking water in years past are associated with increased risks of specific cancers among people who were exposed either at work or while living on base.
2. Vapor Intrusion Public Health Assessment: This assessment is evaluating whether people's health might be harmed from exposures to indoor air contamination that may have resulted from vapor intrusion on Camp Lejeune. Vapor intrusion can occur when contaminants in groundwater and/or soil vaporize, and the vapors move up into the indoor air in overlying buildings.

Completion dates have yet to be confirmed, but ATSDR estimates that information on remaining public health activities may be available to the public as early as 2022. For more information about these and other ATSDR public health activities, visit <http://www.atsdr.cdc.gov/sites/lejeune/> or call (800) 232-4636.

A CLHDW Resource Guide is enclosed that provides potential benefits, support organizations, completed and ongoing studies, and other resources for those who may have been affected by past exposure to contaminated drinking water at Camp Lejeune. The Guide consolidates information from the Marine Corps, VA, and ATSDR as a convenient reference for individuals to find further information on CLHDW.

The health and welfare of our Marines, Sailors, their families and our civilian workers are top priorities for the Marine Corps. We continue to work diligently to identify and notify individuals who may have been exposed to chemicals in the drinking water while at Camp Lejeune and keep them informed about this important issue. For more information about these efforts, or to update your contact information, please visit <http://www.marines.mil/clwater/>, contact the Camp Lejeune Historic Drinking Water Call Center at (877) 261-9782, or e-mail clwater@usmc.mil. Please share this information with anyone who may have been at Camp Lejeune in 1987 or prior years and encourage them to register with us.

Semper Fidelis,

E. D. BANTA
Major General, USMC
Assistant Deputy Commandant
Installations and Logistics (Facilities)

✓ Enclosure: CLHDW Resource Guide



Benefits Qualification & Eligibility

Per the Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012, Veterans who served at Camp Lejeune or MCAS New River for at least 30 cumulative days from August 1953 through December 1987, and their family members, are eligible for health care benefits. The VA may pay you back for your out-of-pocket health care costs that were related to 15 qualifying health conditions. Active duty, reserve, and National Guard members diagnosed with one or more of eight presumptive conditions are also eligible for disability compensation. Learn more at: <https://www.publichealth.va.gov/exposures/camp-lejeune/>.

Civilian employees who believe they may have been impacted by past exposure to contaminated drinking water at Camp Lejeune should work through the Department of Labor Office of Workers Compensation Programs. For more information, visit <https://www.dol.gov/owcp/>.



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CLHDW Call Center

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The CLHDW Notification Database and Call Center provide a wealth of information for registrants and other interested parties. Partnerships with USMC, Veteran, and health organizations help to meet the needs of affected individuals. In addition to the resources available through those tools, the following organizations and programs are frequently useful to those seeking further information.



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- **Office of the Judge Advocate General** ♦ (202) 685-4600
- **VA Healthcare** ♦ (877) 222-8387
- **VA Benefits** ♦ (800) 827-1000
- **Camp Lejeune Family Member Program** ♦ (866) 372-1144
- **Base Housing Records** ♦ (910) 451-0600
- **Civilian Employees/Department of Labor** ♦ (866) 692-7487
- **Veteran Crisis Line** ♦ (800) 273-8255



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Dear Sir or Madam:

As a registrant in the Camp Lejeune Historic Drinking Water (CLHDW) Notification Database, you are receiving this letter in order to keep you informed of research activities being conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) and benefits that may be available to you from the U.S. Department of Veterans Affairs (VA).

The ATSDR continues to study whether there is a connection between past exposure to contaminated drinking water at Camp Lejeune and adverse health effects. The ATSDR is currently conducting a cancer incidence study to determine whether past exposures to the drinking water contaminants at Camp Lejeune are associated with increased risks of specific cancers. The ATSDR is also conducting a vapor intrusion assessment to evaluate whether exposures to chemicals in indoor air originating from groundwater or soil contamination have occurred and could be of concern. For more information about ATSDR public health activities, visit <http://www.atsdr.cdc.gov/sites/lejeune/> or call (800) 232-4636.


The ATSDR has established a Community Assistance Panel (CAP) to provide a forum to hear the concerns of veterans and their families, and to receive input on ATSDR public health activities. The most recent CAP meeting was held September 13-14, 2019, in Arlington, VA. The next CAP meeting will be held February 13, 2020 in Atlanta, GA. For more information on CAP Meetings, including archived video of the latest live meeting and transcripts of previous meetings, visit <https://www.atsdr.cdc.gov/sites/lejeune/capmeetings.html>.

A recent update to the VA Camp Lejeune Health and Disability Benefits Fact Sheet is enclosed. The Fact Sheet addresses the January 13, 2017 VA rule providing former Camp Lejeune veterans presumptive service connection for eight diseases and the Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012, which provides health care benefits to veterans and their family members for fifteen qualifying conditions. In order to be eligible, veterans are required to have been stationed at/lived on Camp Lejeune for at least 30 days between August 1, 1953 and December 31, 1987. The recent update to the VA Fact Sheet clarifies that individuals meeting the eligibility requirements under the Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012 will receive a minimum of Category 6 status for VA health care. To contact the VA and learn more about health care benefits, please visit <http://www.publichealth.va.gov/exposures/camp-lejeune/>, or call (877) 222-8387 (Healthcare), or (800) 827-1000 (Benefits). To learn more about health care benefits, please visit <http://www.publichealth.va.gov/exposures/camp-lejeune/>, or call (877) 222-8387 (Healthcare), or (800) 827-1000 (Benefits).

The health and welfare of our Marines, Sailors, their families and our civilian workers are top priorities for the Marine Corps. We continue to work diligently to identify and notify individuals who may have been exposed to chemicals in the drinking water while at Camp

Lejeune. For more information about these efforts, or to update your contact information, please visit <http://www.marines.mil/clwater/>, contact the Camp Lejeune Historic Drinking Water Call Center at (877) 261-9782, or e-mail clwater@usmc.mil. Please share this information with anyone who may have been at Camp Lejeune in 1987 or prior years and encourage them to register with us.

Semper Fidelis,



E. D. BANTA
Major General, USMC
Assistant Deputy Commandant
Installations and Logistics (Facilities)

✓ Enclosure: Fact Sheet

CAMP LEJEUNE HEALTH *and* DISABILITY BENEFITS

Benefits for Camp Lejeune Veterans and family members include health care for 15 conditions listed in the Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012.

Veterans can receive disability and health care benefits for eight presumptive disease conditions associated with contaminants in the water at Camp Lejeune.

HEALTH

Health care for eligible* Veterans stationed at Camp Lejeune and health care funding assistance for family members who lived in Camp Lejeune base housing is available for the following conditions.

Qualifying health conditions:

- Bladder cancer
- Breast cancer
- Esophageal cancer
- Female infertility
- Hepatic steatosis
- Kidney cancer
- Leukemia
- Lung cancer
- Miscarriage
- Multiple myeloma
- Myelodysplastic syndromes
- Neurobehavioral effects
- Non-Hodgkin's lymphoma
- Renal toxicity
- Scleroderma

Veterans who meet the eligibility requirements* will receive a minimum of Category 6 status for VA health care.

DISABILITY

The presumption applies to eligible* active duty, reserve, and National Guard members exposed to contaminants in the water supply at Camp Lejeune who later developed one or more of the following eight conditions:

- Adult leukemia
- Aplastic anemia and other myelodysplastic syndromes
- Bladder cancer
- Kidney cancer
- Liver cancer
- Multiple myeloma
- Non-Hodgkin's lymphoma
- Parkinson's disease

There are no copays for VA hospital care or medical services for these conditions after service connection is established and the rating has completed processing.

Family members are not eligible for disability benefits.

CAMP LEJEUNE DISABILITY BENEFIT COVERAGE AREA

FOR INFORMATION

VA Health Care
1-877-222-8387

VA Benefits
1-800-827-1000

CL Family Health Care
1-866-372-1144

www.va.gov/

www.clfamilymembers.fsc.va.gov/



* ELIGIBILITY REQUIREMENTS

Stationed at/lived on Camp Lejeune for at least 30 days between August 1, 1953 and December 31, 1987.



U.S. Department of Veterans Affairs



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SEP 29 2015

Dear Sir or Madam:

I would like to provide you information on a recent health study that was completed by the Agency for Toxic Substances and Disease Registry (ATSDR) and update you on other Camp Lejeune Historic Drinking Water (CLHDW) related articles.

On September 16, 2015 ATSDR's journal article "Evaluation of contaminated drinking water and male breast cancer at Marine Corps Base Camp Lejeune, North Carolina: a case control study" was published (<https://www.atsdr.cdc.gov/sites/lejeune/MaleBreastCancerStudy.html>). The purpose of this study was to determine if marines who were exposed in the past to contaminated drinking water at Camp Lejeune were more likely to have male breast cancer. Enclosed you will find a copy of the ATSDR Press Release of this study.

*Camp
Lejeune
Water
Problems.*

This Study is one of several health initiatives that ATSDR is expected to complete in the next several years. For more information about these studies, visit <http://atsdr.cdc.gov/sites/lejeune/> or call ATSDR at (800) 232-4636.

Since 1991, the Marine Corps has supported the health initiatives conducted by various scientific agencies. We also are working diligently to identify and notify individuals who, in the past, may have been exposed to the chemicals in drinking water at Camp Lejeune. In order to keep you informed, enclosed you will find a newsletter about recent CLHDW health activities and a fact sheet on Department of Veterans Affairs health benefits for Camp Lejeune Veterans. For more information about these efforts or to update your contact information, please go to: <http://www.marines.mil/clwater/> or contact the CLHDW Call Center at (877)261-9782 or email clwater@usmc.mil.

Semper Fidelis,

C. L. HUDSON
Major General, USMC
Assistant Deputy Commandant
Installations and Logistics (Facilities)

ATSDR study examines possible link between Marines' male breast cancer and exposure to contaminated drinking water at Camp Lejeune

Jacksonville, North Carolina
Monday, September 21, 2015

ATLANTA—Results from a study conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) suggest that male breast cancer might be associated with being stationed at Camp Lejeune Marine Corps Base in North Carolina and military housing exposure to the volatile organic compounds (VOCs) perchloroethylene (PCE), t-1, 2 dichloroethylene (DCE), and vinyl chloride in drinking water at the base. However, the findings of this study were based on small numbers of cases, and modeled levels of exposure, so should be interpreted with caution.

According to the study which appears in the journal *Environmental Health*, the risk of male breast cancer increased slightly with being stationed at Camp Lejeune and higher levels of exposure to PCE. The findings also suggested that exposures to trichloroethylene (TCE), PCE, DCE, and vinyl chloride while stationed at the base might have accelerated the onset of male breast cancer.

The study included 444 male Marines who were born before Jan. 1, 1969, and diagnosed with or treated for certain forms of cancer at a U.S. Department of Veterans Affairs medical facility between Jan. 1, 1995, and May 5, 2013. The study identified 71 men with breast cancer; 30 of the men were stationed at Camp Lejeune at some point during their service.

The results of this study add to the scientific literature on the health effects of exposures to these chemicals in drinking water. To gather more information, ATSDR intends to evaluate male breast cancer in a planned cancer incidence study that will involve state cancer registries nationwide as well as federal cancer registries. ATSDR will begin working with state and federal cancer registries in 2016.

The full report is available at: <http://www.ehjournal.net/content/14/1/74>.

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ATSDR, a federal public health agency of the U.S. Department of Health and Human Services, evaluates the potential for adverse human health effects of exposure to hazardous substances in the environment.



CAMP LEJEUNE: PAST WATER CONTAMINATION

From the 1950s through the 1980s, people serving or living at the U.S. Marine Corps Base Camp Lejeune, North Carolina, were potentially exposed to drinking water contaminated with industrial solvents, benzene, and other chemicals. This chemical exposure may have led to adverse health conditions.

YOU MAY BE ELIGIBLE FOR VA HEALTH BENEFITS IF YOU SERVED ON ACTIVE DUTY (VETERANS) OR RESIDED (FAMILY MEMBERS) AT CAMP LEJEUNE FOR 30 DAYS OR MORE BETWEEN AUGUST 1, 1953 AND DECEMBER 31, 1987:

- Veterans who are determined to be eligible will be able to receive VA health care. In addition, care for qualifying health conditions is provided at no cost to the Veteran (including copayments).
- Eligible family members receive reimbursement for out-of-pocket medical expenses incurred from the treatment of qualifying health conditions after all other health insurance is applied.

QUALIFYING HEALTH CONDITIONS INCLUDE:

- Bladder cancer
- Breast cancer
- Esophageal cancer
- Kidney cancer
- Leukemia
- Lung cancer
- Multiple myeloma
- Myelodysplastic syndromes
- Non-Hodgkin's lymphoma
- Female infertility
- Hepatic steatosis
- Miscarriage
- Neurobehavioral effects
- Renal toxicity
- Scleroderma

VETERAN ELIGIBILITY:

- A Camp Lejeune Veteran does not need to have one of the 15 health conditions to be eligible to receive VA health care, nor do they need a service connected disability to be eligible as a Camp Lejeune Veteran for VA health care.

VETERANS

ENROLL IN VA HEALTH CARE

- Inform VA that you served on active duty at Camp Lejeune for at least 30 days during the covered time period.
- Already enrolled? Contact your local VA health care facility at <http://www.va.gov/directory/guide/> to sign up for the Camp Lejeune Program and receive VA care.
- Not yet enrolled? Apply online at <http://www.va.gov/healthbenefits/apply/> or call toll-free 1-877-222-8387.

FAMILY MEMBERS

GATHER DOCUMENTS

- Show your relationship to a Veteran, such as a marriage license or birth certificate.
- VA will assist you with verifying residency on Camp Lejeune during the covered timeframe.

GATHER QUALIFYING EXPENSE RECEIPTS

- By law, VA may only compensate for eligible out-of-pocket expenses after family members have received payment from all other health plans.

APPLY FOR REIMBURSEMENT

- Apply online at <https://www.cfamilymembers.fsc.va.gov> or call toll-free 1-866-372-1144.



CAMP LEJEUNE

HISTORIC DRINKING WATER



Camp Lejeune Historic Drinking Water Update

AUGUST 2015

Camp Lejeune Historic Drinking Water (CLHDW) is a very important issue for the Marine Corps. The Navy and Marine Corps continue to work with a Federal public health agency, the Agency for Toxic Substances and Disease Registry (ATSDR), in an effort to provide comprehensive science-based answers to the health questions that have been raised. Our outreach efforts on this issue first began in 1984, following the discovery of chemicals in certain drinking water wells at Camp Lejeune. Today, we continue to engage in community outreach and notification activities, including the distribution of this newsletter, to keep you informed on the latest research and information on the CLHDW issue. Below is a synopsis of important activities and events that have recently occurred.

ATSDR RESEARCH STUDIES

In 2014, ATSDR released three research studies about the CLHDW issue:

- February 2014 | ATSDR Mortality Study of Marine Corps and Navy Personnel:** An evaluation of mortality of Marines and Navy personnel exposed to contaminated drinking water at Camp Lejeune.
- August 2014 | ATSDR Mortality Study of Civilian Employees Exposed to Contaminated Drinking Water:** An evaluation of mortality of civilian employees exposed to contaminated drinking water at Camp Lejeune.
- November 2014 | ATSDR Adverse Birth Outcomes Study:** A reanalysis of a previous ATSDR cross-sectional study conducted in 1998 to evaluate contaminated drinking water and preterm birth, small for gestational age, and birth weight at Camp Lejeune.

HEALTH BENEFITS

Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012:

- On August 6, 2012, President Barack Obama signed into law the *Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012*. The law provides health benefits for 15 illnesses or conditions affecting veterans and family members who served on active duty or resided at Camp Lejeune for 30 days or more between January 1, 1957 and December 31, 1987. For more information about the new health benefits and eligibility visit: www.publichealth.va.gov/exposures/camp-lejeune.
- In 2014, the inclusive dates for the Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012 was expanded to include the period from August 1, 1953, through December 31, 1956.

If you served on active duty or resided at Camp Lejeune from August 1, 1953 – December 31, 1987, and have any of the following illnesses or conditions, you may be eligible for health benefits.

Illnesses or conditions included in the *Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012*:

- Bladder cancer
- Breast cancer
- Esophageal cancer
- Female infertility
- Hepatic steatosis
- Kidney cancer
- Leukemia
- Lung cancer
- Miscarriage
- Multiple myeloma
- Myelodysplastic syndromes
- Neurobehavioral effects
- Non-Hodgkin's lymphoma
- Renal toxicity
- Scleroderma

Information about these studies can be found at <http://www.atsdr.cdc.gov/sites/lejeune>



CAMP LEJEUNE

HISTORIC DRINKING WATER



The Notification and Outreach Today

The Marine Corps continues its effort to identify and notify those who lived or worked at Camp Lejeune in 1987 or before. A notification database was established that includes contact information for over 235,000 individuals. The Marine Corps utilizes the database to keep registrants informed about health studies and other CLHDW-related events. For the most current registrant count, visit: www.marines.mil/clwater.

Registering with the CLHDW notification database does not enroll you in VA programs. If you would like to apply for VA programs, please use the contact information provided on this page. Regarding eligibility for benefits under the health care law, VA can verify residency in most cases. In cases where they cannot verify residency, they will work with the Marine Corps to find an answer. A Freedom of Information Act request to verify residency is not required, unless a copy of a housing record is desired.

The Marine Corps recently ran advertisements in the following publications to encourage individuals to be included in the CLHDW notification database:

January 2014: *The Jacksonville Daily News* and the *Tampa Bay Tribune*

August 2014: *The New York Times*

September 2014: *The Washington Post*

October 2014: *The Reader's Digest*

Fall 2015 (planned): *USA Today*

LOOKING AHEAD

The following research studies are projected to be released in the future:

- Public Health Assessment reanalysis
- Male breast cancer study
- Health survey (morbidity) study
- Cancer incidence study

IMPORTANT LINKS AND CONTACTS:

U.S. Marine Corps:

Website: <http://www.marines.mil/clwater>

Phone: 877-261-9782 , 8:30 a.m. to 5:00 p.m. ET

Email: clwater@usmc.mil

Q&A Booklet: https://clnr.hqi.usmc.mil/clwater/content/documents/CLHDW_Booklet.pdf

Agency for Toxic Substances and Disease Registry:

Website: <http://www.atsdr.cdc.gov/sites/lejeune/index.html>

Phone: 800-232-4636

Email: <http://www.cdc.gov/dcs/request-form.html>

U.S. Department of Veteran Affairs:

Website: <http://www.publichealth.va.gov/exposures/camp-lejeune/>

Phone: 877-222-8387 (Veterans), 866-372-1144 (family members)

Apply for VA Health Benefits:

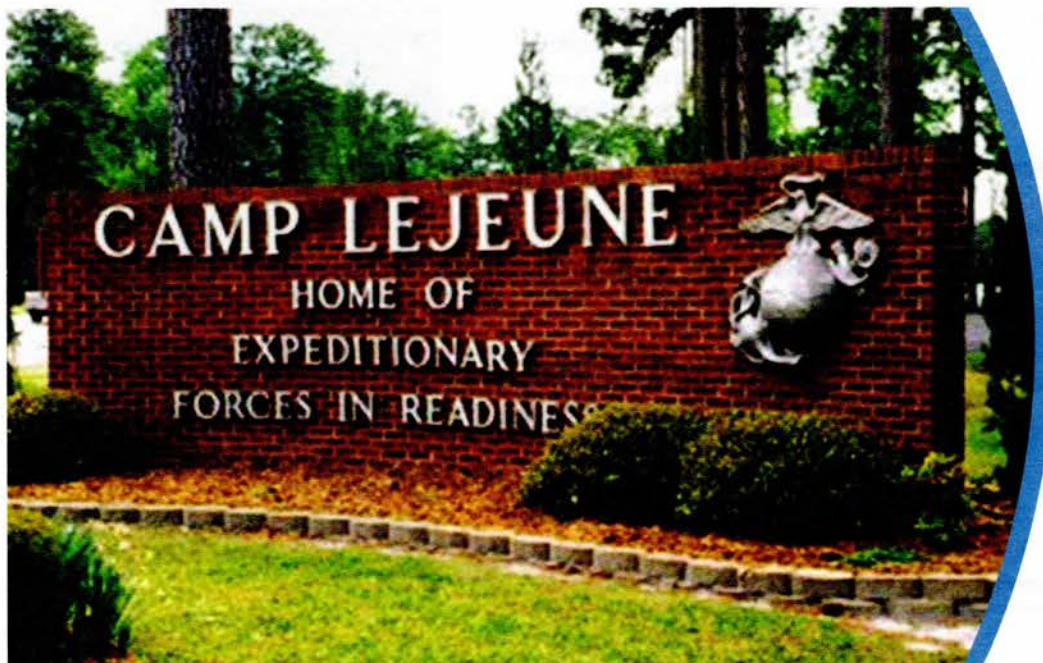
<http://www.va.gov/healthbenefits/apply>

U.S. Department of Labor:

Website: <http://www.dol.gov/>

Phone: 1-866-487-2365

Email: <http://www.dol.gov/dol/contact/contact-email.htm>





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HEADQUARTERS UNITED STATES MARINE CORPS
3000 MARINE CORPS PENTAGON
WASHINGTON, DC 20350-3000

IN REPLY REFER TO:

5090

LF

AUG 25 2014

9-20-2014

Dear Sir or Madam:

On August 13, 2014 the Agency for Toxic Substances and Disease Registry's (ATSDR) journal article "Mortality study of civilian employees exposed to contaminated drinking water at USMC Base Camp Lejeune: a retrospective cohort study" was published (<http://www.atsdr.cdc.gov/sites/lejeune/civilianmortalitystudy.html>). Enclosed you will find a copy of the ATSDR fact sheet summarizing the results of this study.

The purpose of this study was to determine whether potential exposures to the drinking water contaminants at Camp Lejeune are associated with increased risk of death from specific cancers and other chronic diseases among civilian workers employed at the base. The study evaluated specific causes of death in 4,647 full-time workers who were employed at Camp Lejeune during 1973-1985. ATSDR also evaluated a comparison group of 4,690 full-time workers who were employed at Camp Pendleton during 1973-1985 but were not employed at Camp Lejeune during this period. The Camp Pendleton workers were not exposed to contaminated drinking water.

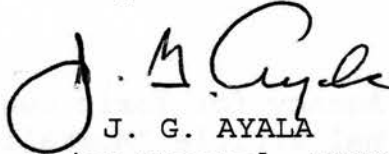
This study is one of several health initiatives that ATSDR is expected to complete in the next several years. For more information about these studies, visit <http://www.atsdr.cdc.gov/sites/lejeune/> or call (800) 232-4636.

The "Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012" allows the Department of Veterans Affairs to provide health benefits for 15 illnesses or conditions affecting veterans and their families who lived or worked at Camp Lejeune for at least 30 days during the period from January 1, 1957 to December 31, 1987. To learn more about health care benefits provided under this law, please visit <http://www.publichealth.va.gov/exposures/camp-lejeune/> or call (877) 222-8387 (Healthcare) or (800) 827-1000 (Benefits).

Since 1991, the Marine Corps has supported the health initiatives conducted by various scientific agencies. We are also working diligently to identify and notify individuals who, in the past, may have been exposed to the chemicals in drinking water. For more information about these efforts or to update

your contact information, please see:
<http://www.marines.mil/clwater/>, call (877) 261-9782 or e-mail
clwater@usmc.mil.

Semper Fidelis,



J. G. AYALA

Major General, USMC

Assistant Deputy Commandant

Installations and Logistics (Facilities)

Camp Lejeune Health Studies

Mortality study of civilian employees exposed to contaminated drinking water at USMC Base Camp Lejeune: A retrospective cohort study

Rev'd 9-20-2014

Study Purpose

The purpose of the study was to determine whether potential exposures to the drinking water contaminants at Camp Lejeune are associated with increased risk of death from specific cancers and other chronic diseases among those who were employed at the base. The contaminants included trichloroethylene (TCE), tetrachloroethylene (also known as perchloroethylene or PCE), benzene, and two contaminants that are formed when TCE or PCE degrade in ground water: 1,2-dichloroethylene and vinyl chloride.

What Was Studied

The study evaluated specific causes of death in 4,647 full-time workers who were employed at Camp Lejeune during 1973-1985¹. We also evaluated a comparison group of 4,690 full-time workers who were employed at Camp Pendleton during 1973-1985 but were not employed at Camp Lejeune during this period. The Camp Pendleton workers were not exposed to contaminated drinking water.

Cause of death data from 1979-2008 were used to study the Camp Lejeune and Camp Pendleton cohorts. Information on causes of death was obtained from the National Death Index (NDI) of the National Center for Health Statistics. The study included all underlying causes of death that other studies have shown to be associated with one or more of the chemicals found in the drinking water at Camp Lejeune. Causes of death were selected based on literature reviews conducted by the U.S. Environmental Protection Agency (EPA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), and Agency for Toxic Substance and Disease Registry (ATSDR).

The causes of death that were studied include:

- Amyotrophic lateral sclerosis (ALS)
- Cancers of the bladder, brain, cervix, colon, esophagus, female breast, kidney, larynx, liver, lung, oral cavity, pancreas, prostate, rectum, and soft tissue
- Hematopoietic cancers
 - Hodgkin's Lymphoma
 - Leukemias
 - Multiple myeloma
 - Non-Hodgkin's lymphoma
- Non-cancerous kidney diseases
- Non-cancerous liver diseases
- Multiple sclerosis
- Parkinson's disease

¹Continuous quarterly information on DOD employment from the Defense Manpower Data Center began with the second quarter of 1973. The most heavily contaminated wells at Camp Lejeune were shut down in 1985.

Continued on next page



The study also included three causes of death known to be caused by cigarette smoking but not known to be associated with the drinking water contaminants: cardiovascular disease, chronic obstructive pulmonary disease (COPD), and stomach cancer. These causes of death were included to assess the possible impact of smoking on the findings because we did not have information on smoking status for study subjects.

Features of this Study

The study looked at the Camp Lejeune civilian workers and a comparison civilian worker population from Camp Pendleton. Camp Pendleton did not have a contaminated drinking water supply.

The cumulative exposure of each Camp Lejeune worker was based on the workplace location, duration of employment, and the monthly average estimates of the contaminants in the drinking water serving the workplace. Monthly contaminant levels in the drinking water were estimated by modeling the movement of the contaminants from the source of pollution through the ground water and into the water distribution system.

Key Results

During 1979-2008, there were 654 deaths in the Camp Lejeune group of civilian workers and 869 deaths in the Camp Pendleton group. The median ages in 2008 for the Camp Lejeune and Camp Pendleton cohorts were 58 years and 60 years, respectively.

Compared with the Camp Pendleton workers, the Camp Lejeune workers had higher mortality rates for the following causes of death:

- Cancers of the female breast, kidney, lung, oral cavity, prostate, and rectum
- Kidney diseases
- Leukemias
- Multiple myeloma
- Parkinson's disease

The higher rates of cancers of the kidney, prostate and rectum, leukemias, and Parkinson's disease were mainly among the Camp Lejeune civilian workers with higher cumulative exposures to the contaminants.

When those with higher exposures at Camp Lejeune were compared to those with lower exposures at Camp Lejeune, higher cumulative exposures to the contaminants were associated with increased risks for cancers of the kidney, esophagus, prostate, and rectum, leukemias, and Parkinson's disease.

The findings for the smoking-related causes of death, such as stomach cancer, cardiovascular disease, and chronic obstructive pulmonary disease suggested that smoking would have only a minor impact on any association between cause of death and exposure to the drinking water contaminants at Camp Lejeune.

Conclusion

The study found elevated risks in the Camp Lejeune civilian workers for several causes of death, including kidney cancer, leukemia's, prostate cancer, rectal cancer and Parkinson's disease. Because only 14% of the Camp Lejeune group had died by the end of the study, the numbers of cause-specific deaths were small, resulting in wide confidence intervals. Wide confidence intervals indicate considerable uncertainty about the actual risk (it could be higher or lower). Note: ATSDR recently published a mortality study of Marines and Navy personnel at Camp Lejeune. Several cancers with elevated risk in that study were also elevated among the civilian employees: cancers of the kidney, prostate, lung and rectum, leukemias, and multiple myeloma: <http://www.atsdr.cdc.gov/sites/lejeune/mortalitystudy.html>.



DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
3000 MARINE CORPS PENTAGON
WASHINGTON, DC 20350-3000

Revd 3-22-2014

IN REPLY REFER TO:
5090
LF

Dear Sir or Madam:

On February 19, 2014 the Agency for Toxic Substances and Disease Registry's (ATSDR) "Evaluation of mortality among Marines and Navy personnel exposed to contaminated drinking water at USMC Base Camp Lejeune: A retrospective cohort study" was published (<http://www.atsdr.cdc.gov/sites/lejeune/update.html>). Enclosed you will find a copy of the ATSDR fact sheet summarizing the results of this study.

The purpose of this study was to determine whether exposures of Marine and Naval personnel to contaminated drinking water at Camp Lejeune increased risk of mortality from cancers and other chronic diseases. The study focused on 154,932 Marine and Naval personnel who began active duty service during April 1975 to December 1985 and were stationed at USMC Base Camp Lejeune anytime during this period. A comparison cohort consisted of 154,969 Marine and Naval personnel who began active duty service during April 1975 - December 1985, were stationed anytime during this period at USMC Base Camp Pendleton, but were not stationed at Camp Lejeune during this period. The study relies on ATSDR's previous water modeling estimates (<http://www.atsdr.cdc.gov/sites/lejeune/watermodeling.html>) of past exposures to a class of chemicals known as "volatile organic compounds" (VOCs) in water.

This study is one of several health initiatives that ATSDR is expected to complete in the next several years. For more information about these studies, visit <http://www.atsdr.cdc.gov/sites/lejeune/> or call (800) 232-4636.

Also enclosed, you will find information from the U.S. Department of Veterans Affairs (VA) about the "Honoring America's Veterans and Caring for Camp Lejeune Family Act of 2012." This law, signed in 2012, allows the VA to provide health benefits for fifteen illnesses or conditions affecting veterans and their families who lived or worked at Camp Lejeune for at least 30 days during the period from January 1, 1957 to December 31, 1987. To learn more about health care benefits provided under this law, please visit <http://www.publichealth.va.gov/exposures/camp-lejeune/> or call (877) 222-8387 (Healthcare) or (800) 827-1000 (Benefits).

Since 1991, the Marine Corps has supported the health initiatives conducted by various scientific agencies. We are also working diligently to identify and notify individuals who, in the past, may have been exposed to the chemicals in drinking water. For more information about these efforts or to update your contact information, please see:
<http://www.marines.mil/clwater/>, call (877) 261-9782 or e-mail clwater@usmc.mil.

Semper Fidelis,

A handwritten signature in cursive script that reads "J. G. Ayala". The signature is written in black ink and is positioned above the printed name.

J. G. AYALA
Major General, USMC
Assistant Deputy Commandant
Installations and Logistics (Facilities)

Camp Lejeune Health Studies

Evaluation of mortality among Marines and Navy personnel exposed to contaminated drinking water at USMC Base Camp Lejeune: A retrospective cohort study

Study Purpose

The purpose of this study was to determine whether residential exposures of Marines and Navy personnel to contaminated drinking water at Camp Lejeune increased risk of mortality from cancers and other chronic diseases.

What Was Studied

The study evaluated specific causes of death in 154,932 Marines and Navy personnel who began service during 1975-1985¹ and were stationed at Camp Lejeune anytime during this period. We also evaluated a comparison group of 154,969 Marines and Navy personnel from Camp Pendleton. The Camp Pendleton group was not exposed to contaminated drinking water, but was otherwise similar to the Camp Lejeune group.

Cause of death data from 1979-2008 was used to study the Camp Lejeune and Camp Pendleton cohorts. Information on causes of death was obtained from the National Center for Health Statistics National Death Index (NDI). The study included all underlying causes of death that other studies have shown associations with one or more of the chemicals found in the drinking water at Camp Lejeune. Causes of death were selected based on literature reviews conducted by the U.S. Environmental Protection Agency (EPA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), and ATSDR.

The causes of death studied include:

- Amyotrophic lateral sclerosis (ALS)
- Cancers of the bladder, brain, cervix, colon, esophagus, female breast, kidney, larynx, liver, lung, oral cavity, pancreas, prostate, rectum, and soft tissue
- Hematopoietic cancers
 - Hodgkin's Lymphoma
 - Leukemias
 - Multiple myeloma
 - Non-Hodgkin's lymphoma
- Non-cancerous kidney diseases
- Non-cancerous liver diseases
- Multiple sclerosis

¹Unit information with location for marines and navy personnel was not available in the Defense Manpower Data Center personnel database prior to 1975. The most heavily contaminated wells were shut down in 1985.

Continued on next page



Also included in the study were three causes of death that are known to be caused by cigarette smoking but are not known to be associated with the drinking water contaminants: cardiovascular disease, chronic obstructive pulmonary disease (COPD), and stomach cancer. These causes of death were included to assess the possible impact of smoking on the findings because we did not have information on smoking status for study subjects.

Features of this Study

The study included a comparison population from Camp Pendleton that was similar to the Camp Lejeune cohort on risk factors such as military training, occupations, and smoking. Camp Pendleton did not have a contaminated drinking water supply.

Residential cumulative exposure to each contaminant was based on results from the water modeling and the location and duration of residence.

Key Results

Compared to Camp Pendleton, the Camp Lejeune group had higher mortality rates for the following causes of death:

- Cancers of the cervix, esophagus, kidney, liver, lung, pancreas, prostate, rectum, and soft tissue
- Hodgkin's lymphoma
- Leukemias
- Multiple myeloma
- Multiple sclerosis

The higher rates for kidney cancer, cervical cancer, Hodgkin's lymphoma, leukemias, multiple myeloma, and lung cancer were mainly among those with higher cumulative exposures to the contaminants. However, the precision of the estimated rates of many of these conditions was low.

The findings for the smoking-related causes of death such as stomach cancer, cardiovascular disease, and COPD suggested that smoking would have only a slight impact on the associations between causes of death and exposure to the drinking water contaminants at Camp Lejeune.

Conclusion

The study found increased risk of death in the Camp Lejeune cohort for several causes including cancers of the cervix, esophagus, kidney, and liver, Hodgkin's lymphoma, and multiple myeloma. This study makes an important contribution to the body of evidence about harm caused by these chemicals. However, due to its limitations it does not provide definitive evidence for causality nor can it answer the question whether an individual has been affected by these exposures at Camp Lejeune.



Camp Lejeune Water Contamination (Historical)

Description

From at least the 1950s to the 1980s, Veterans and family members living or serving at the U.S. Marine Corps Base Camp Lejeune in North Carolina were potentially exposed to drinking water contaminated with chemicals known as volatile organic compounds (VOCs), including industrial solvents and components of fuels.

On August 6, 2012, President Obama signed into law the "Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012." For Veterans who served at Camp Lejeune between 1957 and 1987, this law provides VA health care for 15 medical conditions. Support for health care costs may also be provided for family members for these conditions once new regulations are published.

Illnesses or Conditions

The new law requires VA to provide health care for the following illnesses or conditions:

- Bladder cancer
- Breast cancer
- Esophageal cancer
- Female infertility
- Hepatic steatosis
- Kidney cancer
- Leukemia
- Lung Cancer
- Miscarriage
- Multiple myeloma
- Myelodysplastic syndromes
- Neurobehavioral effects
- Non-Hodgkin's lymphoma
- Renal toxicity
- Scleroderma

Veterans

To be eligible for care under this law, the Veteran must have served on active duty at Camp Lejeune for not fewer than 30 days between January 1, 1957, and December 31, 1987.

Veterans who are eligible for care under the Camp Lejeune authority, regardless of current enrollment status with VA, will not be charged a copayment for health care related to the above illnesses or conditions, nor will a third party insurance company be billed for these services. Copayments for care unrelated to the above illnesses or conditions may be applicable.

Family Members

Before VA can provide health care to covered family members, regulations must be published. Once the regulations are in place, a family member will need to show documentation that the Servicemember was stationed at Camp Lejeune for at least 30 days, their relationship to the Camp Lejeune Servicemember (i.e., marriage license or birth certificate), and proof of residency on Camp Lejeune for not fewer than 30 days between January 1, 1957, and December 31, 1987 (i.e., copies of orders, base housing records, etc.). VA will be the final payer for health care related to the 15 covered conditions after payment has been made by your other health insurance plan, Medicare, Medicaid and TRICARE. You are strongly urged not to alter or cancel current health insurance as this could put family members at great risk for obtaining and paying for health care for anything that is not within the 15 conditions provided for under the law.

Keep receipts for health care expenses you paid for a covered condition on or after March 26, 2013. This is the date when Congress began to fund this program and will be needed by VA to reimburse for the services once regulations are published.

Additional Information

Health concerns:

If you are concerned about possible adverse health effects from exposure to contaminated water while working or living at Camp Lejeune between the years 1957 to 1987, please contact your health care provider.

Veterans can contact their VA health care provider or their nearest VA health facility, which may be located by calling **1-877-222-VETS (8387)** or visiting www.va.gov/directory.

Veteran disability claims:

If you believe you have health problems related to the water at Camp Lejeune, you may file a claim for disability compensation (this is separate from the new law). These claims will be decided on a case-by-case basis. You can file for disability benefits online at www.ebenefits.va.gov, or contact your nearest VA Regional Office at **1-800-827-1000**.

For further information and to sign up for updates: VHA Office of Public Health has a website on Camp Lejeune historical water contamination at: www.publichealth.va.gov/exposures/camp-lejeune/index.asp.

The US Marine Corps encourages all those who lived or worked at Camp Lejeune before 1987 to register to receive notifications regarding Camp Lejeune Historic Drinking Water at <https://clnr.hqi.usmc.mil/clwater/index.aspx>.



DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
3000 MARINE CORPS PENTAGON
WASHINGTON, DC 20350-3000

2013

IN REPLY REFER TO:
5090
LF

Dear Sir or Madam:

On December 4, 2013 the Agency for Toxic Substances and Disease Registry's (ATSDR) "Evaluation of exposure to contaminated drinking water and specific birth defects and childhood cancers at Marine Corps Base Camp Lejeune, North Carolina: a case--control study" was published (<http://www.atsdr.cdc.gov/sites/lejeune/update.html>). Enclosed you will find a copy of the ATSDR fact sheet summarizing the results of this study.

ATSDR's study evaluated whether or not maternal exposures to drinking water containing volatile organic compounds (VOCs) at Camp Lejeune increased the risk of certain health conditions. The study used ATSDR's previous water modeling efforts to estimate past exposures (<http://www.atsdr.cdc.gov/sites/lejeune/watermodeling.html>). VOCs were commonly used as solvents for cleaning machinery and weapons, for dry cleaning, and some are found in fuels.

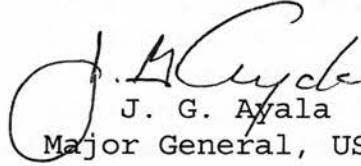
This study is the first of several health initiatives that ATSDR is expected to complete in the next several years. For more information about these studies, visit <http://www.atsdr.cdc.gov/sites/lejeune/> or call (800) 232-4636.

Also enclosed, you will find information from the U.S. Department of Veterans Affairs (VA) about the "Honoring America's Veterans and Caring for Camp Lejeune Family Act of 2012." This law, signed in 2012, allows the VA to provide health benefits for fifteen illnesses or conditions affecting veterans and their families who lived or worked at Camp Lejeune for at least 30 days during the period from January 1, 1957 to December 31, 1987. To learn more about health care benefits provided under this law, please visit <http://www.publichealth.va.gov/exposures/camp-lejeune/> or call (877) 222-8387 (Healthcare) or (800) 827-1000 (Benefits).

Since 1991, the Marine Corps has supported the health initiatives conducted by various scientific agencies. We are also working diligently to identify and notify individuals who, in the past, may have been exposed to the chemicals in drinking

water. For more information about these efforts or to update your contact information, please see:
<http://www.marines.mil/clwater/>, call (877) 261-9782 or e-mail clwater@usmc.mil.

Semper Fidelis,



J. G. Ayala
Major General, USMC

Assistant Deputy Commandant
Installations and Logistics (Facilities)

Birth Defects and Childhood Cancers Journal Article Study Design and Outcomes

Exposure to Contaminated Drinking Water and Specific Birth Defects and Childhood Cancers at Marine Corps Base Camp Lejeune, North Carolina

Study Purpose

The purpose of this study was to determine if maternal exposures to the drinking water contaminants at Camp Lejeune increased the risk of neural tube defects (NTDs), oral clefts, and childhood hematopoietic cancers. This study also examined whether children exposed to contaminated drinking water during the first year of life had an increased risk of childhood cancers. Drinking water at Camp Lejeune was contaminated with volatile organic compounds (VOCs) including trichloroethylene (TCE), tetrachloroethylene (PCE), benzene, 1,2-dichloroethylene (DCE) and vinyl chloride from the 1950s through 1985.

What Was Studied

The Agency for Toxic Substances and Disease Registry (ATSDR) surveyed the parents of 12,598 children during 1999-2002 to identify potential cases of birth defects and childhood cancers. ATSDR asked parents if their child had a birth defect or developed a childhood cancer. To be eligible for the survey, the mother had to reside on base some time during her pregnancy and children had to be born between 1968-1985.

The survey's participation rate was approximately 76% (ATSDR 2003). Survey participants reported 106 cases: 35 NTDs, 42 oral clefts, and 29 childhood hematopoietic cancers. ATSDR made extensive efforts to obtain medical information from health providers to confirm reported cases. ATSDR was able to confirm 15 NTDs, 24 oral clefts, and 13 cancers. Only confirmed cases from the survey were eligible for the study.

Based on the survey results, the study focused on NTDs (spina bifida and anencephaly), oral clefts (cleft lip and cleft palate), and childhood hematopoietic cancers (leukemia and non-Hodgkin's lymphoma [NHL]) diagnosed before 20 years of age.

Features of this Study

Due to the lack of exposure information, ATSDR used extensive water modeling to reconstruct exposures before 1987. This study is unique because it used this water modeling to thoroughly examine associations between monthly exposures to VOCs in drinking water at the residence and the risk of developing specific birth defects and childhood cancers. Most previous studies that have evaluated these associations have done so at the broad water system level versus drinking water at the residence.

Continued on next page



Conclusion and Key Results

ATSDR's study results suggested associations between TCE and benzene in Camp Lejeune drinking water and NTDs.

- In this study, these effects were seen in children born from 1968-1985 whose mothers were exposed to contaminated drinking water in their residences at Camp Lejeune.
- During the first trimester of pregnancy, the risk of a NTD increased with increasing levels of exposure to TCE.
 - This finding is consistent with a previous study conducted in New Jersey, which found similar risk of NTDs when exposed to TCE during the first trimester.
- Investigators observed an association between NTDs and first trimester exposure to benzene. ATSDR was unable to evaluate whether increasing levels of exposure to benzene were associated with increased risk of NTDs because of small numbers of exposed cases.

ATSDR's study results suggested weaker associations between 1st trimester exposure to PCE, vinyl chloride, and 1,2- DCE and childhood hematopoietic cancers such as leukemia.

- These associations are weaker than those found for NTDs.
- Researchers did not observe an increased risk for these cancers with increasing levels of exposure to the chemicals.

The study found no evidence suggesting any other associations between outcomes and exposures.

- For childhood cancers, ATSDR also looked at exposures during the second and third trimesters, the entire pregnancy as a whole, and exposures in the first year of life. The investigators did not see any associations between these chemicals with these time periods.
- Exposure to contaminants in Camp Lejeune drinking water did not increase the risk of oral clefts.



Camp Lejeune Water Contamination (Historical)

Description

From at least the 1950s to the 1980s, Veterans and family members living or serving at the U.S. Marine Corps Base Camp Lejeune in North Carolina were potentially exposed to drinking water contaminated with chemicals known as volatile organic compounds (VOCs), including industrial solvents and components of fuels.

On August 6, 2012, President Obama signed into law the "Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012." For Veterans who served at Camp Lejeune between 1957 and 1987, this law provides VA health care for 15 medical conditions. Support for health care costs may also be provided for family members for these conditions once new regulations are published.

Illnesses or Conditions

The new law requires VA to provide health care for the following illnesses or conditions:

- Bladder cancer
- Breast cancer
- Esophageal cancer
- Female infertility
- Hepatic steatosis
- Kidney cancer
- Leukemia
- Lung Cancer
- Miscarriage
- Multiple myeloma
- Myelodysplastic syndromes
- Neurobehavioral effects
- Non-Hodgkin's lymphoma
- Renal toxicity
- Scleroderma

Veterans

To be eligible for care under this law, the Veteran must have served on active duty at Camp Lejeune for not fewer than 30 days between January 1, 1957, and December 31, 1987.

Veterans who are eligible for care under the Camp Lejeune authority, regardless of current enrollment status with VA, will not be charged a copayment for health care related to the above illnesses or conditions, nor will a third party insurance company be billed for these services. Copayments for care unrelated to the above illnesses or conditions may be applicable.

Family Members

Before VA can provide health care to covered family members, regulations must be published. Once the regulations are in place, a family member will need to show documentation that the Servicemember was stationed at Camp Lejeune for at least 30 days, their relationship to the Camp Lejeune Servicemember (i.e., marriage license or birth certificate), and proof of residency on Camp Lejeune for not fewer than 30 days between January 1, 1957, and December 31, 1987 (i.e., copies of orders, base housing records, etc.). VA will be the final payer for health care related to the 15 covered conditions after payment has been made by your other health insurance plan, Medicare, Medicaid and TRICARE. You are strongly urged not to alter or cancel current health insurance as this could put family members at great risk for obtaining and paying for health care for anything that is not within the 15 conditions provided for under the law.

Keep receipts for health care expenses you paid for a covered condition on or after March 26, 2013. This is the date when Congress began to fund this program and will be needed by VA to reimburse for the services once regulations are published.

Additional Information

Health concerns:

If you are concerned about possible adverse health effects from exposure to contaminated water while working or living at Camp Lejeune between the years 1957 to 1987, please contact your health care provider.

Veterans can contact their VA health care provider or their nearest VA health facility, which may be located by calling **1-877-222-VETS (8387)** or visiting www.va.gov/directory.

Veteran disability claims:

If you believe you have health problems related to the water at Camp Lejeune, you may file a claim for disability compensation (this is separate from the new law). These claims will be decided on a case-by-case basis. You can file for disability benefits online at www.ebenefits.va.gov, or contact your nearest VA Regional Office at **1-800-827-1000**.

For further information and to sign up for updates: VHA Office of Public Health has a website on Camp Lejeune historical water contamination at: www.publichealth.va.gov/exposures/camp-lejeune/index.asp.

The US Marine Corps encourages all those who lived or worked at Camp Lejeune before 1987 to register to receive notifications regarding Camp Lejeune Historic Drinking Water at <https://clnr.hqi.usmc.mil/clwater/index.aspx>.



UNITED STATES MARINE CORPS
HEADQUARTERS UNITED STATES MARINE CORPS
3000 MARINE CORPS PENTAGON
WASHINGTON, DC 20350-3000

RCVD

IN REPLY REFER TO:
LF

4-2-2013

Dear Registrant:

On March 15, 2013 the Agency for Toxic Substances and Disease Registry (ATSDR) released its "Chapter A: Summary and Findings" water modeling report for the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities for Marine Corps Base Camp Lejeune, N.C. (<http://www.atsdr.cdc.gov/sites/lejeune/hadnotpoint.html>). Enclosed you will find a copy of the ATSDR fact sheet about this report and other information from the Department of Veterans Affairs.

The Chapter A report provides ATSDR's assessment of past exposures to a class of chemicals known as "volatile organic compounds" (VOCs) in the drinking water distributed by these two Camp Lejeune water treatment systems. These VOCs were commonly used as solvents for cleaning machinery and weapons, for dry cleaning, and some are found in fuels.

ATSDR's water modeling estimates that the first month any VOC exceeded the current Environmental Protection Agency (EPA) regulatory standards in drinking water in the Hadnot Point system was August 1953, and at least one VOC exceeded the current standard in Hadnot Point drinking water from August 1953 through January 1985.

This release marks a major milestone towards the completion of scientific efforts pertaining to this issue and another step in ongoing efforts to provide comprehensive science-based answers to the health questions that have been raised. ATSDR will use these results and the results of a similar water model developed for the Tarawa Terrace area in 2007 to estimate chemical exposures for several of their on-going health studies.

Since 1991, the Marine Corps has supported scientific and public health organizations that are studying these issues. We continue to support these initiatives and are working diligently to identify and notify individuals who, in the past, may have been exposed to the chemicals in drinking water. For more information about these efforts, or to update your contact information, please see: <http://www.marines.mil/clwater/>, call (877) 261-9782 or e-mail at clwater@usmc.mil.

For the complete report and for information about studies being conducted by ATSDR, visit <http://www.atsdr.cdc.gov/sites/lejeune/> or call (800) 232-4636. To contact Veterans Affairs to learn more about the health care benefits, please visit <http://www.publichealth.va.gov/exposures/camp-lejeune/> or call (877) 222-8387 (Healthcare) or (800) 827-1000 (Benefits).

Semper Fidelis,

J. A. KESSLER

Major General, USMC

Assistant Deputy Commandant

Installations and Logistics (Facilities)

*IN 1966(OR) 67

I was a member of the
Charleston, South Carolina
Naval Station Pistol Team.

Our team went to Camp Lejeune, NC for a pistol match and I, and my team-mates, drank their water.



Camp Lejeune Water Contamination (Historical)

Description

From at least the 1950s to the 1980s, Veterans and family members living or serving at the U.S. Marine Corps Base Camp Lejeune in North Carolina were potentially exposed to drinking water contaminated with chemicals known as volatile organic compounds (VOCs), including industrial solvents and components of fuels.

On August 6, 2012, President Obama signed into law the "Honoring America's Veterans and Caring for Camp Lejeune Families Act of 2012." For Veterans who served at Camp Lejeune between 1957 and 1987, this law provides VA health care for 15 medical conditions. Support for health care costs may also be provided for family members for these conditions once Congress appropriates funds and new regulations are published.

Illnesses or Conditions

The new law requires VA to provide health care for the following illnesses or conditions:

- Bladder cancer
- Breast cancer
- Esophageal cancer
- Female infertility
- Hepatic steatosis
- Kidney cancer
- Leukemia
- Lung Cancer
- Miscarriage
- Multiple myeloma
- Myelodysplastic syndromes
- Neurobehavioral effects
- Non-Hodgkin's lymphoma
- Renal toxicity
- Scleroderma

Veterans

To be eligible for care under this law, the Veteran must have served on active duty at Camp Lejeune for not fewer than 30 days between January 1, 1957, and December 31, 1987.

Veterans who are eligible for care under the Camp Lejeune authority, regardless of current enrollment status with VA, will not be charged a copayment for health care related to the above illnesses or conditions, nor will a third party insurance company be billed for these services. Copayments for care unrelated to the above illnesses or conditions may be applicable.

Family Members

Before VA can provide health care to covered family members, funds must be appropriated by Congress, and final regulations published. Once funds and regulations are in place, a family member will need to show documentation that the Servicemember was stationed at Camp Lejeune for at least 30 days, their relationship to the Camp Lejeune Servicemember (i.e., marriage license or birth certificate), and proof of residency on Camp Lejeune for not fewer than 30 days between January 1, 1957, and December 31, 1987 (i.e., copies of orders, base housing records, etc.). VA will be the final payer for health care related to the 15 covered conditions after payment has been made by your other health insurance plan, Medicare, Medicaid and TRICARE. You are strongly urged not to alter or cancel current health insurance as this could put family members at great risk for obtaining and paying for health care for anything that is not within the 15 conditions provided for under the law.

Additional Information

Health concerns:

If you are concerned about possible adverse health effects from exposure to contaminated water while working or living at Camp Lejeune between the years 1957 to 1987, please contact your health care provider.

Veterans can contact their VA health care provider or their nearest VA health facility, which may be located by calling **1-877-222-VETS (8387)** or visiting www.va.gov/directory.

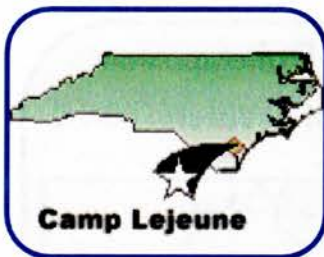
Veteran disability claims:

If you believe you have health problems related to the water at Camp Lejeune, you may file a claim for disability compensation (this is separate from the new law). These claims will be decided on a case-by-case basis. You can file for disability benefits online at www.ebenefits.va.gov, or contact your nearest VA Regional Office at **1-800-827-1000**.

For further information and to sign up for updates: VHA Office of Public Health has a website on Camp Lejeune historical water contamination at: www.publichealth.va.gov/exposures/camp-lejeune/index.asp.

The US Marine Corps encourages all those who lived or worked at Camp Lejeune before 1987 to register to receive notifications regarding Camp Lejeune Historic Drinking Water at <https://clnr.hqi.usmc.mil/clwater/index.aspx>.

Camp Lejeune – Chapter A Report



Summary and Findings: Analyses and Historical Reconstruction of Drinking Water in the Hadnot Point and Holcomb Boulevard Water Treatment Plants Service Areas

Background

U.S. Marine Corps Base Camp Lejeune, North Carolina was established in 1942. In 1982, the Marine Corps discovered specific volatile organic compounds (VOCs) in the drinking water provided by two of the eight water distribution systems on base. The Agency for Toxic Substances and Disease Registry has several projects underway to help Marines, civilians, health officials, and other interested parties understand more about the drinking water contamination and whether it affected the health of persons living or working on the base during the period 1968-1985.

Using Research to Understand Health Effects

ATSDR is determining associations between human health effects and exposures to VOCs in drinking (finished) water at Camp Lejeune. To accomplish this, ATSDR used water modeling to determine which areas at Marine Corps Base Camp Lejeune received VOC-contaminated drinking water in the past. Water modeling is a method of analysis that enabled ATSDR to estimate drinking water concentrations for the period 1942-2008. This work will help ATSDR epidemiologists determine what populations were exposed to contaminants and at what levels they were exposed.

Chapter A: Summary and Findings presents summaries of analyses and results of reconstructed VOC-contaminant concentrations in water supply wells and drinking water within the Hadnot Point and Holcomb Boulevard water treatment plant service areas. This report summarizes previous analyses and investigations—Chapters B, C, and D—and results of water modeling investigations. Completing Chapter A and the eight supplements required discovery, extraction, and analyses of data and information from tens of thousands of federal and state government documents.

This report is a companion to previously published reports on geohydrologic data (Chapter B), selected groundwater contaminants at Installation Restoration Program sites (Chapter C), and occurrence of selected groundwater contaminants at above- and underground storage tank sites (Chapter D).

Chapter A Supplements

1. Water supply well operations
2. Reconstruction of historical water supply well operations
3. Water level data and groundwater flow
4. Simulation of 3-dimensional groundwater flow
5. Reconstruction of contaminant concentrations using linear control model methodology
6. Reconstruction of VOC concentrations in groundwater
7. Simulation of LNAPL migration and concentrations in groundwater
8. Intermittent transfers of drinking water between the Hadnot Point and Holcomb Boulevard water distribution systems



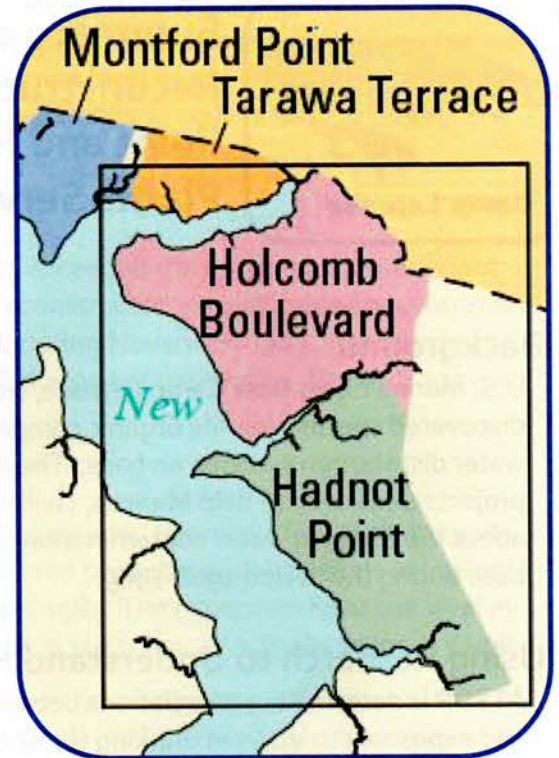
Information in Chapter A

ATSDR's water-modeling techniques and historical reconstruction process were used to estimate monthly contaminant levels in drinking water within the Hadnot Point and Holcomb Boulevard water treatment plant service areas.

ATSDR estimates that drinking water from the Hadnot Point water treatment plant exceeded the current maximum contaminant levels (MCL) for one or more VOCs from August 1953 through January 1985. The specific VOCs that ATSDR examined are:

- trichloroethylene (TCE),
- tetrachloroethylene (PCE),
- *trans* 1,2-dichloroethylene, (1,2-tDCE)
- vinyl chloride, and
- benzene.

With the exception of *trans* 1,2-dichloroethylene, these chemicals have been classified as causing or probably causing cancer (carcinogenic). Non-cancer diseases associated with the chemicals are aplastic anemia, infertility, kidney diseases, liver disease, lupus, miscarriage, Parkinson's disease, scleroderma, and skin disorders.



What is a maximum contaminant level?

The maximum contaminant level (MCL) is the highest level of a contaminant that is allowed in drinking water. Drinking water, including bottled water, reasonably may be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. EPA sets standards for approximately 90 contaminants and indicators in drinking water. The MCL is based on a scientific opinion after a careful review of scientific literature for both cancer and non-cancer health effects.

The Hadnot Point Water Treatment Plant opened in 1942 and provided water to both the Hadnot Point and Holcomb Boulevard service areas. The Hadnot Point water system was contaminated with TCE, PCE and refined petroleum products. The Holcomb Boulevard Water Treatment plant came online in 1972. The Holcomb Boulevard system was not contaminated, except for periodic transfers of water from the Hadnot Point Water System.

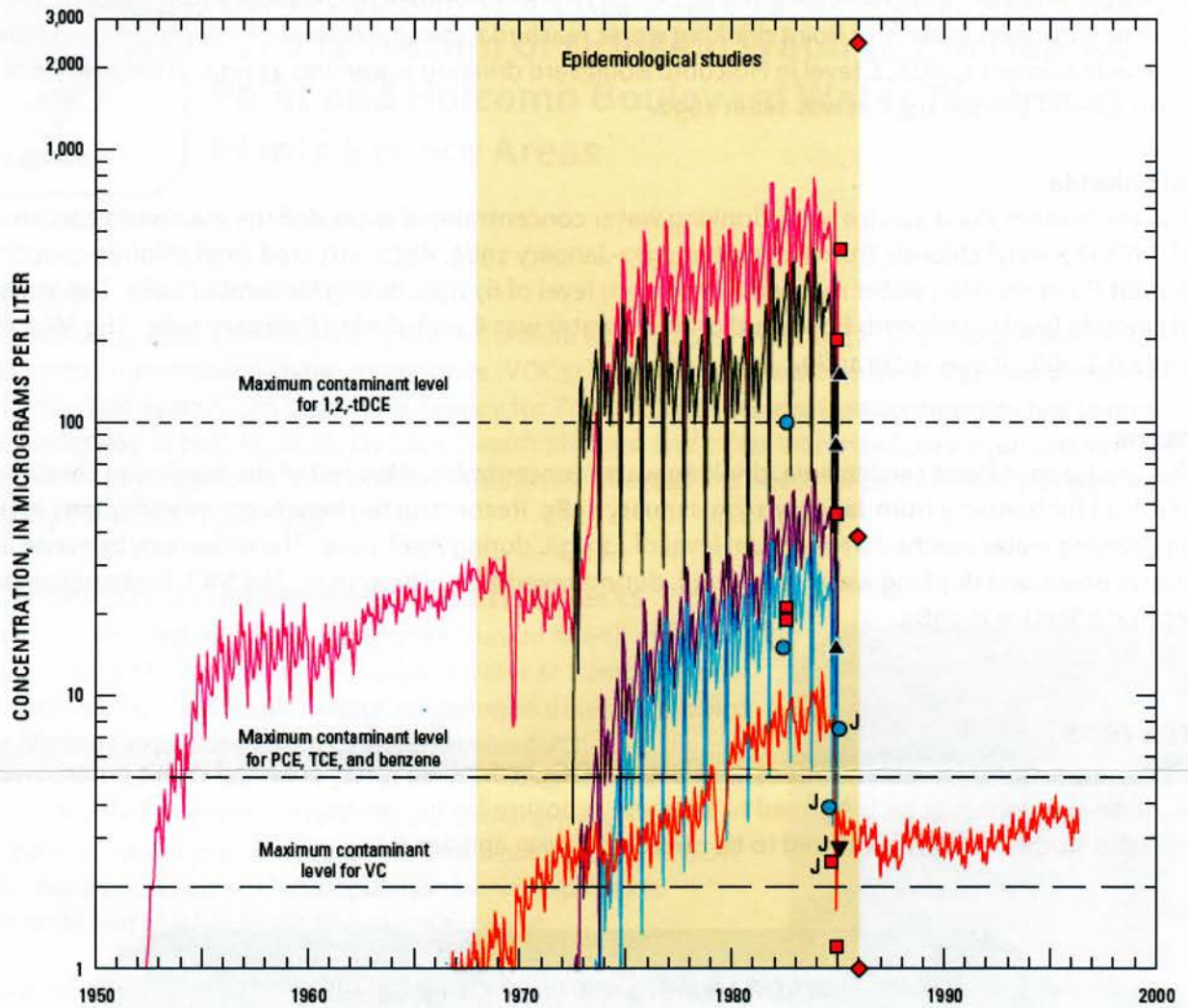
Trichloroethylene

Within the Hadnot Point service area, drinking water concentrations exceeded the maximum contaminant level (MCL) for trichloroethylene (TCE) from August 1953-January 1985. Reconstructed TCE concentrations in Hadnot Point drinking water reached a maximum level of 783 µg/L during November 1983. The maximum TCE level in Holcomb Boulevard was 66 µg/L in February 1985. The MCL for TCE is 5 µg/L. It was set in 1989.

Tetrachloroethylene

Within the Hadnot Point service area, drinking water concentrations exceeded the maximum contaminant level (MCL) for tetrachloroethylene (PCE) from August 1974-January 1985. Reconstructed PCE concentrations in Hadnot Point drinking water reached a maximum level of 39µg/L in November 1983. The maximum PCE level in Holcomb Boulevard drinking water was 3 µg/L in February 1985. The MCL for PCE is 5 µg/L. It was set in 1992.

Reconstructed drinking water concentrations at the Hadnot Point Water Treatment Plant



Concentration in finished water at water treatment plant

Contaminant	Measured	Reconstructed
PCE	●	—
TCE	■	—
1,2-tDCE	▲	—
VC	▼	—
Benzene	◆	—

J = estimated concentration

Trans-1,2-dichloroethylene

Within the Hadnot Point service area, drinking water concentrations exceeded the maximum contaminant level (MCL) for *trans*-1,2-dichloroethylene (1,2-tDCE) from November 1972-January 1985. Reconstructed 1,2-tDCE concentrations in Hadnot Point drinking water reached a maximum level of 435 µg/L during November 1983. The maximum 1,2-tDCE level in Holcomb Boulevard drinking water was 33 µg/L in February 1985. The MCL for 1,2-tDCE is 100 µg/L. It was set in 1992.

Vinyl chloride

Within the Hadnot Point service area, drinking water concentrations exceeded the maximum contaminant level (MCL) for vinyl chloride from November 1972-January 1985. Reconstructed vinyl chloride concentrations in Hadnot Point drinking water reached a maximum level of 67 µg/L during November 1983. The maximum vinyl chloride level in Holcomb Boulevard drinking water was 6 µg/L during February 1985. The MCL for vinyl chloride is 2 µg/L. It was set in 1989.

Benzene

Within the Hadnot Point service area, drinking water concentrations exceeded the maximum contaminant level (MCL) for benzene from January 1979-January 1985. Reconstructed benzene concentrations in Hadnot Point drinking water reached a maximum level of 12 µg/L during April 1984. The maximum benzene level in Holcomb Boulevard drinking water was 3 µg/L during several months in 1972. The MCL for benzene is 5 µg/L. It became effective in 1989.

Next Steps

The estimated monthly concentrations of selected VOCs in drinking water provided in this report gives epidemiologists information they need to estimate exposure for human health studies. ATSDR is working on four health studies that are expected to be released in 2013 and 2014.

ATSDR Health Studies for Camp Lejeune

Birth Defects and Childhood Cancer Study—Looks at whether children born from 1968-1985 to mothers who were exposed to contaminated drinking water at Camp Lejeune have increased risk for specific birth defects and childhood cancers

Health Survey of Marine Corps Personnel and Civilians—Will help determine whether contaminated water may have affected people's health and provide more information about how environmental and chemical exposures affect human health

Male Breast Cancer Study—Will look at cases of male breast cancer among Marines to determine whether a link exists between cases and exposure to contaminated drinking water at Camp Lejeune

Mortality Study—Looks at all causes of death to determine if there is a link between specific causes of death and exposure to contaminated drinking water at Camp Lejeune



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

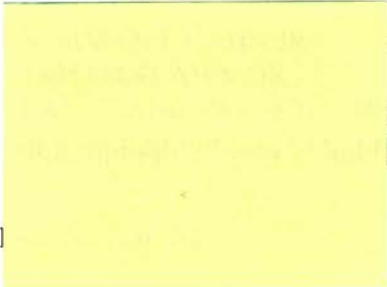


0029288

Agency for Toxic Substances and Disease Registry
Atlanta, GA 30333

*Camp Lejeune
Exposure*

649770762



0029288



The Agency for Toxic Substances and Disease Registry (ATSDR) is doing a survey to find out about the health status of those who resided or worked at U.S. Marine Corps (USMC) Base Camp Lejeune or Camp Pendleton in 1985 or before. ATSDR is a federal public health agency of the U.S. Department of Health and Human Services. The ATSDR Health Survey of Marine Corps Personnel and Civilians is funded by the U.S. Navy and Marine Corps.

The survey asks about when and where you lived or worked at Camp Lejeune or Camp Pendleton, as well as your work history and your health. By completing this survey, you will help us learn more about ways to improve health and prevent disease in the future. We really need your help to make this survey a success.

Please complete the survey and mail it back in the envelope provided. We would like to receive your completed survey within two weeks.

Taking part in this survey is voluntary, but we hope you will participate. There are no penalties if you decide not to take part. All answers will be kept private to the extent permitted by law. You will not be identified personally in any reports from this survey. *Survey mailed back 6-17-2012*

If you have any questions, you may call the Centers for Disease Control and Prevention (CDC) Information Line at 1-800-232-4636. Thank you in advance for your help with this important survey.

Sincerely,

Frank Bove

Frank Bove, ScD
Senior Epidemiologist
Division of Toxicology and
Human Health Sciences (proposed), ATSDR

Perri Ruckart

Perri Ruckart, MPH
Epidemiologist
Division of Toxicology and
Human Health Sciences (proposed), ATSDR



INFORMED CONSENT FORM

ATSDR Health Survey of Marine Corps Personnel and Civilians

Introduction and Purpose

The Agency for Toxic Substances and Disease Registry (ATSDR) is doing a health survey of persons who lived or worked at Camp Lejeune or Camp Pendleton in 1985 or before. The ATSDR Health Survey of Marine Corps Personnel and Civilians is funded by the U.S. Navy and the Marine Corps. ATSDR is doing this survey to learn more about the health effects of workplace and environmental exposures. The survey asks questions about when and where you lived or worked at Camp Lejeune or Camp Pendleton. It also asks about your work history and your health.

If you agree to take part, please read and sign this consent form and complete the following survey. The survey should take about 45 minutes to complete.

Risks and Benefits

Data are collected through a mail questionnaire with minimal risk to participants. Some of the questions are personal, like questions about your health. Answering the survey is voluntary. If you choose not to take part, there will be no penalty. You will not lose any benefits if you decide not to participate. There are no direct benefits from taking part in this survey.

Confidentiality

All answers you give will be kept private to the extent permitted by law. We do not plan to share your information with anyone other than ATSDR staff and its contractors. Data that identify you or where you live will not be included in any report. All information from the surveys will be kept in a locked file. Data will be stored separately from any personal identifiers.

If you have any questions about this survey, please contact the Centers for Disease Control and Prevention (CDC) Information Line at 1-800-232-4636. For questions about your rights as a survey participant, please contact CDC's Human Research Protection Office at 1-800-584-8814. Please leave a brief message with your name and phone number, and mention that you are calling about CDC protocol #5536. Someone will return your call as soon as possible.



Signed and
mailed the form back 6-17-2012

PLEASE READ AND SIGN BELOW

I have read or have had read to me the description of the ATSDR Health Survey of Marine Corps Personnel and Civilians. I have been informed of the risks and benefits of the survey.

My rights as a research subject have been explained to me. The purpose of the survey and how it is being done have been explained to me. I understand that I have the right to refuse to answer any question or refuse to complete the survey. I voluntarily agree to take part in this survey.

Your name (please print)

Your signature

Date



I agree to potentially being re-contacted by ATSDR regarding participation in future studies about Camp Lejeune. I understand that agreeing to be contacted in the future is voluntary.

Yes, I agree

No, I do not agree

Your name (please print)

Your signature

Date





DEPARTMENT OF THE NAVY
 HEADQUARTERS UNITED STATES MARINE CORPS
 2 NAVY ANNEX
 WASHINGTON, DC 20380-1775

Note: I was at Camp Lejeune, NC in early 1967 for a pistol match (.45+.22) when I was a member of the Charleston, SC Naval Station Pistol Team. My duty station was NSGA, RPIO, Charleston, S.C.

IN REPLY REFER TO:
 5090
 LFL
 JUN 25 2009

Dear Registrant: I was a member of the Charleston, SC Naval Station Pistol Team. My duty station was NSGA, RPIO, Charleston, S.C.

On June 13, 2009, a committee of the National Academies National Research Council (NRC) released a report on its independent review of the available scientific and medical information to determine whether adverse health outcomes are associated with past contamination of the water supply at Camp Lejeune, North Carolina prior to 1987. The report assesses the strength of evidence associating exposure to trichloroethylene (TCE), tetrachloroethylene (PCE), benzene, and other volatile organic compounds (VOCs) in drinking water to adverse health effects in prenatal children, children, and adults.

Enclosed you will find a copy of the NRC committee's "Report In Brief" that summarizes the findings of the review. For additional information, to view the full report, or to download a free copy of the executive summary, please visit the National Academies Web site:

<http://www.nationalacademies.org/morenews/20090613.html>

If you do not have computer access, you can request a hard copy of the executive summary by sending a request in writing to:

Headquarters, U.S. Marine Corps (LFL)
 2 Navy Annex, RM 3109
 Washington, DC 20380-1775

Additionally, on April 28, 2009, the Agency for Toxic Substances and Disease Registry (ATSDR) announced that they were removing the 1997 Public Health Assessment (PHA) for Camp Lejeune from their Web site. According to ATSDR, the PHA should have mentioned benzene contamination and stated that the extent of exposure to benzene was unknown.

The ATSDR is currently conducting water modeling as part of an ongoing study to determine if past exposure to VOCs from contaminated drinking water at Camp Lejeune is associated with certain birth defects and childhood cancers. After the water modeling is completed, the ATSDR will re-analyze and update the PHA. Persons interested in reading the 1997 PHA may request a printed copy by contacting the ATSDR Records Center at (770) 488-0707, or e-mail: atsdrrecordscenter@cdc.gov.

The Marine Corps is dedicated to taking care of our Marines, Sailors, civilians and their families. Thank you again for your service to our Nation. If you have further questions, please contact our toll-free call center at (877) 261-9782, Monday-Friday 8:30 a.m.-5:00 p.m. You may also visit our Web site at www.marines.mil/clwater.

Semper Fidelis,

A handwritten signature in black ink, appearing to read 'E. G. Payne', with a long horizontal flourish extending to the right.

E. G. PAYNE
Major General, USMC
Assistant Deputy Commandant
Installations and Logistics (Facilities)

Public Summary and Context

Contaminated Water Supplies at Camp Lejeune

Assessing Potential Health Effects

In the early 1980s, two water-supply systems on the Marine Corps Base Camp Lejeune in North Carolina were found to be contaminated with the industrial solvents trichloroethylene (TCE) and perchloroethylene (PCE). The water systems were supplied by the Tarawa Terrace and Hadnot Point water-treatment plants, which served enlisted-family housing, barracks for unmarried service personnel, base administrative offices, schools, and recreational areas. The Hadnot Point water system also served the base hospital and an industrial area and supplied water to housing on the Holcomb Boulevard water system (full-time until 1972 and periodically thereafter).

This report examines what is known about the contamination of the water supplies at Camp Lejeune and whether the contamination can be linked to any adverse health outcomes in former residents and workers at the base. Because of the technical nature of the report, this public summary is being provided to explain the committee's approach

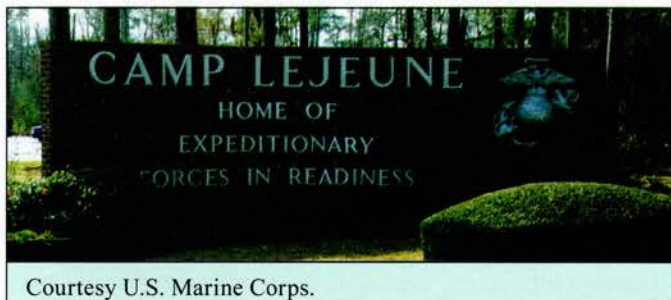
and reasoning, so that people who are not scientists can understand what was done and why. It attempts to place the committee's analysis and findings into the context of a larger discussion about environmental health issues at Camp Lejeune in a way that will be helpful to people who have personal concerns about the situation at the base. It also provides perspective on why the committee was unable to answer some questions.

The Charge to the Committee

The National Research Council (NRC) conducted this review in response to a request from the U.S. Navy, the department under which the Marine Corps operates. The Navy was mandated by the U.S. Congress (Public Law 109-364, Section 318) to request a review by the NRC to address the evidence on whether adverse health outcomes are associated with past contamination of the water supply at Camp Lejeune. The NRC developed specific instructions for the scope of the review ("the charge").

It then recruited and appointed a committee of scientists with diverse but pertinent backgrounds and perspectives to carry out the review.

The charge had several elements. One was to review the scientific evidence about the kinds of adverse health effects that could occur after exposure to TCE, PCE, and other contaminants. The second was to



Courtesy U.S. Marine Corps.

evaluate studies that were performed or that are under way on former residents of the base and to consider how useful it will be to conduct additional studies. The third element was to identify scientific considerations that could help the Navy set priorities on future activities. The responsibility of the committee was to address its charge in a dispassionate, expert, and unbiased way. Analyses and findings were neither subject to oversight nor influenced by the agenda of any of the entities with responsibilities for Camp Lejeune, former or current residents of Camp Lejeune, or any other entity.

The Concerns of Former Residents and Workers

The committee held three public meetings over the course of its study, two in Washington, DC (September 24, 2007, and September 12, 2008) and one in Camp Lejeune, NC (November 15, 2007). Former residents and other concerned individuals presented oral and written testimonies about their experiences at Camp Lejeune at those meetings. The committee also sought comments from consultants working with community groups seeking answers to questions about the water contamination. Although these encounters were not exhaustive in identifying all issues of concern or all perspectives, they gave the committee a chance to hear firsthand from people who have concerns. The committee sincerely appreciates the time and effort that went into the presentations, testimonies, and materials that were provided.

On the basis of the public input, the committee understands that some people believe that the Marine Corps has not responded appropriately to the contamination since it was first discovered. Some believe that the military leadership has not been fully forthcoming in providing data and information about the contamination and about the people who lived in affected areas. Some have concerns about whether information was disclosed or released in timely and appropriate ways. Questions have also been raised about the pace at which investigations have been conducted and whether the investigations are the most appropriate ones. Many expressed an interest in an unbiased and credible review.

Many of the people who addressed the committee have suffered from serious diseases or have family members or friends who have suffered. The committee was moved by the testimonies it heard and understands that some may have been looking for the committee to make a judgment on their particular

case. However, science does not allow the committee to determine the cause of a specific case of disease. This may be hard to understand. Why would scientific experts not be able to determine whether a child's birth defect or a parent's cancer diagnosis was due to a chemical exposure? Unfortunately, for diseases that can have multiple causes and that develop over a long period of time, it is generally impossible to establish definitively the cause in individual cases. It was beyond the scope of the committee's charge to try to determine whether any particular case of a disease or disorder is associated with exposure to the water supply at Camp Lejeune.

Some parties contend that the Marine Corps has not done what it should to compensate them or to provide medical care for the harm they believe was caused by their exposure to the contaminated water supplies. In 2007, the U.S. Government Accountability Office (GAO) reported that former residents and employees of Camp Lejeune had filed more than 750 claims against the federal government related to the contamination. GAO also reports that the federal government is awaiting the results of a study on childhood cancers and birth defects before adjudicating claims. It was beyond the scope of the committee's charge to judge whether the military authorities acted appropriately from a legal or ethical perspective or fulfilled their responsibilities to those under their charge. It was also beyond the scope of the committee's charge to determine whether or how the military authorities should address claims made.

The Committee's Review and Findings

The committee divided its review into two major categories: (1) evaluating the exposures of former residents and workers to the contamination of the Tarawa Terrace and Hadnot Point water-supply systems, and (2) evaluating the potential health effects associated with the water contaminants. The assessments were then considered together to ascertain whether conclusions could be drawn about whether any adverse health outcomes could be attributed to the water contaminants.

Exposures to Former Residents and Workers

The term "exposure" refers to contact with contaminants in air, water, or food that may occur through inhalation, ingestion, or dermal absorption (through the skin). In this case, it refers to drinking water that contains contaminants or using it for other purposes. Bathing and showering are relevant, as well

as drinking, because TCE and PCE (and other solvents) can evaporate into the air (volatilize) when present in hot water used for bathing, showering, or washing dishes or clothing and can then be inhaled. All of these routes of exposure affect how the body metabolizes TCE and PCE, how the metabolites are distributed and cleared by the body, and how organ systems respond.

It is also important to understand the duration of exposure, which is the length of time a person is exposed. An understanding of individual behaviors helps to estimate the degree of exposure that occurred. Water-related behaviors include water-consumption and showering or bathing patterns, but whether such information can be accurately recalled is questionable. The contaminated water systems also supplied nonresidential areas of the base, including schools, workplaces, recreational areas, and a hospital. Water-use patterns and behaviors in these settings are expected to vary substantially from those in residential

areas. In addition, residential and nonresidential exposures could overlap, thus, exposing individuals to contaminated water at multiple locations.

The Water Systems at Camp Lejeune

Figure 1 provides a simplified illustration of a water-supply system at Camp Lejeune. Water-supply wells collected groundwater and pumped it to a water-treatment plant when the wells were turned on. The wells were “cycled,” meaning that only a few wells pumped water to the treatment plant at any given time. A few wells that supplied water to the Tarawa Terrace and Hadnot Point systems were contaminated by solvents from sources on and off the base. When the contaminated wells were in service, contaminated water was delivered to the water-treatment plant where water from several wells was mixed and processed before being distributed in the pipes that supplied water to the base. Thus, the contamination of the water supplies varied and was

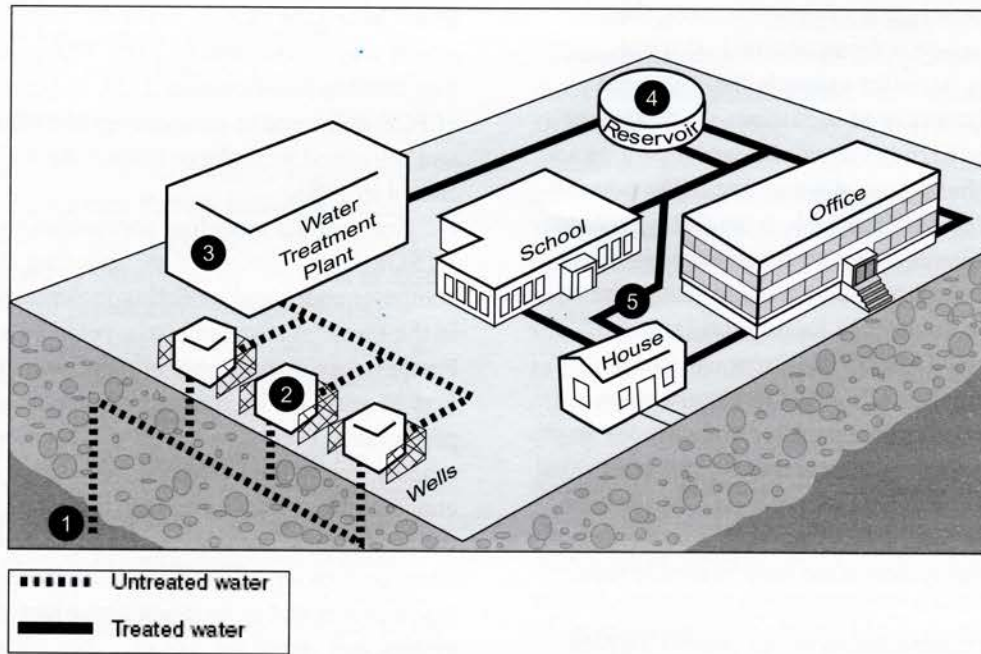


FIGURE 1 Conceptual model of a Camp Lejeune water system. (1) The drinking water at Camp Lejeune is obtained from groundwater pumped from a freshwater aquifer located approximately 180 feet below the ground. (2) Groundwater is pumped through wells located near the water-treatment plant. (3) In the water-treatment plant, the untreated water is mixed and treated through several processes: removal of minerals to soften the water, filtration through layers of sand and carbon to remove particles, chlorination to protect against microbial contamination, and fluoride addition to help to prevent tooth decay. (4) After the water is treated, it is stored in ground and elevated storage reservoirs. (5) When needed, treated water is pumped from the reservoirs and tanks to facilities such as offices, schools, or houses on the base. Source: GAO. 2007. Defense Health Care: Activities Related to Past Drinking Water Contamination at Marine Corps Base Camp Lejeune. GAO-07-276. Washington, DC: U.S. Government Accountability Office.

dependent on many factors, such as the time of operation of the contaminated wells, the water treatments used, and the rate at which water was supplied to the base.

Exposure Review

The committee's exposure evaluation involved identifying the contaminants of concern, their sources, and the concentrations estimated to be present in the water supplies over time. For Tarawa Terrace, the committee relied on work by the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR compiled the available information on the Tarawa Terrace water system and used computer models to simulate how contaminants moved underground, entered water-supply wells, and were distributed in the water supply. Contaminant measurements were only available from 1980 to 1985, so models were needed to make estimates of the concentrations of contaminants in the water supply in the preceding decades.

A similar historical reconstruction has not yet been performed for the Hadnot Point water system. To identify contaminants of concern there, the committee reviewed information on historical activities on the base (for example, building and chemical uses and sites of hazardous-waste storage or disposal) and findings from site investigations and plans for remedial action at waste sites. The committee also reviewed data available from testing records and other documents to get a preliminary characterization of the exposures that occurred. For some of its analyses, the committee focused on samples taken from "mixed water," that is, water mixed from several supply wells at the treatment plant, because those measurements were probably the most representative of the contaminant concentrations that were delivered to the taps on base. As was the case with Tarawa Terrace, contaminant measurements of the Hadnot Point system were only available from 1980 to 1985.

The major contaminants of the Tarawa Terrace and Hadnot Point systems are of a particular form that tends to serve as a continuing source of contamination even after the contaminants are underground. These are called "DNAPLs," which stands for dense nonaqueous phase liquids. DNAPLs are dense, so they have the potential to sink into the deeper aquifers. Such chemicals get trapped in the soil and dissolve slowly into groundwater. The geology of the area makes it probable that DNAPLs that were spilled on the ground or that were leaked or disposed of in

the soil got into the groundwater that supplied some of the wells of the two systems.

The dry-cleaning solvent PCE is the primary contaminant of the Tarawa Terrace water-supply system. Spills and improper disposal of PCE by an off-base dry-cleaner contaminated the groundwater collected by on-base supply wells. Other contaminants detected in water-supply wells were TCE, 1,1-dichloroethylene (DCE), *cis*-1,2-DCE, *trans*-1,2-DCE, benzene, toluene, and vinyl chloride. Several of the contaminants (TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, and vinyl chloride) may be the result of degradation of PCE in the soil and groundwater. There was some on-base contamination of the Tarawa Terrace supply system as well.

Sophisticated computer modeling techniques were used by ATSDR to make predictions about the monthly concentrations of PCE to which residents of Tarawa Terrace were exposed. To provide perspective on its estimates, ATSDR compared its monthly estimates with the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) for PCE in drinking water of 5 µg/L, which was established in 1985. The model estimated that starting in November 1957, the concentration of PCE delivered to residents exceeded that MCL and remained well above it until the wells were closed in 1985.

Some of the modeling approaches used by ATSDR were "cutting-edge," meaning that they used computer codes and modeling techniques that are still in the research stage and have yet to be validated. Furthermore, the absence of measurement data for the first 30 years of the contamination period means the predictions, even if based on validated codes and models, cannot be evaluated for accuracy. The actual concentrations may have been higher or lower than the predictions, but that cannot be assessed. Other uncertainties were introduced into the models because assumptions had to be made about how the water system was operating. For example, little information was available on which wells were supplying water at specific time periods, so assumptions had to be made about when the contaminated wells were operating. Another uncertainty is that the models did not take into account the DNAPL form of pollutants. Given the multiple uncertainties and likely variation in contaminant concentrations, the committee concluded that the Tarawa Terrace modeling predictions should only be used to provide a general estimate of the timeframe and magnitude of exposure.

The contamination of the Hadnot Point system was more complex than Tarawa Terrace. There were multiple sources of pollutants, including an industrial area, a drum dump, a transformer storage lot, an industrial fly ash dump, an open storage pit, a former fire training area, a site of a former on-base dry cleaner, a liquids disposal area, a former burn dump, a fuel-tank sludge area, and the site of the original base dump. The available data on contaminant measurements taken in the 1980s show that TCE and *trans*-1,2-DCE were the contaminants found most often in mixed-water samples, with a few detections of PCE, methylene chloride, and vinyl chloride. The nature of the hazardous-waste sites in the vicinity of the Hadnot Point supply wells suggests that other contaminants may have been present. For example, tests of samples taken from special monitoring wells installed after the contamination was discovered have detected fuel constituents and metals, compounds that were not routinely analyzed in the water samples taken in the 1980s.

Recommendations

- For the purposes of epidemiologic studies, the results of the Tarawa Terrace historical reconstruction can be used to characterize people as being exposed or unexposed on the basis of date and location of residence or workplace. The monthly estimates imply more accuracy than is appropriate and should not be used to characterize exposure of individual people.
- Because any groundwater modeling of the Hadnot Point system will be fraught with considerable difficulties and uncertainties, simpler modeling approaches should be used to assess exposures from the Hadnot Point water system. Simpler modeling will not reduce the uncertainty associated with the estimates, but they have the advantage of providing a broad picture of the timeframe and magnitude of exposure encountered by people who used water from that system more quickly and with less resources than complex modeling exercises.
- To facilitate better understanding of the contamination on the base, the Marine Corps should develop a comprehensive and accessible database of water-quality measurements taken from the base.



Photo by Bruce Muhlenberg.

Potential Health Effects

The committee undertook four kinds of reviews to determine what kinds of diseases or disorders (adverse health effects) have been found to result from exposure to TCE and PCE: (1) review of epidemiologic studies of solvents and their effects, including studies in occupational and industrial settings and community studies; (2) review of epidemiologic studies of other communities with solvent-contaminated water supplies; (3) review of toxicologic studies conducted in animals and humans to test for health effects of TCE and PCE; and (4) review of studies conducted specifically on the Camp Lejeune population.

Review of Epidemiologic Evidence on Solvents

Epidemiologic studies examine whether people with greater exposure to particular chemicals have greater frequency of disease than people with lesser or no exposure (also referred to as greater incidence or greater risk of disease). To manage the review of the vast amount of peer-reviewed scientific literature on TCE and PCE, the committee began with a comprehensive review of the epidemiologic studies of those solvents that was conducted by the Institute of Medicine (IOM) in 2003. IOM categorized the evidence according to an established scheme accepted by the Department of Veteran's Affairs in evaluating risks to veterans of the Vietnam War and the Gulf War. These categories are shown in Box 1. The committee identified new studies published from

BOX 1—Five Categories Used by IOM to Classify Associations

Sufficient Evidence of a Causal Relationship

Evidence from available studies is sufficient to conclude that a causal relationship exists between exposure to a specific agent and a specific health outcome in humans, and the evidence is supported by experimental data. The evidence fulfills the guidelines for sufficient evidence of an association (below) and satisfies several of the guidelines used to assess causality: strength of association, dose-response relationship, consistency of association, biologic plausibility, and a temporal relationship.

Sufficient Evidence of an Association

Evidence from available studies is sufficient to conclude that there is a positive association. A consistent positive association has been observed between exposure to a specific agent and a specific health outcome in human studies in which chance and bias, including confounding, could be ruled out with reasonable confidence. For example, several high-quality studies report consistent positive associations, and the studies are sufficiently free of bias, including adequate control for confounding.

Limited/Suggestive Evidence of an Association

Evidence from available studies suggests an association between exposure to a specific agent and a specific health outcome in human studies, but the body of evidence is limited by the inability to rule out chance and bias, including confounding, with confidence. For example, at least one high-quality study reports a positive association that is sufficiently free of bias, including adequate control for confounding. Other corroborating studies provide support for the association, but they were not sufficiently free of bias, including confounding. Alternatively, several studies of less quality show consistent positive associations, and the results are probably not due to bias, including confounding.

Inadequate/Insufficient Evidence to Determine Whether an Association Exists

Evidence from available studies is of insufficient quantity, quality, or consistency to permit a conclusion regarding the existence of an association between exposure to a specific agent and a specific health outcome in humans.

Limited/Suggestive Evidence of No Association

Evidence from well-conducted studies is consistent in not showing a positive association between exposure to a specific agent and a specific health outcome after exposure of any magnitude. A conclusion of no association is inevitably limited to the conditions, magnitudes of exposure, and length of observation in the available studies. The possibility of a very small increase in risk after exposure studied cannot be excluded.

Source: IOM (Institute of Medicine). 2003. Gulf War and Health, Vol. 2, Insecticides and Solvents. Washington, DC: National Academies Press.

2003 to 2008 and considered whether they changed the conclusions in the IOM report. The studies included people exposed in occupational situations and in community settings.

IOM's approach to evaluating the literature is to determine whether a "statistical association" exists between the chemicals and diseases and disorders. When studies are conducted properly, a statistical association means that people who are exposed to the chemicals are more likely to have or develop the disease or disorder than people who are not exposed. A statistical association, however, does not establish that the chemicals cause the diseases or disorders.

Judgment about the quality of each study and additional supporting evidence from other studies are needed. Statistical associations are often represented by numeric estimates, known as "relative risks" or "odds ratios." The estimates describe the relative frequency of disease in groups with higher exposures compared with groups with lower or no exposure. For example, in a study in which individuals are classified as either exposed or unexposed, a relative risk of 2 means that exposed people in the study were twice as likely to develop the disease as people who were not exposed.

As shown in Box 2, all the health outcomes reviewed were placed into one of two categories.

**BOX 2—Categorization of Health Outcomes^a Reviewed
in Relation to TCE, PCE, or Solvent Mixtures**

Sufficient Evidence of a Causal Relationship

- No outcomes

Sufficient Evidence of an Association

- No outcomes

Limited/Suggestive Evidence of an Association

- | | |
|--|---|
| <ul style="list-style-type: none"> • Esophageal cancer (PCE) • Lung cancer (PCE) • Breast cancer (PCE) • Bladder cancer (PCE) • Kidney cancer • Adult leukemia (solvent mixtures) • Multiple myeloma (solvent mixtures) • Myelodysplastic syndromes (solvent mixtures) | <ul style="list-style-type: none"> • Renal toxicity (solvent mixtures) • Hepatic steatosis (solvent mixtures) • Female infertility (with concurrent exposure to solvent mixtures) • Miscarriage (with exposure to PCE during pregnancy) • Scleroderma (solvent mixtures) • Neurobehavioral effects (solvent mixtures) |
|--|---|

Inadequate/Insufficient Evidence to Determine Whether an Association Exists

- | | |
|--|---|
| <ul style="list-style-type: none"> • Oral/pharyngeal cancer • Nasal cancer • Laryngeal cancer • Esophageal cancer (TCE) • Stomach cancer • Colon cancer • Rectal cancer • Pancreatic cancer • Hepatobiliary cancer • Lung cancer (TCE) • Bone cancer • Soft tissue sarcoma • Melanoma • Non-melanoma skin cancer • Breast cancer (TCE) • Cervical cancer • Ovarian/uterine cancer • Prostate cancer • Bladder cancer (TCE) • Cancer of the brain or central nervous system • Non-Hodkin lymphoma • Hodgkin disease • Multiple myeloma • Adult leukemia | <ul style="list-style-type: none"> • Myelodysplastic syndromes • Childhood leukemia • Childhood neuroblastoma • Childhood brain cancer • Aplastic anemia • Congenital malformations • Male infertility • Female infertility (after exposure cessation) • Miscarriage, preterm birth, or fetal growth restriction (from maternal preconception exposure or paternal exposure) • Preterm birth or fetal growth restriction (from exposure during pregnancy) • Cardiovascular effects • Liver function or risk of cirrhosis • Gastrointestinal effects • Renal toxicity • Amyotrophic lateral sclerosis • Parkinson disease • Multiple sclerosis • Alzheimer disease • Long-term reduction in color discrimination • Long-term hearing loss • Long-term reduction in olfactory function |
|--|---|

Limited/Suggestive Evidence of No Association

- No outcomes

^aOutcomes for TCE and PCE unless otherwise specified.

The strongest evidence was in the category of *limited/suggestive of an association*, which means that there is some evidence that people who were exposed to TCE or PCE were more likely to have the disease or disorder but that the studies were either few in number or had important limitations. In many cases, the studies could not separate out the effects of individual chemicals because the people were exposed to mixtures. Some of these studies were of highly exposed groups of workers where detection of effects would be expected if present. Such studies might reach conclusions about solvents in general but not about TCE or PCE specifically. For diseases and disorders where the evidence is limited/suggestive of an association, the committee has concluded that the epidemiologic studies give some reason to be concerned that sufficiently high levels of the chemical may cause the disease, but the studies do not provide strong evidence that they actually do so.

The majority of the health outcomes reviewed by the committee were placed into the category of *inadequate/insufficient evidence to determine whether an association exists*, which means that the studies were too few in number, limited in quality, inconsistent, or inconclusive in results to make an informed assessment. It also means that such an association cannot be ruled out. For diseases and disorders in this category, the committee has concluded that the epidemiologic studies cannot tell us whether exposure to the chemicals is associated with the disease or not.

The committee is aware that some health outcomes reported by former residents of the base (for example, male breast cancer and second-generation effects) are not cited in Box 2. The absence of inclusion of specific health outcomes does not mean that such effects are unrelated to exposures from the contaminated water supplies at Camp Lejeune. Rather, those outcomes have not been specifically investigated or, if they were considered, the studies were too small or of insufficient quality to allow conclusions to be drawn.

Review of Epidemiologic Evidence from Community Studies

The committee decided to consider the subset of epidemiologic studies that were conducted in communities exposed to solvents in their water supplies in more detail. Because these studies involved populations and exposure situations that more closely resemble those at Camp Lejeune, some relevant

implications might be learned. A few studies reported certain diseases and disorders, such as congenital heart defects, spontaneous abortions, and very low birth weight. However, the studies reported differing effects, so generally they did not confirm each other. In general, the studies had limitations in their design that are unavoidable because of the circumstances that gave rise to them. The limitations include lack of data on levels of contaminants in the water, lack of adequate information about diseases and disorders in the population, and relatively small populations. These factors limit the capacity of such studies to detect associations even if they exist. Limitations in such studies often mean that people in the study communities can only be classified into two groups to reflect exposure to contamination—those exposed and those considered unexposed. Such classification is a crude way to address exposure because it can make it more difficult to detect any effects that might occur. Another common limitation of community studies in general is that they are not able to account for other factors that may affect the likelihood of disease. Furthermore, the studies face the difficult task of addressing diseases that are relatively uncommon. It is harder to find enough cases of uncommon diseases to make comparisons when studying relatively small populations. The committee concluded that the evidence provided by this subset of epidemiologic studies needs further support and confirmation before they can be considered significant on their own.

Review of the Toxicologic Evidence

Toxicologic studies are mainly laboratory experiments, usually conducted on animals. The committee's review on TCE and PCE were in part based on previously published toxicologic reviews but were mainly based on analyses of recently published studies. The studies were analyzed using criteria for good study design and degree of agreement between the conclusions and the data presented. Further, the committee took into consideration the quality and reliability of studies, consistency of findings of similar studies, understanding of the biologic processes, toxicologic significance, dose- and duration-dependence, and understanding of whether effects observed in animals are predictive of human risks. Each chemical was reviewed for effects on the major organ systems—for example, liver, kidneys, lungs, reproductive system, nervous system, and immune system.

In animal experiments, TCE was reported to cause kidney and testicular cancers in rats and liver and lung cancers in mice. PCE was reported to cause

liver cancer in mice and mononuclear cell leukemia and kidney cancer in rats. Differences in how these chemicals are handled in the body by rodents and humans, as well as current scientific understanding of how these tumors develop, led the committee to the conclusion that kidney cancer is the most relevant to humans.

For other kinds of adverse health effects, kidney toxicity and liver toxicity were observed in rodents given high doses of TCE and PCE. Effects on male rodent fertility, but not female fertility, were observed. Neither chemical caused birth defects in rats. There were some adverse effects on offspring of pregnant female rats exposed to PCE but to not TCE. Adverse changes in some nervous system measurements were seen in some TCE and PCE studies. TCE causes some effects on the immune system of sensitive strains of mice, but there are few immunotoxicity studies on PCE.

When possible, the committee identified the lowest dose of TCE or PCE at which adverse effects were observed in animal studies (the dose is called the lowest-observed-adverse-effect level or LOAEL). To put these doses in perspective, the committee did a comparison of the doses with approximated doses to former residents that were estimated from concentrations of TCE and PCE measured in mixed water.¹ Because of the known variation in contaminant concentrations, the range used for the comparison included the highest measured concentrations of TCE and PCE in mixed water, one-half those concentrations, and twice the highest measured concentrations. The adverse health effects considered for this comparison were those thought to be most relevant to humans (kidney cancer, renal toxicity, and immunosuppression for TCE, and renal toxicity and neurotoxicity for PCE). This comparison is not an assessment or prediction of risk and can only give a general indication of the degree of difference between doses that caused a response in laboratory animals and doses to former residents of Camp Lejeune. The comparison reflects estimated combined daily doses from all three routes of exposure (ingestion, inhalation, and skin contact) that could have occurred for adults and children at Camp Lejeune. Results of the comparison suggest that the highest levels of either TCE or PCE measured in the mixed-water samples at Camp Lejeune were much lower than the lowest dose that caused adverse

effects in the most sensitive strains and species of laboratory animals. The lower levels of exposure may be of some concern for effects on neurotoxicity and immunotoxicity, but further research is needed to evaluate the specific effects of TCE and PCE and whether they are relevant to humans.

Consideration of the Epidemiologic and Toxicologic Evidence Together

The committee considered collectively what is known about adverse health effects that are associated with exposure to TCE and PCE from human epidemiologic and animal toxicologic studies. Evidence on similar outcomes reported in animal and human studies were compared to see whether the data were supportive of the potential health consequences of exposure to TCE and PCE in the water supply.

Review of epidemiologic studies on cancer outcomes provided limited/suggestive evidence for an association between chronic exposure to TCE or PCE and kidney cancer and to PCE and cancers of the esophagus, lungs, breast, and bladder. For these outcomes, the toxicologic evidence was strongest for kidney cancer.

Noncancer effects that were found to be similar in humans and laboratory animals included adverse effects on the liver, kidneys, and nervous and immune systems. In the epidemiologic literature, toxic effects on the liver and kidneys appeared to be related to short-term inhalation of high concentrations of solvents as opposed to longer-term exposure at lower concentrations. Support for these effects observed in toxicologic studies come from rodents exposed to high concentrations of TCE and PCE. For kidney effects, adverse findings were only found in male rats. Epidemiologic studies of occupational exposure to mixed solvents showed limited/suggestive evidence of neurobehavioral effects, and toxicologic studies of TCE showed some decrements in neurobehavioral outcomes. For effects on the immune system, epidemiologic studies showed limited/suggestive evidence for an association with mixed solvent exposure for certain immunologically mediated diseases. Toxicologic studies also showed that TCE can affect the immune system, as shown by immunosuppression and worsening of preexisting autoimmune diseases. These findings are shown in Table 1. The absence of other diseases and disorders in the table does not mean that such outcomes are irrelevant or unworthy of study, but that the findings for them were inconsistent between the toxicologic and the epidemiologic evidence or were not addressed in the available studies.

¹ A dissenting viewpoint from one committee member on this evaluation is provided in Chapter 4.

Review of Camp Lejeune Studies

Only a few studies have been conducted on the Camp Lejeune population, and these have focused on health effects in people who were exposed as children or while their mothers were pregnant with them. One study evaluated pregnancy outcomes among women who lived in base housing from 1968 to 1985.

Although the water contamination probably began before 1968, ATSDR selected 1968 as its starting point because electronic birth certificates became available that year. ATSDR compared data on premature births, births of babies who were small relative to other babies from pregnancies of similar duration (small for gestational age), and birth weights between mothers who were exposed and those who were unexposed. Whether mothers were exposed was determined by where they lived on the base when the child was born, not taking into account whether they moved during the pregnancy. Two analyses were performed; one that evaluated residents of Hadnot Point and Tarawa Terrace and one that focused only on Tarawa Terrace residents.

In both analyses, no clear associations were found between mean birth weight, preterm birth, or small for gestational age. However, a comparison of subgroups within the Tarawa Terrace population found a weak association between PCE exposure and small-for-gestational-age births for children of women over 35 or of women who had prior miscarriages. However, a limitation of this conclusion is that the decision to perform this analysis was added after the original

design of the study. It was not one of the hypotheses or theories set out before the study. Therefore, scientists give this finding less weight.

The findings from these analyses are no longer valid. After the study was completed, ATSDR discovered that a residential area it classified as unexposed (Holcomb Boulevard) received water from the Hadnot Point system for the first 4 years of the study period, and the study results must be reanalyzed to correct for this mistake in classification. ATSDR has indicated that it will reanalyze the results of the study using exposure estimates from its groundwater modeling of the Tarawa Terrace and Hadnot Point systems.

ATSDR also has a study under way on prenatal exposure to water-supply contaminants and birth defects and childhood cancer. The specific outcomes being studied are childhood leukemia, childhood non-Hodgkin lymphoma, spina bifida, anencephaly, cleft lip, and cleft palate. These outcomes are rare, and given the number of study participants, it appears that the statistical power of this study could limit its ability to detect associations. The study is also awaiting the completion of groundwater modeling of the Hadnot Point water system so that differences in exposure can be assessed.

Recommendations

- The committee recommends that ATSDR go forward with reanalyzing its study of birth

TABLE 1 Similar Health Effects Found in Epidemiologic and Toxicologic Studies

Effects	Epidemiologic Evidence	Toxicologic Evidence
Kidney cancer	Limited/suggestive for TCE and PCE	TCE and PCE (limited to male rats)
Liver toxicity	Limited/suggestive for solvents and hepatic steatosis ^a	TCE and PCE (liver damage)
Kidney toxicity	Limited/suggestive for solvents	TCE and PCE (limited to male rats)
Neurobehavioral effects	Limited/suggestive for solvents (effects on visuomotor and motor function, fatigue, headache, deficits in concentration)	TCE: central nervous system depression, attention deficits, deficits in visual discrimination, altered visual evoked potentials ^b PCE: anesthetic effects; changes in behavior and neurochemical markers
Immunologic effects	Limited/suggestive for solvents and glomerulonephritis ^c and scleroderma ^d	TCE: sensitization, immunosuppression, influence autoimmune disease (in sensitive strains of mice)

^a Hepatic steatosis is fatty accumulation in the liver.

^b Electrical response recorded by a skull electrode after a visual stimulus (e.g., a flash).

^c Glomerulonephritis is a disease that affects kidney function.

^d Scleroderma is a disease resulting in abnormal growth of connective tissue.

outcomes to correct for errors in exposure classification without awaiting the results of groundwater modeling of the Hadnot Point system. For the reasons given earlier, such modeling is unlikely to yield reliable quantitative estimates of exposure that would refine exposure classification for epidemiologic study.

- Despite the committee's concerns about the statistical power of the study of birth defects and childhood cancer, it recommends that the study be completed as soon as possible. Simpler approaches to groundwater modeling should be performed to support the exposure classification in the study rather than performing the same type of complex groundwater modeling that was performed for Tarawa Terrace.

The Feasibility and Utility of Future Studies of the Camp Lejeune Population

ATSDR has evaluated the feasibility of conducting three additional studies of the Camp Lejeune population, including a health survey and studies that would evaluate deaths from all causes and cancer incidence among former residents and workers. ATSDR identified some of the same diseases and disorders identified in the committee's review as being of interest. These included kidney cancer, lung cancer, breast cancer, scleroderma, liver disease, kidney disease, and spontaneous abortion. ATSDR also identified additional outcomes of possible interest for its study.

Difficulties with performing the studies are identifying, locating, and recruiting the study participants and obtaining reliable health information on them in an efficient manner. The committee found that although ATSDR did consider the major issues bearing on the feasibility of the proposed studies and proposed reasonable approaches to conducting the studies, there remain serious, unresolved questions about the feasibility and ultimate value of the studies. For example, it is not clear that the cancer incidence study could be performed successfully, because it is contingent on the cooperation of many state cancer registries. Even with cooperation, the statistical power to compare groups of interest across the range of outcomes has yet to be assessed. Statistical power is also an issue with the mortality study.

The committee also reviewed ATSDR's plans for a health survey that was generated in response to a congressional directive. The survey would seek information on residential history and various health

outcomes. Although the survey could contribute to designing future studies at Camp Lejeune, its success depends on getting adequate participation (at least 60%). Even if satisfactory participation is achieved, there are concerns that there could be bias in the reported data because people who have experienced disease or illness are more likely to participate in the survey.

After reviewing the study plans and feasibility assessments, the committee concluded that most questions about whether exposures at Camp Lejeune resulted in adverse health effects cannot be answered definitively with further scientific study. There are two main reasons for this. First, it is not possible to reliably estimate the historical exposures experienced by people at the base. Second, it will be difficult to detect any increases in the rate of diseases or disorders in the study population. Most of the health effects of concern are relatively rare, which means that very large numbers of people are needed to detect increased cases. Although the total number of people who have lived at Camp Lejeune while the Tarawa Terrace and Hadnot Point water supplies were contaminated is sizable, the population is still unlikely to be large enough to detect effects, other than common diseases or disorders, of concern. Another factor is that the population was relatively young, so many who would be studied are in an age range in which chronic diseases are rare. Yet another factor is that the people tended to live on the base for a relatively short time, resulting in a small increase in risk of disease at most, making it difficult to rule out other exposures or factors that could have contributed to disease or illness. All these factors make it unlikely that the proposed studies, even if the notable uncertainties about feasibility are resolved favorably, will produce results of sufficient certainty to resolve the question of whether Camp Lejeune residents suffered adverse health effects from exposure to contaminated water.

The available scientific information does not provide a sufficient basis for determining whether the population at Camp Lejeune has, in fact, suffered adverse health effects as a result of exposure to contaminants in the water supplies. On the one hand, several lines of scientific reasoning suggest such effects are unlikely to have occurred. The evidence includes a substantial body of research on the toxicology of TCE and PCE that indicates that the exposures required to cause adverse effects in laboratory animals were much larger than the highest

measurements available on the Camp Lejeune water supplies; evidence that humans have lower sensitivity to TCE and PCE than rodents; epidemiologic data largely from occupational settings with higher, longer-term exposures to TCE and PCE that has not generated compelling evidence of adverse health effects; and the relatively short-term, intermittent nature of the exposures incurred at Camp Lejeune. On the other hand, the possibility that health effects have been produced by the contaminant exposures at Camp Lejeune cannot be ruled out. Some effects of TCE or PCE exposure might have occurred below the level of detection in toxicologic studies, which focused on single contaminant exposures at high doses, used genetically homogeneous animal strains, and necessarily involved extrapolation across species. In addition, the population exposed at Camp Lejeune is more diverse and possibly more susceptible than those who have been exposed to TCE and PCE in occupational settings, and the actual concentrations of PCE and TCE and the presence of additional water contaminants are poorly documented and could thus be higher or more complex than the limited historical measurements suggest. There were

divergent views among the committee members about the probability that each would assign to whether adverse health effects have in fact occurred, but there was consensus among them that scientific research is unable to provide more definitive answers to that question.

Conclusion and Recommendation

It cannot be determined reliably whether diseases and disorders experienced by former residents and workers at Camp Lejeune are associated with their exposure to contaminants in the water supply because of data shortcomings and methodological limitations, and these limitations cannot be overcome with additional study. Thus, the committee concludes that there is no scientific justification for the Navy and Marine Corps to wait for the results of additional health studies before making decisions about how to follow up on the evident solvent exposures on the base and their possible health consequences. The services should undertake the assessments they deem appropriate to determine how to respond in light of the available information.

Committee on Contaminated Drinking Water at Camp Lejeune: David A. Savitz (Chair), Mount Sinai School of Medicine; Caroline L. Baier-Anderson, Environmental Defense Fund; James V. Bruckner, University of Georgia; Prabhakar Clement, Auburn University; Carole A. Kimmel, Independent Consultant; Francine Laden, Harvard School of Public Health; Bruce P. Lanphear, Simon Fraser University; Xiaomei Ma, Yale University School of Medicine; John R. Nuckols, Colorado State University; Andrew F. Olshan, The University of North Carolina at Chapel Hill; Lianne Sheppard, University of Washington School of Public Health; Elaine Symanski, University of Texas School of Public Health; Janice W. Yager, The University of New Mexico; Susan Martel (*Study Director*), National Research Council.

The National Academies appointed the above committee of experts to address the specific task requested by the U.S. Navy. The members volunteered their time for this activity; their report is peer-reviewed and signed off by both the committee members and the National Academies.



For more information, contact the Board on Environmental Science and Technology at (202) 334-3060 or visit <http://nationalacademies.org/best>. *Copies of Contaminated Water Supplies at Camp Lejeune—Assessing Potential Health Effects* are available from the National Academies Press, 500 Fifth Street, NW, Washington, D.C. 20001; (800) 624-6242; www.nap.edu.

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DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
2 NAVY ANNEX
WASHINGTON, DC 20380-1775

IN REPLY REFER TO:

5090

LEL

MARCH 27, 2009

Dear Registrant:

Thank you for taking part in the Camp Lejeune Water registry. As you may be aware, the purpose of the registry is to help us notify individuals who may have lived or worked aboard Marine Corps Base Camp Lejeune, North Carolina between 1957 and 1987 of potential exposure to contaminated drinking water. We want to ensure those who may have been exposed are provided with the most up to date information.

At this time, the Department of the Navy is funding health studies to determine when the drinking water was first impacted, who may have consumed it, and whether or not there may be an association between exposure to the water and certain health conditions.

For complete details regarding the registry, on-going studies, and other information, please visit our website www.marines.mil and click on the Camp Lejeune Water Study icon. You may also call our toll-free information line, (877) 261-9782, to speak to a representative who can assist you with questions and concerns.

Please encourage other former residents and employees of the base between 1957 and 1987 to register as we want to ensure the widest dissemination of information to our Marine Corps family.

Sincerely,

E. G. PAYNE
Major General
United States Marine Corps
Assistant Deputy Commandant
Installations and Logistics
(Facilities)

In 1967 I went
to Camp Lejeune with

the Naval Station, Charleston, SC
and that in a pistol match. While
there at the pistol match I, (we, the pistol team),
drank their water and ate in their
Marine Mess hall. 112#



Website Links of Interest

Marine Corps

Camp Lejeune Water Primary Website:
www.marines.mil/clsurvey

Camp Lejeune Environmental Management:
<http://www.lejeune.usmc.mil/emd/>

Agency for Toxic Substances and Disease Registry (ATSDR)

ATSDR Camp Lejeune Website:
<http://www.atsdr.cdc.gov/sites/lejeune/>

Public Health Assessment: http://www.atsdr.cdc.gov/HAC/PHA/usmclejeune/clej_toc.html

Volatile Organic Compounds In Drinking Water And Adverse Pregnancy Outcomes:
<http://www.atsdr.cdc.gov/HS/lejeune/>

National Academy of Sciences (NAS)

NAS Camp Lejeune Water Project Website:
<http://www8.nationalacademies.org/cp/ProjectView.aspx?key=BEST-K-06-08-A>

Navy

Navy and Marine Corps Public Health Center (NMCPHC): <http://www-nmcpHC.med.navy.mil/>

Office of the Judge Advocate General

Claims Packet: <http://www.jag.navy.mil/documents/CampLejeuneClaimsPacket.pdf>

Environmental Protection Agency

EPA-ABC One Hour Cleaners: <http://www.epa.gov/region4/waste/npl/nplnc/abc1hrnc.htm>

EPA-Region IV: <http://www.epa.gov/region4/>

What You Need To Know

- Taking care of Marines, Sailors and their families is our top priority.
- Camp Lejeune water meets or exceeds all environmental standards today.
- The Marine Corps is a good steward of the environment and remains committed to the ongoing environmental efforts associated with Camp Lejeune Historic Drinking Water.
- The Marine Corps wants to ensure that our policies and ongoing environmental efforts continue to protect our community and our environment.
- The Marine Corps remains committed to the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Academy of Sciences (NAS) research initiatives.
- Upon completion of the research, the Marine Corps will directly notify those on the registry through direct mail and e-mail. For the general public, research findings will be announced on the Marine Corps web site and through the general media.
- To update your registration information, please contact the Call Center and they will make these changes for you.

CAMP LEJEUNE

 HISTORIC DRINKING WATER

Call Center

(877) 261-9782

Hours: M-F 8:30am-5:00pm EST

Online Registration

www.marines.mil/clsurvey

In the early 1980's two unregulated solvents, trichloroethylene (TCE) and perchloroethylene (PCE), were found in two drinking water systems that served portions of Camp Lejeune. Estimates indicate the water may have been impacted from 1957 to 1987. Camp Lejeune water meets or exceeds all environmental standards today. The Marine Corps is a good steward of the environment and remains committed to the independent research initiatives associated with this issue.

This brochure provides the most current information on this important issue and how to register to receive updated information and study results. We would like for you to share this information with former Marines and other past Camp Lejeune residents and encourage them to register.

Background

In the early 1980's, two solvents, trichloroethylene (TCE) and perchloroethylene (PCE), unregulated chemicals at the time, were found in two water systems that served base housing areas in Hadnot Point and Tarawa Terrace. Certain drinking water wells were identified as the source of the chemicals and were taken out of service in 1984/1985.

The Department of the Navy is funding two independent research initiatives. The Agency for Toxic Substance and Disease Registry (ATSDR) is conducting a health study to see if there is an association between exposure to the water and certain adverse health effects. The National Academy of Sciences (NAS) is conducting a comprehensive review of scientific literature and potential health risks related to exposures at Camp Lejeune.

Individuals registered with the Marine Corps will be directly notified with the final study results.

Registration

Q: Why am I being contacted?

A: The Marine Corps is contacting individuals who lived or worked on board Camp Lejeune 1987 or before. We are committed to building a registry of former Marines and residents so that we can conduct direct notification upon completion of the health studies.

Q: Who should register?

A: Anyone who lived or worked on board Camp Lejeune 1987 or before.

Q: How can I register?

Register at www.marines.mil/clsurvey or via the Call Center at 877-261-9782.

Q: Once I'm registered, how do I update my information?

A: Please contact the Call Center and they will update your information for you. The Call Center number is 877-261-9782.

Health

Q: Is the water safe to drink?

A: Yes, the water at Camp Lejeune is safe to drink. Camp Lejeune water meets or exceeds all environmental standards today.

Q: As a retiree, how can I get a copy of my medical record?

A: For more information contact:
National Personnel Records Center
Military Personnel Records
9700 Page Avenue
St. Louis, MO 63132-5100

Q: I think my medical condition is related to the water at Camp Lejeune. What should I do?

A: We encourage you to contact your local or family physician regarding any questions about your health. You may also contact the ATSDR at 888-422-8737.

Q: Can I participate in the ATSDR study?

A: The information collection part of the ATSDR survey ended in January 2002. Please contact ATSDR directly if you would like more information. They may be reached at 888-422-8737.

Environment

Q: How were the chemicals discovered?

A: Chemicals were discovered in the early 1980s during sampling in preparation for new regulations requirements. Once the source of the chemicals was determined to be the wells, the wells were immediately taken out of service.

Q: Does Camp Lejeune continue to test its water?

A: The drinking water wells are tested four times a year for volatile organic compounds (VOCs), in addition to monthly drinking water sampling. The base is in compliance with all federal and state laws and regulations to ensure safe drinking water. Camp Lejeune has a very strong and proactive environmental program.

Filing a Claim Against the Government

Q: How can I file a claim?

A: Requirements for filing may be accessed at: <http://www.usdoj.gov/civil/forms/SF95.pdf>. For more information on claims, contact:

Department of the Navy
Office of the Judge Advocate General
Washington Navy Yard, Bldg 33
1322 Patterson Ave SE Suite 3000
Washington DC, 20374-5066
ATTN: Camp Lejeune Claim
(202) 685-4600

Future Notifications

Q: When will we know the final study results?

A: Upon conclusion of ATSDR and NAS research, the Marine Corps will notify the public of their completion. This will be done through direct notification to those on the Marine Corps notification registry and general notification via media outlets and announcements on the Marine Corps web site.

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