

[H.A.S.C. No. 110-70]

**EMERGING CONTAMINANTS AND ENVIRONMENTAL MANAGEMENT AT DEPARTMENT OF DEFENSE INSTALLATIONS**

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HEARING

BEFORE THE

READINESS SUBCOMMITTEE

OF THE

COMMITTEE ON ARMED SERVICES  
HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

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HEARING HELD

JULY 12, 2007



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LATIONS**

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HOUSE OF REPRESENTATIVES,  
COMMITTEE ON ARMED SERVICES,  
READINESS SUBCOMMITTEE,  
*Washington, DC, Thursday, July 12, 2007.*

The subcommittee met, pursuant to call, at 2:07 p.m. in room 2118, Rayburn House Office Building, Hon. Solomon P. Ortiz (chairman of the subcommittee) presiding.

**OPENING STATEMENT OF HON. SOLOMON P. ORTIZ, A REP-  
RESENTATIVE FROM TEXAS, CHAIRMAN, READINESS SUB-  
COMMITTEE**

Mr. ORTIZ. This hearing will come to order. I thank our distinguished witnesses for appearing before this subcommittee today to talk about our environmental restoration programs.

The Department has faced a daunting task of addressing environmental contamination in a variety of bases, both active and closed, for many years. In some cases, contamination dates back to the Revolutionary War. But the fact remains that the costs to complete the cleanup of known contaminants exceed \$32 billion. After putting nearly \$1.9 billion toward these requirements in fiscal year 2008, the Department estimates the overall cost of cleanup known as contaminants is expected to increase in future years. It is not in the Department's best interests to conform to the minimum cleanup goals just to avoid litigation and to establish a formal cleanup goal by the year 2061 because of fiscal limitations. That is not how a great, free Nation operates.

This strategy is flawed, irresponsible, and will place additional environmental burdens on the Department in the future. To the Department's credit, they have done a good job in determining a risk-based strategy of environmental cleanup, which could be a useful roadmap to apply scarce resources. Unfortunately, it appears that the Department has elected to give highest priority to funding cleanup at active installations.

The Department must understand that the environmental contamination left by our forefathers is just as important to clean up as the environmental contamination left by today's force. Applying varying cleanup goals to active bases, Base Realignment and Closure (BRAC) bases, and closed bases is losing support in the local communities that have strongly supported our bases in the past. The Department's current management strategy for perchlorate—and I hope I pronounce it right—or rocket fuel contamination is insufficient.

It has been reported that the Department and National Aeronautics and Space Administration (NASA) are responsible for 90 percent of production in the United States. While it is apparent that the Department has contributed to the overall rocket fuel contamination, the Department seems to be applying sufficient Research and Development (R&D) funding to better characterize the nature of the source. Yet the Department has not performed a comprehensive review at former defense sites and has not fully identified the full extent of rocket fuel contamination to be cleaned up.

The Department must continue to provide a serious review of former defense sites and provide the necessary funding to restore trust in the Department's ability to be responsible environmental stewards.

As for Trichloroethylene (TCE) contamination, the Department has a long history of using and cleaning it up. However, unlike rocket fuel contamination, TCE contamination limits were set by Environmental Protection Agency (EPA) way back in 1989. And it is my understanding that the Department has said it honored those limits since 1989. Doctors say new scientific information indicates that the exposure pathways and health impacts on TCE may not yet be fully understood. I am concerned that it may be years before this new information could be incorporated into new regulatory standards.

So I am interested in hearing from you today how the Department is responding to TCE's uncertain regulatory requirement.

The Chair now recognizes the distinguished gentleman from North Carolina, my friend Mr. Jones, for any remarks he would like to make. Mr. Jones.

**STATEMENT OF HON. WALTER B. JONES, A REPRESENTATIVE  
FROM NORTH CAROLINA, READINESS SUBCOMMITTEE**

Mr. JONES. Thank you, Mr. Chairman. This is an important and timely hearing. It highlights the difficult policy and budgetary issues involved in environmental stewardship, as well as the human element. By law, Federal agencies are now required to manage lands under their jurisdiction. Before these laws were enacted, the Department of Defense (DOD) and the military conducted environmentally harmful activities for some years. Now the requirements present an immediate and expensive liability to DOD. With each base closure round and each new emerging contaminant discovery, the bill grows larger.

For that reason, DOD continues to budget annually for environmental cleanup at former defense sites, BRAC sites, and active installations. Cleanup is very expensive, and the sites are numerous. Nevertheless, human health is paramount and must be protected against known hazards. All of us are very sympathetic to those harmed through no fault of their own. It is especially aggrieving when the harm is caused through the careless actions of the Federal Government.

In the case of Camp Lejeune, which I have the privilege to represent, I find it extremely distressing that young Marine families were required to live in substandard housing in the 1980's, supplied by contaminated water. It is clear that some children born to mothers living at Camp Lejeune at the time were affected. How-

ever, it is difficult to prove which children were harmed by the contaminated water and which had health difficulties unrelated to TCE. I know the matter of individual tort claims is under review, and I have no wish to interfere in that process.

However, I urge the witnesses here today to do everything they can to prevent such tragedies in the future. We must act aggressively to try to mitigate immediate danger to military families. Our installations are home to our military families and military members. Those who volunteered to serve will live and train there. They expect to be safe during their brief return from missions overseas. Those in uniform face enough hazards when deployed. They should not be placed in harm's way here in America.

Mr. Chairman, I want to thank you, as I close, for holding this hearing, and I look forward to our witnesses. And may we continue to do what is right for those in uniform. I yield back.

Mr. ORTIZ. Thank you so much.

We are very happy to have our witnesses with us today. And we have the Honorable Alex Beehler, Assistant Deputy Under Secretary of Defense for Environment, Safety and Occupational Health, Department of Defense; and Mr. John Stephenson, Director of Natural Resources and Environment, Government Accountability Office. And, without objection, the witnesses' prepared statements will be accepted for the record. And Mr. Secretary Beehler, whenever you are ready to start with your testimony.

**STATEMENT OF ALEX A. BEEHLER, ASSISTANT DEPUTY UNDER SECRETARY OF DEFENSE (ENVIRONMENT, SAFETY AND OCCUPATIONAL HEALTH)**

Secretary BEEHLER. Thank you very much, Chairman Ortiz, Congressman Davis, and distinguished members of the subcommittee. I appreciate the opportunity to appear before you today to discuss the Department of Defense activities associated with environmental restoration and emerging contaminants.

The Department is committed to cleaning up property and protecting human health in the environment from contamination resulting from past military activities, while being a good steward of both the environment and the Federal budget. Department of Defense (DOD) has and will continue to comply with applicable Federal and state standards.

The Defense Environmental Restoration Program, DERP, involves 31,000 sites at 4,600 active installations, BRAC installations and Formerly Used Defense Sites (FUDS) properties. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and its implementing regulation, the National Contingency Plan, provide the framework for DOD's remediation efforts.

Emerging contaminants are addressed under DERP, using the same CERCLA process. The DERP uses a worst-first cleanup philosophy that consistently tackles the higher-risk sites to achieve the greatest risk reduction. DOD considers emerging contaminants as those contaminants for which there is no established toxicity values or standards, or the toxicity value of standards are evolving due to new science. DOD has been proactively engaged with EPA and the State regulators on how to respond to emerging contaminants under such circumstances.

By fiscal year 2006, we achieved remedy in place or response complete at 83 percent of the 28,000 installation restoration program sites with non-munitions contamination.

In 2001, the Department established the Military Munitions Response Program, composed of some 3,300 sites, and by fiscal year 2006 we completed response action at 25 percent of those sites.

DOD relies on perchlorate as an oxidizer in explosives, pyrotechnics, rocket fuel, and missiles, because it is the most efficient and stable propellant oxidizer available. There are two misperceptions about DOD and perchlorate. First, while DOD is a major purchaser of domestic perchlorate, our facilities do not appear to be the major source of contamination of drinking water based on the data reviewed to date. While DOD does have sites with perchlorate releases, these are mostly confined on base, and DOD is taking appropriate response actions, in consultation with EPA and State authorities.

Over the past several years, research has revealed a number of significant natural and non-DOD man-made sources of perchlorate, such as road flares, fireworks, certain natural mineral formations, fertilizers, herbicides, and even chlorine bleach that can cause low-level widespread contamination. Now that an ability to differentiate between different sources of perchlorate exists, responsible parties can be identified with greater confidence.

Second, it has been claimed that DOD will not respond to perchlorate unless a maximum contaminant level is established. In fact, DOD has been and will continue to take appropriate response actions for perchlorate, in consultation with EPA and State regulators. My written testimony contains seven such examples.

Moreover, DOD has engaged a three-prong approach to risk management of perchlorate:

One, assessing potential releases, where I note the vast majority of samples taken at these sites are either non-detects or levels well below the current EPA reference dose.

Two, taking appropriate response actions where necessary.

And three, investing millions of dollars in finding substitutes to eliminate perchlorate for military use, such as in pyrotechnic flare compositions.

As for TCE, a solvent for cleaning metal parts, it became a common contaminant in groundwater due to past poor disposal practices by industry and DOD. Currently, 424 installations and FUDS properties have ongoing environmental restoration activities where TCE has been identified. Also, the Department over the last 10 years has found suitable replacements with other types of cleaning agents, such as citrus-based agents, mineral oils, and other non-toxic solutions.

In conclusion, across DOD we are going beyond compliance, to ensure better sustainability of our assets and our mission capabilities. We will continue to take appropriate response actions for perchlorate, TCE, and other contaminants. We believe that DOD has acted responsibly as the science and understanding of perchlorate and other contaminants has evolved.

In closing, Mr. Chairman, I sincerely thank you for this opportunity to highlight the Department's response activities related to chemical contaminants.



[The prepared statement of Mr. Beehler can be found in the Appendix on page 43.]

Mr. ORTIZ. Mr. Stephenson.

**STATEMENT OF JOHN B. STEPHENSON, DIRECTOR, NATURAL RESOURCES AND ENVIRONMENT, U.S. GOVERNMENT ACCOUNTABILITY OFFICE**

Mr. STEPHENSON. Thank you, Mr. Chairman, Mr. Loeb sack. I am pleased to be here to discuss Government Accountability Office's (GAO) work on the Department of Defense's activities associated with emerging contaminants and the cleanup of its hazardous waste sites. DOD faces a daunting task of cleaning up thousands of active, closed, and formerly used military installations across the country. Many of these sites are contaminated with toxic substances in soil, water, or containers such as underground storage tanks, ordnance, and explosive and unsafe buildings. Identifying and investigating these hazards will take decades, and cleanup will cost many billions of dollars.

Contamination problems at formerly used defense sites has economic consequences for individual communities, as the sites are now owned by States, local governments, and individuals for use for parks, schools, farms, and homes. Also, while many of the military facilities closed under DOD's BRAC program have been cleaned up and transferred to local communities for redevelopment, some have been awaiting cleanup and conversion for many years, and this delays the ability to replace jobs that were lost as a result of the base closures.

My testimony today addresses two specific emerging contaminants, perchlorate and TCE, and draws on our reports on TCE contamination at Camp Lejeune, efforts to address perchlorate nationwide, cleanup at formerly used defense sites, as well as updated information from DOD, EPA, Food and Drug Administration (FDA), and the Centers For Disease Control (CDC).

In summary, we found that while DOD classifies both TCE and perchlorate as emerging contaminants, there are important distinctions in the extent to which they are regulated and what is known about their effects on human health and the environment. TCE, as has been mentioned, is a degreaser for metal parts that DOD has used widely for industrial and maintenance processes for decades. It continues to be found in underground and surface water sources. TCE has been found to cause dizziness, headaches, nausea, unconsciousness, cancer, and even death in extreme exposures. EPA adopted a TCE drinking water standard of five parts per billion, as you mentioned, in 1989, and DOD has used this standard for requiring cleanups at installations such as Camp Lejeune, where 46 separate sites have been identified for cleanup.

TCE is a big issue for DOD because of its widespread use. It has been found in over 1,400 defense sites, over half at concentrations exceeding the 5 parts per billion standard.

Perchlorate, as you mentioned, is a primary ingredient and propellant used in rockets and missiles, has been found in drinking water, groundwater, surface water, and soil across the United States. However, EPA has in this case not yet set a drinking water standard, citing the need for additional research, and notwith-

standing recent CDC and FDA studies showing that perchlorate can cause fetal development problems in pregnant women, and that there is extensive low-level perchlorate contamination in the Nation's food supply.

In the absence of a Federal perchlorate standard, 8 states, including Texas and California, have established non-regulatory action levels or advisories for perchlorate ranging from 1 part per billion to 18 parts per billion, all below the National Academy of Sciences suggested 24 parts per billion.

DOD adopted a new perchlorate policy in December of 2006 that applies broadly to DOD's active and closed installations, and uses the National Academy's 24 parts per billion action level to guide its testing and cleanup efforts. DOD has found perchlorate above 4 parts per billion at 135 active bases or thereabouts, but only 8 bases had concentrations above the 24 parts per billion action level. So the level which EPA ultimately sets a perchlorate standard, if they do at all, will be critical to DOD in terms of cleanup expense.

Interestingly, several states have used their authorities to require DOD cleanups. For example, Texas required the Navy to reduce perchlorate levels and wastewater discharges at the McGregor Naval Weapons Industrial Reserve.

In conclusion, Mr. Chairman, DOD faces significant challenges and potentially huge costs in addressing emerging contaminants, particularly in light of new scientific developments and regulatory uncertainty surrounding these chemicals and materials. DOD has stated further efforts to address perchlorate would require a regulatory standard from EPA. The fact some States have moved to create such standards complicates the issue by presenting DOD with varying cleanup standards across the country.

Until EPA acts, DOD will continue to face questions about whether its efforts to control perchlorate contamination are sufficient to protect human health and the environment.

Mr. Chairman, this concludes my statement. I will be happy to take questions.

[The prepared statement of Mr. Stephenson can be found in the Appendix on page 21.]

Mr. ORTIZ. Thank you so much for your testimony.

Dr. Beehler, you know all known high-risk contamination sites should be speedily cleaned. However, the Department has elected to place a priority of funding toward active installations and much lower priority toward former Defense sites. Can you explain why there is a difference in this approach between the active sites that we have plus the ones that have been like bases being closed in the past?

Secretary BEEHLER. Mr. Chairman, several points. One is that the percentage spent on high-risk active installations related sites is the same percentage that is spent on FUDS high-risk sites within the total amount that is spent on FUDS versus the total amount that is spent on active installations.

The second point is that in fact one must look at individual services. For instance, the Navy makes no discrimination really. They continue to spend money on the high-risk sites across the board, whether it is FUDS or the active installations.

As to the Army, they over the last several years, in order to be the most efficient they could be as far as achieving cleanup and cost, they went to a performance-based contract approach, whereby this fiscal year 30 percent of all of their cleanup contracts are or are about to be performance-base oriented. And what that allows them to do is when they are in a given site—for example, Aberdeen Proving Ground has 253 sites, you know, some high risk, some medium risk, some low risk—under the performance-based contracting, there is flexibility to use economies of scale. If there is, for instance, a given soil contamination interest that may cover—cut across all three levels of sites, then it is perceived to make the most sense to deal with that issue at all of those related sites within Aberdeen Proving Grounds.

So there is this balancing between the triage effect of making sure that you are dealing with the worst first, as I alluded to in my testimony, and balancing that with the economies of scale that can be engendered at sites such as Aberdeen that have all three different categories.

The other thing, of course, about FUDS sites is there are greater challenges that the military face. The military does not own the property, in many instances has had no connection with the property for decades. They are dealing with current owners of the property and also with interests from State and local regulators and communities as to how best to clean up the properties.

So it is not an exact science, for the reasons that I suggest.

Mr. ORTIZ. You know—and the reason that I ask this question is because as times change, there might be a necessity to open new bases. And when we find out that there are certain communities who have never had their cleanup, other communities might be hesitant to receive our military. And this could create problems.

So you say there is a goal that maybe between 2014, 2020, that maybe—

Secretary BEEHLER. Mr. Chairman, we are always pushing. The reason that these goals are set is sort of to establish benchmarks. And then they are annually reviewed to see where the services are in not only meeting the goals, but actually doing better, given—and this would certainly greatly apply to a FUDS situation—enhanced technology, to both find out what the contaminants are, as well as how best to remove them. And we certainly rely heavily on enhanced research to help speed things up and to do a more effective approach.

We have also found, certainly the Army has, that by going with performance-based contracts they have found the cleanup is done more efficiently, more effectively, more expeditiously, and we would expect that that would carry forth in the dealing of cleanup of FUDS sites.

Mr. ORTIZ. Because you know, we want to be sure that we have recruitment, retention. It is just like the Veterans Administration (VA) hospital, when they cannot treat the veterans coming back from the war. I think this has an impact also in that if I had a son or daughter in the military, I don't want to have them go to a place where they are going to be drinking contaminated water. And you know, we want to work together, and I hope by working

with the Congress and DOD that we can come up with a solution to hopefully expedite to do some of this cleaning up.

Secretary BEEHLER. Well, I certainly appreciate that on behalf of the Department of Defense. And we certainly do want to work as closely as possible with Congress to achieve that goal.

I might add, apropos your comment, that obviously on active installations we do have 24/7 responsibility of the service men and women and their families, which once again we want to make sure that contamination is effectively dealt with in that venue as well.

Mr. ORTIZ. Thank you.

Mr. Loeb sack, you have any questions?

Mr. LOEBSACK. Thank you, Mr. Chairman. Thanks to you as well, Mr. Stephenson and Mr. Beehler. I am new to the Congress. And when I got on the Armed Services Committee, you know, of course I had to choose which subcommittees I wanted to be on. And the district in Iowa, we don't have bases as such right now much at all. But I do have, in my district in Middletown, the Iowa Army Ammunition Plant. And I thought about, while I was running for this office, I had heard stories about some of the contamination problems at that plant. And I am on this subcommittee in no small measure because I want that to be dealt with while I am in Congress at some point, and the problems.

And it has been the site of an installation restoration program (IRP), since 1994. The groundwater and the soil at the plant are contaminated with both perchlorate and trichloroethylene. To date, the Army Environmental Center has spent about \$90 million—that is the data that I have at least—on the cleanup effort. The restoration of the site is still not complete. And it is projected to cost an additional \$11 million over the course of the next 5 years.

And I suppose even more concerning for me and many of the people there at the plant and the areas, sites, within the plant's compound that were not originally selected for cleanup in 1994, but have since been found to be in need of remediation as a result of the plant's historical activities, are not included in the cleanup effort. Meaning that no money has been made available for the restoration.

So I just want to ask at the outset, Mr. Beehler, if you have any direct knowledge of the cleanup efforts at the Iowa Army Ammunition Plant. I know there are many facilities around the country, but do you have any specific information on this?

Secretary BEEHLER. Thank you, Congressman. As I think you know, generally the cleanup issues are handled on an installation-by-installation basis, and then as an oversight by the service particularly involved with the effort. I do have some minimum knowledge. I know, for instance, that a consortium led by the University of Iowa with other universities and other entities have a prototype trial project involving phytoremediation, which at this point is proving to be effective, and hopefully therefore can be expanded to have a more efficient cleanup.

And as to the other aspect that you mentioned of sites or parcels that have been found to be contaminated but have not been included in the cleanup site, I don't have any direct knowledge about that. I would be happy to take that back to the Army, provide you with more detailed information.

I can say that obviously—and I am sure you know this as well—that the remediation is done in accord with the State and Federal regulators, and therefore I can only assume at this point that there is a good reason that the regulators have concurred in as to why those parcels have not yet been included in the cleanup. But I will take that back for the record and get more detail for the committee.

Mr. LOEBSACK. That is all I request.

[The information referred to can be found in the Appendix beginning on page 74.]

Mr. LOEBSACK. I really appreciate that very much, your cooperation. I look forward to working with you on it in the future. Thank you.

Secretary BEEHLER. Thank you, sir.

Mr. ORTIZ. Chairman Taylor.

Mr. TAYLOR. Thank you, Mr. Chairman. Gentlemen, the only thing that I would ask of you is—I am from down south Mississippi. We got clobbered a couple years ago with the hurricane. And I would remind you both when I called the Chief of Naval Operations (CNO) and the Chief of the National Guard Bureau and said we desperately needed help, both of them's very first words were, how are your bases? Where can I put people?

And I got to know, just being human nature, that as you look at these problems there is going to be a tendency to say, you know, if we shut down our water well and just use city water maybe we can eliminate some of these problems.

What I would definitely encourage you to keep in mind is that when the acts of terror that the chiefs have told us are going to happen in the States happen here, the same response is going to be coming from the Chief of the Guard Bureau and the CNO and others, okay; we got to get people in there. Where can we put them? Okay, we can put them on the bases. Can we feed them? Is there a place where they can take a shower, et cetera?

And so I would just encourage you, to the greatest extent possible, to keep the bases self-sufficient when it comes to things like their water wells, when it comes to things like electrical generation, when it comes to things like even sewage treatment. I know that everything, all the pressure is on you to save money, say farm it out to the cities. But the cities in the wake of those storms could not take care of themselves, and the bases really did become where the folks rode to the rescue from.

And I just want to throw that at you because it is something that we have been through that other people are eventually going to go through. And we should not be giving away for short-term gain, like to avoid a pollution problem, we should not be giving away national assets. Because each one of these assets—any one of those bases could be called upon to do the same thing that our bases in south Mississippi did two years ago.

Secretary BEEHLER. Sir, I appreciate your comments. As you may know, the Defense Science Board has an energy task force that is about in the next couple of months to issue their report after a year's study. And one of the things that undoubtedly they will focus on is independence of military bases on energy, on utilities such as water, the very issues that you are raising. And we certainly anticipate that there will be significant push within DOD to attempt to

achieve as much independence as possible in these areas per responsive to the recommendations that will emanate out of the task force. Once again, we have to wait and see for further detail because they haven't issued their report.

Mr. TAYLOR. Sir, if I may, because my memory of the initial moves by Secretary Rumsfeld—I realize this is six years ago and he is no longer the Secretary—but a lot of the people that he brought to the table are still at the table. One of his moves was, to the greatest extent possible, was to farm out those responsibilities. If Keesler can get their water from the city of Biloxi, have them do so, et cetera.

Again, hell, I could not have visualized how catastrophic that storm would have been, but I can now. And so the only point I am trying to make is when you make these decisions, I would hope that you would keep that in mind. Because like I said, whether it happens in Los Angeles, San Diego, wherever, those bases are going to—their bases are going to need to be every bit as self-sufficient as Keesler and the Naval Construction Battalion bases were for the benefit of south Mississippi. And I would just ask you, despite all the budgetary pressures that are telling you otherwise, to try to the greatest extent possible to protect those resources that the taxpayers have already paid for.

Secretary BEEHLER. Yes, sir. Thank you.

Mr. TAYLOR. Thank you, Mr. Chairman.

Mr. ORTIZ. My good friend, Robin Hayes. You have any questions, Robin?

Mr. HAYES. I will pass, Mr. Chairman.

Mr. ORTIZ. Thank you. One of the reasons we are here is because we do, in my opinion, have a serious problem. But Mr. Beehler, you indicated in your statement the Department has identified something like, what, \$32 billion worth of environmental cleanup requirements? Yet the request that has been made for funding for fiscal year 2008 is only \$1.8 billion. I was just wondering, do you have any input as to what the Department will have to—the request that they make to the Congress for funding?

Secretary BEEHLER. I am sorry, sir, do I have any input?

Mr. ORTIZ. Input as to how much money you think not only coming from DOD, but to come to you guys who are the experts, and to say how much money do you think we should put in?

Secretary BEEHLER. Well, with all candor, sir, those decisions are made at a higher level than mine. I can tell you that the \$1.8, \$1.9 billion cleanup level per year has been gradually increasing or being held steady over the course of the years. So it is sort of a consistent, and, it is my understanding, has been deemed, under all the circumstances and with various competing interests involved, the best level to get the job done given other competing circumstances.

And I believe that, for instance, to date—the program started after 1986—so in roughly 20 years in today's dollars at least \$32 billion has been spent on cleanup. And we are at roughly about 80-some percent response complete or in place.

Mr. ORTIZ. I think that when we have identified at least, you know, \$32 billion worth of cleanup problems that we have, 1.9 or 1.8 is not sufficient to reduce the existing contamination that we

have. So I am just hoping—and I know that we have some other priorities. I know we have got two wars going on at the same time. But it is a very serious problem.

I know that at least one of the bases that we have in Texas that you are probably familiar with is the one in San Antonio. And I was just wondering what efforts has the Air Force taken to moderate potential problems with disease resulting from exposure to harmful chemicals among former civilian employees and military personnel who previously worked at the Kelly Air Force Base?

Secretary BEEHLER. I am sorry; is this Kelly Air Force Base?

Mr. ORTIZ. Kelly Air Force Base, yes, sir.

Secretary BEEHLER. As I understand it, there has been about \$300 million spent by the Air Force to clean up Kelly. I believe that Kelly is basically a BRAC site, so that means that the base effectively has been closed. They have taken leadership and worked very closely with the communities in addressing the TCE issue, which I believe they spent \$70-some-million focused on that issue alone, working closely with the city health municipal authorities, making sure that TCE no longer contaminates the drinking water of the surrounding neighborhoods. And as I understand it, the progress being made now is in the right direction.

Mr. ORTIZ. Because if I am correct—now, I could be wrong, but I understand that some of this contamination has spread to other communities which are not under the in-site existing military base. And what is being done to have the people who reside outside the areas of the military jurisdiction? Have they been advised that that area has been contaminated?

Secretary BEEHLER. Well, my understanding is that there has been, at least in recent times, a very effective communication with the local communities about contamination issues and problems. And in fact there is, as I recall, two plumes which, through a wide variety of rather creative forward thinking—and once again with the approval of the local communities of a permeable barrier approach, have actually shrunk the respective plumes by half in the space of about three or four years. Much quicker than if they had engaged in pump and treat, which is the standard remediation that has historically been proven.

So, as I say, it seems to be headed, for all those reasons, in the right direction.

Mr. ORTIZ. Mr. Taylor.

Mr. TAYLOR. Again just for my memory, what have we spent on environmental restoration at bases that have been closed by previous rounds of BRAC to date, and what is your estimated amount to clean up the bases that have been identified to be BRAC'd by the panels that have already met and made decisions?

Secretary BEEHLER. I hope I am going to answer your question correctly.

Mr. TAYLOR. I will repeat it, because I tend to mumble. How much have we spent so far? And there are still installations that have been targeted for closure that have either not been closed or have not—or the environmental restoration has not taken place. So what is your estimate that you will have to spend just to fulfill what has been mandated by the rounds of BRAC that have already occurred?

Secretary BEEHLER. I think there are roughly—if you include all rounds of BRAC, including the first four plus now the five, as best we understand the five, which is somewhat a work in progress—

Mr. TAYLOR. Sure.

Secretary BEEHLER [continuing]. Because, of course, these are relatively newly added to the mix, it is roughly \$3.9 billion needed to complete.

Mr. TAYLOR. And what has been spent so far?

Secretary BEEHLER. What has been spent so far? I want to say around \$9 billion so far.

Mr. TAYLOR. May I make this request of you?

Secretary BEEHLER. I will take that back for the record.

Mr. TAYLOR. Would you take it for the record and answer for the record?

Secretary BEEHLER. I will, and give you the support.

Mr. TAYLOR. Thank you very much, sir.

[The information referred to can be found in the Appendix beginning on page 74.]

Mr. TAYLOR. Thank you, Mr. Chairman.

Mr. ORTIZ. Mr. Stephenson, in the absence of an EPA standard, do you think it is prudent for the Department to move forward and clean up sites contaminated with rocket fuel contamination?

Mr. STEPHENSON. Well, I think they are moving forward using the National Academy's 24 parts per billion. But I think it is incumbent upon EPA to act first. They need to set a drinking water standard, and then DOD will know with certainty what the clean-up standard is. And there is a lot of support for that. The American Water Works Association, who represents all the private drinking water facilities and public drinking water facilities, has encouraged EPA to do so. So I think they actually need that regulatory standard in order to do a lot more.

Mr. ORTIZ. Does any other member have any questions? I know you just came in. I know you are full of questions.

Mr. BISHOP. Well, I am, and I feel chagrined here, because usually I have a good reason for either being late or missing a committee meeting. And this time I have no reason except I just forgot the time. So I apologize. And I am assuming you may have covered a lot of these issues. Can I just ask four questions? And if it has already been covered will you just stop me?

Mr. ORTIZ. You go right ahead. You are a very important member of this subcommittee.

Mr. BISHOP. If I was that important I wouldn't be sitting at the end of the aisle here.

Mr. Stephenson, if I can start with you— and you were probably talking about as I came in—but how many sites catalogued in the government accounting or the GAO's May 2005 report are contaminated sites nationwide where naturally occurring sources? Does that make sense?

Mr. STEPHENSON. Yeah, we identified nearly 400 in total. Of those, there were upwards of 200 of those sites where it couldn't be determined. And we think it was reasonable to assume that around 100 of those are naturally occurring. Most of the naturally occurring perchlorate is in the desert southwest, in the high plains of Texas.



Mr. BISHOP. Based on any information that has come out since that report, do you have any kind of ballpark estimate of how many sites exist nationwide? Naturally occurring.

Mr. STEPHENSON. No. That is the best information there is available. It is not easy to identify perchlorate sites. We had to work with EPA and DOD and many local communities and States to come up with that 400-site estimate.

Mr. BISHOP. And once again, you probably said this already, but I apologize for that. Of the 395–400, roughly, sites that you have that have been identified in that 2005 report, how many are currently experiencing remediation activity?

Mr. STEPHENSON. We don't know. It has been two years since that study. About 65 percent of those sites were DOD sites, so maybe Mr. Beehler can shed some light on that. But we have not updated that information since then.

Mr. BISHOP. Mr. Beehler, do you have anything to add on how many are going through remediation at the present time?

Secretary BEEHLER. I am happy to take that for the record. I do know that EPA said that we have 34, I believe, Superfund sites, of which really one installation accounted for 11 of those sites where perchlorate had been found. And these would be sites listed on the National Priorities List.

Now, that is not, I don't think, exactly the same question that you asked, but it is a related answer. But I would be happy to take that back for the record and provide you the information we have.

Mr. BISHOP. I would be appreciative of that.

[The information referred to can be found in the Appendix beginning on page 74.]

Mr. BISHOP. If I could ask maybe two other questions. Once again, if they have been covered, I apologize profusely for that. And it is my understanding that many of the defense, the aerospace industries are not waiting for the EPA to set the drinking water standards for this particulate, and they are spending a lot of money doing that. Is the Defense Department working with the private industry and other public agencies to gain the benefit of this private sector knowledge and expertise in this particular issue in this contaminant remediation technology?

Secretary BEEHLER. Absolutely. That is one of the cornerstones of what we are looking at. For instance, we spent a total to date of about \$114 million for a whole range of efforts, such as research into substitutes, better pollution prevention approaches, new technologies for more effective cleanup, for instance, and more effective handling of perchlorate. And we have set up a directorate within our office as a long-term institutional basis to examine perchlorate and other emerging contaminants. The directorate regularly meets with industry folks, with health regulators, environmental regulators, both at the State, local, and Federal level, county folks, water experts, to make sure that there is the most effective knowledge share in figuring out how best to proceed in this in the most cost-efficient manner, using the best science and technology available.

Mr. BISHOP. I am very happy to hear that. Once again, you probably covered that in your testimony, but that is wonderful to know,

because these industries are putting millions of dollars into the research in this particular area.

One last question then, Mr. Chairman, and I will yield back.

Mr. ORTIZ. Go right ahead.

Mr. BISHOP. If the EPA were to determine that this perchlorate should not be regulated by the drinking water standards, what effect would that determination have on the Department of Defense's current or future remediation activities?

Secretary BEEHLER. To the best of my knowledge, I think very little. I mean we have before us, we all have before us the various health concerns that have been presented by the National Academy of Science, by the CDC, Center For Disease Control and we—and also by past research done by EPA. And we at DOD have made a commitment to make sure that we get our arms around, effectively, perchlorate and effectively deal with it. Right now we are following the current EPA guidance, which EPA guidance established a reference dose of 24 parts per billion based on the research put forward by the—and the study done by the National Academy of Sciences. So we have used that figure as our point of departure for instructing the services to examine whether there is a perchlorate problem and how best to deal with it. And that is the way we will continue.

The other thing is, EPA is only one part of the picture here as far as a regulator is concerned. The states have a significant role. And already—and this was mentioned earlier in the hearing—states have stepped out. Foremost is Massachusetts, that has set a standard for drinking water of two parts per billion. We fully expect other states to take, you know, positions one way or the other on this. And we want to be—and our feeling is to be ahead of the curve rather than behind the curve in dealing with this issue, to be most effective in handling the health issues, and to do it most efficiently and economically. And that is the way we will continue to proceed.

Mr. BISHOP. Thank you. I appreciate both of you for answering those questions that I did have. Thank you for your indulgence. And once again I apologize for my tardiness, Mr. Chairman.

Mr. ORTIZ. Thank you, Mr. Bishop. Thank you very much.

Mr. Stephenson, please tell us about impact of human exposure to TCE in drinking water and vapors in the air, if you could.

Mr. STEPHENSON. Our TCE knowledge base is really limited to Camp Lejeune, where we looked at uptake from drinking water only. The research on intake from vapor is relatively new—well, not relatively new, but is ongoing, and it is not finalized yet. The fact that there is a drinking water standard, though, is we think obviously excellent. And the research on that continues. And, in fact, EPA may even make that standard more stringent if the evidence supports that.

Mr. ORTIZ. But we are working on it to come up with a system to—

Mr. STEPHENSON. We are. There is ongoing research to study the intake from vapors as well as from drinking water. Breathing TCE is not good either.

Mr. ORTIZ. Mr. Beehler, I want to ask you the same question, but this has to do with vapors in the air. How do you address that?

Secretary BEEHLER. Well, first we are following very closely the science and research that Mr. Stephenson has just alluded to. As he mentioned, there are several studies, recently the National Academy of Sciences, and in turn another panel of the National Academy of Sciences is studying Camp Lejeune. And I believe it is due out with a report in the next 6 to 12 months.

In the meantime, we are engaged in working groups with EPA and the State regulators on whatis—given the state of flux, if you will, of the science and health effects on vapor intrusion—what should be the smart thing to do here and now as we are awaiting additional research information?

We are also stepping out on a site-specific basis, going ahead and specifically testing and monitoring for vapor intrusion, as appropriate. Some of the services have put out guidances on how to handle vapor intrusion issues at individual sites. DOD departmental-wide is going to put out a guidance in the very near future so that we get a minimum consistent policy on what to look for and how to handle vapor intrusion issues while we are waiting for the research to come in and EPA to decide what to do about this issue.

And, finally, once again, there have been States who have set vapor intrusion regulatory limits. And, of course, we comply with those accordingly.

Mr. ORTIZ. Any other member have any other questions? If not, I know there are a lot of members who wanted to be here, but there is a lot of activities going on, and they will probably submit to you some questions for the record.

And being no further business, this hearing stands adjourned. Thank you so much for your testimony.

[Whereupon, at 3 p.m., the subcommittee was adjourned.]



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**A P P E N D I X**

JULY 12, 2007

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**PREPARED STATEMENTS SUBMITTED FOR THE RECORD**

JULY 12, 2007

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GAO

Testimony  
Before the Subcommittee on Readiness,  
Committee on Armed Services, House of  
Representatives

For Release on Delivery  
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ENVIRONMENTAL  
CONTAMINATION

Department of Defense  
Activities Related to  
Trichloroethylene,  
Perchlorate, and Other  
Emerging Contaminants

Statement of John B. Stephenson, Director  
Natural Resources and Environment



GAO-07-1042T

July 12, 2007

## ENVIRONMENTAL CONTAMINATION

## Department of Defense Activities Related to Trichloroethylene, Perchlorate, and Other Emerging Contaminants



### Highlights

Highlights of GAO-07-1042T, a testimony before the Subcommittee on Readiness, Committee on Armed Services, House of Representatives

#### Why GAO Did This Study

DOD defines emerging contaminants as chemicals or materials with (1) perceived or real threat to health or the environment and (2) lack of published standards or a standard that is evolving or being reevaluated. Two emerging contaminants—trichloroethylene (TCE) and perchlorate—are of particular concern to DOD because they have significant potential to impact people or DOD's mission.

TCE, a degreasing agent in metal cleaning which has been used widely in DOD industrial and maintenance processes, has been documented at low exposure levels to cause headaches and difficulty concentrating. High-level exposure may cause dizziness, headaches, nausea, unconsciousness, cancer, and possibly death. Similarly, perchlorate has been used by DOD, NASA, and others in making, testing, and firing missiles and rockets. It has been widely found in groundwater, surface water, and soil across the United States. Perchlorate health studies have documented particular risks to fetuses of pregnant women.

GAO was asked for testimony to summarize its past work on perchlorate, TCE, and defense activities related to (1) the state of knowledge about the emerging contaminants TCE and perchlorate, (2) DOD responsibilities for managing TCE and perchlorate contamination at its facilities, and (3) DOD activities to address TCE and perchlorate contamination.

[www.gao.gov/cgi-bin/getrpt?GAO-07-1042T](http://www.gao.gov/cgi-bin/getrpt?GAO-07-1042T)

To view the full product, including the scope and methodology, click on the link above. For more information, contact John Stephenson at (202) 512-3841 or [stephensonj@gao.gov](mailto:stephensonj@gao.gov).

#### What GAO Found

While TCE and perchlorate are both classified by DOD as emerging contaminants, there are important distinctions in how they are regulated and in what is known about their health and environmental effects. Since 1989, EPA has regulated TCE in drinking water. However, health concerns over TCE have been further amplified in recent years after scientific studies have suggested additional risks posed by human exposure to TCE. Unlike TCE, no drinking water standard exists for perchlorate—a fact that has caused much discussion in Congress and elsewhere. Recent Food and Drug Administration data documenting the extent of perchlorate contamination in the nation's food supply has further fueled this debate.

While DOD has clear responsibilities to address TCE because it is subject to EPA's regulatory standard, DOD's responsibilities are less definite for perchlorate due to the lack of such a standard. Nonetheless, perchlorate's designation by DOD as an emerging contaminant has led to some significant control actions. These actions have included responding to requests by EPA and state environmental authorities, which have used a patchwork of statutes, regulations, and general oversight authorities to address perchlorate contamination. Pursuant to its Clean Water Act authorities, for example, Texas required the Navy to reduce perchlorate levels in wastewater discharges at the McGregor Naval Weapons Industrial Reserve Plant to 4 parts per billion (ppb), the lowest level at which perchlorate could be detected at the time. In addition, in the absence of a federal perchlorate standard, at least nine states have established nonregulatory action levels or advisories for perchlorate ranging from 1 ppb to 51 ppb. Nevada, for example, required the Kerr-McGee Chemical site in Henderson to treat groundwater and reduce perchlorate releases to 18 ppb, which is Nevada's action level for perchlorate.

While nonenforceable guidance had existed previously, it was not until EPA adopted its 1989 TCE standard that many DOD facilities began to take concrete action to control the contaminant. According to EPA, for example, 46 sites at Camp Lejeune have since been identified for TCE cleanup. The Navy and EPA have selected remedies for 30 of those sites, and the remaining 16 are under active investigation. Regarding perchlorate, in the absence of a federal standard DOD has implemented its own policies on sampling and cleanup, most recently with its 2006 *Policy on DOD Required Actions Related to Perchlorate*. The policy applies broadly to DOD's active and closed installations and formerly used defense sites within the United States and its territories. It requires testing for perchlorate and certain cleanup actions and directs the department to comply with applicable federal or state promulgated standards, whichever is more stringent. The policy notes, that DOD has established 24 ppb as the current level of concern for managing perchlorate until the promulgation of a formal standard by the states and/or EPA.

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Mr. Chairman and Members of the Subcommittee:

We are pleased to be here to discuss our work on the Department of Defense's (DOD) activities associated with emerging contaminants and the cleanup of its hazardous waste sites. DOD defines emerging contaminants as chemicals or materials characterized by (1) a perceived or real threat to human health or environment and (2) a lack of published health standards or a standard that is evolving or being reevaluated. DOD may also classify a contaminant as "emerging" because of the discovery of a new source of contamination, pathway to human exposure, or more-sensitive detection method. Two emerging contaminants—trichloroethylene (TCE) and perchlorate—are of particular concern to DOD because they have significant potential to impact people or DOD's mission.

As we have previously reported,<sup>1</sup> DOD faces the daunting task of cleaning up thousands of military bases and other installations across the country. Many of these sites are contaminated with toxic and radioactive wastes in soil, water, or containers such as underground storage tanks, ordnance and explosives, and unsafe buildings. Identifying and investigating these hazards will take decades, and cleanup will cost many billions of dollars.

In addition to the federal fiscal implications of the large cleanup costs, defense-related contamination problems have economic consequences for individual communities. Many of these formerly used defense sites are now owned by states, local governments, and individuals and used for parks, schools, farms, and homes. Of particular concern are military facilities closed under DOD's Base Realignment and Closure (BRAC) program that are intended to be redeveloped for productive new uses and must generally be cleaned up before conversion. Environmental cleanup is necessary for the transfer of unneeded contaminated property, which becomes available as a result of base closures and realignment.<sup>2</sup> Concerns have risen in recent years within affected communities about the extent to which contamination on these properties could delay or affect the potential for economic redevelopment to replace jobs that were lost as a

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<sup>1</sup>Appendix I provides a selected bibliography of recent GAO studies on Defense-related hazardous waste issues.

<sup>2</sup>When an installation becomes a BRAC action, the unneeded property is reported as excess. Federal property disposal laws require DOD to first screen excess property for possible reuse by defense and other federal agencies. If no federal agency needs the property, it is declared surplus and is made available to nonfederal parties, including state and local agencies, local redevelopment authorities, and the public.

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result of the base closures. While most of the land on bases closed between 1988 and 1995 has been cleaned up and transferred for redevelopment, some has been awaiting cleanup and conversion for many years. Additional bases approved for closure in the 2005 BRAC round will increase the inventory of military properties slated for civilian reuse.

As you requested, my remarks today will focus on (1) the state of knowledge about certain emerging contaminants of concern to the Subcommittee—specifically TCE and perchlorate, (2) DOD's responsibilities for managing emerging contaminants for which federal regulatory standards do not exist, as is the case with perchlorate, and (3) DOD's activities to address the emerging contaminants TCE and perchlorate contamination at its facilities. To address these issues, we relied primarily on our May 2005 report and April 2007 testimony on perchlorate<sup>3</sup> and our May 2007 report and June 2007 testimony on drinking water contamination problems at the Marine Corps Base Camp Lejeune (Camp Lejeune).<sup>4</sup> We also used information from related GAO work on DOD cleanup issues<sup>5</sup> and examined recent data and other information from DOD, the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the states.

In summary, we found the following:

- While TCE and perchlorate are both DOD-classified emerging contaminants, there are important distinctions in the extent to which they are regulated and in what is known about their effects on human health and the environment. TCE, a degreaser for metal parts that DOD has used widely for industrial and maintenance processes, has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical. TCE has been shown to

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<sup>3</sup>GAO, *Perchlorate: A System to Track Sampling and Cleanup Results is Needed*, GAO-05-462 (Washington, D.C.: May 20, 2005) and GAO, *Perchlorate: EPA Does Not Systematically Track Incidents of Contamination*, GAO-07-797T (Washington, D.C.: April 25, 2007).

<sup>4</sup>GAO, *Defense Health Care: Activities Related to Past Drinking Water Contamination at Marine Corps Base Camp Lejeune*, GAO-07-276 (Washington, D.C.: May 11, 2007) and GAO, *Issues Related to Past Drinking Water Contamination at Marine Corps Base Camp Lejeune*, GAO-07-833T (Washington, D.C.: June 12, 2007).

<sup>5</sup>GAO, *Military Base Closures: Opportunities Exist to Improve Environmental Cleanup Cost Reporting and to Expedite Transfer of Unneeded Property*, GAO-07-166 (Washington, D.C.: January 30, 2007).

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cause headaches and difficulty concentrating at low levels of exposure, whereas high-level exposure may cause dizziness, headaches, nausea, unconsciousness, cancer, and possibly death. As a consequence of these health risks from TCE ingestion, EPA adopted a TCE drinking water standard that became effective in 1989. However, health concerns over TCE have been further amplified in recent years as scientific studies have suggested additional risks posed by human exposure to TCE. In addition, ongoing study of the health effects associated with past exposures on Camp Lejeune may affect DOD's decision whether to settle or deny the pending health claims of former residents. Perchlorate, a primary ingredient in propellant used in the manufacture and firing of rockets and missiles, has been found in drinking water, groundwater, surface water, and soil across the United States. Health studies have shown that it can affect the thyroid gland, which helps to regulate the body's metabolism, and may cause developmental impairments in the fetuses of pregnant women. Unlike TCE, EPA has not set a regulatory standard limiting perchlorate in drinking water—a fact that has caused much discussion in Congress and elsewhere. Recent FDA data documenting extensive, low-level perchlorate contamination in the nation's food supply have further fueled the debate about the extent of perchlorate contamination and its health effects.

- While DOD has certain regulatory compliance responsibilities with regard to emerging contaminants such as TCE that are regulated by EPA or state governments, responsibilities are less definite for other emerging contaminants, such as perchlorate, that lack federal regulatory standards. In the absence of a federal regulatory standard, DOD's designation of perchlorate as an emerging contaminant indicates its concern about the significant potential impact the chemical has on people or the department's mission. That designation also has resulted in DOD deciding to take certain actions and cleanup efforts even without a federal requirement. While there is no nationwide perchlorate standard, DOD has taken steps to address perchlorate in individual cases in response to EPA regional or state agency actions under various environmental laws such as the Clean Water Act. For example, pursuant to its authority under the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) program, Texas required the Navy to reduce perchlorate levels in wastewater discharges at the McGregor Naval Weapons Industrial Reserve Plant to 4 parts per billion (ppb), the lowest level at which perchlorate could be detected. Also, in the absence of a federal perchlorate standard, at least eight states have established nonregulatory action levels or advisories for perchlorate ranging from 1 ppb to 51 ppb. Nevada, for example, required the Kerr-McGee Chemical site in Henderson to treat groundwater and reduce perchlorate concentration releases to 18 ppb—

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Nevada's action level.

- DOD is taking a number of actions to address emerging contaminants, including TCE and perchlorate. In 1979, EPA issued nonenforceable guidance establishing "suggested no adverse response levels" for TCE in drinking water. However, the guidance did not suggest actions that public water systems should take if TCE concentrations exceeded those values. Ten years later, EPA's drinking water standard for TCE of 5 ppb became effective. The new standard served as a regulatory basis for many DOD facilities to take concrete actions to control TCE. According to EPA's Region 4 Superfund Director, for example, 46 sites at Camp Lejeune have since been identified for TCE cleanup. The Navy and EPA have selected remedies for 30 of those sites, and the remaining 16 are under active investigation. Regarding perchlorate, in the absence of a federal perchlorate standard, DOD adopted its own policies on sampling and cleanup—specifically a 2003 interim policy followed by a more comprehensive 2006 policy that required more aggressive sampling and, in some cases, cleanup. The 2006 policy applies broadly to DOD's active and closed installations and formerly used defense sites within the United States, its territories and possessions. It directs testing for perchlorate and certain other cleanup actions and directs DOD to comply with applicable federal or state promulgated standards, whichever is more stringent.

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### The State of Knowledge About TCE and Perchlorate

While TCE and perchlorate are both DOD-classified emerging contaminants, there are key distinctions between the contaminants that affect the extent to which they are regulated, and the information that may be needed before further steps are taken to protect human health and the environment. Since 1989, a maximum contaminant level (MCL) under the Safe Drinking Water Act has been in place for TCE. In contrast, EPA has not adopted an MCL for perchlorate, although recent government-sponsored studies have raised concerns that even low-levels of exposure to perchlorate may pose serious risks to infants and fetuses of pregnant women.

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### EPA Has Established a Standard for TCE and Knowledge is Evolving

We provided details about EPA's evolving standards for TCE and the evolving knowledge of its health effects in our May 2007 report and June 2007 testimony on issues related to drinking water contamination on Camp Lejeune. TCE is a colorless liquid with a sweet, chloroform-like odor that is used mainly as a degreaser for metal parts. The compound is also a component in adhesives, lubricants, paints, varnishes, paint strippers, and pesticides. At one time, TCE was used as an extraction solvent for

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cosmetics and drug products and as a dry-cleaning agent; however, its use for these purposes has been discontinued. DOD has used the chemical in a wide variety of industrial and maintenance processes. More recently, the department has used TCE to clean sensitive computer circuit boards in military equipment such as tanks and fixed wing aircraft.

Because TCE is pervasive in the environment, most people are likely to be exposed to TCE by simply eating, drinking, and breathing, according to the Department of Health and Human Services' Agency for Toxic Substances and Disease Registry (ATSDR). Industrial wastewater is the primary source of release of TCE into water systems, but inhalation is the main route of potential environmental exposure to TCE. ATSDR has also reported that TCE has been found in a variety of foods, with the highest levels in meats, at 12 to 16 ppb, and U.S. margarine, at 440 to 3,600 ppb. In fact, HHS's National Health and Nutrition Examination Survey (NHANES) suggested that approximately 10 percent of the population had detectable levels of TCE in their blood.

Inhaling small amounts of TCE may cause headaches, lung irritation, poor coordination, and difficulty concentrating, according ATSDR's Toxicological Profile. Inhaling or drinking liquids containing high levels of TCE may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, or possibly death. ATSDR also notes that some animal studies suggest that high levels of TCE may cause liver, kidney, or lung cancer, and some studies of people exposed over long periods to high levels of TCE in drinking water or workplace air have shown an increased risk of cancer. ATSDR's Toxicological Profile notes that the National Toxicology Program has determined that TCE is "reasonably anticipated to be a human carcinogen" and the International Agency for Research on Cancer has determined that TCE is probably carcinogenic to humans—specifically, kidney, liver and cervical cancers, Hodgkin's disease, and non-Hodgkin's lymphoma—based on limited evidence of carcinogenicity in humans and additional evidence from studies in experimental animals.

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Effective in 1989, EPA adopted an MCL of 5 ppb of TCE in drinking water supplies pursuant to the Safe Drinking Water Act.<sup>6</sup> Despite EPA's regulation of TCE as a drinking water contaminant, concerns over serious long-term effects associated with TCE exposures have prompted additional scrutiny by both governmental and nongovernmental scientific organizations. For example, ATSDR initiated a public health assessment in 1991 to evaluate the possible health risks from exposure to contaminated drinking water on Camp Lejeune. The health concerns over TCE have been further amplified in recent years after scientific studies have suggested additional risks posed by human exposure to TCE. ATSDR is continuing to develop information about the possible long-term health consequences of these potential exposures in a subregistry to the National Exposure Registry specifically for hazardous waste sites.

As we previously reported with respect to Camp Lejeune, those who lived on base likely had a higher risk of inhalation exposure to volatile organic compounds such as TCE, which may be more potent than ingestion exposure. Thus, pregnant women who lived in areas of base housing with contaminated water and conducted activities during which they could inhale water vapor—such as bathing, showering, or washing dishes or clothing—likely faced greater exposure than those who did not live on base but worked on base in areas served by the contaminated drinking water.

Concerns about possible adverse health effects and government actions related to the past drinking water contamination on Camp Lejeune have led to additional activities, including new health studies, claims against the federal government, and federal inquiries. As a consequence of these growing concerns—and of anxiety among affected communities about these health effects and related litigation—ATSDR has undertaken a study to examine whether individuals who were exposed in utero to the contaminated drinking water are more likely to have developed certain childhood cancers or birth defects. This research, once completed later in

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<sup>6</sup>For contaminants that are known or anticipated to occur in public water systems and that the EPA Administrator determines may have an adverse impact on health, the act requires EPA to set a nonenforceable maximum contaminant level goal (MCLG) at which no known or anticipated adverse health effects occur and that allows an adequate margin of safety. Once the MCLG is established, EPA may set an enforceable standard for water as it leaves the treatment plant, the maximum contaminant level (MCL). The MCL generally must be set as close to the MCLG as is feasible using the best technology or other means available, taking costs into consideration.



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2007, is expected to help regulators understand the effects of low levels of TCE in our environment.

In addition, some former residents of Camp Lejeune have filed tort claims and lawsuits against the federal government related to the past drinking water contamination. As of June 2007, about 850 former residents and former employees had filed tort claims with the Department of the Navy related to the past drinking water contamination. According to an official with the U.S. Navy Judge Advocate General—which is handling the claims on behalf of the Department of the Navy—the agency is currently maintaining a database of all claims filed. The official said that the Judge Advocate General is awaiting completion of the latest ATSDR health study before deciding whether to settle or deny the pending claims in order to base its response on as much objective scientific and medical information as possible. According to DOD, any future reassessment of TCE toxicity may result in additional reviews of DOD sites that utilized the former TCE toxicity values, as the action levels for TCE cleanup in the environment may change.

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**EPA Has Not Established a Standard for Perchlorate**

As we discussed in our May 2005 report and April 2007 testimony, EPA has not established a standard for limiting perchlorate concentrations in drinking water under the SDWA. Perchlorate has emerged as a matter of concern because recent studies have shown that it can affect the thyroid gland, which helps to regulate the body's metabolism and may cause developmental impairments in the fetuses of pregnant women. Perchlorate is a primary ingredient in propellant and has been used for decades by the Department of Defense, the National Aeronautics and Space Administration, and the defense industry in manufacturing, testing, and firing missiles and rockets. Other uses include fireworks, fertilizers, and explosives. It is readily dissolved and transported in water and has been found in groundwater, surface water, drinking water, and soil across the country. The sources of perchlorate vary, but the defense and aerospace industries are the greatest known source of contamination.

Scientific information on perchlorate was limited until 1997, when a better detection method became available for perchlorate, and detections (and concern about perchlorate contamination) increased. In 1998, EPA first placed perchlorate on its Contaminant Candidate List, the list of contaminants that are candidates for regulation, but the agency concluded

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that information was insufficient to determine whether perchlorate should be regulated under the SDWA.<sup>7</sup> EPA listed perchlorate as a priority for further research on health effects and treatment technologies and for collecting occurrence data. In 1999, EPA required water systems to monitor for perchlorate under the Unregulated Contaminant Monitoring Rule to determine the frequency and levels at which it is present in public water supplies nationwide.<sup>8</sup>

Interagency disagreements over the risks of perchlorate exposure led several federal agencies to ask the National Research Council (NRC) of the National Academy of Sciences to evaluate perchlorate's health effects. In 2005, NRC issued a comprehensive review of the health effects of perchlorate ingestion, and it reported that certain levels of exposure may not adversely affect healthy adults. However, the NRC recommended more studies on the effects of perchlorate exposure in children and pregnant women and recommended a reference dose of 0.0007 milligrams per kilogram per day. In 2005, the EPA adopted the NRC recommended reference dose, which translates to a drinking water equivalent level (DWEL) of 24.5 ppb. If the EPA were to develop a drinking water standard for perchlorate, it would adjust the DWEL to account for other sources of exposure, such as food.

Although EPA has taken some steps to consider a standard, in April 2007 EPA again decided not to regulate perchlorate—citing the need for additional research—and kept perchlorate on its Contaminant Candidate List. Several human studies have shown that thyroid changes occur in human adults at significantly higher concentrations than the amounts typically observed in water supplies. However, more recent studies have since provided new knowledge and raised concerns about potential health risks of low-level exposures, particularly for infants and fetuses. Specifically, in October 2006, researchers from the Centers for Disease Control and Prevention (CDC) published the results of the first large study

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<sup>7</sup>Under the Safe Drinking Water Act, EPA's determination to regulate a contaminant must be based on findings that: (a) the contaminant may have an adverse effect on the health of persons; (b) the contaminant is known to occur or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern; and (c) in the sole judgment of the Administrator, regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by public water systems.

<sup>8</sup>EPA recently determined that it had collected sufficient data and that further monitoring was not needed, 72 *Fed. Reg.* 374, January 4, 2007.

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to examine the relationship between low-level perchlorate exposure and thyroid function in women with lower iodine levels. About 36 percent of U.S. women have these lower iodine levels. The study found decreases in a thyroid hormone that helps regulate the body's metabolism and is needed for proper fetal neural development.

Moreover, in May 2007, FDA released a preliminary exposure assessment because of significant public interest in the issue of perchlorate exposure from food. FDA sampled and tested foods such as tomatoes, carrots, spinach, and cantaloupe; and other high water content foods such as apple and orange juices; vegetables such as cucumbers, green beans, and greens; and seafood such as fish and shrimp for perchlorate and found widespread low-level perchlorate levels in these items. FDA is also planning to publish, in late 2007, an assessment of exposure to perchlorate from foods, based on results from its fiscal year 2005-2006 Total Diet Study—a market basket study that is representative of the U.S. diet.

Some federal funding has been directed to perchlorate studies and cleanup activities. For example, committee reports related to the DOD and EPA appropriations acts of fiscal year 2006 directed some funding for perchlorate cleanup. In the Senate committee report for the Department of Health and Human Services fiscal year 2006 appropriations act, the committee encouraged support for studies on the long-term effects of perchlorate exposure. The Senate committee report for FDA's fiscal year 2006 appropriations act directed FDA to continue conducting surveys of perchlorate in food and bottled water and to report the findings to Congress. In the current Congress, legislation has been introduced that would require EPA to establish a health advisory for perchlorate, as well as requiring public water systems serving more than 10,000 people to test for perchlorate and disclose its presence in annual consumer confidence reports.<sup>9</sup> Other pending legislation would require EPA to establish a national primary drinking water standard for perchlorate.<sup>10</sup>

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<sup>9</sup>S. 24.

<sup>10</sup>S. 150 and H.R. 1747. A national primary drinking water standard is a legally enforceable standard that applies to public water systems. It sets an MCL or specifies a certain treatment technique for public water systems for a specific contaminant or group of contaminants.

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**DOD's  
Responsibilities to  
Address Perchlorate  
and Other Emerging  
Contaminants Where  
Federal Regulatory  
Standards Do Not  
Exist**

DOD has certain responsibilities with regard to emerging contaminants such as TCE that are regulated by EPA or state governments, but its responsibilities and cleanup goals are less definite for emerging contaminants such as perchlorate that lack federal regulatory standards. As we have previously reported, DOD must comply with any cleanup standards and processes under all applicable environmental laws, regulations, and executive orders, including the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act's National Pollutant Discharge Elimination System (NPDES), and the SDWA. DOD's designation of perchlorate as an emerging contaminant reflects the department's recognition that the chemical has a significant potential impact on people or the Department's mission. DOD's recognition of a substance as an emerging contaminant can lead DOD to decide to take to certain cleanup efforts even in the absence of a federal regulatory standard. In addition, federal laws enacted in fiscal years 2004 and 2005 required DOD to conduct health studies and evaluate perchlorate found at military sites. For example, the Ronald W. Reagan National Defense Authorization Act for fiscal year 2005 stated that the Secretary of Defense should develop a plan for cleaning up perchlorate resulting from DOD activities when the perchlorate poses a health hazard and continue evaluating identified sites.<sup>11</sup>

As we reported in our 2005 perchlorate report, DOD has sometimes responded at the request of EPA and state environmental authorities—which have used a patchwork of statutes, regulations, and general oversight authorities—to act (or require others, including DOD, to act) when perchlorate was deemed to pose a threat to human health and the environment. For example, pursuant to its authority under the Clean Water Act's NPDES program, Texas required the Navy to reduce perchlorate levels in wastewater discharges at the McGregor Naval Weapons Industrial Reserve Plant to 4 parts per billion, the lowest level at which perchlorate could be detected. Similarly, after sampling required as part of a RCRA permit detected perchlorate, Utah officials required ATK Thiokol, an explosives and rocket fuel manufacturer, to install a monitoring well to determine the extent of perchlorate contamination at their facility and take steps to prevent additional releases of perchlorate.

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<sup>11</sup>Pub. L. No. 108-375, § 318, 118 Stat. 1811, 1845 (2004).

In addition, EPA and state officials also told us during our 2005 review that they have sometimes used their general oversight responsibilities to protect water quality and human health to investigate and sample groundwater and surface water areas for perchlorate. For example, EPA asked Patrick Air Force Base and the Cape Canaveral Air Force Station, Florida, to sample groundwater for perchlorate near rocket launch sites. Previously, both installations had inventoried areas where perchlorate was suspected and conducted limited sampling. DOD officials did not find perchlorate at Patrick Air Force Base and, according to an EPA official, the Department of the Air Force said it would not conduct additional sampling at either installation until there was a federal standard for perchlorate.

Finally, according to EPA, in the absence of a federal perchlorate standard, at least eight states have established nonregulatory action levels or advisories for perchlorate ranging from 1 part per billion to 51 parts per billion. (See table 1.) Massachusetts is the only state to have established a drinking water standard—set at 2 ppb. The California Department of Health Services reports that California will complete the rulemaking for its proposed standard of 6 ppb later this year.<sup>12</sup>

**Table 1: States That Have Established Nonregulatory Perchlorate Levels**

State	Level (ppb)	Type of Level
Arizona	14	guidance
California	6	notification level
Maryland	1	advisory level
Nevada	18	public notice standard
New Mexico	1	drinking water screening level
Oregon	18	action level
New York	5	drinking water planning level
	18	public notification level
Texas	17	residential protective cleanup level (PCL)
	51	industrial/commercial PCL

Source: EPA and state documents.

<sup>12</sup>In September 2006, the California Department of Health Services (CDHS) proposed a primary drinking water standard (in this case a maximum contaminant level, MCL) of 6 ppb for perchlorate. CDHS reports that the completed rulemaking will be submitted to the Office of Administrative Law by August 31, 2007.

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States have used these thresholds to identify the level at which some specified action must be taken by DOD and other facilities in their state, in the absence of a federal standard. For example, Oregon initiated in-depth site studies to determine the cause and extent of perchlorate contamination when concentrations of 18 ppb or greater are found. Nevada required the Kerr-McGee Chemical site in Henderson to treat groundwater and reduce perchlorate concentration releases to 18 ppb, which is Nevada's action level for perchlorate. Utah officials told us that while the state did not have a written action level for perchlorate, it may require the responsible party to undertake cleanup activities if perchlorate concentrations exceed 18 ppb.<sup>19</sup>

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### **DOD Is Taking Several Actions to Address TCE, Perchlorate, and Other Emerging Contaminants**

DOD is undertaking a number of activities to address emerging contaminants in general, including the creation of the Materials of Evolving Regulatory Interest Team (MERIT) to systematically address the health, environmental, and safety concerns associated with emerging contaminants. As noted above, DOD is required to follow EPA regulations for monitoring and cleanup of TCE. In addition, DOD is working with ATSDR, which has projected a December 2007 completion date for its current study of TCE's health effects on pregnant women and their children. In the absence of a federal standard, DOD has adopted its own perchlorate policies for sampling and cleanup activities or is working under applicable state guidelines.

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### **DOD Recently Has Established a Mechanism for Addressing Emerging Contaminants**

DOD created MERIT to help address the health, environmental, and safety concerns associated with emerging contaminants. According to DOD, MERIT has focused on materials that have been or are used by DOD, or are under development for use, such as perchlorate, TCE, RDX, DNT and new explosives, naphthalene, perfluorooctanoic acid (PFOA), hexavalent chromium (i.e., chromium VI), beryllium, and nanomaterials. MERIT's initiatives include pollution prevention, detection/analytical methods, human health studies, treatment technologies, lifecycle cost analysis, risk assessment and risk management, and public outreach. Another of MERIT's activities was to create an Emerging Contaminant Action List of materials that DOD has assessed and judged to have a significant potential

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<sup>19</sup>According to state and EPA officials, in instances where perchlorate was found, state agencies have sometimes taken steps to minimize human exposure or perform cleanup, or required responsible private parties to do so.

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impact on people or DOD's mission. The current list includes five contaminants—perchlorate, TCE, RDX, naphthalene, and hexavalent chromium. To be placed on the action list, the contaminant will generally have been assessed by MERIT for its impacts on (1) environment, safety, and health (including occupational and public health), (2) cleanup efforts, (3) readiness and training, (4) acquisition, and (5) operation and maintenance activities.

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#### DOD is Taking Actions to Address TCE

In 1979, EPA issued nonenforceable guidance establishing "suggested no adverse response levels" for TCE in drinking water. These levels provided EPA's estimate of the short- and long-term exposure to TCE in drinking water for which no adverse response would be observed and described the known information about possible health risks for these chemicals. However, the guidance for TCE did not suggest actions that public water systems should take if TCE concentrations exceeded those values. Subsequently, in 1989, EPA set an enforceable MCL for TCE of 5 micrograms per liter, equivalent to 5 ppb in drinking water.

The new standard served as a regulatory basis for many facilities to take concrete action to measure and control TCE. According to EPA's Region 4 Superfund Director, for example, 46 sites on Camp Lejeune have since been identified for TCE cleanup. The Navy and EPA have selected remedies for 30 of those sites, and the remaining 16 are under active investigation. The first Record of Decision was signed in September 1992 and addressed contamination of groundwater in the Hadnot Point Area, one of Camp Lejeune's water systems. Remedies to address groundwater contamination include groundwater "pump and treat" systems, in-situ chemical oxidation, and monitored natural attenuation.<sup>14</sup>

DOD contends that it is aggressively treating TCE as part of its current cleanup program. It notes that the department uses much less TCE than in the past and requires strict handling procedures and pollution prevention measures to prevent exposure to TCE and the release of TCE into the environment. Specifically, DOD has replaced products containing TCE with other types of cleaning agents such as citrus-based agents, mineral oils and other non-toxic solutions.

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<sup>14</sup>Statement of Franklin Hill, Director of Region 4 Superfund Division, U.S. Environmental Protection Agency, Before the Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, U.S. House of Representatives (June 12, 2007).

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**DOD is Sampling For  
Perchlorate and Taking  
Cleanup Actions Under  
Certain Conditions**

In the absence of a federal perchlorate standard, DOD has adopted its own policies with regard to sampling and cleanup. The 2003 *Interim Policy on Perchlorate Sampling* required the military services—Army, Navy, Air Force, and Marines—to sample on active installations (1) where a reasonable basis existed to suspect that a perchlorate release occurred as a result of DOD activities, and (2) a complete human exposure pathway likely existed or (3) where a particular installation must do so under state laws or applicable federal regulations such as the NPDES permit program. However, DOD's interim policy on perchlorate did not address cleanup responsibilities nor did it address contamination at closed installations.

As we detailed in our previous work, DOD only sampled for perchlorate on closed installations when requested by EPA or a state agency, and only cleaned up active and closed installations when required by a specific environmental law, regulation, or program such as the environmental restoration program at formerly used defense sites. For example, at EPA's request, the U.S. Army Corps of Engineers (Corps) installed monitoring wells and sampled for perchlorate at Camp Bonneville, a closed installation near Vancouver, Washington. Utah state officials also reported to us that DOD removed soil containing perchlorate at the former Wendover Air Force Base in Utah, where the Corps found perchlorate in 2004. However, as we previously reported, DOD cited reluctance to sample on or near active installations because of the lack of a federal regulatory standard for perchlorate.

In the absence of a federal standard, DOD has also worked with individual states on perchlorate sampling and cleanup. For example, in October 2004, DOD and California agreed to prioritize perchlorate sampling at DOD facilities in California, including identifying and prioritizing the investigation of areas on active installations and military sites (1) where the presence of perchlorate is likely based on previous and current defense-related activities and (2) near drinking water sources where perchlorate was found.

In January 2006, DOD updated its policy with the issuance of its *Policy on DOD Required Actions Related to Perchlorate*. The new policy applies broadly to DOD's active and closed installations and formerly used defense sites within the United States, its territories and possessions. It directs DOD to test for perchlorate and take certain cleanup actions. The policy also acknowledges the importance of EPA direction in driving DOD's response to emerging contaminants. It stated, for example, that its adoption of 24 ppb as the current level of concern for managing perchlorate was in response to EPA's adoption of an oral reference dose



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that translates to a Drinking Water Equivalent Level of 24.5 ppb. The policy also states that when EPA or the states adopt standards for perchlorate, "DOD will comply with applicable state or federal promulgated standards whichever is more stringent."

The 2006 policy directs DOD to test for perchlorate when it is reasonably expected that a release has occurred. If perchlorate levels exceed 24 ppb, a site-specific risk assessment must be conducted. When an assessment indicates that the perchlorate contamination could result in adverse health effects, the site must be prioritized for risk management.<sup>15</sup> DOD uses a relative-risk site evaluation framework across DOD to evaluate the risks posed by one site relative to other sites and to help prioritize environmental restoration work and to allocate resources among sites. The policy also directs DOD's service components to program resources to address perchlorate contamination under four DOD programs—environmental restoration, operational ranges, DOD-owned drinking water systems, and DOD wastewater effluent discharges.

Under the 2006 perchlorate policy, DOD has sampled drinking water, groundwater, and soil where the release of perchlorate may result in human exposure and responded where it has deemed appropriate to protect public health. As we have reported, DOD is responsible for a large number of identified sites with perchlorate contamination, and the department has allotted significant resources to address the problem. According to DOD, sampling for perchlorate has occurred at 258 active DOD installations or facilities. Through fiscal year 2006, DOD reported spending approximately \$88 million on perchlorate-related research activities, including \$60 million for perchlorate treatment technologies, \$9.5 million on health and toxicity studies, and \$11.6 million on pollution prevention. Additional funds have been spent on testing technology and cleanup. DOD also claims credit for other efforts, including strict handling procedures to prevent the release of perchlorate into the environment and providing information about perchlorate at DOD facilities and DOD's responses. For example, DOD posts the results of its perchlorate sampling, by state, on MERIT's Web site.<sup>16</sup>

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<sup>15</sup>DOD's perchlorate website has additional information regarding policy and guidance, <http://www.denix.osd.mil/denix/Public/Library/MERIT/Perchlorate/efforts/policy/index.html>.

<sup>16</sup>See <https://www.denix.osd.mil/denix/Public/Library/MERIT/Perchlorate/index.html>.

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As we have previously reported, DOD must comply with cleanup standards and processes under applicable laws, regulations and executive orders, including EPA drinking water standards and state-level standards. In the absence of a federal perchlorate standard, DOD has also initiated perchlorate response actions to clean up perchlorate contamination at several active and formerly used defense sites under its current perchlorate policy. For example, at Edwards Air Force Base in California, DOD has treated 32 million gallons of ground water under a pilot project for contaminants that include perchlorate. In addition, DOD has removed soil and treated groundwater at the Massachusetts Military Reservation and Camp Bonneville in Washington State.

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In conclusion, Mr. Chairman, DOD faces significant challenges, and potentially large costs, in addressing emerging contaminants, particularly in light of the scientific developments and regulatory uncertainties surrounding these chemicals and materials. To help address them, DOD recently identified five emerging contaminants for which it is developing risk management options. As in the case of TCE, DOD took action to address contamination after EPA established an MCL in 1989. DOD has stated that further efforts to address perchlorate would require a regulatory standard from EPA and/or the states. The fact that some states have moved to create such standards complicates the issue for DOD by presenting it with varying cleanup standards across the country.

As the debate over a federal perchlorate standard continues, the recently-issued health studies from CDC and FDA may provide additional weight to the view that the time for such a standard may be approaching. Until one is adopted, DOD will continue to face the challenges of differing regulatory requirements in different states and continuing questions about whether its efforts to control perchlorate contamination are necessary or sufficient to protect human health.

Mr. Chairman, this concludes my prepared statement. I would be happy to respond to any questions that you or Members of the Subcommittee may have at this time.

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## Contacts and Acknowledgements

For further information about this testimony, please contact John Stephenson at (202) 512-3841 or [stephensonj@gao.gov](mailto:stephensonj@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Contributors to this testimony include Steven Elstein, Assistant Director and Terrance Horner, Senior Analyst.

Marc Castellano, Richard Johnson, and Alison O'Neill also made key contributions.

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## Appendix I: Selected GAO Reports on Defense-related Hazardous Waste Issues

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*Defense Health Care: Issues Related To Past Drinking Water Contamination at Marine Corps Base Camp Lejeune*, GAO-07-933T (June 12, 2007).

*Defense Health Care: Activities Related To Past Drinking Water Contamination at Marine Corps Base Camp Lejeune*, GAO-07-276 (May 11, 2007).

*Perchlorate: EPA Does Not Systematically Track Incidents of Contamination*, GAO-07-797T (April 25, 2007).

*Environmental Information: EPA Actions Could Reduce the Availability Of Environmental Information To The Public*, GAO-07-464T (February 6, 2007).

*Military Base Closures: Opportunities Exist to Improve Environmental Cleanup Cost Reporting and to Expedite Transfer of Unneeded Property*, GAO-07-166 (January 30, 2007).

*Perchlorate: A System to Track Sampling and Cleanup Results Is Needed*, GAO-05-462 (May 20, 2005).

*Military Base Closures: Updated Status of Prior Base Realignments and Closures*, GAO-05-138 (January 13, 2005).

*Environmental Contamination: DOD Has Taken Steps To Improve Cleanup Coordination At Former Defense Sites But Clearer Guidance Is Needed To Ensure Consistency*, GAO-03-146 (March 28, 2003).

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<b>Congressional Relations</b>	<p>Gloria Jarmon, Managing Director, <a href="mailto:JarmonG@gao.gov">JarmonG@gao.gov</a> (202) 512-4400 U.S. Government Accountability Office, 441 G Street NW, Room 7125 Washington, D.C. 20548</p>
<b>Public Affairs</b>	<p>Paul Anderson, Managing Director, <a href="mailto:AndersonP1@gao.gov">AndersonP1@gao.gov</a> (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, D.C. 20548</p>

**STATEMENT OF**

**MR. ALEX BEEHLER**

**ASSISTANT DEPUTY UNDER SECRETARY OF DEFENSE  
(ENVIRONMENT, SAFETY, & OCCUPATIONAL HEALTH)**

**BEFORE THE  
SUBCOMMITTEE ON READINESS  
OF THE  
HOUSE ARMED SERVICES COMMITTEE**

**July 12, 2007**

Chairman Ortiz, Ms. Davis, and distinguished members of the Subcommittee, I appreciate the opportunity to appear before you today to address the Department of Defense's (DoD's) activities associated with emerging contaminants and environmental restoration at active and Base Realignment and Closure (BRAC) installations, and Formerly Used Defense Sites (FUDS).

***Defense Environmental Restoration Program***

The Department of Defense is cleaning up property and protecting human health and the environment from contamination resulting from past military activities. The Department's cleanup effort, the Defense Environmental Restoration Program (DERP), actually predates the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), which forms the basis for most of the federal cleanup work in the United States. The DERP is conducted at over 31,000 sites at over 4,600 active installations, Base Realignment and Closure (BRAC) installations, and Formerly Used Defense Site (FUDS) properties. DoD cleanups occur in all 50 states, the District of Columbia, and U.S. Commonwealths and Territories, with more than \$1.8 billion annual budget and an estimated \$32.6 billion cost-to-complete measured from Fiscal Year 2007. CERCLA and its implementing regulation, commonly referred to as the National Contingency Plan (NCP), provide the main framework and process for study and clean up under the DERP. DoD considers "emerging contaminants" as contaminants for which there are no published toxicity values or standards, or the values or standards are evolving. Emerging contaminants are addressed under DERP using the same risk-based CERCLA cleanup process as other contaminants of concern.



Like CERCLA, the DERP is a mature program with its cleanup sites managed according to risk to provide the most protection of human health and the environment at the earliest opportunity. DoD and its Components have years of experience developing cost estimates for cleanup. These estimates are integrated into DoD's Planning, Programming, and Budget Execution process using realistic DERP environmental restoration goals based on a "worst first" cleanup philosophy that tackles the complex higher risk sites first to achieve the greatest risk reduction within DoD's resources. Meeting these goals is predicated on stable and predictable DERP funding built upon site specific information from the bottom-up for the two main components of DERP:

- Installation Restoration Program (IRP) – which the Department has been using since the 1980s to address the release of hazardous substances and pollutants or contaminants resulting from past practices that pose human health or environmental risks; and
- Military Munitions Response Program (MMRP) –While the military has been cleaning up unexploded ordnance since DERP began, the Department formally established goals in 2001 to manage environmental responses to unexploded ordnance, discarded military munitions, and munitions constituents. This category does not include any operational range, operating storage or manufacturing facility, or permitted facility for the treatment or disposal of military munitions.

As of the end of FY 2006, DoD has achieved "remedy in place" or "response complete" ("RIP/RC") for response actions at about 23,000 IRP sites, or approximately 83 percent. The IRP RIP/RC percentage for active installations is 85 percent (16,833 out

of 19,796), for BRAC locations 85 percent (4,275 out of 5,010), and for FUDS properties 67 percent (2,014 out of the 3,021).

In 2001, the Department formally established the Military Munitions Response program (MMRP) under DERP. As of the end of FY 2006, there are 3,316 MMRP sites at about 1,900 current and former Defense properties. DoD completed response actions at about 25 percent or 821 of these sites, of which 226 sites are at active installations, 122 sites are at BRAC installations, and the remaining 473 sites are at FUDS properties.

#### ***Risk Management in DoD Cleanup***

##### *Relative Risk Prioritization to Achieve Maximum Risk Reduction*

DoD employs a risk management approach in prioritizing investigation and response efforts which focuses first on response actions to address higher relative risk and then, when resources become available, focuses on addressing longer-term, risk management actions. This risk management approach applies to all environmental restoration program sites at active installations and FUDS properties.

The DERP uses two similarly devised, risk-based frameworks to prioritize response actions at IRP and MMRP sites. IRP sites use a relative-risk site evaluation protocol that evaluates relative risk (high, medium, or low relative-risk) based on the nature and extent of contamination (including emerging contaminants) found at a site, the potential for contaminants to migrate, and an assessment of potential impacts on populations and ecosystems. MMRP sites are prioritized using the Munitions Response Site Prioritization Protocol (MRSPP). The MRSPP evaluates relative risk by reviewing the hazards of unexploded ordnance and discarded military munitions; the unique, acute effects of any chemical warfare material; potential chronic health hazards posed by

munitions constituents including emerging contaminants; and possible impacts on human populations and ecosystems. The phases for investigation and cleanup under DERP are similar for each program and are based on CERCLA and the NCP. DoD established one program goal for all high relative risk sites at active installations and FUDS properties in the Installation Restoration Program: nearly all remedy in place or response complete (RIP/RC) by FY 2007. Current projections are that 89 percent of DoD's high-relative risk sites will achieve that goal.

Another long term goal is achieving RIP/RC for all (high, medium, and low-relative risk sites) IRP sites at active installations by the end of FY 2014, which current projections show nearly all DoD active installations will attain. The corresponding long term IRP goal for FUDS is the end of FY 2020, and reflects the differences in the kinds of sites included in the FUDS program, such as the larger number of MMRP sites and clean up of sites with multiple parties other than DoD. The FUDS program focuses on the cleanup of contamination on property transferred out of DoD before October 17, 1986. Although DoD no longer owns these properties, it works closely with regulators and current property owners to achieve environmental restoration program goals. FUDS IRP sites are currently expected to achieve about 92 percent RIP/RC by the FY 2020 goal.

Conversely, under the BRAC program, the Department cleans up sites located on military installations identified for closure or realignment in a series of special legislation since 1988. BRAC 2005 will result in 24 major base closures, 24 major realignments and 765 minor actions. BRAC 2005 differs from the prior BRAC rounds because the majority of the installations to be closed under BRAC 2005 have been performing

environmental remediation work for many years. The Department has achieved RIP/RC at 85 percent of legacy BRAC IRP sites and 63 percent of BRAC 2005 IRP sites.

The FUDS program is also working to improve progress towards program goals through performance reviews and annual objectives. Beginning in 2000, the Department initiated a series of enterprise-wide reforms to transform business practices. Through the Army's strategic plan, the Corps of Engineers has increased the emphasis on progress towards program goals, with specific annual objectives to meet RIP/RC. Headquarters, Corps of Engineers, also conducts quarterly Command Performance Reviews to ensure that Districts and Divisions achieve their goals. And lastly, the Army improved accuracy and stability of cost to complete estimates, reducing cost growth, stabilizing cost estimates, and increasing overall fiscal accountability.

*Risk Assessment for Environmental Response Actions*

While the Department uses prioritization tools to focus its program and resources on assessing and addressing potential high relative risks first, the need to conduct response actions usually is determined by conducting a site-specific risk assessment consistent with CERCLA, and the NCP, and EPA guidance. Emerging contaminants and other contaminants of concern are identified and evaluated during the remedial investigation and corresponding baseline risk assessment process. Risk assessments and the results of site characterization efforts are used by DoD to determine if individuals or populations may be exposed to contaminants from a site, the potential risks associated with that exposure, and the response action required. Risk assessments are conducted for emerging contaminants, along with other more common contaminants of concern. DoD assesses contaminants during risk assessments using site-specific exposure scenarios and

uses published toxicity values to characterize risks to both current and potential future populations, consistent with U.S. Environmental Protection Agency (EPA) guidance. Also consistent with EPA guidance, when no published toxicity values are available (as may be the case for emerging contaminants), DoD uses the best available current science to evaluate the risks in determining the need for a response at a site.

***Emerging Contaminants—Perchlorate Background***

Perchlorate is both man-made and naturally occurring. Since the 1940s, DoD has used potassium and ammonium perchlorate as oxidizers in explosives, pyrotechnics, rocket fuel, and missiles. Perchlorate is by far the most efficient and stable propellant oxidizer available. The high ignition temperature, controllable burn rate, and stable chemical characteristics of perchlorate reduce its handling and storage risks as well as the likelihood of unexpected detonations.

Private industry uses perchlorate in explosives, air bags, matches, dyes, road flares, fireworks, and paints. Other commonly used chemicals, such as chlorine bleach and perchloric acid, are also thought to contribute to perchlorate found in the environment.<sup>1</sup> Perchlorate is also found naturally in some agricultural fertilizers and occurs naturally through atmospheric deposition that has occurred over thousands of years as evidenced by its build up in desert environments. However, perchlorate is highly soluble in water and EPA and several states have taken or are considering measures to address public health concerns.

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<sup>1</sup> Massachusetts Department of Environmental Protection. August 2005, draft report. Occurrence and Sources of Perchlorate in Massachusetts.

***Dispelling Some Myths About DoD and Perchlorate.***

There are two misperceptions about DoD and perchlorate. First, while it is sometimes stated that DoD will not initiate response actions for perchlorate without the promulgation of a Maximum Contaminant Level (MCL), this is not true. Seven specific examples are discussed in detail below. Second, while DoD is a major *purchaser* of perchlorate it is not the sole user of perchlorate, nor does it appear from the data examined, that DoD facilities are a major source of perchlorate *detections* in drinking water. Provided further below are summary results from DoD's assessments of perchlorate at DoD installations and Formerly Used Defense Sites, as well as findings by researchers and state regulators that support this statement.

Irrespective of MCL promulgation, DoD has been taking appropriate response actions for perchlorate, and for contaminated sites that include perchlorate, under a number of statutory authorities and in coordination with EPA and State regulators. "Response action" is a term of art under CERCLA that includes site investigations to risk assessments and remedial actions. In many cases, the Department has conducted expeditious soil cleanups as removal actions in accordance with the National Contingency Plan. Removal actions can be taken before formal Records of Decision (RODs) are completed but are coordinated with regulators. Likewise, pilot treatment projects – such as the treatment unit at Edwards Air Force Base – can be constructed and placed into service as part of the investigation stage even before RODs are signed. These pilot treatment projects often remove substantial contamination as part of the feasibility and verification process conducted prior to deploying the technology fully. Thus, RODs alone are not an effective measure of an agency's response or cleanup activities.

Prior to the National Academy of Sciences review of perchlorate science in January of 2005 and EPA's subsequent posting of a reference dose, no final federal peer-reviewed toxicity values for perchlorate had been adopted. Yet, before 2005, while the risks to human health related to low levels of perchlorate were being determined, DoD initiated responses at sites determined by risk assessments to pose a potential risk to the public and the environment, using best available toxicity information at the time.

DoD has worked hard to dispel the myth that action cannot be taken until an MCL exists; in fact, the Department has been developing with EPA and the Environmental Council of States (ECOS) a series of white papers to provide information and improve coordination regarding cleanup of emerging contaminants. The Department has also established a process within DoD to identify emerging contaminants at an early stage, determine if they are used by DoD, assess the impacts of potential changes in regulatory status, and develop proactive risk management options for DoD program managers to respond to these chemicals.

Initial reactions by public and regulators are often that DoD must be the source of perchlorate contamination because of the portrayal of perchlorate releases almost singularly from rocket fuel. As States and local authorities examine the evidence more closely, they are coming to different conclusions. For example:

On April 10, 2007 the California House Natural Resources Committee, Subcommittee on Water and Power, led by Rep. Grace F. Napolitano (D-CA), held an oversight field hearing on "Sustainable Water Supplies for the West: Part I – Protecting Groundwater Resources." At the hearing, Mr. Robert E. Martin, General Manager, East Valley Water District, Highland, CA provided the following testimony:

“Based upon research conducted by our regional water quality control board (Santa Ana Region), we have concluded that our perchlorate problem can be traced back to fertilizer brought in from South America in the early 20th century and used on orange groves that are now part of our service area. Since these deliveries were made generations ago and land ownership has changed, often many times, there is little hope of our securing funding help from principal responsible parties. This means that the customers of the East Valley Water District will have to bear the cost of building and operating complex perchlorate treatment systems.”

In a March 14, 2005 letter to EPA Assistant Administrator Ben Grumbles, Mr. Robert Golledge, Commissioner, Massachusetts Department of Environmental Protection stated the following:

“In March 2004, the Department initiated the process to establish a drinking water maximum contaminant level (MCL) for perchlorate by promulgating regulations requiring all public water supplies to test for perchlorate. Several rounds of sampling have been completed statewide. Nine public water supplies have detected perchlorate, seven of the nine have perchlorate ranging from just below 1 ppb to slightly above 3 ppb. However, two water supplies had greater than 45 ppb, one as high as 1300 ppb. When confronted with the perchlorate plume at Massachusetts Military Reservation in 2001, most thought the primary source of perchlorate contamination was the result of military training activities. None of the nine water supplies that have tested positive for perchlorate in Massachusetts appear to have any connection to military bases or activities.”



***DoD Perchlorate Policy***

DoD has had perchlorate policies specifically directing perchlorate assessment since November 2002. DoD's most recent perchlorate policy, released in January 2006, requires perchlorate sampling in drinking water, groundwater, and wastewater discharges. In this policy, DoD also established a 24 part per billion (ppb) level of concern in water that is based on the science review by the National Academy of Sciences and EPA's reference dose. The DoD "level of concern" is simply a departure point for site-specific risk analyses. Site-specific risk analyses may include consideration of the relative source contribution of perchlorate in food and water. DoD has complied, and will continue to comply with applicable Federal or state standards regarding perchlorate.

***DoD's Integrated Risk Management Approach to Perchlorate***

DoD has adopted a three-pronged approach to risk management of perchlorate -- assessment of potential releases, taking appropriate response actions where necessary, and investing in research and development.

***Assessment of Potential Releases***

The myth that DoD facilities are the only major source of perchlorate exposure is not supported by data collected by government and non-governmental entities. While the Department does have sites with perchlorate releases, these releases are mostly confined to DoD installations and are being addressed under the DERP in coordination with regulators. DoD sites most likely to have perchlorate releases from past activities are rocket motor testing areas, rocket motor overhaul or "hog-out" facilities and detonation pits for unwanted munitions. These activities and/or the releases are now controlled.

Cumulatively through FY 2006, perchlorate sampling has been conducted at 237 DoD installations or former properties. The majority of samples taken at sites where perchlorate releases may have occurred have resulted in either “non-detects” or levels well below 24.5 ppb, which is a translation of the current EPA reference dose to a drinking water equivalent level; in fact, of the 146 installations that reported sampling in FY 2006, only nine installations reported a detection between 4 ppb and 24 ppb in any media: drinking water, surface water, groundwater, or soil. Eight installations indicated detection above 24 ppb in any of these media. Some of these detections are in point-source wastewaters subject to limits in state discharge permits. Since 2004, sampling results have been posted on our publicly accessible web site (<https://www.denix.osd.mil/denix/Public/Library/Water/Perchlorate/perchlorate.html>).

Perchlorate has been a particular concern in California. DoD and the State of California worked collaboratively to develop a prioritization protocol for assessing DoD sites with *potential* perchlorate releases -- 924 current and Formerly Used Defense Sites (FUDS) in California were jointly reviewed by DoD and the State -- so far, 97 percent of these sites do not currently appear to contain perchlorate nor pose a threat to drinking water related to perchlorate. The remaining three percent have some confirmation sampling underway or the completed assessments are still being reviewed by Californian regulatory agencies.

In addition to the California perchlorate study, the FUDS program has undertaken a systematic approach to reviewing FUDS properties to identify, evaluate, and sample properties where perchlorate is likely to be found. The first step was a munitions review where 1,137 types of munitions were reviewed to determine potential perchlorate and

other constituents content. Approximately 125 types of munitions were found to contain perchlorate with quantities that ranged widely from grams to trace amounts. The second step was screening all of the FUDS properties for historical use or storage of perchlorate, approximately 1000 of those FUDS properties were identified as having some potential for having had perchlorate on site. The third and final step in the FUDS perchlorate review is a thorough site-specific evaluation. Archival and munitions review information is used to make determinations about the potential for perchlorate releases and the need for sampling of site environmental media. Based on that review, DoD conducts a site inspection (SI), collecting samples to determine if perchlorate was released to soil, groundwater, or surface water, and if the releases were related to past DoD operations. During the site inspection (SI) phase, DoD conducts sampling for munitions constituents including perchlorate. Sampling for perchlorate has begun at some sites. DoD's goal, as established by Congress, is to complete all the MMRP SIs by FY 2010. The FUDS program continues to work towards meeting this goal.

Research sponsored by DoD and other agencies is also helping to answer questions about the natural and other man-made sources of widespread, low levels of perchlorate occurring in numerous states across the nation. New results from research are being published and are particularly enlightening:

- Fireworks. About 200 million pounds of fireworks were consumed in the U.S. in 2003. More than 90% of that perchlorate is imported and not captured in domestic production/purchase statistics. A fireworks' charge contains up to 70% potassium perchlorate. A lake was studied before and after fireworks

displays. After the displays, perchlorate in surface water rose from a pre-display mean of 0.04 ppb to a maximum of 44 ppb in one sample collected.<sup>2</sup>

- Road flares. There are 20-40 million road flares sold in the U.S. annually with about 10 grams of potassium perchlorate per 15 minute flare. Many flares are not completely burned when used. Field tests measuring runoff from a flare on I-95 showed a maximum concentration leaving the highway and flowing to streams of 314,000 ppb.<sup>3</sup>
- Consumer Products. Perchlorate is found in a number of electrochemically-prepared consumer products that can be released to the environment such as herbicides and sodium hydroxide. It is also present in household bleach with concentrations increasing with storage length.<sup>4 5 6</sup>
- Fertilizers. A great deal of the widespread low level contamination in agricultural regions results from the use of imported fertilizers from Chile which is high in perchlorate. This fertilizer is still being imported and imports have been increasing over the past decade. Ironically, this fertilizer is often

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<sup>2</sup> Wilkin, R. T., Fine, D. D., Burnett, N. G. (2007). Perchlorate Behavior in a Municipal Lake Following Fireworks Displays. *Sci. Technology* 41(11), 3966-3971.

<sup>3</sup> Aziz, C. E., Borch, R., Nicholson, P., and Cox, E. (2006). *Perchlorate environmental occurrence, chemistry, toxicology, and remediation technologies* (Gu, B., Coates, J. Ed). Springer Science and Business Media, Inc.

<sup>4</sup> Aziz, C. E., Borch, R., Nicholson, P., and Cox, E. (2006). *Perchlorate environmental occurrence, chemistry, toxicology, and remediation technologies* (Gu, B., Coates, J. Ed). Springer Science and Business Media, Inc.

<sup>5</sup> Massachusetts Department of Environmental Protection. August 2005, draft report. Occurrence and Sources of Perchlorate in Massachusetts.

<sup>6</sup> Kang, N., Anderson, T., Jackson, W. A. (2006). *Photochemical formation of perchlorate from aqueous oxychlorine anions*. *Analytica Chimica Acta*. 567 (1), pp 48-56.

used on organically grown crops. Other organic fertilizers, such as those that use kelp, also contain low levels of perchlorate.<sup>7 8 9</sup>

- Natural sources. Perchlorate occurs naturally in the environment as a result of both dry and wet deposition. There are a number of natural deposits around the world with high levels of perchlorate. The U.S. Geological Survey has identified a large area of naturally occurring perchlorate in west Texas.<sup>10 11</sup>

DoD sponsored research on analytical techniques has been especially rewarding. Using scientifically valid isotopic analyses techniques, The Department is now able to distinguish clearly between naturally occurring perchlorate and that which is manufactured. On-going research shows promise in using the same techniques to distinguish between various types of manufactured perchlorate. With an ability to differentiate between different sources of perchlorate, responsible parties can be identified with greater confidence, as can sources that may be contributing to perchlorate exposures.

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<sup>7</sup> Dasgupta, P. K., Martinelango, P. K., Jackson, W. A., Anderson, T. A., Tian, K., Tock R. W., Rajagopalan, S. (2005). *The origin of naturally occurring perchlorate: The role of atmospheric processes.* Environmental Science Technology. 39(6). pp 1569-1575.

<sup>8</sup> Snyder, S. A., Pleus, R. C., Vanderford, B. J., Holady, J. C. (May 2006). *Analytica Chimica Acta.* 567(1). pp 26-32.

<sup>9</sup> Dasgupta, P. K., Dyke, J. V., Kirk, A. B. Jackson, W. A. (2006). *Perchlorate in the United States: Analysis of relative source contributions to the food chain.* Environmental Science Technology. 40(21) pp 6608-6614

<sup>10</sup> Rao, B., Anderson, T. A., Orris, G. J., Rainwater, K. A., Rajagopalan, S., Sandvig, R. M., Scanlon, B. R., Stonestrom, D. A., Walvoord, M. A., Jackson, W. A. (2007). *Widespread natural perchlorate in unsaturated zones of the Southwest United States.* Environmental Science Technology.

<sup>11</sup> Rajagopalan, S., Anderson, T.A., Fahlquist, L., Rainwater, K. A., Ridley, M., Jackson, W. A. (2006). *Widespread presence of naturally occurring perchlorate in high plains of Texas and New Mexico.* Environmental Science Technology. 40(10) pp 3156-3162.

Response Actions

DoD has been taking appropriate response actions related to perchlorate releases. Well before there was any clear regulatory requirement, DoD began response and cleanup actions at a number of bases including the following:

- Massachusetts Military Reservation (MMR). Groundwater contaminated with RDX and perchlorate is being remediated through a groundwater treatment system. Removal actions have been completed for contaminated soils. All investigations and actions have been fully coordinated with EPA Region 1 and the Commonwealth of Massachusetts.
- Longhorn Army Ammunition Plant, Texas. A fluidized bed reactor was added to a TCE groundwater treatment system in 2001 to remove perchlorate from an effluent. There is no groundwater use and actions were taken to protect Caddo Lake (drinking water supply). Soil covers were placed over two soils sites which contained high perchlorate concentrations to prevent runoff into streams. Final RODs are being developed to address remaining soil contamination through soils removal and disposal. All actions have been fully coordinated with EPA Region 6 and the State of Texas.
- Naval Weapons Industrial Reserve Plant (NWIRP) McGregor, Texas. At McGregor, the Navy's in-situ biological treatment system is treating perchlorate in groundwater and soil; this is the first – and world's largest – full-scale bio-wall application for groundwater remediation of perchlorate and volatile organic compounds. Recent groundwater data shows a marked decrease in the amount of perchlorate in groundwater. In fact, last October, the NWIRP McGregor became

the very first U.S. Navy facility to receive a “Ready for Reuse” determination from EPA. This verifies that environmental conditions at the property are protective of human health and the environment for its current and future commercial, industrial and agricultural uses. A Record of Decision was completed.

- White Oak, Maryland. White Oak has a number of RODs. The RODs primarily address other key contaminants but the treatment systems put in place under the RODs are also addressing perchlorate. All actions have been coordinated with EPA Region 3 and State of Maryland and both agencies concurred with the remediation goal for perchlorate.
- Redstone Arsenal, Alabama. Perchlorate was detected in soil and groundwater. A Remedial Investigation report was completed in July 2005. A Feasibility Study is underway to analyze remedial options. A health risk evaluation was conducted for surface water off-base and it was determined that there is no health risk to recreational users and residents as a municipal water system supplies drinking water. There is no human consumption of groundwater either on-base or off-base, thus no threat to human health. Sampling showed non-detectable levels of perchlorate in the Tennessee River. The Arsenal is working closely with EPA and Alabama Department of Environmental Management (ADEM).
- Vandenberg Air Force Base, California. Perchlorate was detected in groundwater but drinking water supplies have not been affected by perchlorate. The Air Force initiated a pilot treatment process that uses injections of lactate and a de-chlorinating agent. The pilot study was successful – both TCE and perchlorate

were removed to non-detectable levels in one month. Planning is underway to scale up the pilot treatment process to complete TCE and perchlorate removal at this site.

- Edwards Air Force Base, California. Perchlorate was detected in soil at Edwards. Drinking water supplies have not been affected by perchlorate. In May 2003, Edwards AFB implemented a pilot project/treatability study to evaluate the effectiveness of using ion-exchange technology for perchlorate removal from contaminated groundwater. As of January 2007, the system has treated 32.1 million gallons and removed 133.7 pounds of perchlorate from the groundwater. Edwards also performed a field study that examined the effectiveness of a soil flushing technique to remove perchlorate contamination from the soil. Preliminary results indicate almost complete removal of perchlorate from the soil column. Cleanup actions are continuing.

#### Research and Development

DoD has invested over \$114 million in research related to perchlorate toxicity, treatment technologies, perchlorate substitutions in munitions and training materials, perchlorate recycling and analytical and detection advancements. The Department's investments are paying dividends – DoD has advanced the state-of-technology regarding perchlorate treatment in water and has found suitable substitutes for a number of military-specific applications.

For example, the Department's research and development has achieved advances in ex-situ treatment using bio-reactors and ion exchange, and in-situ treatment using bioremediation, permeable reactive barriers, substrate injection, soil composting, and



phytoremediation. In Fiscal Years 2005 through 2007, DoD competitively selected and deployed six water treatment technology demonstrations in California in Rialto, Colton, Fontana, West Valley and East Valley. Both the water purveyors and the California Department of Health Services were involved. These projects added approximately 5,000 gallons per minute of new treatment capacity in the Inland Empire region with significant cost reduction potential in capital and operation and maintenance costs.

Regarding military unique applications, research and development has led to finding perchlorate substitutes for ground burst simulators and hand grenade simulators. These simulators accounted for a majority of expended perchlorate on Army training ranges in past years. Production of the replacement is scheduled to begin in 2008. Work is underway to eliminate perchlorate in pyrotechnic flare compositions. Lab-scale testing has identified perchlorate-free red, green, and yellow signal flare compositions and they are currently in the full-scale demonstration phase. Alternative approaches to some ammonium perchlorate-based solid rockets are in various stages of development, testing and evaluation. The alternatives must meet high performance specifications and have a low environmental burden. No drop-in replacement exists for heavy load missiles or launch vehicles.

#### ***DoD TCE Response Actions***

Trichloroethylene, or TCE, is another contaminant of concern that is addressed as needed in the DERP. TCE has been used as a solvent for cleaning metal parts by industry and business throughout the United States. Due to past disposal practices TCE has become a common contaminant in groundwater. TCE has been found in at least 852 of the 1,430 National Priorities List (NPL) sites identified by the EPA. DoD currently has

424 installations and FUDS properties with ongoing environmental restoration activities in which TCE has been identified.

As discussed earlier, site specific risk assessments are developed using toxicity values for contaminants. In the case of TCE, EPA is revising their draft chemical risk assessment for TCE in light of a review of the science by the National Academy of Sciences. In the absence of an IRIS value or promulgated standards, DoD follows the hierarchy in the 2003 OSWER guidance and DoD-EPA-ECOS Provisional Values paper in selecting toxicity values for use in site-specific risk assessment. When new toxicity values are issued by EPA, DoD will use these values in future risk assessments and to evaluate the continued viability of past remedial actions. Where a site-specific assessment indicates that a release presents an unacceptable risk to human health or the environment, DoD is taking appropriate response actions at active installations, closed installations, and FUDS. DoD has been taking appropriate response actions related to releases of TCE for many years. The DERP Annual Report to Congress provides summaries of cleanup actions at DoD installations. This report is publicly available at <https://www.denix.osd.mil/denix/Public/News/OSD/DEP2006/deparc2006.html>

While cleanup to address past releases continues, the Department has worked continually to reduce the use of TCE and other toxic solvents where suitable replacements can be found. To reduce the risk of exposure to TCE and to prevent the release of TCE into the environment, DoD now requires strict handling procedures and pollution prevention measures. The Department has replaced products containing TCE with other types of cleaning agents such as citrus-based agents, mineral oils and other non-toxic solutions. The Department's search for safer and greener alternatives to

trichloroethylene in degreasing operations dates back more than ten years, with efforts by Army's Holston Ammunition Plant, Barstow's Marine Corps Logistics Base (MCLB) and Kelly Air Force Base. These efforts resulted in reducing the Army's use of TCE by 61% and entirely eliminating MCLB's TCE usage, despite an increase in workload over the same time period. Under EPA's 17 Chemical Reduction Plan that included TCE, Kelly's original goal of 50% overall reduction was actually surpassed (59%) and was achieved ahead of schedule by two years. Other efforts include the study of alternative processes such as baking soda blasting for paint removal on aircraft and the Defense Logistics Agency's outreach to the community on alternative chemicals, such as biobased cleaners.

***Conclusion***

DoD has, and will continue to take, appropriate response actions for TCE, perchlorate, and other contaminants. The latest round of DoD-wide perchlorate sampling data shows that the Department is taking appropriate response actions for perchlorate and DoD installations, overall in the situations examined, do not appear to be a significant source of perchlorate releases to the nation's drinking water. DoD has acted responsibly at each step as the science and understanding of perchlorate and other contaminants has evolved. Protection of human health and the environment is an important component of DoD's mission.

In closing, I sincerely thank the Committee for this opportunity to highlight the Department's response activities related to chemical contaminants.



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**QUESTIONS AND ANSWERS SUBMITTED FOR THE  
RECORD**

JULY 12, 2007

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## QUESTIONS SUBMITTED BY MR. ORTIZ

Mr. ORTIZ. In the absence of an EPA standard, do you think it is prudent for the Department of Defense to move forward and clean up sites contaminated with perchlorate?

Mr. STEPHENSON. In the absence of a federal standard, at least 8 states have established non-regulatory action levels or advisories that range from 1 part per billion (ppb) to 51 ppb of perchlorate. In addition, Massachusetts established a drinking water standard of 2 ppb, and California is in the final stages of rulemaking to establish a 6 ppb standard. DOD certainly will have to move forward and clean up sites contaminated with perchlorate in those states.

Our work detailed some of the significant challenges, and potentially large costs, that the Department of Defense (DOD) must address with regard to perchlorate.<sup>1</sup> DOD's designation of perchlorate as an emerging contaminant, and January 2006 revisions to its perchlorate policy, reflects the department's recognition that the chemical has a significant potential impact on people and/or the department's mission. As we discussed in our April and July 2007 testimonies, DOD has certain responsibilities with regard to contaminants that are regulated by EPA or state governments, but the department's responsibilities and cleanup goals are less definite for contaminants, such as perchlorate, that lack federal regulatory standards.<sup>2</sup>

The fact that some states have moved to create their own standards further complicates cleanup issues for DOD by presenting the department with varying standards across the country. Until a national perchlorate standard is adopted, DOD will continue to face differing requirements in different states and continuing questions about whether its efforts to control perchlorate contamination are necessary or sufficient to protect human health. Until EPA acts, we believe it is prudent for the department to have adopted a uniform perchlorate policy with sampling and cleanup criteria for both its active and closed installations. We also believe that DOD can do more to keep the public informed of its sampling and cleanup efforts for perchlorate and other emerging contaminants.

Mr. ORTIZ. Please tell us about the impact of human exposure to TCE from drinking water and from vapors in the air?

Mr. STEPHENSON. According to the Department of Health and Human Services' (HHS) Agency for Toxic Substances and Disease Registry (ATSDR), trichloroethylene (TCE) is pervasive in the environment and is known or suspected to cause a range of health effects depending upon the level and length of exposure. Most people are likely to be exposed to TCE simply by drinking and breathing, but ATSDR also reported that TCE has been found in a variety of foods such as meats and margarine. HHS's National Health and Nutrition Examination Survey estimated that approximately 10 percent of the U.S. population has detectable levels of TCE in their blood as a result of these exposures.

ATSDR's toxicological profile provides a summary of the known short- and long-term effects from drinking and breathing TCE. Drinking small amounts of TCE over long periods may cause liver and kidney damage, harm the immune system, and impair fetal development in pregnant women. Drinking large amounts may cause nausea, liver damage, impaired heart function, or death. With regard to breathing, ATSDR's profile states that small amounts of TCE may cause headaches, lung irritation, poor coordination, and difficulty concentrating, whereas large amounts may impair heart function and cause unconsciousness, nerve, kidney and liver damage, and death. However, there is less certainty about the long-term health effects from breathing small amounts of TCE on diseases such as cancer.

ATSDR's profile noted that TCE is "reasonably anticipated to be a human carcinogen," and the International Agency for Research on Cancer determined that TCE

<sup>1</sup>GAO, *Perchlorate: A System to Track Sampling and Cleanup Results is Needed*, GAO-05-462 (Washington, D.C.: May 20, 2005).

<sup>2</sup>GAO, *Perchlorate: EPA Does Not Systematically Track Incidents of Contamination*, GAO-07-797T (Washington, D.C.: April 25, 2007) and *Environmental Contamination: Department of Defense Activities Related to Trichloroethylene, Perchlorate, and Other Emerging Contaminants*, GAO-07-1042T (Washington, D.C.: July 12, 2007).

is probably carcinogenic to humans—specifically kidney, liver, and cervical cancers, Hodgkin’s disease, and non-Hodgkin’s lymphoma—based on limited evidence of carcinogenicity in humans and additional evidence from animal studies. Although EPA’s Integrated Risk Information System (IRIS) initially contained a carcinogenicity assessment, EPA withdrew it from IRIS in 1989. As such, EPA’s IRIS database does not currently contain information on the health effects of TCE exposures. In 1998, EPA initiated a new TCE assessment but will not likely complete it until 2010, or later.

Mr. ORTIZ. Please provide the Committee with your recommendations for improvements in the management of environmental issues on DOD facilities?

Mr. STEPHENSON. We recommend that DOD improve publicly available testing and cleanup information for emerging contaminants, including TCE, on its Web sites. During the course of our work, DOD did improve the information provided to the public about the results from its perchlorate testing program.<sup>3</sup> In addition, we suggest that the Committee ask DOD and EPA to provide information about their joint work related to emerging contaminants, including (1) DOD involvement in EPA risk assessments, (2) DOD input into EPA regulations and IRIS updates, and (3) funding for studies that could advance their understanding of the health effects of emerging contaminants.

Mr. ORTIZ. Please describe how Environmental Management Systems function on installations. What proportion of these systems are paper-based, versus computer-based? I am aware that the Army has been conducting demonstration programs for web-based Environmental Management Information Systems. How are the web-based systems progressing, and how do they compare to the paper-based systems? What are the prospects for utilizing web-based Environmental Management Systems at all DOD facilities?

Secretary BEEHLER. An Environmental Management System (EMS) is a *process* for analyzing and improving environmental aspects of operations. EMS is a formal framework for integrating the consideration of environmental issues into the overall management structure at an installation. When properly implemented, an EMS identifies the environmental aspects of the mission, highlights and prioritizes areas of risk, promotes pollution prevention, and tracks progress toward environmental goals. Cross-functional teams are formed with members from the various organizations on the installation whose activities interact with and impact the environment. These teams identify issues that are provided to an environmental management council who advise the installation commander on the management/prioritization of objectives, goals, and targets. Through an EMS, actions are implemented to meet the objectives, goals, and targets, and then assessed for effectiveness. The management system facilitates correction action for continuous improvement. With a successful EMS, an installation evaluates the environmental impacts of the various operations (planned and existing) on the facility, then establishes objectives, targets, and projects/programs to improve or mitigate the more ‘significant’ impacts. For example, the most significant impact at an ‘administrative’ or ‘school house’ installation (e.g., Fort Myer or West Point) might be energy use. That installation’s EMS objectives and targets would then focus on reducing energy use and improving energy efficiency.

Within DoD, the majority of installations/organizations with an EMS use computer based information systems to assist with EMS operation. Each Service develops its own methods for implementing EMS within overall DoD policies. It is important to remember that the EMS is a management process—a way of thinking and operating. An EMS is not simply an information system.

Within the Army, the web-based Environmental Management Information Systems (EMIS) fielded in 2005 are fully functional. They have been well received by installation personnel and are both improving EMS performance and reducing administrative costs. EMIS automates current EMS architecture and provides a significant advance in performance and management of environmental tracking and task performance and has great potential in providing visibility of environmental performance Army wide. EMIS is significantly more cost effective than manual EMS systems and provides operational and management efficiencies.

DoD provides overarching guidance on EMS requirements and performance, allowing the Services to develop their own implementation procedures based on their mission requirements. The prospects are good for each Service to use web-based systems to support their EMS. It makes good business sense and would further the overall EMS concept by aiding in information availability and management. Each Service also provides some or all of their EMS training by web-based delivery. DoD

<sup>3</sup>See DOD’s Materials of Evolving Regulatory Interest Team Web site, <https://www.denix.osd.mil/denix/Public/Library/MERIT/merit.html>, last accessed on September 5, 2007.



already uses web-based systems (DENIX, FedCenter, and the Joint Services Pollution Prevention Library) to provide EMS information, guidance, lessons learned, best practices, and to facilitate EMS status reporting.

Mr. ORTIZ. I believe that all known, high-risk contamination sites should be speedily cleaned. However, I note that the Department has elected to place a priority of funding toward active installations and much lower priority toward former defense sites. Can you explain why there is a difference in approach?

Secretary BEEHLER. There are currently 21,106 active installation sites, which account for 68 percent of all Defense Environmental Restoration Sites. In FY 2007, the Department allocated 58 percent of the funds appropriated to the Department for Defense Environmental Restoration Programs towards the cleanup of active installations. By contrast, there are 4,654 Formerly Used Defense Sites (FUDS), which account for 14 percent of the total inventory. In FY 2007, the Department allocated 12 percent of the funds appropriated to the Department for the Defense Environmental Restoration Programs towards the cleanup of FUDS. The remainder of the funding is provided to Components to cleanup BRAC sites. In accordance with Congressionally mandated statutory requirements, first priority for funding has gone to BRAC sites, while active and FUDS locations are almost equal in relative funding.

In determining progress and allocating funding for FUDS, the number and scope of environmental restoration of all FUDS sites must be taken into account, including both Installation Restoration Program (IRP) sites and Military Munitions Response Program (MMRP) sites. The Department is also working diligently to determine the full extent of FUDS MMRP cleanup requirements. FUDS MMRP projects are generally more complex, higher cost projects, and are typically perceived to present a high hazard probability. The actual hazards associated with these sites will not be known until the Department has completed site surveys. The Department's goals for conducting MMRP preliminary assessments (PAs) and site inspections (SIs) are the end of FY 2007 and FY 2010 respectively. When these surveys are completed, they will improve our understanding of the risks associated with MMRP sites and improve our ability to identify and prioritize funding requirements and establish meaningful performance goals with accurate budget links. In 2003, the Department increased FUDS funding by \$20 million a year, to fund MMRP site surveys, recognizing that these budget requirements should be revisited once the surveys are completed. In addition, the Department is implementing a number of improvements to the program that will result in more efficient cleanups.

Mr. ORTIZ. Mr. Beehler, you indicated in your statement the Department has identified over \$32 billion worth of environmental cleanup requirements. Yet the Department has elected to request \$1.8 billion in funding in fiscal year 2008. Do you believe that the cost to complete environmental cleanup is a good metric? Do you believe that sufficient funding has been requested in the environmental restoration program to reduce existing contamination?

Secretary BEEHLER. The combined \$1.8 billion requested for fiscal year (FY) 2008 in the Defense Environmental Restoration and BRAC Accounts is sufficient to fund cleanup requirements identified for that year and to make progress in the lengthy remediation process for existing contamination.

The DoD cleanup program cost to complete estimate, currently about \$32 billion, is for a cleanup process that can take 12 or more years from identification of a cleanup site to having a remedy in place (RIP) after site characterization, investigation, remedy decision, design, and construction. The RIP milestone can then be followed by a three to 30-year or longer remedial action-operation phase before reaching the cleanup objective for the site. Even after reaching the cleanup objective, cleanup sites may be subject to periodic review and long term management. The cost-to-complete, as a snap shot of the total remaining cost of remediation, is a useful metric in managing the overall DoD cleanup program with 31,000 sites in different stages of the cleanup process. As site level execution occurs, annual funding requirements are developed and become the basis for the Department's annual budget request. Additional annual funding would not appreciably speed up the DoD cleanup program as a whole.

Mr. ORTIZ. If EPA determines that perchlorate should not be regulated with a national drinking water standard, what effect will that have on DOD's current and future perchlorate cleanup?

Secretary BEEHLER. A Maximum Contaminant Level (MCL) is a standard for public drinking water suppliers under the Safe Drinking Water Act. Cleanup actions to address perchlorate releases to the environment are continuing and will continue at DoD sites, with or without a federal MCL. The existence of an MCL will not affect whether a cleanup is conducted. DoD will use the perchlorate reference dose to indicate if a site-specific cleanup is needed. If it is determined that a response action

is needed, under the Comprehensive Environmental Response, Compensation, and Liability Act, the cleanup must comply with all requirements that are applicable or relevant and appropriate to the site-specific circumstances. If EPA were to promulgate an MCL for perchlorate, a State or federal MCL, whichever is more stringent, would generally be used as the cleanup level for ground water that may affect a drinking water supply.

Mr. ORTIZ. What actions is the Department taking to address the risk of inhalation of TCE vapors in air?

Secretary BEEHLER. For worker exposures to Trichloroethylene (TCE) vapors, the Department's policy is to comply with Occupational Safety and Health Administration (OSHA) standards in accordance with section 19 of the OSH Act (29 U.S.C. 668) and Executive Order 12196. DoD monitors and controls its worker exposures to TCE to within the OSHA permissible exposure limits.

DoD is also assessing and addressing inhalation of TCE vapors as part of its cleanup program. Vapor intrusion is the migration of volatile chemicals from subsurface media into overlying buildings. For DoD cleanups that involve a potential TCE vapor intrusion pathway, TCE exposures are evaluated during the investigation phase, as part of the site-specific human health risk assessment. If the risk assessment indicates that an action is required, a diverse set of measures may be evaluated to address the risk, although ventilation systems are generally placed on buildings themselves to control exposure to permissible levels.

DoD is developing guidance on evaluating potential exposures through vapor intrusion and the DoD Components are also developing more specific guidance. For example, the Army issued its interim Vapor Intrusion guidance on November 6, 2006 directing installations to assess and to mitigate unacceptable risks from vapor intrusion into existing buildings. DoD representatives are also working with the Interstate Technology Regulatory Council to develop specific sampling, characterization, and remediation technologies for indoor air.

Mr. ORTIZ. What efforts has the Air Force taken to monitor potential problems with disease resulting from exposure to harmful chemicals among former civilian employees and military personnel who previously worked at Kelly Air Force Base? What is the Department's approach for addressing contamination that has spread off of DOD installations into adjoining communities? How is this approach being implemented at Kelly Air Force Base?

Secretary BEEHLER. In April 2005, the Air Force Institute for Operational Health (AFIOH) conducted the *Case Series Investigation of Amyotrophic Lateral Sclerosis (ALS) Among Former Kelly Air Force Base Workers*. The study resulted from concerns over a possible cluster of amyotrophic lateral sclerosis (ALS) among former workers at Kelly Air Force Base (AFB). In an attempt to gain insight into the occupational, environmental and lifestyle exposure histories of Persons with ALS (PALS), the ALS Association-South Texas Chapter (ALSA-STC) and the AFIOH collaborated on a case series investigation of persons linked to Kelly AFB who reported having ALS. The report concluded: (1) Using reported prevalence figures as a comparison, PALS appeared similar to other ALS cases and the U.S. adult population for ALS disease course, recreational, immunization, infection/trauma, tobacco use, alcohol use, and family medical histories. (2) Historically, these cases may have been more physically active than other ALS case series and U.S. adults overall, perhaps due to a "healthy worker" or "healthy soldier effect." (3) The limitations of the study, including the highly heterogeneous population, amount of proxy report, absence of a control group, length of the questionnaire, and use of generalized comparison figures, must be considered when discussing and interpreting the results.

The San Antonio Metropolitan Health District, Environmental Health and Wellness Center offers free environmental health assessments to individuals who have ever lived near the former base for at least one year or who have ever worked at the former Kelly AFB. The center refers individuals if additional evaluation(s) are needed. In addition, the Air Force has partnered with the San Antonio Metropolitan Health District, Public Center for Environmental Health to conduct studies relating the community health concerns and the environmental program at the former Kelly AFB.

Additionally, individuals who contact the Air Force claiming health effects from past on-the-job exposure are referred to the Department of Labor Federal Employees Compensation division. Using established employment and medical verification, the Department of Labor processes these claims.

Mr. ORTIZ. Mr. Beehler, can you explain to me the current state of Environmental Management Systems and how the recent Executive Order may change the Department's approach for environmental management?

Secretary BEEHLER. An Environmental Management System (EMS) is a formal framework for integrating environmental issues and considerations into the overall

management structure at an installation. When properly implemented, EMS's identify the environmental aspects of the mission, highlight and prioritize areas of risk, promote pollution prevention, and track progress toward environmental goals.

DoD has 596 EMS appropriate facilities (506 U.S. and territories, 90 overseas). Implementing EMS overseas is not required by Executive Order (EO) 13423; however, DoD decided to make it a requirement for overseas facilities due to the overall benefits of an integrated management system. An EMS is "in-place" at all 506 U.S. facilities and 72 of the overseas facilities. (The term "in-place" means that the EMS elements have been developed and the plan-do-check-act cycle is beginning to function). Full EMS implementation in accordance with EO 13423 requirements is expected by Fiscal Year 2009. A DoD-wide work group was formed to oversee the implementation and operation of EMS's across the Department. Its membership includes representatives from the OSD staff, various DoD agencies, and the Military Departments.

The EMS work group is refining EMS guidance to emphasize the cross functional nature of the EMS framework, and the inter-relationships outside of the environmental community. For example, EMS implementation and operation is being written into both the Defense Installations Strategic Plan and the AT&L Implementation Plan. In addition, the Military Departments have developed EMS policies and training that emphasize awareness outside of their environmental directorates, as well as the criticality of senior leadership involvement. Together, these efforts are beginning to change how environmental management is perceived—moving from being a restriction on operations to being a mission enabling asset.

Many aspects of EO 13423 were already underway by the Department before the EO became official. DoD is moving towards a more sustainability based approach to environmental management by balancing mission, environment, and support activities. The EO will strengthen this relationship and will foster a closer relationship with the energy and transportation communities. These functions have always been related to our environmental programs, but they will now complement and enhance one another.

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#### QUESTIONS SUBMITTED BY MRS. MCMORRIS RODGERS

Mrs. MCMORRIS RODGERS. A 2002 GAO report (GAO-02-658) indicated that the Army Corps of Engineers had performed insufficient investigations in determining that certain Formerly Used Defense Sites did not require cleanup action. A chief concern of the GAO report was the Corps files did not contain evidence that the presence of hazardous, toxic and radioactive waste was assessed. The Corps determinations covered by the report date back to 1984. One of the subjects of this hearing is trichloroethylene or TCE. Because methods for testing for TCE in the 1980s were inconclusive at best, and the EPA did not adopt a TCE drinking water standard until 1989, does the Department of Defense intend to reassess for this hazardous contaminant as previous determinations are incomplete? Should public confidence in the Corps determinations be increased? If so, why?

Secretary BEEHLER. The referenced GAO report (GAO-02-658) concerned the methodology used to identify potential hazards at Formerly Used Defense Sites (FUDS) based on records, site visits, and the No DoD Action Indicated (NDAI) process. The Department addressed GAO's recommendations in 2002, acknowledging that in some cases, the FUDS project files were not complete or sufficient for an outside agency, such as GAO, to identify the "paper trail" leading to all decisions, but maintained that the Corps had amply demonstrated that decisions associated with site evaluation for FUDS eligibility and hazard evaluation were made appropriately and in cooperation with regulatory agencies. The Corps of Engineers subsequently issued new policies for file content and maintenance. In addition, the US Army Corps of Engineers (USACE) offered to review 'no further action' sites if new information about a site became available or at the request of a state or EPA.

The GAO report (GAO-02-658) does not mention trichloroethylene or the chemical sampling and analytical methods used for testing for trichloroethylene. The methods for testing for trichloroethylene have changed little since the 1980's, and still use the same technologies and method performance (precision, accuracy, sensitivity, and selectivity) capable of detecting concentrations between 1 to 5 parts per billion.

Further, the Superfund Amendment and Reauthorization Act, enacted in 1986, institutionalized the requirements for investigation and remediation of all chemical contamination that could potentially pose a risk to human health or the environment on active installations and Formerly Used Defense Sites. As such, previous NDAI determinations are considered complete unless new information becomes

available about the site or site chemicals or if a state or federal regulatory agency requests a review of a previous NDAI site.

Mrs. McMORRIS RODGERS. I would also like you to address your office's working relationship with the Army Corps of Engineers, the Environmental Protection Agency and other related agencies. How do you work with these entities to address environmental concerns in Formerly Used Defense Sites? Is there a review process for past determinations as new environmental concerns emerge? I appreciate the Department's work to address environmental issues resulting from important Department activities, but I hope that some isolated concerns are not neglected as we learn more about environmental hazards and possible connections to the Department of Defense.

Secretary BEEHLER. The Secretary of the Army is designated as the DoD Executive Agent for the Formerly Used Defense Sites (FUDS) program. As such, the Department of Defense develops policy and oversees the FUDS program, the Secretary of the Army manages the program, and the U.S. Army Corps of Engineers (USACE) executes environmental restoration activities. With regard to relationships with regulatory agencies, DoD policy requires substantive involvement of the US Environmental Protection Agency (EPA) and state regulatory agencies, current and prospective federal land managers, other federal agencies, states, local agencies, and tribes throughout the environmental restoration process. USACE is required to take proactive steps to identify and address issues of concern to all stakeholders, including EPA.

Over the past six years, the Department of Defense, the Army, and USACE worked with regulatory agencies to further improve overall coordination on FUDS. Through that effort, USACE developed statewide management action plans with states and EPA to reconcile cleanup priorities and revised policy and guidance to ensure that each phase of FUDS cleanups is coordinated with regulatory officials. In addition, USACE offered to review 'no further action' sites if new information about a site became available or at the request of a state or EPA. The 2003 General Accounting Office report, GAO-03-146, "ENVIRONMENTAL CONTAMINATION: DoD has Taken Steps to Improve Cleanup Coordination at Former Defense Sites, but Clearer Guidance is Needed to Assure Consistency", recognized USACE efforts, finding that they had improved overall coordination with regulatory agencies.

Mrs. McMORRIS RODGERS. My office has been coordinating with the Army Corps of Engineers for several months regarding a Nike battery site near Fairchild AFB in Spokane, WA. This site was reviewed by the Corps in 1989 but the EPA recently raised concerns about the accuracy of the determination and thoroughness of the investigation. The Corps advised that they would issue a report revisiting in February of this year. The report is still pending and the response from the Corps upon inquiry has been, "I'm sorry that I have been unable to reply to your message before now. I would like to assure you that we are in the final stages of the final review of the document for release ability. I really do not have any more information to provide at this time." I realize that you are not the Corps, but they are not in attendance. This is an important issue that has affected the lives of many people that I represent in Eastern Washington. I would appreciate any insight you could offer as to the reason for the delay.

Secretary BEEHLER. The Corps of Engineers completed the Site Ownership and Operational History (SOOH) report for former Nike Battery 87 near Fairchild AFB, Washington in July 2007. That report was provided to EPA Region 10 and Representative McMorris's staff on July 18, 2007. The Corps of Engineers experienced a delay in completing the report due to additional studies conducted in order to better understand the relationship between the site operational practices and physical characteristics of the former Nike Battery 87, and EPA sampling results. The letter accompanying that report summarized the results of the investigation, and the Army's consequent position regarding the Department's responsibility for contaminants found in the vicinity of former Nike Battery 87.

#### QUESTIONS SUBMITTED BY MR. MCKEON

Mr. MCKEON. Perchlorate moves faster through groundwater than most contaminants, suggesting that groundwater (which is often drinking water in Southern California) contamination remediation needs to be implemented in the early stages of the site investigation and clean up process. (a) What special requirements will be imposed on DoD to ensure that groundwater supplies will be given a high priority? (b) In the event that drinking water supplies are threatened or contaminated, will DoD make provisions for replacement drinking water until a containment/abatement plan is implemented?

Secretary BEEHLER. (a) DoD has a published relative risk ranking system that prioritizes response actions at sites according to the widely accepted risk factors of source, pathway, and receptor. Groundwater paths, especially those with human receptors, would typically be ranked high. (b) Where necessary, to prevent unacceptable exposures from DoD contamination, DoD has provided, and will provide, replacement drinking water.

Mr. MCKEON. The executive branch has been an advocate of a reference dose (a level often used in establishing drinking water standards) concentration for perchlorate ingestion/consumption, which is higher than California and other states. Will DoD be required to use the lower state standards in developing their risk based clean up plans?

Secretary BEEHLER. Based on the preface to the question, there appears to be confusion between a reference dose (risk based health standard) and a drinking water regulation such as a Maximum Contaminant Level (MCL) under the Safe Drinking Water Act. It is important that the difference be fully understood. The reference dose is the amount of a contaminant per unit of body weight per day from all sources that over a long period is not expected to cause unhealthful effects. The National Academy of Science and EPA have both indicated that the reference dose of 0.0007 mg/kg/day for perchlorate is protective for humans, including sensitive subpopulations such as pregnant woman and infants. In setting a drinking water regulation, regulators consider a number of other factors including the quality and extent of information and the *relative source contribution* of the contaminant between food and water. For example, if a regulator determines that there is a need to account for perchlorate intake from food, the final drinking water standard may be adjusted downward proportionately. This explains differences in the reference dose and drinking water standard. It's important to understand that an MCL is applicable to public drinking water suppliers. For cleanup, DoD will use the perchlorate reference dose to indicate if a site-specific cleanup is needed. If it is determined that a response action is needed, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the cleanup must comply with all requirements that are applicable or relevant and appropriate to the site-specific circumstances. If a State has promulgated a drinking water standard (i.e., MCL) for perchlorate, that value is likely to be viewed as a "relevant and appropriate requirement" and thus the groundwater cleanup level for sites in that State. Applicable or relevant and appropriate requirements are determined on a site-specific basis.

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#### QUESTIONS SUBMITTED BY MS. BORDALLO

Ms. BORDALLO. The military build-up on Guam will cost over \$10 billion dollars over a multi-year period; undoubtedly, the build-up on island will raise serious questions about the environmental impact of constructing new facilities for 8,000 Marines and their families. In my opinion, this build-up also affords the Department of Defense an opportunity to ensure that old installations, which may be re-used for the incoming forces, are free from harmful contaminants. According to some reports, there is a \$32 billion backlog of identified environmental remediation; can you describe what steps are being taken to identify any environmental remediation that may be needed on Guam? Are there any sites, which for example may be used for housing or for training, that need substantial environmental clean-up and mitigation work? Moreover, has the cost of clean-up and remediation been factored into the overall estimate for the cost of the build-up?

Secretary BEEHLER. The Department of the Navy (DON) is addressing all contaminated sites on its installations through the Defense Environmental Restoration Program. To date, DON has invested over \$3 billion to cleanup sites across the department, with emphasis placed on addressing the higher risk sites first. The estimated cost to complete all DON sites is \$2.14 billion. There are 112 remediation sites on Guam, of which only 17 require further action. DON has invested just under \$190 million investigating and remediating these sites, with a cost to complete the remaining sites of just over \$40 million. All remaining sites will have a remedy in place by 2014, which is prior to completion of the build-up construction phase. As the military build-up plans progress, the status and condition of the remaining cleanup sites will be factored into these plans. DON will ensure that all remediation is completed to be protective of human health and the environment to support the build-up, including housing, training, and other operational needs.

Ms. BORDALLO. Additionally, the Joint Guam Program Office completed its initial scoping meetings a few months ago and has begun to draft the Environmental Impact Statement (EIS). Can you describe what steps are being taken to incorporate

the lessons learned about emerging contaminants at Department of Defense installations into the EIS for Guam?

Secretary BEEHLER. The Department of the Navy is working closely with the Office of the Secretary of Defense to identify and share lessons learned regarding emerging contaminants. The analyses conducted during an Environmental Impact Statement (EIS) do not specifically address emerging contaminants. However, the emerging contaminants lessons learned will be incorporated into the planning, design, material selection, and construction for the build up on Guam.

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#### QUESTIONS SUBMITTED BY MR. LOEBSACK

Mr. LOEBSACK. So I just want to ask at the outset, Mr. Beehler, if you have any direct knowledge of the cleanup efforts at the Iowa Army Ammunition Plant. I know there are many facilities around the country, but do you have any specific information on this?

Secretary BEEHLER. In 1941, the Army constructed the Iowa Army Ammunition Plant (IAAP) in Middletown, Iowa to load, assemble and pack various conventional ammunition and fuzing systems. During operations, industrial process wastewater and by-products were disposed at the installation. Department of Defense (DoD) cleanup sites include surface impoundments, former production disposal areas, landfills, and a fire training pit. Soil and groundwater contamination resulted primarily from historic practices of disposal of explosives and heavy metal-containing wastes directly onto the soil. The installation also identified contamination by volatile organic compounds such as trichloroethylene. Perchlorate was detected at one location in 2000, however, follow-on sampling did not confirm its presence.

The Environmental Protection Agency (EPA) placed IAAP on the National Priorities List in August 1990, and in December 1990, the installation and EPA signed a Federal Facilities Agreement (FFA) that identified specific sites and cleanup schedules. DoD cleanup actions taken include treatment and removal of contaminated soil, capping landfill cells, groundwater treatment and connecting local residences to a public water supply. Funding through FY 2006 has been over \$95 million. Evaluations related to past use of the property by the Atomic Energy Commission have been conducted and three sites are being addressed under the separate Department of Energy Formerly Utilized Sites Remedial Action Program (FUSRAP).

In 2001, DoD added a new category of sites to its Defense Environmental Restoration Program—the military munitions response program (MMRP). In FY 2004, the Army identified MMRP sites at IAAP. Site inspections to evaluate the extent of munitions and level of risk continued through FY 2007. The Army reached agreement with EPA to add these munitions sites to the FFA so that they could be addressed according to the munitions response site prioritization protocol regulation and the risk they present.

Groundwater cleanup activities and the MMRP at IAAP are expected to continue to FY 2017 with a remaining cost to complete of more than \$20 million. Groundwater treatment system operation will continue beyond 2017.

The Army is working with the local community to keep it informed and receive input into the cleanup decision process. In FY 1997 the Army established a Restoration Advisory Board (RAB) which meets regularly.

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#### QUESTIONS SUBMITTED BY MR. TAYLOR

Mr. TAYLOR. What have we spent on environmental restoration at bases that have been closed by previous rounds of BRAC to date?

Secretary BEEHLER. Through the end of FY 2006, \$9.12 billion has been spent for site level environmental restoration at all BRAC properties, including BRAC 2005 installations. The funding came from the BRAC Accounts and the Defense Environmental Restoration Account.

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#### QUESTIONS SUBMITTED BY MR. BISHOP

Mr. BISHOP. Do you have any kind of ballpark estimate of how sites exist nationwide? How many are going through remediation at the present time?

Secretary BEEHLER. DoD has a number of sites with detectable concentrations of perchlorate. A summary of sampling results was provided in the written statement. Detection does not necessarily mean there is a need to remediate. After sampling and assessing the risks, many of the DoD sites with perchlorate detections have been determined not to require remedial actions. DoD sampling has also dem-

onstrated that, for the most part, contamination was confined to our bases. The Department is taking appropriate actions for perchlorate releases. These actions include sampling, assessing risks to human health, coordinating with regulators and, where necessary, taking remedial actions. The remedial actions are being conducted under the Defense Environmental Restoration Program (DERP) in coordination with regulators.

The May 2005 U.S. Government Accountability Office (GAO) report noted that approximately 400 sites had been identified as having perchlorate. That GAO Report on perchlorate noted that 65 percent of the sites containing perchlorate were DoD, National Aeronautics and Space Administration (NASA), or defense related activities but did not differentiate among the activities or site owners. The prevalence of DoD sites reported is a manifestation of the fact that DoD has been sampling for perchlorate for about a decade and it is this information that makes up the majority of data available to regulators. Thus, mathematically, DoD and NASA would be expected to comprise a high percentage of the sites sampled. Again, perchlorate detections do not equate with the requirement to remediate.

DoD's cleanup database cannot ascertain every site where perchlorate is part of the remediation. This is because perchlorate is often mixed with other more significant contaminants and as such is often assessed and remediated in conjunction with these other contaminants. Nevertheless, we are aware of the following sites with completed or ongoing perchlorate remediation:

- Massachusetts Military Reservation (MMR). Removal actions have been completed for contaminated soils. Groundwater contaminated with RDX (Cyclotrimethylene-trinitramine) and perchlorate is being remediated through a groundwater treatment system which is in place and operating. All investigations and actions were fully coordinated with Environmental Protection Agency (EPA) Region 1 and the State of Massachusetts.
- Longhorn Army Ammunition Plant, Texas. A fluidized bed reactor was added to a TCE (Trichloroethylene) groundwater treatment system in 2001 to remove perchlorate from an effluent. There is no groundwater use and actions were taken to protect Caddo Lake (drinking water supply). Soil covers were placed over two soil sites which contained high perchlorate concentrations to prevent runoff into streams. Final Records Of Decisions (RODS) are being developed to address remaining soil contamination through soil removal and disposal. All actions have been fully coordinated with EPA Region 6 and Texas.
- Naval Weapons Industrial Reserve Plant (NWIRP), McGregor, Texas. At McGregor, the Navy completed a ROD. An in-situ biological treatment system is treating perchlorate in groundwater and soil; this is the first—and world's largest—full-scale bio-wall application for groundwater remediation of perchlorate and volatile organic compounds. Recent groundwater data shows a marked decrease in the amount of perchlorate in groundwater. In fact, last October, the NWIRP McGregor became the very first U.S. Naval facility to receive a Ready for Reuse determination from EPA. This verifies that environmental conditions at the property are protective of human health and the environment for its current and future commercial, industrial and agricultural uses.
- Former Naval Surface Warfare Center (NSWC), White Oak, Maryland. NSWC-White Oak has a number of completed RODs. The RODS primarily address other key contaminants, but the treatment systems put in place under the RODs are also addressing perchlorate. All actions have been coordinated with EPA Region 3 and Maryland, and both agencies concurred with the remediation goal for perchlorate.
- Redstone Arsenal, Alabama. Perchlorate was detected in soil and groundwater. A Remedial Investigation report was completed in July 2005. A Feasibility Study is underway to analyze remedial options. A health risk evaluation was conducted for surface water off-base, which concluded that there was no health risk to recreational users and residents. Sampling showed non-detectable levels in the Tennessee River. Drinking water is supplied by the municipal water system. There is no human consumption of groundwater either on-base or off-base, and thus no threat to human health. The Arsenal is working closely with EPA and the Alabama Department of Environmental Management (ADEM).
- Vandenberg Air Force Base (AFB), California. Perchlorate was detected in groundwater, but drinking water supplies have not been affected. The Air Force initiated a pilot treatment process that uses injections of lactate and

a dechlorinating agent to groundwater. The pilot study was successful, and both TCE and perchlorate were removed to non-detectable levels in one month. Planning is underway to scale up the pilot treatment process to complete TCE and perchlorate removal at this site.

Edwards AFB, California. Perchlorate was detected in soil and groundwater. Drinking water supplies have not been affected. In May 2003, Edwards AFB implemented a pilot project/treatability study to evaluate the effectiveness of using ion-exchange technology for removing perchlorate from groundwater. As of January 2007, the system has treated 32.1 million gallons and removed 133.7 pounds of perchlorate from the groundwater. This pilot treatment system continues to operate. Also, a treatability study that examined the effectiveness of flushing to remove perchlorate from soil at Edwards AFB demonstrated almost complete removal of perchlorate from the soil column.

