Report No. SPO-2011-009 September 28, 2011

Inspector General

United States Department of Defense

Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003:

Part II - Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure

Inspector General

United States Department of Defense

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DEPARTMENT OF DEFENSE
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September 28, 2011

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR PERSONNEL AND READINESS
COMMANDER, U.S. CENTRAL COMMAND
COMMANDER, U.S. ARMY CORPS OF ENGINEERS

SUBJECT: Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003, Part II - Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure (Report No. SPO-2011-009)

We are providing this report for information and use. We received comments in response to the draft report from the Office of the Under Secretary of Defense (Personal and Readiness), Director, Force Readiness and Health Assurance; Deputy Assistant Secretary of the Army; U.S. Army Corps of Engineers; and the U.S. Central Command.

Management concurred with draft report observations and provided technical comments. We considered all technical comments in the preparation of this final report.

We appreciate the courtesies extended to the staff. If you have any questions, please contact me or have your staff contact Mr. George Marquardt at (703) 604-9159 (DSN 664-9159) or Mr. Michael Herbaugh (703) 604-9164 (DSN 664-9164).

Kenneth P. Moorefield
Deputy Inspector General
Special Plans and Operations

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Results in Brief: Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure at Qarmat Ali Iraq in 2003

What We Did

In response to requests from the Senate Armed Services and Democratic Policy Committees, we reviewed DoD actions regarding the exposure of approximately 1,000 U.S. Army soldiers and U.S. Army civilian employees to sodium dichromate at the Qarmat Ali water treatment plant in 2003. This report discusses U.S. Army, U.S. Army Corps of Engineers, Combined Forces Land Component Command, and contractor actions from April 2003 to January 2004 specific to the exposure at the Qarmat Ali facility. An earlier report addressed actions by the U.S. Army, National Guard Bureau, and Department of Veterans Affairs to identify, notify, and provide access to care for exposed personnel that took place from 2008 to 2010.

The team also examined documents totaling over 83,000 pages provided by the U.S. Army Center for Health Promotion and Preventive Medicine, U.S. Army Corps of Engineers, and the on-site contractor, KBR, related to operations at the Qarmat Ali water treatment plant. We took sworn testimony from 19 individuals assigned to the U.S. Army Corps of Engineers with duty at Qarmat Ali during 2003. We conducted interviews with representatives of the Occupational Safety and Health Administration, Environmental Protection Agency, Assistant Secretary of Defense for Health Affairs, Defense Health Board, Assistant Secretary of the Army for Manpower and Reserve Affairs, U.S. Central Command, U.S. Army Corps of Engineers, and U.S. Army Center for Health Promotion and Preventive Medicine.

What We Found

DoD military, civilian, and contractor personnel did not effectively address environmental hazards found prior to beginning work to restore to service the water treatment plant at Qarmat Ali, Iraq, in 2003. Preparation was inadequate because contract language describing the site clearance process was impractical. Moreover, the Army changed the contract scope of work after contractor elements deployed to Kuwait. As a result, Service members and DoD civilian employees were unintentionally exposed to toxic chemicals and the U.S. Government was made vulnerable to potential health care liabilities for individuals exposed to contamination.

Contractor recognition of, and response to, the health hazard represented by sodium dichromate contamination, once identified at the Qarmat Ali facility, was delayed. The delay occurred because KBR did not fully comply with occupational safety and health standards required by the contract, and Task Force Restore Iraqi Oil failed to enforce contractor compliance. As a result, a greater number of Service members and DoD civilian employees were exposed to sodium dichromate, and for longer periods, increasing the potential for chronic health effects and future liabilities.

The DoD response to identified sodium dichromate contamination at the Qarmat Ali facility in 2003 lacked urgency and was incomplete. The delayed response may have occurred as a result of mission prioritization within the Command. The response was also incomplete because:

- the request from the Command for consultative services and other circumstances on-site limited the effectiveness of the U.S. Army Center for Health Promotion and Preventive Medicine operational risk assessment;
- the Combined Forces Land Component Commander did not act on all U.S. Army Center for Health Promotion and Preventive Medicine recommendations; and,
- the DoD personnel deployment medical records system lacked accessibility.

As a result, Service members continued to be exposed until mid-September 2003, and many remained unaware of their exposure until 2008.

Since the sodium dichromate exposure at the Qarmat Ali water treatment plant in 2003, responsible organizations in DoD have made noteworthy changes to policies and procedures. (See Observation 4, starting on page 24).

- The Assistant Secretary of Defense for Health Affairs updated policy for post-deployment health assessments.
- The Assistant Secretary of Defense for Health Affairs, in coordination with Service medical commands, developed and fielded electronic medical records.
- The Commander, U.S. Army Corps of Engineers published a policy addressing hazardous and toxic agent incident response during contingency operations, and fielded new environmental support teams that were unavailable in 2003.
- The Commander, U.S. Army Center for Health Promotion and Preventive Medicine issued revised health risk assessment and chemical exposure guidelines.

While it is impossible to rule out exposure to hazardous chemicals during contingency operations, the steps taken by DoD organizations should reduce the likelihood of future exposures and minimize their impact. Finally, DoD and the Department of Veterans Affairs have continued efforts to identify, contact, and provide current and ongoing access to medical surveillance and/or medical care for personnel who may have been exposed to sodium dichromate at Qarmat Ali.

What We Recommend

The exposure of Service members and DoD civilian employees to sodium dichromate only occurred during 2003. Since then, DoD and the Department of Veterans Affairs have notified and provided individuals identified as potentially exposed access to medical surveillance and/or medical care. In addition, the policy and procedure changes discussed in Observation 4 address deficiencies identified during this review. Therefore, this report does not have recommendations.

Client Comments

The Office of the Under Secretary of Defense (Personal and Readiness); Assistant Secretary of the Army (Military Personnel); U.S. Army Corps of Engineers, Acting Chief Transatlantic Division Regional Integration Team Directorate of Military Programs; and U.S. Central Command, Office of the Inspector General, provided technical and editorial comments to the draft report. Comments were responsive and concurred with our observations and conclusions. For detailed discussion of management comments to the draft report, see Appendix G.

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Acronyms and Abbreviations

AHLTA	Armed Forces Health Longitudinal Technology Application
AHLTA-T	Armed Forces Health Longitudinal Technology Application – Tactical Module
ARNG	Army National Guard
CFR	Code of Federal Regulations
KBR	Kellogg, Brown & Root
TF RIO	Task Force Restore Iraqi Oil
USACE	U. S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine

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Introduction

In March 2003, in anticipation of combat operations, the U.S. Army Corps of Engineers (USACE) contracted KBR (at the time, Brown and Root Services, Inc., a division of Kellogg, Brown, and Root) to restore Iraq's oil industry. On March 20, 2003, USACE awarded Task Order 3 of contract DACA63-03-D-0005, covering the restoration of several hundred oil production facilities: oil wells, gas oil separation plants, and other supporting facilities, including the water treatment plant located at Qarmat Ali.

While providing site security and conducting renovations U.S. Army soldiers, U.S. Army civilian employees, and contractor and subcontractor employees were exposed to industrial hazards, including sodium dichromate. Sodium dichromate, used by the Iraqi Southern Oil Company[1] prior to U.S. military presence, exhibits as an orange powder and contains hexavalent chromium (chromium VI), a known carcinogen. USACE and the Army command in Iraq were made aware of the exposure in 2003 and took a series of actions in response.

In June 2008 and August 2009, the Senate Democratic Policy Committee conducted hearings concerning the exposure. In June 2008, Senator Dorgan sent the Secretary of Defense the first in a series of inquiries from Senators representing potentially exposed Army National Guard (ARNG) units. Army responses continued through April 2009. In August 2009, seven members of the Senate Democratic Policy Committee requested the DoD Inspector General review the conduct of the Army and KBR related to the exposure of U.S. soldiers to sodium dichromate in 2003 (see Appendix A). We announced our review on September 11, 2009.

In September 2009, the Senate Armed Services Committee asked the Secretary of Defense to evaluate the adequacy and timeliness of the Department's efforts to identify and contact potentially exposed soldiers and ensure they had access to appropriate medical surveillance and/or medical care. The Secretary referred the request to the Army, who in turn requested the DoD Inspector General include the evaluation in the ongoing review (see Appendix B).

We conducted this project to address the concerns of both Committees and reported our results in two parts. We published, "Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I - Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel," on September 17, 2010, responding to the request from the Senate Armed Services Committee.[2]

We found that the Army conducted adequate efforts to identify and contact military and DoD civilian personnel in a reasonably timely manner, subsequent to a request from Congress in June 2008. While these efforts were thorough, not all identified personnel could be found or were willing to respond once located. As of September 2010,

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[1] This organization is also referred to as the South Oil Company in some references.
[2] The report is available at http://www.dodig.mil/spo/reports.html.

representatives of impacted organizations reported contacting 895 (92 percent) of the 972 living personnel identified as having potentially served at Qarmat Ali in 2003. We determined that these military and DoD civilian personnel had the opportunity to receive medical surveillance and/or medical care, and that they received care from different medical care providers. We did not evaluate the quality of this care. We recommended four actions - one to the Commander, U.S. Army Corps of Engineers, and three to the Under Secretary of Defense for Personnel and Readiness, to enhance efforts to identify, contact, and provide access to care for personnel.

Part II (this report) describes our findings regarding DoD and contractor actions taken at the Qarmat Ali facility in 2003 and early 2004, and answers questions posed by the Senate Democratic Policy Committee (see Appendix C).

Objectives

Our overall objective was to review DoD actions leading to and following the exposure of personnel to sodium dichromate at the Qarmat Ali water treatment plant in 2003. This report specifically addresses:

- contractor implementation and USACE oversight of Task Order 3 at the Qarmat Ali water treatment plant as it relates to the health and safety of personnel; and,
- U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM)[3] and Defense Health Board responses to sodium dichromate exposure at the Qarmat Ali facility.

Scope and Methodology

Our objective was to review DoD actions regarding the exposure of approximately 1,000 U.S. Army soldiers and U.S. Army civilian employees to sodium dichromate at the Qarmat Ali water treatment plant in 2003. This report discusses U.S. Army, USACE, Combined Forces Land Component Command, and contractor actions from April 2003 to January 2004 specific to the exposure at the Qarmat Ali facility. An earlier report addressed actions by the U.S. Army, National Guard Bureau, and Department of Veterans Affairs to identify, notify, and provide access to care for exposed personnel that took place from 2008 to 2010.

For this project, the team examined documents totaling over 83,000 pages provided by the National Guard Bureau, U.S. Army Corps of Engineers, and KBR related to operations at the Qarmat Ali water treatment plant. We conducted 22 interviews, including sworn testimony from 19 individuals assigned to the U.S. Army Corps of Engineers with duty at Qarmat Ali during 2003. We interviewed and collected information from representatives of the Assistant Secretary of Defense for Health Affairs,

[3] On October 1, 2009, the Army renamed USACHPPM as the U.S. Army Public Health Command (Provisional). We use "USACHPPM" throughout this report for consistency with previous documents.

Defense Health Board, Assistant Secretary of the Army for Manpower and Reserve Affairs, U.S. Central Command, USACE, and USACHPPM.

We met with representatives of the Occupational Safety and Health Administration and the Environmental Protection Agency to discuss the interpretation of regulations and health effects of sodium dichromate exposure. See Appendix D for further discussion of project scope and methodology.

Background

General Information. USACE established Task Force Restore Iraqi Oil (TF RIO) under the command of a U.S. Army Engineer Brigadier General to restore oil production facilities throughout Iraq. In 2003, TF RIO consisted of approximately 120 Service members and civilians who oversaw over 500 contractors and provided technical assistance to 60,000 Iraqi oil workers at approximately 220 sites across Iraq.

Qarmat Ali Facility. The Qarmat Ali water treatment plant, located near Al Basrah in southern Iraq, was constructed in the 1970s by the Union of Soviet Socialist Republics. The facility was critical to maintenance of the North Rumallah, South Rumallah, and Az Zubayr oil fields (see Figure 1.) Water drawn from the Shatt al Arab waterway was treated at the facility, distributed to eleven cluster pumping stations, and injected under pressure into the ground to drive oil to the surface. Prior to U.S. occupation of the site, the Southern Oil Company treated filtered water with sodium dichromate, a corrosion inhibitor, to increase the life of pipelines, pumps, and other equipment. Pre-war operations and post-war vandalism resulted in sodium dichromate contamination over parts of the facility. See Appendix E for a diagram of the Qarmat Ali water treatment facility highlighting areas of contamination.

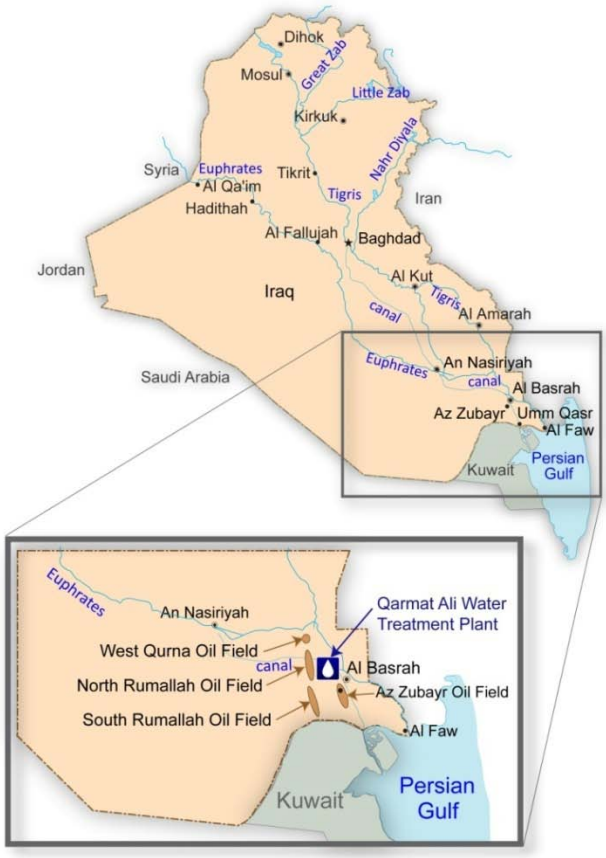

Figure 1. Location of the Qarmat Ali Water Treatment Facility.

U.S. Presence. USACE and KBR first visited the Qarmat Ali site in April 2003. KBR personnel initially entered the Qarmat Ali site no later than April 24, 2003 to begin to develop requirements to restore functionality (see Figure 2.)

Starting with the initial visits in April, U.S. soldiers from the Oregon and West Virginia ARNG escorted DoD civilian employees and contractors on day trips from Kuwait to

perform work at the site. U.S. personnel did not live at the site during repair and renovation. Soldiers from the Indiana and South Carolina ARNG were added to the security mission in June 2003 and continued after the Oregon and West Virginia ARNG units were reassigned. A military unit from the United Kingdom provided 24-hour general site security.

Documentation indicates that contracted Nepalese Gurkhas provided security for a period of time in the Fall of 2003 when the site was placed off-limits to "coalition soldiers" by the military command. ARNG soldiers turned over the mission to contracted security forces in January 2004.

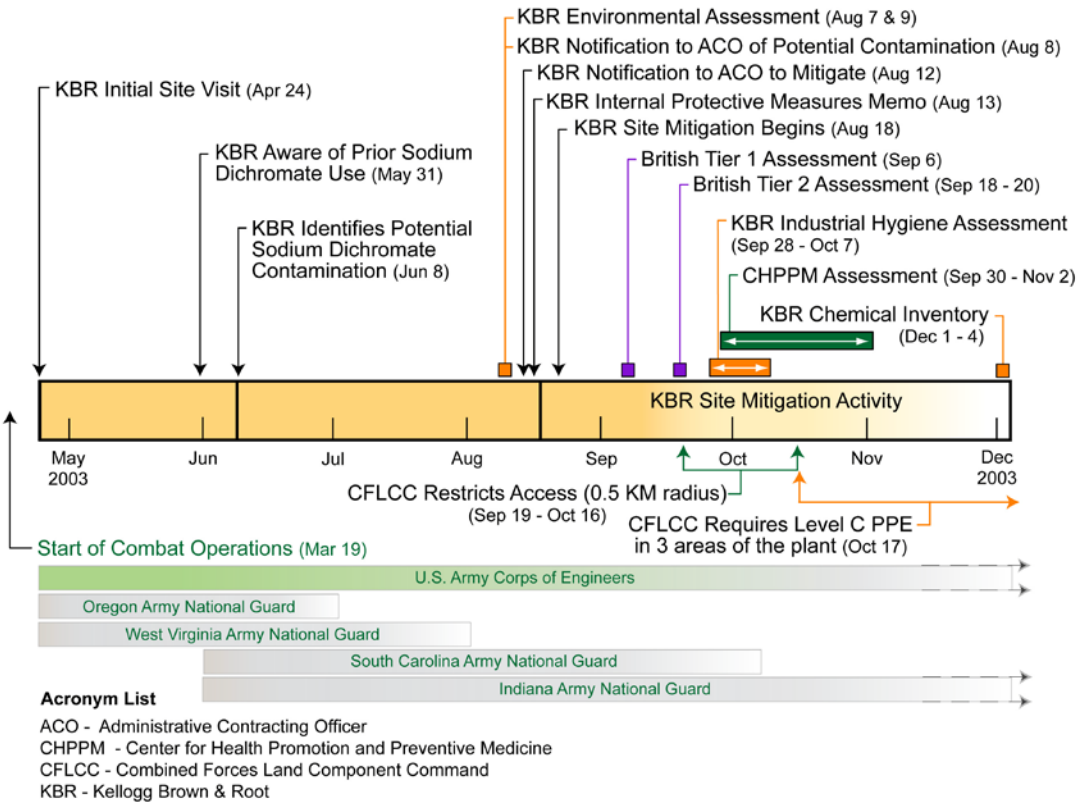

Figure 2. Timeline for Potential Sodium Dichromate Exposure at the Qarmat Ali Water Treatment Plant Facility

TF RIO authorized KBR to start work at Qarmat Ali on May 13, 2003 and the contractor began regular work at the site in late May. KBR, as the prime U.S. contractor, provided equipment, tools, materials, and personnel to complete infrastructure repairs, and provided the Southern Oil Company with technical and managerial assistance. The Southern Oil Company continued to own the site and worked with KBR to restore operational capabilities. KBR hired subcontractors, from the U.S. and Kuwait, who performed tasks on the site during the day.

In early June 2003, KBR returned the plant to partial operating capacity, with subcontracted Halliburton employees operating pumps on skids as a temporary solution

for providing processed water to the Basrah refinery and other locations before the permanent pumps were put back in service.

Sodium Dichromate at the Qarmat Ali Facility. On May 31, 2003, KBR reviewed an Iraqi operating manual that described the use of sodium dichromate as a corrosion inhibitor at the facility. Early in June 2003, a KBR Environmental specialist observed and recorded discolored soils at the site. Later in June, both KBR and TF RIO representatives reported that the site was potentially contaminated with sodium dichromate, which they recognized as a carcinogen. Subsequent actions addressed existing contamination and chemicals on-site prior to the arrival of U.S. personnel.

On August 7 to 9, 2003, KBR conducted a limited environmental assessment, including air and soil samples. The assessment results confirmed chromium contamination, and on August 12, KBR notified TF RIO of their intent to encapsulate the contaminated areas. Encapsulation activities began on August 18. Dust control and limited soil removal continued into December 2003.

During September and October 2003, three organizations performed assessments of the facility: forces of the United Kingdom conducted "Environmental and Industrial Hygiene Tier 1" and "Tier 2" assessments, KBR conducted an Industrial Hygiene assessment, and USACHPPM conducted a "Deployment Occupational and Environmental Health Survey and Operational Risk Assessment." However, the sample collection for all of the assessments listed above took place after the contractor hired by KBR began soil encapsulation, changing site conditions. Also during this time, from September 19 to October 16, the military command restricted access by U.S. personnel to the site, and required the use of personal protective equipment at certain areas of the facility thereafter.

The chemical inventory conducted by KBR in early December identified approximately 700 bags of sodium dichromate still at the site. The continued presence of sodium dichromate at the site does not allow us to exclude the possibility that it was used during 2003, but we found no evidence of its use. Documents support the conclusion that KBR did not purchase sodium dichromate – in fact, KBR initiated a requisition for chemicals including sodium dichromate on July 5, 2003, but cancelled it on August 24, 2003 prior to delivery. Also, the Southern Oil Company submitted a requisition for sodium dichromate in December 2003 that KBR denied.

KBR reported completing work at Qarmat Ali and associated facilities in March 2005, and USACE returned control of the site to the Iraqi Southern Oil Company on November 14, 2005.

The timeline shown in Figure 2 above illustrates the length of time it took TF RIO and KBR to: become aware of sodium dichromate on site; understand the extent and impact of site contamination; communicate the risk; and effectively respond to the health threats. The fading color represents the reduced potential for personnel exposure resulting from mitigation activities. Nearly 1000 U.S. Army soldiers and U.S. Army civilian employees were exposed to sodium dichromate in the five months it took from the initial site visit

until the military Command required personal protective equipment. The following observations discuss U.S. Forces and contractor actions during that time period. For a more detailed discussion of the timeline of events at the Qarmat Ali facility, see Appendix F.

TF RIO, KBR, and the Southern Oil Company worked together to seek and test a substitute, non-toxic, corrosion inhibitor. As of March 15, 2004, the Kuwait Institute of Scientific Research had not provided the final test results. Although we found no confirmation of test results, documentation indicated that as of May 2004, plant operators used Flogard MS6201, a corrosion inhibitor deemed not hazardous to health or dangerous to the environment.

Observation 1 – DoD Military, Civilian, and Contractor Preparation For Work at Qarmat Ali

DoD military, civilian, and contractor personnel did not effectively address environmental hazards found prior to beginning work to restore to service the water treatment plant at Qarmat Ali, Iraq, in 2003. Preparation was inadequate because contract language describing the site clearance process was impractical. Moreover, the Army changed the contract scope of work after contractor elements deployed to Kuwait. As a result, the Government was made vulnerable to potential health care liabilities for individuals exposed to contamination.

Description and Background of Contract Language. In preparation for military operations, DoD tasked KBR to write a Contingency Support Plan describing a broad concept of operations for the mission to restore the oil infrastructure of Iraq following combat operations. KBR undertook the effort under the statement of work for Task Order 31 of contract number DAAA09-02-D-0007, the Logistics Civil Augmentation Program. The Contingency Support Plan for Repair and Continuity of Operations of the Iraqi Energy Infrastructure, dated January 31, 2003,[4] stated the mission was to "support the Commander, U.S. Central Command in the assessment of damage, repair, maintenance, resumption and/or continuity of the operations of the oil infrastructure of Iraq." One of the assumptions included in that plan was that, "Iraqi energy infrastructure sites are in a benign condition; i.e., no fighting, clear of unexploded ordnance, and chemical and biological weapons." These passages were the same in all versions of the Contingency Support Plan we reviewed.

On February 13, 2003, the Secretary of the Army designated the Commander, USACE as the Executive Agent for the execution of the plan. USACE established TF RIO to provide technical, contracting, and administrative support, and on March 8, 2003, awarded contract DACA63-03-D-0005 to Brown and Root Services[5]. Combat operations began on March 19, 2003, and the following day USACE executed Task Order 3, "Emergency Response Tasks for Iraq Oil Reconstruction," assigning KBR the mission.

Impractical Contract Language. Task Order 3, paragraph 1.1.1, set the formal conditions for the contractor to deploy to an Iraq Oil Infrastructure site:

> No earlier than the day after the Ground Forces secure an Iraq Oil Infrastructure facility, contractor personnel shall be notified by [the] ACO [Administrative Contracting Officer] that benign conditions exist and directed by the ACO to deploy from staging areas located behind the line of departure, i.e. Kuwait, to specific facilities. An Iraq Oil Infrastructure facility shall be considered benign and ready for a contractor if the following conditions are met:
>
> a. Facility is not within range of any enemy direct fire weapon systems.

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[4] The Contingency Support Plan was classified when published. The Office of the Under Secretary of Defense for Policy redacted and declassified a version of the plan on May 8, 2008.
[5] Task Order 3 was awarded to Brown and Root Services (BRS) which later combined with Kellogg to become Kellogg, Brown and Root.

b. Facility has been cleared of all enemy forces, environmental hazards (NBC [nuclear, chemical, and biological] and industrial), mines, unexploded ordnance, booby-traps, and sabotage systems.

c. Contractor does not enter the facility any earlier than the day after the facility has been secured and cleared and declared benign.

This description of "benign" differed from the assumption in the Contingency Support Plan primarily in that it combines "nuclear, chemical and biological weapons" with "industrial" in a larger category of "environmental hazards."

KBR personnel first visited the Qarmat Ali site by April 24, 2003.[6] We were unable to locate documentary evidence that the Army declared the Qarmat Ali site "benign" or that TF RIO notified KBR that benign conditions existed in accordance with Task Order 3. Two TF RIO employees explained that during early 2003, TF RIO determined that sites were "benign" and provided the contractor with notice-to-proceed in meetings and over the telephone. However, there was no disagreement that the TF RIO Administrative Contracting Officer directed the contractor to deploy to Qarmat Ali.

Furthermore, comments from various sources indicated that representatives from TF RIO and KBR considered facilities to be ready for the contractor to begin work if they were free of military hazards. This indicated all parties disregarded the "industrial" part of "environmental hazards" included in Task Order 3.

A TF RIO Operations Officer and Security Manager stated that, "From an operations security side, benign would mean no enemy threat, e.g. free from chemical weapons etc…I wasn't initially looking for environmental hazards types of issues…Benign meant it was safe to operate from a security standpoint." A former TF RIO Administrative Contracting Officer said that, regarding site determination, "It would have been the military and the context of benign pertained to hostilities." A TF RIO Environmental Engineer concurred.

> There was very, very strong concern and consideration that they [contractors] would not have to engage on any sites where we believed munitions were an issue or booby traps or things like that - landmines, etc…and obviously, weaponized chemical agents…I don't recall any discussion of those types of consideration [industrial chemical].

The KBR self-evaluation of Task Order 3, dated February 12, 2004, includes statements describing their understanding of "benign" sites. The self-evaluation did not note any concerns over clearing industrial hazards from sites prior to KBR employees performing duties, but discussed military hazards several times.

> The military provided security for all KBRS [KBR Services] movements into Iraq. Initially [Explosive] Ordnance Disposal (EOD) teams and Marines accompanied all KBRS assessment teams to the work sites…however the area remained dangerous due to minefields, unexploded ordnance, and booby trapped

[6] The site visit on April 24, 2003 was documented in a trip report. One former KBR employee provided uncorroborated testimony that he visited the site on April 13, 2003.

> oil facilities. As the work sites were cleared and the minefields marked, responsibility for KBRS security transitioned to other units in the area…
>
> Virtually every production facility, distribution facility, or support facility, was littered or surrounded by minefields, unexploded ordnance, or caches of Iraqi munitions. Although these had caused minimal impact to the facilities, they hampered and delayed the initial assessments of oil infrastructure particularly in the southern oil fields.
>
> The Coalition Forces' EOD teams began explosive sweeping operations that included not only the platform itself [the Al Basra Oil Terminal - ABOT], but also a mile-wide swath around the facility. As soon as clearance was granted, KBRS started personnel moving toward ABOT, and within 24 hours KBRS had personnel on board ABOT conducting assessments.

On November 11, 2003, KBR reported that, "In mid-September, the KBR Environmental Section began conducting Preliminary Hazard Assessments at the 75 South Iraq oil facilities to document actual and potential environmental and human health hazards…not limited to, transformer oil with PCBs [polychlorinated biphenyls], exposed insulation potentially containing asbestos, gas leaks, chlorine cylinders, spilled oil and oil contaminated soil." It appears that KBR understood that industrial hazards were integral to oil production processes and were not unanticipated.

The aforementioned February 12, 2004, KBR self-evaluation also reported the recognition and mitigation of sodium dichromate at the Qarmat Ali facility. The narrative drew attention to "extremely dangerous conditions caused by environmental contamination, as well as serious security issues." While it mentioned sodium dichromate contamination, it did not express specific concern that a technically "benign" site containing industrial hazards was cleared by the Command for work by the contractor.

A final complication was the lack of access to contract language. USACE executed Task Order 3 on March 20, 2003; however, the order was classified.[7] According to witness testimony, TF RIO did not have access to classified storage or computer systems in the early part of the operation. Personnel, including the Administrative Contracting Officer, had minimal, if any, opportunity to review the contract language once they deployed. This precluded discussions between the Administrative Contracting Officer and the contractor concerning contract language.

Performance to a strict interpretation of the definition of a "benign" site contained in Task Order 3 was not practical. Industrial hazards were integral to, and often the product of, oil infrastructure processes. Evidence shows that representatives from TF RIO and KBR applied a common definition of "benign" that addressed military hazards. It was impractical to expect TF RIO or KBR to clear industrial facilities of all industrial-based environmental hazards prior to starting work. We found no evidence that representatives

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[7] Task Order 3 was declassified by the Office of the Under Secretary of Defense for Policy on April 21, 2004.

from either organization considered the presence of industrial or non-military environmental hazards in the decision to proceed to any oil infrastructure site, including the facility at Qarmat Ali.

Contract Scope Change. Task Order 3 executed by USACE on March 20, 2003, required the contractor to perform five primary functions:

> 2.1 Establish Management Infrastructure System
>
> 2.2 Establish Initial Facility Operational Control
>
> 2.3 Oil Well and Other Facilities Fire Suppression
>
> 2.4 Respond to Oil Spills
>
> 2.5 Emergency Restoration of Oil Systems. The contractor shall provide the necessary equipment, materials and personnel to perform and complete emergency repairs on oil wells, GOSPs (Gas-Oil Separation Plants) and pipelines. Emergency repairs in this context are considered to be minor repairs that can be easily performed to stop leaks, correct safety deficiencies, and restore oil production.

A primary mission described in Task Order 3 was fighting oil fires. Combat operations and sabotage did not result in the level of destruction anticipated, and by mid-April the mission of TF RIO evolved into a focus on restoring pumping and refining capabilities to generate oil for export. On April 30, 2003, USACE modified Task Order 3 to expand the scope of work beyond emergency repairs:

> 2.5 Restoration of Oil Systems. The contractor shall provide the necessary equipment, tools, materials and personnel to perform and complete repairs on oil wells, oil fields, GOSPs, pipelines, pump stations, refineries, and other associated infrastructure which are necessary to stop leaks, correct safety deficiencies and restore the facilities to operating condition. The contractor also shall coordinate the start-up and operation of the system with the Iraqis and provide technical and managerial assistance as required."

This contract modification expanded the original scope and magnitude of Task Order 3 beyond the original emergency "minor repairs" to “restoring facilities to operating condition” and coordinating operations with the Iraqis. It also added pump stations, refineries, and oil fields to the list of facilities that would require “technical and managerial assistance” if not repair.

This change to the scope and focus of the statement of work was significant, and occurred after TF RIO and contractor elements were deployed to Kuwait and had conducted initial site surveys in Iraq. The time was not available to plan and execute a deliberate response to the expanded scope of work.

Government Vulnerability to Potential Liabilities. As a result of inadequate preparation by the Army and KBR, Service members and DoD civilian employees who served at Qarmat Ali were exposed to sodium dichromate and may suffer chronic health effects. The inclusion of “environmental hazards - industrial” in the definition of “benign” in the contract was inconsistent with the definition in the Contingency Support

Plan. As of April 15, 2011, approximately 150 U.S. and United Kingdom Service members who served at Qarmat Ali have ongoing litigation against KBR and related companies.

The inadequate preparation and subsequent exposure led to the creation of a joint medical surveillance program by DoD and the Department of Veterans Affairs for military personnel who spent time at Qarmat Ali between April 1 and September 30, 2003. This program was created as part of the Gulf War Registry[8] under the Department of Veterans Affairs. DoD established a parallel program for the medical surveillance of DoD civilians analogous to the Gulf War Registry. The costs of administering these programs, and of treating health effects determined to have been caused by exposure to sodium dichromate, if any, are unknown.

[8] The VA Persian Gulf War Registry was established by Public Law 102-585, "Persian Gulf War Veterans Health Status Act," November, 1992, to identify individuals who served as members of the Armed Forces in the Persian Gulf theater of operations during the Persian Gulf War. According to the Veterans Health Affairs Handbook 1303.02, the intent of the registry was to "identify possible diseases resulting from U.S. military personnel service in certain areas of Southwest Asia."

Observation 2 – Contractor Recognition and Response to Sodium Dichromate at Qarmat Ali, Iraq

Contractor recognition of, and response to, the health hazard caused by sodium dichromate contamination at the Qarmat Ali facility was delayed. The delay occurred because KBR did not fully comply with applicable occupational safety and health standards required by the contract, and TF RIO failed to enforce contractor compliance. As a result, a greater number of Service members and DoD civilian employees experienced longer exposure to sodium dichromate, increasing the potential for possible chronic health effects and future liabilities to the U.S. Government.

Discussion

Contractor recognition of, and response to, the health hazard caused by sodium dichromate contamination at the Qarmat Ali facility was delayed. KBR representatives first visited the site in April, and became aware of the use of sodium dichromate on site on May 31, 2003, when a KBR representative read an operating manual describing the injection of sodium dichromate during water processing. A week later, a KBR Environmental representative reported observing discolored soils at the site. In a document dated August 23, KBR reported covering "yellow stained soil" with soil from outside the water treatment plant sometime in June "as an initial measure to minimize direct contact with the stained soil and prevent or minimize the airborne mobility and inhalation of the contaminated surface soil."

KBR officially informed TF RIO of potential soil contamination by sodium dichromate on August 8, and halted work around the chemical injection building on August 9, 2003. There were at least 61 days between initial recognition of the presence of sodium dichromate on site by the contractor and official notification of the Government contracting officer.

Contract Safety and Health Requirements. KBR did not fully comply with applicable occupational safety and health standards, and TF RIO failed to enforce contractor compliance. Task Order 3 required KBR to provide its employees with a safety and health program, and stated that work at sites would be in compliance with applicable Occupational Safety and Health Administration and Army regulations.

> 1.14 Safety and Health Program. The Contractor shall establish a safety and health program, including methods and procedures for ensuring compliance with applicable Health and Safety standards…The Contractor shall coordinate with the PCO [Procuring Contracting Officer] or designated representative to tailor program requirements in order to accommodate anticipated conditions in theater."

Task Order 3 also listed initial documents and sources for this effort, including:

> 4.6 Army Corps of Engineers Manual (EM) 385-1-1, Safety and Health Requirements Manual.
>
> 4.7 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Standards.
>
> 4.8 29 CFR 1926, Health and Safety Regulations for Construction.

The listed standards required KBR, as part of their safety and health program, to: complete an accident prevention plan; conduct workplace assessments, activity hazard analysis, and hazard communication; and provide personal protective equipment.

Accident Prevention Plan. EM-385-1-1 required contractors to complete an accident prevention plan, "reviewed and found acceptable by designated Government personnel," prior to beginning work at a job site. In April 2003, KBR developed Document No. K-HSE-0007, "Project RIO Accident Prevention Plan," and requested Government review.

On May 7, 2003, TF RIO provided KBR comments requesting changes and further clarification. One particularly relevant change required KBR to include the requirement to, "Identify potential chemical exposures and provide a brief risk analysis. (29 CFR 19l0, Hazard Communication Standard)." In their response, KBR concurred with all the recommended changes. Notably, it also included the statement, "BRS [KBR] management is not aware of any conditions that would require BRS or their subcontractors to deviate from the requirements of EM 385-1-1."

KBR issued the updated accident prevention plan for information on June 1, 2003. It was available to KBR management for the period when KBR conducted most of the work at the Qarmat Ali facility. However, the plan was not signed by a KBR Department Head and Project General Manager until August 12, 2003, and we found no evidence that TF RIO sought to confirm KBR compliance with the plan consistent with its contract oversight responsibilities.

Workplace Assessments. 29 CFR Part 1910.132 required employers to conduct workplace assessments, "to determine if hazards are present, or are likely to be present…" Further, EM-385-1-1 required evaluation of "all operations, materials, and equipment…to determine the presence of hazardous environments," which included identifying substances that presented a hazard and recommending hazard control measures.

EM 385-1-1 required that a certified industrial hygienist, or other competent person, evaluate environments where there may be a potential exposure to hazardous substances. KBR performed an industrial hygiene assessment at the Qarmat Ali facility from September 28 to October 7, 2003, over three months after they identified potential sodium chromate contamination. The report by the industrial hygienist notes that the USACHPPM assessment was ongoing and the Combined Forces Land Component Command had already "banned force protection providers to travel within 1 kilometer radius around the Qarmat Ali Water Treatment Plant…"

Additionally, 29 CFR 1910.132 required an employer to "verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated, the person certifying that the evaluation has been performed; the date(s) of the hazard assessment; and, which identifies the document as a certification of hazard assessment." We found no evidence of a certification.

We did find evidence of KBR early identification of worksite hazards. A May 27, 2003 report from the Health, Safety, and Environment coordinator to the program manager

identified several hazards at the Qarmat Ali facility. The report cited, "Many buildings with trip - fall - cut - no lighting - residual chemicals hazards. These need to be secured from entry…[and] marked condemned/Do NOT Enter In Iraqi and English with Skull Symbols." The report also noted that personal protective equipment was required, and that the report writer initiated procurement.

Activity Hazard Analysis. EM 385-1-1 required the contractor prepare, and the Government accept, an activity hazard analysis prior to starting work. It described this analysis as a "documented process by which the steps (procedures) required to accomplish a work activity are outlined, the actual or potential hazards of each step are identified, and measures for the elimination or control of those hazards are developed."

The KBR June 1, 2003, Accident Prevention Plan incorporated the requirement for activity hazard analysis. It also directed that an activity hazard analysis would be conducted prior to each phase of work, specifically mentioning "access to work areas," and "assessment of existing facilities." An example hazard assessment survey included in the plan required a review of chemical, heat, harmful dust, and other hazard categories.

KBR modified the plan on December 1, 2003, incorporating the KBR, "Total Safety Task Instruction," as section 14. The Total Safety Task Instruction required, "KBR front-line supervisors and subcontractor supervisors… to analyze each task for safety hazards, communicate those hazards to their crews, and provide instructions on safe work practices to their crews prior to beginning the task."

KBR reports described the challenges with meeting documented requirements. A "Project RIO Daily HSE [Health, Safety, and Environment] Log" report from June 19, 2003 provides an illustrative example. The report highlighted that the first interpreter to arrive was on site that day, and further stated the "Need to start implementing the TSTI [Total Safety Task Instruction] program for site once interpreters and Khurafi Safety guys [subcontractors] are on site." The safety coordinator who wrote the report also noted that "shots heard in the early morning from village getting to be a daily ritual," and that the activity posed no apparent problem for the site.

While acknowledging the challenges, we found no evidence of KBR conducting an effective activity hazard analysis that met the criteria of EM 385-1-1 prior to beginning work. In addition, we did not observe documentation of TF RIO accepting or requesting any activity hazard analyses at Qarmat Ali.

Hazard Communication. EM-385-1-1 required contractors to implement a hazard communication program[9] including employee training, chemical labeling, inventory and maps of chemicals on site, and the use of material safety data sheets. Documentation confirms some chemical labeling and the presence of the material safety data sheet for sodium dichromate on site during June 2003. The earliest chemical site map we found

[9] EM 385-1-1 requires consistency with the Code of Federal Regulations, Title 29, "Labor," Chapter XVII, Occupational Safety and Health Administration, Part 1910.1200, "Hazard Communication."

was from December 2003. USACE provided no evidence of TF RIO oversight or review of the hazard communication program.

Personal Protective Equipment. The reason for mandating workplace hazard assessments described above was to protect workers. If hazards were, or were likely to be, present, then 29 CFR Part 1910.132 requires employers to, "Select, and have each affected employee use, the types of PPE [Personal Protective Equipment] that will protect the affected employee from the hazards identified in the hazard assessment." Both EM 385-1-1 and the KBR Accident Prevention Plan included the requirement, and the KBR plan further stated that, "PPE [Personal Protective Equipment] is issued whenever by reason of hazards of process, environmental chemical hazards or radiological hazards exist or have the potential to exist within the employee's task assignment."

The earliest discussion of the use of personal protective equipment at the Qarmat Ali site we found in the record was in a previously mentioned report to the KBR Health, Safety, and Environment manager dated May 27, 2003. The report stated the need for this equipment, without specifying the type of equipment necessary. The first evidence of the use of respiratory protective equipment was contained in KBR meeting minutes dated August 8, 2003, that stated, "Halliburton hands will wear a paper mask and goggles…" However, we observed the material safety data sheet for sodium dichromate attached to an e-mail sent to KBR managers responsible for the Qarmat Ali site dated July 23, 2003. The material safety data sheet recommended eye protection, chemical resistant clothing and gloves in the presence of sodium dichromate. It also described respirator use.

> At any detectable concentration - Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
>
> For Unknown Concentrations or Immediately Dangerous to Life or Health - Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.

Testimonial and documentary evidence support KBR use of personal protective equipment starting in early August 2003, including "Tyvek coveralls, rubber boots, rubber gloves, and HEPA [High Efficiency Particulate Air] type respirator." USACE personnel assigned to TF RIO in 2003 testified that quality assurance focused on ensuring the contractor accomplished work and met work schedules. They provided no indication that they reviewed proper use of personal protective equipment.

Increased Service member and DoD civilian employee exposure. KBR officials were aware of sodium dichromate contamination at the site in early June 2003. They officially notified the administrative contracting officer, as part of the process to conduct site mitigation, on August 8, 2003. Timely and effective completion of a workplace assessment or compliance with hazard communication and personal protective equipment requirements contained in the KBR Accident Prevention Plan would likely have reduced the exposure of Service members and DoD civilian employees to sodium dichromate contamination and mitigated the potential for chronic health effects and future liabilities.

Observation 3 – DoD Response to Sodium Dichromate at Qarmat Ali, Iraq

The DoD response to identified sodium dichromate contamination at the Qarmat Ali facility in 2003 lacked urgency and was incomplete. The delay may have occurred as a result of mission prioritization within the Command. The response was incomplete because:

- the request for consultative service from the Command and circumstances on-site limited the effectiveness of the USACHPPM operational risk assessment;
- the Combined Forces Land Component Commander did not fully act on all USACHPPM recommendations; and,
- the DoD personnel deployment medical records system lacked accessibility.

As a result, Service members continued to be exposed until mid-September 2003, and many remained unaware of their exposure until 2008.

Discussion

The DoD response to identified sodium dichromate contamination at the Qarmat Ali facility lacked urgency and was incomplete. We found credible evidence that in late June 2003, TF RIO knew about the presence of sodium dichromate at Qarmat Ali, and the potential health effects. KBR representatives officially informed TF RIO of potential soil contamination by sodium dichromate on August 8, 2003.

On August 12, 2003, following confirmation of this contamination, KBR notified the TF RIO Administrative Contracting Officer of their intent to "immediately procure a contractor, materials, and means to encapsulate the soils in question." On September 19, 2003, the Combined Forces Land Component Command issued an order restricting access within a one-half kilometer radius of the Qarmat Ali facility: 85 days after TF RIO technical personnel identified use of the chemical, and 42 days after KBR notified the Command.

The Combined Forces Land Component Command Surgeon requested occupational and environmental health personnel support from USACHPPM on September 26, 2003. USACHPPM conducted a health risk assessment from September 30 through November 2, 2003. They briefed preliminary results and recommendations to the Command in late October, 2003, and published a classified report of their findings on January 15, 2004.

Mission Prioritization. The overall response to identified hazards at Qarmat Ali did not appear to be appropriately prioritized. Beginning in late April 2003, Coalition forces witnessed an increase in looting, crime, and general disorder in Iraq. At the same time, U.S. civilian and military leadership in Iraq began a significant transition.

In late May 2003, the Coalition Provisional Authority replaced the Office of Reconstruction and Humanitarian Assistance as the sovereign political power in Iraq. Just

prior to the transition in U.S. civilian leadership, the U.S. Army V Corps began accepting responsibility for all ground forces in Iraq from the Combined Forces Land Component Command.

U.S. Army V Corps was designated Combined Joint Task Force 7 on June 15, 2003, and assumed responsibilities as the Combined Forces Land Component Command for Operation Iraqi Freedom. The addition of personnel from the U.S. Navy, Marine Corps, and Air Force, as well as other coalition nations under the control of the Commander enabled the task force to meet its new mission requirements. Describing this transition, a former V Corps Commander stated, "You can't take a tactical headquarters [V Corps] and change it into an operational [level] headquarters [Combined Joint Task Force] at the snap of your fingers…Your focus changes completely, and you are either going to take your eye off the tactical fight in order to deal with the operational issues, or you are going to ignore the operational issues and stay involved in the tactical fight."

Also on June 15, operational control of TF RIO transferred from the Combined Forces Land Component Command to the Coalition Provisional Authority.

Later, during July and August, as the Command responded to increasing guerrilla attacks on coalition forces and other friendly agencies, the search for weapons of mass destruction was a strategic priority. Adapting to civilian and military organizational changes and the increased focus on a tactical security mission likely contributed to the delayed response to identified contamination at Qarmat Ali.

DoD Response to Identified Contamination. The DoD response to identified sodium dichromate contamination at the Qarmat Ali facility was incomplete. The scope of the USACHPPM operational risk assessment conducted in September 2003 was limited. Once received, the Combined Forces Land Component Commander did not fully act on all USACHPPM recommendations. And information obtained from and about deployed Service members, especially ARNG soldiers, remained scattered throughout the medical records system.

CHPPM Health Risk Assessment. On September 15, 2003, the Combined Forces Land Component Command Surgeon notified USACHPPM of a potential problem at Qarmat Ali. On September 26, he requested USACHPPM support. Four days later, a USACHPPM team of specialists from the U.S., Kuwait, and Germany began a deployment occupational and environmental health survey and operational risk assessment. The request for consultative service from the Command and circumstances limited the effectiveness of the USACHPPM operational risk assessment and resulted in lost opportunities to detect exposures and take prompt action to determine health effects.

The Command specifically requested that the USACHPPM team:

- assist with the provision of health risk communication to U.S. personnel,
- assist with the medical evaluations of U.S. personnel,

- model the occupational and environmental health risks to U.S. personnel from potential exposure to hexavalent chromium [Cr(VI)] and other hazards prior to containment strategies to control the contamination on the site's grounds and surrounding areas,
- assess the current occupational and environmental health risks to U.S. personnel after the containment of the contamination on the site's grounds and surrounding areas, and
- recommend measures to manage any current or future potential occupational and environmental health risks identified from the assessments.

The stated purpose of the review was to "assess potential health risks to U.S. personnel from occupational and environmental contamination at the Qarmat Ali Industrial Water Treatment Plant (WTP), Basra, Iraq, and provide recommendations to manage any identified health risks." To accomplish this purpose, the USACHPPM team performed five main tasks.

- Collected and analyzed air, soil, and surface wipe samples.
- Conducted physical exams of 129 Indiana ARNG soldiers and 10 TF RIO personnel who were on-site at the time of the evaluation.
- Provided questionnaires to 52 Oregon ARNG soldiers and 53 South Carolina ARNG soldiers who were still in the area of responsibility, but no longer serving at the site during the evaluation.
- Provided health risk communication to all of the soldiers contacted directly by the team or by questionnaire.
- Provided products for Combined Forces Land Component Command Surgeon's Office to follow-up with risk communication and questionnaires to the remaining population.

The effectiveness of the USACHPPM assessment was limited by the scope of the request and circumstances on the ground. The Combined Forces Land Component Command Surgeon made the request to USACHPPM after the initial ARNG units had rotated off the mission. USACHPPM reported that the KBR efforts to mitigate hazards complicated the assessment of past exposures. Further, in 2011 USACHPPM representatives confirmed that, "the emphasis was on acute, short term effects," e.g. those evident at the time of the exposure. USACHPPM did provide an assessment of long term effects in their final report. Collectively, this reduced the information available, resulting in a reported low level of confidence concerning past exposures.

On October 21 and 27, respectively, the USACHPPM team briefed preliminary results to the Combined Forces Land Component Command Deputy Command Surgeon and TF RIO Deputy Commander. USACHPPM published a classified report of their findings on January 15, 2004, and released an unclassified version on January 10, 2009, redacting facts related to military operations and personally identifiable information.

Concerns with USACHPPM Assessment. The deployment occupational and environmental health survey and operational risk assessment responded to specific requests made by the Command. The USACHPPM health survey team determined the operational risk for the Qarmat Ali site for "past, current, and future exposures," to be low. They further assessed a low to negligible overall long-term health risk. The USACHPPM report stated that their conclusions were based on actual data for current exposures, and assumed data and self-reported information for past exposures.

We found two areas of concern.

- During the provision of health risk communication to U.S. personnel, USACHPPM communications from 2003 to present contained some inaccurate information.
- In 2003 the USACHPPM team chose to provide medical exams only to a portion of all known personnel who served at Qarmat Ali.

The following sections discuss our concerns in detail.

Risk Communication. USACHPPM provided exposed soldiers with briefings and a series of fact sheets. Its statements in 2003 concerning the potential reproductive effects of chromium exposure overstated available evidence, and subsequent fact sheets later summarizing the results of blood tests administered to potentially exposed personnel in 2003 were inaccurate.

Multiple fact sheets used by USACHPPM in 2003[10] stated that studies of individuals who had worked with chromium indicated no reproductive problems, and asserted that there was, "no association between the level of chromium in biological fluids and the quality of semen or the level of male sexual hormones."

However, the 2000 U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Toxicological Profile for chromium - current at the time of the USACHPPM assessment – reached a more conservative conclusion concerning the scientific knowledge of the reproductive effects of chromium exposure. "Because these studies were generally of poor quality and results were poorly reported, no conclusions can be made regarding the potential for chromium to produce reproductive effects in humans." The Agency for Toxic Substances and Disease Registry summarized, stating, "We do not know if exposure to chromium will result in birth defects or other developmental effects in people."

In March 2011, USACHPPM representatives agreed that the fact sheets did not stress the lack of information concerning potential reproductive effects of chromium exposure. In 2008, exposed individuals had access to a more accurate summary. The fact sheet

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[10] USACHPPM Fact Sheets "Update #1 about Sodium Dichromate Exposure and Health Effects," September 24, 2003, "Information on Health Evaluation for Potential Sodium Dichromate Exposure," September 29, 2003, and "Health Risk Facts Related to Sodium Dichromate at Qarmat Ali Water Treatment Plant, Basrah, Iraq," October 29, 2003.

published by the Department of Veterans Affairs provided a more prudent description, stating, "…there is no reliable information that any form of chromium has harmful effects on reproduction or causes birth defects in humans."

In addition, two USACHPPM fact sheets released in 2008 and 2010 inaccurately summarized blood tests for chromium administered to personnel in 2003. In their 2003 assessment, USACHPPM reported that 72 of the 135 tests (53 percent) of potentially exposed Service members administered registered below the detection limit of 0.5 Micrograms per Liter. The report accurately summarized the results, stating, "the majority of test results were below the detection limit of the test method."

However, the "Update on Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant in 2003 (for Soldiers)," published by USACHPPM in September 2008, stated, "The results showed that *nearly all* [blood] test results were below the detection limit…" A second fact sheet they issued, "Health Assessment of 2003 Qarmat Ali Water Treatment Plant Sodium Dichromate Incident Status Update," May 2010, stated, "The results, compared to reference population levels on people with no occupational Cr [Chromium] exposure, indicated that *nearly all* levels were so low that the analytical method used did not detect chromium in the sample." [italics added]

These subsequent statements made by USACHPPM were inconsistent with their 2003 depiction of the 2003 blood test results. While these statements, like the comments on reproductive effects, do not change the overall risk communication message, they present an inaccurate depiction of the facts.

Medical Exams in 2003. The USACHPPM decision to limit full physicals to a portion of the potentially exposed population created a lost opportunity for medical recognition and documentation of symptoms of acute, short-term chromium (VI) exposure.

The USACHPPM report stated, "The initial purpose in offering medical evaluations was to ascertain whether there were any adverse health effects to potentially exposed soldiers and/or DoD civilian employees in the absence of any quantitative exposure monitoring results." USACHPPM conducted physical exams of 129 Indiana ARNG and TF RIO personnel performing duties at the Qarmat Ali facility at the time of the assessment, resulting in 39 (30 percent) with physical findings possibly related to chromium exposure.[11] In addition, they provided a questionnaire to another group of Service members identified as having spent time at the site. Of these, 37 of 137 (27 percent) self-reported symptoms potentially related to chromium exposure. However, neither sample of the populations tested or queried was random, impacting the validity of generalizations to the entire population. There was certainly a possibility of missing subclinical cases, and cases of lower exposure, that still could have been of concern.

[11] USACHPPM-identified, chromium-related symptoms included irritation or inflammation of the skin, eyes, lungs, nose, sinus, or throat.

As stated above, the USACHPPM team realized the impact to their assessment of KBR encapsulation and containment efforts. However, they also determined that the population exposed prior to their risk assessment in 2003 reported having spent less time at the Qarmat Ali facility. Indiana ARNG members, accompanying TF RIO and KBR personnel to the site during the assessment, reported working on site an average of 20 days on site for 7.3 hours per day. The prior group, Oregon and South Carolina ARNG soldiers, reported an average of 2.6 days per person on site for 3.1 hours per day.

USACHPPM decided that, "Based on the limited adverse health effects found in the most current exposed population due to the potential exposure to chromium, a self-reported exposure and symptom questionnaire was used for the past exposed populations." USACHPPM provided questionnaires to members of the Oregon and South Carolina ARNG. USACHPPM reported 15 of 85 (18 percent) soldiers from the past population described various symptoms possibly related to chromium exposure in their questionnaire responses.[12]

Based on the results of their medical evaluation, USACHPPM concluded that, "the minor irritative and inflammatory symptoms and physical findings, though possibly related to low-level chromium exposures, are non-specific and could have been reasonably expected to just have been from the general desert environmental conditions, i.e., heat, sand, dust and wind.' Their report recommended that commanders should ensure that individuals with abnormal results receive follow-up medical evaluations.

Defense Health Board Review. At the request of the Surgeon General of the Army, the Defense Health Board[13] reviewed the classified report and issued their assessment on December 19, 2008. The Defense Health Board stated in its review of the USACHPPM assessment that, "…the essentially negative results for the Indiana National Guard led to a pragmatic and reasonable decision not to extend testing and medical examination to the other Guard contingents…"

In response to concern expressed by the Senate Democratic Policy Committee about the conclusion, we requested further explanation from the Defense Health Board and their representative responded.

> It was the understanding of the Committee [Defense Health Board Military Occupational and Environmental Health and Medical Surveillance Subcommittee] that the Indiana Guard unit was on site pre encapsulation AND post encapsulation and did not demonstrate evidence of either elevated blood levels of chromium, or stigmata such as chrome ulcers. It was assumed by the

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[12] USACHPPM identified members of the West Virginia Army National Guard as part of the past population in the out-brief to the Combined Forces Land Component Commander Deputy Surgeon and TF RIO Deputy Commander, but we observed no evidence of contact with them during the assessment.

[13] The Defense Health Board is a Federal Advisory Committee to the Secretary of Defense that provides independent scientific advice and recommendations on matters pertaining to the health of DoD beneficiaries.

> Committee that other soldiers with similar pre-encapsulation exposure would be similarly exposed. Therefore it was assumed that testing and examination even farther after the cessation of exposure would have been even less revealing than for the most recent group, the Indiana National Guard. It was the suggestion of the Committee that the proposed registry and all communication and inclusion of information in medical charts be extended to all with potential exposure.

Discussions with representatives from the Environmental Protection Agency supported these assumptions. They stated that modeling pre-mitigation conditions would be very difficult, and that the science to determine the effects of chemical exposures is not sufficiently developed. We do not believe the USACHPPM decision to, "extrapolate test results from one group of soldiers to another group"[14] and neither provide, nor recommend providing, full physicals to the past population violated any particular principles of health assessment.

The decision by the USACHPPM assessment team not to provide medical exams to the entire available Qarmat Ali population in 2003 represents a lost opportunity for obtaining more complete knowledge of the possible medical impact of pre-encapsulation exposure.

Command Implementation of USACHPPM Recommendations. The Combined Forces Land Component Commander did not act on all USACHPPM recommendations contained in the January 2004 health survey report. The health risk assessment report included 13 recommendations to the Combined Forces Land Component Command Surgeon. The first 11 recommendations outlined on-site actions. The final two pertained to medical follow-up, stating:

- "units in past potentially exposed population" receive the same risk communication as units present during the assessment; and
- "individuals identified with abnormal ancillary test results complete follow-up medical evaluation…"

We found no evidence that Combined Forces Land Component Command Surgeon implemented either of these recommendations. Neither were we able to determine why the Command apparently did not implement these recommendations. However, we posit that the CHPPM-assessed low risk for exposed personnel, the redeployment of impacted units, and the significant operations tempo of a wartime environment were contributing factors.

Deployment Medical Records. The medical records system for deployed soldiers in 2003, especially mobilized ARNG personnel, lacked accessibility. Records were not electronic, and paper copies followed individuals from their unit, to mobilization, through deployment, and back. Information contained in Post-Deployment Health Assessments was incomplete.

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[14] The Senate Democratic Policy Committee used this terminology in its request for a DoD Inspector General investigation into sodium dichromate exposure at Qarmat Ali. See Appendix B for this request.

Soldier Medical Records. Deploying units maintained permanent medical records in DA (Department of the Army) Form 3444-series, "Alphabetical and Terminal Digit File for Treatment Record (Color)," where colors were assigned based on individual social security numbers. Units took permanent record files to the mobilization site, where they would generally be kept for the duration of the deployment. Deploying individuals were provided a Department of Defense Form 2766, "Adult Preventive and Chronic Care Flow Sheet." Deploying unit personnel officers maintained the forms for individuals assigned to their unit.

All visits to medical professionals should ultimately have been recorded on the Form 2766 by a variety of means.

- Soldiers ordered to see medical personnel: Medical personnel would document the visit on Department of Defense Form 689, "Individual Sick Slip," and provide the soldier a copy. The soldier would give it to their chain of command, which would take appropriate action and provide it to the unit personnel officer for inclusion with the soldier's Form 2766.
- Soldiers visiting medical personnel of their own accord: Medical personnel would complete a Standard Form 600, "Chronological Record of Medical Care." Medical personnel would send the Form 600 to the unit personnel officer for inclusion in the soldier's Form 2766.

However, during deployment soldiers served in multiple locations, were occasionally cross-attached to different units, and may have visited various medical entities depending on their medical need and location. Units did not always maintain continuity in their personnel office staffs for the length of the deployment. Also, unit medics focused on meeting immediate needs, and may not have documented treatment depending on the medical circumstances.

Upon redeployment, the Form 2766 would be added to the permanent medical record for each soldier. Again, not every soldier redeployed with their unit, and in some cases their mobilization and demobilization sites were different locations. Theoretically, soldier medical records generated during deployment would eventually link up with the permanent file and be returned to the individual's home unit.

The complexity of the paper medical records process in 2003 created impediments to the inclusion of complete documentation of an individual's medical care received while deployed in their permanent record. Incomplete records reduced their value as a tool to identify personnel exhibiting sodium dichromate exposure symptoms both during the USACHPPM health risk assessment in 2003 and after.

Post-Deployment Health Assessments. DoD, Joint Staff, and Army policy in effect in 2003 required active duty soldiers, and reserve component soldiers called to active duty for over 30 days, who were also deployed in support of contingencies, to complete a Post-Deployment Health Assessment within 5 days of redeployment. Reserve component units generally completed the requirement during demobilization. At that

time, the policy required commands to submit completed forms to the Army Medical Surveillance Activity in Washington, D.C.[15]

Inaccurate and incomplete information provided by soldiers on their Post-Deployment Health Assessments upon returning from Iraq led to another missed opportunity for individuals to be screened for symptoms of sodium dichromate exposure. The authors of a 2007 study on health risk communication[16] reported that, of a 245 soldier sample chosen from individuals who served at Qarmat Ali, 227 had a Post-Deployment Health Assessment on file for review. Of those 227, only 55 (24 percent) noted chromium exposure despite having been directed to do so during written and verbal health assessments. Another 41 reported chemical exposure without specifying chromium. While accurate reporting by individuals would not have led to an earlier recognition of or response to the hazard, it is another example of a process not yielding the desired outcome.

Greater Exposure and Delayed Awareness. As a result of the delayed Command response in 2003, a greater number of Service members were exposed to the chemical hazard over a longer period of time. As stated above, soldiers continued to deploy on force protection missions to the Qarmat Ali facility for almost three months between the time the chemical contamination was identified at the site and when the order was issued restricting access to the area of contamination.

Many soldiers and DoD civilians who visited the Qarmat Ali facility were unaware of their exposure to the hazard until 2008. The USACHPPM team reported contact during their health risk assessment in 2003 with 222 ARNG and TF RIO personnel assigned to units performing duty at the site. In 2005 and 2007 testimonies before Congressional committees, DoD representatives stated that about 250 military and DoD civilian personnel were potentially exposed. However, after the 2008 and 2009 Congressional hearings the Army identified and contacted a broader population of almost 1,000 potentially exposed personnel. [17]

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[15] Beginning in 2008, completed forms are sent to the Armed Forces Health Surveillance Center.
[16] "Postdeployment Evaluation of Health Risk Communication after Exposure to a Toxic Industrial Chemical," MAJ James D. Mancuso, MC USA; Margaret Ostafin, MPH; COL Mark Lovell, MC USA, in Military Medicine, Vol. 173, April 2008.
[17] DoD IG Report Number SPO-2010-006, "Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I - Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel," September 17, 2010. The report is available at http://www.dodig.mil/spo/reports.html.

Observation 4 – DoD and Department of Veterans Affairs Actions Taken Since 2003

Since the exposure of DoD military and civilian personnel at the Qarmat Ali water treatment plant in 2003, responsible organizations in DoD have made noteworthy related changes in policies and procedures. We highlight four improvements.

- The Assistant Secretary of Defense for Health Affairs updated policy for post-deployment health assessments.
- The Assistant Secretary of Defense for Health Affairs in coordination with Service medical commands developed and fielded electronic medical records.
- The Commander, USACE published policy addressing hazardous and toxic agent incident response during contingency operations, and fielded environmental support teams that were unavailable in 2003.
- The Commander, USACHPPM issued revised health risk assessment and chemical exposure guidelines.

While it is impossible to rule out exposure to hazardous chemicals during contingency operations, the steps taken by DoD organizations should reduce the likelihood of future exposures and minimize their impact. Finally, DoD and the Department of Veterans Affairs have continued efforts to identify, contact, and provide access to medical surveillance and/or medical care for personnel who may have been exposed to sodium dichromate at Qarmat Ali.

Discussion

Post-Deployment Health Assessments. Since 2003, DoD has continued to refine the existing requirement for Post-Deployment Health Assessments of its personnel. In 2005, the Assistant Secretary of Defense for Health Affairs mandated the addition of a Post-Deployment Health Reassessment. Individuals must complete the reassessment three to six months after return from deployment. The purpose of the reassessment is "to proactively identify health concerns that emerge over time following deployments, to help remove potential barriers, and facilitate the opportunity for service members to have their health needs and concerns more fully addressed following deployments." Both the Post-Deployment Health Assessment and the Post-Deployment Health Reassessment ask the individual about health concerns related to any environmental and/or occupational exposure experienced during deployment. Current policy requires health care providers to review the completed forms and indicate appropriate follow-up medical needs. The addition of the Post-Deployment Health Reassessment provides personnel one more structured opportunity to document health concerns after a deployment and obtain appropriate follow-up care.

Electronic Medical Records. In 2004, DoD began implementing an electronic medical records system called the Armed Forces Health Longitudinal Technology Application (AHLTA). DoD representatives stated that AHLTA allows medical providers to access

patients' computer-based records from any military treatment facility. While system users have reported problems with its usability, speed, and availability, worldwide online access greatly increased the ability of DoD health care providers to view complete patient histories.

DoD integrated a tactical medical recording application module (AHLTA-T) into theater medical facilities beginning in 2005. Deployed public health and preventive medicine staff use the Joint Medical Workstation, a module within the Medical Situational Awareness in Theater System, which may be used to access data from AHLTA-T. Deployed medical staff can view and analyze trend and geographic data to determine if specific locations are the source of illnesses or injuries. A preventive medicine consultant for U.S. Forces - Afghanistan reported weekly use of and benefit from the Joint Medical Workstation to scan theater records for identification of outbreaks through patterns of symptoms.

DoD has provided some deployed medical clinics a hand-held AHLTA-T Mobile. Patient information is collected in the mobile device and later downloaded into the Theater Medical Data Store. Medics without immediate access to AHLTA-T still capture information on paper records, which are either scanned into AHLTA-T or added directly into an existing patient paper medical record.

Fielding of electronic medical records is complete within DoD; refinement of the system to access them continues. However, implementation of electronic medical records has increased the capability to recognize – and therefore respond to – a hazardous exposure.

Incident Response and Environmental Support Teams. On July 9, 2010, USACE issued Operations Order 2010-36, **"**Requirements for Evaluation, Response, and Reporting of Incidents Involving Hazardous or Toxic Agents during Overseas Contingency Operations (OCO)." Prior to 2003, USACE established Environmental Support Teams to assist deployed commanders but they were not fielded at Qarmat Ali. Compliance with the policy and the presence of expertise should decrease the likelihood and impact of future hazardous exposures.

Operations Order 2010-36. The purpose of Operations Order 2010-36 was to "direct the revision and implementation of appropriate policies and procedures for the evaluation of hazardous or toxic agents and associated response when operating in OCO [Overseas Contingency Operations]." The order extended existing policy guidance to all sites not previously covered. The order also specified reporting and notification requirements in response to threats to health and safety due to the presence of hazardous or toxic agents. USACE stated they completed the review directed by the Operations Order and implemented key actions.

USACE released Annex A to Operations Order 2010-36, "Hazardous or Toxic Agent Risk Evaluation Instruction," on April 4, 2011. Annex A provided guidance to determine, "whether a site assessment should be conducted for the presence of hazardous or toxic agents."

> When Military and civilian personnel are required to execute missions at forward locations, information regarding the site conditions must be reviewed prior to deploying and upon initial arrival at the site. This review should be performed to identify the potential presence of hazardous or toxic agents and address those hazards prior to exposure. For some locations, a US Army Public Health Command (USAPHC) Occupational and Environmental Health Site Assessment (OEHSA/EHSA) will be available. For locations where an OEHSA/EHSA is not available, USACE DA [Department of the Army] civilians and Commanders will follow the assessment process outlined in this instruction. The five-step process outlined in this instruction is based on the USACE Safety Management Action Plan and/or Department of the Army Composite Risk Management (CRM) process.

Annex A included land-use descriptions, associated hazard estimates, hazard types, and potential materials of concern. Attachments to Annex A included a "Toxic Hazards Checklist" to be used during site assessments, written such that an individual with minimal experience should be able to recognize site hazards. Had the policy existed in 2003 and been properly applied to the Qarmat Ali facility, it would have alerted the assessor to the risk posed by chlorine gas and other industrial chemicals, required a site assessment, and triggered command notification.

Environmental Support Teams. USACE defines Environmental Support Teams as deployable teams that conduct environmental assessments, baseline and other surveys, and studies.[18] Environmental Support Teams support all echelons of command, but will typically be tailored in support of an Army component headquarters with support missions requiring base camp development. Environmental Support Teams conduct environmental management tasks. They are designed to be deployed as an initial element to perform assessments and identify environmental hazards, and remain as one of the last elements to provide remediation actions and support for base closure. Effective use of Environmental Support Teams should minimize the impact of future exposures to hazardous substances through earlier recognition.

Health Risk Assessment and Chemical Exposure Guidelines. In June 2010, USACHPPM released a revised version of Technical Guide 230, "Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel." The revised guide included new policy and doctrine, and incorporated recommendations made by the National Research Council during a review of the earlier version of Technical Guide 230 conducted in 2004. Relevant changes included added guidance on evaluating potential chronic health effects, and updated direction on the conduct of deployment risk assessments in accordance with new Army risk management doctrine. The updated Technical Guide 230 included a larger range of military exposure guidelines, which represent chemical concentrations above which negative health effects may occur after a specified duration.

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[18] USACE Engineer Pamphlet 500-1-2, "Emergency Employment of Army and Other Resources: Field Force Engineering – United States Army Corps of Engineers Support to Full Spectrum Operations," August 1, 2010.

Identify, Contact, and Provide Access to Care for Exposed Personnel. DoD and the Department of Veterans Affairs continued efforts to identify, contact, and provide access to medical surveillance and/or medical care for personnel who may have served at Qarmat Ali.[19] On October 12, 2010, the Secretaries of Defense and Veterans Affairs co-signed a letter to be delivered to the individuals exposed at Qarmat Ali in 2003. The letter invited recipients to participate in a medical surveillance program developed specifically to evaluate them for symptoms of sodium dichromate exposure.

On May 10, 2011, the Department of Veterans Affairs reported having mailed the letter to 664 ARNG veterans who were identified as having served at Qarmat Ali. Of the 135 who chose to participate in the medical surveillance program, 34 individuals demonstrated abnormal results on their exams. However, medical personnel from the Department of Veterans Affairs had not established any presumptive service connections to sodium dichromate exposure based on these abnormal results.

On May 18, 2011, USACE reported having mailed the same letter to 72 individuals identified as having served at Qarmat Ali in 2003 (4 active duty service members and 68 current or former DoD civilian employees). Of these, 20 contacted the Army's Wounded Soldier and Family Hotline, with 16 choosing to participate in the program (3 active duty service members and 13 current or former DoD civilian employees).

The Office of the Assistant Secretary of Defense for Health Affairs also provided the Department of Veterans Affairs with the names of 21 service members from TF RIO in 2003 that had since separated from military service. On June 3, 2011, the Department of Veterans Affairs mailed them the letter offering participation in the medical surveillance program.

During project field work after publication of our Part I report in September 2010, we became aware of two additional population groups who may have served at Qarmat Ali in 2003. The 413th Chemical Company, a U.S. Army Reserve unit from Florence, South Carolina, performed security for TF RIO in the Ramallah oil fields. We alerted Army representatives of this possibility, and they identified the names of 114 individuals who deployed with the unit in 2003. Army representatives provided the list to Office of the Assistant Secretary of Defense for Health Affairs, who forwarded the list to the Department of Veterans Affairs. On June 3, 2011 the Department of Veterans Affairs sent letters to these personnel inviting them to participate in the medical surveillance program.

Based on testimonial evidence, a limited number of U.S. Marines from the 1st Marine Expeditionary Force may also have been exposed to sodium dichromate at Qarmat Ali during their unit's participation in the TF RIO security escort mission. We notified the Assistant Secretary of the Navy for Manpower and Reserve Affairs by letter of this potential exposure and requested a plan of action. On June 29, 2011 the Department of the Navy responded with an acceptable course of action.

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[19] This discussion updates the results of our report, "Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I – Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel," September 17, 2010.

Appendix A. Letter from the Senate Democratic Policy Committee

United States Senate
WASHINGTON, DC 20510

August 11, 2009

Via Facsimile: (703) 604-8310

Hon. Gordon S. Heddell
Office of the Inspector General
U.S. Department of Defense
400 Army Navy Drive
Arlington, VA 22202-4704

Dear Inspector General Heddell:

We are writing to request that you perform a formal investigation into the exposure of U.S. soldiers to sodium dichromate, a potentially deadly carcinogen, at the Qarmat Ali water injection facility in Iraq in 2003.

As you know, the Senate Democratic Policy Committee has conducted two hearings on this exposure: 1) on June 20, 2008, the Committee examined the performance of contractor KBR, which was retained by the Army under Restore Iraq Oil (RIO I) Task Order 3 to conduct an assessment of environmental conditions and operational functionality of the facility, and to make recommendations for its repair and resumption of operations; and 2) on August 3, 2009, the Committee examined the response of the Department of Defense to the exposure, including oversight conducted by the U.S. Army Corps of Engineers (USACE), testing and monitoring performed by the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), and a subsequent review done by the Defense Health Board (DHB).

Based on these hearings, and the investigation conducted by the Committee, we believe that the conduct and/or inaction of KBR and the Army may have caused hundreds of U.S. troops to be exposed to dangerous levels of sodium dichromate, which may have caused many of these soldiers to develop serious medical conditions related to their exposure at Qarmat Ali. We also believe that the testing, monitoring and review conducted by USACHPPM and the DHB may have been deeply flawed. During the course of your investigation, please assess the following:

1) Did the Army include provisions in Task Order 3 to specify the nature and extent of the Army's and KBR's duties to identify, prevent, report and/or remediate nuclear, biological, chemical and industrial hazards and to ensure the safety of U.S. soldiers at RIO I sites?

2) Task Order 3 states, "…it is not the intent of this contract to remediate pre-hostilities environmental contamination unless such remediation is necessary to protect the health and safety of contractor and Government personnel during ongoing restoration actions." Based on this language, should the Army have directed, and KBR performed, a timely remediation of the Qarmat Ali facility beginning in March 2003 to "protect the health and safety of contractor and Government personnel"?

OSD 09112-09

3) Task Order 3 required the Army to inform KBR that an Iraqi oil infrastructure facility was "benign" and had been cleared of all environmental hazards (including nuclear, biological, chemical and industrial hazards) before allowing KBR to enter a facility. Did the Army fail to clear sodium dichromate from the Qarmat Ali water injection facility before authorizing KBR to enter the site?

4) U.S. soldiers reported that a distinctive orange powder covered the Qarmat Ali facility and was swept into the air and onto their clothes, faces and exposed skin during frequent, intense windstorms. Many of these soldiers began experiencing symptoms consistent with exposure to sodium dichromate, including nasal perforations, "chrome holes" or ulcers on the skin, and severe nosebleeds, within days or weeks of arriving at the facility in April 2003. Given these conditions and symptoms, did the Army and KBR fail to implement timely health and safety protocols to detect industrial hazards; restrict access to the plant; and provide military-issued protective gear or Personal Protective equipment (PPE), which could have eliminated or significantly reduced the risk to U.S. military personnel?

5) USACHPPM did not begin testing soldiers at the facility until October 1, 2003, which was more than five months after the exposures began. Should USACHPPM have started testing soldiers at the site within days of when the conditions and symptoms started to be reported?

6) USACHPPM concluded that "there was not a significant inhalation exposure from Chromium VI" and "there does not appear to be any specific follow-up indicated, since there does not appear to be evidence of acute exposures." However, Herman Gibb, Ph.D, one of the country's leading experts on the health effects of sodium dichromate exposure, testified at the August 3 hearing that "the air concentration to which the Qarmat Ali soldiers were exposed could be estimated to be approximately 80 to 200 times the current OSHA limit" and "the symptoms reported by some of the soldiers who served at Qarmat Ali are consistent with significant exposure to sodium dichromate." Did USACHPPM improperly conclude that "there does not appear to be any specific follow-up indicated, since there does not appear to be evidence of acute exposures"? If so, should USACHPPM revise and re-issue its risk communications and health guidance to the soldiers who were exposed?

7) In its December 2008 report on USACHPPM's occupational and environmental health assessment at Qarmat Ali, the Defense Health Board (DHB) concluded, "Soldiers who were similarly exposed but were not studied *should be reassured that these results apply to them as well* (emphasis added)…the essentially negative results from the Indiana National Guard led to a pragmatic and reasonable decision not to extend testing and medical examination to the other Guard contingents…" Because soldiers who served during earlier periods (April to July 2003) may have been exposed to a greater risk of chromium inhalation than the soldiers tested by USACHPPM weeks after remediation, was it scientifically sound for USACHPPM to extrapolate (and for DHB to endorse the extrapolation of) test results from one group of soldiers to another group?

Thank you for your continued service and prompt attention to this matter. We look forward to receiving the results of your investigation.

Sincerely,

Byron L. Dorgan
United States Senator

Evan Bayh
United States Senator

Robert C. Byrd
United States Senator

John D. Rockefeller IV
United States Senator

Ron Wyden
United States Senator

Jeff Merkley
United States Senator

Sheldon Whitehouse
United States Senator

cc: Secretary Robert M. Gates
Secretary of Defense

Secretary William J. Lynn
Deputy Secretary of Defense

Secretary Pete Geren
Secretary of the Army

Under Secretary Ashton B. Carter
Under Secretary of Defense of
Acquisition, Technology & Logistics

Appendix B. Letter from the Senate Armed Services Committee

CARL LEVIN, MICHIGAN, CHAIRMAN
EDWARD M. KENNEDY, MASSACHUSETTS
ROBERT C. BYRD, WEST VIRGINIA
JOSEPH I. LIEBERMAN, CONNECTICUT
JACK REED, RHODE ISLAND
DANIEL K. AKAKA, HAWAII
BILL NELSON, FLORIDA
E. BENJAMIN NELSON, NEBRASKA
RYAN BAYH, INDIANA
JIM WEBB, VIRGINIA
CLAIRE McCASKILL, MISSOURI
MARK UDALL, COLORADO
KAY R. HAGAN, NORTH CAROLINA
MARK BEGICH, ALASKA
ROLAND W. BURRIS, ILLINOIS
JOHN McCAIN, ARIZONA
JAMES M. INHOFE, OKLAHOMA
JEFF SESSIONS, ALABAMA
SAXBY CHAMBLISS, GEORGIA
LINDSEY GRAHAM, SOUTH CAROLINA
JOHN THUNE, SOUTH DAKOTA
MEL MARTINEZ, FLORIDA
ROGER F. WICKER, MISSISSIPPI
RICHARD BURR, NORTH CAROLINA
DAVID VITTER, LOUISIANA
SUSAN M. COLLINS, MAINE
RICHARD D. DeROMER, STAFF DIRECTOR
JOSEPH W. ROWAN, REPUBLICAN STAFF DIRECTOR

United States Senate
COMMITTEE ON ARMED SERVICES
WASHINGTON, DC 20510-6050

September 15, 2009

The Honorable Robert M. Gates
Secretary of Defense
1000 Defense Pentagon
Washington, DC 20301

Dear Secretary Gates:

The Committee is aware of recent testimony by military veterans attributing health concerns, including both respiratory and central nervous system symptoms, to exposure to the chemical sodium dichromate during their service at the Qarmat Ali water treatment plant in Iraq in 2003.

Committee staff received a briefing in December of 2008 on the results of the Army's Center for Health Promotion and Preventive Medicine survey of the Qarmat Ali site, which acknowledged that U.S. soldiers were exposed to a known carcinogen while on duty at the Qarmat Ali water injection facility in Iraq in 2003. The Army's review determined that the level and amount of that exposure was "well below the levels that would cause concern," and that there was "no expectation of any future adverse health outcomes for these soldiers." An external review of the Army's assessment conducted in 2008 by the Defense Health Board, which included exposure, medical risk assessment, and health communication efforts, reached a similar conclusion.

It is critical that the Department of Defense does all that is necessary to identify and contact every soldier who was or potentially was exposed to sodium dichromate to determine if those soldiers are experiencing medical problems related to that exposure, and to ensure that they have access to appropriate care for all conditions related to their military service. With that objective as our goal, we request that you evaluate the adequacy and timeliness of the Department's efforts to date, including actions undertaken jointly with the Department of Veterans Affairs. Please report to the Committee on the results of your review no later than December 31, 2009. Should you conclude that additional actions are necessary, please identify those actions and specify whether any require authorization or funding from Congress.

We raise this concern with confidence not only that you share our concerns, but that you will do all that is necessary to ensure that service members receive high quality health care that is equal to their selfless service to the nation.

Sincerely,

John McCain
Ranking Member

Carl Levin
Chairman

OSD 10604-09

Appendix C. Response to Senate Democratic Policy Committee Questions

This appendix lists the seven questions posed by the Senate Democratic Policy Committee (see Appendix A) and our answers. Each answer includes a reference to the pages within the body of the report where we discuss the issues in greater depth.

Question 1. *Did the Army include provisions in Task Order 3 to specify the nature and extent of the Army's and KBR's duties to identify, prevent, report and/or remediate nuclear, biological, chemical and industrial hazards and to ensure the safety of U.S. soldiers at RIO I sites?*

OIG Response. Task Order 3 required KBR to provide employees with a safety and health program, and stated that work at sites would be in compliance with applicable Occupational Safety and Health Administration, and Army, regulations. Task Order 3 specified compliance with several standards that required KBR, as part of their safety and health program, to: complete an accident prevention plan; conduct workplace assessments, activity hazard analysis, and hazard communication; and provide personal protective equipment. The contract did not specify the Army's duties to identify, prevent, report, and/or remediate nuclear, biological, chemical and industrial hazards and to ensure the safety of U.S. soldiers at TF RIO sites. (Pages 12-15)

Question 2. *Task Order 3 states, "…it is not the intent of this contract to remediate pre-hostilities environmental contamination unless such remediation is necessary to protect the health and safety of contractor and Government personnel during ongoing restoration actions." Based on this language, should the Army have directed, and KBR performed, a timely remediation of the Qarmat Ali facility beginning in March 2003 to "protect the health and safety of contractor and Government personnel"?*

OIG Response. Army and KBR representatives learned of the contamination in June, 2003. KBR notified TF RIO of their intent, and the administrative contracting officer approved their plan, to encapsulate chromium contaminated soils in mid-August 2003. Mitigation activities to protect the health and safety of personnel could have started earlier. (Pages 12 and 16)

Question 3. *Task Order 3 required the Army to inform KBR that an Iraqi oil infrastructure facility was "benign" and had been cleared of all environmental hazards (including nuclear, biological, chemical and industrial hazards) before allowing KBR to enter a facility. Did the Army fail to clear sodium dichromate from the Qarmat Ali water injection facility before authorizing KBR to enter the site?*

OIG Response. The Army took no action to clear the site of industrial hazards. The general understanding that sites free of military hazards were ready for contractors to begin work was a major consideration that led to the inaction. We found no evidence that representatives from either the Army or KBR considered the presence of industrial or

non-military environmental hazards in the decision to proceed to an oil infrastructure site. (Pages 7-9)

Question 4. *U.S. soldiers reported that a distinctive orange powder covered the Qarmat Ali facility and was swept into the air and onto their clothes, faces and exposed skin during frequent, intense windstorms. Many of these soldiers began experiencing symptoms consistent with exposure to sodium dichromate, including nasal perforations, "chrome holes" or ulcers on the skin, and severe nosebleeds, within days or weeks of arriving at the facility in April 2003. Given these conditions and symptoms, did the Army and KBR fail to implement timely health and safety protocols to detect industrial hazards; restrict access to the plant; and provide military-issued protective gear or Personal Protective Equipment (PPE), which could have eliminated or significantly reduced the risk to U.S. military personnel?*

OIG Response. The Army and the contractor were aware of sodium dichromate contamination in June, 2003. They implemented appropriate protocols, restricted access, and required personal protective equipment in August. Activities to protect the health and safety of personnel could have started earlier. (Pages 12-15)

Question 5. *USACHPPM did not begin testing soldiers at the facility until October 1, 2003, which was more than five months after the exposures began. Should USACHPPM have started testing soldiers at the site within days of when the conditions and symptoms started to be reported?*

OIG Response. USACHPPM could not have begun testing until notified by the Combined Forces Land Component Command Surgeon. Notification and the request for support did not occur until September 15 and September 26, 2003, respectively. The USACHPPM team began its deployment occupational and environmental health survey and operational risk assessment four days after the request. (Pages 16-17)

Question 6. *USACHPPM concluded that "there was not a significant inhalation exposure from Chromium VI" and "there does not appear to be any specific follow-up indicated, since there does not appear to be evidence of acute exposures." However, Herman Gibb, Ph.D, one of the country's leading experts on the health effects of sodium dichromate exposure, testified at the August 3 hearing that "the air concentration to which the Qarmat Ali soldiers were exposed could be estimated to be approximately 80 to 200 times the current OSHA limit" and "the symptoms reported by some of the soldiers who served at Qarmat Ali are consistent with significant exposure to sodium dichromate."*

Question 6.1. *Did USACHPPM improperly conclude that "there does not appear to be any specific follow-up indicated, since there does not appear to be evidence of acute exposures"?*

OIG Response. USACHPPM conducted physical exams of 129 Indiana ARNG and TF RIO personnel and obtained self-reported medical information by questionnaire from 137 additional personnel performing duties at the Qarmat Ali facility for their assessment.

USACHPPM findings and the testimony of Dr. Gibb are not necessarily contradictory. While approximately 30 percent of the individuals demonstrated or reported physical findings potentially related to chromium exposure, USACHPPM reported no findings of acute exposure. In their report, USACHPPM recommended to the Combined Forces Land Component Command Surgeon that, "individuals identified with abnormal ancillary test results complete follow-up medical evaluation." In any event, DoD and VA have offered physical exams to all personnel who served at Qarmat Ali, regardless of the intensity and duration of exposure. (Page 20)

Question 6.2. *If so, should USACHPPM revise and re-issue its risk communications and health guidance to the soldiers who were exposed?*

OIG Response. USACHPPM risk communication efforts included fact sheets and "town hall" type meetings. In addition, in 2008 and 2009 representatives from the Army and National Guard Bureau met with personnel from ARNG units that performed duty at Qarmat Ali in 2003. On October 12, 2010, the Secretaries of Defense and Veterans Affairs co-signed a letter inviting recipients to participate in a medical surveillance program developed specifically to evaluate them for symptoms of sodium dichromate exposure. The Army and Department of Veterans Affairs mailed copies to individuals identified as having served at Qarmat Ali in 2003. (Pages 19 and 28)

Question 7. *In its December 2008 report on USACHPPM's occupational and environmental health assessment at Qarmat Ali, the Defense Health Board (DHB) concluded, "Soldiers who were similarly exposed but were not studied should be reassured that these results apply to them as well (emphasis added)…the essentially negative results from the Indiana National Guard led to a pragmatic and reasonable decision not to extend testing and medical examination to the other Guard contingents…" Because soldiers who served during earlier periods (April to July 2003) may have been exposed to a greater risk of chromium inhalation than the soldiers tested by USACHPPM weeks after remediation, was it scientifically sound for USACHPPM to extrapolate (and for DHB to endorse the extrapolation of) test results from one group of soldiers to another group?*

OIG Response. During their assessment in 2003, USACHPPM reported conducting physical exams of ARNG and TF RIO personnel performing duties at the Qarmat Ali facility. They also reported obtaining self-reported medical information by questionnaire from soldiers who served "during earlier periods." In neither case did USACHPPM report symptoms of acute exposure to sodium dichromate. Representatives from the Environmental Protection Agency told us that modeling pre-mitigation conditions would be very difficult, and that the science to determine the effects of chemical exposures was not sufficiently developed. The decision by the USACHPPM assessment team not to provide medical exams to the entire available Qarmat Ali population in 2003 represented a lost opportunity for obtaining more complete knowledge of the possible medical impact of pre-encapsulation exposure. Regardless, DoD and the Department of Veterans Affairs have offered all personnel who served at Qarmat Ali inclusion in the Gulf War Registry and sodium dichromate specific screenings. (Pages 19-21)

Appendix D. Scope and Methodology

Our objective was to review DoD actions regarding the exposure of personnel to sodium dichromate at the Qarmat Ali water treatment plant in 2003. We conducted this evaluation from September 2009 to May 2011, in accordance with the standards established by the President's Council on Integrity and Efficiency (now the Council of the Inspectors General on Integrity and Efficiency) published in the *Quality Standards for Inspections*, January 2005. The evidence we obtained provides a reasonable basis for our observations and conclusions in concert with our objectives.

Scope

Our project assessed U.S. Army and contractor actions in response to the exposure of military and DoD civilian personnel to sodium dichromate at the Qarmat Ali water treatment plant, Iraq, from April 2003 through January 2011. This report discusses U.S. Army, Combined Forces Land Component Commander - Iraq, and contractor actions in 2003 and 2004 specific to the exposure at the Qarmat Ali facility. An earlier report addressed U.S. Army and National Guard Bureau actions to identify, notify, and provide access to care for exposed personnel that took place in 2008 to 2010.

We did not visit the Qarmat Ali site; direct observations of the site six years after the exposure would not further our objective and U.S. Forces ceded control to the Iraqi Southern Oil Company in November 2005.

Methodology

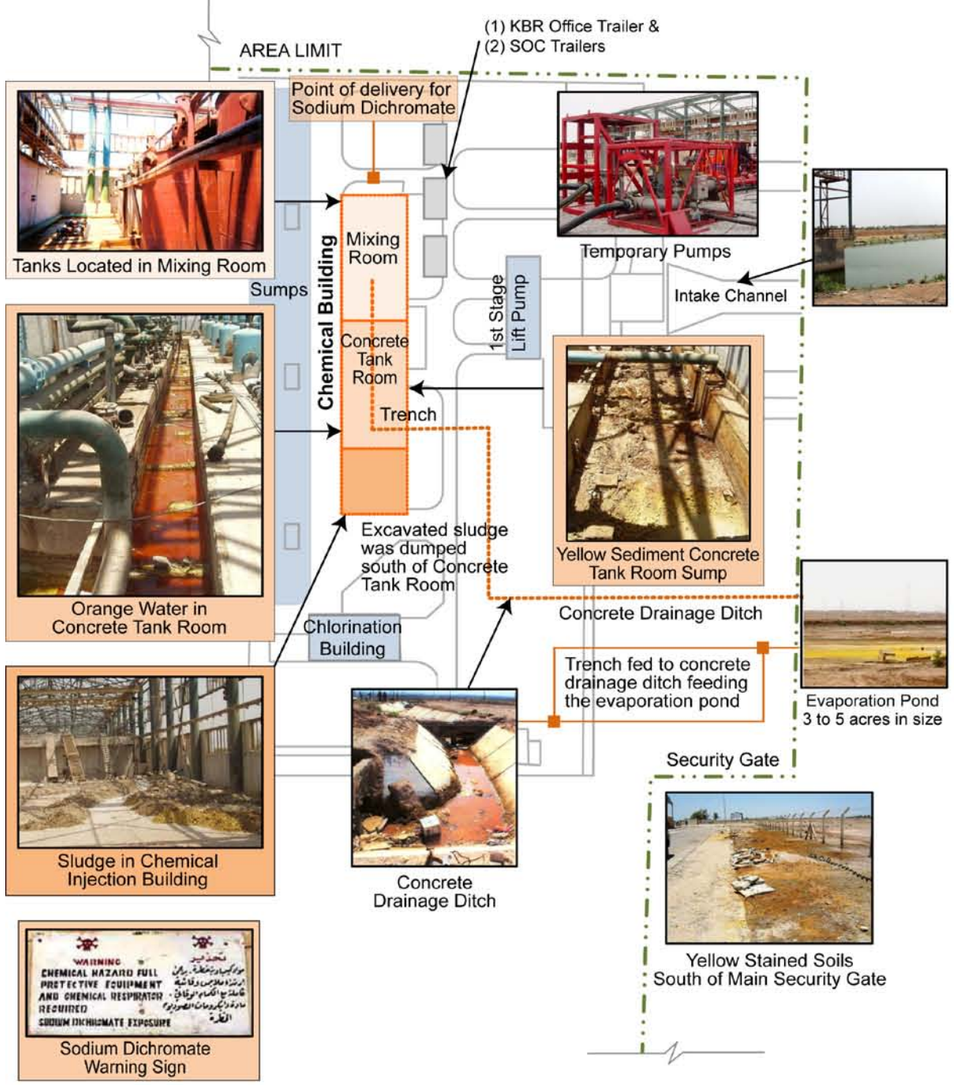
For this report, we examined statutes, policies, procedures, and management and oversight reports relevant to DoD policy and practices regarding efforts to identify and communicate the risks associated with exposure to sodium dichromate at the Qarmat Ali water treatment plant in 2003 and 2004. We reviewed contract number DACA63-03-D-005 and its subordinate Task Order 3 as they related to actions at the Qarmat Ali facility.

The team examined documents totaling over 83,000 pages provided by the National Guard Bureau, U.S. Army Corps of Engineers, and KBR related to operations at the Qarmat Ali water treatment plant. We reviewed a draft report of investigation and associated exhibits prepared by USACE for the Secretary of the Army in accordance with Army Regulation 15-6, "Procedures for Investigating Officers and Boards of Officers."

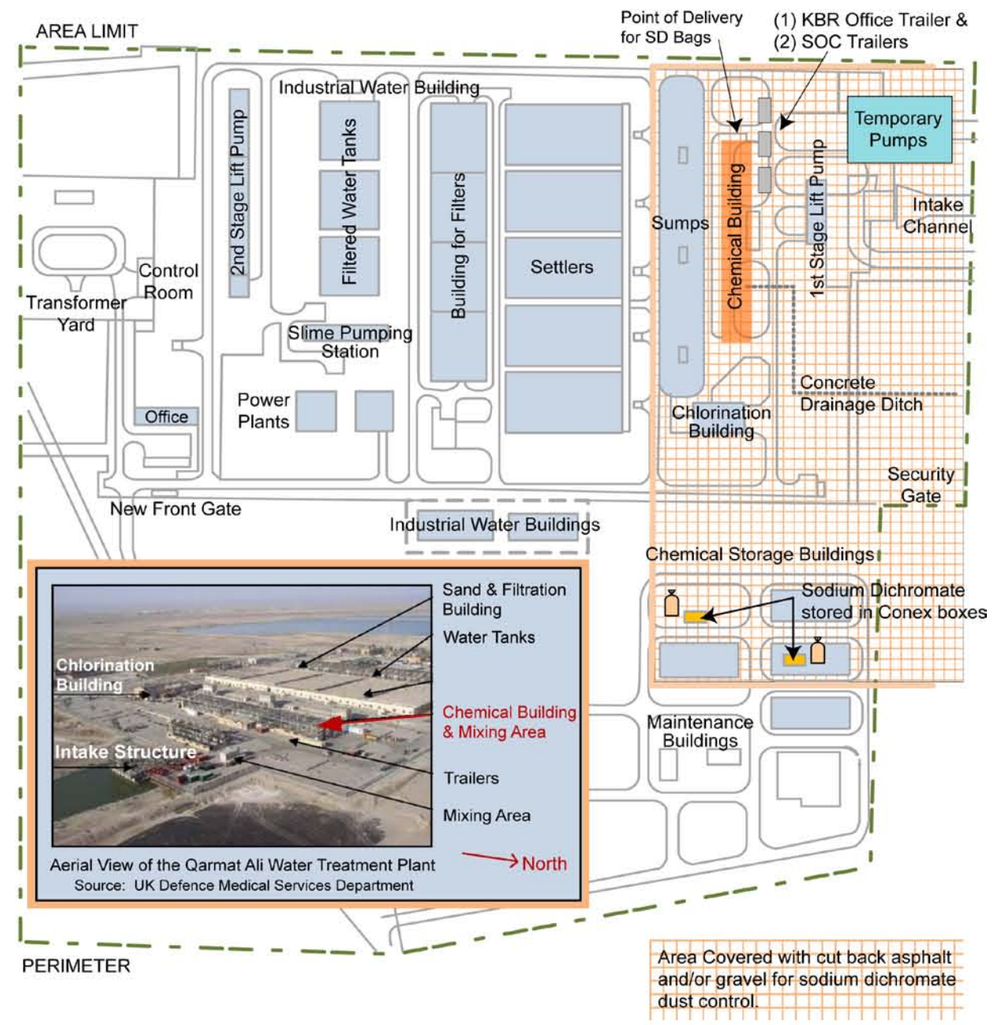
We conducted 22 interviews, including sworn testimony from 19 individuals assigned to the U.S. Army Corps of Engineers with duty at Qarmat Ali during 2003. We interviewed and collected information from representatives of the Assistant Secretary of Defense for Health Affairs, Defense Health Board, Assistant Secretary of the Army for Manpower and Reserve Affairs, U.S. Central Command, U.S. Army Corps of Engineers, and U.S. Army Center for Health Promotion and Preventive Medicine.

We met with and received technical assistance from representatives of the Occupational Safety and Health Administration and the Environmental Protection Agency concerning the interpretation of regulations and health effects of sodium dichromate exposure.

Appendix E. Diagram of the Qarmat Ali Water Treatment Plant Facility



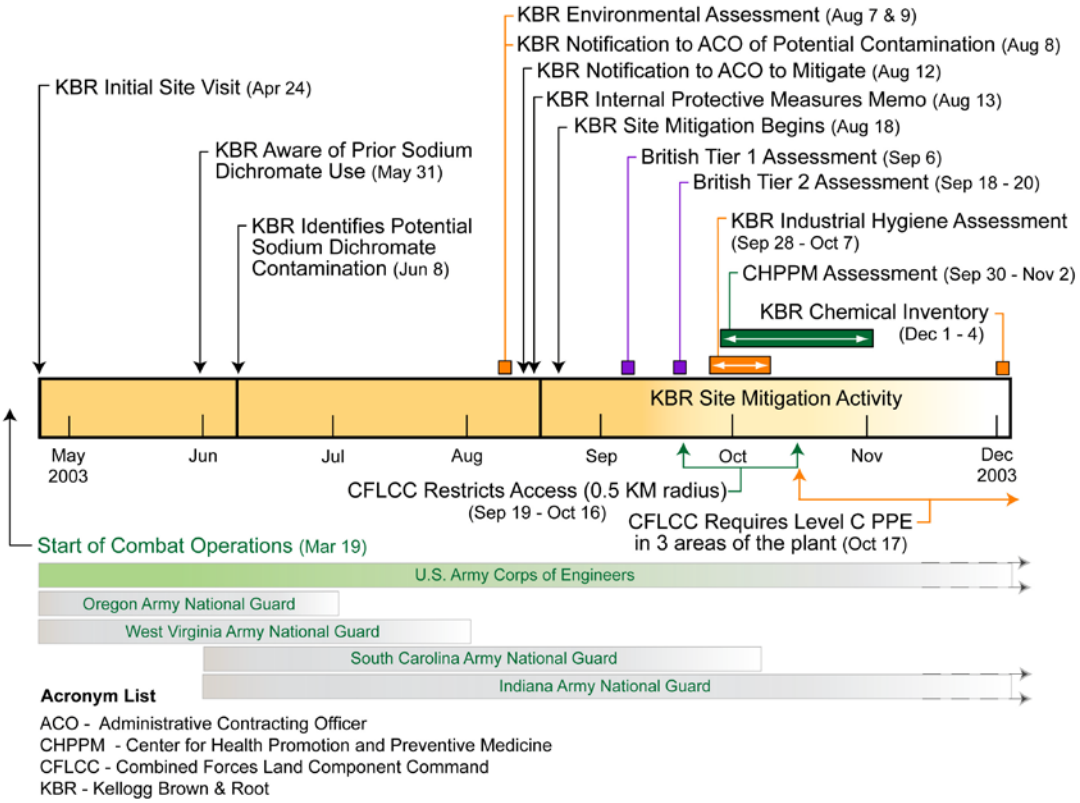
Partial Plan Qarmat Ali Water Treatment Plant and the Chemical Injection Building North
Not to Scale



Qarmat Ali Water Treatment Plant North
Not to Scale

Appendix F. Timeline of Events at the Qarmat Ali Facility in 2003

Planning for Operation Iraqi Freedom included reestablishing the Iraqi oil infrastructure. The Qarmat Ali water treatment plant was one facility identified as important to Iraqi oil production. The following timeline lists important events associated with the exposure of U.S. personnel to sodium dichromate the Qarmat Ali facility.



Timeline for Potential Sodium Dichromate Exposure at the Qarmat Ali Water Treatment Plant Facility

Sodium Dichromate Recognition

April 2003 – A TF RIO safety manager testified that he observed sodium dichromate on site in April, and that the "contractor was aware those chemicals were hazardous". However, other testimony indicated the visit in question occurred in June and we were unable to find documentation supporting the statement.

May 2003 – A document dated May 19 indicated KBR did not know what chemicals the Iraqis used at Qarmat Ali. On May 27 the KBR Health, Safety, and Environment Manager was warned of "residual chemical hazards." Notes documented by a KBR engineer on May 31 show he was aware of prior use of sodium dichromate at Qarmat Ali.

June 2003 – On June 1 Iraqi Southern Oil Company representatives notified KBR that they used sodium dichromate and other chemicals at Qarmat Ali. On June 8 a KBR environmental specialist reported observing discolored soils at the site.

On June 21 a KBR project engineer reported to KBR environmental officials that sodium dichromate was used as a corrosion inhibitor at the plant and inquired whether the use of the chemical was acceptable. On the same day, a KBR environmental specialist e-mailed a KBR environmental manager that he observed sodium dichromate contamination at the Qarmat Ali water treatment plant, that it was a "strong irritant and a potential carcinogen," and recommended testing. Also on June 21, a KBR environmental engineer demonstrated recognition of the challenges associated with the use of sodium dichromate. He wrote that, "Sodium dichromate has been replaced as a commonly utilized corrosion inhibitor in the US due to toxicity and disposal issues…I suggest that another less toxic material be identified to replace the sodium dichromate as there is a potential for use of the treated injection water for drinking, bathing and cooking by uniformed persons…."

Documentation of a June 25 site visit indicates that TF RIO representatives may have been aware that sodium dichromate was used by the Iraqis, was considered a carcinogen, and that a significant amount was in the mixing tank room. Further, a briefing to the TF RIO Commanding General in October or November noted that a TF RIO safety officer identified sodium dichromate use in a June site assessment

Initial Response to Sodium Dichromate Hazard

June 2003 – KBR reported covering "yellow stained soil" with soil from outside the water treatment plant sometime in June "as an initial measure to minimize direct contact with the stained soil and prevent or minimize the airborne mobility and inhalation of the contaminated surface soil."

Minutes of a June 14-15 meeting between TF RIO, KBR, and Iraqi State Company for Oil Projects representatives noted that "chemical treatment should [be] selected based on widely available nontoxic commodity chemicals." However, e-mails between KBR personnel in late June indicated a decision from corporate headquarters in Houston to keep using "chromate" and other chemicals used previously. Three TF RIO witnesses we interviewed supported the conclusion that sodium dichromate was not used at Qarmat Ali after TF RIO and KBR personnel arrived.

In a June 29 meeting, Southern Oil Company representatives reportedly asked KBR - with TF RIO representatives present - to research a more environmentally-friendly corrosion inhibitor. This request contradicts the general Iraqi lack of concern with the hazards of sodium dichromate.

July 2003 – As of July 6, at least one TF RIO employee was aware of the presence and potential dangers of sodium dichromate. A July 7 KBR site assessment report consolidating information from early July identified sodium dichromate and other chemicals being stored in the chemical building. On July 25, KBR advised USACE of its decision to abandon the existing chemical injection system, and stated that USACE agreed that sodium dichromate would no longer be used.

August 2003 – Per an undated memorandum, a KBR Health, Safety, and Environment manager met with 17 employees on August 6 to discuss their concerns over potential sodium dichromate exposure. This represents the first observed documentation of KBR management communicating with employees about sodium dichromate. The KBR Health, Safety, and Environmental manager stated that the employees provided him with a copy of KBR e-mails from July 27 and 28 describing the presence of sodium dichromate in the chemical feed tank area of the site. The manager instructed the employees to stay out of that area unless wearing personal protective equipment prescribed by the material safety data sheet for sodium dichromate.

On August 7 and 9 KBR conducted a limited environmental assessment of potential sodium dichromate contamination, including air and soil samples. The report noted recommendations to restrict personnel from, and wear PPE in, certain areas, and to conduct a complete environmental safety and health assessment. KBR informed TF RIO of potential soil contamination on August 8, and halted work around the chemical injection building on August 9. On August 12, following confirmation of chromium contamination, KBR notified the TF RIO Administrative Contracting Officer of their intent to "immediately procure a contractor, materials, and means to encapsulate the soils in question." On August 19 KBR initiated blood testing of its employees for chromium and other substances.

Mitigation and Cleanup

August 2003 – On August 13 a KBR environmental technician recommended procedures for decontaminating selected areas of the plant. On August 18, a Kuwaiti subcontractor hired by KBR began to encapsulate contaminated soil. Mitigation actions included application of a liquid asphalt sealant, adding a three inch layer of gravel over the asphalt, sweeping and flushing roads and walkways with water, and removing sludge and other debris. Dust control measures and other clean-up operations continued through at least October 30, 2003.

September 2003 – On September 8 KBR limited facility access to two mission-essential workers wearing PPE. In a September 12 memo, a KBR environmental specialist recommended ceasing asphalt coverage efforts due to lack of asphalt and personal protective equipment. He recommended a complete environmental assessment of the facility as soon as possible.

On September 15 KBR began medical surveillance of employees, and the Combined Forces Land Component Command Surgeon's Office notified USACHPPM of the potential exposure.

On September 19, Combined Forces Land Component Command issued an order restricting all coalition soldiers from a radius of 0.5 kilometer from the site and discontinuing any mission to the facility without permission from the Command Surgeon. On September 26 the Command Surgeon sent an official request for occupational and environmental health personnel support.

October 2003 – Minutes of an October 2, 2003 meeting between, KBR, TF RIO, CHPPM, and Southern Oil Company representatives document KBR health, Safety, and Environmental managers as stating that "…the use of sodium dichromate right now is not in a closed system," and, "chemicals are not being injected in a closed system as they should, it is being spread all over the place."

Site Assessments

August 2003 – On August 7 and 9 KBR conducted a limited environmental assessment of potential sodium dichromate contamination, including air and soil samples.

September 2003 – On September 6 the British Army Medical Directorate Environmental Monitoring Team conducted a Tier 1 Environmental and Industrial Hazards Assessment, and on September 18-20 a Tier 2 Assessment, to evaluate the exposure of United Kingdom troops to sodium dichromate and other chemicals at Qarmat Ali.

From September 28 to October 7 a KBR industrial hygienist conducted a health hazard assessment at Qarmat Ali and collected area samples for hexavalent chromium and total chromium.

On September 30, a USACHPPM Special Medical Augmentation Response Team (including specialists from Maryland and Germany) began a health risk assessment at the Qarmat Ali facility. KBR provided the USACHPPM health survey team the results of air quality and soil samples collected at the Qarmat Ali facility from August through October.

Post-Assessment Actions

October 2003 – On October 17, 2003, during the USACHPPM assessment, the Combined Forces Land Component Commander modified the order of September 19, restricting coalition soldiers from entering certain portions of the Qarmat Ali facility and mandating appropriate personal protective equipment.

On October 27 the contractor resumed work with personnel wearing required personal protective equipment.

January 2004 – USACHPPM published a classified report of their findings on January 15, 2004, including 13 recommendations to the Combined Forces Land Component Command Surgeon.

November 2003 – Documentation from November shows KBR was still responding to issues about sodium dichromate contamination at Qarmat Ali. On November 1 KBR was having difficulty obtaining PPE for personnel working at the water treatment plant. On November 3 a KBR project manager reminded project RIO personnel to make sure they asked vendors to provide material safety data sheets with all purchases containing chemicals. On November 19, 2003, a KBR project manager sent an internal e-mail asking KBR personnel to put signs or suitable tape/flagging to make sure everyone understood that Class C personal protective equipment was required to enter all buildings at the site. Finally, the minutes of a meeting held on November 24 at the Qarmat Ali site

stated that a KBR project manager discussed the requirement for wearing personal protective equipment in all buildings and the area east of the filter building, and that signs were being made for posting at these buildings. Representatives from KBR, TF RIO, and the Southern Oil Company reportedly attended the meeting.

December 2003 – From December 1 until December 4 KBR performed a hazard assessment that identified the quantities and locations of chemicals and contaminants, including chlorine, sodium dichromate, and polychlorinated biphenyls. In the December assessment, KBR recommended continued sampling and chemical analysis as necessary to define potential health risks to all workers (KBR, subcontractors, and Southern Oil Company representatives). The hazard assessment report also recommended the disposal of approximately 700 bags of sodium dichromate remaining on site.

December 2003 – Evidence indicates that the Southern Oil Company was trying to purchase more sodium dichromate as late as December 2003, but KBR representatives blocked the purchase.

March 2004 – Reportedly, as late as March 2004, the Iraqis still kept a large amount of sodium dichromate on-site.

March 2005 – KBR completed work at the Qarmat Ali facility and associated pumping stations.

November 2005 – On November 14 the Iraqi Southern Oil Company accepted control of the site.

August 2007 – Parsons Iraq Joint Venture, a U.S. Contractor, provided engineering and equipment support, with Iraqi workers performing installation/construction tasks, as late as August 2007.

December 2008 – The Defense Health Board reviewed the classified USACHPPM report and issued their assessment on December 19.

January 2009 – USACHPPM released an unclassified version of its report on January 10 redacting information related to military operations and personally identifiable information.

Appendix G. Management Comments and Our Response

We requested and received comments from four DoD organizations. Summaries of their comments follow; complete comments are available upon request.

Office of the Under Secretary of Defense (Personal and Readiness). The Director, Force Readiness & Health Assurance, Office of the Under Secretary of Defense (Personal and Readiness) provided six technical comments to the report. We incorporated four comments. The comment relating to policy in effect in 2003 regarding completion of the Post Deployment Health Assessment was incorrect. Department of Army policy published on December 20, 2002, supports our statement as written in the draft report. Their final comment provided updated information subsequent to our May 18, 2011 discussions. They stated that as of August 1, 2011 USACE contacted one additional active duty service member, increasing the total from 72 to 73. Also, 43 individuals have chosen to participate in the DoD program, an increase from 20 in May 2011.

Deputy Assistant Secretary of the Army. The Deputy Assistant Secretary of the Army (Military Personnel) concurred with the report observations, and provided 20 technical and editorial comments. We incorporated 12 comments into this report. Of the remaining 8 comments, three asked for facts that were not present in documents and other records collected, one requested the inclusion of data already in the report, one provided evidence available after May 2011, and three recommended changing "exposure" to "potential exposure," when individuals were exposed.

U.S. Army Corps of Engineers. The Acting Chief Transatlantic Division Regional Integration Team Directorate of Military Programs concurred with the report observations. His response included two technical comments referring to the development of environmental surveillance teams and the relationship of TF-RIO to Iraqi oil workers. We incorporated both comments into the report.

U.S. Central Command. The U.S. Central Command Inspector General concurred with the report observations. Their three comments were technical and editorial. We did not incorporate their comments concerning the specific command responsible for the delayed notification and response to the exposure. We were unable to determine dates for notifications in 2003 and chose to summarize the events in a general DoD response.

Appendix H. Distribution

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General Information

Forward questions or comments concerning this assessment and report and other activities conducted by the Office of Special Plans & Operations to spo@dodig.mil

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