Abu Khasib to Al Ah'qaf:
Iraq Gulf War II Field Investigations Report ©

Uranium Medical Research Centre
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British Ministry of Defence on the Cleaning-up of Iraq - 2003

"A nation which has fired DU in conflict is under no legal obligation per se to return to the region to clean up any DU that remains".

Operation Telic Middle East DU Brief
British Ministry of Defence

US Department of Defense on Kinetic Energy Weapon (KEW) Systems - 2002

"High-density KE cannon-launched penetrators have been, and will continue to be a mainstay of U.S. anti-armor capabilities. The most advanced (and most lethal) manifestation of the technology are the modern U.S. depleted-uranium (DU) 120-mm tank-gun armour-piercing, fin-stabalized, discard sabot (APFSDS) rounds.

"The DU alloy has been state of the art … since 1970, and improvements in metallurgy and processing have yielded continual advances in … [the] performance of U.S. rounds. Alternative developing technologies include composite rods (typically DU reinforced with higher strength structural elements), and efforts to duplicate the performance of DU in tungsten alloys.

"The primary impetus for looking at tungsten alloy has been to obtain commonality with NATO allies, many whom will not deploy DU rounds because of environmental concern. However, since the break-up of the FSU [Former Soviet Union], the United States and its allies have been less focused on planning for conventional land war against numerically superior Warsaw Pact armoured forces, and indications are that other countries have eased their stance on the use of DU."

Military Critical Technologies,
Defense Technologies Information Center,
Defense Information Systems Agency
U.S. Department of Defense, July 2002.

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Special acknowledgement: UMRC notes the special contribution of Dr. M. A. Shaickly, Professor of Nuclear Medicine, for his leadership, consultations and guidance during the 13 days of investigations. In addition to procuring critical resources in Iraq, Dr. Shaickly and his associate risked their personal safety in the presence of unexploded ordnance, cluster munitions, mines, collapsing buildings and nervous Coalition security patrols.

Preface

The unfortunate fate of Iraqi civilians and Coalition veterans … case studies in the investigations of the effects of radiation dispersion weapons…

The international anti-terrorism/anti-WMD (weapons of mass destruction) Coalition's admission of its deployment of uranium munitions in yet another conflict was first confirmed by physical evidence collected by the Japanese, No War-No DU science team (September 2003). The team identified artificial radionuclides in tanks and wide scale elevations of radioactivity in Iraq's environment. Earlier, Christian Science Monitor staff reporter, Scott Peterson, revealed the results of his independent radiation survey of Baghdad battlefields, detecting radioactivity in tanks 1,900 X's background levels (August 2003).

Pre-Gulf War II radiation surveys by Iraqi scientists had already detected elevated readings of ionising radiation associated with the Operation Desert Storm legacy. In 1992, Dr S. Horst Gunther collected field evidence in the form of a fragment of a tank penetrator, later confirmed in the laboratory to be Depleted Uranium. Dr. Gunther's work, including his disclosure that Germany had fielded uranium penetrators since WW II, led to his arrest and conviction for importing "dangerous radioactive materials", under the country's atomic energy control regulations. Indigenous studies statistically correlating cancer, birth defects, premature death and leukaemia trends in Iraq established epidemiological certainties in areas subject to Gulf War I bombing campaigns where uranium was used in combat and may have been used throughout the 1990's in US-led Operations Desert Fox and Desert Strike.

With the exception of the Uranium Medical Research Centre's studies of Gulf War I veterans' urine and body tissue specimens, no independent clinical radiological studies have been published in science or medical journals that demonstrate human contamination by inhalation of battlefield uranium by-products dispersed in Iraq. Physical evidence of contamination attributed to retained DU shrapnel accompanied by elevated urine uranium levels in US Gulf War I veterans was reported in published studies by associates of the US Gulf War Clinical Follow-up and Surveillance Programs. The US DVA (Department of Veterans Affairs) and DoD (Department of Defence) physicians take a position that retained shrapnel constitutes the only battlefield uranium exposure condition placing armed forces personnel at risk. Claims that elevated urine uranium levels in veterans is due to retained DU shrapnel remain metabolically questionable. Inhalation is the primary pathway by which veterans and civilians are contaminated by battlefield uranium and is therefore likely to have been coincidental with shrapnel wounding. DoD and the DVA have not permitted lung or lymph node studies in this small group of veterans – preventing the obvious examinations to determine inhalational exposure.

Although US-led Coalition-members' and NATO defence departments acknowledge battlefield uranium by-products, if inhaled, could be a biological hazard, they do not attribute any significance to their findings of DU in those veterans who do not have DU shrapnel wounds. German, Australian, Danish, Canadian and British defence department studies for example, identified abnormally high concentrations of uranium in urine (some finding DU isotopes) of Balkan and/or Gulf veterans. They dismiss the findings by explaining that veterans' urine uranium levels do not exceed the US DoD's expressed reference point: 50 ng (nanograms) of uranium per litre of urine for unexposed populations. They claim the veterans exhibit "normal distributions".

Dismissing elevated urine uranium values in Canadian and European armed forces based on a threshold limit value of 50 ng/litre reveals these counties are ignoring international and domestic occupational and civilian public health regulations. The US public health regulatory baseline for biological background levels of uranium in urine is actually 8 ng/litre; a significant variation from the DoD standard and a distinction they all fail to report to veterans and political oversight committees. UMRC's control sampling shows normal European populations excrete uranium in urine at a rate of 2 to 11 ng/litre. By not comparing veterans urine uranium values to the US Center for Disease Control's 8 ng/l average for normal populations, EU, Canadian and NATO states' defence departments are ignoring uranium contamination ~6 X's the norm.

Misrepresenting clinical and environmental facts allows defence departments to persist at avoiding what they know is the most important step in DU research and clinical follow-up: dose reconstruction by "retroactive differential decay analysis". Dose reconstruction is legislated as the means to determining worker eligibility for health benefits for diseases resulting from exposure to industrial and commercial uranium in the US nuclear sector. Using retroactive differential decay analysis, UMRC has published data showing some Canadian, British and American Gulf War I veterans, whose urine contains trace amounts of DU ten years after exposure, inhaled sufficient quantities of battlefield uranium to receive an internal dose exceeding the legally permitted radiation dose levels for civilians. External doses at these levels would be unusual and short-lived events, ceasing when the subject departs the source of exposure. Incorporation of uranium by inhalation presents internal radioactive "hot-spots", permanently contaminating organ tissues and bones, and assaulting the chromosomal structure of the DNA. This is clinically established as a condition which can never be escaped and for which there is no known medical treatment.

Defence departments' official policy is to protect their personnel with the same standard as civilians. If they were to reconstruct the dose levels in properly tested veterans with battlefield uranium exposure, they would have to admit to uranium contamination exceeding civilian protection standards -- facing litigation by veterans and political pressures to desist from using uranium munitions. If instead, they choose to adopt the more tolerant, "occupational" dose limits, they would become subject to "nuclear employer" status with onerous occupational health and safety regimes and pressures to extend radiation protection and exposure control into the battlefield. Controlling battlefield exposure to uranium munitions' by-products would be impossible without eliminating uranium altogether. This would likely launch them down the slippery slope of accountability for civilian effects in foreign conflict areas. As indicated in this report's opening quotes (page 2), the DoD and its Coalition partners intend to expand the inventory and more widely deploy uranium munitions now that warfare is intended only to be conducted outside the European theatre.

So far, defence departments have been allowed to fail to explain undiagnosed illnesses and pathologies in exposed civilians and armed forces in every conflict where uranium munitions were deployed (i.e. Gulf War Illness, etc). Uranium weapons remain the only common variable (see UMRC's paper, Unexplained Illnesses and Radiological Warfare, Croatian Medical Journal, October 2003). Once again, Iraq has become the unfortunate laboratory for radiological and medical research into the effects of radiation dispersion weapons. Early research in Iraq and with Coalition veterans must produce works suitable for professional publication, focusing on the scientific and medical fundamentals of contamination by battlefield uranium:

- The biochemistry and nanopathology of ultra-fine, ceramic uranium oxide particles and uranium-rich compounds produced in the battlefield.
- The conflict and post-conflict atmospheric entrainment, transport, and environmental exposure mechanisms.
- The unique contamination pathway of inhaled uranium particulate via lungs to the lymph and blood circulatory systems.
- The metabolic life cycle, organ and tissue incorporation, long-lived retention and recirculation of low-soluble to insoluble ceramic uranium.
- Radiological and chemical toxicity – at cellular levels with systemic effects of long term individual and multigenerational genetic and congenital pathologies -- due to dose-effects unique to internally incorporated contamination.

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November 2003

Abu Khasib to Al Ahqaf:
Radioactive warfare in Iraq – Field Investigations Report

Uranium Medical Research Centre

Introduction

On September 27, 2003, UMRC sent a field research team to Iraq in its first phase of radiological and clinical studies on the scale and effects of uranium dispersed by air-delivered munitions and ground combat weapons deployed during Operation Iraqi Freedom, Operations Telic and James (British) and Operation Falconer (Australia). UMRC conducted a 13-day survey throughout the primary conflict zones in urban and rural areas of central and southern Iraq (Fig 1). The team performed radiation surveys, nuclide analysis, interviewed civilians and community leaders, collected biological and field samples, and investigated the possible health effects of radiological weapons on Iraqi civilians. The types of locations investigated include:

- Ground-zero of acquired targets of the air bombing campaign.
- Disabled Iraqi armoured assets and their defensive positions.
- Suburban, inner-city and agricultural areas that served as battlefields.
- Locations subject to both aerial bombing and ground combat.
- Collateral damage sites.
- Military facilities, airforce bases and the perimeters of Coalition occupied bases.
- Down-wind and wide-area environments potentially subject to atmospheric, surface soil and ground water contamination.

The order of investigations

UMRC's field survey, bombsite and battlefield investigations, and sample collection activities were conducted in central and southern Iraq, corresponding to the major areas of engagement. Under the dictates of the Powel Doctrine of "overwhelming force" and "total demoralisation", Operation Iraqi Freedom executed two operational programs: "Rapid Dominance" and "Shock and Awe"; each was investigated by UMRC (Figure 1).

- "Rapid Dominance": the mechanised ground and air cavalry advance

The team traversed Iraq from the south to the north, beginning at the Persian Gulf, Al Fau peninsula, and Coalition entry points at the port of Umm Qasr and the UN Demilitarised Zone at the Kuwaiti border adjacent to Az Zubair. The investigations proceeded northerly along the Shaat al Arabi corridor to sites of engagement led by the British approaching the city of Al Basra – known in European press as the "Battle for Basra". Investigations continued north to An Nasiriyah where the US mechanised main column divided its forces into three: north-easterly along the Tigris River, north-westerly along the Euphrates River and centrally through the uplands of Mesopotamia[1]. Battlefields were surveyed along each route, westerly through As Samawah to An

[1] "Mesopotamia" – The land between the two rivers. Although referred to as the uplands, the converging and eventual confluence of the Tigris and Euphrates Rivers below Baghdad, southern Iraq (the "source"), forms a massive river delta composed of fine clay-based silt deposits. This region is geographically unusual in that much of the area adjacent to and between the two rivers is at a lower elevation than the rivers themselves.

Najf, centrally through Karbala and As Suweirah, and easterly through Al Kuts and Al Hillah. UMRC investigated a major combat area not reported during the war in the fertile plain of the As Suweirah agricultural area (60 kilometres south of Baghdad). The team also concentrated efforts at the southerly approach-point to Baghdad where the main northbound highways from the east and west converge at Baghdad Gate.

- Shock and Awe": the air-delivered and ship- and submarine-launched bombing campaign.

The field team investigated radiation levels at some of the highly publicised strategic military and civilian demoralisation targets in Baghdad, where the explosions of ship-launched weapons such as the TLAM – Tomahawk Land Attack Munition, and the air-delivered, precision guided bombs - primarily the CALCM – Conventional Air launched Cruise Missile, J-DAM – Joint Direct Attack Munitions, JSOW – Joint Stand-off Weapons, and the newly deployed British bunker-buster called the Storm Shadow - were seen around the world on network television.

The team took radiation readings and collected laboratory samples from urban bombsites acquired by a variety of bombs, including bunker-busters, earth-penetrating ordnance, thermobaric and combined-effects (high-explosive, incendiary and fragmentation) munitions. Locations investigated include the Mansour District, the site of the famous April 7th leadership decapitation strike [2], Baath Party HQ, the Central Telephone Exchange (Sadaam Tower), and the Baghdad Central Market and International Centre. Although not permitted access to Coalition-occupied bases, UMRC was able to survey the combat areas and down-wind communities on the perimeter of the International Airport. Witnesses living next to the airport report 3,000 civilians were incinerated by one morning's attack from aerial bursts of thermobaric and fuel air bombs. Since the cessation of the main phase of battle, several of the Baghdad area battlefields, collateral damage sites, urban combat areas, decapitation strikes, and bunker buster bomb sites had been cleaned up, back-filled with fresh soil and landscaped by the US forces and Iraqi contractors, thus preventing a thorough examination.

[2] The team found that the target of the April 7th decapitation strike, instead of a restaurant with an underground bunker, was a residence around the corner from Ramadan Avenue. This strike by four precision guided 2000 pound (or 3000 pound, depending on reports) bunker busters vaporised a large upper-class home, left a 60 foot crater, and killed members of three families. The next door neighbours found the leg of the 15 year old daughter on their balcony and the grandmother's head was found on the roof of the house across the street. US Special Forces arrived 10 days after the bombing to take DNA samples off the walls of the neighbours' houses, removed all soil in the crater and back-filled the crater with fresh soil trucked in to the neighbourhood. The tactical effectiveness of the bunker busters was evident by the great depth acquired prior to detonation. This ballistic feature allowed total destruction of the target without demolishing the neighbouring houses. The seismic effects cracked the walls and floors of all surrounding homes. The Special Forces were helpful by using their heavy equipment to remove large 500-pound clumps of solidified mud from the neighbour's roof.

Figure 1

Bomb sites, battlefields and communities surveyed and investigated by UMRC
September 30 to Oct 13, 2003

Order of Investigations Areas surveyed and sites investigated	"Overwhelming Force" Order of Battle Operations Iraqi Freedom, Telic and Falconer
Baghdad area, heavy-weight bombsites: • Baghdad Central Market • Baghdad Central Telephone Exchange • Al Rashid Air Force Base • Baath Party Headquarters • Ministry of Information • Mansour District – April 7/03 leadership decapitation strike (Sector 613) • Jammah Suburb # 512, Baghdad	Air campaign: U.S. and British "Shock and Awe" Strategic Military and Civilian Demoralization bombing Joint Air-delivered and Ship-launched Bombing Campaign by: • U.S. & UK Royal Airforces • U.S. and British Royal Navies • 15,500 strike sorties • 27,000 bombs •
Baghdad combat battlefields, US led: • Haiyy al Mavalemeen – Teachers District • Auweirj Coalition/SRG HQ • Tank-graveyard • Baghdad Gate	Ground force battles Advance and Battle for Baghdad: "Rapid Dominance" Comprised of two main divisions, western and eastern, main columns advancing from Kuwait to Baghdad. • U.S. 1st Marine Expeditionary Force – East • U.S. 5 Corps – West • U.S. 3rd Mechanised Infantry Division • Close-in air support: - 101st Air Assault Division - 82nd Airborne Divisions
Central Iraqi, U.S. led combat: • Suweirah and Suweirah Air Force Base • Salman Pak Road Battlefield • An Najaf and Diiwaniyah • Karabla and Al Husseiniyah • Al Kut • Al Hillah • An Nasiriyah	
British led combat: • Battle for Al Basra • Az Zubayr (Kuwaiti/Iraq DMZ) • Al Ashar and Abu Khasib • Basra Canal and Shaat al Arabi corridor • Al Faw peninsula • Umm Qasr	UK Operation Telic & Operation James Combat Joint Special Operations Task Force; including Australia - Operation Falconer • 3rd Commando Division (Desert Rats) • 1st UK Armoured Division • 7th Armoured Brigade • 2nd Close Support Division (Royal Logistics) • 16 Air Assault Brigade & SAS Sabre Squadron

Objectives and summary of accomplishments

The UMRC field team concentrated its effort on the collection of three types of field data:

(1) Detection and measurement of ionising radiation (radioactivity) emissions from munitions deployed during the Rapid Dominance ground force operations, including tactical combat aircraft bomb sites, armoured assets and their battlefield defensive positions; and, surveying and sample collection from the Shock and Awe air-delivered, heavy weight strategic ordnance and demoralisation targets and surrounding environments.

(2) Nuclide identification where the quantities of ballistic source material was sufficient for analysis by portable field equipment.

(3) Civilian exposure and conflict history interviews of selected populations:
- those living adjacent to the battlefields and bombsites
- persons present during ground force engagements
- persons retrieving the wounded and conducting body recovery and burials
- children frequenting battlefields and playing in craters, disabled tanks and bombed buildings
- adults and children salvaging and recycling hardware, mechanical equipment and diesel engines from military assets positively identified as radioactive.

The team collected three types of field samples and specimens for laboratory analysis and post-field examination:

(1) Water, soil, wind-blown and deposited dust and ballistically ejected compounds.

(2) Human biological specimens from conflict-exposed and post-conflict exposed civilians.

(3) Battlefield artefacts such as clothing, incinerated and oxidised target materials, ordnance by-products, ballistic debris and ballistic residues.

One hundred (100) inorganic field samples, biological specimens, bomb-crater and battlefield artefacts were collected, logged and delivered to UMRC's laboratories. These materials are scheduled for radiological and radiochemical analysis of any incorporated isotopes, their concentrations and ratios, nuclide species and comparative radioactive heavy metal profiles.

The team collected radiation spectra data of both positively identified and the field-unidentifiable nuclides. Spectra data of the field-unidentifiable radiological substances were logged manually and electronically and have been delivered to the laboratory for corroboration of the field readings and further analysis. The UMRC's portable MCA (Multi Channel Nuclide Analyser) was pre-calibrated for the identification of 25 radionuclides, including naturally occurring species of uranium isotopes, artificial isotopes and transuranics (e.g. fission-activation and spent fuel waste products). Where nuclides were identified and radioactivity measurements taken from source materials were not coded into the MCA's library, spectra data was sent to the laboratory for identification by the Master Library.

Overall impressions

- Reports and conditions on the ground

Order of Battle CentCom reports and "embedded reporters" coverage was found to be about 70% unreliable when compared to the situation and evidence on the ground. Differences were noted in the geographic locations (place names) and reported to be the scene of head-to-head combat. Press coverage exaggerated the scale and stubbornness of the Iraqi armoured forces and organised military defences.

Witnesses, whose reports were corroborated by observations of active battlefields, show that Iraqi organised defences quickly deteriorated to low-intensity guerrilla fighting much earlier than reported - within the first 4 or 5 days of battle. Observers report that ground force engagements, characterised by the embedded reporters as "stiff resistance", rarely persisted beyond a few minutes to hours. Many Iraqi tanks were defeated while in retreat. Anti-aircraft and artillery defences were helpless against stand-off infrared, heat and radar seeking rockets. There were little to no substantive infantry defences. Pentagon pre-conflict assertions of Iraqi armed forces strength and inventories of battle-ready equipment were not substantiated by local reports, witnesses to the battles and interviews of retired Iraqi military personnel and civilian leaders.

The majority of Iraqi armoured assets were too old to withstand US and British modern ordnance; many of these assets were placed in the field as decoys and tactical facades. Serviceable heavy-armoured Iraqi assets were placed in fixed, immobile defensive positions behind sand-berms – rarely taking the offensive. According to witnesses, serviceable tanks, armoured vehicles and anti-aircraft emplacements surviving standoff rocketing and precision artillery fire were abandoned at the first sight of advancing air-cavalry and mechanised infantry. The few major tank-to-tank engagements evidenced by the conditions and size of the battlefields were short in duration – a matter of minutes. The main prolonged armoured engagements were reported as being in Al Basra, An Nasiriyah, the southern approach to Baghdad and the International Airport. The reports generally correspond to the larger battlefields identified by the team.

Residential neighbourhoods inside Baghdad that served as shields and camouflage for Iraqi armoured divisions were destroyed by combat aircraft days before Coalition ground forces arrived. Airforce bases were abandoned before the opening of the conflict as Iraqi aircraft were destroyed well before the ground advance. Haiyy-al Mavalemeen, a large residential neighbourhood adjacent to the unoccupied Al Rashid Air Force Base was turned to rubble by Coalition combat aircraft using stand-off ordnance. Although it remains upright, the minaret of the Mosque of Imam Abu Hanifa (Baghdad), one of the most important of the many historical and religious sites was rocketed by an combat aircraft. Coalition "trolling missions" fired blind and unprovoked into buildings and homes to draw out the enemy. Reports indicate extensive bombing continued well beyond the decline of local (paramilitary) resistance, which was largely eliminated by the end of the second week of the invasion. Aerial bombing sites and frequencies reveal a persistent effort to demoralise civilians and discourage unorganised resistance. Most Iraqis remained cloistered in their homes for the duration of both phases of battle (air and ground). Surprisingly few refugees left the cities to cross the main corridor left open for this eventuality -- over the western desert to seek protection at UN, ICRC/RC, and Jordanian campsites set up on the borders in expectation of an exodus. Reports reveal that more Iraqis entered the country during the conflict than left.

The largest intact battlefield located by UMRC was found in Abu Khasib at the approach to Al Basra. This engagement was fought by the British Desert Rats and 7th Mechanised Combat Division, with materiel supply by the 2 Close Support Regiment. The battlefield held the largest

concentration of Iraqi tanks found by the team, outside Baghdad. An intelligence miscalculation about the Iraqi defensive positions in and around Al Basra, combined with an error in planning nearly spelled disaster for the British. Refusing a US offer of close in air support, the British initially resisted the US Rapid Dominance strategy in favour of a head-to-head confrontation. After meeting the strongest and best-organised Iraqi defences in the entire engagement, the British quickly changed tactics.

Under the code name, Operation James (styled on the mythical Hollywood character, James Bond, and using such place names as "pussy", "gold-finger" and "galore" on the commander's maps at Operation Telic HQ, Qatar), the British faced an unusually committed and unexpected, well organised Iraqi defence. Since the Battle for Basra took place within the first 72 hours of Operation Iraqi Freedom, the Iraqi forces surrounding Al Basra had not been psychologically demoralised or mechanically weakened by Shock and Awe aerial bombing. Aerial bombing of Basra was intentionally limited to facilitate the formation of anti-Sadaam alliances with the local Shia leadership. All factors intersected, resulting in one of the most prolonged conventional ground, mechanised forces engagements in the 26 days of battle. The centre of the battle was in a suburb called Abu Khasib. Abu Khasib is the most radioactive battlefield identified by UMRC's 13 days of radiation surveys. The larger diameter, tank armour penetration channels emit ionising radiation readings ~2,500 X's the reference level. Some areas of Basra present background radioactivity ~20 X's the reference level.

- Rapid Dominance

Every Iraqi heavy-armoured asset inspected by the UMRC team showed the effects and marks of having received fire. About ½ of Iraq's main battle tanks (MBT's) investigated – Pentagon estimates were 2,500 serviceable Iraqi tanks – were defeated by radioactive weapons. The physical features of the penetration channels, trajectories and armoured target effects reveal four different sizes (diameters) and three types of radioactive armour penetrating ordnance: (1) inert, (2) incendiary and (3) high explosive.

- Shock and Awe

Radiation surveys of the Shock and Awe bombing do not reveal the same pattern of contamination or concentrations of radioactive source-material present in the "hotspots" of the Rapid Dominance, ground combat areas. The Basra and Baghdad baselines for total radioactivity on soil surfaces and ambient air are markedly elevated over North American standard reference levels. Radiation spatially associated with Shock and Awe bombsites and surrounding neighbourhoods range from the wide-area elevated Baghdad background up to ~3 X's the Baghdad baseline.

- Quantities of uranium munitions deployed (Figure 2)

The April 2003, US CENTAF (Central Airforce Command) post-conflict report, OPERATION IRAQI FREEDOM - By the Numbers, a desk-study by a US veterans' advocate, and a letter solicited from a US Senator conclude that 30-mm rounds fired by A-10 Thunderbolts constitute the highest fraction of DU munitions deployed in Gulf War II. These reports admittedly include only partial and limited accountings of the depleted uranium ordnance delivered by tactical combat platforms (i.e. gun-ships and mechanised infantry). They do not provide any information on the going-in inventories and pre-existing US and UK Telic stockpiles. There is a significant discrepancy between the independent reports that rely on official government and defence department numbers (i.e. 100 – 200 metric tonnes) and the 1000 to 2000 metric tonnes of DU attributed to estimates by unnamed United Nations Environment Program and Pentagon sources.

Figure 2

Published estimates of quantities of uranium munitions

1. 24 Imperial Tons (21.8 Metric Tonnes). U.S. Army data related by U.S. Senator Jon Kyle, U.S. Senator, Chair of the Republican Policy Committee, in a letter to J. Cohen-Joppa, July 14, 2003.
2. 100 – 200 Metric Tonnes – D. Fahey, The Use of Depleted Uranium in the 2003 Iraq War: An Initial Assessment of Information and Policies, June 24, 2003.
3. 68 Metric Tonnes (75 Imperial Tons), representing calculations based on % of DU rounds loaded in total fired rounds of 300,000 by A-10 Thunderbolt. Reported interview of unnamed CentCom spokesperson, Christian Science Monitor, May 15, 2003.
4. 311,597 30-mm rounds, T M Mosley, USAF, By the Numbers, Operation Iraqi Freedom, Assessment and Analysis Division, USAF, April 2003.
5. 1,000 – 2,000 metric tonnes (1,100 – 2,200 imperial tons), posted in Associated Press article, The Environment in the News, UNEP Environmental Press Release Reports, Communications and Public Information, United Nations Environment Program, Associated Press, April 2003.

Conditions in Iraq

Iraqis are familiar with the fact that uranium weapons were deployed during Gulf War I and over the years have developed a fear of exposure. A history of unexplained illnesses and chronic health problems in communities affected by DU deployed in Gulf War I and perhaps later by ordnance used in Operations' Desert Fox and Desert Strike is widely attributed to Coalition weapons. A portion of the population is convinced radiological contamination is a permanent feature of the Iraqi environment. Many say this is why they want to leave the country.

Since Operation Iraqi Freedom combat ceased, physicians are preoccupied with the treatment of a widely experienced public health crisis due to rampant viral and bacterial diseases – explained by the disruption of the clean water supply, power generation failures and a decade of decline in health care resulting from the embargo. Doctors and hospitals are busy treating wounds and tending recuperating civilians injured by collateral damage and wounded Iraqi armed forces' members. The decline in the nation's central health care system was preceded by a severe decline of the national decentralised public health program. The few, very limited national and community health resources are dedicated to emergency services. Physicians are neither trained to nor have the time and facilities to diagnose the relatively unexplained illnesses derived from uranium internal contamination and acute effects from recent exposures. Longer-term effects present a different challenge. As widely reported, cancer and long-term treatment wards are filled with children and teenagers suffering leukaemia and incapacitating congenital deformities attributed locally and by many international sources as direct and inherited effects of uranium contamination.

Unemployment levels in major urban areas exceed 70% to 80%. Those employed receive salaries 20% to 30% of pre-war income levels. There is a robust underground economy, the trading and bartering of goods and services, but it is cash poor. A new social and economic elite is comprised of those engaged in selling goods and services to the Coalition, business and government operations permitted to function by the Coalition, and those few commercial and civil organisations linked to the Coalition-sponsored, Governing Council. The Coalition is refusing many businesses and factories the permits to resume business activities. The largest group of

newly employed and the widest distribution of US dollars is to the IP (the Coalition controlled, newly formed and fast swelling ranks of Iraqi Police).

The narrow and short economic supply-chain is insufficient to trickle resources or cash down and out to the majority of unemployed Iraqis. Contrary to disparaging western press reports about local Iraqi looting and rampant civil disruptions by "loyalists and rebels", Iraq is experiencing the brunt of pre-planned, organised crime, raping the country of its liquidable assets. For example, sponsored from adjacent countries, Iraq suffered organised and well-finance theft (demonstrated by witnessed convoys of heavy equipment and transport trucks) of thousands of kilometres of high-voltage power transmission cables – dismantled and sold for their copper and aluminium content.

In deference to overly enthusiastic and badly researched western press reports claiming wide-scale, disorganised looting and vandalism, Iraq has been systematically dismantled. A second organised program of theft extracted tens and perhaps hundreds of thousands of pre-cast, galvanised steal door and window frames, virtually destroying in the process, every undefended government, military, state enterprise and private commercial building in the country. This program began before the launch of OIF and continued until the Coalition became organised, well after the end of the combat phase of the war. Building materials were loaded and transported on commercial trucks under the watchful eyes of the Coalition, taken to neighbouring countries and reserved for resale – pending the planned, multi-billion dollar urban renewal program. The crime was very sophisticated; using decoy tactics of setting fires, indiscriminate high profile looting designed to feed western video cameras, and inciting riots to attract security forces. Supervised theft succeeded in destroying all major buildings in Baghdad (that survived the bombing), collecting all heavy equipment, construction and building materials' stockpiles, heating, air conditioning, plumbing and electrical equipment and all commercial and government inventories. This theft was deterred only where Iraqis made a concerted effort to defend their personal businesses, protect public property and their homes. Iraqis complain and accuse the Coalition of intentionally facilitating the theft and looting, refusing to protect homes, businesses and government facilities.

Economic problems and systemic disruptions of critical civilian infrastructure plague Iraq. The general population in urban areas reserve their few remaining resources for the purchase of food, school supplies, building materials, inflated gasoline prices, medicine, automobile repair and other goods and services elemental to survival. Although better equipped to ride out economic declines, the rural populations have also suffered from the embargo and the past decade of continuous bombing of the government and civilian infrastructure. Iraq's second largest city, Basra, is the most severely disaffected and impoverished urban community in the nation – appearing much as it did during the Iran-Iraq War – destroyed by eight years of continuous artillery barrage exacerbated by the recent British artillery bombardments. Basra was abandoned by Sadaam Husein's government for siding with the Coalition after Gulf War I. Inaccurate and politically divisive western press coverage has claimed that the south was abandoned due to a religious difference between Sunni's and Shia. In fact, the southern, eastern and western rural areas of Iraq were the first to experience losses due to the embargo – as wealth and resources were concentrated in the capital. Most of the country and the rural populations are situated inside the pre-war US-controlled, northern and southern non-fly zones, which rendered the areas ungovernable. The economic impact of the trade and technology embargo coupled with 13 years of bombing and experimental weapons' testing in the no-fly zones brought most of Iraq's civilian population - other than in Baghdad and the NATO-protectorate in the northern Kurdish communities -- into poverty and a subsistence lifestyle.

Coalition clean-up and soil replacement activities

The field team observed a concentrated effort by U.S. military engineering units and Iraqi contractors escorted by U.S. army security forces in the process of clean-up operations of bomb and battle sites. The most disturbing circumstance was observed in the U.S. occupied base in south-western Baghdad in the Auweirj district. It is close to the International Airport and hosts one of the largest Coalition bases around Baghdad, occupying the operational headquarters of the Iraqi Special Republican Guard. The area was subject to considerable aerial bombing and rocket fire prior to the Coalition ground forces' arrival followed by several ground skirmishes along the main routes to the International Airport and western entrances to the City. This area is adjacent to the Mansour District and the main route to many bridges crossing the Tigris into the downtown core. Auweirj contains a wealthy residential neighbourhood including the homes of many (former) Iraqi military officers and the main barracks and staging area for the Republican Guard. Some of the highest overall ambient air and ground surface radioactivity readings were measured in Auweirj.

Throughout most of the year, Baghdad's atmosphere is saturated by dust blowing out of the western desert – a meteorological pattern called the "Sharqi". Its dust laden winds give an appearance of a fog blanketing the horizon, reaching to a ceiling of ~2,000 meters. The dust and winds were not present during the teams first few days in Baghdad – the city was experiencing one of its brief periods of clear skies, windless and cooling days typical of the late fall. Leaving the downtown core for Auweirj requires crossing one of the elevated bridges over the Tigris River. The raised bridge provides a long view towards the south/southwest. On October 1st, the team's third day in Baghdad, this view was interrupted by an enormous dust cloud hovering over a several hectare area, rising upwards of 300 meters (1000 ft). The cloud slowly traversed Auweirj, moving north easterly towards the main residential neighbourhoods on the west side of the river.

As the team's vehicle approached Auweirj, the cloud was blanketing the Coalition-occupied base, depositing a layer of fresh dust on people, houses, automobiles, and the highway. We had to turn on the windshield wipers. Departing the Coalition-occupied base was a long, a steady stream of tandem-axle dump trucks carrying full loads of sand, heading south away from the city. Returning from the south was a second stream of fully loaded dump trucks waiting to enter the base. As we passed the base's main entrance, the gates were opened to reveal bulldozers spreading soil while front-end loaders were filling the trucks that had just emptied their loads of soil (silt and sand). The arriving trucks were delivering loads of sand into the base while the departing trucks were hauling away the base's topsoil.

Interviews of roadside vendors revealed the U.S. had been, for months, removing surface soil, trucking this material into the desert south-west of the city and returning with fresh sand to build up a new surface. Being a "dirty battlefield", it was understandable that U.S. forces were removing potentially contaminating soils from their living and working areas. But this earth moving exercise appeared counterproductive if contamination was the concern. The soil removal was lofting tonnes of fine, light dust into the local environment, which was then falling back to inundate square kilometres of residential neighbourhoods and Coalition occupied facilities. In several locations, the potentially contaminated soils was dumped so as to establish defensive berms and fill perimeter security caissons surrounding occupied facilities. This practice was observed inside several cities.

The method of topsoil removal and replacement at U.S.-occupied bases, living facilities and administrative buildings is mechanically resuspending tonnes of potentially contaminated

particulate. The dust clouds are lofting above and spreading over the entire area -- 5,000,000 residents in Baghdad alone. It is also exposing thousands of U.S. military personnel and the many frequent foreign visitors including NGO staff, reconstruction crews, business and trade delegates, and diplomatic and foreign service employees.

- Landscaping the battlefields

Throughout the team's tours to locate Baghdad area battlefields and bombsites, mostly at the City's southern and western approach points, earth-moving crews were observed "landscaping" the battlefields. This work began shortly after the cessation of the major combat engagements in Baghdad. The U.S. is conducting a systematic but incomplete effort to isolate and rectify contaminated sites. The program began with removing damaged and disabled military assets. Emphasis has been placed on the visible sites easily accessed along the roads and highways. Most Iraqi tanks, APC's and artillery pieces have been winched out of their defensive positions, loaded onto flatbeds and transported to the tank graveyards in Auweirj and the occupied airports. In Baghdad, there remains a small number of damaged tanks and other disabled armoured assets along secondary roads, back yards, and in farm fields. Because of security risks to U.S. forces, they are either not permitted or are understandably disinclined to venture away from the major highways to finish the clean up. With the growing security problems and attacks, resources are being returned to combat duty.

Following the removal of Iraqi military assets, U.S. engineering divisions supervise the landscaping program. Press report the battlefield-landscaping program as a cleanup (largely represented by covering over with soil) of UXO (unexploded ordnance) and other dangerous debris left in the many combat areas. The program has not been declared as a clean up of radioactive contamination. Heavy trucks bring in topsoil and debris recycled from the combat and bomb damaged, now Coalition-occupied facilities, and spread it in a course and uneven layer – it is not graded or levelled – leaving the surface impossible to drive on and very difficult to walk on. The backfill is used to cover ad hoc battlefield graveyards, diesel, kerosene and oil spills, an extensive array and high quantity of unexploded tank munitions, pools of loose high-explosive polymer fills, unexploded mines and cluster munitions, and uranium oxide deposits surrounding burned-out and penetrator-defeated Iraqi tank defensive positions. While UMRC was investigating the Auweirj tank graveyard, UXO's were exploding in the hot sun. In the Al Basra area the team was shaken by the spontaneous detonation of a UXO. At that same Basra location, days before, a child was killed by a spontaneous explosion as he walked thought the battlefield in the date palm orchard next to his house.

- Clean-up operations missing or avoiding radioactive tanks and uranium oxide deposits

Battlefield landscaping operations are most extensive in Baghdad although they have been carried out to lesser degrees elsewhere. Locals report that the Coalition troops are careful to avoid the radioactive sites and radioactive, disabled Iraqi assets. UMRC interviewed residents, a municipal engineer and industrial workers in Nasiriyah and Basra who witnessed post-conflict battlefield inspections, describing these in detail. The team's radiation surveys of these sites demonstrate that Coalition forces are missing or avoiding several high-risk areas. Three examples are outlined below:

1. U.S. clean-up in Baghdad:

   Baghdad Gate, Route 6, is the main entry point to the city from the south. The Gate is a massive concrete monument with a double archway spreading over the six-lane, divided highway. One kilometre north of the gate is a main interchange where traffic entering the city can follow a cloverleaf ramp onto an overhead highway, proceeding northbound on the

west side of the Tigris to access any of several bridges entering the city. Vehicles can go northwesterly towards the airport or enter the many suburban neighbourhoods. Baghdad Gate was strategically important to the Iraqi defence of Baghdad due to the intersection of the main northbound highways, flanked by the river and forcing all traffic into a slow moving bottleneck.

Iraqi tanks and anti-aircraft guns established a major defensive position beside and under the Gate, dug into tank pits and foxholes in the trees and hiding in the orchard perimeter east of the highway. The position stretched a kilometre under mature tree cover. Iraqi command and control was nested underneath the criss-cross of overhead highway exit ramps of the six lane elevated highway. A small date palm orchard behind the tanks and artillery positions provided cover for infantry snipers and chain guns. An anti-tank, anti-aircraft unit was stationed under the northbound archway of the monument. Two hundred yards to the east is a village type suburb housing farmers, small merchants and commuters. There is a roadside picnic area under the trees with automobile pull-off lanes on either side where merchants sell refreshments and gasoline to highway travellers. On the western side of the highway are the remnants of a small medical clinic destroyed by an U.S. rocket during the engagement at Baghdad Gate.

According to a roadside merchant selling gasoline next to the monument, a stiff battle ensued here. He watched as helicopter gun-ships and armoured vehicles engaged the Iraqi's position. He described Iraqi tank crews bailing out of rocketed and burning tanks to be killed by a hail of both U.S. suppression fire and their own friendly fire as they ran towards the orchard for cover. This man personally collected and buried 23 bodies in the field next to Baghdad Gate – a graveyard now covered over by Coalition battlefield landscaping operations. The merchant explained that he was a soldier in Desert Storm, Gulf War I and knew the danger of uranium toxicity from U.S. and British ordnance. He said he was careful only to bury Iraqi soldiers and tank crewmen killed by friendly fire, small arms and aircraft. He was afraid to handle the bodies of Iraqi troops and civilians killed by Coalition tank rounds and A-10 suppression fire.

Baghdad Gate exemplifies Coalition landscaping operations in the U.S. controlled areas in the capital. The battlefield was large and complex, requiring three field visits to survey. By the third visit the battleground was almost completely covered with piles of sand and bombed-out building debris trucked into the site and pushed over most of the combat area. During the second visit to this site, while completing the radiation survey of burned-out tank defensive positions on one end of the battlefield, a U.S. security patrol in HUMWVE's with top-mounted 50 calibre machineguns was guarding Iraqi contractors as they spread the fill towards us.

The covering over of this radioactive battlefield was careless and incomplete. Left open and exposed were the scorched and twisted remains of tanks decimated by continuous heavy fire of high explosive rockets and radioactive kinetic penetrators. The remaining metal parts, tank treads, clothing and piles of spent and unspent ammunition littered foxholes and defensive pits where tanks and other assets had been hidden to lower their profiles. Several emplacements, visible as circular burn (DU oxide pools) patches 8 to 10 meters in diameter remained uncovered and undisturbed by the landscaping operation. The field team was invited to join a travelling Iraqi family that had stopped here to have lunch. They were seated on a concrete bench less than 6 metres from a radioactive source measuring ~200 X's the already elevated, Baghdad reference level.

2. Abandoning radioactive tanks in Nasiriyah:

During the opening days of Rapid Dominance, the north-west corridor through Nasiriyah was defended by an Iraqi mechanised, heavy armour group. The battle for control of the entry to Nasiriyah centred on the bridge across the Euphrates River and was reported by US embedded reporters to be one of the toughest engagements fought by the 1st U.S. Marine Expeditionary Force. To defend this approach point and slow the Coalition's advance, five T-72 Russian-built MBT's (main battle tanks) were dug into a low-ground position between the road and the adjacent Aluminium Fabrication and Engineering Company's employees' residential quarters. This was a typical Iraqi defensive position, close to urban cover, occupying the low ground, not the high ground, extending the survival time by avoiding close in air cavalry attacks, and limiting visibility by oncoming forces with an escape route at the back.

In August, an U.S. forces post-conflict investigation and recovery team, accompanied by heavily armed security arrived to conduct a radiation survey of the battlefield. They were observed by residents of the adjacent houses who, in their curiosity, approached the survey team. The residents watched as each tank was inspected with G-M counters. The survey team called in two flat bed trucks and a heavy winching unit. Two of the five tanks were pulled up and out of the battlefield, over a steep and difficult pitch and on to the flatbeds. From here they were transported to a secure location at the Coalition occupied airport. Seven months after the battle, and three months after the US survey team had removed the two tanks, UMRC investigated this battlefield to find the three remaining tanks were radioactive. The tanks had been disabled by a combination of low-trajectory delivered non-explosive, kinetic penetrators and direct armour, explosively-formed or shaped charge penetrators (e.g., probably by mechanised infantry vehicles or manually fired rockets). Neither top munitions nor air delivered penetrator entry channels were found on these tanks.

The radioactive ballistic penetrations were clearly visible on the turrets and chassis of the three MBT's, generating G-M count levels several hundred times background. The residents of the houses located within 30 metre of the tanks reported being warned by the U.S. survey team. Teenagers in a group watching the survey work and tank removal were advised by an interpreter not to play in the tanks because they could get sick.

3. British investigations at Abu Khasib fail to post warnings or remove hazards

The advance on Al Basra was commanded by the British under the code name, Operation James (a sub-division of Operation Telic). The 7 Armoured Division's joint operations included the famous Desert Rats of the 3rd Commando Brigade and attachments from the Australian armed forces (Operation Falconer). They engaged the toughest of the Iraqi armoured divisions during what is reported to have been the heaviest combat witnessed during the 26 days of combat. The approach to Al Basra was defended by three Iraqi mechanised tank divisions, marine units using the canals and rivers, and a host of paramilitary and local resistance groups. UMRC found the largest concentration of disabled Iraqi MBT's and the largest battlefield in Iraq at Abu Khasib, south of Al Basra. Al Basra, the second largest city in Iraq, with 1.5 million residents, was under the control of the British forces at the time of UMRC's investigation.

Unlike Baghdad, where U.S. forces have carried out soil removal and replacement, battlefield landscaping and military hardware retrieval operations, the Al Basra's combat areas remain largely unchanged over the seven months since the end of the battle. Witnesses interviewed in this area report that a British army radiation survey team inspected the large Abu Khasib battlefield. The UK team arrived to the area dressed in bright white,

full-body radiation suites with protective facemasks and gloves. They were accompanied by translators who were ordered to warn residents and local salvage and recycling crews (typically described as looters in the western press) that the tanks in this battlefield are radioactive and must be avoided.

The British team surveyed tanks and APC's (Armoured Personnel Carriers) in which UMRC later found the highest number, highest levels and highest concentrations of radioactive source points and hot spots throughout its 13-day field trip. According to several persons interviewed, the UK MOD survey team strongly encouraged a group of bystanders to post signs on the tanks warning of the dangers of radioactivity to children, salvagers and curiosity seekers. The British forces have taken no steps to post warnings, seal tanks and APC's or remove the highly radioactive assets. The team found radioactivity in and around most tanks in this battlefield as well as elevated readings on the soil surface, in the air and inside occupied buildings situated in the battlefield.

The British Army 2 Close Support Regiment (Royal Logistics Corp) has posted on the internet, photographs showing the burned-out remains of an Iraqi MBT in Abu Khasib. This particular tank was, coincidentally, inspected by UMRC's field team. It remains as a curiosity-seekers attraction on the roadside between Abu Khasib and Al Basra. The tank's diesel engine and several forged metal parts have been removed and recycled into the community. The direct-armour, uranium kinetic penetrator's entry channels can be seen in the MOD photo at the base of the main gun. The tank was also hit by a rocket or HEAT (high-explosive anti tank) round that kicked the turret off its rotary mount. This tank's radioactivity readings are 200 X's background. Tens of thousands of unexploded rounds of ammunition (UXO) and ballistic debris still litter the Abu Khasib and Basra battlefields. British security and stabilisation forces are regularly seen touring this neighbourhood but are careful not to approach the battlefields and disabled Iraqi tanks.