



TECHNICAL MEMORANDUM

RECOMMENDATIONS FOR COMPLETION OF TRENCHING AT THE ANIMAL CARCASS BURIAL AREA VICINITY PROPERTY "G"

**NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK**

REVISION 0

**Contract DACW 49-97-D-0001
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**Submitted by:
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LIST OF ACRONYMS

AEC	Atomic Energy Commission
AG	Acid Gas
ATSDR	Agency for Toxic Substances and Disease Registry
bgl	below ground level
CDC	Center for Disease Control
CFR	Code of Federal Regulations
CG	Phosgene
CWA	Chemical Warfare Agents
CWM	Chemical Waste Management
CPM	Counts per minute
CX	Phosgene oxime
DOD	Department of Defense
DOE	Department of Energy
GA	Tabun
GB	Sarin
GD	Soman
GEL	General Engineering Laboratories
H	Mustard Gas
HD	Mustard Gas (distilled)
HL	Mustard/Lewisite
HP	Health Physics
K	Thousand
L	Lewisite
LOOW	Lake Ontario Ordnance Works
MED	Manhattan Engineering District
NaI	Sodium Iodide
NFSS	Niagara Falls Storage Site
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NO _x	Nitrogen Oxides
OV	Organic Vapor
P100	High Efficiency Particulate Attenuation
PAPR	Powered-Air-Purifying Respirator
PEL	Permissible Exposure Limit
PFIB	Perfluoroisobutylene
PPE	Personal Protective Equipment
RI	Remedial Investigation
RMW	Regulated Medical Waste
SAIC	Science Application International Corporation
SOW	Scope of Work
TAGM	Technical Administrative Guidance Memorandum
USACE	U.S. Army Corps of Engineers



USACHPPM US Army Center for Health Promotion and Preventive Medicine
USDOT United States Department of Transportation
USEPA U.S. Environmental Protection Agency
VOA Volatile Organic Analytes
VX VX Nerve Agent
XXL Double Extra Large



1.0 Introduction

The trenching investigation being performed at Vicinity Property G by Maxim Technologies was suspended in May, 2002 due to the discovery of laboratory debris and concerns that further investigation in the area had the potential to expose site worker to unanticipated biological hazards. This Technical Memorandum presents the results of a review regulations of the state of New York, the United State Department of Transportation (USDOT), a review of available literature concerning Nuclear, Biological and Chemical Warfare agents, and consultation with experts in biological hazards from the Center for Disease Control (CDC) and Consultation with Agency for Toxic Substances and Disease Registry (ATSDR). Also presented in this document are conclusions based on the findings of the literature review and consultations with experts of the CDC and ATSDR in biological hazards and response, and recommendations for the resumption of investigative activities at the Animal Carcass Burial Area located in Vicinity Property "G".

2.0 Summary of Trenching Activities -TG01 and TG02

Trench TG01 is located within an area of Vicinity Property G reportedly used for the disposal of radiologically contaminated animal carcasses and lab wastes. Available documentation suggests that at some time in the past the contaminated materials were removed from the pit. The location of the pit is not known with certainty. The purpose of the trenching is to answer two questions:

- 1) What was the actual location and size of the pit?
- 2) Is there evidence radiologically contaminated materials are present in the pit?

The proposed location of the 65' long trench was staked at the presumed pit location and a trench approximately 13' long and 6' deep was excavated, starting at the 'A' stake. An area of slightly elevated gamma radiation (approximately 20K cpm) was found in the trench and a soil sample was collected. (All cpm measurements within this document were obtained with a NaI 2"x2" gamma detector, and are in units of "counts per minute". Average background soil surface measurements with a NaI 2"x2" are approximately 8.5K cpm, while trench measurements are normally about 15K cpm due to the change in geometry.) Because the trench is located in a wet area, the field crew had the excavator operator push approximately 6" of mud off an access path. As the field HP was walking on this path to the trench, he noticed that his meter was measuring elevated gamma radiation at a location on the path approximately 4' from the trench. The HP Technician and Geologist inspected the area and found a piece of rusted metal and field measurements indicated that this metal was the source of the gamma radiation. The field team then probed the area with a shovel and determined that the metal was part of a container and the container was too large to dig out by hand. The excavator was then used to uncover the container and the location of the metal container was designated TG02. All spoils excavated from TG02 were placed on a plastic sheet.



The excavator removed the container and placed it on a plastic sheet. The container was rusted and in poor condition. Though the field crew believed that while the excavator may have damaged the container, it is their opinion that container was already breached before it was further damaged by the excavator. Inspection of the contents of the container found syringes, syringe needles, tubing, and other materials thought to be laboratory trash. The container and the contents of the container exhibited gamma activity of approximately 250K cpm. Based on the material discovered in the excavation and the historical use of the area, the work zone was temporarily evacuated. The Site Safety Officer and the Radiation Safety Officer evaluated the site conditions and determined that the investigation could resume after the PPE used by the field crew was upgraded to level C. The exclusion zone was also expanded, downwind air monitoring was instituted, and all spoils were wetted with water to minimize the potential for airborne contamination.

Upon further inspection of the excavated materials, microscope slides, petri dishes, and glass reagent bottles were found near the original location of the metal container. The field HP measured gamma radiation on the petri dishes at 290K cpm. The bottles also exhibited elevated gamma counts. It is not known whether these glass items were originally in the bucket or were separate from the bucket at the time of disposal. The slides and bottles were found at about 2.5' bgl – the approximate elevation of the bottom of the metal container.

Two samples (three 8 ounce for each sample) were collected from TG02: a soil sample from a location adjacent to and below the metal container and a sample of the microscope slides and associated soil.

The excavator advanced TG02 to a depth of 4' bgl. Additional miscellaneous lab debris was found at elevations above 3.5' bgl. At 4' bgl, the gamma reading in the bottom of the hole was 35K cpm and it was decided to terminate the excavation at this depth. The bottom of the hole was lined with plastic, the contaminated spoils were backfilled, and the excavation was capped with an additional 2' of apparently clean soil. The 13' trench at TG01 was also backfilled with apparently clean spoils.

The investigation at Vicinity Property G was suspended at this point. Because laboratory debris was found, there was a concern that further investigation of the area might encounter unanticipated biological hazards. The field crew decontaminated all equipment that came in contact with the soils at Vicinity Property G and the excavator was brought back onto the NFSS. Decon procedures were modified to include a rinse of all equipment with a 5% bleach solution. All personnel performing decon were dressed in level C PPE.

All PID readings of the excavated soils from TG01 and TG02 and in the breathing zone were consistent with background conditions. The results of perimeter and personnel air monitoring samples collected at Vicinity Property G during the investigation did not find evidence of airborne contamination above background concentrations. Following trenching activities, the area around TG01 and TG02 was posted with "Danger" ribbon.



A gamma survey of the trench vicinity found another location 4' east of the 'A' stake that had a gamma reading of 60K cpm at the ground surface. No further investigation was made at this location.

Based upon the discovery of syringes, petri dishes, pipettes, and assorted other laboratory wastes during the excavating activities at the trenching location TG02 in Vicinity Property "G", work was suspended pending a review of available literature and consultation with experts experienced with this type waste stream. This consultation was initiated to ensure that adequate respiratory protection and other PPE considerations were in-place to ensure that site workers would be adequately protected during trenching activities at Vicinity Property G. The results of this review and consultation are presented in the following sections.

3.0 Definitions of Regulated Medical Waste (RMW) - New York State Environmental Conservation, Division of Solid Waste

Public Health Law 1389 -aa defines Regulated Medical Waste (RMW) as: *"Regulated medical waste shall mean any of the following waste which is generated in the diagnosis, treatment or immunization of human beings or animals, in research pertaining thereto, or in production and testing of biologicals, provided however, that the regulated medical waste shall not include hazardous waste identified or listed pursuant to Section 27-0903 of the Environmental Conservation Law, or any household waste promulgated under this section."*

There are six subcategories that exist within the general definitions of regulated medical wastes as defined in Public Health Law 1389 -aa. These are:

- 1) Cultures and Stocks
"This waste shall include cultures and stocks of agents infectious to humans and associated biologicals, cultures from medical or pathological laboratories, culture and stocks of infectious agents from research and industrial laboratories, waste from the production of biologicals, discarded live or attenuated vaccines, or culture dishes and devices used to transfer, inoculate, or mix cultures."
- 2) Human Pathological Wastes
"This waste shall include tissues, organs, and body parts (except teeth and the contiguous structure of bone and gums) body fluids that are removed during surgery, autopsy, or other medical procedures or specimens of body fluids and their containers, and discarded material saturated with body fluids other than urine, provided that the Commissioner, by duly promulgated regulation, may exclude such discarded material saturated with such body fluids from this definitions if the Commissioner finds that it does not pose a significant risk to public health. This waste shall not



include urine or fecal materials submitted for other than diagnosis of infectious diseases."

3) Human Blood and Blood Products

"This waste shall include: (I) discarded human blood, discarded blood components (e.g. serum and plasma), containers with free flowing blood or blood components, or discarded saturated material containing free flowing blood or blood components; and (II) materials saturated with blood or blood products provided that the Commissioner, by duly promulgated regulation, may exclude such material saturated with blood or blood products from this definitions if the Commissioner finds that it does not pose a significant risk to public health."

4) Sharps

Sharps are defined as follows: *"This waste shall include but not be limited to discarded unused sharps and sharps used in animal or patient care, medical research, or clinical or pharmaceutical laboratories, hypodermic, intravenous, or other medical needles, hypodermic or intravenous syringes to which a needle or other sharp is still attached, Pasteur pipettes, scalpel blades or blood vials. These wastes shall include, but not be limited to, other types of broken or unbroken glass (including slides and cover slips) in contact with infectious agents. This waste shall not include those parts of syringes from which sharps have been removed, and which are intended for recycling or disposal, so long as such syringes have not come in contact with infectious agents."*

Glass or rigid plastic culture tubes flasks, beakers, lancets etc. must also be considered sharps and disposed of accordingly.

5) Animal Waste

"This waste shall mean discarded materials including carcasses, body parts, body fluids, blood, or bedding originating from animals known to be contaminated with infectious agents. (i.e. zoonotic organisms) or from animals inoculated during research, production of biologicals, or pharmaceutical testing with infectious agents."

6) Reserved for Designation by the Commissioner of Health to Designate specific items not currently identified as regulated medical waste.

4.0 Definition of Regulated Medical Waste - United States Department Of Transportation (USDOT)

The U.S Department of Transportation defines regulated medical waste as: *"a waste, or reusable material, that contains an infectious substance and is generated in the*



diagnosis, treatment, or research of humans or animals. This definition does not include discarded cultures or stocks."

5.0 Consultation with Agency for Toxic Substances and Disease Registry (ATSDR)

A representative of Maxim contacted the Agency for Toxic Substance and Disease Registry and discussed these issues with Dr. Susan Kess (Emergency Response, Agency for Toxic Substances and Disease Registry - 404-498-0120). Maxim informed her that we were working at a rad contaminated site in upstate NY. The exact location of the site was not divulged. We informed Dr. Kess that the site was a former MED/AEC/DOE site and that Maxim has been taking the appropriate safety precautions/screening for radiological contamination. Recently, while trenching, we uncovered syringes and other miscellaneous laboratory glassware such as petrie dishes, pipettes, bottles, etc. Maxim indicated that the syringes and laboratory glassware were discovered and thought to likely be from experiments conducted by the University of Rochester for the MED/AEC. The University of Rochester was reported to have researched PELs for some isotopes.

Maxim requested information concerning recommended safety precautions that should be employed during further trenching in this area and shipment of samples to the laboratory.

Dr. Kess responded by saying that for the most part, the radiological precautions supercede any biological precautions. Except for the presence of needles or "sharps", we should use the same PPE used for the radiological hazards. Protective gloves such as steel mesh gloves would be required if needles or "sharps" were involved and were handled.

A representative of Maxim also discussed these issues with Mr. Rich Nickles, Emergency Response Health Physicist for the Agency for Toxic Substances and Disease Registry, U.S. Public Health Service (404-498-0361). Mr. Nickles was informed that these same issues had been discussed with Dr. Kess and that she had indicated we should treat the waste as medical waste. Mr. Nickles was provided a description of the site and what was found. Again, the exact location of the site was not divulged. Maxim further informed Mr. Nickles that all necessary precautions for the radiological contamination were being used and that Maxim had recently uncovered syringes and glass laboratory equipment during investigative trenching activities. Dates on the glassware are from the mid 1940s, but burial may have taken place anywhere between the 40s and the 70s. The radiological screening instruments have indicated the materials are radiologically contaminated.

Mr. Nickles recommended that before Maxim resumed work in this area we needed to ensure that safety procedures were established that would be protective of personnel participating in the trenching, sample shipment and sample analysis. Maxim informed Mr. Nickles there were some concerns about the possibility of infectious agents in this area. Mr. Nickles said that, with the exception of anthrax, biological agents do not survive well in the environment. According to Mr. Nickles, it was unlikely that biological hazards were present and the radiological hazards would take precedence in



this case. Any biological agents originally present would no longer be viable. Mr. Nickles stated that Maxim should employ tear/puncture resistant gloves when sampling to protect from "sharps"

Mr. Nickles indicated that standard procedure to prevent infectious agent contamination included the use of a decontamination solution. This solution is usually a 10:1 solution of bleach can be used but many investigators/responders use a 5:1 to 4:1. He recommended that Maxim contact biosafety representatives from the Center for Disease Control (CDC). Mr. Nickles provided the ATSDR 24-hour number and the CDC's 24-hour number. He indicated that we should have these numbers with us when working at this site. These numbers are as follows:

The ATSDR 24-hour number	404-498-0120
CDC - 24-hour number	770-488-7100
CDC biosafety director's number	404-639-0229.

6.0 Consultation with Center for Disease Control (CDC), Office of Health and Safety

Maxim initially contacted Dr. Rob Weyant, Chief of the Laboratory Safety Branch, CDC Office of Health and Safety (404-639-3238). The site history was repeated and Maxim indicated that the syringes and laboratory glassware were discovered and thought to likely be from experiments conducted by the University of Rochester for the MED/AEC. The University was reported to have researched PELs for some isotopes.

Maxim also informed him that these issues had been discussed with Dr. Susan Kess and Rich Nickles of the ATSDR. Maxim indicated that Mr. Nickles and Dr. Kess had indicated that the predominating hazard was radiological and that the lab articles should be treated as medical waste and we should take precautions for "sharps". Mr. Nickles also said that we could spray the area down with a bleach solution. We were concerned with the possibility that the university could have disposed of "other" wastes with their radiological wastes. Mr. Weyant indicated that he would discuss these issues with a radiation expert and respond to Maxim as soon as possible.

Mr. Weyant initiated a conference call which included Mr. Paul Simpson (Chief, Radiation Safety), Ms. Janice Knight (Occupational Health and Safety Officer) and Ms. Dana Jones (Occupational Health and Safety Officer) with the CDC Safety Office and Maxim. Maxim repeated the history of the site and what was found. Mr. Simpson asked if we knew the isotopes that were present at this area. Maxim indicated that based on the portable gamma spec, the primary isotopes present were thorium, radium and uranium, and that some cesium may also be present.

The CDC representatives agreed that the predominating hazard at the site was the radiological hazards. Maxim asked if we needed to use respirators or supplied air to protect against exposure to possible infectious agents. They indicated that the only hazards Maxim needed to be concerned with were the physical hazards from sharps and



the radiological hazards. They all expressed the opinion that the possibility of the presence of biohazards was nil.

Maxim inquired if samples from this area would need to be shipped as medical waste. The CDC representatives indicated that due to the long period of burial, the waste would not be considered as medical waste. The CDC directed that Maxim should ensure that samples containing sharps should be properly handled and packaged and that laboratory personnel were aware of the presence of sharps hazards in the samples. Maxim inquired if there were any other precautions we needed to consider when dealing with the lab glassware etc. found in the trench. The CDC indicated no additional precautions were necessary.

Maxim informed them that the 24-hour numbers would be made available during any future work at the site.

7.0 Chemical Warfare Agents (CWA)

The disposal of chemical warfare agents at Area "G" has not been documented in documents that have been reviewed by Maxim. These materials are similar to infectious agents in that they do not persist in the environment for long periods of time and would not be expected to be present at this location if undocumented disposal of any CWA materials would have taken place at Vicinity Property "G". Most agents, in their dispersed form, range in persistence in the environment from several hours to one weeks. The Medical NBC Battle Book, USACHPPM Tech Guide 244 Table 5-M (Page 5-22) details relative persistence in the environment under battlefield conditions. Typical CWA materials include:

- 7.1 Lung-Damaging Agents** - Lung-damaging agents attack lung tissue causing pulmonary edema. Mustard (H, HD) Lewisite (L) and Chlorine act primarily on the larynx, trachea, bronchi, while Phosgene (CG) Perfluoroisobutylene (PFIB) and Nitrogen oxides (NO_x) have predominate effects in the small airways and alveoli.
- 7.2 Nerve Agents** - Nerve agents are all liquid in the nondispersed form. Nerve agents may be absorbed through any body surface but typically are absorbed as an aerosol or droplets through the skin, eyes or respiratory tract. These agents generally interrupt or disrupt the transfer of stimuli from nerves to muscles by inhibiting cholinesterase. Nerve agents such as GA, GB, GD persist for 2 hours to 3 days. VX, another nerve agent, persists for two days to one week. The following agents are classified as official nerve agents by the United States Department of Defense.

Tabun - GA
Sarin - GB
Soman - GD
VX



- 7.3 **Blister Agents** - These agent are also known as vesicants which burn and blister the skin or any other part of the body with which they come in contact. They act on the eyes, mucous membranes, lungs and the respiratory tract when inhaled, skin and blood forming organs. They also damage the gastrointestinal tract and cause vomiting and diarrhea when ingested. Blister agents such as HD, HN, L, HL, and CX persist from one day to one week. The U.S. DOD lists the following agents as official blister agents.

Distilled Mustard - HD
Nitrogen Mustard -HN
Lewisite - L
Mustard/Lewisite - HL
Phosgene oxime - CX

- 7.4 **Blood Agents** - Blood agent are absorbed by the mucous membrane and intact skin and have effects on respiration and heart rate. Blood agents such as AC and CK, persist from between 1 to 10 minutes. The U.S. DOD lists the following agents as official blood agents.

Hydrogen Cyanide - AC
Cyanogen Chloride - CK
Arsine - SA

8.0 **Conclusions and Recommendations**

8.1 **Conclusions**

Classification of Materials as RMW - Based upon the review of the definitions of RMW as presented in Public Law 1389-aa and TAGM SW-97-10, it is Maxim's opinion that these waste materials may be considered RMW in the state of New York due to the presence of sharps. Sharps are classified as regulated medical waste independent of known contact with infectious agents. Sharps that have been treated by a treatment method such as incineration, autoclaving or any other New York State Department of Health (NYSDOH) approved method and destroyed, may be disposed of as solid waste. Destruction is defined as "as RMW that has been ruined, torn apart, or mutilated through processes such as thermal treatment, melting, shredding, grinding, tearing, or breaking, so that it is no longer recognizable as RMW. It does not mean compaction."

The U.S DOT does not classify sharps as RMW unless the material contains an infectious substance therefore there are no specific labeling requirements for sample shipment containers. The current sample packaging protocols used by



Maxim satisfy the requirements for shipment of regulated medical wastes as presented in 49 CFR 173.197.

Infectious Agents Hazards - Based upon the previously presented information and discussion with the CDC and ATSDR, the PPE and work practices in Area "G" should be based upon the radiological hazards at the site and physical hazards associated with the needles and glassware. There is no documented evidence that these materials have been in contact with or contaminated with human blood or infectious agents (*i.e. zoonotic organisms*). The documentation available concerning the wastes at the animal carcass burial area indicates that the experiments were conducted with radiological isotopes, not infectious agents. The CDC and the ASTDR have indicated that these materials would not present biohazards to site workers based on the period of time that as elapsed since disposal and that any infectious agents would no longer be viable.

Chemical Warfare Agent Hazards - Chemical warfare agents would not present a hazard to site workers unless sealed containers of the materials were uncovered and the container ruptured, there by releasing the material to the environment. Since there has been no documented disposal of these materials at the site, hazards associated with CWA materials are not expected to be present.

8.2 Recommendations

Based upon the above presented consultations and information, Maxim presents the following recommendations for the resumption of trenching activities at the animal carcass burial area of Vicinity Property "G":

- 1) The safety procedures described in the SSHP Addendum for Trenching Activities should be amended and submitted to the USACE for approval prior to work at the site. Maxim recommends that the level of respirator protection should be upgraded to Level C and that Powered-Air-Purifying Respirator (PAPRs) equipped with organic vapor/acid gas/ P100 (OV/AG/P100) cartridges should be used. The use PAPRs will increase the protection factor from 50 to 1000 (based on NRC regulations) and also aid in the reduction of the effects of heat stress/heat stroke caused by the increased level of protection on site workers.
- 2) The known presence of hazards associated with laboratory sharps will require the use of a disposable coverall constructed of a more tear resistant material. Maxim recommends the use of System CPF[®] protective garments which offer greater physical strength and durability and chemical holdout than typical protective garment materials. These suits will be hooded and booted, with sealed seams. Costs of these suits are \$54.30 per unit in size XXL. Each member of the field crew would require two suits per day.
- 3) The known presence of hazards associated with laboratory sharps requires the use of hand protection constructed from materials which will reduce the



potential for cuts and punctures from incidental contact with sharps during sampling activities. Maxim recommends the use of Kevlar® gloves with leather palms and finger coverings to mitigate this hazard. All personnel within the exclusion zone will be required to wear this type of hand protection.

- 4) Emergency phone contact numbers for the ATSDR and the CDC will be included in the Revised SSHP Addendum.
- 5) The presence of hazards associated with laboratory sharps will require the use of substantial rubber overboots and steel toed leather work boots to provide for additional foot protection. Site workers entering the exclusion zone will not be allowed to use latex rubber "nuke boots".
- 6) Maxim recommends further investigation of the 60,000 cpm hot spot located east of TG01, and any other hotspots found in the vicinity of the planned trench, adjacent spoils storage areas and completion of the planned trench at TG01.
- 7) Because of safety concerns, Maxim will restrict the number of personnel in the exclusion zone to the equipment operator, SAIC HP technician, Maxim Geologist, Maxim Environmental Scientist, and one USACE - Buffalo District representative. All personnel working within the exclusion zone will be required to wear the prescribed PPE ensemble. Other visitors will be allowed to enter the support zone to observe the progression of work. This restriction is made based on the constraints on mobility and vision caused by the PPE on the equipment operator and other personnel in the work zone. It is Maxim's position that by restricting the number of personnel entering the work zone, the work can be conducted in a safer more efficient manner.
- 8) If similar sharps-type materials are discovered during trenching at TG01, and the collection of these items is deemed necessary for laboratory analysis, then stainless steel or wooden disposable implements will be used to transfer these materials to sample containers.
- 9) Sample containers containing sharps material should be identified with warnings to alert laboratory personnel as to the sharps hazards associated with broken glass, needles, etc.
- 10) Decontamination of personnel and equipment will include a sodium hypochlorite rinse.
- 11) Due to the non-viability of infectious agents following long-term interment in the environment, no biological screening or biological analysis of samples is recommended.



12) Based on the USDOT definitions of RMW, no additional sample shipment container labeling will be required for the shipment of sharps containing samples to the analytical laboratory.

13) Maxim, in consultation with SAIC, recommends that samples collected from TG01 and TG02 and all future samples collected at the organic burial area be analyzed by the following methodology:

- 1) Dry and homogenize the entire content of each sample container.
- 2) Perform the following analyses:
 - Gamma Spec
 - Total alpha/beta
 - Isotopic Uranium
 - Isotopic Thorium
 - Isotopic Plutonium

Note: the higher activity sample jar is 80 MicroRem/hr on contact, this is a fairly high activity sample (in NFSS terms)

11) Based upon the current Scope of Work, Maxim has been tasked to collect samples for radiological analysis only. Maxim does not recommend modification of the SOW to collect samples for chemical characterization from Vicinity Property "G"

9.0 REFERENCES

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http://ccc.apgea.army.mil/reference_materials/reference.asp

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