



COLORADO DEPARTMENT OF HEALTH

4210 EAST 11TH AVENUE • DENVER, COLORADO 80220 • PHONE 388-6111
Edward G. Dreyfus, M.D., M.P.H., Executive Director

August 28, 1975

John P. Byrne, Col., Cm1C
Rocky Mountain Arsenal
U. S. Department of the Army
Denver, Colorado 80240

Dear Colonel Byrne:

Your letter of August 18, 1975 describing actions planned and taken for compliance with the Findings of Fact and Order, has been received. Review of the letter indicates that good progress is being made towards containing and removing the contaminants plus determining the extent of contamination.

Under the Section "Work In Progress, Part D", this is a matter which should be evaluated in conjunction with this office before any work is started. The reason is that the expense of the project would be high but yet it may not accomplish what is desired unless handled properly.

The toxicity data you supplied to this office on August 1, 1975 is presently being reviewed. I would like to thank you for supplying the information and, if a press release is planned, a copy will be sent to you plus prior notification.

It is hoped that our staffs continue the exceptional cooperation exhibited to this point.

Very truly yours,


Edward G. Dreyfus, M.D., M.P.H.
Executive Director

EGD:dec

RMA 89-1209 //

G9514885

<u>MATERIAL</u>	<u>SPILL a/ NUMBER</u>	<u>DATE</u>	<u>QUANTITY GALLONS</u>	<u>LOCATION</u>	<u>COMMENTS</u>
Bicycloheptadiene (BCH)	6				Water seepage to ditch
	8				
	22	1960	200	E Bldg. 424A	
BCH bottoms	23	1950-81	b/	Bldg. 471	Mixed with No. 6 Fuel Oil
	60	9/78	50,864	S Tank Farm	
	66	2/56	1,400	T-464B	
Benzene	1				See Aldrin
	2				
	3	1951-53	16,000	S of Bldg. 522A	See Acetic Acid
	12				
	23				
Caustic soda, 20%w	63	12/57	3,000	N Bldg. 515	See Acetic Acid Removed dirt and replaced
	12				
	25	1978	500	N Bldg. 514	
	25a	-1981 ^{c/}	b/	N Bldg. 514	
	33	1969	900	Plant Area	
Caustic soda, 50%w	58	12/29/71	7,400	N Bldg. 514	See Azodrin
	32	1965	200	N Bldg. 514	
	40				
Chloroform	55	6/1/76	960	NE Bldg. 514	Likely cleaned up - bad odor
	31	1967	500	NW Bldg. 512	

a/This represents a number placed on a map to locate the spill area.

b/Greater than 55 gallons; total quantity impractical to estimate.

c/Date leak started is unknown.

1312

RSH898

BN 752
 PN 00
 PD 8/308/5-6
 FS 1
 RSH898
 RECEIVED
 HAZARDOUS WASTE
 DEPT. OF ENVIRONMENTAL
 PROTECTION

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<u>MATERIAL</u>	<u>SPILL NUMBER</u> ^{a/}	<u>DATE</u>	<u>QUANTITY GALLONS</u>	<u>LOCATION</u>	<u>COMMENTS</u>
Compound 773	15 15a				
Cyclopentadiene (CPD)	28	1949-74	500	N Bldg. 521	
CPD bottoms	64	12/58	650	E Bldg. 525	
CPD dimer (DCPD)	9	1973	55	S Bldg. 433	
	28			Trenches,	
	37	1953	200	Section 36	
DCPD bottoms	42	1949-74	b/	S Bldg. 528	
	65	9/63	1,700	N Bldg. 514	
	20	1967	1,500	T-464A	Mixed with No. 6 Fuel Oil
D-D Soil Fumigant	56	8/8/76	1,548	S Tank Farm	" " " " " "
	36	ca 1971	100	SE Bldg. 433	Dirt removed from ditch
Dieldrin	50	1975	250	S Bldg. 433	See Acetic Acid
	12				
Dinitrochloroethoxyphenol (SD 11829)	46	1/7/75	400	Around Bldg. 534	See Acetic Acid
Endrin	12				See DPCD bottoms
Fuel Oil (No. 6)	20				" " "
	56				See BCH bottoms
	60				
Heptane	38	1949	2,000	N Bldg. 534B	

a/This represents a number placed on a map to locate the spill area.
b/Greater than 55 gallons; total quantity impractical to estimate.
c/Date leak started is unknown.



RSH898

BN 752
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 FL & REE HAZARDOUS SPILLS/LEAKS

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<u>MATERIAL</u>	<u>SPILL NUMBER</u> ^{a/}	<u>DATE</u>	<u>QUANTITY GALLONS</u>	<u>LOCATION</u>	<u>COMMENTS</u>	
Hexachlorocyclopentadiene (Hex) (HCCPD)	6				See Aldrin	
	8					
	14	1949-55	b/	N Bldg. 516		
	27	1953-64	1,500	Around Bldg. 512		Removed some and covered with soda ash
	29	1949-55	200	NE Bldg. 521		
	39	ca 1960	150	Near Flare-North Plant area.		
Hexane	15	1953-64	100	E Bldg. 512		
	41	1958	1,200	N Bldg. 511		
	43	1974	1,000	E Bldg. 534		
Isopropanol	15a	1953-64	400	Around Bldg. 512		
Mineral spirits	8				See Aldrin	
	62	4/24/75	300	N Bldg. 471		
Mixed acid	46					
	47	1969	100	N Bldg. 534A		
Naled (DIBROM)	11	1964	200	S Bldg. 254		
NEMAGON Soil Fumigant (DBCP)	8				See Aldrin Replaced dirt in entire area	
	10	11/13/73	1,100	N Bldg. 471		
	51	1973	60	S Bldg. 347		
	57	11/10/71	93	N Bldg. 471		

a/This represents a number placed on a map to locate the spill area.

b/Greater than 55 gallons; total quantity impractical to estimate.

c/Date leak started is unknown.

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RSH898

752
 PN 00
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 FS 1
 FL RSH898 SPILLS/LEAKS

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<u>MATERIAL</u>	<u>SPILL NUMBER</u> ^{a/}	<u>DATE</u>	<u>QUANTITY GALLONS</u>	<u>LOCATION</u>	<u>COMMENTS</u>
Spent acid	34	1973	100	SW of E Gas Holder	
	35	1973	100	W Bldg. 422	
	52	1967-75	b/	T-464A	
Sulfuryl chloride	45	1958	200	Bldg. 528	
	49	1978	100	Near Flare-North Plant area.	
Trimethyl phosphite (TMP)	44	1970	3,000	N Bldg. 514	Removed dirt to depth of 2-3 f
Toluene	4	1955	1,000	N Bldg. 514	
VAPONA Insecticide (Dichlorvos)	23	1960-80	200	S Bldg. 471	
Xylene	8				See Aldrin
	12				See Acetic Acid

a/This represents a number placed on a map to locate the spill area.

b/Greater than 55 gallons; total quantity impractical to estimate.

c/Date leak started is unknown.

13157

RSH898

BN 752 FS 1 PD 8/308/5-6
 FL RCEB HAZARDOUS SPILLS/LEAKS

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NEWS

DEPARTMENT OF HEALTH
4210 E. 11TH AVENUE DENVER 80220 PHONE 388-6111 EXT. 329

(for immediate release)

DENVER - The Colorado Department of Health is issuing cease and desist, clean-up and monitoring orders to the U. S. Army's Rocky Mountain Arsenal and the Shell Chemical Co. in connection with the alleged pollution of ground and surface waters north of the facility.

The cease and desist order, which calls for the Arsenal and Shell Chemical to stop an unauthorized discharge from a ditch to waters of the state, stems from the alleged discharge of DCPD, a substance used in the manufacture of pesticides, into surface and groundwaters just north of the Arsenal.

The clean-up order applies to the DCPD, and also to a substance called DIMP, a by-product of GB nerve gas found in wells north of the Arsenal. Under the order, the Arsenal and Shell Chemical are required to "immediately take whatever steps are necessary to clean up all sources of the substances DIMP and DCPD located at their facilities."

The Arsenal and Shell Chemical are further ordered to "perform all work necessary to insure that existing sources of the substances DIMP and DCPD cannot enter the water of the state."

The third order calls for the Arsenal and Shell Chemical to "initiate and continue a program of groundwater surveillance" to determine the geographical extent of the two substances, and to report the program's findings to the State Health Department on a regular basis.

(more)

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orders - 2.

DIMP (Disopropylmethylphosphonate) was found in "detectable levels" in groundwater north of the Arsenal during sampling last December by the Tri-County District Health Department.

The substance, according to a State Health Department environmental official, was found in surveillance wells as far north as 144th Ave. approximately one mile south of two wells which provide water for the City of Brighton.

Test results of the water samples were released after analyses and interpretation by State Health Department chemists and water quality control specialists.

Frank Rozich, director of water quality control for the Department, said DIMP's health risk, if any, needs to be determined. The levels of DIMP range from 0.57 parts per billion (ppb) in the well near 144th Ave. to 6.0 parts per million (ppm) in a well immediately north of the Arsenal.

Those levels compare with a level of 48 ppm found in a well inside the Arsenal, and a level of 408 ppm in a lake at the facility known as Lake F, Rozich said.

Samples taken last August and January showed "a wide distribution" of DIMP in groundwater at the Arsenal itself, he said.

Sampling of groundwater wells on and near the Arsenal also revealed the presence of DCPD (Dicyclopentadiene), an organic hydrocarbon used in the manufacture of pesticides such as endrin, aldrin and dieldrin.

DCPD was found in a tributary of First Creek just north of the Arsenal during tests conducted last May. Since those tests, drainage to the tributary was blocked, but now the substance has surfaced in a ditch which flows to the tributary, and ultimately to First Creek, Rozich said.

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The substance also was found in two wells immediately north of the Arsenal, he said.

Information from the U. S. Department of Health, Education and Welfare's list of toxic substances indicates that DCPD in the detected concentrations is not toxic, according to William Dunn, the Department's chief chemist.

Dunn said, however, that relatively little is known about DIMP. He speculated that the substance may have been present in and around the Arsenal for the past 20 years, but the technique for monitoring its residue was not perfected until last year.

Because little is known about DIMP, the Department has recommended that wells north of the Arsenal which provide water to the City of Brighton be sampled for the substance on a regular basis, and closed if DIMP is found in them.

"We have no reason to believe that DIMP is harmful or toxic, especially in the concentrations we have found," Rozich said, "but we want to take this precaution because so little is known about it."

Rozich said the Department has recommended that wells in the area be monitored to determine how far the DIMP may extend, and also has recommended that a "disinterested third party" conduct toxicity studies on DIMP.

One possible source of the DIMP is Lake A, a lake at the Arsenal that was used as a disposal site for the substance prior to to 1957. State Health Department water quality control specialists theorize that the DIMP may have leached from the unlined lake into the groundwater.

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Orders - 4

The DCPD, as well as minimal amounts of endrin, aldrin and dieldrin found in groundwater at and near the Arsenal, appear to be originating from the southeast corner of Lake F, but further investigation is necessary to substantiate that assumption, Rozich said.

He said the Environmental Protection Agency has been notified of the situation, and will be cooperating with the Health Department in defining the problem.

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ADDINGTON & R
COAST GUARD (B7.4M)

RSH 917

U S F F



DEPARTMENT OF THE ARMY
OFFICE OF THE SECRETARY OF THE ARMY
WASHINGTON, D.C. 20310

8 FEB 1974

OFFICE CHIEF OF
DISBURSEMENT DIVISION

Honorable Patricia Schroeder
Representative in Congress
Denver Federal Building
1961 Stout Street
Denver, Colorado 80202

Dear Mrs. Schroeder:

This is in reply to your request of 10 July 1973 concerning a listing of waste materials which have been released from Rocky Mountain Arsenal. As you will recall, you were advised on 30 July that a collection of this type of information would require a review of Arsenal and lessee records.

The attached report is a summary of the activities from the time of initial construction of the Arsenal in 1942 until the present. Included are letters from the Shell Chemical Company, Dr. Julius Hyman and the Colorado Fuel and Iron Chemical Company.

During the period 1942 until 1969, there were no requirements to maintain data on disposal of industrial wastes. However, since 1969 and the initiation of activities associated with the National Environmental Policy Act, detailed records have been maintained and environmental controls have been placed on all Arsenal activities.

As you know, environmental statements have been filed with the Council on Environmental Quality on all disposal activities underway at Rocky Mountain Arsenal and such statements specify the methods for recording and controlling discharges of any type resulting from the operation.

A copy of this correspondence is being furnished to Governor Vanderhoof for his information.

Sincerely,

Max E. Thomas

MAX E. THOMAS
Lieutenant Colonel, GS
Negative Developmental
Inquiry Division

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OFFICE, CHIEF OF
LEGISLATIVE LIAISON

DEPARTMENT OF THE ARMY
OFFICE OF THE SECRETARY OF THE ARMY
WASHINGTON, D.C. 20310

8 FEB 1974

Honorable John D. Vanderhoof
Governor of Colorado
State Capital Building
Denver, Colorado 80211

Dear Governor Vanderhoof:

Attached for your information is a copy of a report furnished
Representative Schroeder in response to her request for infor-
mation concerning waste materials which have been released
from Rocky Mountain Arsenal.

Sincerely,

MAX E. THOMAS
Lieutenant Colonel, GS
Deputy, Congressional
Inquiry Division

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SUMMARY OF ACTIVITIES
AT ROCKY MOUNTAIN ARSENAL

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1. Rocky Mountain Arsenal's operations can be divided into six phases as listed below. The production operations and mission have changed several times since the Arsenal facilities were constructed in 1942.

- a. Phase 1 - Establishment of Rocky Mountain Arsenal and World War II Activity
- b. Phase 2 - Post World War II Activities
- c. Phase 3 - Korean Conflict
- d. Phase 4 - Post Korean Activities
- e. Phase 5 - Vietnam Conflict
- f. Phase 6 - Change of Mission Emphasis from Production to Demilitarization

2. FWASE 1 - Establishment of Rocky Mountain Arsenal and World War II Activity (1942-1945)

a. The War Production Board approved the construction of a chemical arsenal, at Rocky Mountain Arsenal on 2 May 1942, with construction initiated in June 1942. The construction of the Mustard Facility was completed in six months, and the final completion of the Arsenal was accomplished during November 1943.

b. During this period, the following materials were produced:

- (a) Chlorine
- (b) Levinstein Mustard
- (c) Distilled Mustard
- (d) Lewisite
- (e) Arsenic Trichloride
- (f) Sulfur Dichloride
- (g) ThiomyI Chloride
- (h) Five-Hundred Pound E48 Cluster
- (i) M47 Incendiary Bomb
- (j) M39 Incendiary Bombs

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- (k) E46 Five-Hundred Pound Bomb
- (l) Incendiary Cluster, M12 and M13
- (m) White Phosphorous Igniter
- (n) White Phosphorous-Filled Cup
- (o) Industrial Waste Operations (Phase 1)

(1) An Industrial Waste Pond, designated as "Lake A" and covering approximately sixty (60) acres, was established on the Arsenal to contain all chemical industrial wastes from the manufacturing facilities. This disposal pond did not discharge into any streams leaving Rocky Mountain Arsenal, since the liquid level in the disposal pond was maintained by normal evaporation. During this phase of operations, there were no requirements for maintaining records as to quantities or types of chemicals discharged into the waste disposal system; therefore, no data are available to definitely specify what was introduced into the waste disposal pond (Lake A).

(2) It could be assumed that there were some quantities of all chemicals, used or manufactured at the Arsenal, deposited in the waste disposal pond as detoxified, neutralized salt solutions. These salts, or brine solutions, could have included some detoxified Mustard or Lewisite and some sulfur, chlorine or arsenic in various forms of salt solutions. These wastes could also have included some washdown waste water from the incendiary lines, or the Arsenal's Clothing Treatment Plant, and could have contained some phosphorous compounds or chlorinated paraffin.

(3) Attached as an inclosure is a letter from the Secretary of the Army to Representative Armstrong which describes in considerable detail the history of the Industrial Waste Ponds at FMA.

3. PHASE 2 - Post World War II Activities

a. Production Mission (1945-1950)

(1) After the cessation of World War II, Arsenal activities were directed toward the renovation of Chemical Corps' Field Equipment, such as flame throwers, decontamination trucks and chemical trailers.

(2) An additional mission of the Arsenal was the demilitarization of 155mm and 75mm Mustard-filled Shells. This demilitarization facility operated during the period September 1947 through January 1949. The Mustard Agent was removed from the shells and transferred by one ton cylinders for storage. The empty shells were decontaminated by flushing with Oleum (104% sulfuric acid) and concentrated nitric acid.

b. Leasing of Idle Facilities

(1) In 1946, a decision was made to lease certain standby plants to private industry. The plants included the chlorine manufacturing plant and the Mustard and Lewisite manufacturing facilities. The initial lessees were the Colorado Fuel and Iron Chemical Company and the Julius Hyman Chemical Company.

(2) In 1950, the Julius Hyman Chemical Company assumed the lease of the Colorado Fuel and Iron Chemical Company; and in 1951, the Shell Chemical Company purchased the lease held by the Julius Hyman Chemical Company. The Shell Chemical Company enlarged their activities for the manufacture of various types of insecticides.

c. Waste Disposal Operations (Phase 2)

(1) There was no industrial waste generated in the chemical equipment renovation facility.

(2) The liquid brine waste, generated in detoxifying Mustard Agent wastes or neutralizing acid waste during the Mustard Shell Demilitarization Program, was discharged into the waste disposal pond (Lake A). There was no requirement for maintaining records of industrial waste disposal during phase 2 therefore no hard data are available on the quantity or composition of materials released into the disposal pond.

(3) The waste disposal operations, from the lessees plants, would have contained some by-products from the manufacture of insecticides and neutralized wash water from operational cleanup around their facilities. The Julius Hyman Chemical Company and the Colorado Fuel and Iron Chemical Company were requested, by letter, to furnish any data that may have been maintained which would indicate the types and quantities of wastes generated. A response from both the Julius Hyman Chemical Company and the Colorado Fuel and Iron Chemical Company (Inclosure Numbers 1 and 2) states that no records were maintained which would list the quantities or types of liquid wastes expelled to the waste disposal pond (Lake A). Some of the insecticides manufactured included Aldrin and Dieldrin, and the Colorado Fuel and Iron Chemical Company operated the chlorine plant including a sodium hydroxide concentration unit.

4. PHASE 3 - Korean Conflict (1950-1954).

a. Operations included continued manufacturing of incendiary clusters for the Air Force, renovation of Army flame throwers and the construction and start-up of the GB Nerve Gas manufacturing and filling plants. The Arsenal was placed on active status during June 1950 concurrent with the start of the Korean conflict. Construction of the nerve gas plant was initiated in 1951 and completed in 1953.

b. During this period the following materials were produced:

M1 Thickerer for Incendiaries.

M15 White Phosphorus-Filled Smoke Grenade

M19, M20A1 and M31 Incendiary Bomb Clusters

Renovation of Flame Throwers

Nerve Gas Agent GB

M34, M2-Filled, Clusters

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c. The Shell Chemical Company continued to produce various insecticides in their leased facilities.

d. Waste Disposal Operations (Phase 3)

(1) The waste disposal pond (Lake A) was continued in use during this phase.

(2) Neutralized and detoxified by-products from the GB Nerve Gas manufacturing plant, along with plant washdown water, were discharged to the waste disposal pond, (Lake A) during the period 1953 and 1954.

(3) The by-products and plant washdown water from the insecticide manufacturing plant, operated by the Shell Chemical, were also discharged into the waste disposal pond (Lake A).

(4) Washdown water from the incendiary lines and Clothing Treatment Plant was discharged into the waste disposal pond (Lake A).

(5) No waste liquids were generated in the field equipment facilities where flame throwers were being renovated.

(6) No records were maintained by the Shell Chemical Company, or the Rocky Mountain Arsenal, as to the quantities or types of waste materials generated.

5. PHASE 4 - Post Korean Activities (1954-1964)

a. Mission Changes

(1) After the Korean conflict, two significant changes in the mission occurred. Government Owned and Operated Arsenals began to concentrate on pilot production, preproduction and limited production runs with mass production performed by industry wherever possible; or practical. Rocky Mountain Arsenal was assigned the production engineering to support research and development for the Chemical Corps of the Department of the Army.

(2) A facility was engineered and built to blend rocket fuel for the Titan II Program.

b. Production Activities (1954-1964)

(1) GB Nerve Agent Manufacture (1953-1957)

(2) Various Munitions Filled (GB) (1953-1964)

(3) Demilitarization of Mustard-Filled Munitions

(4) M34 White Phosphorous Grenade Manufacture

(5) Processing of Anti-crop Material and Maintenance of Stockpile

c. Waste Disposal Operations (Phase 4) (1954-1964)

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(1) The use of Lake A was discontinued in 1954 and replaced with a new disposal pond designated as Lake F. This pond was constructed with a catalytic-blown asphalt membrane on the bottom to prevent any seepage into the earth below. This membrane was covered by approximately twelve inches of dirt to protect it from damage. The area of this disposal pond covers approximately 100 acres and has a capacity of 250,000,000 gallons. When the lake was completed, all industrial waste from the Shell Chemical Company and the Arsenal's manufacturing plants was introduced into this lake, plus the liquid wastes remaining in the Lake A disposal pond.

(2) Utilizing a successful technique employed by industry, delamination was made to dispose of all industrial wastes, including that in Lake F, into a deep well. In 1962, a deep disposal well was completed on the Arsenal, and the pumping of industrial wastes into this well was initiated. The well was drilled to a depth of 12,045 feet and was capable of accepting 400 gallons per minute at a well head pressure of 1,000 pounds per square inch. The use of the deep well was discontinued and the well was capped in February 1966. Attached is an article which may have come to your attention published in SCIENCE MAGAZINE, September 1968 issue concerning the deep well at RMA.

(3) During this period, the industrial wastes included the by-products and washdown water from the GB manufacturing plant. These waste waters were completely detoxified and neutralized with a caustic soda solution prior to disposal. The waste liquids, also, included the detoxified by-products from the Shell Chemical Company's insecticide manufacturing plant including any plant washdown water.

(4) In demilitarizing the N70 Mustard-filled Pump and the 155mm, Mustard-filled, Shell, the agent was burned, and no effluent was expelled to the Lake other than small quantities of neutralized plant washdown water. There would also have been a small amount of plant washdown water introduced into the disposal system from the 105mm Mustard Shell demilitarization line and the White Phosphorous Grenade filling line.

(5) No records were maintained during this period, from either the Shell Chemical Company or the Arsenal, which would furnish data on the quantities or compositions of chemicals expelled to the Lake F industrial waste disposal pond.

6. PHASE 5 - Vietnam Conflict (1965-1969)

a. Operations

(1) During the period 1965 to 1969, the activities at the Arsenal included the following operations:

(a) Filling of various munitions with GB Nerve Agent.

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- (b) Blending of Missile Fuel for the Air Force and Space Program.
- (c) Demilitarization of 155mm and 105mm, Mustard-Filled, Shells.
- (d) Filling of Grenades and 105mm Shells with White Phosphorus.
- (e) Demilitarization of M78 500 lb Phosgene and M79 1000 lb Phosgene Bombs and Renovation for Reuse.
- (f) Demilitarization of 4.2 Phosgene-Filled Mortar Shells and Renovation for Reuse.

b. Waste Disposal Operations (Phase 5) (1964-1969)

- (1) No waste liquids were generated during the GB munition filling operations other than neutralized plant washdown water from the facilities.
- (2) No waste waters were generated and disposed of from the Missile Fuel Blending operating procedure.
- (3) The Mustard-Filled, 155mm and 105mm, Shells were demilitarized, and the agent contained in the shells was burned in furnace. The only disposal liquid from the facilities was the neutralized plant washdown water. The 105mm shells were renovated and refilled with White Phosphorus.
- (4) The filling of 105mm shells and grenades, with White Phosphorus, did not generate industrial wastes other than small amounts of neutralized plant washdown water.
- (5) M78 and M79, Five-Hundred Pound and One-Thousand Pound, Phosgene-Filled Bombs were emptied in order to reuse the bomb body for a high explosive munition. The bomb bodies were not filled with the explosive charge at Rocky Mountain Arsenal. The Phosgene was recovered and stored in the toxic yard at the Arsenal. There were no industrial liquid wastes from this operation.
- (6) The emptying of Phosgene from 4.2 Mortar Shells was also accomplished to furnish shell bodies. The Phosgene from these mortar shells was also recovered in ton cylinders and stored in the toxic yard at this Arsenal with no waste liquids being generated in the process.
- (7) This Arsenal produced several types of small antipersonnel explosive munitions. There was no industrial chemicals introduced into Lake F from these operations.
- (8) Neutralized by-products and washdown water was sent to Lake F by the Shell Chemical Company, and no records were maintained.

7. PHASE 6 - Change of Mission Emphasis from Production to Demilitarization (1970-1973)

- a. The activities at Rocky Mountain Arsenal were as follows:

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- (1) Impregnation of Clothing for the Departments of the Army and Navy.
- (2) Initiation and Operation of a Demilitarization Program for Disposal of an Anticrop Biological Agent.
- (3) Initiation and Operation of a Demilitarization Program for the Disposal of Mustard Agent.
- (4) Planning for the Demilitarization of the Obsolete M34, GB-Filled, Air Force Cluster.
- (5) Blending of Hydrazine Missile Fuel for the Space Program.

b. Waste Disposal Operations (Phase 6) (1970-1973)

- (1) Industrial wastes from the Clothing Treatment Plant were expelled to Lake F. These wastes would include small quantities of chlorinated paraffin and the impregnation compound, XXCC3.
- (2) Anticrop Material
 - (a) The facility, in which the anticrop material was destroyed, was designed to be a completely contained unit. The building was maintained under a constant negative pressure, and all exhaust air passed through an absolute (.3 micron) filter system. The material was destroyed first by chemical treatment followed by incineration. The exhaust stack, from the incineration unit, as well as the exhaust stack from the building, was monitored continuously to assure that no anticrop spores, live or dead, were exhausted into the atmosphere.
 - (b) All washdown water from this plant was evaporated in the incineration furnace to destroy any possible spores from that source; therefore, no waste water was discharged from this facility.
 - (c) Final disposal of inactive ash was spread on the soil as stated in the Environmental Statement. Samples of soil from the area where ash was spread have been subjected to analyses by an independent laboratory and found to be free of any viable anti-crop spores.

(3) Mustard Agent

- (a) The bulk Mustard burning facility was designed so that the Mustard was burned in furnaces, and the exhaust fumes from the operation passed through a packed column and scrubbed with a caustic soda solution to remove any sulfur dioxide or chlorine. These exhaust gases, from the facility stacks, passed both State and Federal stack emission standards.

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(b) The neutralized brine that is generated in scrubbing the gases passed into a spray dryer which evaporated the water and produced solid salts. These salts, containing sodium chloride, sodium sulfite and sodium carbonate, are sealed into metal drums and stored in closed warehouses at the Arsenal. No liquid chemical wastes from the Mustard Demilitarization Plant are being discharged into the Lake F waste disposal pond. Even wash-down water in the thaw room, unload booths or storage tank room is collected and disposed of through the spray dryer system. Complete details are included in the final environmental statement filed with the Council on Environmental Quality.

(c) The most modern analyzing instrumentation equipment was utilized to monitor the exhaust gases from the scrubber system, as well as the operating area exhaust stacks. These operating area exhaust stacks utilized activated charcoal filter systems to prevent any Mustard vapor from exiting the facility. The same type of instrumentation was also utilized to monitor the air within the thaw room where the ton containers of Mustard Agent were heated to fluidize the material and to monitor the areas around the storage tanks and agent pumps. These analyzers detected Mustard Agent at the level of .004 milligrams per cubic meter.

(d) The following data are furnished as an average level of Mustard, or acid from the exhaust stacks, of the Mustard demilitarization facility. It may be noted that the actual rates are below the figures furnished as acceptable standards for stack emissions.

STACK EMISSION
MUSTARD DEMILITARIZATION PLANT

STANDARD ACCEPTABLE LEVEL	ACTUAL 12 MONTH AVERAGE
MUSTARD .03 Milligrams Per Cubic Meter	Less Than .03 Milligrams Per Cubic Meter
SO ₂ 500 Parts Per Million	Less Than 5 Parts Per Million

(4) M34, GB-Filled, Cluster

(a) The facility for demilitarizing the M34, GB-Filled, Air Force Cluster began operations on 29 October 1973.

(b) This facility has, also, been designed in a manner to eliminate any industrial waste water. The brine which will be generated by the neutralization of GB Nerve Agent, collected from the declustered operations, will be used to a salt in a spray dryer. The salt, containing sodium fluoride, sodium carbonate and sodium phosphate, will be placed into steel drums for storage on the Arsenal. No industrial waste water will be expelled to the Lake F disposal pond. Complete details are included in the environmental statement filed with the Council on Environmental Quality.

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(c) All air exhausting from the dechlorinating cubicles and the operating areas, including the decontamination furnaces, is passed through a series of caustic Venturi scrubbers to remove any traces of the agent. The exhaust gases, from the scrubber stacks, are continuously monitored with the modern and sensitive equipment to maintain assurance that the exhaust gases are free of any toxic contaminants. These instruments will detect the presence of GB Nerve Agent at the low level of .0003 milligrams per cubic meter which is well below the level that would have any detrimental effect on human beings.

(5) Monitoring Stations

(a) To further maintain control on the demilitarization operations at the Rocky Mountain Arsenal, nine monitoring stations have been established around the entire perimeter of the Arsenal. Each of these monitoring stations are equipped with highly sensitive instrumentation which will detect sulfur dioxide at the level of .005 parts per million and nitrous oxide at the level of .005 parts per million, as well as the presence of acid mist. The stations, also, will show wind direction and the quantity of solid particles in the air. The information from these nine stations is automatically fed to the Inspection Laboratory, so that any abnormal condition indicated by the monitoring equipment can be checked out; and if due to a plant problem, corrective action can be taken immediately.

(b) The following data are furnished from the records maintained on the information collected on a test basis from these monitoring stations over a twelve month period:

ANNUAL ARITHMETIC MEAN PERIMETER MONITORING DATA	
STANDARD	ACTUAL (12 MONTH AVERAGE)
SO ₂	.02 PPM
NO ₂	.05 PPM
Acid Mist (NC1)	.015 PPM

(c) It may be noted that the actual average concentration of the SO₂, NO₂ and acid mist, falls considerably below the acceptable standard levels. It is also pointed out that these monitoring stations also pickup any SO₂, NO₂, or acid mist entering the Arsenal grounds from outside sources, such as oil refineries or power plants, when the wind is from the direction of the source to the Arsenal monitoring stations.

(d) These monitoring stations also have the capability of checking for GB Nerve Agent concentrations, through a cholinesterase level determination, and will give added protection and awareness of any contamination during the demilitarization of the M34, GS-Filled, Air Force Cluster or in the event a serious leak was to develop in the toxic yard.

(6) Shell Chemical Company Disposal Operations

Inclosure Number 3 is a report from the Shell Chemical Company which reflects their disposal operations since 1966.

(7) A program directed toward overall cleanup of buildings and grounds at RMA is currently underway. An on-site survey of RMA is being conducted by technical personnel to determine specific areas and structures which require decontamination and/or destruction. Upon completion of this survey, a determination will be made concerning appropriate methods for cleanup and the timing of such effort. As you know, a major effort involving disposal of nerve agent GB will continue which will require continued use of facilities and the retention of an adequate safety buffer zone surrounding the arsenal.

3 Incl

1. Reply f/Julius Hyman
6Aug73, to Ltr, 2Aug73
2. Ltr, GFEI Steel Corp,
27Aug73
3. Ltr, Shell Cml Company,
31Aug73
4. Ltr, Congressman Armstrong
5. Article, SCIENCE magazine

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