

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

Compound	CAS No.	Recognized/Suspected Human Health Hazards
1) Bis(2-chloroethyl)ether	111-44-4	Recognized: Carcinogen P65 Suspected: Neurotoxicant HAZMAP,Respiratory Toxicant EPA-HEN,Skin or Sense Organ Toxicant EPA-HEN
2) 4-Chlorophenyl phenyl ether	7005-72-3	Listed: Hazardous Substances (Superfund) Priority Pollutants (Clean Water Act)
3) 2-Nitrophenol	88-75-5	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Neurotoxicant EPA-SARA
4) 1,3-Dichlorobenzene	541-73-1	Suspected: Cardiovascular or Blood Toxicant NJ-FS, Gastrointestinal or Liver Toxicant NJ-FS, Kidney Toxicant NJ-FS, Respiratory Toxicant NJ-FS
5) Fluorene	86-73-7	Suspected: Gastrointestinal or Liver Toxicant ATSDR
6) 2,4-Dimethylphenol	105-67-9	Suspected: Cardiovascular or Blood Toxicant IRIS, Kidney Toxicant NJ-FS, Gastrointestinal or Liver Toxicant NJ-FS, Skin or Sense Organ Toxicant NJ-FS
7) 1,2-Dichlorobenzene	95-50-1	Suspected: Endocrine Toxicant RTECS, Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant HAZMAP,Neurotoxicant DAN HAZMAP, Skin or Sense Organ Toxicant HAZMAP
8) Azobenzene	103-33-3	Recognized: Carcinogen P65
9) 2,4-Dichlorophenol	120-83-2	Suspected: Cardiovascular or Blood Toxicant LADO RTECS, Endocrine Toxicant JNHS KEIT, Immunotoxicant ATSDR
10) 1,4-Dichlorobenzene	106-46-7	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant LADO RTECS, Developmental Toxicant ATSDR JANK, Gastrointestinal or Liver Toxicant ATSDR EPA-HEN OEHHA-CREL RTECS,Kidney Toxicant KLAA OEHHA-CREL RTECS,Neurotoxicant DAN EPA-HEN OEHHA-CREL RTECS,Respiratory Toxicant OEHHA-CREL RTECS, Skin or Sense Organ Toxicant EPA-HEN LU RTECS
11) Hexachlorobenzene	118-74-1	Recognized: Carcinogen P65, Developmental Toxicant P65, Suspected: Cardiovascular or Blood Toxicant LADO RTECS, Endocrine Toxicant BKH BRUC IL-EPA JNHS KEIT RTECS, Gastrointestinal or Liver Toxicant EPA-HEN OEHHA-CREL RTECS ZIMM, Immunotoxicant IPCS,Kidney Toxicant RTECS, Neurotoxicant EPA-SARA, Reproductive Toxicant ATSDR EPA-SARA FRAZIER,Skin or Sense Organ Toxicant EPA-HEN
12) 4-Chloro-3-Methylphenol	59-50-7	Suspected: Immunotoxicant NAP

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13) Bis(2-chloroisopropyl)ether	39638-32-9	Suspected: Carcinogen SCDM
14) Phenanthrene	85-01-8	Suspected: Respiratory Toxicant NTP-HS, Skin or Sense Organ Toxicant NTP-HS
15) 2,4,6-Trichlorophenol	88-06-2	Recognized: Carcinogen P65, Suspected: Gastrointestinal or Liver Toxicant RTECS, Respiratory Toxicant EPA-HEN
16) Uranium	7440-61-1	Recognized: Carcinogen P65-MC, Suspected: Cardiovascular or Blood Toxicant EPA-HEN Kidney Toxicant ATSDR HAZMAP LAND MERCK, Neurotoxicant DAN, Reproductive Toxicant FRAZIER, Respiratory Toxicant EPA-HEN NEME
17) Anthracene	120-12-7	Suspected: Endocrine Toxicant KEIT, Gastrointestinal or Liver Toxicant ATSDR RTECS, Skin or Sense Organ Toxicant KLAA TIMB
18) 2,4-Dinitrophenol	51-28-5	Suspected: Cardiovascular or Blood Toxicant EPA-HEN RTECS, Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant EPA-HEN, Neurotoxicant EPA-HEN RTECS, Reproductive Toxicant EPA-SARA, Skin or Sense Organ Toxicant EPA-HEN LU
19) Hexachloroethane	67-72-1	Recognized: Carcinogen P65, Suspected: Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant ATSDR EPA-HEN OEHHA-CREL RTECS, Kidney Toxicant OEHHA-CREL RTECS, Neurotoxicant ATSDR EPA-HEN OEHHA-CREL,
20) Dibutyl phthalate	84-74-2	Suspected: Developmental Toxicant ATSDR CERHR EPA-SARA JANK NTP-R P65-CAND, Endocrine Toxicant BKH JNHS KEIT WWF, Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant HAZMAP, Kidney Toxicant RTECS, Neurotoxicant DAN RTECS, Reproductive Toxicant EPA-SARA NTP-R P65-CAND, Skin or Sense Organ Toxicant HAZMAP
21) 4-Nitrophenol	100-02-7	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Neurotoxicant EPA-HEN EPA-SARA RTECS, Skin or Sense Organ Toxicant EPA-HEN RTECS
22) Nitrobenzene	98-95-3	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant EPA-HEN HAZMAP MALA RTECS, Kidney Toxicant MERCK, Neurotoxicant EPA-HEN RTECS, Reproductive Toxicant EPA-SARA, Respiratory Toxicant OEHHA-CREL RTECS, Skin or Sense Organ Toxicant HAZMAP
23) Fluoranthene	206-44-0	Suspected: Gastrointestinal or Liver Toxicant ATSDR
24) 2-Methyl-4,6-Dinitrophenol	534-52-1	Suspected: Cardiovascular or Blood Toxicant EPA-HEN HAZMAP RTECS, Gastrointestinal or Liver Toxicant EPA-HEN RTECS, Kidney Toxicant HAZMAP, Neurotoxicant ATSDR DAN EPA-HEN RTECS, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN

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25) Isophorone	78-59-1	Suspected: Carcinogen EPA-HEN IRIS OPP-CAN SCDM, Developmental Toxicant OEHHA-CREL Gastrointestinal or Liver Toxicant ATSDR OEHHA-CREL, Kidney Toxicant RTECS, Neurotoxicant EPA-HEN HAZMAP, Respiratory Toxicant EPA-HEN RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP RTECS
26) Pyrene	129-00-0	Suspected: Neurotoxicant RTECS, Skin or Sense Organ Toxicant RTECS
27) Pentachlorophenol	87-86-5	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant EPA-HEN LADO RTECS, Developmental Toxicant ATSDR EPA-SARA OEHHA-CREL, Endocrine Toxicant ATSDR BRUC IL-EPA JNHS KEIT RTECS WWF, Gastrointestinal or Liver Toxicant EPA-HEN OEHHA-CREL RTECS, Immunotoxicant EPA-HEN, Kidney Toxicant EPA-HEN OEHHA-CREL, Neurotoxicant DAN EPA-HEN RTECS, Reproductive Toxicant ATSDR EPA-SARA, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP RTECS
28) Bis(2-chloroethoxy)methane	111-91-1	Suspected: Skin or Sense Organ Toxicant NTP-HS
29) Butylbenzyl phthalate	85-68-7	Suspected: Carcinogen IRIS, Developmental Toxicant CERHR P65-CAND, Endocrine Toxicant BKH JNHS KEIT WWF, Neurotoxicant RTECS, Reproductive Toxicant CERHR
30) 1,2,4-Trichlorobenzene	120-82-1	Suspected: Carcinogen OEHHA-TCD P65-CAND, Developmental Toxicant EPA-SARA, Neurotoxicant DAN HAZMAP RTECS
31) 3,3'-D Dichlorobenzidine	91-94-1	Recognized: Carcinogen P65, Suspected: Gastrointestinal or Liver Toxicant EPA-HEN RTECS Immunotoxicant EEC HAZMAP, Kidney Toxicant RTECS, Neurotoxicant EPA-HEN, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EEC HAZMAP
32) Naphthalene	91-20-3	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant EPA-HEN HAZMAP LADO MALA, Developmental Toxicant EPA-HEN EPA-SARA, Gastrointestinal or Liver Toxicant EPA-HEN, Neurotoxicant ATSDR DAN EPA-HEN RTECS, Respiratory Toxicant ATSDR FOTH OEHHA-CREL, Skin or Sense Organ Toxicant EPA-HEN LU RTECS
33) Benzo(a)anthracene	56-55-3	Recognized: Carcinogen P65
34) Hexachlorobutadiene	87-68-3	Suspected: Carcinogen EPA-HEN IRIS P65-CAND SCDM, Cardiovascular or Blood Toxicant RTECS, Developmental Toxicant EPA-SARA JANK, Endocrine Toxicant RTECS, Gastrointestinal or Liver Toxicant OEHHA-CREL RTECS, Kidney Toxicant ATSDR HAZMAP KLAA OEHHA-CREL RTECS STAC, Neurotoxicant DAN, Reproductive Toxicant EPA-SARA
35) Chrysene	218-01-9	Recognized: Carcinogen P65

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36) 2-Chloronaphthalene	91-58-7	Listed: Hazardous Constituents (Resource Conservation and Recovery Act), Hazardous Substances (Superfund), Priority Pollutants (Clean Water Act), Lacks at least some of the data required for safety assessment
37) Bis(2-ethylhexyl)phthalate	117-81-7	Recognized: Carcinogen P65, Developmental Toxicant P65, Reproductive Toxicant P65 Suspected: Endocrine Toxicant BKH BRUC IL-EPA JNHS KEIT WWF,Gastrointestinal or Liver Toxicant EPA-HEN OEHHA-CREL RTECS,Respiratory Toxicant OEHHA-CREL RTECS Skin or Sense Organ Toxicant RTECS
38) Dimethyl phthalate	131-11-3	Suspected: Immunotoxicant HAZMAP, Neurotoxicant DAN RTECS, Respiratory Toxicant EPA-HEN,Skin or Sense Organ Toxicant EPA-HEN HAZMAP
39) Di-n-octyl phthalate	117-84-0	Suspected: Endocrine Toxicant BRUC JNHS, Gastrointestinal or Liver Toxicant ATSDR
40) 2,6-Dinitrotoluene	606-20-2	Recognized: Carcinogen P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant ATSDR RTECS, Neurotoxicant EPA-SARA
41) Benzo(b)fluoroanthene	205-99-2	Recognized: Carcinogen P65
42) Acenaphthylene	208-96-8	Suspected: Respiratory Toxicant RTECS
43) Benzo(k)fluoroanthene	207-08-9	Recognized: Carcinogen P65
44) Acenaphthene	83-32-9	Suspected: Gastrointestinal or Liver Toxicant ATSDR
45) Benzo(a)pyrene	50-32-8	Recognized: Carcinogen P65, Suspected: Developmental Toxicant JANK P65-PEND, Endocrine Toxicant KEIT WWF, Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant IPCS, Respiratory Toxicant EPA-HEN FOTH RTECS, Skin or Sense Organ Toxicant LADO RTECS
46) 2,4-Dinitrotoluene	121-14-2	Recognized: Carcinogen P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant ATSDR EPA-HEN RTECS,Gastrointestinal or Liver Toxicant OEHHA-CREL , Neurotoxicant ATSDR EPA-HEN EPA-SARA OEHHA-CREL RTECS
47) Ideno(1,2,3-cd)pyrene	193-39-5	Suspected: Carcinogen EPA-IRIS, Developmental, Reproductive, Endocrine, Genotoxicity,
48) Diethyl phthalate	84-66-2	Suspected: Endocrine Toxicant JNHS WWF, Gastrointestinal or Liver Toxicant ATSDR RTECS, Immunotoxicant HAZMAP,Neurotoxicant RTECS,Reproductive Toxicant ATSDR,Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant HAZMAP RTECS

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49) Dibenzo(a,h)anthracene	53-70-3	Recognized: Carcinogen P65, Suspected: Skin or Sense Organ Toxicant LADO
50) Benzidine	92-87-5	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant HAZMAP, Gastrointestinal or Liver Toxicant OEHHA-CREL RTECS, Immunotoxicant IPCS, Kidney Toxicant EPA-HEN KLAA RTECS, Neurotoxicant OEHHA-CREL
51) Benzo(g,h,l)perylene	191-24-2	Listed: Hazardous Constituents (Resource Conservation and Recovery Act), Hazardous Substances (Superfund), Priority Pollutants (Clean Water Act), Lacks at least some of the data required for safety assessment
52) 4-Bromophenyl phenyl ether	101-55-3	Listed: Hazardous Constituents (Resource Conservation and Recovery Act), Hazardous Substances (Superfund), Priority Pollutants (Clean Water Act), Lacks at least some of the data required for safety assessment
53) N-Nitrosodiphenylamine	86-30-6	Recognized: Carcinogen P65, Suspected: Kidney Toxicant RTECS, Respiratory Toxicant RTECS
54) N-Nitrosodimethylamine	62-75-9	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant EPA-HEN KLAA RTECS, Developmental Toxicant JANK, Gastrointestinal or Liver Toxicant DOSS EPA-HEN HAZMAP LADO MALA RTECS ZIMM, Immunotoxicant IPCS, Neurotoxicant RTECS, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant RTECS
55) Phenol	108-95-2	Suspected: Cardiovascular or Blood Toxicant EPA-HEN HAZMAP OEHHA-CREL RTECS, Developmental Toxicant EPA-SARA JANK, Gastrointestinal or Liver Toxicant EPA-HEN OEHHA-CREL, Kidney Toxicant OEHHA-CREL, Neurotoxicant DAN EPA-HEN OEHHA-CREL, RTECS, Reproductive Toxicant FRAZIER P65-CAND, Respiratory Toxicant EPA-HEN OEHHA-AREL RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP KLAA OEHHA-AREL RTECS
56) Hexachlorocyclopentadiene	77-47-4	Suspected: Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant ATSDR RTECS, Neurotoxicant EPA-SARA, Reproductive Toxicant EPA-SARA, Respiratory Toxicant ATSDR EPA-HEN HAZMAP OEHHA-CREL RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP
57) 2-Chlorophenol	95-57-8	Suspected: Neurotoxicant RTECS, Skin or Sense Organ Toxicant RTECS
58) 1-Methylnaphthalene	90-12-0	Suspected: Respiratory Toxicant ATSDR
59) Acetophenone	98-86-2	Suspected: Skin or Sense Organ Toxicant EPA-HEN

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60) Diphenylamine	122-39-4	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Gastrointestinal or Liver Toxicant EPA-TRI, Immunotoxicant HAZMAP, Kidney Toxicant EPA-TRI, Neurotoxicant DAN RTECS, Respiratory Toxicant RTECS,
61) 2-Aminonaphthalene	91-59-8	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant HAZMAP, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS
62) 1-Nitropyrene	5522-43-0	Recognized: Carcinogen P65
63) 2,5-Diphenyloxazole (Biphenyl)	92-52-4	Suspected: Cardiovascular or Blood Toxicant RTECS, Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant EPA-HEN HAZMAP RTECS, Kidney Toxicant EPA-HEN MERCK, Neurotoxicant EPA-HEN HAZMAP RTECS, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant EPA-HEN
64) 2-Nitronaphthalene	581-89-5	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS
65) Triethylaluminum	97-93-8	6 of 8 basic tests to identify chemical hazards have not been conducted on this chemical or are not publicly available according to US EPA's 1998 hazard data availability study.
66) 2 Methylnaphthalene	91-57-6	Suspected: Respiratory Toxicant ATSDR FOTH
67) 2-Methylphenol (o-Crestol)	95-48-7	Suspected: Carcinogen IRIS, Cardiovascular or Blood Toxicant OEHHA-CREL, Endocrine Toxicant RTECS, Gastrointestinal or Liver Toxicant RTECS, Neurotoxicant ATSDR DAN EPA-SARA RTECS, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN RTECS
68) 3-Methylphenol (m-Crestol)	108-39-4	Suspected: Carcinogen IRIS OPP-CAN, Cardiovascular or Blood Toxicant OEHHA-CREL, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS, Neurotoxicant DAN RTECS, Respiratory Toxicant ATSDR EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN RTECS
69) 4-Methylphenol (p-Crestol)	106-44-5	Suspected: Carcinogen IRIS, Cardiovascular or Blood Toxicant OEHHA-CREL, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS, Neurotoxicant ATSDR DAN RTECS, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN LADO RTECS
70) 2,4,5-Trichlorophenol	95-95-4	Suspected: Cardiovascular or Blood Toxicant LADO, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN
71) HMX	2691-41-0	Suspected: Gastrointestinal or Liver Toxicant ATSDR, Neurotoxicant ATSDR RTECS

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72) RDX	121-82-4	Suspected: Carcinogen IRIS SCDM, Gastrointestinal or Liver Toxicant RTECS, Neurotoxicant ATSDR HAZMAP RTECS, Reproductive Toxicant ATSDR
73) 2,4,6-Trinitrotoluene (TNT)	118-96-7	Suspected: Carcinogen IRIS SCDM, Cardiovascular or Blood Toxicant HAZMAP LADO MALA RTECS STAC, Gastrointestinal or Liver Toxicant ATSDR DIPA HAZMAP LADO RTECS ZIMM, Neurotoxicant RTECS, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant LU
74) 1,3,5-Trinitrobenzine	99-35-4	Suspected: Cardiovascular or Blood Toxicant RTECS, Neurotoxicant RTECS, Respiratory Toxicant RTECS
75) 2-Amino-4,6-Dinitrotoluene (2ADNT)	35572-78-2	Recognized: Carcinogens
76) 4-Amino-2,6-Dinitrotoluene (4ADNT)	19406-51-0	Recognized: Carcinogens
77) 1,3- Dinitrobenzine	99-65-0	Recognized: Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant ATSDR HAZMAP RTECS, Gastrointestinal or Liver Toxicant DIPA MALA, Neurotoxicant DAN RTECS, Respiratory Toxicant RTECS
78) Nitroglycerin	55-63-0	Suspected: Carcinogen ORD-SF, Cardiovascular or Blood Toxicant HAZMAP KRIS LADO RTECS Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant HAZMAP, Kidney Toxicant MERCK, Neurotoxicant DAN RTECS, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant HAZMAP
79) Dioxin (TCDD)	1746-01-6	Recognized: Carcinogen P65, Developmental Toxicant P65, Suspected: Cardiovascular or Blood Toxicant ATSDR EPA-HEN LADO OEHHA-CREL RTECS, Endocrine Toxicant BKH BRUC IL-EPA JNHS KEIT OEHHA-CREL RTECS WWF, Gastrointestinal or Liver Toxicant EPA-HEN LADO OEHHA-CREL RTECS ZIMM, Immunotoxicant ATSDR NAP, Kidney Toxicant MERCK RTECS, Neurotoxicant STAC, Reproductive Toxicant OEHHA-CREL, Respiratory Toxicant OEHHA-CREL RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP KLAA RTECS
80) Furan	110-00-9	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant RTECS, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS, Respiratory Toxicant RTECS
<b>Other Constituents, Flash Composition, Smoke Charge, Pyrotechnics</b>		
81) Potassium Perchlorate	7778-74-7	Suspected: Cardiovascular or Blood Toxicant MALA
82) Flaked Aluminum (Aluminum)	7429-90-5	Suspected: Cardiovascular or Blood Toxicant LADO, Neurotoxicant ATSDR DAN KLAA LU, Reproductive Toxicant FRAZIER, Respiratory Toxicant KLAA LU NEME

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83) Sulfur	7704-34-9	Listed: Registered Pesticides (Federal Insecticide, Fungicide, and Rodenticide Act) Air Contaminants (California Occupational and Safety Health Act) Lacks at least some of the data required for safety assessment
84) Pentaerythritol tetranitrate (PETN)	78-11-5	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Skin or Sense Organ Toxicant RTECS
85) Magnesium Powder (Magnesium)	7439-95-4	Suspected: Respiratory Toxicant NEME
86) Sodium Nitrate	7631-99-4	Suspected: Cardiovascular or Blood Toxicant RTECS, Respiratory Toxicant RTECS
87) Barium Nitrate	10022-31-8	Suspected: Carcinogen, A poison via ingestion subcutaneous, parenteral, and intravenous routes (Toxnet)
88) Phosphorus, white	7723-14-0	Suspected: Cardiovascular or Blood Toxicant EPA-HEN RTECS, Gastrointestinal or Liver Toxicant DIPA DOSS EPA-HEN LADO MALA RTECS ZIMM, Kidney Toxicant EPA-HEN HAZMAP, Musculoskeletal Toxicant EPA-HEN, Neurotoxicant EPA-HEN RTECS, Reproductive Toxicant ATSDR EPA-SARA OEHHA-CREL, Respiratory Toxicant ATSDR EPA-HEN HAZMAP RTECS, Skin or Sense Organ Toxicant HAZMAP KLAA RTECS
89) Polyvinyl Chloride	9002-86-2	Suspected: Gastrointestinal or Liver Toxicant DIPA, Respiratory Toxicant HAZMAP
90) Titanium Tetrachloride	7550-45-0	Suspected: Respiratory Toxicant ATSDR EPA-HEN HAZMAP, Skin or Sense Organ Toxicant EPA-HEN HAZMAP
<b>Metals:</b>		
91) Copper	7440-50-8	Suspected: Cardiovascular or Blood Toxicant HAZMAP KLAA, Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant ATSDR DOSS KLAA RTECS ZIMM, Kidney Toxicant MERCK, Reproductive Toxicant EPA-SARA FRAZIER, Respiratory Toxicant NEME OEHHA-AREL OEHHA-CREL
92) Barium	7440-39-3	Suspected: Developmental Toxicant EPA-SARA, Neurotoxicant DAN, Reproductive Toxicant FRAZIER, Respiratory Toxicant NEME

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93) Cadmium	7440-43-9	Recognized: Carcinogen P65, Developmental Toxicant P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant BENO KLAA LADO RTECS, Endocrine Toxicant IL-EPA KEIT WWF, Immunotoxicant IPCSKidney Toxicant ATSDR EPA-HEN HAZMAP KLAA LAND MERCK OEHHA-CREL RTECS STAC, Neurotoxicant DAN ,Respiratory Toxicant EPA-HEN HAZMAP NEME OEHHA-CREL RTECS
94) Lead	7439-92-1	Recognized: Carcinogen P65, Developmental Toxicant P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant BENO EPA-HEN HAZMAP KLAA KRIS LADO MALA STAC, Endocrine Toxicant BRUC IL-EPA KEIT WWF,Gastrointestinal or Liver Toxicant EPA-HEN RTECS STAC, Immunotoxicant IPCS,Kidney Toxicant EPA-HEN HAZMAP KLAA LAND MERCK STAC,Neurotoxicant DAN EPA-HEN EPA-SARA FELD HAZMAP KLAA LU RTECS STAC, Respiratory Toxicant NEME,Skin or Sense Organ Toxicant KLAA
95) Nickel	7440-02-0	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant OEHHA-CREL, Developmental Toxicant EPA-SARA, Immunotoxicant EEC HAZMAP OEHHA-AREL SNCI, Kidney Toxicant KLAA, Neurotoxicant FELD, Reproductive Toxicant EPA-SARA FRAZIER JANK, Respiratory Toxicant ATSDR EPA-HEN HAZMAP KLAA LU NEME OEHHA-AREL OEHHA-CREL RTECS, Skin or Sense Organ Toxicant EEC EPA-HEN HARV HAZMAP KLAA LADO TIMB
96) Aluminum	7429-90-5	Suspected: Cardiovascular or Blood Toxicant LADO, Neurotoxicant ATSDR DAN KLAA LU, Reproductive Toxicant FRAZIER, Respiratory Toxicant KLAA LU NEME
97) Chromium	7440-47-3	Suspected: Carcinogen HAZMAP SCDM, Gastrointestinal or Liver Toxicant CARB TAC, Immunotoxicant HAZMAP, Kidney Toxicant HAZMAP KLAA MERCK, Reproductive Toxicant FRAZIER, Respiratory Toxicant HAZMAP NEME, Skin or Sense Organ Toxicant HAZMAP KLAA LADO TIMB
98) Potassium	7440-09-7	Lacks at least some of the data required for safety assessment
99) Calcium	7440-70-2	Air Contaminants (California Occupational and Safety Health Act) Lacks at least some of the data required for safety assessment
100) Mercury	7439-97-6	Recognized: Developmental Toxicant P65, Suspected: Cardiovascular or Blood Toxicant KLAA, Endocrine Toxicant IL-EPA KEIT WWF, Gastrointestinal or Liver Toxicant RTECS STAC, Immunotoxicant HAZMAP SNCI, Kidney Toxicant HAZMAP KLAA LAND MERCK STAC, Neurotoxicant ATSDR DAN EPA-HEN EPA-SARA FELD HAZMAP KLAA OEHHA-CREL RTECS STAC, Reproductive Toxicant EPA-SARA FRAZIER HAZMAP OEHHA-AREL, Respiratory Toxicant HAZMAP NEME, Skin or Sense Organ Toxicant HAZMAP KLAA RTECS
101) Zinc	7440-66-6	Suspected: Cardiovascular or Blood Toxicant ATSDR, Developmental Toxicant EPA-SARA, Immunotoxicant OEHHA-CREL, Reproductive Toxicant EPA-SARA, Respiratory Toxicant NEME OEHHA-CREL RTECS, Skin or Sense Organ Toxicant RTECS

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102) Titanium Metal Powder	7440-32-6	Suspected: Respiratory Toxicant NEME
103) Antimony	7440-36-0	Suspected: Cardiovascular or Blood Toxicant BENO LADO, Neurotoxicant DAN, Reproductive Toxicant EPA-SARA FRAZIER, Respiratory Toxicant EPA-HEN NEME, Skin or Sense Organ Toxicant EPA-HEN
104) Beryllium	7440-41-7	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant KLAA, Gastrointestinal or Liver Toxicant ATSDR DOSS LADO MALA, Immunotoxicant EEC OEHHA-CREL, Kidney Toxicant LAND, Reproductive Toxicant FRAZIER, Respiratory Toxicant EPA-HEN HAZMAP KLAA LU NEME OEHHA-CREL, Skin or Sense Organ Toxicant EEC
105) Cadmium	7440-43-9	Recognized: Carcinogen P65, Developmental Toxicant P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant BENO KLAA LADO RTECS, Endocrine Toxicant IL-EPA KEIT WWF, Immunotoxicant IPCS, Kidney Toxicant ATSDR EPA-HEN HAZMAP KLAA LAND MERCK OEHHA CREL RTECS STAC, Neurotoxicant DAN, Respiratory Toxicant EPA-HEN HAZMAP NEME OEHHA-CREL RTECS

**Most Table 1 Constituents compiled from 1994 Basewide RI/FS Vol. II Table 12**

**Human Health Hazard Information source: Scorecard Database <http://www.scorecard.org/chemical-profiles/index.tcl>**

Cancer References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=cancer](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=cancer)

Developmental Toxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=endo](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=endo)

Endocrine Toxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=endo](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=endo)

Gastrointestinal or Liver Toxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=liver](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=liver)

Immunotoxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=immun](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=immun)

Kidney Toxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=kidn](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=kidn)

Neurotoxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=neuro](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=neuro)

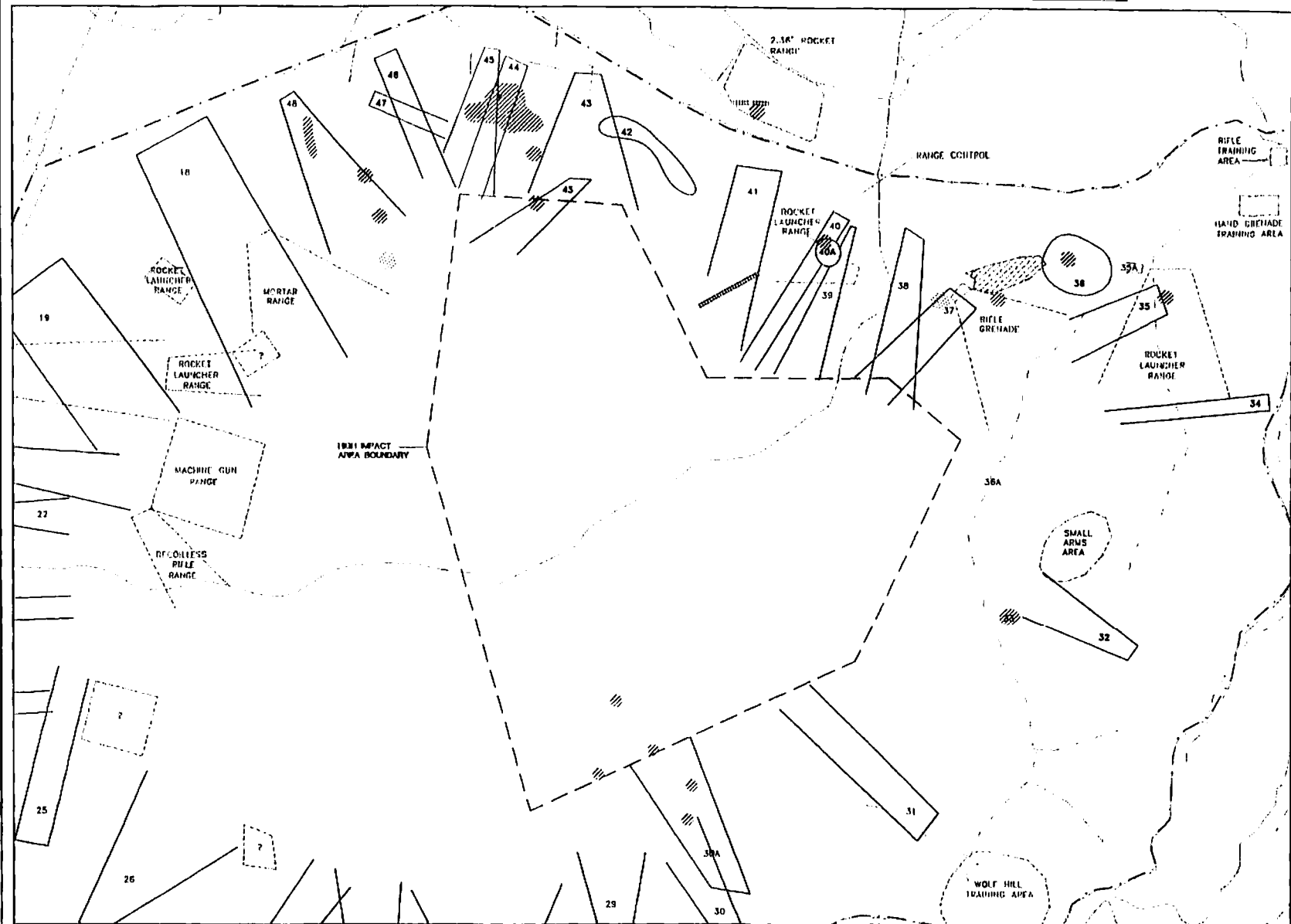
Reproductive Toxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=repro](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=repro)

Skin or Sense Organ Toxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=skin](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=skin)

Respiratory Toxicants: [www.scorecard.org/health-effects/explanation.tcl?short\\_hazard\\_name=resp](http://www.scorecard.org/health-effects/explanation.tcl?short_hazard_name=resp)

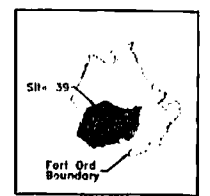
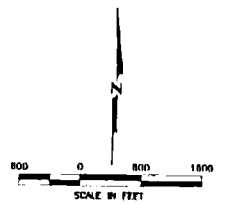
Cardiovascular or Blood Toxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=cardio](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=cardio)

Musculoskeletal Toxicity References: [www.scorecard.org/health-effects/references.tcl?short\\_hazard\\_name=musc](http://www.scorecard.org/health-effects/references.tcl?short_hazard_name=musc)



**EXPLANATION**

- ⊕ SOIL BORING (REA)
- - - PLAND RANGE'S BOUNDARY
- - - 1981 IMPACT AREA BOUNDARY
- ||||| MOVING TARGET TRACK
- - - INTERMITTENT STREAM
- ▨ POND/PERMANENT CATCHMENT BASIN
- 50 RANGE FAN AND RUNNER
- - - DISCOMMISSIONED RANGE ? - DISTURBED AREA OF UNKNOWN SIZE
- - - ROADS AND TRAILS
- DEPRESSION
- ▨ APPROXIMATE LOCATION OF SOIL REMEDIAL UNIT 1 AREAS CONTAINING EXPLOSIVE COMPOUNDS AND TPH (NOT TO SCALE)
- ⊕ APPROXIMATE LOCATION OF SOIL REMEDIAL UNIT 2 AREAS CONTAINING LEAD (NOT TO SCALE)
- \*

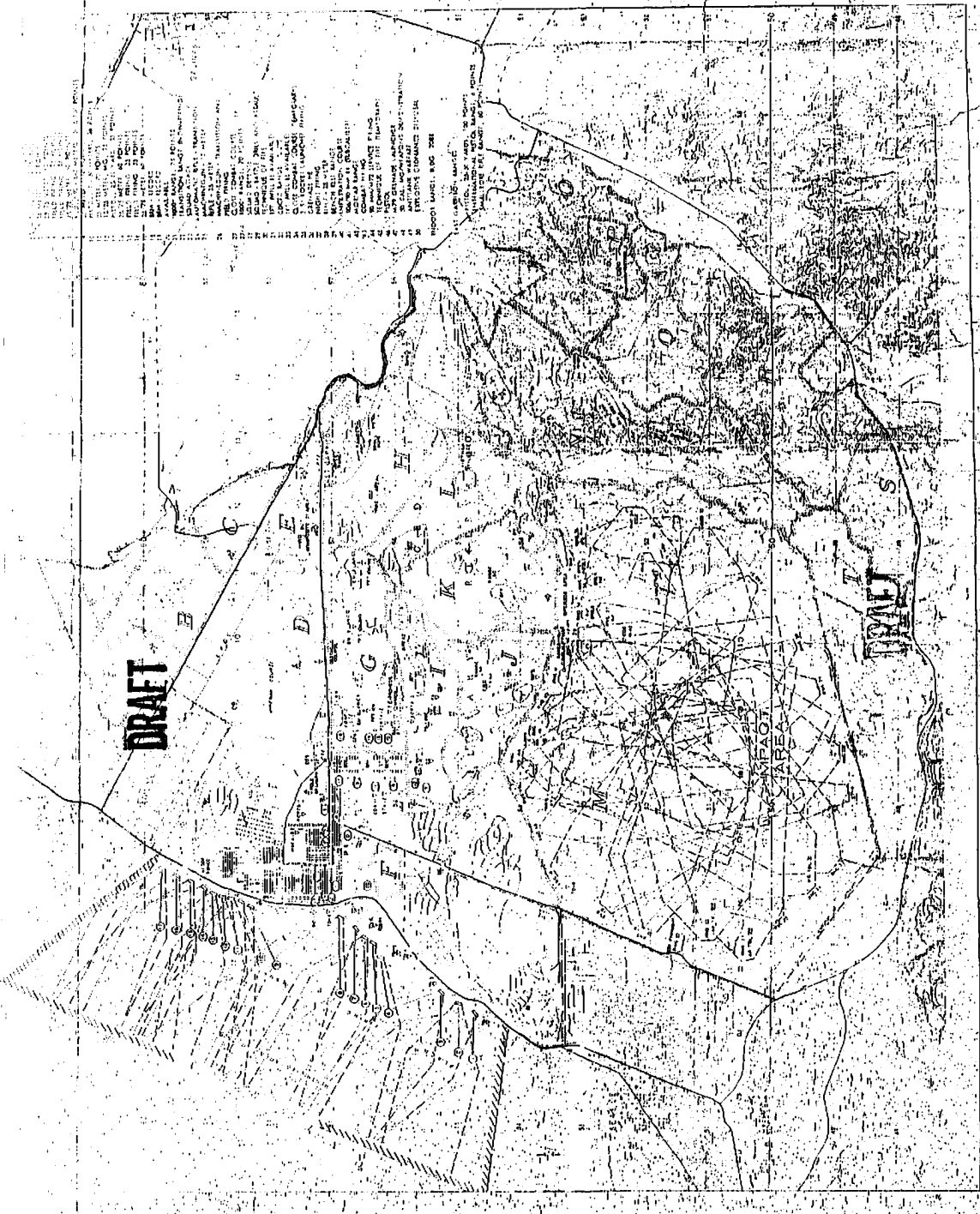


NO.	DATE	REVISIONS	HLA FILE NO.	PROJECT NO.	APPROVED	APPROVAL DATE	DRAWN BY	Harding Lawson Associates Engineering and Environmental Services	Volume V - Feasibility Study Basewide RI/FS Fort Ord, California	Locations of Soil Remedial Units 1 and 2 - Site 39	PLATE:
1	12/82	DRAFT FINAL	23308837	23388 9/1/78	MLB	10/17/82	JL				6.2
2	10/83	FINAL	23348637	23388 04/1/87	MLB						



**DRAFT**

**TRAIL**

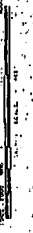


**TRAINING FACILITIES - LEGEND**

1	ARTILLERY
2	AVIATION
3	ENGINEER
4	INFANTRY
5	ARMORED
6	CAVALRY
7	ARTILLERY
8	AVIATION
9	ENGINEER
10	INFANTRY
11	ARMORED
12	CAVALRY
13	ARTILLERY
14	AVIATION
15	ENGINEER
16	INFANTRY
17	ARMORED
18	CAVALRY
19	ARTILLERY
20	AVIATION
21	ENGINEER
22	INFANTRY
23	ARMORED
24	CAVALRY
25	ARTILLERY
26	AVIATION
27	ENGINEER
28	INFANTRY
29	ARMORED
30	CAVALRY

**TRAINING FACILITIES - LEGEND**

31	ARTILLERY
32	AVIATION
33	ENGINEER
34	INFANTRY
35	ARMORED
36	CAVALRY
37	ARTILLERY
38	AVIATION
39	ENGINEER
40	INFANTRY
41	ARMORED
42	CAVALRY
43	ARTILLERY
44	AVIATION
45	ENGINEER
46	INFANTRY
47	ARMORED
48	CAVALRY
49	ARTILLERY
50	AVIATION
51	ENGINEER
52	INFANTRY
53	ARMORED
54	CAVALRY
55	ARTILLERY
56	AVIATION
57	ENGINEER
58	INFANTRY
59	ARMORED
60	CAVALRY



**FORT ORD**  
CALIFORNIA

**TRAINING FACILITIES MAP**

Scale: 1:50,000

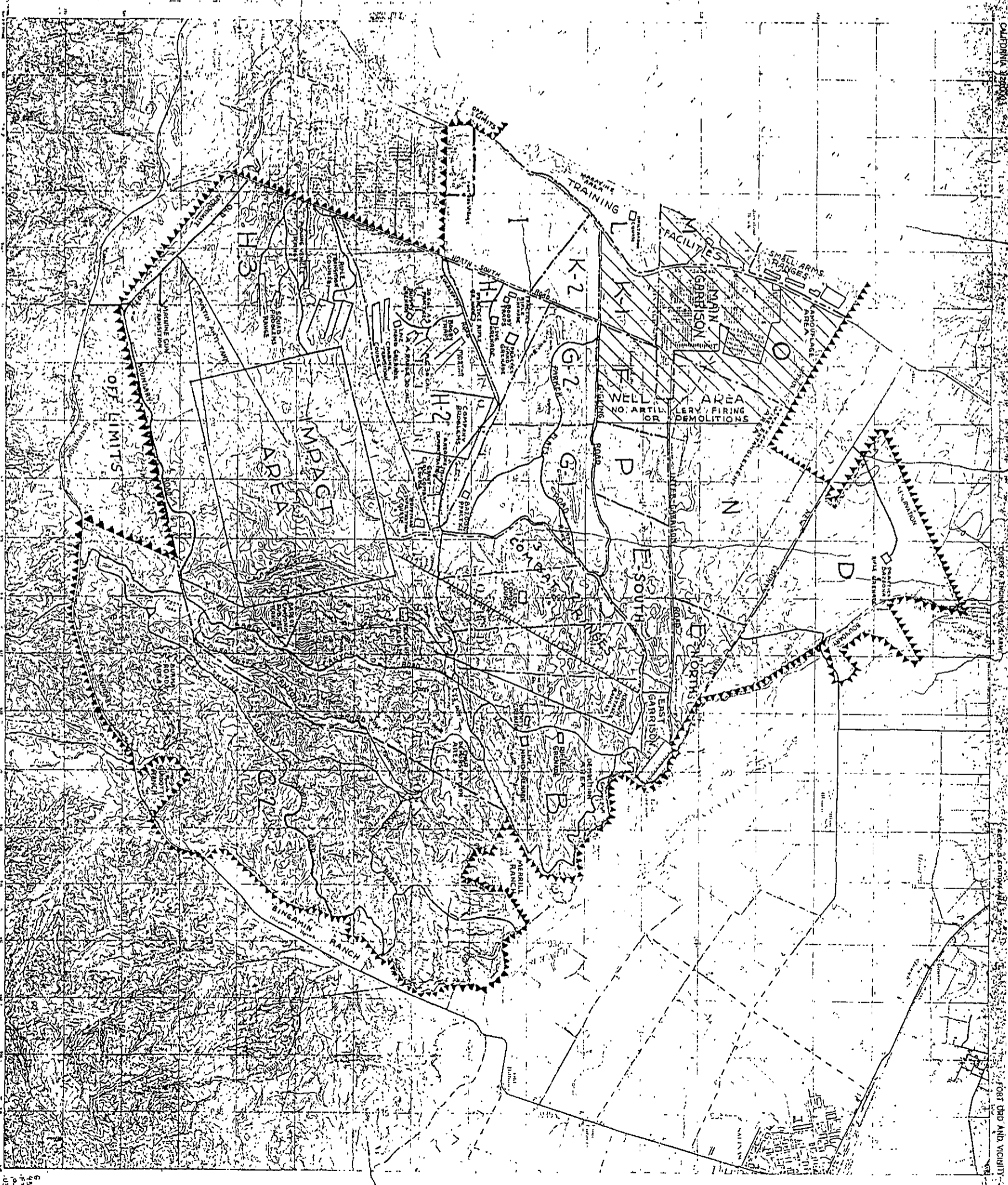
Map No. 100000000

Sheet No. 100000000

Scale: 1:50,000

Map No. 100000000

Sheet No. 100000000



LEGEND

RESERVATION BOUNDARY

TRAINING AREA BOUNDARY

ROAD

TRAIL, FENCE, OR ACTUAL

APPROVED BY: *[Signature]*

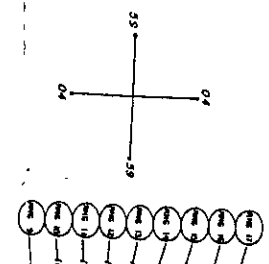
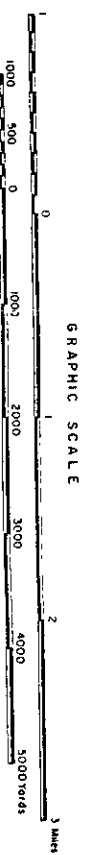
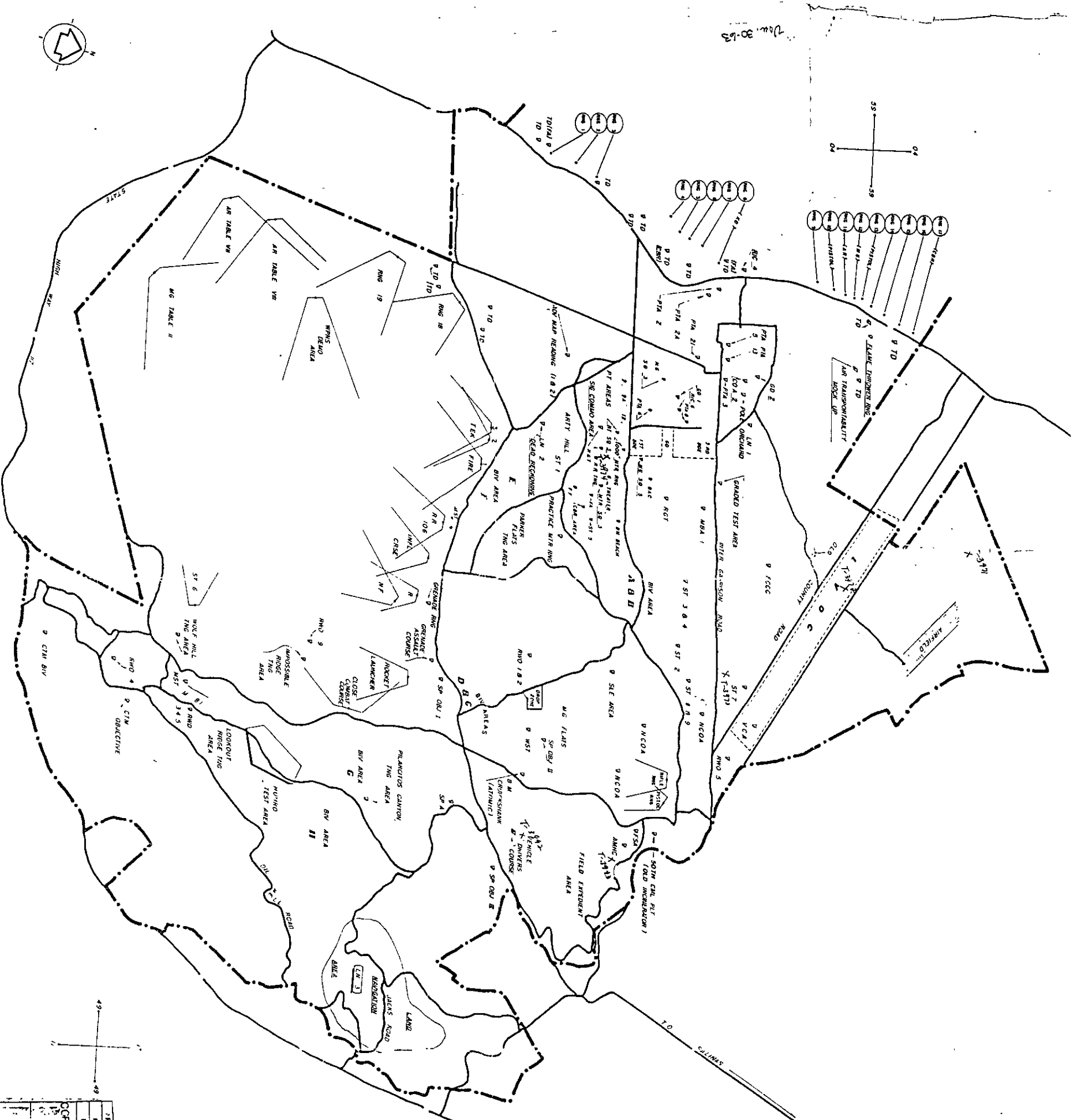
DIRECTOR OF TRAINING

**TRAINING FACILITIES**

FORT ORD AND VICINITY, CALIF.

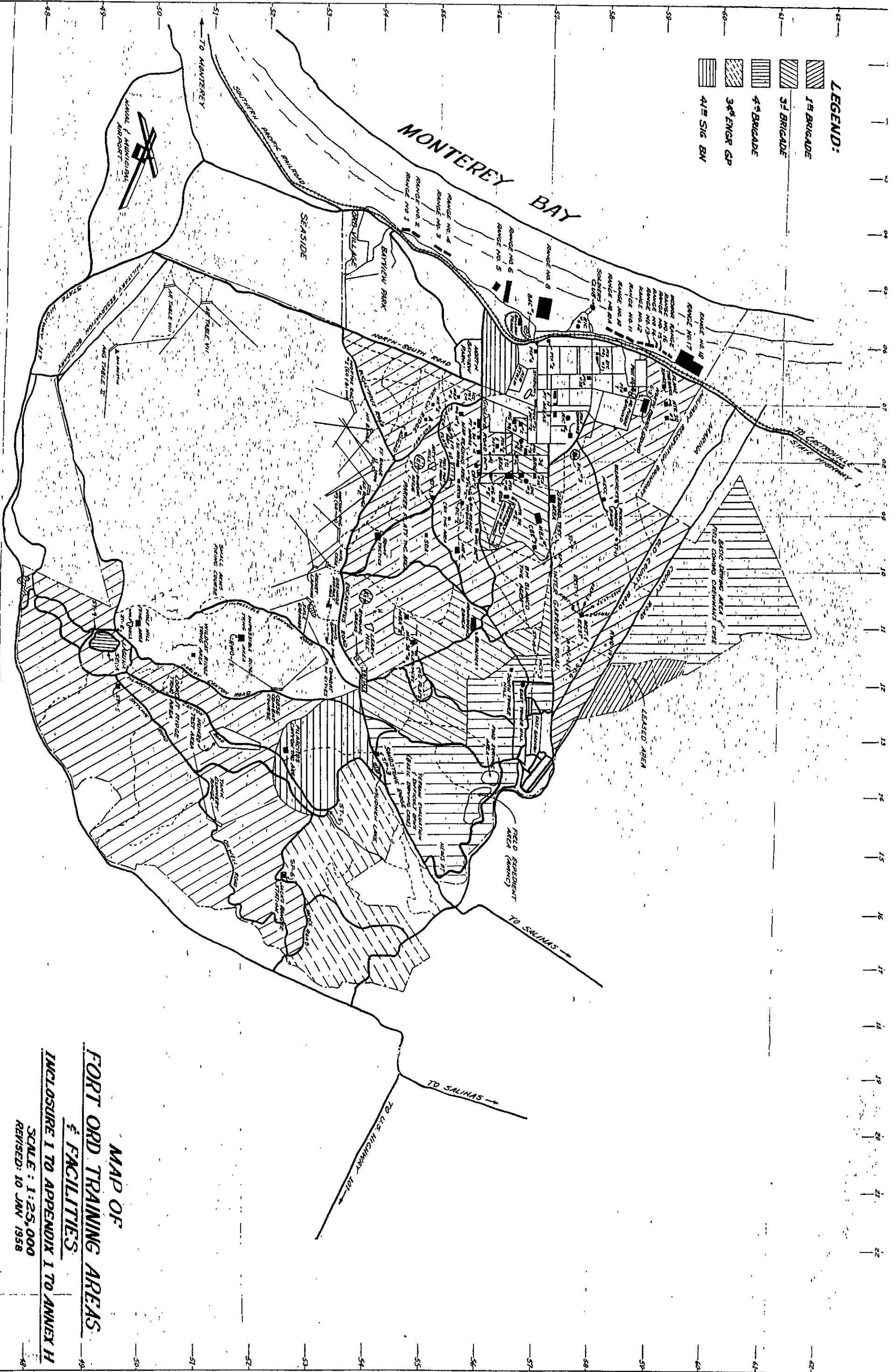
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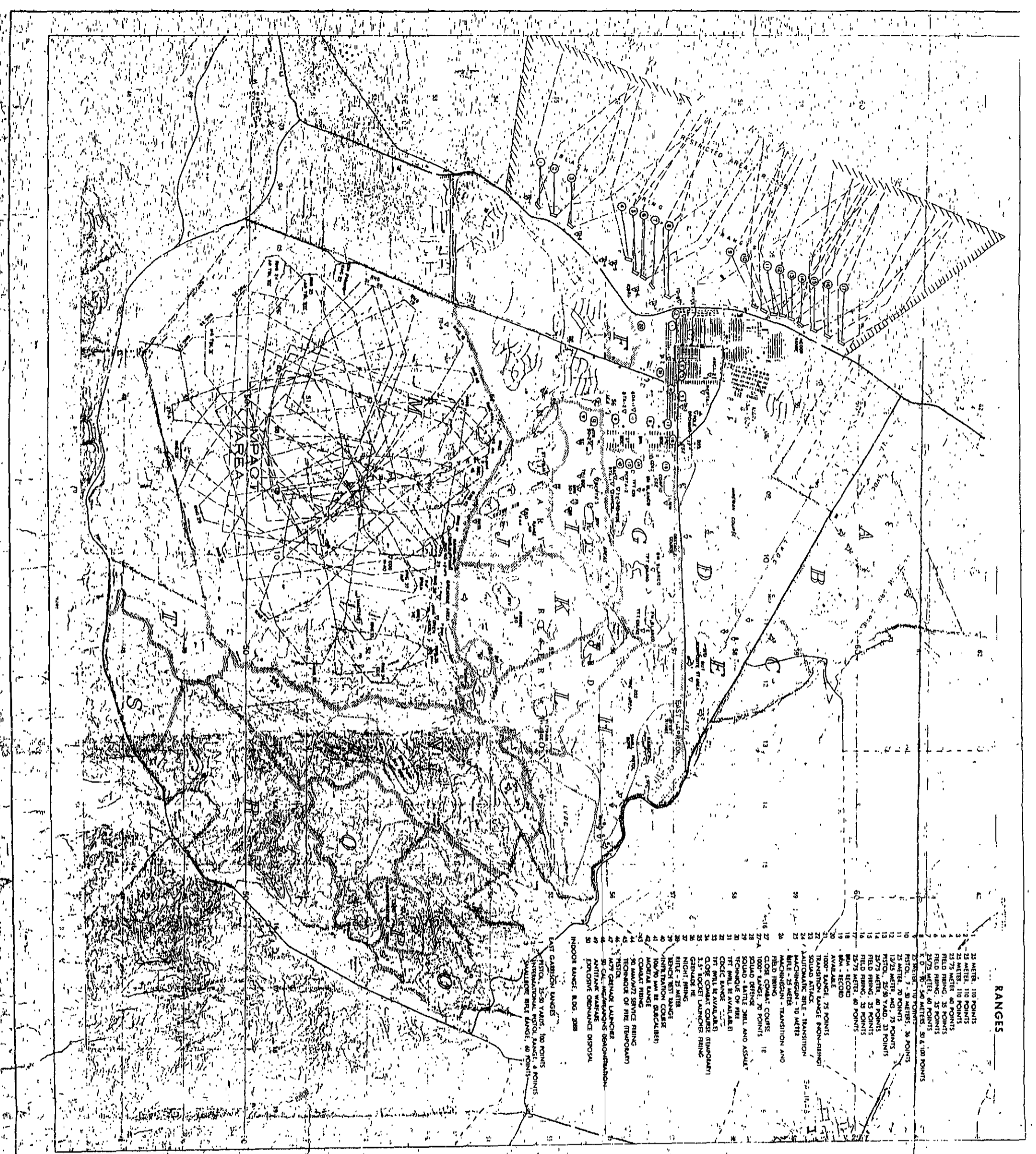


REVISED AS OF 30 JUNE 1961		ED: 100
REVISED AS OF 11 DECEMBER 1960 - 100		ED: 100
REVISED AS OF 11 DECEMBER 1959		ED: 100
<b>U S ARMY</b> <b>BASIC INFORMATION</b> <b>TRAINING FACILITIES</b> <b>PLANNING BOARD</b>		
APPROVED BY	DATE	
PLANNING BOARD	11 DECEMBER 1956	

- LEGEND:**
- 1<sup>st</sup> BRIGADE
  - 3<sup>d</sup> BRIGADE
  - 4<sup>th</sup> BRIGADE
  - 34<sup>th</sup> ENGR GP
  - 41<sup>st</sup> SIG BN



**MAP OF  
FORT ORD TRAINING AREAS  
& FACILITIES**  
INCLOSURE I TO APPENDIX I TO ANNEX H  
SCALE : 1:25,000  
REVISED: 10 JAN 1958



**RANGES**

- 1 25 METERS, 100 POINTS
- 2 25 METERS, 110 POINTS
- 3 25 METERS, 110 POINTS
- 4 FIELD RIFING, 35 POINTS
- 5 FIELD RIFING, 35 POINTS
- 6 25/75 METERS, 40 POINTS
- 7 25 METERS, 50 & 100 POINTS
- 8 25 METERS, 50 POINTS
- 9 25 METERS, 50 POINTS
- 10 25 METERS, 50 POINTS
- 11 25 METERS, 50 POINTS
- 12 13/25 METERS, 40 POINTS
- 13 13/25 METERS, 40 POINTS
- 14 25/75 METERS, 40 POINTS
- 15 FIELD RIFING, 35 POINTS
- 16 25 METERS, 40 POINTS
- 17 25 METERS, 40 POINTS
- 18 25 METERS, 40 POINTS
- 19 25 METERS, 40 POINTS
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- 50 25 METERS, 40 POINTS

WEST GARDEN RANGES  
 PISTOL, 25-50 YARDS, 100 POINTS  
 INTERNATIONAL PISTOL RANGE, 8 POINTS  
 LIVE FIRE RANGES, 40 POINTS

**LEGEND**

- 1 1000' TARGET, 25 POINTS
- 2 25 METERS, 70 POINTS
- 3 25 METERS, 70 POINTS
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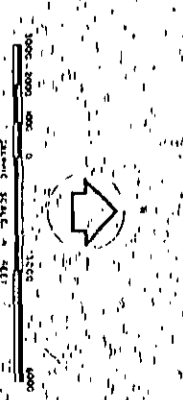
**TRAINING FACILITIES LEGEND**

- 1 1000' TARGET, 25 POINTS
- 2 25 METERS, 70 POINTS
- 3 25 METERS, 70 POINTS
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- 5 25 METERS, 70 POINTS
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**FORT ORD**  
 CALIFORNIA

MANAGER PLAN  
 BASIC INFORMATION AVIS  
 TRAINING FACILITIES MAP

DATE: 10/1/53  
 DRAWN BY: [Signature]  
 CHECKED BY: [Signature]  
 APPROVED BY: [Signature]

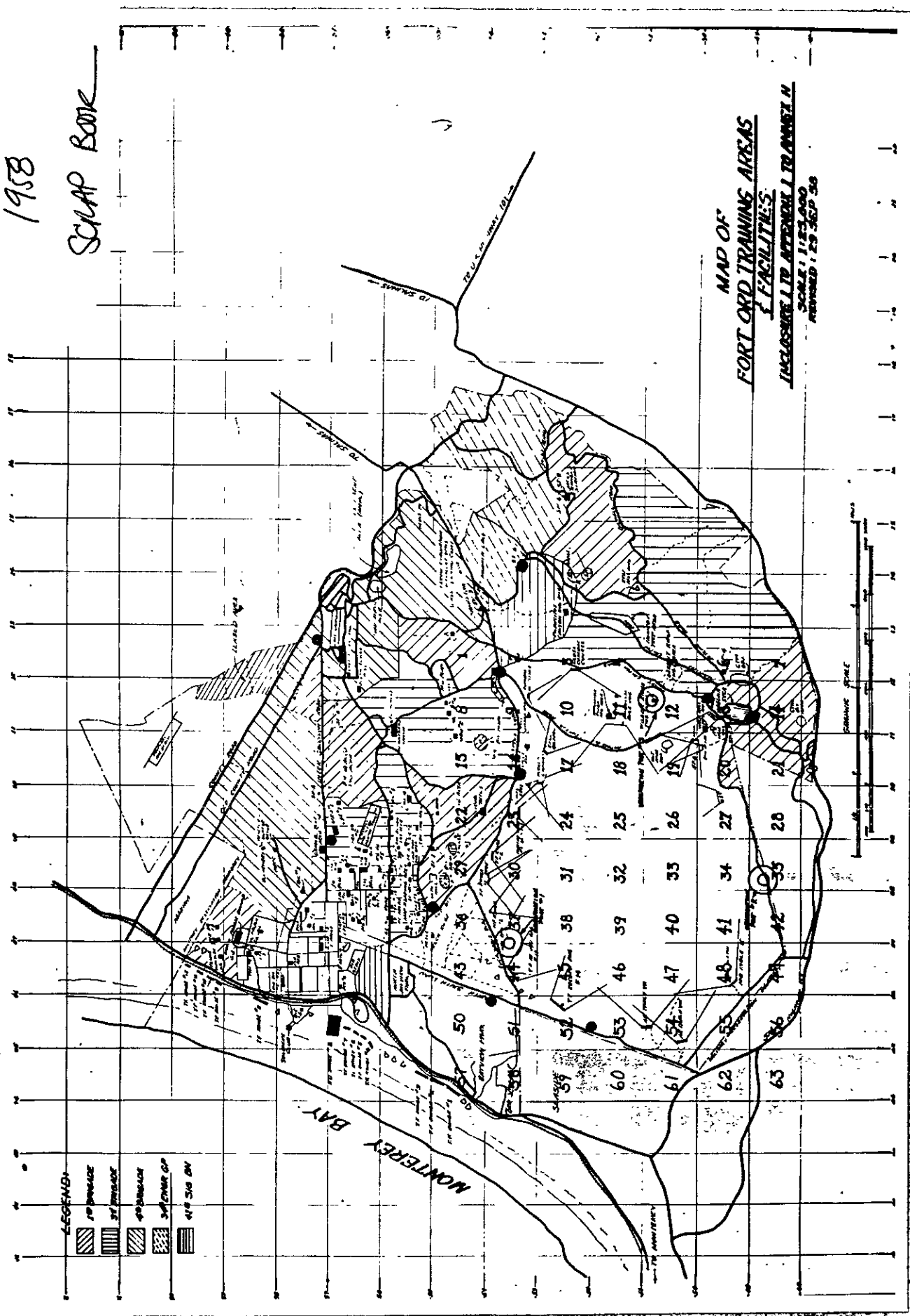




FIRE DEPARTMENT

1958

SNAP BOOK

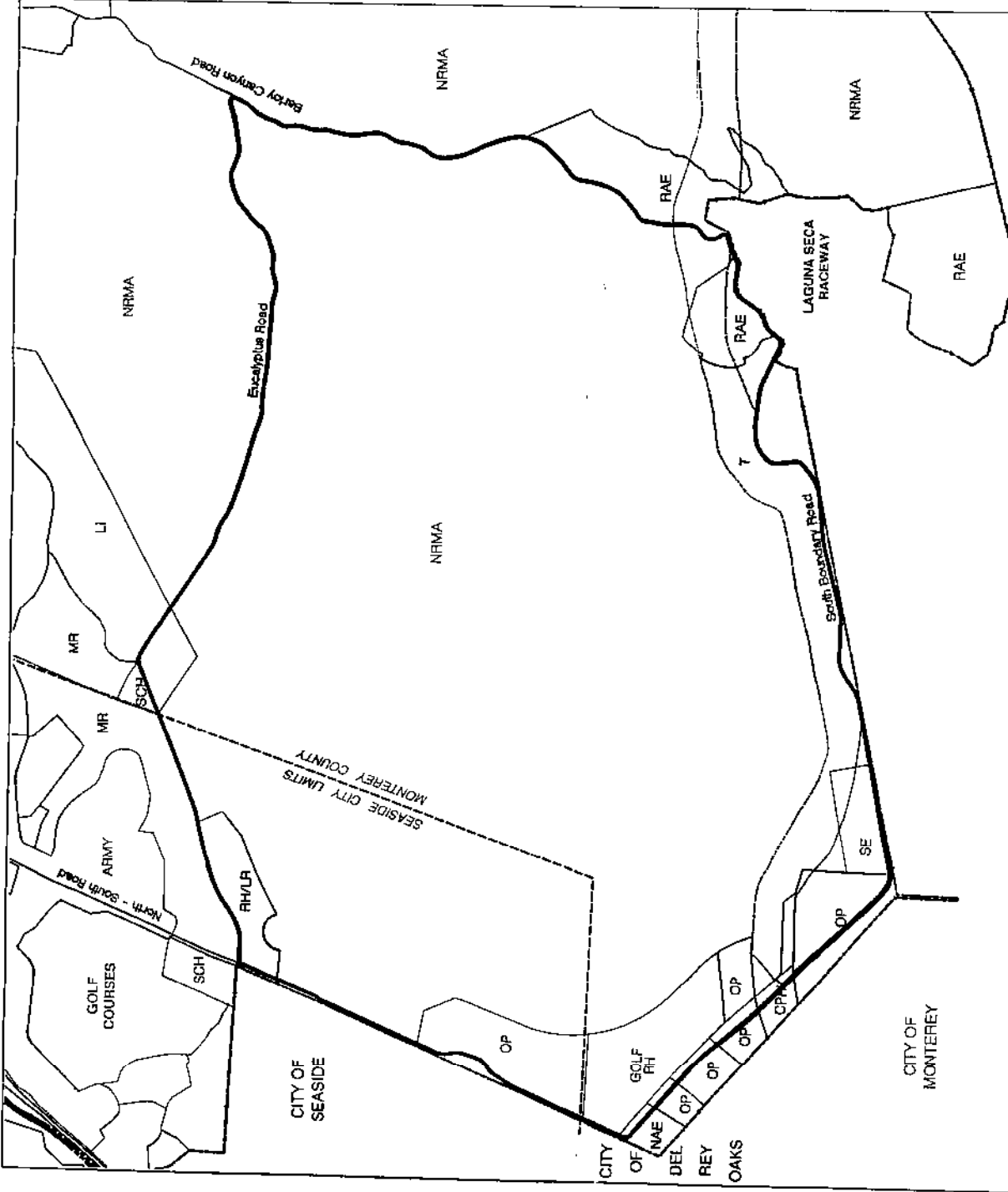


Ten each double faced forest fire prevention signs were placed at strategic locations



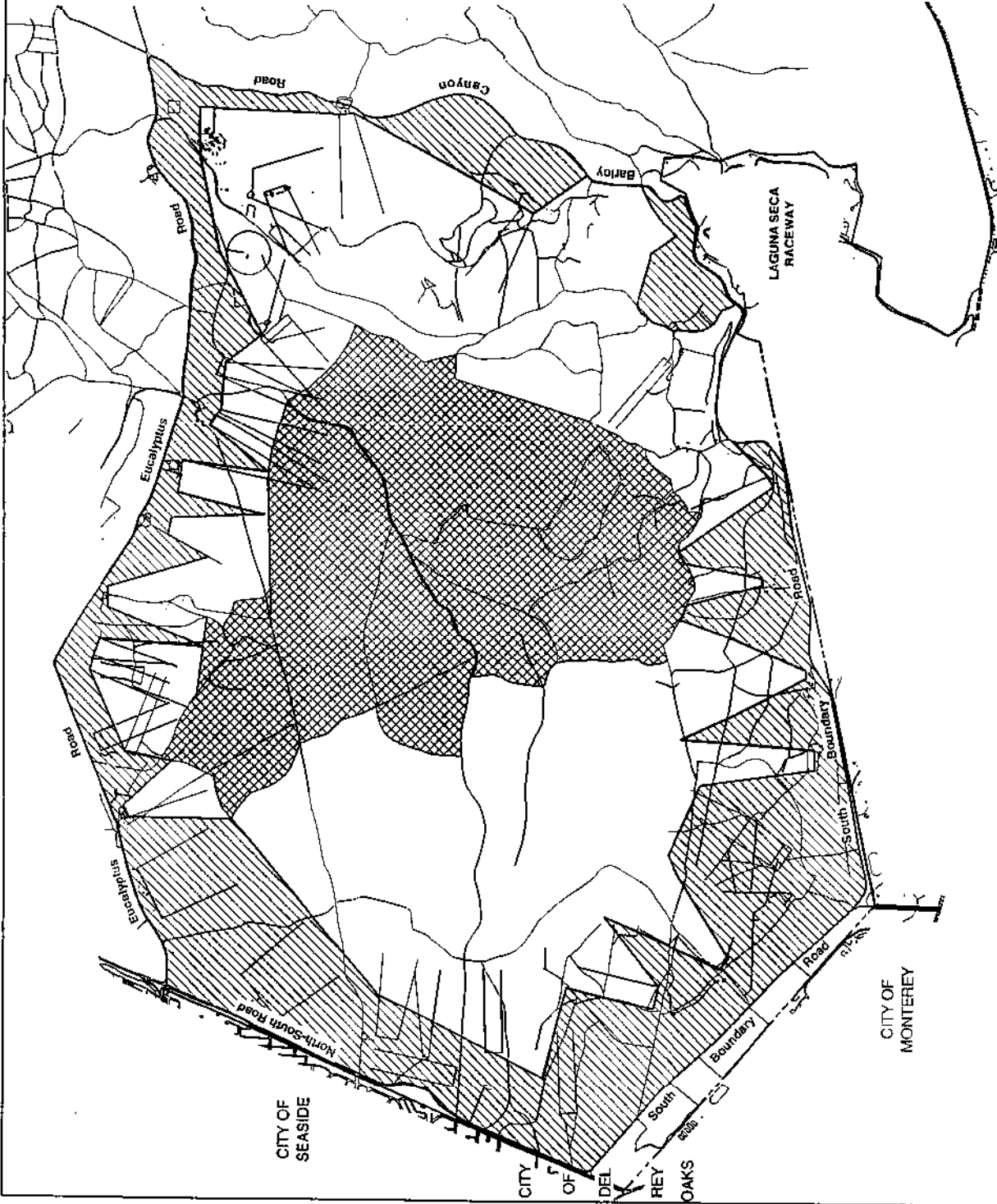
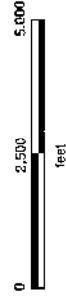
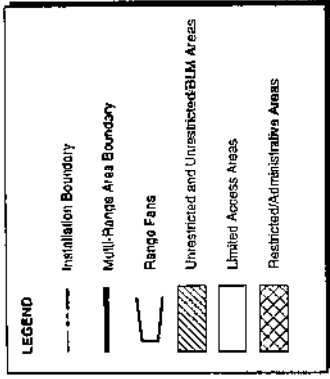
# Plate 2 Proposed Future Land Use Plan

LEGEND	
— · — · —	Installation Boundary
—	Multi-Range Area Boundary
Proposed Uses*	
NRMA	BLM Natural Resource Management Area
RAE	Monterey County Parks Department Recreation Area Expansion
T	California Department of Transportation Highway 68 Realignment Corridor (approximate boundary based on the Record of Decision)
SE	York School Expansion (approximate boundary based on the Record of Decision)
OP	FORA Office Park
CPRK	Community Park
NAE	Monterey Peninsula Regional Parks Natural Area Expansion
GOLF/RH	FORA Golf Course and Resort Hotel
RH/LR	FORA Resort Hotel and Low-Density Residential Area
LI	Monterey County Light Industrial
SCH	Existing School and Outdoor Lab
MR	Medium-Density Residential
ARMY	Presidio of Monterey Annex



\* Proposed uses based on FORA December 1994 Phase Reuse Plan except for boundary for York School expansion (SE) and transportation corridor (T)

**Plate 3**  
**Conceptual Multi-Range Area Land**  
**Reuse Plan**



**Table 3. Summary of Ordnance Types and Functions - Site 39**  
**Volume II - Remedial Investigation, Basewide RI/FS**  
**Fort Ord, California**

Ordnance Type	Function
Shotgun rounds	Ball
9 mm rounds	Ball, tracer
20 mm rounds	Ball, tracer, armor piercing
5.56 mm rounds (MG)	Ball, tracer, armor piercing
7.62 mm rounds (MG)	Ball, tracer, armor piercing
.30 cal rounds	Ball, tracer, armor piercing
.357 cal rounds	Ball
.38 cal rounds	Ball
.45 cal rounds	Ball, tracer
.50 cal rounds	Ball, tracer, armor piercing
60 mm Mortar	High explosive, white phosphorous, smoke, illumination
81 mm Mortar	High explosive, white phosphorous, smoke, illumination
Stokes Mortar	High explosive, smoke
4.2" Mortar	High explosive, white phosphorous, smoke, illumination
66 mm Rocket (M74 flash)	Incendiary

**Table 3. Summary of Ordnance Types and Functions - Site 39  
Volume II - Remedial Investigation, Basewide RI/FS  
Fort Ord, California**

Ordnance Type	Function
35 mm LAW	Photo flash
66 mm LAW	HEAT
SMAW	HEAT, inert
37 mm Cannon	High explosive, armor piercing, inert
57 mm Recoilless Rifle	HEAT
75 mm Recoilless Rifle	HEAT
90 mm Recoilless Rifle	HEAT
106 mm Recoilless Rifle	HEAT
40 mm Aircraft Rounds	High explosive
40 mm Grenade	High explosive
40 mm Airburst	High explosive
Fragmentation Hand Grenade	High explosive
40 mm Round (M203)	High explosive, photo flash, inert
Rifle Grenade	High explosive, white phosphorous

**Table 3. Summary of Ordnance Types and Functions - Site 39  
 Volume II - Remedial Investigation, Basewide RI/FS  
 Fort Ord, California**

Ordnance Type	Function
14.5 mm Subcaliber Artillery	Photo flash
75 mm Howitzer	High explosive, white phosphorous, smoke, illumination
105 mm Howitzer	High explosive, white phosphorous, smoke, illumination
155 mm Howitzer	High explosive, white phosphorous, smoke, illumination
Claymore Mine (M18A1)	High explosive
Anti-Tank Mine	High explosive
Dragon M47	HEAT, inert
2.36" Anti Tank Rocket (Bazooka)	HEAT
3.5" Anti Tank Rocket	HEAT
84 mm Round (M136)	HEAT
Gustov Mortar	HEAT
100 lb. CP Bomb	Inert
250 lb. CP Bomb (M57A1)	High explosive
500 lb. Bomb	Inert

**Table 3. Summary of Ordnance Types and Functions - Site 39  
Volume II - Remedial Investigation, Basewide RI/FS  
Fort Ord, California**

Ordnance Type	Function
7" Naval Rounds	High explosive, illumination
8" Naval Rounds	High explosive, illumination
Bangalore Torpedo	High explosive
Blasting Caps	High explosive
C-4	High explosive
TNT	High explosive
Military Dynamite	High explosive
Shaped Charges	High explosive
Riot Gas Projectile (M79)	Tear gas

Comments on  
Draft  
MRS-SEA.1-4  
Time Critical Removal Action and Geophysical Operations (Phase 1)  
Technical Information Paper  
Former Fort Ord, California  
July, 2004.

Prepared by Dr. Peter L. deFur  
Environmental Stewardship Concepts  
1108 Westbriar Dr., Suite F  
Richmond VA 23238

September 2004

Comments prepared for the Fort Ord Administrative record

These comments were prepared at the request of the Fort Ord Environmental Justice Network (FOEJN) to provide technical comment to the Army and summarize the report on the Munitions and Explosives of Concern removal at the Seaside sites for the community. FOEJN represents the affected community in the greater Fort Ord area in the clean up of contamination and ordnance related waste.

Mention of any trade name or commercial product or company does not constitute endorsement by any individual or party that prepared or sponsored this report.

**Recommendations:**

- 1 conduct an independent quality control/ quality assurance review of the removals because of the uncertainty with finding all of the identified anomalies;
- 2 conduct soil sampling for chemical weapons material compounds because WW I weapons used with chemical weapons were found on the site;

**Purpose of this report and this action:** The report on the Time Critical Removal Action cleanup at the Seaside areas near Gen. Jim Moore Blvd is meant to summarize all of the work that was done at these sites in the period from 2002 to 2004. The work was to clear some brush, remove surface Munitions and Explosives of Concern, do a geophysical survey and then remove the buried Munitions and Explosives of Concern. All of these steps were taken and are described

in this report. The Army is required to report on what was done and how effective the work was in both finding and removing the Munitions and Explosives of Concern. Any problems with finding debris or Munitions and Explosives of Concern are supposed to be identified.

There are several significant findings in this report, having to do with other aspects of the Fort Ord clean up.

First, this site survey used several different pieces of equipment to locate debris and unexploded ordnance, one of which was the Schonstedt metal detector. The report notes that Parsons recommended discontinuing use of the Schonstedt at one point because it was not working out as they had hoped. We raised this issue on the First Tee site- that the exclusive use of a Schonstedt was not sufficient to locate more deeply buried munitions.

Second, the site survey and excavations dug up three older types of munitions or unexploded ordnance (UXO): Livens projector, Stokes mortars and 4.2 inch mortars. All three of these have the potential to contain chemical warfare materiel. At least one other military site from WW I has these types of munitions and chemical weapons. The Army has stated in meetings that chemical weapons were not used or found on the site. The finding of Livens, Stokes and 3.5 inch mortars is evidence to the contrary. These were some kind of chemicals or smokes used on Fort Ord back in the WW I era. This issue warrants further investigation.

### **Summary:**

This technical information paper is a summary of the work conducted by Parsons under contract to the Army to find and remove unexploded ordnance, munitions debris and other debris from a part of Fort Ord. The area under study is designated as MRS-SEA.1-4, constituting four adjacent plots along Gen. Jim Moore Blvd and Eucalyptus Rd. through the Del Ray Oaks and Seaside areas.

The activity that this report describes is the brush clearing and then the clean-up of old munitions, waste, unexploded ordnance, debris, etc. All the waste and munitions that were left behind on the site were supposed to be identified, mapped and removed.

The MRS-SEA areas are not intended to be part of the future wildlife habitat. Therefore the wildlife protection issues are not the same as for the range areas that were burned last fall (October 2003). The cleanup plan (Fort Ord Ordnance and Explosives clean up Programmatic Work Plan) calls for manual clearing of the shrubbery using heavy cutting equipment, some digging equipment, and hand held chain saws. Approximately 70% of the clearing was done with equipment and 30% by hand (page 3-2).

The initial removal of surface Munitions and Explosives of Concern was done as a Time Critical Removal Action (Time Critical Removal Action) (explained immediately below). Following the Time Critical Removal Action, the contractors proceeded to conduct the more intensive and time-consuming geophysical investigation for clearing the area to depth.

**TCRA is a Time Critical Removal Action:** The Time Critical Removal Action is a clean up action that happens quickly and with little delay because the agencies recognize there is an immediate threat to human health. Time Critical Removal Action cleanups are done when an agency is cleaning up a contaminated site and discovers exposed contamination or something equally as dangerous. In the case of Fort Ord and the Munitions and Explosives of Concern, a Time Critical Removal Action cleanup is done, and was in the case of the Seaside areas, when there are exposed Munitions and Explosives of Concern or dangerous debris. The location of this action also made a Time Critical Removal Action necessary because the public could readily get to the sites.

A Time Critical Removal Action cleanup is also conducted with a streamlined administrative process so that it can proceed faster to remove the threat to public health.

The Army Corps of Engineers defines a Time Critical Removal Action as: “Removal Actions where, based on the site evaluation, a determination is made that a removal is appropriate, and that less than 6 months exists before onsite removal activity must begin.”

### **Time-Critical Removal Action**

The first step was a survey of these areas and staking out the corners of the grids. After they surveyed the areas, they removed the brush, largely by cutting it with heavy equipment, but they did use some hand clearing on some parts of the site. After clearing, the contractor unexploded ordnance (UXO) teams walked the entire area to find surface debris and Munitions and Explosives of Concern. The teams used hand-held Schonstedt magnetometers to aid the visual inspection and investigation. The debris was removed; the Munitions and Explosives of Concern was identified and anything confirmed as explosive was either removed and destroyed, or blown in place. When explosives were blown in place, the item was covered with sand bags and plywood for protection.

The report summarizes the Munitions and Explosives of Concern items: 247 items were found to be Munitions and Explosives of Concern, 10 of which could not be moved because it was too dangerous (page 3-4). The other 237 items were removed to staging/ collecting areas and detonated later. The maps of the location of each MEC item are presented as figures 3-1 through 3-4. The contractors determined that 226 of the 247 items were in fact Munitions and Explosives of Concern, only 21 were really debris.

The Munitions and Explosives of Concern items included the following (Table 3-1, pages 3-4 and 3-5):

Smoke grenades  
Fuzes  
Rockets, practice, various sizes  
Projectiles, practice and high explosive, various sizes

Cartridge, practice  
Illumination signal

A Quality Control/ Quality Assurance (QA/QC) inspection consisted of inspectors walking over 10% of the areas and re-inspecting them to be certain that the visual inspection had not missed anything. The QA/QC inspection found nothing had been overlooked in the initial inspection. Nor did the QA/QC inspection find any explosives mis-identified and placed with the debris.

### **TIME CRITICAL REMOVAL ACTION Issues and Questions:**

The Time Critical Removal Action inspection and removal seems to have been conducted according to the specifications in the project work plan with no deviations and nothing abnormal. The results of the investigations turned up the debris and Munitions and Explosives of Concern that was expected. There are no lingering concerns over this part of the report.

The surface inspection and removal is more straightforward than the geophysical investigation because the team is looking for Munitions and Explosives of Concern and debris that is on the surface. The contractors are not (yet) looking for the buried ordnance and debris.

### **Non Time-Critical Removal Action:**

The contractors followed the surface inspections with a geophysical survey of the entire area with different types of metal detecting equipment. For the most part, they tried to use equipment that could be pulled behind small tractors and cover larger areas in a day. After the entire area was surveyed with geophysical survey equipment, the results were put into computers to generate maps of the places where they found something. The specific spots and objects found are referred to as anomalies. The report gives maps of what equipment was used where, in maps 4-1 through 4-4.

The contractors used the following metal detectors on this project:

EM61-MK2 – detects iron and non-iron metals; used as the primary digital survey device; is towed behind a tractor or pulled by hand

G-858- detects only iron containing metals; has two ways to operate

Schonstedt – hand held device that detects iron-containing metals

Once the anomalies had been mapped out, and the results entered in the computers, the contractors created maps of the anomalies, figures 4-5 through 4-80. The teams returned to confirm the presence and location of each anomaly and then remove the item. A great number and range of types of munitions and waste was found on the site during this investigation.

The teams dug up and removed 43,695 specific anomalies, weighing nearly 50,000 pounds, and consisting of debris and munitions from the areas. Most of the material was range debris, totaling 46,745 lbs; 2963 lbs were munitions debris, and 292 items were identified as munitions.

52 of these munitions and explosives were too deteriorated and unsafe to remove from the site. These unsafe items were blown in place. These items included Stokes mortars and 4.2 inch mortars, plus Livens projectiles. These items were scrutinized carefully, and when the contents could to be confirmed, the contractors called in the Army special unit that deals with chemical warfare materials (CWM). This unit examined the three types of Munitions and Explosives of Concern for chemical weapons materials and found titanium tetrachloride in all of them. Titanium tetrachloride was used during WW I as a smoke agent in projectiles that were fired at enemy lines to obscure sight lines and decrease visibility.

The results of the anomaly excavations that yielded Munitions and Explosives of Concern are presented in Table 4-2, with the identity and description of the item, the location, type of excavation, number and depth. The table shows at least 9 Stokes mortars and 2 Livens projectors. These Munitions and Explosives of Concern items are from WW I and did contain chemical weapons materials (smokes are considered CWM).

Parsons conducted a check (QA/QC) on the geophysical survey and re-location of the items they found, in the Quality Assurance and Quality Control operations (QA/QC). They buried a number of items in the areas to be sure that the survey teams would find them. This activity was largely successful, but several items were not recovered. These items were in places that are hard to find, or nearly inaccessible.

#### **Non- Time Critical Removal Action Issues and Questions:**

There were problems with the investigations intended to serve as a check on the process (QA/QC), leading the teams to repeat some surveys and to have to go back over some of the grids that had been examined or dug up. These problems have not been completely resolved and an additional review (QA/QC) should be conducted by an independent organization.

I have concerns that the quality assurance and control review (QA/QC) revealed problems that may indicate more problems remain. Some independent check on the investigation needs to be conducted.

The equipment issues are not serious, largely because they found these problems with using the Schondstedt and took steps to correct the problem by discontinuing use.

The greatest problem may be the presence of WW I Munitions and Explosives of Concern that did contain chemical weapons materials, specifically titanium tetrachloride. The titanium tetrachloride was used as a smoke agent. The compound is toxic and can cause serious health problems. Titanium tetrachloride is highly irritating to mucus membranes and can increase the instance of bronchitis and pneumonia. Exposure can lower ventilating capacity, and inhaled  $TiCl_4$  can actually become embedded in the lungs as titanium dioxide. Long term or acute exposure can lead to the formation of lung polyps. At room temperature  $TiCl_4$  can react with copper to form copper titanium chloride ( $CuTiCl_4$ ), and also readily reacts with all ketones.

The Army needs to take soil samples at the locations where the chemical weapons materials munitions were recovered and at random locations throughout the areas, sampling for chemical weapons materials, chemical weapons materials residues and metals. This sampling is needed to confirm that no chemical contamination residues remain in the soil. The community remains extremely concerned about human health effects from the contaminants at Fort Ord and the soil sampling and testing for contaminants is needed to confirm that further contamination will not add to the present health threats faced by the community.

I do think that an independent survey needs to go back over these areas and conduct an additional confirmation or QA/QC investigation. In addition, the areas where they found the WW I munitions need soil sampling to test for chemical weapons materiel.

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# The Faroes Statement: Human Health Effects of Developmental Exposure to Chemicals in Our Environment

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The periods of embryonic, foetal and infant development are remarkably susceptible to environmental hazards. Toxic exposures to chemical pollutants during these windows of increased susceptibility can cause disease and disability in infants, children and across the entire span of human life. Among the effects of toxic exposures recognized in the past have been spontaneous abortion, congenital malformations, lowered birthweight and other adverse effects. These outcomes may be readily apparent. However, even subtle changes caused by chemical exposures during early development may lead to important functional deficits and increased risks of disease later in life. The timing of exposure during early life has therefore become a crucial factor to be considered in toxicological assessments.

During 20–24 May 2007, researchers in the fields of environmental health, environmental chemistry, developmental biology, toxicology, epidemiology, nutrition and paediatrics gathered at the International Conference on Fetal Programming and Developmental Toxicity, in Tórshavn, Faroe Islands. The conference goal was to highlight new insights into the effects of prenatal and early postnatal exposure to

chemical agents, and their sustained effects on the individual throughout the lifespan. The conference brought together researchers to focus on human data and the translation of laboratory results to elucidate the environmental risks to human health.

## Research State of the Art

The developing embryo and foetus are extraordinarily susceptible to perturbation of the intrauterine environment. Chemical exposures during prenatal and early postnatal life can bring about important effects on gene expression, which may predispose to disease during adolescence and adult life. Some environmental chemicals can alter gene expression by DNA methylation and chromatin remodelling. These epigenetic changes can cause lasting functional changes in specific organs and tissues and increased susceptibility to disease that may even affect successive generations.

New research on rodent models shows that developmental exposures to environmental chemicals, such as hormonally active substances (endocrine disruptors), may increase the incidence of reproductive abnormalities, metabolic disorders such as diabetes, and cancer, presumably through epigenetic mechanisms that do not involve changes to DNA sequences but which may, nevertheless, be heritable.

Prenatal exposure to diethylstilboestrol, an oestrogenic drug no longer used during pregnancy, has been shown to cause an increased risk of vaginal, uterine and breast cancer

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in human beings and animal models. In animal models, low-level developmental exposure to a plastics ingredient, bisphenol A, may increase the susceptibility to breast or prostate cancer, and prenatal exposure to vinclozoline, a common fungicide, may also promote later development of cancer. These substances are only weak carcinogens, if at all, in the adult organism but are nonetheless hazardous to the growing foetus. In addition, when exposure to a carcinogenic substance occurs during early development, the expected lifespan will exceed the normal latency period for development of the disease.

The human reproductive system is highly vulnerable to changes in the intrauterine hormonal environment. In men, there is an increase in the occurrence of testicular cancer, poor semen quality and cryptorchidism, jointly termed the testicular dysgenesis syndrome. In animals, a similar combination of outcomes is replicated by developmental exposure to certain phthalate esters. However, links between environmental chemicals and the testicular dysgenesis syndrome in human beings are still unclear, although suggestive associations have been found with maternal smoking, fertility treatment of the mother, phthalate exposure and occupational exposure to pesticides with suspected oestrogenic and anti-androgenic activity. Perinatal exposure to endocrine-disrupting chemicals, such as polychlorinated or polybrominated biphenyls or dichlorodiphenyltrichloroethane compounds, may affect puberty development and sexual maturation at adolescence. Many other environmental chemicals can cause such effects in animal models. Expression of some of these effects may be promoted by predisposing genetic traits.

The brain is particularly sensitive to toxic exposures during development, which involves a complex series of steps that must be completed in the right sequence and at the right time. Slight decrements in brain function may have serious implications for future social functioning and economic activities, even in the absence of mental retardation or obvious disease. Each neurotoxic contaminant may perhaps cause only a negligible effect, but the combination of several toxic chemicals, along with other adverse factors, such as poor nutrition, may trigger substantial decrements in brain function.

The immune system also undergoes crucial developmental maturation both before and after birth. New evidence suggests that a number of persistent and non-persistent environmental pollutants may alter the development of the immune system. Studies in a variety of species of experimental animals indicate polychlorinated biphenyls to be highly immunotoxic. While exposures of human adults show little indication of such effects, early life exposures appear capable of inducing similar aberrations in children as seen in other species. Asthma, allergic sensitization or greater susceptibility to infections may be linked to prenatal or early postnatal chemical exposures. In addition, because of multiple interactions between the immune and nervous systems, abnormal maturation of immune responsiveness may also be implicated in some neurodevelopmental disorders.

While the research on developmental toxic effects has, to date, emphasized maternal exposures and the infant environment, the possibility exists that paternal exposures may also

affect the child's development. Experimental studies suggest that ionizing radiation, smoking and certain environmental chemicals may be of importance, and that some exposures may affect the health and development of children, as well as the sex ratio of the offspring.

### Conclusions

Three aspects of children's health are important in conjunction with developmental toxicity risks. First, the mother's chemical body burden will be shared with her foetus or neonate, and the child may, in some instances, be exposed to larger doses relative to the body weight. Second, susceptibility to a wide range of adverse effects is increased during development, from preconception through adolescence, depending on the organ system. Third, developmental exposures to environmental chemicals can lead to life-long functional deficits and disease.

Research into the environmental influence on developmental programming of health and disease has, therefore, led to a new paradigm of toxicologic understanding. The old paradigm, developed over four centuries ago by Paracelsus, was that 'the dose makes the poison'. However, for exposures sustained during early development, another critical, but largely ignored, issue is that 'the timing makes the poison'. This extended paradigm deserves wide attention to protect the foetus and child against preventable hazards.

These insights derive in part from numerous animal studies indicating that events during the foetal and early postnatal period may be responsible for reproductive, immunological, neurobehavioural, cardiovascular and endocrine dysfunctions and diseases, including certain cancers and obesity. Some of these adverse effects have been linked to environmental chemicals at realistic human exposure levels (i.e. levels similar to those occurring from environmental sources).

Among the mechanisms involved, particular concern is raised about changes in gene expression due to altered epigenetic marking, which not only may lead to increased susceptibility to diseases later in life, but may, in some cases, also affect subsequent generations.

Most chronic disease processes are characterized by multi-causality and complexity. Understanding such processes requires a broad systems approach that focuses on integrative biology within socio-environmental contexts.

### Recommendations

Studies on the aetiology of human disease need to incorporate early development and characterize appropriately the factors that determine organ functions and subsequent disease risks. Such associations can best be examined in long-term prospective studies, and existing and planned pregnancy or birth cohorts should be utilized for this purpose.

The aetiology of human disease can be better understood through cross-disciplinary approaches, translation of animal data, better exposure biomarkers and understanding individual susceptibility. Improved communication needs to be

stimulated among the scientific disciplines involved and between scientists and policy-makers.

Environmental chemical exposure assessment should emphasize the time period of early development. Exposure data already routinely collected should be applied, when feasible, in epidemiological studies. In addition, cord blood, cord tissue, human milk and other biological samples should be collected for assessment of exposure biomarkers and for determination of gene expression changes.

Because human beings are exposed to numerous chemicals during development and throughout life, mixed exposures need to be considered in a life-course approach to disease. Other factors, such as nutrition, other lifestyle factors and societal environment, need to be considered for additive or interactive effects. This research should also capitalize on the ability of genetic variation and gene-environment interaction to explore the causal nature of environmental exposures with respect to health outcomes.

Risk assessment of environmental chemicals needs to take into account the susceptibility of early development and the long-term implications of adverse programming in a variety of organ systems. Although test protocols exist to assess reproductive toxicity, neurodevelopmental toxicity and immune toxicity, such tests are not routinely used, and the potential for such effects is, therefore, not necessarily considered in decisions on safety levels of environmental exposures.

The accumulated research evidence suggests that prevention efforts against toxic exposures to environmental chemicals should focus on protecting the embryo, foetus and small

child as highly vulnerable populations. Given the ubiquitous exposure to many environmental chemicals, there needs to be renewed efforts to prevent harm. Healthier solutions should be researched and proposed in future work. Prevention should not await definitive evidence of causality when delays in decision-making would lead to the propagation of toxic exposures and their long-term, harmful consequences. Current procedures, therefore, need to be revised to address the need to protect the most vulnerable life stages through greater use of precautionary approaches to exposure reduction.

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# Neurodevelopmental Disorders in Children

## Autism and ADHD

[environmentalchemistry.com/yogi/environmental/200804childrenautismadhd.html](http://environmentalchemistry.com/yogi/environmental/200804childrenautismadhd.html)

**By Mona Sethi Gupta, Ph.D.**

April 14 2008

Autism, ADHD, learning disabilities, developmental delays and intellectual retardation are among the neurodevelopmental disorders that exact an enormous emotional, mental and financial toll in terms of compromised quality of life and lifelong disability. Additionally, these require special education, psychological and medical support services that drain resources and contribute to further stress on the families and communities. While it is generally accepted that the cause for these disabilities is likely to include genetic and environmental factors, for a vast majority of these disabilities, the cause remains unknown. Many factors contribute in complex ways to brain development. These include gene expression, heredity, socioeconomic factors, stress, drugs, nutrition and chemical contaminants. Brain development is a long, complicated process involving cell proliferation, migration, differentiation and cell death (apoptosis). There are multiple ways by which chemicals can disrupt neurological development such as influencing gene expression, protein pathways<sup>(1)</sup> and hypothyroidism<sup>(2)</sup>. It is a well established fact that a child's nervous system is more sensitive to chemical exposures compared to an adult nervous system. This is evident from incidence of permanent brain damage in fetus of pregnant mothers who consumed alcohol during their pregnancy resulting in fetal alcohol spectrum disorder<sup>(3)</sup>. Similarly, pregnant women involved in methylmercury disasters showed minimal signs of toxicity compared to their children who displayed effects ranging from cerebral palsy to delayed development<sup>(4)</sup>.

In the 1950s, Thalidomide was introduced into the market to treat morning sickness and as a sedative. It created an epidemic of 15,000 babies worldwide with missing limbs and other developmental disabilities including mental retardation and autism<sup>(5)</sup>. Today, it is a widely accepted fact that chemicals in the environment can cause developmental disabilities in children. Even more intriguing is the fact that certain environmental agents can cause long-lasting damage to the developing brain at exposure levels that have no lasting effect in the adult.

A wide range of toxic chemicals in the environment have been associated with neurodevelopmental disabilities which affect an estimated 3-8% of the 4 million babies born each year in the United States. In a recent study published in *The Lancet*, researchers from Harvard School of Public Health and the Mount Sinai School of Medicine examined publicly available data on chemical toxicity to identify the industrial chemicals likely to damage the developing brain. The researchers compiled a list of 202 industrial chemicals that are known to be toxic to the human brain using the Hazardous Substance Data Bank of the National Library of Medicine and other data sources<sup>(6)</sup>. The exposure to these chemicals came from industrial accidents, occupational exposure, suicide attempts and accidental poisonings. The authors noted that the list was not comprehensive since the number of chemicals that can cause neurotoxicity in laboratory animal test exceeds 1000. A key point highlighted in the study was the fact that even though moderate amounts of

chemicals, such as lead and mercury, were needed to cause neurological damage in most adults, only small amounts might be needed to damage the developing brains in babies, infants and young children.

It is a well known fact that certain chemicals, such as lead, mercury, PCBs, dioxins, arsenic and toluene can cause clinical and sub-clinical deficits in neurobehavioral development through injury to the fetal brain. The developing brain is extremely vulnerable to these environmental agents at doses much lower than those that affect adult brain function. Studies have shown that prenatal exposure to even relatively low levels of lead result in lifelong reductions of intellectual functions and disorders of behavior <sup>(7)</sup>. Polychlorinated biphenyls (PCBs) cross the placental barrier and can cause injury to the developing brain <sup>(8)</sup>. Organic mercury compounds such as methyl mercury are among the most potent neurotoxins causing severe developmental problems <sup>(9)</sup>. In view of this fact, it seems disconcerting that there is little information available on possible toxic potential for the 80,000 chemicals registered with the Environmental Protection Agency (EPA). Of the 3000 chemicals produced or imported at over 1 million pounds a year, a mere 23% have been tested for their potential to cause developmental damage <sup>(10)</sup>.

Autism is a neurodevelopmental disorder characterized by impaired social interaction as well as verbal and non-verbal communication. There are various degrees of severity involved in this disorder. Therefore, this condition is commonly referred to as “autism spectrum disorders” or ASD which include autism, Asperger’s syndrome, pervasive developmental disorders not otherwise specified (PDD-NOS) and high-functioning autism. Statistics based on data gathered in 2002 indicates that more than 550,000 children are affected by varying degrees of autism spectrum disorders (ASD). In fact, it has been reported that autism is the fastest growing developmental disability, increasing at a rate of 10 to 17 percent annually according to the Autism Society of America. While improved diagnostic measures may contribute to the perceived increase in the number of cases, it is becoming increasingly apparent that environmental neurotoxins in combination with genetic predispositions could also create adverse gene-environment interactions.

Surveys conducted in California indicate an almost 210% increase in the number of cases of autism in children over the past 10 years. There is increasing concern that certain chemicals (such as mercury, halogenated aromatics and pesticides) and biotic factors (such as vaccine antigens) may act synergistically to alter certain susceptibility or genetic risk factors to result in ASD. The UC Davis Center for Children’s Environmental Health has established the first large scale epidemiological study to investigate the underlying causes of autism. The UC Davis researchers at the Children’s center have suggested an association between thimerosal (ethyl mercury) and immune system dysfunction in mice. In a recent study, Windham et. al. (2006) explored the possible association between ASD and environmental exposures to hazardous air pollutants in the San Francisco Bay area <sup>(11)</sup>. Based on the data from the study, the authors suggested that living in areas with higher ambient levels of HAPs, especially metals and chlorinated solvents, during pregnancy or early childhood could be associated with a moderately increased risk of autism. This study highlighted the need for more complex etiologic studies combining exposure to multiple compounds by various pathways with genetic information to further understand the contribution of environmental exposures to the development of autism.

Another developmental disorder that affect the areas of social skills, behavior and communication is Attention Deficit Hyperactivity Disorder (ADHD). Presently, some researchers believe that there is a correlation between ASD and ADHD. It is estimated that ADHD affects approximately 4.5 million children in the US. The main characteristics that define ADHD include inattention, hyperactivity and impulsivity. Though almost everyone at some point in their life blurts out something inappropriate or has difficulty focusing on a task or could become forgetful, experts say that such behavior must be demonstrated to a degree that is inappropriate for that age, for a diagnosis to be made. There is insufficient evidence that suggests that ADHD could be a result of simply social factors or child-rearing factors. Other factors such as environmental agents like heavy metals and organohalides, traumatic brain injury, food additives and sugar, neurobiology and genetics have been implicated in the etiology of this condition.

Medications that seem to be most effective in treating ADHD are a class of drugs known as stimulants such as Ritalin (methylphenidate). However, there is mounting controversy over the widespread use of methylphenidate and possible life-threatening effects from its long-term use. This makes it imperative that alternative modalities be implemented for ADHD management. Nutrient deficiencies are common in ADHD; supplementation with minerals, the B vitamins (added in singly), omega-3 and omega-6 essential fatty acids, flavonoids, and the essential phospholipid phosphatidylserine (PS) can improve ADHD symptoms <sup>(12)</sup>. In a first of its kind study, Dr. Sarina Grosswald, an educator and expert in cognitive learning and clinical neuropsychologist, William Stixrud investigated the effect of meditation in kids with ADHD in the school setting. For the study, kids with ADHD meditated 10 minutes, twice a day. This study revealed that kids who meditated showed a 45 to 50 percent reduction in stress, anxiety and depression. These kids also showed significant improvements in organizational skills, memory, strategizing, mental flexibility, attention and impulsivity. According to Stixrud, teaching a child to regulate his own body and mind in response to anxiety should be the first response rather than putting them on medication.

Neurodevelopmental disorders have increased over the past 30 years and are at least partly attributed to exposure to environmental contaminants. Therefore, it becomes imperative to mitigate environmental factors that may influence disease. The impact of environmental toxins on children's health has become a major focus in the federal government resulting in establishment of eight new research centers in children's environmental health with joint funding from EPA and the National Institute of Environmental Health Sciences (NIEHS). "The brains of our children are our most precious economic resource, and we haven't recognized how vulnerable they are," says Philippe Grandjean, adjunct professor at Harvard School of Public Health and the lead author of the study published in *The Lancet*. "We must make protection of the young brain a paramount goal of public health protection. You have only one chance to develop a brain."

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**Table 23. Summary of Bullet Distribution Evaluation - Site 39, Small Arms Ranges  
Volume II - Remedial Investigation, Basewide RI/FS  
Fort Ord, California**

Small Arms Range No.	Range Name	Observed Ordnance	Distribution
18	Record Firing Range	7.62mm, 5.56mm, .45 cal, 9mm	<1% bullet coverage overall; 1-8% within 1 meter of targets; greatest concentrations directly in front of targets and in backstop areas and behind targets
19	Record Firing Range	7.62mm, 5.56mm, .45 cal, 9mm, shot gun	<1% bullet coverage overall; >10% in some approximate 15x15 foot areas of sand backstop and in some areas along road near the middle of the range; 1-10% up to 100 feet behind backstop
21*	10m Machine Gun/ 25m Rifle Range	7.62mm, 5.56mm, .45 cal, 9mm, shot gun	<1% bullet coverage overall; >10% on sand backstop; 1-10% up to 100 feet behind backstop.
22	.50 cal. Machine Gun Range 40mm practice grenades	7.62mm, 5.56mm, 9mm, .50 cal, target; 1-10% within 1 meter of some targets	<1% bullet coverage overall; >10% in 10 foot diameter area of one target; <1% at other targets
23	Squad Attack Range	7.62mm, 5.56mm, 40mm practice grenades, subcal LAW, slap flares, rifle-launched flare and smoke grenades, hand grenades fuses, smoke and practice hand grenades	<1% bullet coverage overall; range has three "bunker" target areas with concentrations up to 15% in front (west) of the target areas and 1-3% at the targets; 1-10% within 1 meter of some targets
24	Suiper Range	7.62mm, 5.56mm, 40mm practice grenades, subcal LAW	<1% bullet coverage overall; 1-5% within 2 meters of some targets; < 1% at other targets
25	Offensive Overhead Firing	7.62mm, 5.56mm	<1% bullet coverage overall; >10% on backstop Course
26	Machine Gun Transition	7.62mm, 5.56mm, 3.5-inch rockets	<1% bullet coverage overall; 1-8% within 1 meter of some targets; 10-15% in backstop areas behind some targets; greatest concentrations directly in front of targets and in backstop areas

**Table 23. Summary of Bullet Distribution Evaluation - Site 39, Small Arms Ranges  
Volume II - Remedial Investigation, Basewide RI/FS  
Fort Ord, California**

Small Arms Range No.	Range Name	Observed Ordnance	Distribution
27	Fire Movement Course	7.62mm, 5.56mm, .45 cal, 9mm, 37mm, 75mm RR, slap flares, rifle-launched smoke and flare grenades, hand grenade fuses	<1% bullet coverage overall
27A*	10m Machine Gun/ 25m Rifle Range	7.62mm, 5.56mm, .45 cal, 9mm	<1% bullet coverage overall; 1-3% near 50-meter target line; 5-8% on backstop
28	Technique of Fire Range	7.62mm, 5.56mm, 50mm, subcal LAW, slap flares	<1% bullet coverage overall
29*	Machine Gun Assault Range	7.62mm, 5.56mm, .45 cal, 9mm	<1% bullet coverage overall; greatest concentrations near targets (still <1%)
30	Technique of Fire Range	7.62mm, 5.56mm, 40mm practice grenades	<1% bullet coverage overall
35A*	Combat Pistol Range	7.62mm, 5.56mm, .45 cal, 9mm, black powder rifle balls	1-3% bullet coverage overall; 3-8% within 1 meter of targets; greatest concentrations directly in front and behind targets
38	Zero Range	7.62mm, 5.56mm, shot gun, 40 mm practice grenades, flare and smoke grenades, practice hand grenades, slap flares	1% bullet coverage overall; up to 2% on east side of range
39*	Bench Rest Rifle Range	7.62mm, 5.56mm, .22 cal, .45 cal, black powder rifle balls, shotgun	<1% bullet coverage overall; 1% within 1 meter of some targets; at some targets 10-15% on hill that forms backstop, 950 feet from firing line

**Table 23. Summary of Bullet Distribution Evaluation - Site 39, Small Arms Ranges  
Volume II - Remedial Investigation, Basewide RI/FS  
Fort Ord, California**

Small Arms Range No.	Range Name	Observed Ordnance	Distribution
46*	Pistol Range	7.62mm, 5.56mm, .22 cal, .45 cal, 9mm, shotgun	<1% bullet coverage overall; 1-5% on backstop

\* Short distance firing range; targets are usually located approximately up to 100 meters from the firing line. The remainder of the small arms ranges are long distance ranges which, in addition to short range targets, contain targets at distances greater than 100 meters from the firing line.

**Table 1. Training Range Data - Site 39**  
**Volume II - Remedial Investigation, Basewide RI/FS**  
**Fort Ord, California**

Range Number	Range Name	Ordnance Utilized/Found	Range Type and Date(s) of Use*
18	Record Firing Range	9mm, .45 cal, 5.56mm, 7.62mm, and .30 cal MG rounds	SA (-1950 to 1993)
19	Record Firing Range	9mm, .45 cal, 5.56mm, 7.62mm, and .30 cal MG rounds, shot gun	SA (-1950 to 1993)
21	10m Machine Gun/25m Rifle Range	5.56mm, 7.62mm, and .30 cal MG rounds, shotgun	SA (-1969 to 1993)
22	.50 cal Machine Gun Range	5.56mm, 7.62mm, .30 cal, and .50 cal MG rounds, 106mm RR rounds, 40mm practice grenades	SA (-1987 to 1993)
23	Squad Attack Range	5.56mm, 7.62mm MG, 40mm HE, claymore mines, subcal LAW, slap flares, rifle-launched flare and smoke grenades, hand grenade fuzes, smoke and practice hand grenades	SA (Late 1950s to 1993)
23M	Dragon Tracking Range	Dragons (mostly practice, some HE) and 4.2" mortar fragments found	NF (-1978 to 1988)
24	Suiper Range	7.62mm, 5.56mm, and .50 cal MG rounds, 40mm practice grenades, 35mm subcal LAW	SA (-1965 to 1992)
25	Offensive Overhead Firing Course	.45 cal, 5.56mm, and 7.62mm, 37mm rounds	SA (Late 1950s to 1975, 1981 to 1989)
26	Machine Gun Transition	5.56mm, 7.62mm MG, 2.36", and 3.5" rockets, and 37mm rounds, possible mortars and grenades	SA (Late 1950s to 1993)
27	Fire Movement Course	5.56mm, 7.62mm, .45 cal, 9mm, 37mm, 75mm RR, slap flares, rifle-launched smoke and flare grenades, and hand grenade fuzes	SA (1967 to 1975, 1985 to 1989, and 1990 to 1993)

**Table 1. Training Range Data - Site 39**  
**Volume II - Remedial Investigation, Basewide RI/FS**  
**Fort Ord, California**

Range Number	Range Name	Ordnance Utilized/Found	Range Type and Date(s) of Use*
27A	10m Machine Gun/25m Rifle Range	5.56mm, 7.62mm MG and rifle rounds, .45 cal, 9 mm, and 37mm and 20mm rounds	SA (Early 1970s to 1988)
28	Technique of Fire Range	5.56mm, 7.62mm, 50mm, subcal antitank, slap flares, 40mm practice rounds, 60mm and 81mm smoke mortars	SA (Late 1950s to 1991)
29	Machine Gun Assault Range	5.56mm, 7.62mm MG, .45 cal, 9mm, possible 20mm rounds	SA (1961 to 1975, 1984 to 1993)
30	Technique of Fire Range	Small arms up to .50 cal MG, demolition materials (C-4, blasting caps, shaped charges) 40mm practice grenades	SA (1965 to 1975, 1983 to 1989)
30A	Mark 19 Machine Gun Range	40mm MG (HE, DP, flash, and smoke rounds), demolition materials (C-4, blasting caps, shaped charges)	HE (1990 to 1993)
31	Platoon Attack Course	5.56mm, 7.62mm MG, LAW, 84mm AT4, grenades, claymores, Dragon, shrapnel (75, 105, and 155mm howitzer) 40mm grenades, 60mm & 81mm mortars, 7" & 8" Navy rounds, 500lb. concrete-filled bombs	SA (1950 to -1960), HE (1961 to 1993)
32	Wildcat Ridge	57, 75 & 106mm HE RR (possible 37mm), 60 and 81mm mortars, 40mm HE aircraft rounds	HE (1950s and 1960s, 1980 to 1987)
33	Demolitions Range	TNT, field expedient explosives, Bangalore Torpedo remnants, 3.5" rockets, and 81mm mortars	ST (-1985 to 1989)
34	Machine Gun Assault Range	5.56mm, 7.62mm MG, mortars, rifle grenades, smoke grenades	SA (1950s), HE (1979)
35	Mout Complex	No live fire at Impossible City, 40mm HE & bazooka rounds in Wildcat Canyon, 14.5mm subcal, small arms and IIE fragmentation grenades at The House	ST (mid 1960s to 1993)

**Table 1. Training Range Data - Site 39**  
**Volume II - Remedial Investigation, Basewide RI/FS**  
**Fort Ord, California**

Range Number	Range Name	Ordnance Utilized/Found	Range Type and Date(s) of Use*
35A	Combat Pistol Range	Small arms, TNT & 3.5" practice rockets, 7.62mm, 5.56mm, .45 cal, 9mm, black powder rifle balls	SA (late 1960s to 1993)
36	Fragmentation Hand Grenade	Fragmentation grenades, Claymore mines	HE (1950s to 1993)
36A	EOD	Disposal of wide variety of ordnance	HE (1989? to 1993)
37	25m Night Record Fire	2.36" & 3.5" rockets, rifle grenades, 57 and 75mm RR, some 2.36" items containing unknown ballistic material	HE (late 1960s to 1993)
38	Zero Range	5.56mm, 7.62mm MG and rifle rounds, possible rifle grenades, shotgun, 40mm, practice grenades, flare and smoke grenades, practice hand grenades, slap flares	SA (mid 1960s to 1993)
39	Bench Rest Rifle Range	5.56mm, 7.62mm MG, 9mm, .22 cal, 45 cal rounds, shotgun, black powder rifle balls	SA (pre 1970s to 1993)
40	Infiltration Course - 10m & 25m Machine gun & rifle	small arms, 3.5" rockets, 60mm mortar, Claymore mines	HE, SA (unknown)
40A	FFE Training	Flame field expediency training, 3.5" rockets, 60mm mortars, Claymore mines	ST (unknown)
41	Antitank Subcaliber Range	84mm subcal AT4, 30 cal., 7.62mm MG, 60mm mortar, 90 and 106mm subcal RR	HE (early 1940s to 1993)
42	Mortar Range (Long Range)	60mm, 81mm, and 4.2" mortar, 106mm RR, 9mm sighting rounds, possible 250lb GP bombs	HE (mid 1960s to 1993)

**Table 1. Training Range Data - Site 39**  
**Volume II - Remedial Investigation, Basewide RI/FS**  
**Fort Ord, California**

Range Number	Range Name	Ordnance Utilized/Found	Range Type and Date(s) of Use*
43	Platoon Battle Course	60 and 81mm mortar, 40mm HE grenades, 5.56mm, 7.62mm MC, fragmentation hand grenades, Bangalore Torpedo, LAW, Dragon, 4.2" mortar, Gustov Mortar, 250lb GP bomb down range	HE, SA (pre 1988 to 1993)
44	Antitank Weapons Range	35mm subcal and 66mm LAW (HE), 90mm RR, 84mm incendiary rockets, Dragon	HE, SA (mid 1960s to 1990)
44A	90mm, RR, M72, 106mm RR Subcal	106mm subcal and 90mm HE RR rounds expected, 66mm LAW (HE)	HE (unknown)
45	Grenade Launcher Range	40mm grenades, 66mm incendiary rockets from Range 44, 60mm mortars found 7.5' deep during range reconstruction	HE (-1970 to 1993)
46	Pistol Range	9mm, .22 cal, .38 cal, 45 cal, 357 cal, and shotgun, and 40mm (down range)	SA (-1965 to 1993)
47	M79 Grenade Launcher	40mm grenade	HE (? to 1970)
48	Light Antitank Weapons Range	40mm HE, 66mm incendiary rockets, mortars (60mm, 81mm, and 4.2"), 66mm LAW, 84mm AT4, SMAW, buried 3.5" rockets, Stokes Mortars (duds found 10' deep during range reconstruction), pyrotechnic devices from other countries, Claymore mines, 90mm & 106mm subcal RR	HE (mid 1960s to 1976), SA (-1982 to 1990) and HE (1990 to 1993)
NA	2.36-inch Rocket Range	21.36-inch HE, HEAT and practice rockets	HE (WWII and shortly after)

\* Listed in order of predominant use, dates of use in parentheses.  
HE High explosive/anti armor ranges (HE ranges).  
SA Small arms ranges.  
ST Specially training ranges.  
NF Non-firing ranges.

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Fort Ord Community Advisory Group  
PO Box 2173  
Monterey, CA 93942  
Email: focag@fortordcag.org  
Website: www.fortordcag.org

3-11-08

**FOR THE ADMINISTRATIVE RECORD**

Hand delivered to FORA 3-12-08

Fort Ord Reuse Authority (FORA)  
100 12<sup>th</sup> St., Building 2880  
Marina, CA 93933  
c/o Mr. Stan Cook, Ms. Laura Baldwin

RE: Comments; FORA ESCA Remediation Program (RP) / Document Control Number:  
09595-07-078-001

Dear Mr. Cook and Ms. Baldwin,

Most agree the Army needs to clean up the mess it made at Fort Ord. However, under no circumstance should munitions cleanup be privatized and a waiver granted exempting adherence to Environmental laws in place to protect the public's health, safety, and the environment. To do so would be an abomination of due diligence and process. What is the justification for the Covenant Deferral Request?

“Because of missing or incomplete range activity records, misdirected shots, and poor or undocumented disposal practices, no area in Site 39 can be considered clear of UXO/OEW”. This statement is typical of military munitions training ranges at former Fort Ord. The proposed 3300 acres to be transferred for residential housing, commercial and other public uses is highly contaminated with UXO, OEW, and military munitions constituents.

1994 RI/FS;

“Site 39 was used since the early 1900s for ordinance training activities. As a result, OEW, including UXO, is present at the site. OEW is defined as bombs and war heads; guided and unguided ballistic missiles; artillery, mortar, and rocket ammunition; small arms ammunition; anti-personnel and anti-tank mines; demolition charges; pyrotechnics; grenades; torpedoes and depth charges; containerized or uncontainerized high explosives and propellants; nuclear materials; chemicals and radiological agents; and all similar or related items designed to cause damage to personnel or materials. Oil in which explosive

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compounds are detected will be considered OEW if the concentration is sufficient to present an imminent hazard. UXO is a subset of OEW and consists of unexploded bombs, warheads, artillery shells, mortar rounds, and chemical weapons. Components or ordnance items (e.g., boosters, bursters, fuzes, igniter tubes) are also included in the UXO definition. Many of the UXO/OEW items listed above have been found at Site 39. Nonnuclear materials, chemical agents, or biological agents have been found or reported to have been used at the site.”

To date only limited sampling and removal has been conducted at most of the sites part of the Remediation Program (RP). The proposed FOSET and remediation is in large part based on assumptions rather than sound scientific methodology. There is a significant difference between sampling and clearance to a prescribed depth for a particular use. CERCLA would require a revised RI/FS and ROD for this program. Since the 1994 Base Wide RI/FS, the scope of land uses have changed significantly. Many sites included in the RP were not considered for residential uses because of the exposure dangers to public health and safety from UXO, OEW, and residual contamination.(1) (2) The extent of contamination at former Fort Ord from military munitions training and disposal is unknown. Historically, dangerous military munitions and constituents show up in the most unlikely places. No square inch of former training ranges should be assumed to be free or safe from dangerous ordnance and chemicals. A example of military munitions live and inert found in parcels slated for residential development include but are not limited to the following;

fragment hand grenades MKII ,smoke hand grenades M18, hand grenade M10, 4inch trench mortars MK1, 4inch trench mortars FM, 4inch trenordnance components, blasting caps M6, blasting caps M7, hand grenade fuzes M228, 75mm Shrapnel MK1 , 37mm LE MK1 , 75mm HE MK1, Livens projector FM, surface trip flare M49, 3.5inch rocket M29, 35mm Rockets M73, 3inch Hotchkiss projector, activator mine AT M1, mine AT M1, primer igniter tube M57, cartridge ignition M2, signal illumination M125, mine fuze M6A1, rifle grenade M22, 57mm projector HE M306, flash artillery M110, projectile PD M503ch mortars HC, 3inch trench mortars MK1, 81mm mortar HE M43, 40mm projector M781

Because of the nature of military munitions use and cleanup, the strictest standards available, i.e. CIRCLA should be implemented to the greatest extent possible. Any attempts to side step or circumvent this public health and environmental law must not be allowed . To do so will likely result in negative human health and environmental impacts.

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Historical maps indicate that over the years as ranges were decommissioned, new ranges were opened. It appears that over time there are literally layers and overlaps of ranges the extent of which is unknown. How many millions of troops trained at Fort Ord? How many millions of pounds of munitions were used at former fort Ord? Of the millions of pounds of munitions used , how many millions of pounds of constituents were released into the environment? Were did the residual contamination go?

A new previously unidentified exposure pathway to human and ecological receptors now exists. The burning of former training ranges has resulted in a new and significant threat to human health and safety. A new RI/FS should include Ash analysis for all sites burned purposely or accidentally, and the potential onsite and offsite exposure to human and ecological receptors. This new exposure and potential effects on human and ecological receptors was never analyzed in the 1994 Base Wide RI/FS.

In the Monterey Herald dated 12-05-07 Pg. B6, there was a brief account of a recent U.S. Geological Survey study of ash resulting from the Southern California wild fires. The USGS study found caustic alkali materials and elevated levels of arsenic, lead, and other metals. The studies led author said that USGS found that “rainwater runoff from burned areas may hurt eco systems, aquatic wildfire habitat and surface water quality.” Has the ESCA process analyzed the data revealed in this study? If not, why not?

It appears USGS is well equipped with staff and technology to analyze potential significant negative impacts resulting from burning wild land habitat. USGS participation in analyzing burn impacts at former Fort Ord could result in significant new information that would greatly benefit the full disclosure of impacts resulting from the burning. This new significant information will greatly benefit the understanding of potential adverse impacts by the public, regulators, decision makers, Army and all those involved in the ESCA process.

If USGS is not required to analyze data at the former Fort Ord, what justification exists for this decision?

Many military munitions constituents are known endocrine disruptors, carcinogens, mutagens, ect.. Environmental contamination is reaching epidemic levels likely due to lax regulation, oversight, and enforcement of environmental laws over industry and commerce. Nationally, conservatively, 1 in 150 children has autism. Asthma, Alzheimer’s Disease, cancer, to list a few are at epidemic levels. Today, the U.S. public is sicker than ever before. USGS studies show pharmaceuticals are increasingly showing up in U.S. reclaimed and drinking water supplies. Is there endocrine disruptor screening being conducted at former Fort Ord? If not, why not? Does Soil analysis of ranges include every known or suspected OEW constituent used at For Ord? If not, why not?

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The public is very concerned with the undermining of the Regulatory agencies and their current ability to protect human health, safety, and the environment. A 1999 EPA Range Rule position letter addressing Military Base Closures states; "During the last several years an increasing number of issues have arisen relative to UXO, hazardous contaminants, and military range cleanup. The following represents a description of the major EPA issues or concerns along with installations where we have encountered these problems. This list should not be construed as exhaustive." Since this EPA position letter it appears efforts are being made to circumvent the environmental laws in place to protect the public.(3)

FORA should adopt the Precautionary Principle (1998 Wingspread Statement) and apply it to the Fort Ord Reuse Plan to ensure safety for current and future generations to the greatest extent possible.(4)

Thank you for the opportunity to comment on this project. We look forward to your response to our concerns.

Sincerely,

Lance Houston  
FOCAG Member

Cc.  
Assemblyman John Laird  
Cal DTSC, c/o Joyce Whiten and Yolanda Gaarza  
U.S. EPA, Region 9, c/o Viola Cooper  
Mick Weaver, FOCAG  
Bruce Becker, FOCAG  
Debra Mickelson  
David Dilworth, HOPE

Attachments;

- (1) Scientific Integrity in Policy Making Update-July 2004 Introduction / Union of Concerned Scientists / Full Report @ [www.ucsusa.org](http://www.ucsusa.org)
- (2) EPA - Why we need a code of professional ethics  
[www.nteu280.org/Issues/NTEU-%20Professional%20Ethics.htm](http://www.nteu280.org/Issues/NTEU-%20Professional%20Ethics.htm)
- (3) 1999 EPA letter to DoD, Range Rule [www.epa.gov/fedfac/documents/uxomemo.htm](http://www.epa.gov/fedfac/documents/uxomemo.htm)
- (4) 1998 Wingspread statement [www.rachel.org/library/getfile.cfm?ID=189](http://www.rachel.org/library/getfile.cfm?ID=189)

Union of Concerned Scientists

[www.ucsusa.org](http://www.ucsusa.org)

*Scientific Integrity in Policy Making Update-July 2004*

## **Introduction**

On February 18, 2004, 62 preeminent scientists including Nobel laureates, National Medal of Science recipients, former senior advisers to administrations of both parties, numerous members of the National Academy of Sciences, and other well-known researchers released a statement titled *Restoring Scientific Integrity in Policy Making*. In this statement, the scientists charged the Bush administration with widespread and unprecedented “manipulation of the process through which science enters into its decisions.” The scientists’ statement made brief reference to specific cases that illustrate this pattern of behavior. In conjunction with the statement, the Union of Concerned Scientists (UCS) released detailed documentation backing up the scientists’ charges in its report, *Scientific Integrity in Policy Making*.

On April 2, the White House Office of Science and Technology Policy issued a statement by Director John H. Marburger III that dismissed the scientists’ concerns and attempted to debunk the specific charges. In a detailed analysis released April 19, UCS reviewed each charge again, and directly addressed the administration’s responses, concluding, “UCS stands by the findings and conclusions of our report.” The UCS analysis found that the White House response failed to offer substantive evidence to support its claims. Instead, the White House document was filled with largely irrelevant information and arguments unrelated to the scientists’ charges.

“The administration is dismissive of the concerns of leading scientists across the country,” said Kurt Gottfried, UCS board chair and emeritus professor of physics at Cornell University. “The absence of a candid and constructive response from the White House is troubling, as these issues—from childhood lead poisoning and mercury emissions to climate change and nuclear weapons—have serious consequences for public health, well-being, and national security.”

Since the release of the UCS report in February, the administration has continued to undermine the integrity of science in policy making seemingly unchecked. Many scientists have spoken out about their frustration with an administration that has undermined the quality of the science that informs policy making by suppressing, distorting, or manipulating the work done by scientists at federal agencies and on scientific advisory panels. For instance, Michael Kelly, a biologist who had served at the National Oceanic and Atmospheric Administration’s National Marine Fisheries Service for nine years, recently resigned his position and issued an indictment of Bush administration practices. As Kelly wrote, “I speak for many of my fellow biologists who are embarrassed and disgusted by the agency’s apparent misuse of science.”

This document investigates several new incidents that have surfaced since the February 2004 UCS report. These new incidents have been corroborated through in-depth interviews and internal government documents, including some documents released through the Freedom of Information Act. The cases that follow include:

- ! egregious disregard of scientific study, across several agencies, regarding the environmental impacts of mountaintop removal mining;
- ! censorship and distortion of scientific analysis, and manipulation of the scientific process, across several issues and agencies in regard to the Endangered Species Act;
- ! distortion of scientific knowledge in decisions about emergency contraception;
- ! new evidence about the use of political litmus tests for scientific advisory panel appointees. These new revelations put to rest any arguments offered by the administration that the cases to date have been isolated incidents involving a few bad actors.

Concern in the scientific community has continued to grow. In the months since the original UCS report, more than 4,000 scientists have signed onto the scientists' statement. Signers include 48 Nobel laureates, 62 National Medal of Science recipients, and 127 members of the National Academy of Sciences. A number of these scientists have served in multiple administrations, both Democratic and Republican, underscoring the unprecedented nature of this administration's practices and demonstrating that the issues of scientific integrity transcend partisan politics.

The United States has an impressive history of investing in and reaping the benefits of scientific research. The actions by the Bush administration threaten to undermine the morale and compromise the integrity of scientists working for and advising America's world-class governmental research institutions and agencies. Not only does the public expect and deserve government to provide it with accurate information, the government has a responsibility to ensure that policy decisions are not based on intentionally or knowingly flawed science. To do so carries serious implications for the health, safety, and environment of all Americans.

Given the lack of serious consideration and response by the administration to concerns raised by scores of prominent scientists, UCS is committed to continuing to investigate and publicize cases—corroborated by witnesses and documentation—in which politics is allowed to stifle or distort the integrity of the scientific process in governmental policy making. UCS—working with scientists across many disciplines, other organizations, and elected officials—will also seek to develop and implement solutions that will protect government scientists from retribution when they bring scientific abuse to light, provide better scientific advice to Congress, strengthen the role of the Office of Science and Technology Policy, strengthen and ensure adherence to conflict of interest guidelines for federal advisory panels, and ensure full access to government scientific analysis that has not been legitimately classified for national security reasons.

## WHY WE NEED A CODE OF PROFESSIONAL ETHICS

[www.nteu280.org/Issues/NTEU-%20Professional%20Ethics.htm](http://www.nteu280.org/Issues/NTEU-%20Professional%20Ethics.htm)

This document is intended to explain why a code of professional ethics is needed in the EPA workplace.

8/25/99

### **Management Practices and Workplace Conditions of Concern Because They Create Pressure To Violate the Code of Ethics For Professionals at EPA**

There are current management practices and workplace conditions at EPA condoned by some elements of management which place strong pressure on EPA professionals to violate ethical principles and practices. Several examples follow:

1. Fear by some EPA managers of political retribution from economically powerful industries that are doing things harmful to the environment is one negative condition we as professionals must deal with at EPA. Some managers fear being punished if they tell the truth and/or "do the right thing" with regard to controlling the environmental problem which that particular industry is causing. This is especially problematic when the fearful manager is at the top of an organization's chain of command. The fearful manager "chickens out," because its easier to deal with the dismay and anger of the professionals that work for him or her than to deal with the dismay and anger of higher echelon managers or of an industry with lots of money to contribute to the re-election campaigns of members of Congress and with plenty of access to those members and their staffs, and with the certainty of a sympathetic hearing.
2. It is this condition - political pressure down the chain of command - that is the source of the problem for most unethical behavior by professionals at EPA: Frightened managers pressure professionals to write assessments and analyses that appear to justify a control action which is well less than that which the real risks and real costs suggest are actually warranted.
3. There is a lack of a management process for dealing with a conflict between a professionals's analysis of an issue and Agency policy on that issue. This is a problem: 1) when facts elicited in an analysis do not support the Agency policy and the analysis is then ignored, altered or otherwise subverted by management; or 2) when the professional refuses to remain silent on the issue, and is then subjected to disciplinary sanctions.
4. Tracking and assessment of professional performance should be based on the number of assessments or analyses prepared and their quality, as judged in light of applicable professional standards, and not exclusively on the number of assessments or analyses that produced a certain prescribed result. (E.g., the performance standard should not be "number of new pesticides registered" but "number of proposed new pesticides assessed.")

5. When work is initially assigned to a professional, the assignment must be made in such a way that it is clear that the work product is to be a complete, unconstrained analysis or assessment of the matter at issue.

6. The amount of work time and calendar time allotted to the professional assigned to do the work by the manager assigning the work must be appropriate to the importance of the results. Consideration must be given to the health and environmental risks involved, control and other costs, the complexity of the subject matter, the size of the relevant literature, and the number of experts on that subject within and outside EPA who must be consulted for a complete and balanced work product to be produced.

7. As civil servants serving the public interest, U.S. Environmental Protection Agency employees are entrusted with the responsibility of acting conscientiously to fulfill EPA's assigned mission to protect human health and the environment:

o Those in our trust include:

- The American public, including dependent minors and others not yet of voting age
- Other people throughout the world who are affected by the actions of Americans both here and abroad
- Future generations
- Other living things
- The Earth itself and its ability to sustain life.

o Those affected by our actions also include:

- Those who release pollutants into our environment
- Producers and users of toxic substances
- Those who generate, transport and dispose of hazardous wastes and other wastes and discards.

Those in this latter group are members of the "regulated community"; they are *not* our "customers". They are those whose behavior we must monitor, assess and enforce against environmental standards and the law.

We accept the usefulness of obtaining feedback from those in the first group regarding their satisfaction with our performance. Although some in the latter group appreciate our efforts and do their best to cooperate, many others do not. We reject the validity of assessing how "satisfied" those in the latter group are with our performance.

Every person we deal with, including those in the "the regulated community", deserve to be treated with dignity and respect. But they also need to be handled with candor as to the seriousness of any violations and their impact on the public interest. They need to be handled with firmness when they violate the law.

8. In working to fulfill its mission, EPA managers and staff rarely interact directly with the general public or with regulated firms. Instead, for most programs, EPA managers and staff work with and through State and local agencies. While in some cases the relationship between EPA and the State or Local agency is one of true partnership, more often it is not. Further, with the current focus within EPA on identifying customers and getting customer feedback, there is also a tendency to view State and local environmental agencies as our

"customers." Neither is an accurate description of the nature of the relationship in most cases. Treating State and local environmental agencies and officials as "customers" is therefore inappropriate. They are not our customers; they are at best our partners, but more often they are an additional class of entities and individuals that we - to all intents and purposes - regulate.

## **1999 EPA Position Paper Range Rule**

To

Department of Defense (DoD)

Ms. Sherri W. Goodman

Deputy Under Secretary of Defense

dated April 22, 1999

EPA ISSUES AT CLOSED, TRANSFERRED, AND TRANSFERRING MILITARY RANGES  
During the last several years an increasing number of issues have arisen relative to UXO, hazardous contaminants, and military range cleanup. The following represents a description of the major EPA issues or concerns along with installations where we have encountered these problems. This list should not be construed as exhaustive.

### **1. Range Assessment and Investigation**

1. Range investigations often lack sufficient site-specific information. The Services and the USACE generally are not adhering to CERCLA standards and procedures for assessment and cleanup. The PA/SI, RI/FS, Removal, Remedial, and NOFA processes need to be equivalent to those specified under CERCLA and the NCP. [For example, at the Black Hills Army Depot the PA/SI did not meet the minimum requirements set by EPA for assessment. The RI/FS workplans and all associated documents were based upon this deficient PA/SI and were also determined not to meet EPA minimum requirements. Other sites with similar issues include Savanna Army Depot, Badlands Bombing Range, Lowry Bombing Range, Fort Ritchie, Fort Meade, and the Nansemond Ordnance Depot.]
2. There has been an increasing tendency for UXO investigations to use statistical grid sampling methods. Although statistical grid sampling may yield additional information, extrapolation of these results often lead to inappropriate decisions. The statistical grid sampling approach used by the USACE would only be appropriate if one expected a relatively uniform distribution of UXO, which is not the case at military ranges. EPA believes that in order to achieve protection of human health and the environment, UXO investigations should be based on a combination of information such as historical data (e.g., archives, photos, interviews), range use information, visual site inspections, previous detection surveys, previous Explosives and Ordnance Demolition (EOD) Unit response actions, and the resultant knowledge of impact zones and "hot spots." [For example, at the Lowry Bombing Range the USACE proposed and attempted to use the statistical sampling and extrapolation methodology. The State of Colorado has recently indicated that those methods significantly underestimated the amount of ordnance present (inert or live). Other sites that have similar issues are Savanna Army Depot, Fort Ord, Fort Ritchie, and the Nansemond Army Depot.]
3. Military ranges generally are not designated by the Services or the USACE as areas of concern (AOC) even when the installation is listed on the

Superfund National Priorities List (NPL). EPA believes all areas at closed, transferred, and transferring bases with known or suspected UXO are areas of concern and need to be evaluated in the CERCLA and NCP context. More recently, the Services and the USACE have unilaterally excluded UXO areas from proposed CERCLA Records of Decisions (RODs) or from RODs being implemented where UXO was included in the remedy (e.g., NAF Adak, Umatilla Army Depot) . [At the Umatilla Army Depot, the Army has indicated that they will not address UXO as specified in the ROD. This decision is now in dispute resolution. At NAF Adak, the Navy has recently indicated that they do not wish to proceed with a ROD for a separate UXO operable unit. At Savanna Army Depot, the entire depot (approximately 21 square miles) was initially utilized as a firing range. Activities up to 1997 were not directed at UXO assessment and response, rather they were directed in large degree toward open burning and disposal grounds and non-explosive chemical contamination. Up to this time, UXO in potential firing areas was not included within the realm of the potential cleanup, therefore, most UXO prone or suspected areas were not considered areas of concern. In 1998, the Army tentatively agreed to evaluate several options for assessing areas known or suspected to be contaminated with UXO. The USACE has proposed to use Sitestats/Gridstats which EPA believes is a very problematic analytical method (see 1b above). Other facilities that have ranges with similar issues include, but are not limited to: Jefferson Proving Ground, Lowry Bombing Range, Badlands Bombing Range, Fort Meade, Camp Bonneville, Fort Ord, Aberdeen Proving Ground, Tobyhanna Army Depot, NAF Adak, and Fort Ritchie.]

4. EPA is encouraged by DoD's recent shift to address ranges through a "risk management" strategy focusing on both range assessment and remediation for UXO and other constituents. DoD needs to continue to develop and ultimately implement this approach through the USACE and the Services. However, despite this recent change in strategy, EPA has noted at a number of ranges the USACE continues to apply statistical sampling and risk assessment methods which often lead to premature "informed risk management decisions." Since the proposed Range Rule process is heavily dependent upon accurate "informed risk management decision making," DoD needs to ensure that this revised strategy develops accurate information, reduces short-term risks, and sets the stage to achieve long-term risk reduction goals. The current approach utilized by the USACE generally does not address these goals. [For example, at Fort Ritchie, the Army had proposed to surface clear and provide contractor support in UXO areas that have been proposed by the LRA to include a residential area. Based in large degree upon the statistical sampling, the Army wanted to perform only a surface clearance, even though the DDESB standards recommend much more conservative clearance for residential land use. It is important to note that in many areas where UXO clearance is not performed to the frost line or sufficient depth, additional UXO is likely to surface via frost heaving or erosional processes (i.e., mortars have been found to surface on a golf course). These and other UXO-related issues require the

Army develop a long-term UXO remedial strategy for this area. Other ranges with similar circumstances include Savanna Army Depot, Lowry Bombing Range, Fort Meade, Nansmond Army Depot, Fort Ord, Jefferson Proving Ground, and Badlands Bombing Range.]

5. DoD is generally not applying the best available technologies to assess and remediate UXO. In most cases, there appears to be a standard approach to default to the traditional methods known as "mag and flag". Yet, according to the USACE and others, application of these methods often results in more expensive, slower, and less accurate UXO detections than other demonstrated technologies. DoD needs to begin using better technologies earlier to achieve the most protective level of UXO cleanup, while continuing to examine the capabilities, uncertainties, and acceptabilities of the various detection approaches. [For example, at Fort Ritchie only surface clearance is proposed for areas known to be contaminated with UXO that will be used for residential and commercial purposes. When asked what measures would be used during excavation, the Army indicated they would only have personnel on-site with a magnetometer. At Badlands Bombing Range, the artillery impact area was surveyed using mag and flag but this location would have been suitable for using multiple towed array sensor methods that have yielded more reliable results at other similar locations at Badlands.]
6. In those cases where UXO investigations at ranges (or UXO sites) have been performed, the general approach has been to limit investigation to known ranges/ UXO sites only. Investigations should not be limited to within the "fenceline," especially when information suggests that UXO problems are more extensive. [Although Aberdeen Proving Ground has agreed to perform additional clearance ¼ mile around the existing facility, no additional investigation is being performed off-site (e.g., especially in the adjacent rivers or in the Chesapeake Bay). Other sites with similar issues include the Badlands Bombing Range, Savanna Army Depot, Tooele Army Depot, Lowry Bombing Range, Jefferson Proving Ground, and NAF Adak.]

## **2. Non-Compliance with Regulatory Authorities**

1. DDESB 6055.9 Standards for depth of clearance generally are not being followed. [For example, at Fort Ritchie a surface clearance is proposed for a residential area. DDESB 6055.9 Standards (chapter 12) specifies that default depths of clearance to 10 feet should be used unless an alternative is justified and approved by the DDESB based on detailed site-specific information. As no detailed investigations have taken place over the range areas at Fort Ritchie, a default clearance depth of 10 feet should be used (unless bedrock is shallower). Please note that EPA views chapter 12 as critical due to the nature of explosives safety issues. In addition, many other range situations have already been documented to have uncontrolled listed wastes (and/or hazardous substances) and may present an imminent and substantial endangerment to human health and the environment. Other ranges with similar problems include: Savanna Army Depot, Fort Meade,

Fort Ord, Badlands Bombing Range, Lowry Bombing Range, Umatilla Army Depot, Camp Bonneville, Jefferson Proving Ground, Nansemond Ordnance Depot, Tooele Army Depot, and NAF Adak.]

2. Current EPA environmental regulations, including, but not limited to, RCRA and CERCLA, are applicable, but generally are not being followed. [This is particularly relevant to the depth of clearance of UXO. Many UXO-contaminated areas at closed, transferred, or transferring military ranges are: 1) not being investigated, or 2) when discovered, are not being addressed consistent with human health, environmental, or explosives safety regulations. These types of situations have been noted at many ranges including: Savanna Army Depot, Fort Meade, Fort Ord, Badlands Bombing Range, Lowry Bombing Range, Umatilla Army Depot, Camp Bonneville, Jefferson Proving Ground, Nansemond Ordnance Depot, Tooele Army Depot, and NAF Adak. Other information pertinent to this issue is presented in 1(a) above, and 4(a) below.]

### **3. Communication, Coordination and Dissemination of Information**

Efforts by the Services and the USACE to communicate the scope, nature, and extent of UXO response activities have not always been successful. In some cases, there has been little or no effort. Regulators and the public need to be better informed during all stages of the efforts to address military ranges. The over-reliance on time-critical response actions also tends to reduce coordination with the regulators and other non-DoD parties. [For example, the regulators and the public have been discouraged by the USACE lack of cooperation at the Black Hills Army Depot. Adequate information and answers concerning investigations and cleanup activities have not been provided to these parties. At Fort Wingate there has been little or no public involvement concerning UXO issues. At BRAC RAB meetings only cursory information is presented on the USACE activities. Neither the State, Tribes, or the general public have received sufficient documentation on the USACE UXO activities at Fort Wingate that has both BRAC and FUDS properties. Another example is with the proposed transfer of property at Fort McClellan. The Army has been in the process of negotiating a transfer of UXO contaminated property with the U.S. Fish and Wildlife Service (USFWS). It appears that State and Federal regulatory agencies have not been contacted to participate in these negotiations. Similar situations have been noted at the Badlands Bombing Range, Lowry Bombing Range, Jefferson Proving Ground, Fort Ord, and Fort Ritchie.]

### **4. Remedy Selection and Implementation**

1. EPA believes some range UXO detection/clearance operations may not be appropriate for CERCLA removal nor RCRA emergency situations. To further complicate matters is the Service/USACE preference to implement "CERCLA-like" accelerated actions. Some of these actions may not be consistent with CERCLA and the NCP and generally result in less regulator and public oversight/involvement. Using time-critical/emergency responses as the sole response paradigm should not be a default approach for the Services/USACE, especially for range problems that are well beyond the scope of such actions. [For example, at Fort Ord clearance was conducted

for several years as a time-critical removal action. Similar circumstances are noted at Jefferson Proving Ground, Umatilla Army Depot, and Fort Meade.]

2. There is a general over-reliance on institutional controls as the principal remedy component or as the only remedy to ensure protectiveness. Where employed, the institutional controls may not be adequately defined, roles and responsibilities are left unclear and ultimately they may not prevent future incidents where UXO is encountered. The Services and the USACE are not always implementing adequate access controls (e.g., fencing, posting of guards, patrols, etc.) where needed. In addition, periodic inspections need to be performed at many locations where UXO has been identified, is suspected, or may have surfaced via erosion or frost heaving at previously cleared areas. [For example, at NAF Adak institutional controls are proposed for vast areas outside the town where UXO will generally not be cleared, nor has the area been adequately investigated despite DoD records indicating potentially extensive UXO contamination. This appears to be a problem because the recent reuse proposals to expand the town's uses are expected to lead to an increase in the population (primarily members of the Aleut Tribe, especially children). At Tobyhanna Army Depot, a 20,000 acre UXO area is now a State park where only signs were posted. The park was closed in 1997 when 53 unexploded 37 mm shells were found and a recent removal action has found significant additional UXO. Other examples of access problems have been noted at Camp Elliott (Tierrasanta), Camp Bonneville, Jefferson Proving Ground, Lowry Bombing Range, Badlands Bombing Range, Fort Ritchie, Fort Wingate, and Nansemond Army Depot.]
3. Effective regulatory and DoD oversight is an important aspect of remedy implementation. When it is not implemented, the risk of incidents increase. [For example, the UXO from the Fort Irwin cleanup was mistaken for clean scrap and transported to a scrap yard for recycling (in violation of RCRA – the UXO went to a non-permitted facility without manifest). An employee was killed when he attempted to cut live UXO with welding equipment. Other examples of where better oversight was needed include, Fort Ord, Jefferson Proving Ground, and Fort Meade where UXO contaminated areas were inappropriately slated for transfer.]

## **5. Transfer of UXO Contaminated Land**

1. EPA believes DoD generally should retain ownership and/or control of UXO areas that are not yet assessed and/or cleaned up as determined by DoD, the appropriate regulatory agencies and the public (e.g., "permanently duded" impact areas; UXO burial sites; sites not yet scheduled to be remediated). Federal land management agencies generally want DoD to complete all environmental restoration prior to any transfer to them. Present land transfer practices by DoD indicate that UXO contaminated lands continue to be transferred. [At Fort McClellan the transfer of approximately 10,000 acres of UXO contaminated land has been proposed. The area has not been adequately assessed and UXO contamination not yet addressed. The

proposed transfer is to the USFWS who do not appear to have sufficient resources to address UXO contamination of this magnitude. At Jefferson Proving Ground, a portion of UXO contaminated property north of the firing line was proposed for transfer to the USFWS. The area was proposed to be used for recreational purposes, but it has not been thoroughly assessed and UXO not addressed. It has also been mentioned that the USFWS has since decided not to proceed with the transfer. At Nomans Land Island,

although the fed-to-fed transfer has already taken place, DoD has a continuing obligation to address UXO safety issues there, as does the USFWS (i.e., to secure the property against trespassers, per the transfer agreement). Although the area is planned to be used as a wildlife refuge, it is known to be frequented by boating enthusiasts, and UXO safety issues remain because storm events and other processes (freeze/thaw) will continue to expose UXO in areas where only surface clearance has been performed. At Fort Wingate, two closed test ranges containing UXO are slated for transfer to the DOI. The land may then be re-developed for residential, commercial, open space, and subsistence farming/ranching uses. Much of these lands are proposed to be transferred to the DOI. Another example is the UXO contaminated areas transferred to the State at the Tobyhanna Army Depot.]

2. In some cases, the Services and the USACE have performed only a cursory investigation (see # 1). Based upon limited information, property has been and is being transferred. Rather than sufficiently assessing sites and making the property safe for use or transfer, the DoD and the Services appear to be transferring the land and then waiting for others to identify problems for DoD response. [For example, DoD is contacted periodically about newly found UXO at a number of transferred sites. This has been noted at the Aberdeen Proving Ground, Raritan Arsenal, Morgan Depot, White Sands Missile Range, Lowry Bombing Range, Badlands Bombing Range, Fort Ritchie, Tobyhanna Army Depot, Fort Ord, Fort Meade (i.e., Tipton Air Field), Jefferson Proving Ground, Raritan Arsenal, Morgan Depot, and at EPA private sites such as the Cohen Property Site in Massachusetts. Although the EOD units have a good response record, their responses tend to be limited to the newly found UXO, with generally no further investigation performed to determine the nature and extent of any additional UXO. This EOD "house call" type follow-up cannot substitute for adequate investigations.]

## The Wingspread Statement on the Precautionary Principle

January 1998

The release and use of toxic substances, the exploitation of resources, and physical alterations of the environment have had substantial unintended consequences affecting human health and the environment. Some of these concerns are high rates of learning deficiencies, asthma, cancer, birth defects and species extinctions; along with global climate change, stratospheric ozone depletion and worldwide contamination with toxic substances and nuclear materials.

We believe existing environmental regulations and other decisions, particularly those based on risk assessment, have failed to protect adequately human health and the environment - the larger system of which humans are but a part.

We believe there is compelling evidence that damage to humans and the worldwide environment is of such magnitude and seriousness that new principles for conducting human activities are necessary.

While we realize that human activities may involve hazards, people must proceed more carefully than has been the case in recent history. Corporations, government entities, organizations, communities, scientists and other individuals must adopt a precautionary approach to all human endeavors.

Therefore, it is necessary to implement the Precautionary Principle: When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

In this context the proponent of an activity, rather than the public, should bear the burden of proof.

The process of applying the Precautionary Principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action.

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GAO

Report to the Chairman, Subcommittee  
on Environment and Hazardous  
Materials, Committee on Energy and  
Commerce, House of Representatives

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May 2005

# PERCHLORATE

## A System to Track Sampling and Cleanup Results Is Needed



**Appendix II  
Facilities and Sites Where Perchlorate Was  
Found and Concentration Levels, as of  
January 2005**

(Continued From Previous Page)

	State	Facility/Site name	Highest detection reported <sup>a</sup>		Cleanup status <sup>c</sup>
			Amount (ppb) <sup>b</sup>	Media	
50	CA	City of Corona, Riverside County	12	Drinking water	
51	CA	City of Escondido, San Diego County	4	Drinking water	
52	CA	City of Garden Grove, Orange County	4	Drinking water	
53	CA	City of Hemet, Riverside County	7	Drinking water	
54	CA	City of Loma Linda, San Bernardino County	5	Drinking water	
55	CA	City of Ontario, San Bernardino County	12	Drinking water	
56	CA	City of Patterson, Stanislaus County	4	Drinking water	
57	CA	City of Pomona, Los Angeles County	10	Drinking water	
58	CA	City of Rialto, San Bernardino County	21	Drinking water	
59	CA	City of Riverside, Riverside County	42	Drinking water	
60	CA	City of San Bernardino, San Bernardino County	7	Drinking water	
61	CA	City of Santa Ana, Orange County	4	Drinking water	
62	CA	City of Stockton, San Joaquin County	19	Drinking water	
63	CA	City of Tracy, San Joaquin County	21	Drinking water	
64	CA	City of Tustin, Orange County	9	Drinking water	
65	CA	Coachella Valley Water District, Cove Community, Riverside County	6	Drinking water	
66	CA	Cucamonga Water District, San Bernardino County	9	Drinking water	
67	CA	Denova Environmental, San Bernardino County	460	Soil	
68	CA	Desert Water Agency, Riverside County	6	Drinking water	
69	CA	East Valley Water District, San Bernardino County	16	Drinking water	
70	CA	Eastern Municipal Water District, Riverside County	8	Drinking water	
71	CA	El Centro Naval Air Facility, Imperial County	5	Drinking water	
72	CA	El Toro Marine Corps Air Station, Orange County	1,600 460	Soil Groundwater	
73	CA	EMBEE, Incorporated, Orange County	1,900	Groundwater	
74	CA	Fort Ord, Monterey County	35	Soil	
75	CA	G.E. Plastics, Orange County	1,100,000	Groundwater	
76	CA	Great Oaks Water Company, Incorporated, Santa Clara County	4	Drinking water	
77	CA	Imperial Valley College, Imperial County	6	Drinking water	
78	CA	Irvine Ranch Water District, Orange County	6	Drinking water	

# Synergism

Canadian Centre for Occupational Health and Safety (CCOHS)

<http://www.ccohs.ca/oshanswers/chemicals/synergism.html>

## What is meant by the term "synergism"?

Synergism comes from the Greek word "*synergos*" meaning working together. It refers to the interaction between two or more "things" when the combined effect is greater than if you added the "things" on their own (a type of "when is one plus one is greater than two" effect).

In toxicology, synergism refers to the effect caused when exposure to two or more chemicals at a time results in health effects that are greater than the sum of the effects of the individual chemicals.

When chemicals are synergistic, the potential hazards of the chemicals should be re-evaluated, taking their synergistic properties into consideration.

## What are related terms?

In addition to synergism, other terms are used to define the toxicologic interactions.

**Additive Effect** - This action occurs when the combined effect of two or more chemicals is equal to the sum of the effect of each agents given alone (they do not interact in a direct way); for example:

$$2 + 2 = 4$$

This effect is the most common when two chemicals are given together.

**Potentiation** - This effect results when one substance that does not normally have a toxic effect is added to another chemical, it makes the second chemical much more toxic; for example:

$$0 + 2 > 2, \text{ not just } 2$$

**Antagonism** - Antagonism is the opposite of synergism. It is the situation where the combined effect of two or more compounds is less toxic than the individual effects; for example:

$$4 + 6 < 10$$

Antagonistic effects are the basis of many antidotes for poisonings or for medical treatments. For example, ethyl alcohol (ethanol) can antagonize the toxic effects of methyl alcohol (methanol) by displacing it from the enzyme that oxidizes the methanol

In comparison, a **synergistic effect** is the situation where the combined effect of two chemicals is much greater than the sum of the effects of each agent given alone, for example:

**2 + 2 >> 4 (maybe 10 times or more)**

### **Why does synergism occur?**

While the mechanisms of synergism can change from situation to situation, most of the time there appears to be an effect on the enzymes that regulate or influence the way our bodies work.

Our bodies have enzymes that are designed to do specific "jobs". For example, there is an enzyme that helps break down alcohol - this is why we do not stay intoxicated "forever" after consuming alcohol. These enzymes normally transform (metabolize) the foreign substances (alcohol in this example) into less toxic or non-toxic substances which are eliminated out of the body.

With synergism, an enzyme function could either be inhibited (restricted) or accelerated in some way. Either way, the result is that the chemicals are either "free" or "enhanced" to cause a greater biologic effect in the body.

## Endocrine-Disrupting Chemicals Threaten Animal--and Human-- Reproduction

Reprinted with permission from the Center for Children's Health and the Environment, Mt. Sinai School of Medicine <http://www.childenvironment.org>

[www.checnet.org/HealtheHouse/education/articles-detail.asp?Main\\_ID=489](http://www.checnet.org/HealtheHouse/education/articles-detail.asp?Main_ID=489) 4-19-08

In 1980, an accident at Tower Chemical Co. in Florida released the pesticide, difocol, into Lake Apopka, a major alligator habitat. Poisonous in large doses, difocol, quickly killed 90 percent of the lake's alligators. Although the water was officially clean by the late 1980s, the lake's alligators developed bizarre reproductive abnormalities never previously observed: More than 60 percent of the males had penises so malformed that they could not impregnate females. Among alligator eggs, hatch rates were just 20 percent of normal. And baby gators had an unusually high death rate. All in water that was supposedly clean.<sup>1</sup> Only it wasn't. Difocol levels were extremely low—but still high enough to affect the sex hormones that control alligator reproduction. The pesticide acted like the female sex hormone, estrogen, feminizing the males and causing the gators' other reproductive problems.<sup>2</sup> No such problems were found in nearby Lake Woodward, which had no difocol.

Since then, a large number of widely used substances (pesticides, industrial chemicals, metals) have been shown to have estrogen-mimicking and other endocrine-disrupting effects, including [2,4-D](#), DDT, atrazine, dieldrin, lindane, permethrin, dioxin, PCBs, phthalates, arsenic, lead and mercury.<sup>3</sup> Because these estrogen-mimics affect the endocrine (hormonal) system, they are collectively known as "endocrine disruptors."

A large body of evidence shows that endocrine disruptors cause significant harm to both wildlife and humans. Consider:

- **Beyond Lake Apopka's alligators, endocrine disruptors have been persuasively linked to a variety of reproductive abnormalities in fish.** British scientists linked malformed male genitals in London-area trout to endocrine disruptors released from a sewage treatment plant.<sup>4</sup> Since then, male feminization, hermaphroditism, and other reproductive problems in many fish species have been traced to endocrine-disruptor exposure.<sup>5 6 7</sup>
- **Endocrine disruptors have been shown to cause sex reversal in turtles,<sup>8</sup> and a variety of reproductive abnormalities in other reptiles.<sup>9</sup>** The chemicals may also contribute to the mass die-off the world's frogs and other amphibians.<sup>10</sup>
- **Around the Great Lakes, exposure to dioxins appears responsible for birth defects and other reproductive problems among birds of prey.<sup>11 12</sup>**
- **In the early 1990s, Dutch biologists noticed an unusual die-off of harbor seals.** They eventually traced the killer to PCBs, dioxin, and other endocrine disruptors that had contaminated the herring the seals ate.<sup>13</sup> Hormones help regulate the immune system, and the estrogen-mimics impaired the seals' ability to fight infection.<sup>14</sup>
- **Endocrine disruptors have been shown to cause sterility and other reproductive problems in men.**
  - Chemical workers occupationally exposed to endocrine-disrupting pesticides such as dibromo-chloro-propane (DBCP) have been made temporarily—and in some cases, permanently—sterile.<sup>15 16 17 18</sup>

- Considerable evidence shows that during the past 50 years, the average American and European sperm count has declined approximately 40 percent.<sup>19 20 21</sup> We still don't know whether exposures to endocrine-disrupting chemicals from air, drinking water, and food are responsible for the sperm count decrease in human males
- **Endocrine disruptors may contribute to endometriosis in women.** This poorly understood condition is often associated with infertility. Several animal studies show that it can be caused by even vanishingly small exposures to endocrine-disrupting dioxin—as low as 25 parts per trillion in monkeys.<sup>22</sup>
- **Endocrine disruptors appear to interfere with human conception.** As New York women's consumption of Lake Ontario fish increases, so does the length of time it takes them to get pregnant.<sup>23</sup> Lake Ontario fish are contaminated with such high levels of PCBs and other endocrine disruptors that health authorities discourage their consumption.
- **Endocrine disruptors appear to contribute to miscarriage.** California researchers correlated miscarriage rates with pregnant women's exposures to agricultural pesticides. When pesticides were applied within a 9-square mile area around the women's homes, the researchers found a strong association with fetal death due to congenital defects.<sup>24</sup>
- **Endocrine disruptors may contribute to increased rates of hypospadias,** a birth defect involving misplacement of the urethral opening of the penis. Since 1970, the rate of hypospadias in the U.S. has doubled from 20 to 40 per 10,000 male births.<sup>25 26 27 28</sup>
- **Endocrine disruptors may also contribute to increasing incidence of undescended testicles.** Danish researchers compared the rate of this problem among boys whose mothers had no unusual exposure to estrogen-mimicking pesticides, with boys whose mothers worked as gardeners while pregnant. The sons of pesticide-exposed mothers were 50 percent more likely to have undescended testicles.<sup>29</sup>
- **Endocrine disruptors appear to be able to alter the sex ratio, the ratio of boys to girls at birth.** But after an industrial accident exposed residents of Seveso, Italy, to large amounts of endocrine-disrupting dioxin, births of boys declined and births of girls increased.<sup>30</sup> Even without accidental mass exposure, the sex ratio has changed in favor of girls in several industrialized countries,<sup>31</sup> among them: Denmark,<sup>32</sup> Canada,<sup>33</sup> and the U.S.<sup>34</sup>
- **Finally, endocrine disruptors negate some benefits of breast milk.** Breast milk boosts infants' immune function. But several studies show that as levels of endocrine disruptors in breast milk rise, so does risk of infant infection.<sup>35</sup> Compared with Dutch children who had the lowest levels of endocrine-disrupting PCBs in their bodies, those with the highest levels experienced eight times the risk of chickenpox and three times the risk of having suffered at least six ear infections.<sup>36</sup>

In some studies, scientists have been unable to find a safe level of exposure. Even minute exposures appear to cause significant feminizing effects.<sup>12</sup>

Are exposures to endocrine disruptors the sole cause of rising rates of reproductive problems in both animals and humans? No. They are almost certainly not the sole cause, and a few studies have shown no association between exposure and these problems.<sup>37</sup>

However, the evidence is mounting that endocrine disruptors play a significant role in reproductive problems. We anticipate the case against these compounds will be strengthened further by studies now in progress.

Better safe than sorry. We believe that despite remaining uncertainties, enough evidence has accumulated to justify moving aggressively to limit exposures to endocrine disruptors. These compounds should be phased out as quickly as possible. Ideally, immediately.

*This summary was prepared by the Center for Children's Health and the Environment (CCHE) of the Mount Sinai School of Medicine. Please visit [CCHE's website](#) for other fact sheets and background papers on children's environmental health issues.*

See Also:

[Male Reproductive Health and Environmental Exposures](#)

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<sup>2</sup> Raloff, J. "Environmental Hormones: Threats to Health and Reproduction?", [Radio and Television News Directors Foundation](#), Washington, D.C. 1999.

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# Civil War cannonball kills Virginia relic collector

<http://www.newsweek.com/id/135153?tid=relatedcl>

By STEVE SZKOTAK Associated Press Writer

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Brenda White, widow of Civil War Relics collector Sam White, looks over... ((AP Photo/Steve Helber)) CHESTER, Va.—Like many boys in the South, Sam White got hooked on the Civil War early, digging up rusting bullets and military buttons in the battle-scarred earth of his hometown.

As an adult, he crisscrossed the Virginia countryside in search of wartime relics—weapons, battle flags, even artillery shells buried in the red clay. He sometimes put on diving gear to feel for treasures hidden in the black muck of river bottoms.

But in February, White's hobby cost him his life: A cannonball he was restoring exploded, killing him in his driveway.

More than 140 years after Lee surrendered to Grant, the cannonball was still powerful enough to send a chunk of shrapnel through the front porch of a house a quarter-mile from White's home in this leafy Richmond suburb.

White's death shook the close-knit fraternity of relic collectors and raised concerns about the dangers of other Civil War munitions that lie buried beneath old battlefields. Explosives experts said the fatal blast defied extraordinary odds.

"You can't drop these things on the ground and make them go off," said retired Col. John F. Biemeck, formerly of the Army Ordnance Corps.

White, 53, was one of thousands of hobbyists who comb former battlegrounds for artifacts using metal detectors, pickaxes, shovels and trowels.

"There just aren't many areas in the South in which battlefields aren't located. They're literally under your feet," said Harry Ridgeway, a former relic hunter who has amassed a vast collection. "It's just a huge thrill to pull even a mundane relic out of the ground." After growing up in Petersburg, White went to college, served on his local police force, then worked for 25 years as a deliveryman for UPS. He retired in 1998 and devoted most of his time to relic hunting.

He was an avid reader, a Civil War raconteur and an amateur historian who watched History Channel programs over and over, to the mild annoyance of his wife.

"I used to laugh at him and say, 'Why do you watch this? You know how it turned out. It's not going to be any different,'" Brenda White said.

She didn't share her husband's devotion, but she was understanding of his interest.

"True relic hunters who have this passion, they don't live that way vicariously, like if you were a sports fanatic," she said. "Finding a treasure is their touchdown, even if it's two, three bullets."

Union and Confederate troops lobbed an estimated 1.5 million artillery shells and cannonballs at each other from 1861 to 1865. As many as one in five were duds.

Some of the weapons remain buried in the ground or river bottoms. In late March, a 44-pound, 8-inch mortar shell was uncovered at Petersburg National Battlefield, the site of an epic 292-day battle. The shell was taken to the city landfill and detonated.

Black powder provided the destructive force for cannonballs and artillery shells. The combination of sulfur, potassium nitrate and finely ground charcoal requires a high temperature—572 degrees Fahrenheit—and friction to ignite.

White estimated he had worked on about 1,600 shells for collectors and museums. On the day he died, he had 18 cannonballs lined up in his driveway to restore.

White's efforts seldom raised safety concerns. His wife and son Travis sometimes stood in the driveway as he worked.

"Sam knew his stuff, no doubt about it," said Jimmy Blankenship, historian-curator at the Petersburg battleground. "He did know Civil War ordnance."

An investigation by the Bureau of Alcohol, Tobacco and Firearms will not be complete until the end of May, but police who responded to the blast and examined shrapnel concluded that it came from a Civil War explosive.

Experts suspect White was killed while trying to disarm a 9-inch, 75-pound naval cannonball, a particularly potent explosive with a more complex fuse and many times the destructive power of those used by infantry artillery.

Biemeck and Peter George, co-author of a book on Civil War ordnance, believe White was using either a drill or a grinder attached to a drill to remove grit from the cannonball, causing a shower of sparks.

Because of the fuse design, it may have appeared as though the weapon's powder had already been removed, leading even a veteran like White to conclude mistakenly that the ball was inert.

The weapon also had to be waterproof because it was designed to skip over the water at 600 mph to strike at the waterline of an enemy ship. The protection against moisture meant the ball could have remained potent longer than an infantry shell.

Brenda White is convinced her husband was working on a flawed cannonball, and no amount of caution could have prevented his death.

"He had already disarmed the shell," she said. "From what I was told, there was absolutely nothing he had done wrong, that there was a manufacturing defect that no one would have known was there."

After White's death, about two dozen homes were evacuated for two days while explosives experts collected pieces from his collection and detonated them.

Today, there is little evidence of the Feb. 18 blast. The garage where White did most of his work is still crammed with his discoveries, many painstakingly restored and mounted. Rusted horseshoes are piled high in the crook of a small tree.

White's digging partner, Fred Lange, hasn't had the heart to return to his relic hunting. "I truly miss him," Lange said. "Not a day that goes by that I don't think of him."