01.11-04/01/88-01028

HRS RANKING RESULTS

SUPPORT DOCUMENTATION

MCAS NEW RIVER
Jacksonville, North Carolina

SITES 45, 48, 54, 75, 76, A

Prepared for:

NAVAL FACILITIES ENGINEERING COMMAND
Atlantic Division

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

April 1988

→ Support Documentation

APPENDIX A

EVALUATION OF DATA FROM SECOND ROUND OF VERIFICATION STEP SAMPLE COLLECTION AND ANALYSIS

CONFIRMATION STUDY TO DETERMINE EXISTENCE AND POSSIBLE MIGRATION OF SPECIFIC CHEMICALS IN SITU

MARINE CORPS BASE
Camp Lejeune, North Carolina

Contract No. N62470-83-C-6106

Prepared for:

NAVAL FACILITIES ENGINEERING COMMAND
Atlantic Division

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC,
Gainesville, Florida

July 1987

SITE 45--CAMPBELL STREET UNDERGROUND FUEL STORAGE AREA

Site Investigation

- o Install new well (45GW4) south of fuel farm.
- o Sample (one set) existing monitor wells (45GW1 through 45GW3).
- o Sample (two sets) new well.
- o Sample (one set) SW/SE from drainage ditch in two locations.
- o Sample (one set) soils in six locations along perimeter of fuel from the aviation gas (AVGAS) storage area. Composite 5-ft borings into three samples: 0 to 1 ft, 1 to 3 ft, and 3 to 5 ft.

Data Evaluation

All Round Two sampling stations are shown in Figure S45-1.

GROUND WATER: Three existing Round One wells and a new well were sampled during the set one Round Two effort. Of the target analytes, only O&G was detected in all four wells (Table S45-1). The detected levels may be in excess of organoleptic limits. Lead, detected during Round One, was not detected in any of the samples during set one Round Two. This may be attributed to time variance of this analyte. Three VOCs, not present during the Round One effort, were detected in the current data set. The levels are below the applicable MCLs for the compounds. The occurrence of these compounds may be attributed to the use of solvents at the tank farm.

The new well (45GW4) was resampled during the second set of Round Two sampling. Of the target analytes, only O&G was detected and may be in excess of organoleptic limits (Table S45-2). The set one data identified the presence of two VOCs in addition to O&G at this well. As at many of the other sites within Camp Lejeune, the levels of VOCs appear to have fallen (to below detection limits) in the period of time between the two Round Two sampling efforts. In the same period of time, however, the level of O&G has remained the same, contrary to the downward trend of

contaminant strength. Ground water contours for this site suggest that 45GW4 is downgradient of the westernmost portion of Site 45, and the contamination detected at 45GW4 may be attributed to the tank farm.

SURFACE WATER/SEDIMENT: Two SW/SE stations located in a drainage ditch on the south side of Site 45 were sampled during Round Two. Low levels of benzene and O&G were detected in the SW samples; the concentration of benzene was below the MCL at the time of sampling (Table S45-3).

Lead and O&G were detected in both SE samples and were at elevated levels immediately adjacent to the site (Table S45-4). These data suggest that episodic discharges of fuel from the tank farm into the ditch have occurred. This is further substantiated by both visual observations by the project team throughout the duration of the field program and by discussions with personnel assigned to the fuel farm.

Geohydrology

A geologic cross section (Figure S45-2) was drawn on a generally east-west line (Figure S45-3) and shows the site to be underlain by dipping layers of silty sand, clayey silt, clay, and sand. The surface of the shallow ground water at this site cuts across these dipping strata at depths ranging from 2.64 to 6.96 ft below land surface. The ground water contour map (Figure S45-4) indicates that the shallow ground water flows to the southeast, with a gradient of approximately 0.004 ft/ft.

Migration Potential

The gradient for the shallow ground water is one of the lower recorded of all the Camp Lejeune study areas. As a result, the potential for horizontal migration of contaminants is low. A number of deep water supply wells exist in the area of Site 45 and may exert some influence in the vertical migration of contaminated shallow ground water. No evidence of this has been identified to date. Periodic discharge of contamination from the shallow ground water into the surface drainage network has been

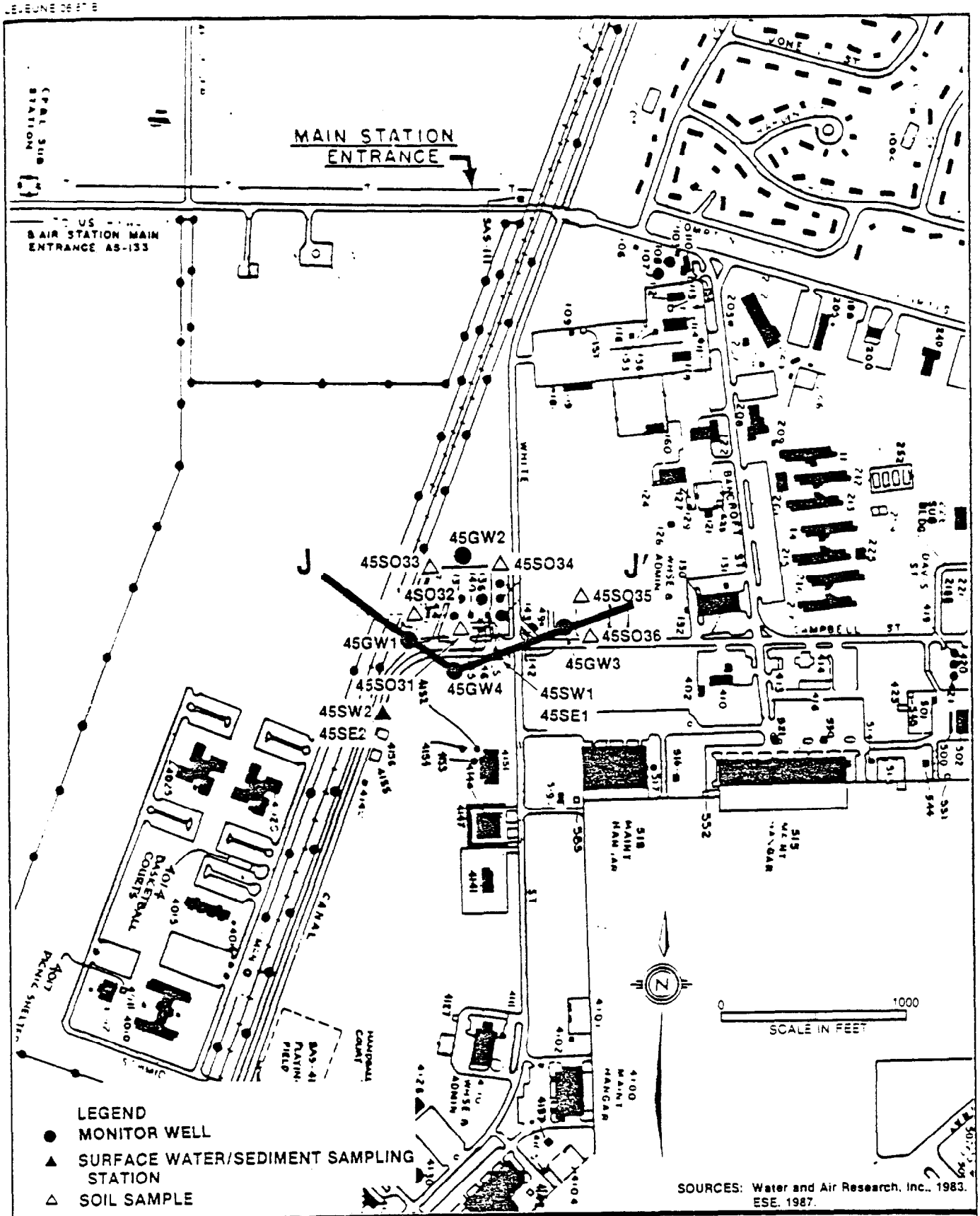


Figure S45-3
GEOLOGIC CROSS SECTION LOCATION, SITE 45—CAMPBELL STREET UNDERGROUND FUEL STORAGE AREA

CONFIRMATION STUDY
MARINE CORPS BASE
CAMP LEJEUNE

identified by the current geochemical database and represents the most important (i.e., fastest) migration pathway from Site 45.

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET # / METHOD	SAMPLE ID/# 45GW1 LJGW-1 50	45GW2 LJGW-1 51	45GW3 LJGW-1 52	45GW4 LJGW-1 53
DATE			12/08/86	12/08/86	12/08/86	12/08/86
TIME			13:10	10:22	11:45	14:10
LEAD,TOTAL	UG/L	1051 ICAP	<27.0	<27.0	<27.0	<27.0
OIL&GR,IR	MG/L	560 I	2	2	2	2
1,2-DIBROMOETHANE (EDB)	UG/L	77651 EC	<0.020	<0.020	<0.020	<0.020
BENZENE	UG/L	34030 GMS	<1.0	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE	UG/L	32101 GMS	<2.2	<2.2	<2.2	<2.2
BROMOFORM	UG/L	32104 GMS	<4.7	<4.7	<4.7	<4.7
BROMOMETHANE	UG/L	34413 GMS	<5.8	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE	UG/L	32102 GMS	<2.8	<2.8	<2.8	<2.8
CHLOROBENZENE	UG/L	34301 GMS	<6.0	<6.0	<6.0	<6.0
CHLOROETHANE	UG/L	34311 GMS	<8.2	<8.2	<8.2	<8.2
2-CHLOROETHYLVINYL ETHER	UG/L	34576 GMS	<15	<15	<15	<15
CHLOROFORM	UG/L	32106 GMS	<1.6	1.9	<1.6	<1.6
CHLOROMETHANE	UG/L	34418 GMS	<4.3	<4.3	<4.3	6.4
DIBROMOCHLOROMETHANE	UG/L	32105 GMS	<3.1	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE	UG/L	34496 GMS	<4.7	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE	UG/L	34531 GMS	<2.8	<2.8	<2.8	<2.8
1,1-DICHLOROETHYLENE	UG/L	34501 GMS	<2.8	<2.8	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE	UG/L	34546 GMS	2.2	<1.6	<1.6	1.9
1,2-DICHLOROPROPANE	UG/L	34541 GMS	<6.0	<6.0	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE	UG/L	34704 GMS	<5.0	<5.0	<5.0	<5.0

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJSW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET #	METHOD	SAMPLE ID/# 45SW1 LJSW-1 31	45SW2 LJSW-1 32
DATE				12/08/86	12/08/86
TIME				11:16	12:30
LEAD, TOTAL	UG/L	1051	ICAP	<27.0	<27.0
OIL&GR, IR	MG/L	560	I	0.6	1
1,2-DIBROMOETHANE (EDB)	UG/L	77651	EC	<0.020	<0.020
BENZENE	UG/L	34030	GMS	1.4	<1.0
BROMODICHLOROMETHANE	UG/L	32101	GMS	<2.2	<2.2
BROMOFORM	UG/L	32104	GMS	<4.7	<4.7
BROMOMETHANE	UG/L	34413	GMS	<5.8	<5.8
CARBON TETRACHLORIDE	UG/L	32102	GMS	<2.8	<2.8
CHLOROBENZENE	UG/L	34301	GMS	<6.0	<6.0
CHLOROETHANE	UG/L	34311	GMS	<8.2	<8.2
2-CHLOROETHYL VINYL ETHER	UG/L	34576	GMS	<15	<15
CHLOROFORM	UG/L	32106	GMS	<1.6	<1.6
CHLOROMETHANE	UG/L	34418	GMS	<4.3	<4.3
DIBROMOCHLOROMETHANE	UG/L	32105	GMS	<3.1	<3.1
1,1-DICHLOROETHANE	UG/L	34496	GMS	<4.7	<4.7
1,2-DICHLOROETHANE	UG/L	34531	GMS	<2.8	<2.8
1,1-DICHLOROETHYLENE	UG/L	34501	GMS	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE	UG/L	34546	GMS	<1.6	<1.6
1,2-DICHLOROPROPANE	UG/L	34541	GMS	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE	UG/L	34704	GMS	<5.0	<5.0

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJSE-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS.	UNITS	STORET # / METHOD	SAMPLE ID/# 45SE1 LJSE-1 31	45SE2 LJSE-1 32
DATE			12/08/86	12/08/86
TIME			00:00	00:00
MOISTURE		70320	59.9	54.0
	%WET WT	1		
LEAD,SED		1052	234	36.1
	UG/G-DRY	ICAP		
OIL&GR,IR,SED		561	12000	1810
	UG/G- DRY	1		

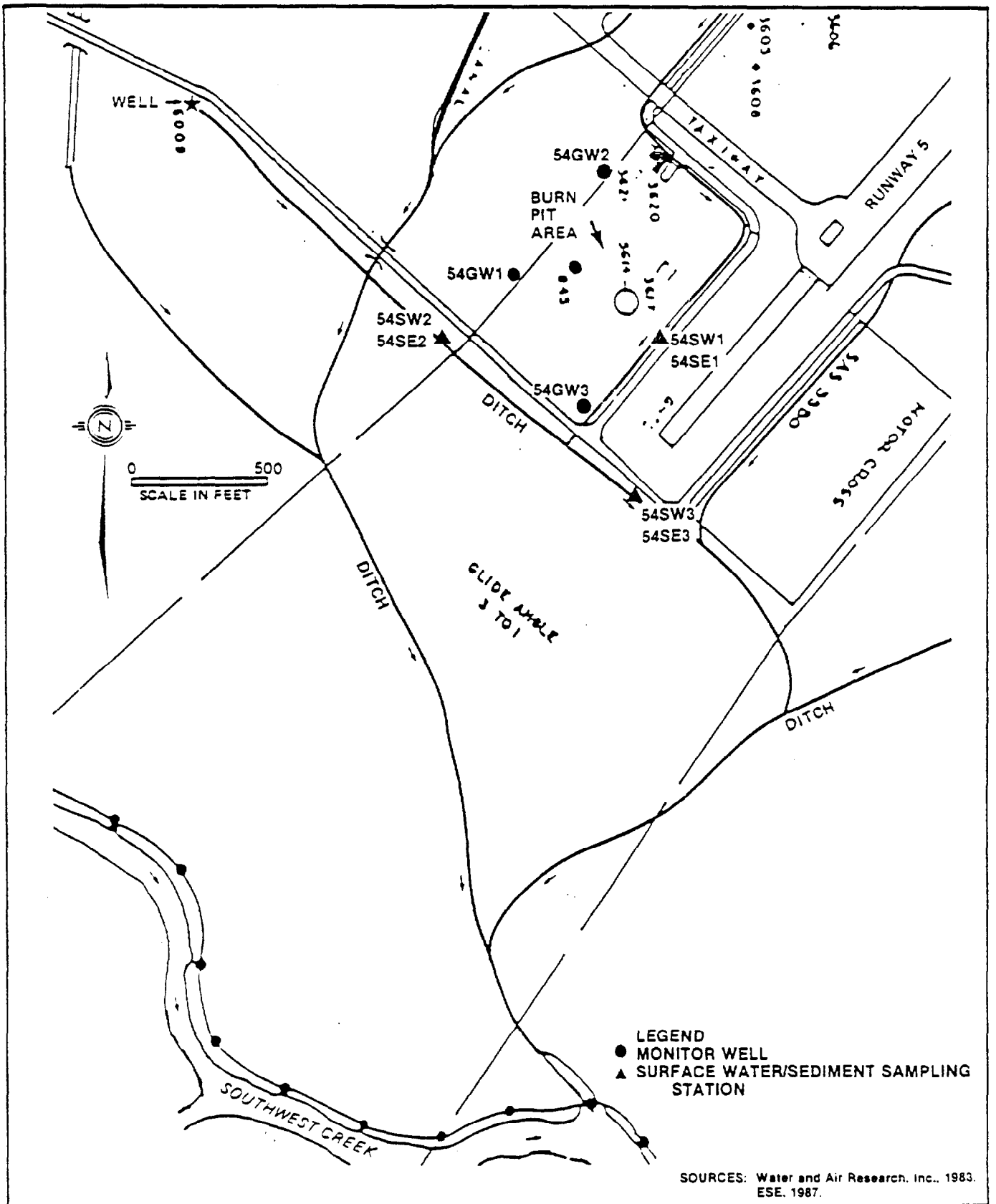


Figure S54-1
ROUND TWO SAMPLING LOCATIONS, SITE 54—
CRASH CREW FIRE TRAINING BURN PIT

CONFIRMATION STUDY
MARINE CORPS BASE
CAMP LEJEUNE

than that for hexavalent chromium; the analysis of both analytes were conducted with complete analytical control, as specified by the project Quality Assurance (QA) Plan. The data should, therefore, be interpreted in the following manner: the value for total chromium most precisely defines the concentration of all chromium species for this sample. The high level of hexavalent chromium strongly suggests that a major portion, if not all, of the detected total chromium is hexavalent chromium.

The detected level of O&G in the sample from well 54GW2 may be in excess of the organoleptic limit.

Total chromium, hexavalent chromium, and O&G were detected in 54GW3, with only O&G potentially greater than the action limit (organoleptic threshold).

The set one data were similar to the set two data, although the set one levels of the detected analytes were slightly higher. In addition, phenols had been detected in 54GW3 in the set one data.

SURFACE WATER/SEDIMENT: Three SW/SE stations located in shallow drainage ditches on the southeast and southwest sides of the site were sampled. One target analyte, phenol, was detected at low levels in one SW sample (54SW1) (Table S54-3). The level was below the applicable action limit. This result is surprising, as the field team had visually detected what appeared to be significant contamination in the ditches during past efforts at this site.

The SE data indicate that periodic contamination of the ditches, attributed to high ground water levels during periods of high rainfall, may occur at this site (Table S54-4). The chromium, lead, and phenols detected in the SE samples are typical constituents of the waste oils and fuels burned in the training pit at this site.

Geohydrology

A geologic cross section (Figure S54-2) was drawn on a northwest-southeast line (Figure S54-3) and shows the site to be underlain primarily by silty sand and silty gravelly sand, with discontinuous layers of coarse sand and clay. The surface of the shallow ground water at this site lies within the silty sand and coarse sand units at depths ranging from 0.79 to 9.83 ft below land surface. The ground water contour map (Figure S54-4) shows that shallow ground water flow is toward the drainage ditch along the southwest side of the site, with a gradient of approximately 0.037 ft/ft.

Migration Potential

As with the Round One effort, the immediate human health concern at Site 54 is the status of adjacent water supply wells. The current database does not indicate the degradation of this potable supply by the activities at Site 54. Shallow ground water and the sediments of the surrounding drainage network were found to contain elevated levels of a few target analytes. This suggests that low-level contamination is present at Site 54. The most significant potential migration pathway of these contaminants is via periodic high surface water flows related to high rainfall.

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET #	METHOD	SAMPLE ID/# 54GW1 LJGW-1 54	54GW2 LJGW-1 55	54GW3 LJGW-1 56
DATE				12/11/86	12/10/86	12/10/86
TIME				10:05	14:04	13:10
CADMIUM, TOTAL	UG/L	1027	ICAP	<2.9	<2.9	<2.9
CHROMIUM, TOTAL	UG/L	1034	ICAP	10.7	67.9	23.9
LEAD, TOTAL	UG/L	1051	ICAP	<27.0	<27.0	<27.0
CHROMIUM, (+6)	UG/L	1032	I	<10.0	14.6	<10.0
OIL&GR, IR	MG/L	560	I	3	<0.3	2
PHENOLS	UG/L	32730	I	4	<2	6
1,2-DIBROMOETHANE (EDB)	UG/L	77651	EC	<0.020	<0.020	<0.020
BENZENE	UG/L	34030	GMS	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE	UG/L	32101	GMS	<2.2	<2.2	<2.2
BROMOFORM	UG/L	32104	GMS	<4.7	<4.7	<4.7
BROMOMETHANE	UG/L	34413	GMS	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE	UG/L	32102	GMS	<2.8	<2.8	<2.8
CHLOROBENZENE	UG/L	34301	GMS	<6.0	<6.0	<6.0
CHLOROETHANE	UG/L	34311	GMS	<8.2	<8.2	<8.2
2-CHLOROETHYLVINYL ETHER	UG/L	34576	GMS	<15	<15	<15
CHLOROFORM	UG/L	32106	GMS	<1.6	<1.6	<1.6
CHLOROMETHANE	UG/L	34418	GMS	<4.3	<4.3	<4.3
DIBROMOCHLOROMETHANE	UG/L	32105	GMS	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE	UG/L	34496	GMS	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE	UG/L	34531	GMS	<2.8	<2.8	<2.8

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJSE-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

		SAMPLE ID/#		
PARAMETERS	STORET #	54SE1 LJSE-1	54SE2 LJSE-1	54SE3 LJSE-1
UNITS	METHOD	33	34	35
DATE		12/10/86	12/10/86	12/10/86
TIME		12:20	12:25	12:45
MOISTURE	70320	60.6	26.6	23.2
%WET WT	1			
CADMIUM,SED	1028	<1.44	<0.734	<0.723
UG/G- DRY	ICAP			
CHROMIUM,SED	1029	19.3	6.45	6.48
UG/G- DRY	ICAP			
LEAD,SED	1052	28.2	9.36	<6.73
UG/G-DRY	ICAP			
CHROMIUM(+6),SED	29405	<127	<68.1	<65.1
MG/KG-DRY	1			
OIL&GR,IR,SED	561	998	884	1560
UG/G- DRY	1			
PHENOLS,SED	32731	443	334	2010
UG/KG- DRY	1			
DIBROMOETHANE	78756	<0.353	<0.197	<0.174
UG/KG-DRY	EC			

SITE 75--MCAS BASKETBALL COURT SITE

Site Investigation

o Resample (one set) three existing monitor wells.

Data Evaluation

All Round Two sampling locations are shown in Figure S75-1.

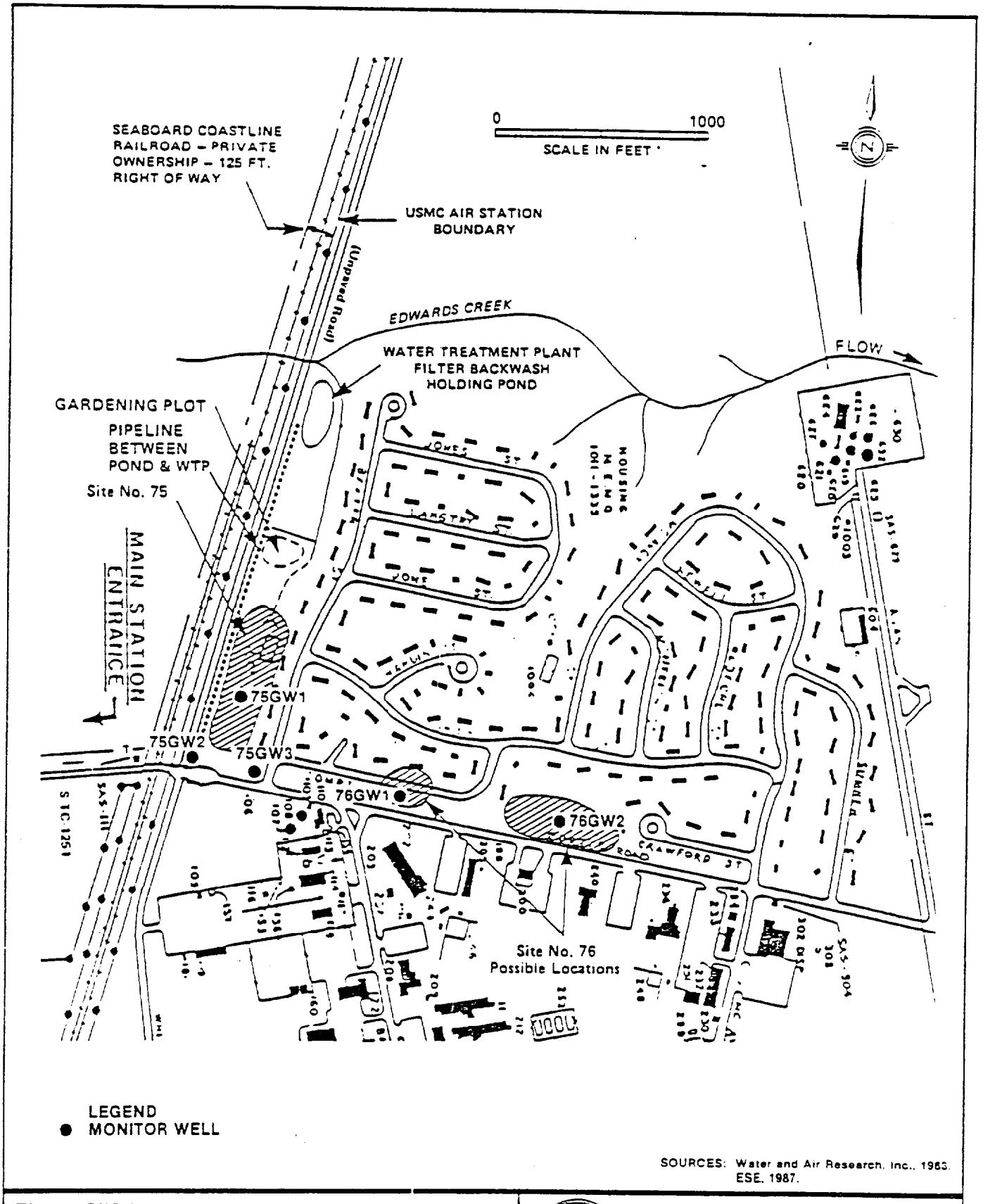
No target analytes were detected in samples from the three wells at Site 75, in accordance with previous sampling and analysis at this site (Table S75-1).

Geohydrology

A geologic cross section (Figure S75-2) was drawn on a generally east-west line (Figure S75-3) and includes wells in both Sites 75 and adjacent Site 76. The cross section shows the area to be underlain primarily by dipping layers of silty sand, silty-clayey sand, and clay. The surface of the shallow ground water cuts across these sloping layers at depths ranging from 2.37 to 5.87 ft below land surface. As four out of the five wells at these sites lie along a line, only a limited ground water contour map could be generated. This map (Figure S75-4) suggests that the ground water flow is in a radial pattern (to the north) from well 75GW3 and then eastward across site 76. The shallow ground water has a gradient of approximately 0.009 ft/ft parallel to Curtis Road (i.e., to the east).

Migration Potential

No target analytes have been detected by either the Round One or Round Two efforts. In addition, the geophysical investigation conducted as part of Round One did not identify the presence of any metallic objects in the subsurface. These data strongly suggest that no contamination problem exists at Site 75.



SOURCES: Water and Air Research, Inc., 1983.
ESE, 1987.

Figure S75-1
ROUND TWO SAMPLING LOCATIONS, SITES 75 AND 76—MCAS BASKETBALL COURT AND CURTIS ROAD SITES

CONFIRMATION STUDY
MARINE CORPS BASE
CAMP LEJEUNE

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PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	STORET #	SAMPLE ID/# 75GW1 LJGW-1 76	75GW2 LJGW-1 77	75GW3 LJGW-1 78
UNITS	METHOD			
DATE		11/21/86	11/21/86	11/21/86
TIME		13:00	11:35	12:10
2,3,7,8-TCDD	34675	<0.01	<0.01	<0.01
UG/L	GMS			
CHLOROPICRIN	77548	<0.010	<0.010	<0.010
UG/L	EC			
BENZENE	34030	<1.0	<1.0	<1.0
UG/L	GMS			
BROMODICHLOROMETHANE	32101	<2.2	<2.2	<2.2
UG/L	GMS			
BROMOFORM	32104	<4.7	<4.7	<4.7
UG/L	GMS			
BROMOMETHANE	34413	<5.8	<5.8	<5.8
UG/L	GMS			
CARBON TETRACHLORIDE	32102	<2.8	<2.8	<2.8
UG/L	GMS			
CHLOROBENZENE	34301	<6.0	<6.0	<6.0
UG/L	GMS			
CHLOROETHANE	34311	<8.2	<8.2	<8.2
UG/L	GMS			
2-CHLOROETHYL VINYL ETHER	34576	<15	<15	<26
UG/L	GMS			
CHLOROFORM	32106	<1.6	<1.6	<1.6
UG/L	GMS			
CHLOROMETHANE	34418	<4.3	<4.3	<4.3
UG/L	GMS			
DIBROMOCHLOROMETHANE	32105	<3.1	<3.1	<3.1
UG/L	GMS			
1,1-DICHLOROETHANE	34496	<4.7	<4.7	<4.7
UG/L	GMS			
1,2-DICHLOROETHANE	34531	<2.8	<2.8	<2.8
UG/L	GMS			
1,1-DICHLOROETHYLENE	34501	<2.8	<2.8	<2.8
UG/L	GMS			
TRANS-1,2-DICHLORO ETHENE	34546	<1.6	<1.6	<1.6
UG/L	GMS			
1,2-DICHLOROPROPANE	34541	<6.0	<6.0	<6.0
UG/L	GMS			
CIS-1,3-DICHLORO PROPENE	34704	<5.0	<5.0	<5.0
UG/L	GMS			
TRANS-1,3-DICHLORO PROPENE	34699	<6.4	<6.4	<6.4
UG/L	GMS			

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	STORET #	SAMPLE ID/# 75GW1 LJGW-1	75GW2 LJGW-1	75GW3 LJGW-1
UNITS	METHOD	76	77	78
DATE		11/21/86	11/21/86	11/21/86
TIME		13:00	11:35	12:10
ETHYLBENZENE	34371	<7.2	<7.2	<7.2
UG/L	GMS			
METHYLENE CHLORIDE	34423	<2.8	<2.8	<2.8
UG/L	GMS			
1,1,2,2-TETRACHLORO	34516	<4.1	<4.1	<4.1
ETHANE UG/L	GMS			
TETRACHLOROETHENE	34475	<3.0	<3.0	<3.0
UG/L	GMS			
TOLUENE	34010	<6.0	<6.0	<6.0
UG/L	GMS			
1,1,1-TRICHLOROETHANE	34506	<3.8	<3.8	<3.8
UG/L	GMS			
1,1,2-TRICHLOROETHANE	34511	<5.0	<5.0	<5.0
UG/L	GMS			
TRICHLOROETHENE	39180	<3.0	<3.0	<1.0
UG/L	GMS			
TRICHLOROFLUORO-	34488	<3.2	<3.2	<3.2
METHANE UG/L	GMS			
VINYL CHLORIDE	39175	<1.0	<1.0	<1.0
UG/L	GMS			
ACROLEIN	34210	<100	<100	<100
UG/L	GMS			
ACRYLONITRILE	34215	<100	<100	<100
UG/L	GMS			
DICHLORODIFLUORO-	34668	<10	<10	<10
METHANE UG/L	GMS			

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PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET # / METHOD	SAMPLE ID/# 75GW1 LJGW-1 76	75GW2 LJGW-1 77	75GW3 LJGW-1 78
DATE			11/21/86	11/21/86	11/21/86
TIME			13:00	11:35	12:10
2,3,7,8-TCDD	UG/L	34675 GMS	<0.01	<0.01	<0.01
CHLOROPICRIN	UG/L	77548 EC	<0.010	<0.010	<0.010
BENZENE	UG/L	34030 GMS	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE	UG/L	32101 GMS	<2.2	<2.2	<2.2
BROMOFORM	UG/L	32104 GMS	<4.7	<4.7	<4.7
BROMOMETHANE	UG/L	34413 GMS	<5.8	<5.8	<5.8
CARBON TETRACHLORIDE	UG/L	32102 GMS	<2.8	<2.8	<2.8
CHLOROBENZENE	UG/L	34301 GMS	<6.0	<6.0	<6.0
CHLOROETHANE	UG/L	34311 GMS	<8.2	<8.2	<8.2
2-CHLOROETHYL VINYL ETHER	UG/L	34576 GMS	<15	<15	<26
CHLOROFORM	UG/L	32106 GMS	<1.6	<1.6	<1.6
CHLOROMETHANE	UG/L	34418 GMS	<4.3	<4.3	<4.3
DIBROMOCHLOROMETHANE	UG/L	32105 GMS	<3.1	<3.1	<3.1
1,1-DICHLOROETHANE	UG/L	34496 GMS	<4.7	<4.7	<4.7
1,2-DICHLOROETHANE	UG/L	34531 GMS	<2.8	<2.8	<2.8
1,1-DICHLOROETHYLENE	UG/L	34501 GMS	<2.8	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE	UG/L	34546 GMS	<1.6	<1.6	<1.6
1,2-DICHLOROPROPANE	UG/L	34541 GMS	<6.0	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE	UG/L	34704 GMS	<5.0	<5.0	<5.0
TRANS-1,3-DICHLORO PROPENE	UG/L	34699 GMS	<6.4	<6.4	<6.4

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	STORET #	SAMPLE ID/# 75GW1 LJGW-1 76	75GW2 LJGW-1 77	75GW3 LJGW-1 78
UNITS	METHOD			
DATE		11/21/86	11/21/86	11/21/86
TIME		13:00	11:35	12:10
ETHYLBENZENE	34371	<7.2	<7.2	<7.2
UG/L	GMS			
METHYLENE CHLORIDE	34423	<2.8	<2.8	<2.8
UG/L	GMS			
1,1,2,2-TETRACHLORO	34516	<4.1	<4.1	<4.1
ETHANE UG/L	GMS			
TETRACHLOROETHENE	34475	<3.0	<3.0	<3.0
UG/L	GMS			
TOLUENE	34010	<6.0	<6.0	<6.0
UG/L	GMS			
1,1,1-TRICHLOROETHANE	34506	<3.8	<3.8	<3.8
UG/L	GMS			
1,1,2-TRICHLOROETHANE	34511	<5.0	<5.0	<5.0
UG/L	GMS			
TRICHLOROETHENE	39180	<3.0	<3.0	<1.0
UG/L	GMS			
TRICHLOROFLUORO-	34488	<3.2	<3.2	<3.2
METHANE UG/L	GMS			
VINYL CHLORIDE	39175	<1.0	<1.0	<1.0
UG/L	GMS			
ACROLEIN	34210	<100	<100	<100
UG/L	GMS			
ACRYLONITRILE	34215	<100	<100	<100
UG/L	GMS			
DICHLORODIFLUORO-	34668	<10	<10	<10
METHANE UG/L	GMS			

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET # METHOD	SAMPLE ID/# 76GW1 LJGW-1 79	76GW2 LJGW-1 80
DATE			11/21/86	11/21/86
TIME			13:40	14:10
ETHYLBENZENE	UG/L	34371 GMS	<7.2	<7.2
METHYLENE CHLORIDE	UG/L	34423 GMS	<2.8	<2.8
1,1,2,2-TETRACHLORO ETHANE	UG/L	34516 GMS	<4.1	<4.1
TETRACHLOROETHENE	UG/L	34475 GMS	<3.0	<3.0
TOLUENE	UG/L	34010 GMS	<6.0	<6.0
1,1,1-TRICHLOROETHANE	UG/L	34506 GMS	<3.8	<3.8
1,1,2-TRICHLOROETHANE	UG/L	34511 GMS	<5.0	<5.0
TRICHLOROETHENE	UG/L	39180 GMS	<1.0	<1.0
TRICHLOROFLUORO-METHANE	UG/L	34488 GMS	<3.2	<3.2
VINYL CHLORIDE	UG/L	39175 GMS	<1.0	<1.0
ACROLEIN	UG/L	34210 GMS	<100	<100
ACRYLONITRILE	UG/L	34215 GMS	<100	<100
DICHLORODIFLUORO-METHANE	UG/L	34668 GMS	<10	<10

PROJECT NUMBER 86447 0403 PROJECT NAME LEJEUNE-NAVY
FIELD GROUP LJGW-2 PROJECT MANAGER JDS
LAB COORDINATOR JEFF SHAMIS

SAMPLE ID/#

PARAMETERS	STORET #	76GW2 LJGW-2
UNITS	METHOD	29
DATE		01/21/87
TIME		09:55
CHLOROPICRIN	77548	<0.010
UG/L	EC	

SITE A--MCAS (H) OFFICERS' HOUSING AREA

Site Investigation

- o Install two shallow monitor wells.
- o Sample (two sets) two monitor wells.
- o Sample (one set) surface water and sediment from one station in the New River adjacent to the site.

Data Evaluation

All Round Two sampling locations are shown in Figure SA-1.

GROUND WATER: No target analytes were detected in the ground water samples (set one) collected from wells AGW1 and AGW2 (Table SA-1). The two monitor wells were resampled during the set two effort. Low levels of O&G, not identified by the set one data, were detected (Table SA-2). The levels may be below the organoleptic limit and do not appear to be related to the suspected burial at this site. No target analytes which would result in a human health risk were detected in the ground water collected from wells at this site. The chemical data strongly indicate that no contamination problem exists at Site A.

SURFACE WATER/SEDIMENT: One SW/SE station located in the New River was sampled. No target analytes were detected in the surface water samples (Table SA-3). O&G was detected in the SE sample, but this appears to be a "background" value typical of the New River sediments in the vicinity of Camp Lejeune (Table SA-4). The materials allegedly disposed of at Site A are not a likely source of the O&G.

Geohydrology

A geologic cross section (Figure SA-2) was drawn on a northwest-southeast line (Figure SA-3) and shows the site to be underlain by clay at the surface, followed by layers of silty sand, sand, and back to silty sand. The surface of the shallow ground water at this site lies within the

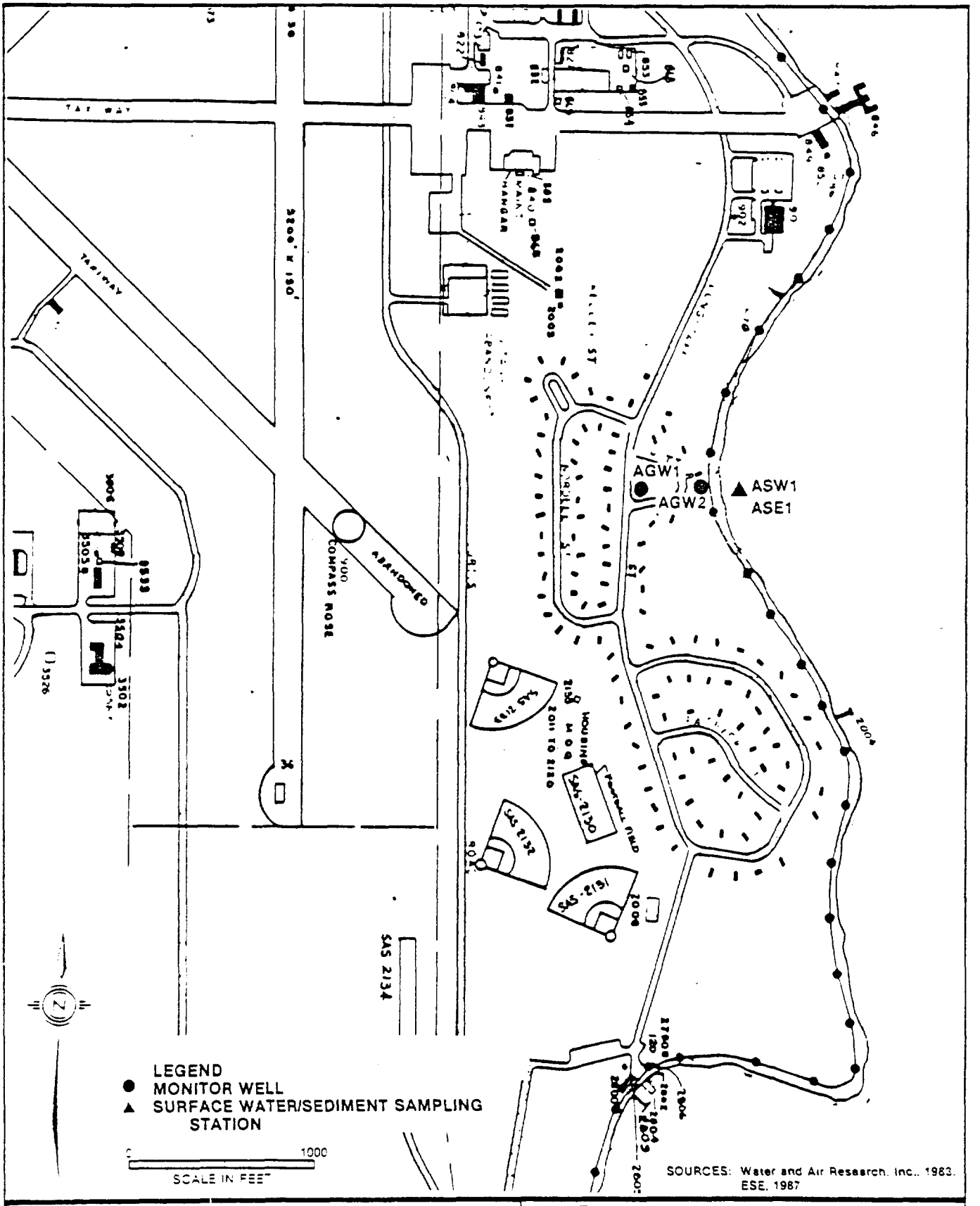

Figure SA-1
ROUND TWO SAMPLING LOCATIONS, SITE A—
MCAS (H) OFFICERS' HOUSING AREA

CONFIRMATION STUDY
MARINE CORPS BASE
CAMP LEJEUNE

upper silty sand and sand at depths ranging from 7.68 to 11.10 ft below land surface. The ground water contour map (Figure SA-4) shows the gradient of the shallow ground water to be to the east (toward the New River) at a value of approximately 0.019 ft/ft.

Migration Potential

The ground water contour map indicates that any contamination present at Site A would migrate to the east and discharge into the New River. The chemical data strongly suggest that no contamination is present at Site A. Therefore, contaminant migration is not a problem.

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MMANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET # METHOD	SAMPLE ID/# AGW1 LJGW-1 81	AGW2 LJGW-1 82
DATE			12/16/86	12/16/86
TIME			10:58	10:10
CHLOR FREE AV.	MG/L	50064 0	<0.1	<0.1
OIL&GR IR	MG/L	560 1	<0.3	<0.3
BENZENE	UG/L	34030 GMS	<1.0	<1.0
BROMODICHLOROMETHANE	UG/L	32101 GMS	<2.2	<2.2
BROMOFORM	UG/L	32104 GMS	<4.7	<4.7
BROMOMETHANE	UG/L	34413 GMS	<5.8	<5.8
CARBON TETRACHLORIDE	UG/L	32102 GMS	<2.8	<2.8
CHLOROBENZENE	UG/L	34301 GMS	<6.0	<6.0
CHLOROETHANE	UG/L	34311 GMS	<8.2	<8.2
2 CHLOROETHYLVINYL ETHER	UG/L	34576 GMS	<26	<15
CHLOROFORM	UG/L	32106 GMS	<1.6	<1.6
CHLOROMETHANE	UG/L	34418 GMS	<4.3	<4.3
DIBROMOCHLOROMETHANE	UG/L	32105 GMS	<3.1	<3.1
1,1 DICHLOROETHANE	UG/L	34496 GMS	<4.7	<4.7
1,2 DICHLOROETHANE	UG/L	34531 GMS	<2.8	<2.8
1,1-DICHLOROETHYLENE	UG/L	34501 GMS	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE	UG/L	34546 GMS	<1.6	<1.6
1,2 DICHLOROPROPANE	UG/L	34541 GMS	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE	UG/L	34704 GMS	<5.0	<5.0
TRANS 1,3 DICHLORO PROPENE	UG/L	34699 GMS	<6.4	<6.4

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJGW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET #	METHOD	SAMPLE ID/# AGW1 LJGW-1 81	AGW2 LJGW-1 82
DATE				12/16/86	12/16/86
TIME				10:58	10:10
ETHYLBENZENE	UG/L	34371	GMS	<7.2	<7.2
METHYLENE CHLORIDE	UG/L	34423	GMS	<2.8	<2.8
1,1,2,2-TETRACHLOROETHANE	UG/L	34516	GMS	<4.1	<4.1
TETRACHLOROETHENE	UG/L	34475	GMS	<3.0	<3.0
TOLUENE	UG/L	34010	GMS	<6.0	<6.0
1,1,1-TRICHLOROETHANE	UG/L	34506	GMS	<3.8	<3.8
1,1,2-TRICHLOROETHANE	UG/L	34511	GMS	<5.0	<5.0
TRICHLOROETHENE	UG/L	39180	GMS	<1.0	<3.0
TRICHLOROFLUORO-METHANE	UG/L	34488	GMS	<3.2	<3.2
VINYL CHLORIDE	UG/L	39175	GMS	<1.0	<1.0
ACROLEIN	UG/L	34210	GMS	<100	<100
ACRYLONITRILE	UG/L	34215	GMS	<100	<100
DICHLORODIFLUORO-METHANE	UG/L	34668	GMS	<10	<10

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PROJECT NUMBER 86447 0403 PROJECT NAME LEJEUNE-NAVY
FIELD GROUP LJGW-2 PROJECT MANAGER JDS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET # / METHOD	SAMPLE ID/# AGW1 LJGW-2 30	AGW2 LJGW-2 31
DATE			03/06/87	03/06/87
TIME			12:05	00:00
CHLOR. FREE AV.	MG/L	50064 / 0	<0.1	<0.1
OIL&GR. IR	MG/L	560 / 1	0.8	0.3
BENZENE	UG/L	34030 / GMS	<1.0	<1.0
BROMODICHLOROMETHANE	UG/L	32101 / GMS	<2.2	<2.2
BROMOFORM	UG/L	32104 / GMS	<4.7	<4.7
BROMOMETHANE	UG/L	34413 / GMS	<5.8	<5.8
CARBON TETRACHLORIDE	UG/L	32102 / GMS	<2.8	<2.8
CHLOROBENZENE	UG/L	34301 / GMS	<6.0	<6.0
CHLOROETHANE	UG/L	34311 / GMS	<8.2	<8.2
2-CHLOROETHYL VINYL ETHER	UG/L	34576 / GMS	<15	<15
CHLOROFORM	UG/L	32106 / GMS	<1.6	<1.6
CHLOROMETHANE	UG/L	34418 / GMS	<4.3	<4.3
DIBROMOCHLOROMETHANE	UG/L	32105 / GMS	<3.1	<3.1
1,1-DICHLOROETHANE	UG/L	34496 / GMS	<4.7	<4.7
1,2-DICHLOROETHANE	UG/L	34531 / GMS	<2.8	<2.8
1,1-DICHLOROETHYLENE	UG/L	34501 / GMS	<2.8	<2.8
TRANS-1,2-DICHLORO ETHENE	UG/L	34546 / GMS	<1.6	<1.6
1,2-DICHLOROPROPANE	UG/L	34541 / GMS	<6.0	<6.0
CIS-1,3-DICHLORO PROPENE	UG/L	34704 / GMS	<5.0	<5.0
TRANS-1,3-DICHLORO PROPENE	UG/L	34699 / GMS	<6.4	<6.4

PROJECT NUMBER 86447 0403 PROJECT NAME LEJEUNE-NAVY
FIELD GROUP LJGW-2 PROJECT MANAGER JDS
LAB COORDINATOR JEFF SHAMIS

PARAMETERS	UNITS	STORET # / METHOD	SAMPLE ID/# AGW1 LJGW-2 30	AGW2 LJGW-2 31
DATE			03/06/87	03/06/87
TIME			12:05	00:00
ETHYLBENZENE	UG/L	34371 GMS	<7.2	<7.2
METHYLENE CHLORIDE	UG/L	34423 GMS	<2.8	<2.8
1,1,2,2-TETRACHLORO ETHANE	UG/L	34516 GMS	<4.1	<4.1
TETRACHLOROETHENE	UG/L	34475 GMS	<3.0	<3.0
TOLUENE	UG/L	34010 GMS	<6.0	<6.0
1,1,1 TRICHLOROETHANE	UG/L	34506 GMS	<3.8	<3.8
1,1,2-TRICHLOROETHANE	UG/L	34511 GMS	<5.0	<5.0
TRICHLOROETHENE	UG/L	39180 GMS	<3.0	<3.0
TRICHLOROFLUORO-METHANE	UG/L	34488 GMS	<3.2	<3.2
VINYL CHLORIDE	UG/L	39175 GMS	<1.0	<1.0
ACROLEIN	UG/L	34210 GMS	<100	<100
ACRYLONITRILE	UG/L	34215 GMS	<100	<100
DICHLORODIFLUORO-METHANE	UG/L	34668 GMS	<10	<10

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJSW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

SAMPLE ID/#

PARAMETERS	UNITS	STORET # / METHOD	ASW1 LJSW-1 44
DATE			12/17/86
TIME			09:30
CHLOR. FREE AV.	MG/L	50064 0	<0.1
OIL&GR. IR	MG/L	560 1	<0.3
BENZENE	UG/L	34030 GMS	<1.0
BROMODICHLOROMETHANE	UG/L	32101 GMS	<2.2
BROMOFORM	UG/L	32104 GMS	<4.7
BROMOMETHANE	UG/L	34413 GMS	<5.8
CARBON TETRACHLORIDE	UG/L	32102 GMS	<2.8
CHLOROBENZENE	UG/L	34301 GMS	<6.0
CHLOROETHANE	UG/L	34311 GMS	<8.2
2-CHLOROETHYL VINYL ETHER	UG/L	34576 GMS	<26
CHLOROFORM	UG/L	32106 GMS	<1.6
CHLOROMETHANE	UG/L	34418 GMS	<4.3
DIBROMOCHLOROMETHANE	UG/L	32105 GMS	<3.1
1,1-DICHLOROETHANE	UG/L	34496 GMS	<4.7
1,2-DICHLOROETHANE	UG/L	34531 GMS	<2.8
1,1-DICHLOROETHYLENE	UG/L	34501 GMS	<2.8
TRANS-1,2-DICHLORO ETHENE	UG/L	34546 GMS	<1.6
1,2 DICHLOROPROPANE	UG/L	34541 GMS	<6.0
CIS 1,3-DICHLORO PROPENE	UG/L	34704 GMS	<5.0
TRANS 1,3-DICHLORO PROPENE	UG/L	34699 GMS	<6.4

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJSW-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

SAMPLE ID/#

PARAMETERS	UNITS	STORET # METHOD	ASW1 LJSW-1 44
DATE			12/17/86
TIME			09:30
ETHYLBENZENE	UG/L	34371 GMS	<7.2
METHYLENE CHLORIDE	UG/L	34423 GMS	<2.8
1,1,2,2-TETRACHLORO ETHANE	UG/L	34516 GMS	<4.1
TETRACHLOROETHENE	UG/L	34475 GMS	<3.0
TOLUENE	UG/L	34010 GMS	<6.0
1,1,1-TRICHLOROETHANE	UG/L	34506 GMS	<3.8
1,1,2-TRICHLOROETHANE	UG/L	34511 GMS	<5.0
TRICHLOROETHENE	UG/L	39180 GMS	<1.0
TRICHLOROFLUORO-METHANE	UG/L	34488 GMS	<3.2
VINYL CHLORIDE	UG/L	39175 GMS	<1.0
ACROLEIN	UG/L	34210 GMS	<100
ACRYLONITRILE	UG/L	34215 GMS	<100
DICHLORODIFLUORO-METHANE	UG/L	34668 GMS	<10

PROJECT NUMBER 86447 0400 PROJECT NAME NAVY - LEJEUNE
FIELD GROUP LJSE-1 PROJECT MANAGER J.D. SHAMIS
LAB COORDINATOR JEFF SHAMIS

SAMPLE ID/#

PARAMETERS	UNITS	STORET # / METHOD	ASE1 LJSE-1 41
DATE			12/17/86
TIME			09:30
MOISTURE		70320	18.1
	%WET WT	1	
OIL&GR, IR, SED		561	167
	UG/G- DRY	1	

REFERENCE B

APRIL 1983

INITIAL ASSESSMENT STUDY OF MARINE CORPS BASE CAMP LEJEUNE NORTH CAROLINA

NEESA 13-011

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY
Port Hueneme, California 93043

MCAS New River. As many as 10,000 to 15,000 gallons may have been disposed of over 9 years. Most were probably burned.

2.4.13 Site No. 41: Camp Geiger Dump Near Former Trailer Park. This dump (at PWDM coordinates 13, E2-3) was active from 1953 to 1970. According to interviews with MCAS New River and Camp Lejeune Base personnel, it received POL compounds, solvents, old batteries, other assorted municipal waste, some ordnance and, in 1964, bags of Mirex. The site is estimated to cover 15 acres and to contain 110,000 cubic yards of waste. The amount of solvents and oils disposed of is estimated to be about 10,000 to 15,000 gallons; the amount of Mirex is estimated to be several tons. The amount of ordnance is not known.

2.4.14 Site No. 45: Campbell Street Underground Avgas Storage and Adjacent JP Fuel Farm. This site is at PWDM coordinates 23, O13-14/P13-14. The two facilities are on each side of White Street and on the north side of Campbell Street. In 1978, 200 to 300 gallons of Avgas were spilled or leaked from this facility. It is estimated that during 1981-1982 more than 100,000 gallons of fuel leaked into the surrounding soil due to corrosion of underground lines at the JP Fuel Farm. These lines have been replaced with an aboveground system. Although the volume of Avgas loss is low, the estimate may be conservative.

2.4.15 Site No. 48: MCAS New River Mercury Dump Site. This area is at PWDM coordinates 23, D17/E17. From 1956 to 1966, metallic mercury from the delay lines of the radar units was reported to have been buried around the photo lab, Building 804. One gallon per year was disposed of in this area. More than 1000 pounds may be dispersed over approximately 20,000 square feet adjacent to the New River.

2.4.16 Site No. 54: Crash Crew Fire Training Burn Pit. This site (PWDM coordinates 23, O24-25/P24-25) is an area off Runway 5-23 that has been used since the 1950s for crash crew training with various POL compounds. Originally, training was on the ground surface with the area surrounded by a berm. Later, a pit was used, which was eventually lined. The area is about 1.5 acres. Based on present annual POL usage of 15,000 gallons, nearly one-half million gallons of these compounds have been used at this site. Most of the POL was burned, but as many as 3,000 to 4,000 gallons may have soaked into the soil.

2.4.17 Site No. 68: Rifle Range Dump. This site (PWDM coordinates 16, H6-8/I6-7) was active from 1942 to 1972. Fill capacity of the dump is estiimated at 100,000 cubic yards. Types of wastes buried here include garbage, building debris, Waste Treatment Plant (WTP) sludge, and solvents. Solvents are used extensively for weapons cleaning. However, the amount disposed of at this site is relatively small and estimated to be approximately 1,000 to 2,000 gallons. Solvents are of concern because nearby Well Nos. RR-45 and RR-97 have been found to contain organic contaminants. The distance between the wells and the site is approximately 1,500 feet. Although the wells are upgradient, pumping could draw contaminants toward these wells. Table 2-2 contains results of volatile organic analyses run on samples from active Well Nos. RR-45, RR-47,

New River in 1968. In 1942, three new runways were added and the station came under the jurisdiction of MCAS Cherry Point. During this time, a PBJ squadron was based here and the facility was also used for glider training (NAVFACENGCOM, 1975). During the Korean War, it was used as a helicopter training base and for touch-and-go training for jet fighters (Natural Resource Management Plan, 1975).

In 1968, Marine Corps Outlying Landing Field (MCOLF) Oak Grove was placed under the jurisdiction of MCAS New River. The field was used as a helicopter base and renamed HOLF Oak Grove. During World War II, the field was under the command of MCAS Cherry Point. At the end of that war, all structures were destroyed with the exception of the runways.

5.3 PHYSICAL FEATURES.

5.3.1 Climatology. The North Carolina coastal plain area in which MCB Camp Lejeune is located is influenced by mild winters. Summers are humid with typically elevated temperatures. Rainfall usually averages more than 50 inches per year. Potential evapotranspiration in the region varies from 34 to 36 inches of rainfall equivalent per year (Narkunas, 1980). Winter and summer are the usual wet seasons. Temperature ranges are reported to be 33°F to 53°F during January and 71°F to 88°F in July (Odell, 1970).

Winds during the warm seasons are generally south-southwesterly while north-northwest winds predominate in winter. There is a relatively long growing season of 230 days. A summary of regional climatic conditions is shown in Figure 5-1.

5.3.2 Topography and Surface Drainage. The generally flat topography of the Camp Lejeune complex is typical of the seaward portions of the North Carolina coastal plain. Elevations on the base vary from sea level to 72 feet above msl; however, the elevation of most of Camp Lejeune is between 20 and 40 feet above msl. The coast is guarded by a 200- to 500-foot-wide barrier island complex. Elevations of the dune field on the barrier islands range from 10 to 40 feet above msl. Drainage at Camp Lejeune is predominately toward the New River, although areas near the coast drain directly toward the Atlantic Ocean through the Intracoastal Waterway. In developed areas, natural drainage has been changed by drainage ditches, storm sewers, and extensive concrete and asphalt areas. Drainage sub-basins for Hadnot Point area and MCAS New River are shown in Figures 5-2 and 5-3, respectively. Most sites evaluated in this study are in these two areas.

Approximately 70 percent of Camp Lejeune is in the broad, flat interstream areas (Atlantic Division, Bureau of Yards and Docks, 1965). Drainage here is poor, and the soils are often wet.

Flooding is a potential problem for base areas within the 100-year floodplain. The U.S. Army Corps of Engineers has mapped the limits of 100-year floodplain at Camp Lejeune at 7.0 feet above msl in the upper reaches of the New River (Natural Resource Management Plan,

(Burnette, 1977). At MCB Camp Lejeune, the New River flows in a southerly direction and empties into the Atlantic Ocean through the New River Inlet. Several small coastal creeks drain the area of MCB Camp Lejeune that is not drained by the New River and its tributaries. These creeks flow into the Intracoastal Waterway, which is connected to the Atlantic Ocean by Bear Inlet, Brown's Inlet, and the New River Inlet.

Wilder et al. (1978) state the standard streamflow measurements employed by the U.S. Geological Survey are not applicable in low-gradient, tidal conditions. This is probably why streamflow in the New River below Jacksonville has not been determined. The tides at New River Inlet have a normal range of 3.0 feet and a spring range of 3.6 feet (U.S. Department of Commerce, 1979). The tidal range diminishes upstream to approximately 1 foot at Jacksonville (Howard, 1982). The flood tidal prism entering the New River Inlet in one tidal cycle was determined to be approximately 2.35×10^5 ft^3 (Burnette, 1977).

The average annual runoff of the MCB Camp Lejeune area has not been determined; however, Craven and Carteret Counties, to the northeast, have an average annual runoff of approximately 18 inches. The groundwater contribution to runoff in the same area northeast of MCB Camp Lejeune is estimated as 65 percent of total runoff (Wilder et al., 1978).

The water in the New River at MCB Camp Lejeune is brackish, shallow, and warm. Salinity is largely a function of distance from the ocean and rainfall. At Jacksonville, the New River may reach salinities of 10 parts per thousand (ppt) during extended periods of low rainfall. However, near the New River Inlet, salinity in the river is usually equivalent to that of sea water (35 ppt). Salinities near the inlet become significantly lower only during heavy rains (Burnette, 1977).

Water quality criteria for surface waters in North Carolina have been published under Title 15 of the North Carolina Administrative Code. The New River at MCB Camp Lejeune falls into two classifications (Figure 5-7). Classification SC applies to three areas of the New River at MCB Camp Lejeune. The best usage of Class SC waters is "fishing, secondary recreation, and any other usage except primary recreation or shellfishing for market purposes." The rest of the New River at MCB Camp Lejeune is Class SA, the highest estuarine classification. The best usage of Class SA waters is "shellfishing for market purposes and any other usage specified by the SB or SC classification."

5.3.4.2 Groundwater. The uppermost 300 feet of sediments at MCB Camp Lejeune is the source of fresh water for the base. Brackish water is usually found deeper than 300 feet below msl (Shiver, 1982). In general, the aquifer system consists of a water table aquifer and one or more semi-confined aquifers. Confining beds lie between the two aquifer systems and between the layers of the semi-confined aquifers. Variations in the local hydrogeology result from the complex depositional history of the area.

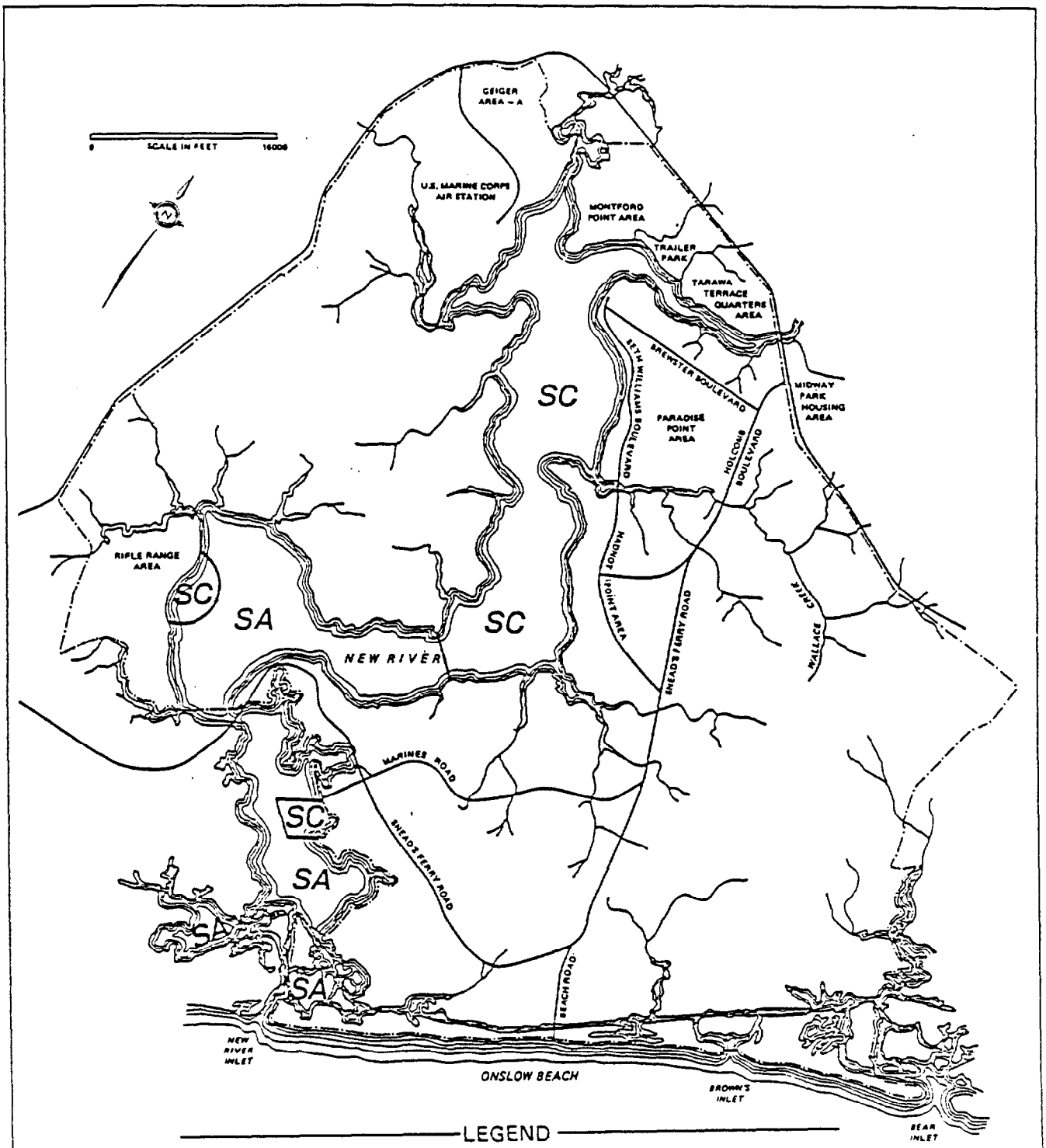


FIGURE 5–7
Water Quality Classifications for the New River at MCB Camp Lejeune

SOURCE: NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES, 1977

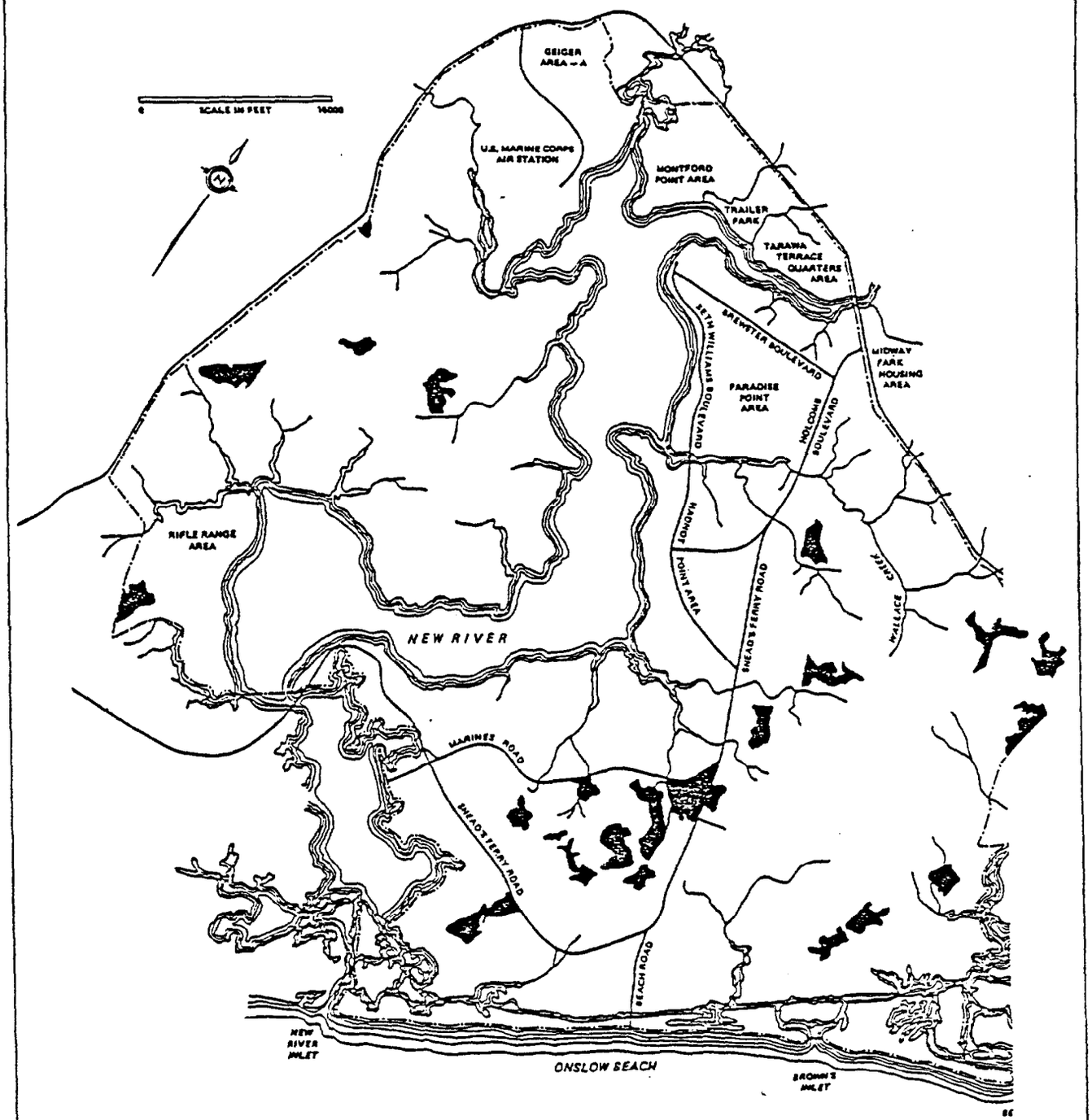


FIGURE 5–9
Red-Cockaded Woodpecker Colony Areas at MCB Camp Lejeune

SOURCE: PETERSON, 1982

Table 6-4. Constituents in Waste Oil, MCB Camp Lejeune, 1981

Component	Concentration (mg/l)
Antimony	<0.02
Arsenic	<0.002
Barium	1.08
Beryllium	<0.005
Cadmium	1.88
Chromium	0.16
Copper	4.44
Lead	376.0
Mercury	<0.002
Nickel	0.36
Selenium	<0.002
Silver	0.16
Thallium	<0.1
Zinc	475.0
Toluene	0.012
1,1-Dichloroethane	0.004
Phenol	20

Source: LANTNAVFACENGCOM, 1981.

Taken from: Initial Assessment Study of Marine Corps Base Camp Lejeune North Carolina.
NEESA 13-011, April 1983

Site No.: 45

Name: Campbell Street Underground Avgas Storage and Adjacent JP Fuel Farm at Air Station

Location: PWDM Coordinates 23, 013-14/P13-14; Campbell Street at White Street (JP Fuel Farm) and approximately 250 feet east of White Street (Avgas).

Figures and Photos: 2-1, 6-23b, 6-24, 6-25

Size: The underground storage area is approximately 40,000 square feet. The JP Fuel Farm covers approximately 6 acres.

Previously Reported: No

Activity: Underground tank (or tanks) leaked at the fuel storage area during 1978. At the JP Fuel Farm, extensive leakage from underground connecting lines was discovered in about 1981. Southeastern one-third of area (i.e., approximately 2 acres) is generally affected.

Materials Involved: Avgas and JP fuel

Quantity: 200 to 300 gallons of Avgas. Assuming soils overlying groundwater are generally saturated with oil over about 2 acres, about 600,000 gallons of oil may be involved (i.e., using 20-percent porosity and 5 feet to groundwater). Therefore, estimates are that more than 100,000 gallons of JP fuel have leaked.

When: 1978

Comments: These two storage areas are close together and are considered as one site. Most recent leaks were JP-4 and JP-5 from underground pipes. These pipes have been replaced by an above-ground system in which leaks can be readily detected. An oil-water separator has been installed on the south boundary of the fuel farm, which now shows a substantial amount of oil. Drainage ditch and canal parallel Campbell Street, then flow southward.

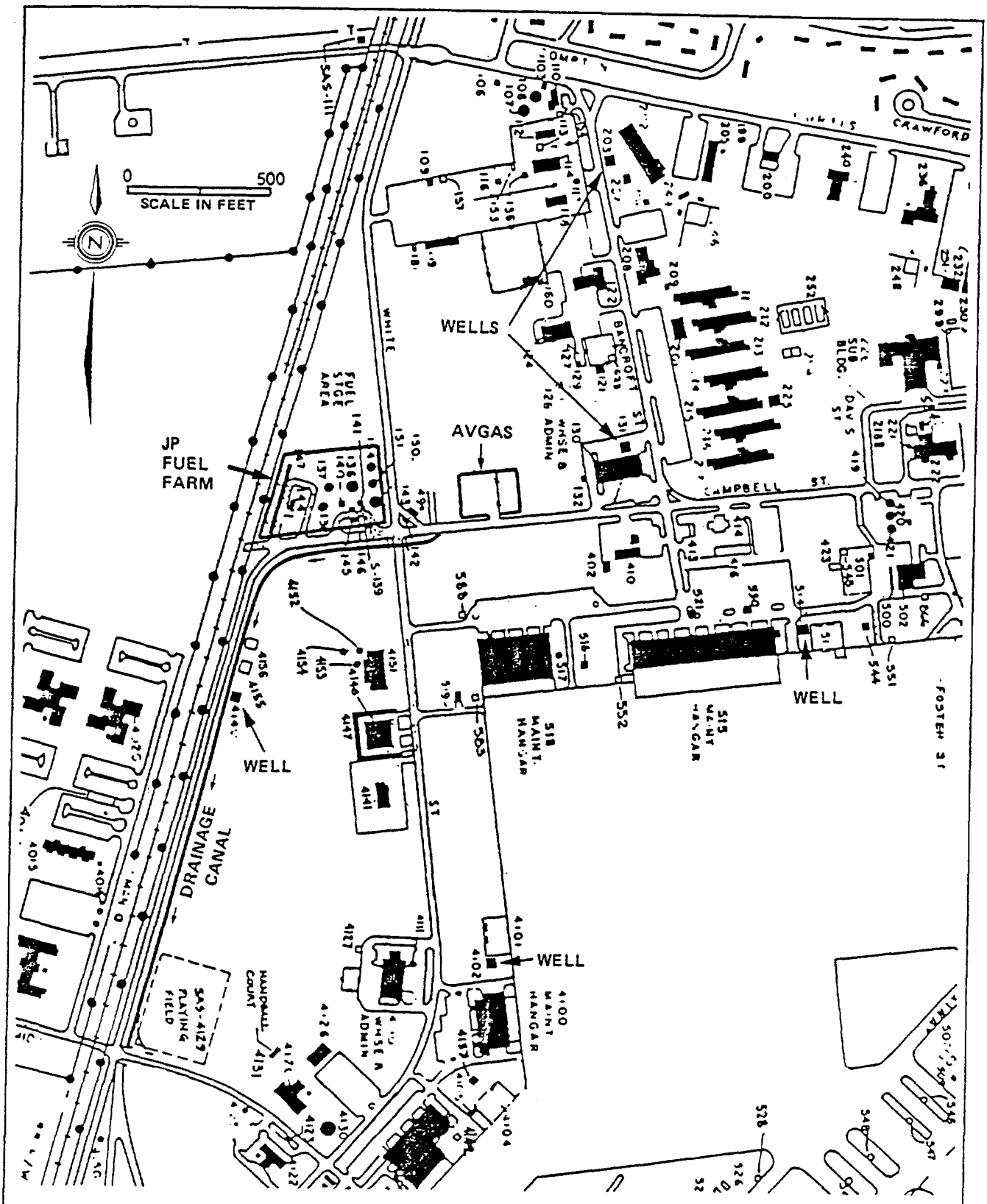


FIGURE 6–24

Detail of Site No. 45, Campbell Street Underground Avgas Storage and Adjacent JP Fuel Farm

SOURCE: BASE PUBLIC WORKS DEVELOPMENT MAP, SHEET 23 OF 24, JUNE 30, 1979.

Site No.: 48

Name: MCAS New River Mercury Dump Site

Location: PWDM Coordinates 23, D17/E17; Building 804 on Longstaff Road

Figures and Photos: 2-1, 6-26

Size: The disposal area is in a 100- x 200-foot corridor extending from the rear of Buiding 804 to the river.

Previously Reported: No

Activity: Mercury was drained from radar units periodically and disposed in woods near photo lab (Building 804).

Materials Involved: Metallic mercury

Quantity: Approximately 1 gallon per year over 10 years, i.e., more than 1,000 pounds total.

When: 1956 to 1966

Comments: Best information indicates that material was carried by hand, probably to area between building and river, and dumped or buried in small quantities at randomly selected spots. The solubility of metallic mercury is about 25 ppb, at 25°C, although this may increase due to chloride or hydride complex formation under the proper environmental conditions. The biological transformations of mercury in the aquatic environment (water and sediment) are complex and can enhance bioaccumulation in the food chain. The EPA drinking water standard for mercury is 2 ppb. One thousand pounds (454 kg) of mercury could contaminate about 184,000 acre-feet (227×10^6 m^3) of water to this level.

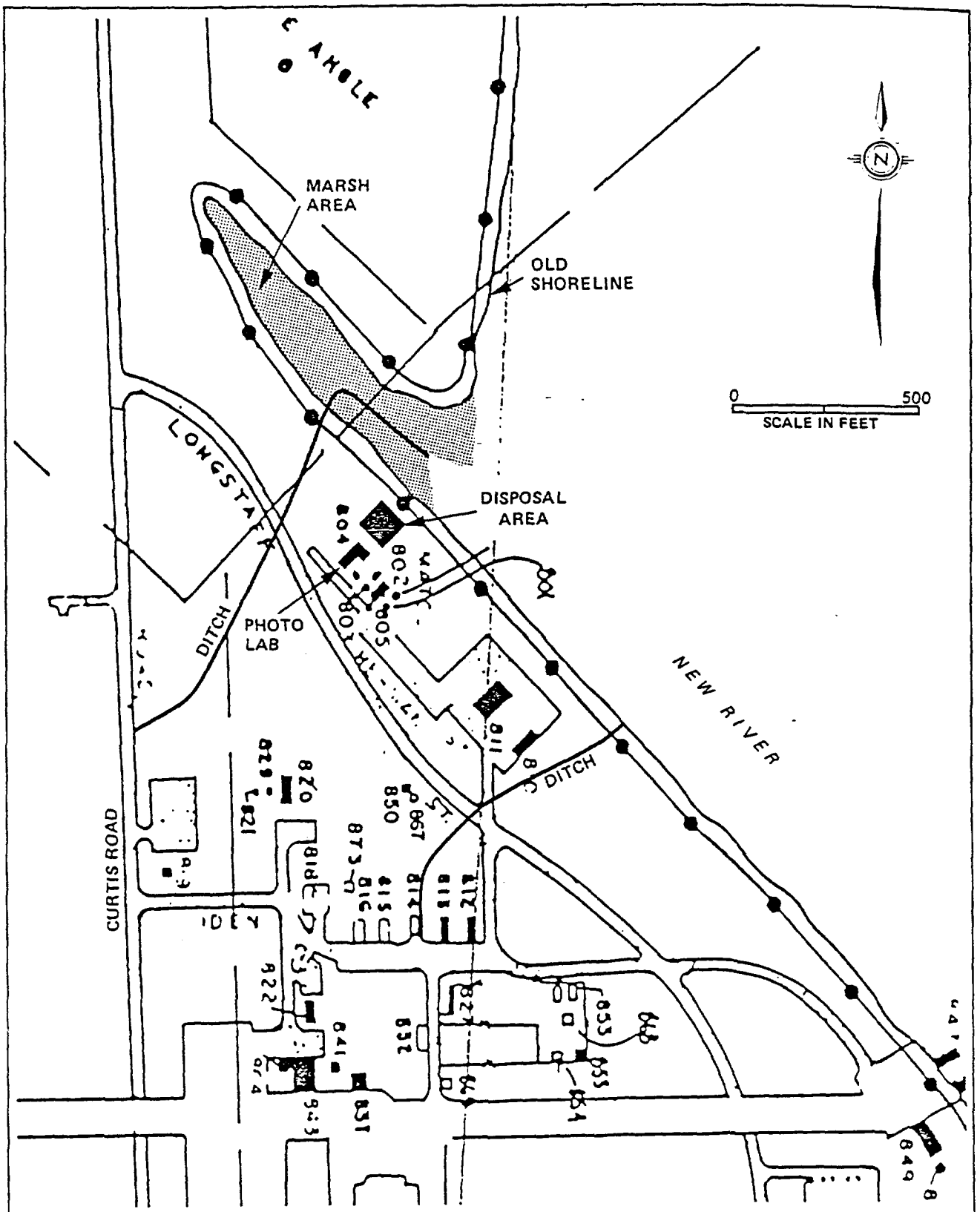


FIGURE 6–26
Detail of Site No. 48, MCAS New River Mercury Dump Site

SOURCE: BASE PUBLIC WORKS DEVELOPMENT MAP, SHEET 23 OF 24, JUNE 30, 1979.

Site No.: 54

Name: Crash Crew Fire Training Burn Pit at Air Station

Location: PWDM Coordinates 23, 024-25/P24-25; adjacent to southwest end of Runway 5-23 near Building 3614.

Figures and Photos: 2-1, 6-27, 6-28

Size: Affected area is approximately 1.5 acres.

Previously Reported: Yes EPA Form 8900-1 MC Bul 6280

Activity: Pit used in crash crew training at air station. Waste oils and solvents were burned.

Materials Involved: Contaminated fuels (principally JP-type, although leaded fuel may also have been used), waste solvents

Quantity: Based on present usage of 15,000 gallons of POL annually, nearly 1/2 million gallons of these compounds have been used at this site. If only 1 percent of solvents and POL soaked into ground before lining, then 3,000 to 4,000 gallons would have entered the soils. Caution: Reliable data have not been found from which to quantify soil contamination. The above estimating procedure is used to provide order of magnitude guidance only.

When: First use is believed to have been in mid-1950s.

Comments: Burn pit was lined around 1975. According to some reports, site was used unlined a number of years before this. However, 1964 aerial photographs reveal a very "clean" looking area; no large fuel stains are apparent.

Note: Size estimates are based on map and photograph information. Field estimates may have been made, but no field measurements have been performed. Estimates are provided for general guidance only.

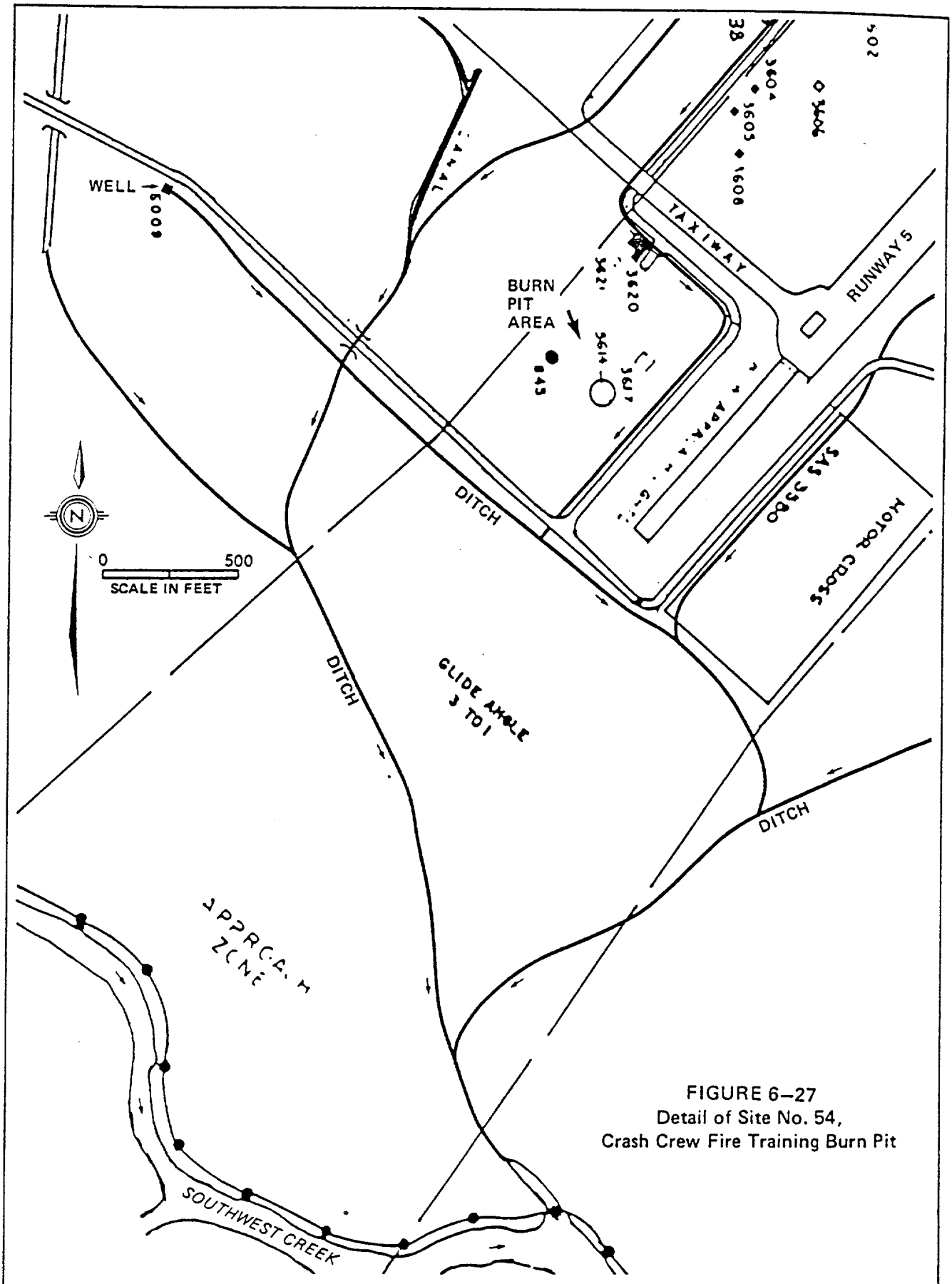


FIGURE 6–27
Detail of Site No. 54,
Crash Crew Fire Training Burn Pit

SOURCE: BASE PUBLIC WORKS DEVELOPMENT MAP, SHEET 23 OF 24, JUNE 30, 1979 AND MCAS DRAINAGE – PUBLIC WORKS DRAWING 13377.

Site No.: 75

Name: MCAS Basketball Court Site

Location: PWDM Coordinates 23, 08-9/P8-9; north of Curtis Road to the vicinity of the basketball court (Structure No. 1005) and between railroad tracks and housing area.

Figures and Photos: 2-1, 6-25, 6-36

Size: Pit was oval shaped, 90 feet long by 70 feet wide, at least 6 feet deep.

Previously Reported: No

Activity: Burial of drums occurred at this location.

Materials Involved: Material was called "gas" by personnel who unloaded it and is believed to be CN tear compound in solution. Solvents might include any one or more of the following: chloroform, carbon tetrachloride, benzene, and chloropicrin (PS).

Quantity: 75 to 100 55-gallon drums or 4,100 to 5,500 gallons

When: Early 1950s

Comments: Some conflicting data from former heavy equipment operators exist about this site. At least one disposal operation took place during which 75 to 100 55-gallon drums were buried. A crane was used to dig an oval hole about 70 feet by 90 feet and deep enough to cut into the groundwater table. The drum contents were called "gas" by the people delivering and unloading it but this was not intended to indicate automotive or airplane fuels. No fire department equipment or personnel were present. The drums may have contained a yellow or brown liquid. Tops of the drums may have had 8 feet of earth covering them.

There are three potable wells within 1,000 feet. No basements or shallow wells are known to exist in the vicinity. Recycled filter backwash water is pumped through a buried pipe between the water treatment plant and a storage pond north of the site. This pipe runs north-south immediately west of the site. Relatively high permeability fill surrounding the pipe may provide an opportunity for groundwater movement from the site to and into the pond.

Aerial photographs for years 1949, 1954, 1956 and 1964 did not reveal a conclusive location for this site.

Site No.: 76

Name: MCAS Curtis Road Site

Location: PWDM Coordinates 23, L10/M10/N10; adjacent to and north of Curtis Road and west of terminus circle of Crawford Street. Precise location cannot be ascertained (see Comments below).

Figures and Photos: 2-1, 6-25, 6-36

Size: Probably about 1/4 acre; assuming two 50 feet by 100 feet areas placed beside each other.

Previously Reported: No

Activity: Burial of drums occurred here on two separate occasions.

Materials Involved: Possibly chloroacetophenone (CN) tear compound/ training agent because similar transporting and unloading procedures as those used at the MCAS Basketball Court Site (Site No. 75) were followed. Chloroform, carbon tetrachloride and benzene may be present as solvents and also chloropicrin (PS).

Quantity: At least 25 and possibly as many as 75 55-gallon drums, i.e., 1,400 to 4,100 gallons.

When: 1949

Comments: Material was delivered to the burial site on a padded truck and was unloaded by people who wore some protective clothing (perhaps only rubber gloves).

In 1949, this area was relatively undeveloped and lacked permanent landmarks. A large pecan tree cited as a landmark could not be located during the site visit. Features on a 22 October 1949 aerial photo indicate that the disposal site might be located 200 to 300 yards west of the area identified during the interview with a former heavy equipment operator. Since neither data source was considered unquestionable both areas are indicated on Figure 6-36. The exact site cannot be conclusively located at either one or the other of these two suggested locations. However, these sites are the most probable based on available data.

This site is different and distinct from the MCAS Basketball Court Site (Site No. 75).

REFERENCE D

DRAFT

Ground-Water Resources of the Camp Lejeune Marine Corps Base-- Water-Use Data, A Preliminary Geohydrologic Framework, And Water-Level Data

U.S. GEOLOGICAL SURVEY
WATER RESOURCES INVESTIGATIONS
OPEN-FILE REPORT

Prepared in Cooperation with the
U.S. Marine Corps
Camp Lejeune, North Carolina

Since Camp Lejeune was first opened in the late 1930's, water supply has been derived from wells that tap freshwater-bearing aquifers (sands and limestone) which occur between land surface and about 300 feet below land surface. Clay and silty clay confining beds are interlayered with the aquifer material but are generally thin and discontinuous beneath the Base. Salty water occurs in the deep sand aquifers that underlie the area and in the shallow aquifer material adjacent to the Atlantic Ocean and tidal reaches of the New River and its tributaries.

Over the years, more than 100 wells have been drilled and operated to satisfy increasing demands for water as the Base's functions and population grew. At present, ground-water withdrawals rank among the largest in the State and are estimated at 7.5 million gallons per day. The Base presently supports a population of about 100,000.

An increase in the amount of waste generated by Base operations has accompanied the growth of the Base. As a result, significant amounts of wastes containing hazardous and toxic organic compounds have been disposed of or spilled on the Base. Most of the disposal and spill sites are directly underlain by sand and lack natural or synthetic barriers to prevent the wastes from moving downward into the ground-water system. Consequently, some wastes have infiltrated to the water table and have contaminated some ground water in the shallow and supply aquifers. Many of the waste-disposal and spill sites are near water-supply wells. The use of a number of supply wells has been discontinued recently because organic compounds have been detected in the well water.

Ground-water withdrawals from wells that are near the tidal reaches of the New River and its tributaries may cause salty water in these drainage-ways to move into and through the shallow aquifers toward the pumping

Table 1. Physical characteristics of each water-treatment plant.

Physical Characteristics of Water Treatment Plants
Camp Lejeune Marine Base - March, 1987

PLANT	Plant Capacity (Mgal/day)	Number of Wells	Population Served
Hadnot Point	5.900	35	32,134
Holcomb Blvd.	2.304	8	8,139
Tarawa Terrace	1.152	6	6,196
Montford Point	0.522	8	2,962
MCAS	4.081	26	10,315
Rifle Range	0.648	4	348
Courthouse Bay	0.864	5	3,091
Onslow Beach	0.250	2	248

REFERENCE E

EVALUATION OF DATA FROM FIRST ROUND OF VERIFICATION SAMPLE COLLECTION AND ANALYSIS

CONFIRMATION STUDY TO DETERMINE EXISTENCE AND POSSIBLE MIGRATION OF SPECIFIC CHEMICALS IN SITU

MARINE CORPS BASE
Camp Lejeune, North Carolina

Contract No. N62470-83-C-6106

Prepared for:

Naval Facilities Engineering Command
Atlantic Division

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

January 1985

SITE 48--MCAS MERCURY DUMP SITE

Site Investigation

o Four soil borings (hand auger) to the water table (behind Photo Lab in area of disposal).

o Four soils samples from materials at soil and ground water contact (Samples 48S1 through 48S4).

o Four sediment sampling stations:

Stations 48SE1 through 48SE4--In marsh area to the north of Photo Lab.

Data Evaluation

Soil:

Hg was found in all four soil borings (see Table 2-26). Values ranged from 0.009 to 0.02 milligram per kilogram (mg/kg).

Sediment:

Hg was found in all four sediment samples obtained from the marsh adjacent to Site 48 (see Table 2-26). Values ranged from 0.02 to 0.03 mg/kg.

Migration Potential

The presence of Hg in the soil and in the sediments of the marsh suggests that Hg may have migrated into the surface water system via the shallow ground water. Correlation between Hg levels in solid media (i.e., soil and sediment) and levels in ground water and surface water cannot be made using the existing data base.

Recommendations

The conceptual design of the verification step specifies that if all suspected analytes at a given site are detected in all environmental media by the initial sampling effort, then additional sampling is not required. Hg was detected in all samples from Site 48. Hg was the only suspected analyte; therefore, no additional sampling is recommended at Site 48 during the verification step.

Table . Site 48--MCAS Mercury Dump Site Sampling Data

ENVIRONMENTAL SCIENCE & ENGINEERING MULTIPLE FIELD GROUP REPORT REPORT DATE: WED, DEC 05 1984

CAMP LEJEUNE
STATION 49

		48S1 374650	48S1 398616	48S2 374651	48S3 374652	48S4 374653	48SE1 374654	48SE2 374655	48SE3 374656	48SE4 374657
COLLECTION DATE		8/6/84	8/6/84	8/6/84	8/6/84	8/5/84	8/6/84	8/6/84	8/6/84	8/21/84
COLLECTION TIME		230	1500	0	0	0	1515	1520	1525	945
MERCURY,SEDIMENT/KG-DRY	71921 0	0.02	0.03	0.02	0.02	0.009	0.02	0.02	0.03	.02
MOISTURE,PERCENT WET WT	70320 0	28.0	29.1	33.5	27.0	24.5	42.4	44.1	48.8	51.7

REFERENCE F

REPORT # 60

LABORATORY ANALYSIS ON

NAVAL SAMPLES

(A/E CONTRACT N62470-84-B-6932)

JTC REPORT # 85-179

PREPARED FOR:

DEPARTMENT OF THE NAVY

ATLANTIC DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

NORFOLK, VA 23511

PREPARED BY:

JTC ENVIRONMENTAL CONSULTANTS, INC.

4 RESEARCH PLACE, SUITE L-10

ROCKVILLE, MARYLAND 20850

May 15, 1985

Ann E. Rosecrance

Ann E. Rosecrance
Laboratory Director

JTC Environmental Consultants, Inc.

Date 5/15/85 Report No. 60 to Naval Facilities Engineering Command, Norfolk, Virginia

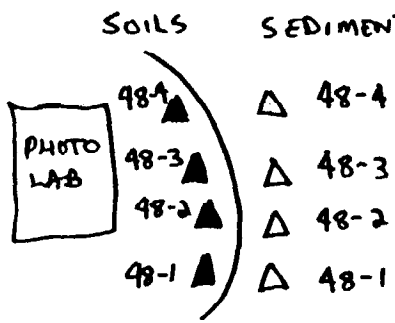
JTC Data Report No. 85-179 Table 1 Date of Sample Receipt 4-15-85

NAVY SAMPLE ID	JTC SAMPLE ID	ANALYSIS PARAMETER							
		Ca mg/g	PCB ug/g	Chloride mg/g	Oil/Grease mg/g	Iodine ppm			
white powder in glass ampules	12-0803	173	X	374	X	X			
"	12-0804	227	X	419	X	X			
"	12-0805	328	X	214	X	X			
clear oil in small flat sided jar	12-0806	X	<50	X	842	X			
tablet * in amber jar	12-0807	X	X	X	X	<0.1			

* Sample did not dissolve in water. A cloudy suspension was formed by placing the tablet in water and stirring for 24 hours. Iodine was not detected in this sample

Soil / Sediment Sampling - Camp Lejeune, NC

DATE	SITE	SAMPLE I.D.	DEPTH OF BORING	FRACTION / PRESERVATION
8-6	48	S-48-1	5.5	CS / CHILLED (C)
		S-48-2	4.3	CS/C
		S-48-3	5.0	CS/C
		S-48-4	3.5	CS/C
		SE-48-1	—	CS/C
		SE-48-	—	CS/C
		SE-48-3	—	CS/C
		SE-48-4	—	CS/C



REFERENCE H

ESE
10691 N. Kendall Dr. - Suite 206
MIAMI, FLORIDA 33176
(305) 274-1215

JOB 84 322 0300
SHEET NO. 1 OF 1
CALCULATED BY JPB DATE 8-10-84
CHECKED BY DATE
SCALE

REFERENCE J

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call : S. Levin

To (or from) : Bob Alexander

of : Camp Lejuene

Telephone Number: 919 451-3034

Time and Date: 1145 AM 2-19-88

Subject of Conversation: Marine Air Station

Project Number: 86601-1000-3120

COMMENTS: Out until Monday

(pm) 2/22/88 Called Bob Alexander

Said New River is not used for drinking within 3 miles of the Marine Air Base. Also the waters are not used for commercial shellfish harvesting- waters classified as SC waters.

The waters are used for recreation, fishing and shrimping

Burn pit description - burn pit has 2 foot freeboard - will contain rainfalls except for hurricanes.

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
P.O. Box 13454 · Gainesville, Florida · 32604 · 904/372-3318

REFERENCE N

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call : S Levin

To (or from) : Mack Frazelle, Supervisor Water and Wastewater Operations

of : Camp Lejuene Utilities

Telephone Number: 919-451-5988

Time and Date: 1145AM 2/19/88

Subject of Conversation: Marine Air Station water supply wells

Project Number: 86601-1000-3120

COMMENTS: All water supply wells at Marine Air Station pump to central distribution treatment system before going to users.

If Marine Air Station wells were to become contamenation - alternate source of water not available. would have to tap into County municipal System.

Drilling logs for water supply wells are available but not readily obtainable. He indicated I would have to talk to Mr. Baker to get permission to copy the logs.

Mack told me to call Ron Kobel of US GS in Raleigh if I needed more information.

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
P.O. Box 13454 · Gainesville, Florida · 32604 · 904/372-3318

REFERENCE 0

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: Slevin

To (or from): Doug Harned

of: USGS Raleigh, NC

Telephone Number: (919) 856-4791

Time and Date: 300 pm 2/22/88

Subject of Conversation: Camp Lejuene - Marine Air Station

Project Number: 86601-1000-3120

COMMENTS: Doug was out until Tuesday. Will call again.

1040am 2/23/88 Basically one aquifer system. No good confining layer. Will get me copies of some drilling logs in the areas of the sites of interest.

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

P.O. Box ESE Gainesville, Florida 32602 904/332-3318

REFERENCE P

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S. Levin

To (or from): John Hefner

of: US Fish and Wildlife Service

Telephone Number: 404-331-0295

Time and Date: 10:00am March 30, 1988

Subject of Conversation: Wetlands definition

Project Number: 86601 Camp Lejeune

COMMENTS:

Mr. Hefner indicated that the brackish and tidally-influenced areas of the New River could be considered coastal wetlands based on location and salinity.

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

2030 Powers Ferry Rd., Suite 204, Atlanta, GA 30339 404/955-2180

REFERENCE Q

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S. Levin

To (or from): Rick Shiver

of: NC Natural Resources and Community Development

Telephone Number: (919) 256-4161

Time and Date: 1:00 pm March 31, 1988

Subject of Conversation: Georgetown Community

Project Number: 86601

COMMENTS:

Asked Rick whether the Georgetown Community north of the site was on private wells.

He said that the community is connected to the County water supply. Several years ago there were several contaminated wells in the area. The county decided to extend their water lines.

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

2030 Powers Ferry Rd., Suite 204, Atlanta, GA 30339 404/955-2180

REFERENCE R

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S. Levin

To (or from): Bob Alexander

of: Camp Lejeune

Telephone Number: (919) 451-3034

Time and Date: March 31 1988 230pm

Subject of Conversation: Population of marine Air Station

Project Number: 86601

COMMENTS:

I asked Bob what the population of the marine Air Base was to be used in calculation for Direct Contact Score.

Officers and enlisted: 5,306 Active duty - every day

Dependents (in housing units): 1,160

Civilian employees 103

Total 6569

Source: monthly Camp Lejeune Area Population Report 1 Feb 88

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

2030 Powers Ferry Rd., Suite 204, Atlanta, GA 30339 404/955-2180

REFERENCE S

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S. Levin

To (or from): Doug Harned

of: USGS Raleigh NC

Telephone Number: (919) 856-4791

Time and Date: March 31, 1988 4:30pm

Subject of Conversation: Camp Lejeune - Marine Air Station

Project Number: 876601

COMMENTS: I talked to Doug about the possibility of ground water movement below the New River. He said that the New River acts as a discharge point for ground water and that ground water from the west side of the New River would discharge into the river and ground water from the east side of the river would likewise discharge to the river. There would be no movement of ground water across and below the river.

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

2030 Powers Ferry Rd., Suite 204, Atlanta, GA 30339 404/955-2180

REFERENCE T

POTENTIAL N.A.C.I.P. SITE AT MCAS(H), NEW RIVER

SITE DESCRIPTION

Location: See Attached map.

Size: Unknown, but estimated at 50 meters in length and 50 meters in width adjacent to the shoreline.

Previously Reported: No

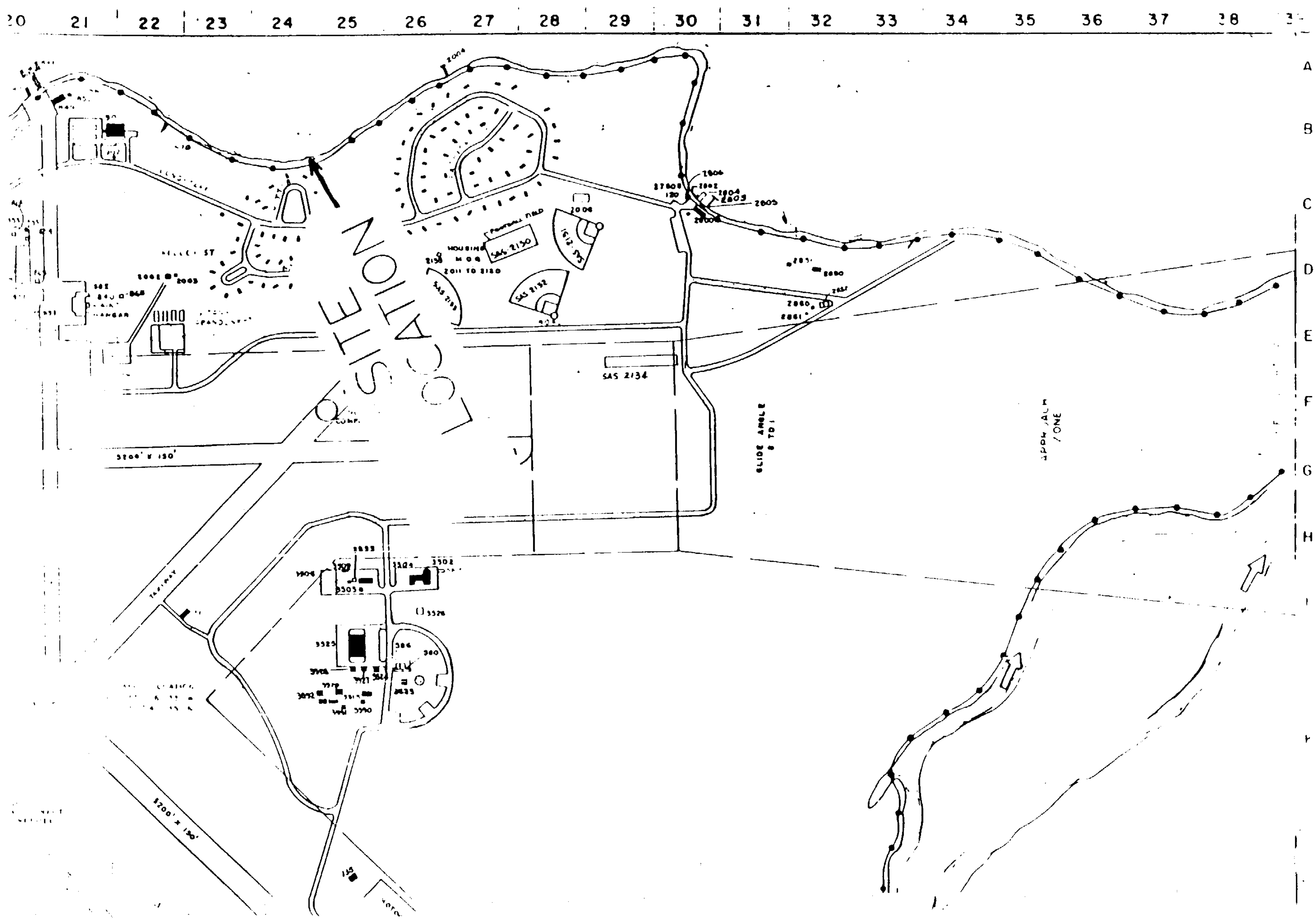
Activity: No known disposal of hazardous substance has occurred in this area due to its location within the MCAS(H), NR officers' housing area. Prior to the development of the area for housing in 1958, the area had been used for Marine Corps field training.

Materials Involved: Calcium hypochlorite in small glass vials and another compound (one glass vial, less than four ounces) of a brown oily liquid, for which laboratory analyses has not been received at the date of this writing. In addition a small medicine bottle was located which contained a few small tablets that have not been identified.

Quantity: An estimated 100 one to two ounce glass vials of a white powdery substance identified as calcium hypochlorite were found at the shoreline of the New River after being exposed by children digging along the eroding shoreline.

When: Late 1940s to late 1950s.

Comments: The area was immediately secured by placing fill material along the shoreline area where the vitals were located to preclude safety hazards or additional exposure to children of the housing area.


SITE LOCATION
20
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22
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31
32
33
34
35
36
37
38
A
B
C
D
E
F
G
H
SAS 2134
SAS 2130
SAS 2131
SAS 2132
SAS 2133
HOUSING
FOOTBALL FIELD
2011 TO 2120
KELLEY ST
HANGAR
TAXIWAY
5200' x 150'
GLIDE ANGLE
2006
2004
2005
2803
2850
2851
2860
2861
3525
3526
3302
3304
3333
386
380
3535

01.11-04/01/88-0

HRS RANKING RESULTS

MCAS NEW RIVER
Jacksonville, North Carolina

SITES 45, 48, 54, 75, 76, A

Prepared for:

NAVAL FACILITIES ENGINEERING COMMAND
Atlantic Division

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

April 1988

SITE NO. 45

Facility name: Site No. 45 - Campbell Street Underground Avgas Storage and Adjacent JP Fuel Farm at Air Station.

Location: MCAS New River, Jacksonville, North Carolina

EPA Region: Region IV

Person(s) in charge of the facility: Commanding General, MCB Camp Lejeune

Name of Reviewer: Susan D. Levin, ESE, Inc. **Date:** April 1, 1988

General description of the facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

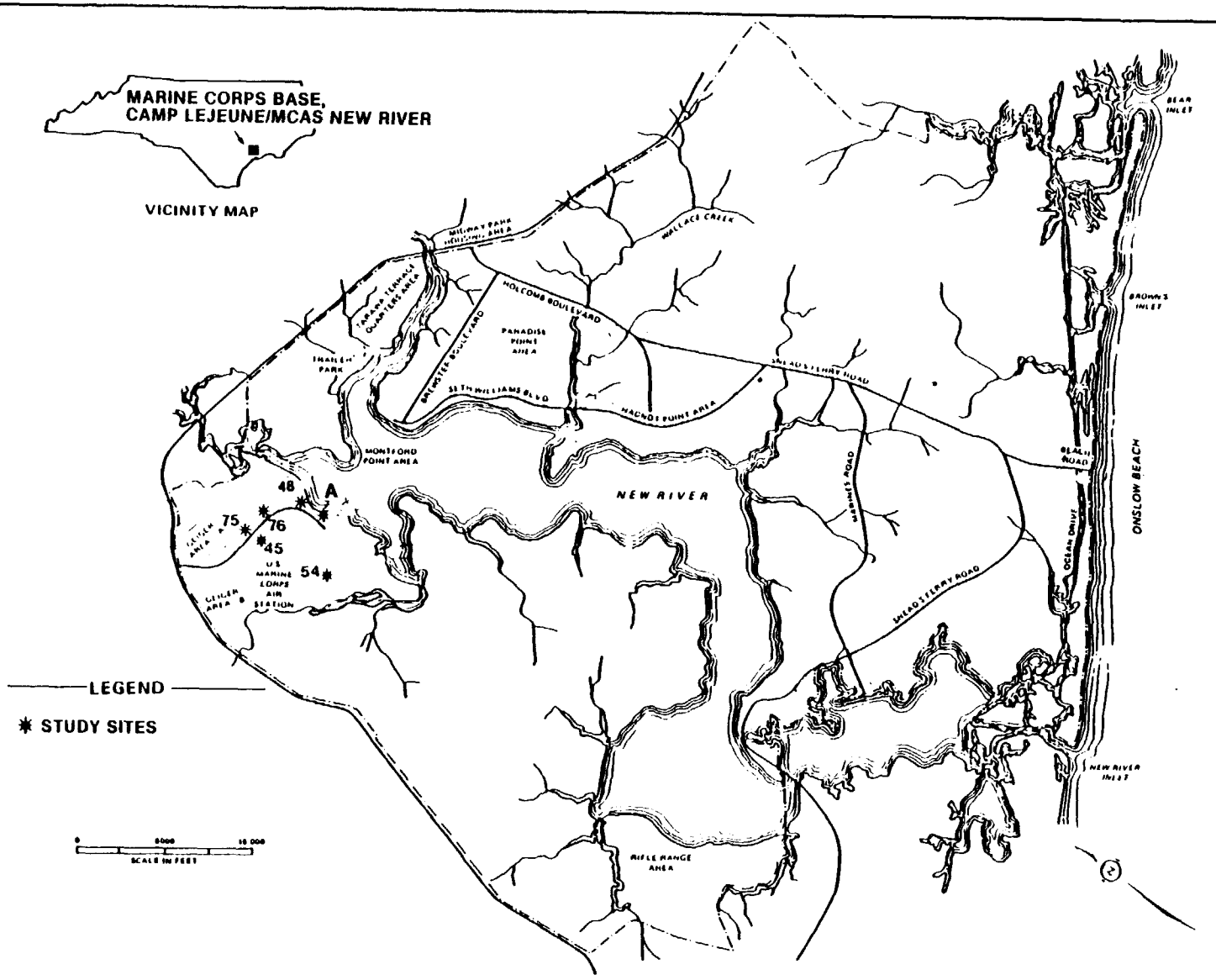
This site is an underground fuel storage area approximately 40,000 square feet and a JP fuel farm covering 6 acres. The underground tanks leaked in 1978 contaminating subsurface soils.

Scores: $S_M = 41.29$ ($S_{gw} = 70.77$ $S_{sw} = 9.65$ $S_a = 0$)

S_{FE} = Not scored

$S_{DC} = 50$

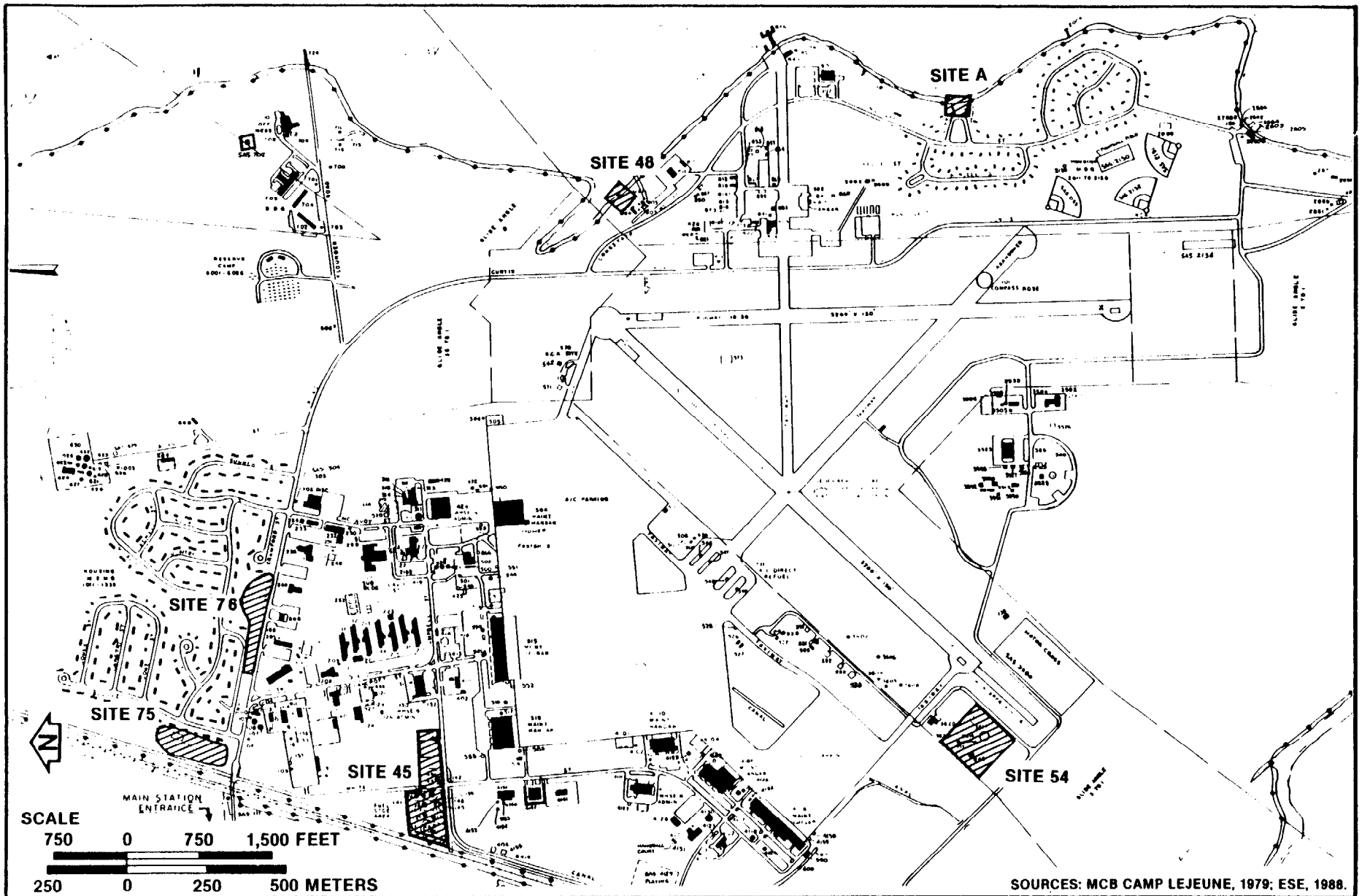
FIGURE 1
HRS COVER SHEET



SOURCES: WATER AND AIR RESEARCH, INC. 1983; ESE, 1988.

SITE MAP SHOWING LOCATIONS OF STUDY SITES

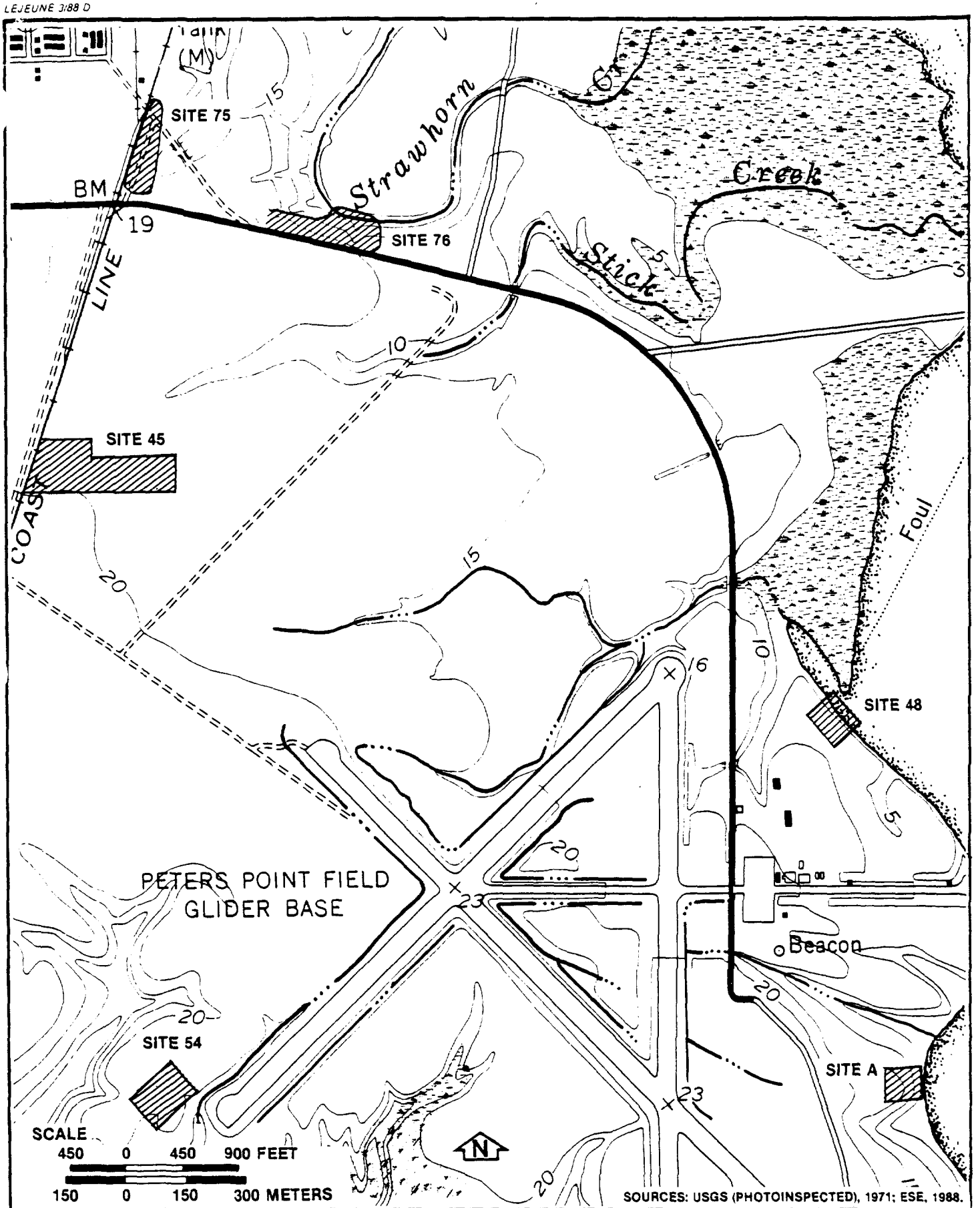
MCAS NEW RIVER, NC



LEJEUNE 3/88 D

LOCATION OF STUDY SITES
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC



PREDEVELOPMENT LAND SURFACE CONTOURS
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: As briefly as possible, summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

FACILITY NAME:
Site No. 45 - Campbell Street Underground Avgas Storage and Adjacent JP Fuel Farm at Air Station

LOCATION:
Camp Lejeune, North Carolina

DATE SCORED:
February 26, 1988, revised April 1, 1988

PERSON SCORING:
Susan D. Levin, Environmental Science and Engineering, Inc.

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):
See Below

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:
Air Pathway Fire and Explosion

COMMENTS OR QUALIFICATIONS:

Sources:

Evaluation of Data from First Round of Verification Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1985.

Evaluation of Data from Second Round of Verification Step Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1987.

Initial Assessment Study of Marine Corps Base Camp Lejeune North Carolina. Water and Air Research, Inc. 1983.

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	3.1
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2 Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 2 (3)	2	6	6	
Net Precipitation	0 1 (2) 3	1	2	3	
Permeability of the Unsaturated Zone	0 (1) 2 3	1	1	3	
Physical State	0 1 2 (3)	1	3	3	
Total Route Characteristics Score			12	15	
3 Containment	0 1 2 (3)	1	3	3	3.3
4 Waste Characteristics					3.4
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 1 2 3 4 (5) 6 7 8	1	5	8	
Total Waste Characteristics Score			23	26	
5 Targets					3.5
Ground Water Use	0 1 2 (3)	3	9	9	
Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 18 20 / 24 30 32 35 (40)	1	40	40	
Total Targets Score			49	49	
6 If line 1 is 45, multiply 1 x 4 x 5 / If line 1 is 0, multiply 2 x 3 x 4 x 5			40,572	57,330	
7 Divide line 6 by 57,330 and multiply by 100			S_{gw} = 70.77		

Surface Water Route Work Sheet

	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Observed Release	0 (45)	1	45	45	4.1
	If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.					
2	Route Characteristics					4.2
	Facility Slope and Intervening Terrain	0 1 2 3	1		3	
	1-yr. 24-hr. Rainfall	0 1 2 3	1		3	
	Distance to Nearest Surface Water	0 1 2 3	2		6	
	Physical State	0 1 2 3	1		3	
	Total Route Characteristics Score				15	
3	Containment	0 1 2 3	1		3	4.3
4	Waste Characteristics					4.4
	Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
	Hazardous Waste Quantity	0 1 2 3 4 (5) 6 7 8	1	5	8	
	Total Waste Characteristics Score			23	26	
5	Targets					4.5
	Surface Water Use	0 1 (2) 3	3	6	9	
	Distance to a Sensitive Environment	(0) 1 2 3	2	0	6	
	Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 / 12 16 18 20 / 24 30 32 35 40	1	0	40	
	Total Targets Score			6	55	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			6,210	64,350	
	Divide line 6 by 64,350 and multiply by 100		S_{sw} = 9.65			

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line 1 is 0, the S_a = 0. Enter on line 5 If line 1 is 45, then proceed to line 2					
2 Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
3 Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
4 Multiply 1 x 2 x 3				35,100	
5 Divide line 4 by 35,100 and multiply by 100		S_a = 0			

	S	S^2
Groundwater Route Score (S_{gw})	70.77	5008.39
Surface Water Route Score (S_{sw})	9.65	93.12
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		5101.51
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		71.42
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} \,/\, 1.73 = S_M =$		41.29

WORKSHEET FOR COMPUTING S_M

Direct Contact Work Sheet

	Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1	Observed Incident	(0) 45	1	0	45	8.1
	If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2	Accessibility	0 1 2 (3)	1	3	3	8.2
3	Containment	0 (15)	1	15	15	8.3
4	Waste Characteristics Toxicity	0 1 2 (3)	5	15	15	8.4
5	Targets					8.5
	Population Within a 1-Mile Radius	0 1 2 3 (4) 5	4	16	20	
	Distance to a Critical Habitat	(0) 1 2 3	4	0	12	
	Total Targets Score			16	32	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			10800	21,600	
7	Divide line 6 by 21,600 and multiply by 100			S_{DC} = 50		

Fire and Explosion Work Sheet

Not a certified threat.
Not scored.

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Containment	1 3	1		3	7.1
2 Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score				20	
3 Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Total Targets Score				24	
4 Multiply 1 x 2 x 3				1,440	

5 Divide line 4 by 1,440 and multiply by 100 S_{FE} =

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):

No contaminants were detected significantly above analytical detection limits. (Ref. A, p. 2-233)

Rationale for attributing the contaminants to the facility:

No contaminants were detected that could be attributed to the facility.
Assigned Value = 0.

***

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

See Insert A.

Depth(s) from the ground surface to the highest seasonal level of the saturated zone (water table(s)) of the aquifer(s) of concern:

The surface of the shallow ground water at this site cuts across dipping layers of silty sand, clayey silt, clay, and sand at depths ranging from 2 to 7 ft below land surface. (Ref. A, p. 2-227). These numbers reflect April 1987 water level measurements and are not necessarily the highest seasonal level of the aquifer.

Depth from the ground surface to the lowest point of waste disposal/storage:

Information avaliable does not give depths of underground tanks, however does indicate tanks leaked sometime in 1978. For scoring purposes a depth of 6 ft was used.

Depth to the aquifer of concern is approximately 1 foot.

Assigned Value = 3

INSERT A

Description of Aquifer of Concern
Castle Hayne Aquifer

The Castle Hayne Aquifer is the principal water-supply source for the southern coast and east central coastal plain of North Carolina. The aquifer consists of a series of sand and limestone beds that underlie the site to a depth of around 200 feet. Clay and silty clay confining beds are interlayered with the aquifer material but are generally thin and discontinuous beneath the Base.

A cross-section drawn up by the USGS-Raleigh, NC office running through the Marine Corps Air Station indicates that the traceable clay units are relatively thin (around 24 percent). The aquifer system seems only partially confined, and is therefore readily open to recharge from the surface.

(reference used: Draft Report - Ground-water Resources of the Camp Lejeune Marine Corps Base — Water-Use Data, A Preliminary Geohydrologic Framework, and Water-Level Data)

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

From climatic atlas, normal annual precipitation (in inches):
56 (Ref. C, p. 43)

Mean annual lake or seasonal evaporation (list months for seasonal):

From climatic atlas, lake evaporation (in inches):
42 (Ref. C, p. 63)

Net precipitation (subtract the above figures):

14 inches

Assigned Value = 2

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

The site is underlain by dipping layers of silty sand, clayey silt, clay, and sand. (Ref. A, p. 2-227)

Permeability associated with soil type:

Hydraulic conductivity = 10^{-5} to 10^{-7} cm/sec (Ref. HRS Manual)

Assigned Value = 1

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Materials in tanks were reported as liquids, Avgas and JP fuel (Ref. B, p. 6-70).

Assigned Value = 3

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Reported that tanks and underground connecting lines have leaked. (Ref. B, p. 6-70)

Method with highest score:
Container in unsound condition, no leachate collection system.

Assigned Value = 3

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:
Chloroform
Chloromethane
trans-1,2-dichloroethene
Presence of these compounds documented by December 1986 samples. (Ref. A, p. 2-233)

Compound with highest score:

Chloroform (Ref. Sax Manual)

Toxicity - Assigned Value = 3
Persistence - Assigned Value = 3

Matrix Value = 18

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

Best estimates are that in 1978, 200 to 300 gallons of Avgas were spilled or leaked from this facility. It is estimated that during 1981-1982 more than 100,000 gallons of fuel leaked into the surrounding soil due to corrosion of underground lines at the JP fuel farm. (Ref. B, p. 2-9) The fuel losses cannot be verified by inventory records.

Basis of estimating and/or computing waste quantity:

Quantity based on gallons of Avgas and fuel reported to have leaked. (Ref. B, p. 6-70) 100,200 gallons is equivalent to 2004 drums.

Assigned Value = 5

* * *

5 TARGETS

Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

See Insert B

Assigned Value = 3

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Water supply well 4140 is located approximately 800 feet southwest of monitor well 45GW4 which exhibited organic contaminants in the ground water. (Ref. A, p. 2-229 and Air Station Area Map)

Distance to above well or building:

800 feet

Assigned Value = 4

Population Served by Ground Water Wells Within a 3-Mile Radius

Identify water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

The Marine Corps Air Station water-treatment plant has 26 wells and services a population of 10,315. (Ref. D, p. 27) Although well fields on the east side of the New River may be within a 3 mile readius of the site, the USGS has reported that the river acts as a ground water discharge point, thus precluding ground water movement below and across the river (ref. D).

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

Not computed.

Total population served by ground water within a 3-mile radius:

10,315 (Ref. D, p. 27)

Assigned Value = 5 Matrix Value = 40

***

INSERT B

GROUND WATER USE

Since Camp Lejeune was first opened in the late 1930's, water supply has been derived from wells that tap freshwater-bearing aquifers. Over the years, more than 100 wells have been drilled and operated to satisfy increasing demands for water as the Base's functions and population grew. There are eight water-treatment plants at the Camp Lejeune Marine Base - one of which is located at the Marine Corps Air Station. (ref. D, pg. 12 and 27)

All of the water supply wells at the Marine Corps Air Station pump to a central treatment facility before going to users. If the wells were to become contaminated, an alternate source of water is not readily available. The users would have to tap into the County water system. (ref. N, telecon with Mack Frazelle)

SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

Lead was detected in sediment samples 45SE1 and 45SE2. (Ref. A, p. 2-242)

Rationale for attributing the contaminants to the facility:

The data suggest episodic discharges of fuel from the tank farm into the ditch have occurred. This is further substantiated by both visual observations by the project team throughout the duration of the field program and by discussions with personnel assigned to the fuel farm. (Ref. A, p. 2-227)

Assigned Value = 45

* * *

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

The generally flat topography of the Camp Lejeune complex is typical of the seaward portions of the North Carolina coastal plain. Elevations on the base vary form sea level to 72 feet above msl; however, the elevation of most of Camp Lej is between 20 and 40 feet above msl. (Ref. B, p. 5-11)
The average slope is less than 3%.

Name/description of nearest downslope surface water:

Unnamed ditch to Southwest Creek to New River. The New River receives drainage from most of the base. The New River flows in a southerly direction and empties into the Atlantic Ocean through the New River Inlet. (Ref. B, p. 5-11)

Average slope of terrain between facility and above-cited surface water body in percent:

Slope is less than 3%. (Ref. B, p. 5-3 and topo map)

Is the facility located either totally or partially in surface water?

No. Detail figure of Site 45. (Ref. B, p. 6-71)

Is the facility completely surrounded by areas of higher elevation?

No. (topo map)

1-Year 24-Hour Rainfall in Inches

3.5 inches (Ref. Figure 8, HRS Manual)

Distance to Nearest Downslope Surface Water

Drainage ditch south of tank farm is directly across Campbell Street from tank farm, approximately 100 feet away. (Ref. B, p. 6-70)

Physical State of Waste

Contaminants were liquids, Avgas and JP fuel. (Ref. B, p. 6-70)

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Contaminants have been identified in drainage ditch south of Avgas storage and JP fuel tank farm. (Ref. A, p. 2-242) Visual observations by field team have indicated fuel from the tank farm had discharged into the ditch. (Ref. A, P. 2-227)

Method with highest score:

Containers (tanks) have been known to leak; no leachate collection system exists. (Ref. B, p. 6-70)

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Lead - detected in sediment samples 45SE1 and 45SE2. (Ref. A, 2-242)

Compound with highest score:

Lead

Toxicity - Assigned Value = 3
Persistence - Assigned Value = 3 Matrix Value = 18

(Ref. Sax description in HRS Manual)

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

200 to 300 gallons Avgas
100,000 gallons of fuel (Ref. B, p. 2-9)

Total Quantity = 100,200 gallons which for HRS purposes is equivalent to 2004 drums.
Assigned Value = 5

Basis of estimating and/or computing waste quantity:

Quantity was computed on the basis of gallons to drums conversion.
(Ref. HRS Manual for conversion)

* * *

5 TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

Southwest Creek is located approximately 1 1/2 miles from the site (Ref. topo map). The creek is used for recreational purposes only.

Assigned Value = 2

Is there tidal influence?

No. This site is too far inland to be effected by tidal influences. (Ref. topo map)

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Coastal wetlands are within 2 miles of the site. However, there is no defined surface water migration pathway.

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Not within 1 mile of freshwater wetland. (Ref. topo map)

Assigned Value = 0

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

Colony area for the Red-cockaded woodpecker located greater than 1 mile south of the tank farm area. (Ref. B, p. 5-25)

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

No water supplies intakes within 3 miles downstream of site. (Ref. B, p. 5-11)

Assigned Value = 0

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

Not computed, surface water not used.

Total population served:

Ø

Name/description of nearest of above-cited intake(s):

No intakes.

Distance to above-cited intakes, measured in stream miles.

No distance calculated.

***

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:
No air data has been collected for this site. Since no evidence of a release exists, this pathway is scored as 0. (ref. HRS manual)

Date and location of detection of contaminants:

Methods used to detect the contaminants:

Rationale for attributing the contaminants to the site:

* * *

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

Most incompatible pair of compounds:

Toxicity

Most toxic compound:

Hazardous Waste Quantity

Total quantity of hazardous waste:

Basis of estimating and/or computing waste quantity:

* * *

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi 0 to 1 mi 0 to ½ mi 0 to ¼ mi

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species, if 1 mile or less:

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

Distance to residential area, if 2 miles or less:

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

DIRECT CONTACT ROUTE

1 OBSERVED INCIDENT

No documented incident in which contact with hazardous substances at the facility has caused illness, injury, or death.

Assigned value = 0

2 ACCESSIBILITY

This site is accessible to any persons or animals. There are no limiting restrictive barriers to the drainage ditches.

Assigned value = 3

3 CONTAINMENT

Contaminants were noted in the drainage ditches. Therefore, the hazardous substance (contaminated sediments) is accessible to direct contact.

Assigned value = 15

4 WASTE CHARACTERISTICS
Toxicity

Lead is the contaminant that was detected in the drainage ditch sediment sample. Metals have a toxicity rating of 3.

Assigned value = 3

5 TARGETS

Population Within a 1-Mile Radius

Based on a telephone conversation with Mr. Bob Alexander (Ref. R), the number of Officers, enlisted personnel, dependents, and civilian workers at Camp Lejeune approximates 6,500.

Assigned value = 4

Distances to a Critical Habitat

There are no known endangered species habitats within 1 mile of the site.

Assigned value = 0

SITE NO. 48

Facility name: Site No. 48 - MCAS New River Mercury Dump Site

Location: MCAS New River, Jacksonville, North Carolina

EPA Region: Region IV

Person(s) in charge of the facility: Commanding General, MCB Camp Lejeune

Name of Reviewer: Susan D. Levin, ESE, Inc. **Date:** April 1, 1988

General description of the facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

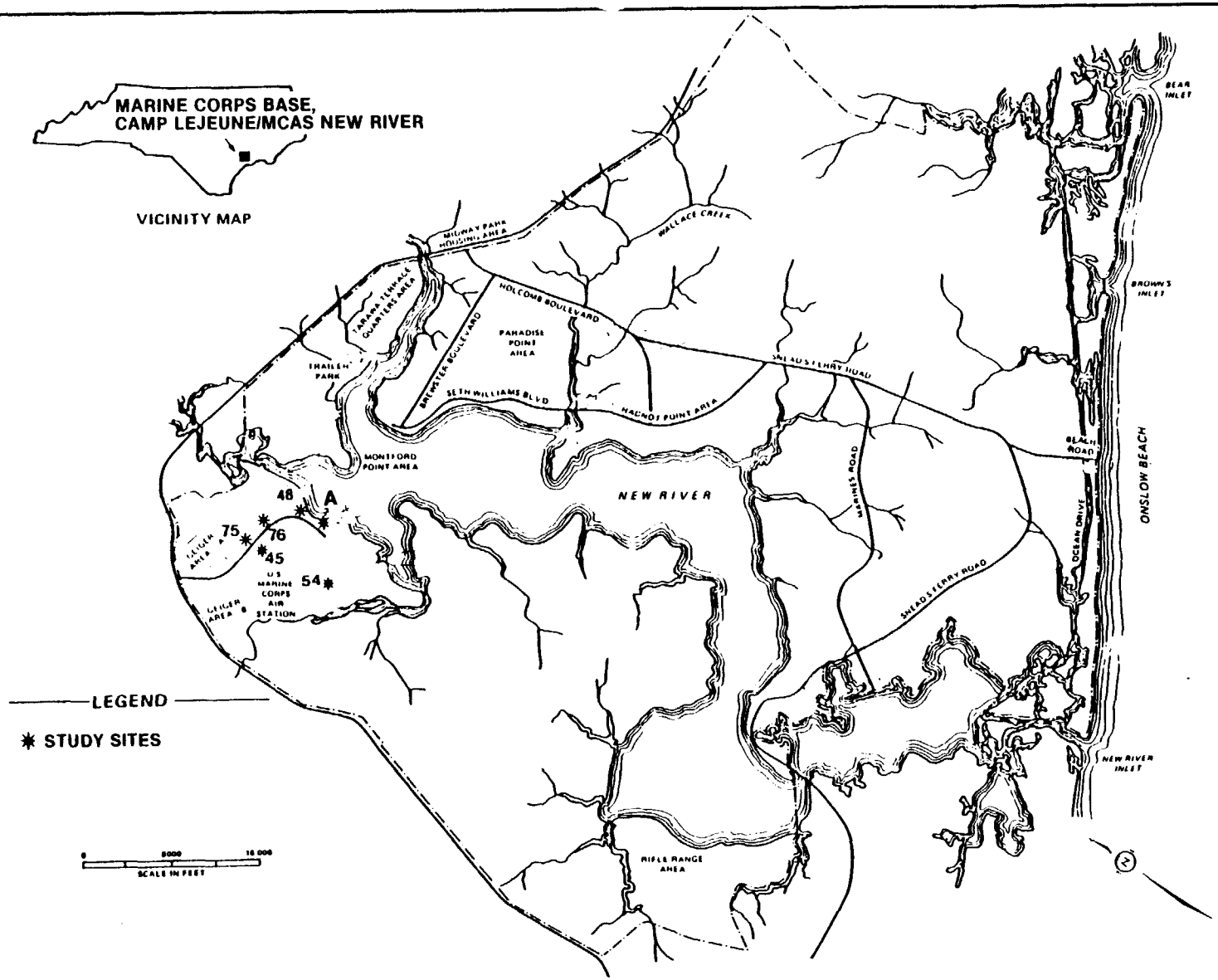
Sometime between 1956 and 1966 mercury was drained from radar units and disposed in woods between building 804 and the river. The disposal area is approximated as a 100- x 200- foot corridor extending from the rear of the building to the river.

Scores: $S_M = 31.23$ ($S_{gw} = 52.50$ $S_{sw} = 12.76$ $S_a = 0$)

S_{FE} = Not scored

$S_{DC} = 50$

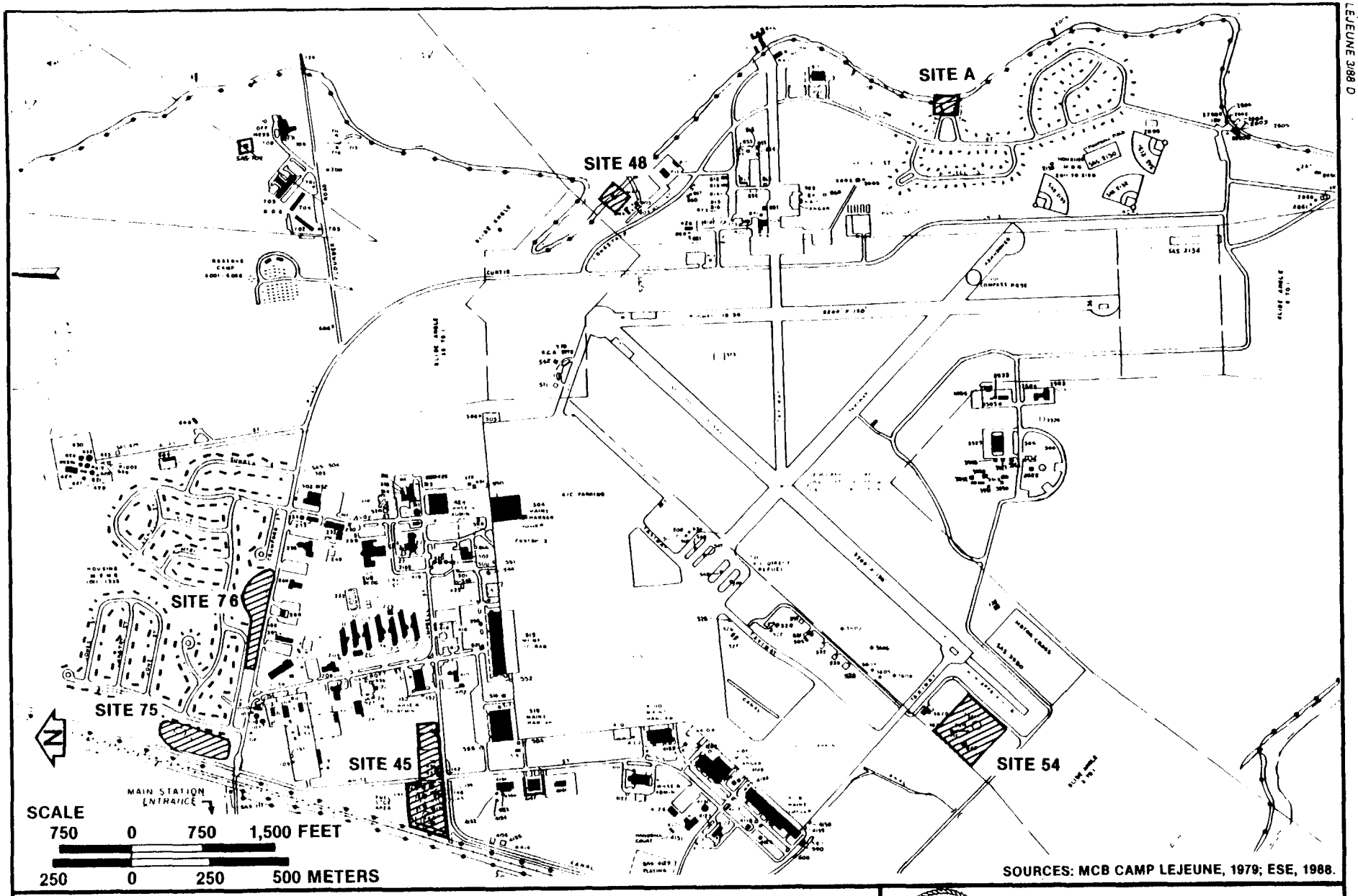
FIGURE 1
HRS COVER SHEET



SOURCES: WATER AND AIR RESEARCH, INC. 1983; ESE, 1988.

SITE MAP SHOWING LOCATIONS OF STUDY SITES

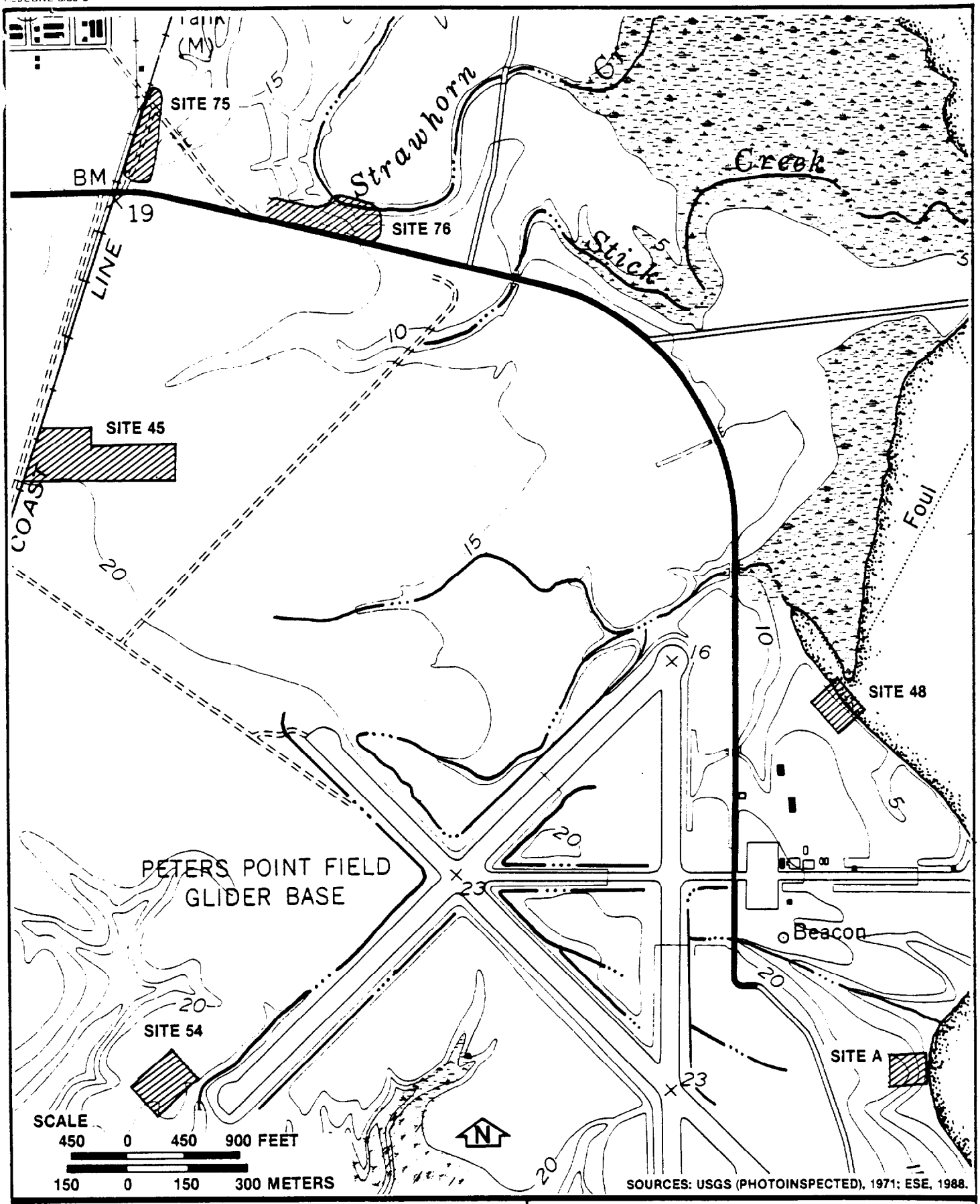
MCAS NEW RIVER, NC



SOURCES: MCB CAMP LEJEUNE, 1979; ESE, 1988.

LOCATION OF STUDY SITES
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC



PREDEVELOPMENT LAND SURFACE CONTOURS
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: As briefly as possible, summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

FACILITY NAME:

Site No. 48 - MCAS New River Mercury Dump Site

LOCATION:

Camp Le jeune, North Carolina

DATE SCORED:

February 26, 1988, Revised April 1, 1988

PERSON SCORING:

Susan D. Levin, Environmental Science and Engineering, Inc.

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):

See Below

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:

Air Pathway Fire and Explosion

COMMENTS OR QUALIFICATIONS:

Sources:

Evaluation of Data from First Round of Verification Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1985.

Evaluation of Data from Second Round of Verification Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1987.

Initial Assessment Study of Marine Corps Base Camp Lejeune North Carolina. Water and Air Research, Inc. 1983.

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	3.1
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2 Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 2 (3)	2	6	6	
Net Precipitation	0 1 (2) 3	1	2	3	
Permeability of the Unsaturated Zone	0 (1) 2 3	1	1	3	
Physical State	0 1 2 (3)	1	3	3	
Total Route Characteristics Score			12	15	
3 Containment	0 1 2 (3)	1	3	3	3.3
4 Waste Characteristics					3.4
Toxicity / Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			19	26	
5 Targets					3.5
Ground Water Use	0 1 2 (3)	3	9	9	
Distance to Nearest Well / Population Served	0 4 6 8 10 12 16 18 20 24 30 32 (35) 40	1	35	40	
Total Targets Score			44	49	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			30096	57,330	
7 Divide line 6 by 57,330 and multiply by 100			S_{gw} = 52.50		

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	4.1
If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.					
2 Route Characteristics					4.2
Facility Slope and Intervening Terrain	(0) 1 2 3	1	0	3	
1-yr. 24-hr. Rainfall	0 1 2 (3)	1	3	3	
Distance to Nearest Surface Water	0 1 2 (3)	2	6	8	
Physical State	0 1 2 (3)	1	3	3	
Total Route Characteristics Score			12	15	
3 Containment	0 1 2 (3)	1	3	3	4.3
4 Waste Characteristics					4.4
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			19	26	
5 Targets					4.5
Surface Water Use	0 1 (2) 3	3	6	9	
Distance to a Sensitive Environment	0 1 2 (3)	2	6	6	
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 / 12 16 18 20 / 24 30 32 35 40	1	0	40	
Total Targets Score			12	55	
6 If line 1 is 45, multiply 1 x 4 x 5 / If line 1 is 0, multiply 2 x 3 x 4 x 5			8208	64,350	
7 Divide line 6 by 64,350 and multiply by 100			S_{sw} = 12.76		

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
[1] Observed Release	(0) 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line [1] is 0, the S_a = 0. Enter on line [5] If line [1] is 45, then proceed to line [2]					
[2] Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
[3] Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
[4] Multiply [1] x [2] x [3]				35,100	
[5] Divide line [4] by 35,100 and multiply by 100		S_a = 0			

	S	S^2
. Groundwater Route Score (S_{gw})	52.50	2756.25
Surface Water Route Score (S_{sw})	12.76	162.82
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		2919.07
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		54.03
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		31.23

WORKSHEET FOR COMPUTING S_M

Direct Contact Work Sheet

	Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1	Observed Incident	(0) 45	1	0	45	8.1
	If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2	Accessibility	0 1 2 (3)	1	3	3	8.2
3	Containment	0 (15)	1	15	15	8.3
4	Waste Characteristics Toxicity	0 1 2 (3)	5	15	15	8.4
5	Targets					8.5
	Population Within a 1-Mile Radius	0 1 2 3 (4) 5	4	16	20	
	Distance to a Critical Habitat	(0) 1 2 3	4	0	12	
	Total Targets Score			16	32	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			10800	21,600	
7	Divide line 6 by 21,600 and multiply by 100			S_{DC} = 50		

Fire and Explosion Work Sheet

No certified threat. Not scored

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Containment	1 3	1		3	7.1
2 Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score				20	
3 Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Total Targets Score				24	
4 Multiply 1 x 2 x 3				1,440	

5 Divide line 4 by 1,440 and multiply by 100 S_{FE} =

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):

No ground water samples collected at this site. (Ref. E, p. 2-89)

Assigned Value = 0

Rationale for attributing the contaminants to the facility:

No ground water samples collected at this site. (Ref. E, p. 2-89)

***

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

See Insert A.

Depth(s) from the ground surface to the highest seasonal level of the saturated zone (water table(s)) of the aquifer(s) of concern:

Depth to ground water is approximately 3-6 feet as noted by soil borings drilled in August 1984 (ref. H)
These numbers reflect Aug. 1984 water level measurements and are not necessarily the highest seasonal level of the aquifer.

Depth from the ground surface to the lowest point of waste disposal/storage:

No information available on depth of disposal. (Ref. B, p. 2-9 and 6-73)
Best information indicates that the material was carried by hand and dumped or buried in small quantities at randomly selected spots. (Ref. B, p. 6-73).

The lowest point of waste disposal will be approximated at 1 foot. Therefore, the depth to the aquifer of concern conservatively equals 5 feet.

Assigned Value = 3

INSERT A

Description of Aquifer of Concern
Castle Hayne Aquifer

The Castle Hayne Aquifer is the principal water-supply source for the southern coast and east central coastal plain of North Carolina. The aquifer consists of a series of sand and limestone beds that underlie the site to a depth of around 200 feet. Clay and silty clay confining beds are interlayered with the aquifer material but are generally thin and discontinuous beneath the Base.

A cross-section drawn up by the USGS-Raleigh, NC office running through the Marine Corps Air Station indicates that the traceable clay units are relatively thin (around 24 percent). The aquifer system seems only partially confined, and is therefore readily open to recharge from the surface.

(reference used: Draft Report - Ground-water Resources of the Camp Lejeune Marine Corps Base — Water-Use Data, A Preliminary Geohydrologic Framework, and Water-Level Data)

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

From climatic atlas, normal annual total precipitation (in inches):
56 (Ref. C, p. 43)

Mean annual lake or seasonal evaporation (list months for seasonal):

From climatic atlas, lake evaporation (in inches):
42 (Ref. C, p. 63)

Net precipitation (subtract the above figures):

14 inches

Assigned Value = 2

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

No data to indicate soil type at this site. Based on soils collected at a nearby site, the soil is expected to be silty sand, sand, and clay. (Ref. A, p. 2-345)

Permeability associated with soil type:

Hydraulic Conductivity = 10^{-5} - 10^{-7} cm/sec (Ref. HRS Manual)

Assigned Value = 1

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Metallic mercury was drained in liquid form from radar units periodically and disposed in woods near the photo lab. (Ref. B, p. 6-73)

Assigned Value = 3

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

From 1956 to 1966, metallic mercury from the delay lines of the radar units was reported to have been buried around the photo lab, Building 804. (Ref. B, p. 2-9) There is no indication that the wastes were contained in any manner.

Method with highest score:

Buried metallic mercury will be evaluated as a waste pile (contaminated soil). There is no mention in the records that the waste was buried in any type of lined ditch. Therefore, the site will be considered as unlined and unsound.

Assigned Value = 3

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Mercury - documented to have been deposited at the site (Ref. B, p. 6-73)

Compound with highest score:

Mercury

Toxicity - Assigned Value = 3
Persistence - Assigned Value = 3
(Ref. Sax description in HRS Manual)

Matrix Score = 18

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

Approximately 1 gallon per year over 10 years, i.e., more than 1,000 pounds total. (Ref. B, p. 6-73)

Basis of estimating and/or computing waste quantity:

Quantity computed =
1 gallon x 10 years = 10 gallons; therefore, quantity would be considered 1 drum. (Ref. B, p. 6-73 and HRS Manual)

Assigned Value = 1

* * *

5 TARGETS

Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

See Insert B.

Assigned Value = 3

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

The nearest well drawing from the aquifer of concern is well #3506. (Ref. Map of Air Station Area, October 1980)

Distance to above well or building:

This well is located approximately 4/5 of a mile from the site. (Ref. Map of Air Station Area, October 1980)

Assigned Value = 3

Population Served by Ground Water Wells Within a 3-Mile Radius

Identify water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

The Marine Corps Air Station water-treatment plant has 26 wells and services a population of 10,315. (Ref. D, p. 27). Although well fields on the east side of the New River may be within a 3 mile radius of the site, the USGS has reported that the river acts as a ground water discharge point, thus precluding ground water movement below and across the river (ref. D).

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

Not computed.

Total population served by ground water within a 3-mile radius:

10,315. (Ref. D, p. 27)

Assigned Value = 5 Matrix Score = 35

***

INSERT B

GROUND WATER USE

Since Camp Lejeune was first opened in the late 1930's, water supply has been derived from wells that tap freshwater-bearing aquifers. Over the years, more than 100 wells have been drilled and operated to satisfy increasing demands for water as the Base's functions and population grew. There are eight water-treatment plants at the Camp Lejeune Marine Base - one of which is located at the Marine Corps Air Station. (ref. D, pg. 12 and 27)

All of the water supply wells at the Marine Corps Air Station pump to a central treatment facility before going to users. If the wells were to become contaminated, an alternate source of water is not readily available. The users would have to tap into the County water system. (ref. N, telecon with Mack Frazelle)

SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):
No surface water samples were collected, sediment samples were collected from the marsh, adjacent to Site 48. All of the sediment samples contained quantifiable levels of mercury. (Ref. E, p. 2-90) However, no background data was collected at this time, therefore, an observed release can not be documented.

Rationale for attributing the contaminants to the facility:

Mercury was known to have been dumped at this site. (Ref. B, p. 6-73)

Assigned Value = 0

* * *

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:
The generally flat topography of the Camp Lejuene complex is typical of the seaward portions of the North Carolina coastal plain. Elevations on the base vary from sea level to 72 feet above msl; however, the elevation of most of Camp Lejeune is between 20 and 40 feet above msl. (Ref. B, p. 5-3) and topographic map) Average slope is less than 3%.

Name/description of nearest downslope surface water:

Site 48 is adjacent to the New River (Ref. topo map). The New River flows in a southerly direction and empties into the Atlantic Ocean through the New River Inlet.

Average slope of terrain between facility and above-cited surface water body in percent:
Average slope is less than 3%. (Ref. B, p. 5-3 and topo map)

Assigned Value = 0

Is the facility located either totally or partially in surface water?
No. However, facility is very close to the New River. (Ref. B, p. 6-74)

Is the facility completely surrounded by areas of higher elevation?
No. (Ref. topo map)

1-Year 24-Hour Rainfall in Inches

3.5 inches (Ref. Figure 8 HRS Manual)

Assigned Value = 3

Distance to Nearest Downslope Surface Water

New River is approximately 100 feet from Site 48. (Ref. topo map)

Assigned Value = 3

Physical State of Waste

Metallic mercury drained in liquid form from radar units periodically and disposed in woods near photo lab. (Ref. B, p. 6-73)

Assigned Value = 3

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:
From 1956 to 1966, metallic mercury from the delay lines of the radar units was reported to have been buried around the photo lab, Building 804. (Ref. B, p. 2-9) There is no indication that the wastes were contained in any manner.

Method with highest score:
Buried metallic mercury will be evaluated as a waste pile (contaminated soil). Records indicated that the waste may have been dumped or buried. (Ref. B, p. 6-73) There are no diversion structures to prevent surface runoff into the marsh area. (Ref. E, p. 2-89)

Assigned Value = 3

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:
Mercury - presence in all sediment samples (Ref. E, p. 2-90) and documented to have been deposited at the site. (Ref. B, p. 6-73)

Compound with highest score:

Mercury

Toxicity - Assigned Value = 3
Persistence - Assigned Value = 3

Matrix Score = 18

(Ref. Sax description in HRS Manual)

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

Approximately 1 gallon per year over 10 years, i.e., more than 1,000 pounds total. (Ref. B, p. 6-73)

Basis of estimating and/or computing waste quantity:

Quantity computed =
1 gallon x 10 years = 10 gallons; therefore, quantity would be considered as 1 drum. (Ref. B, p. 6-73)

Assigned Value = 1

* * *

5 TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:
The New River in the vicinity of Marine Corps Air Station is classified as SC according to Title 15 of the North Carolina Administrative Code. The best usage for class SC waters is "fishing, secondary recreation, and any other usage except primary recreation or shellfishing for marketing purposes". (Ref. B, p. 5-11, 5-12)

Assigned Value = 2

Is there tidal influence?

Yes. However, the tidal range diminishes to approximately 1 foot at Jacksonville which is north of the Marine Corps Air Station. (Ref. B, p. 5-11)

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Site is adjacent to coastal wetlands (ref. topo map and wetlands inventory map)

Assigned value = 3

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

Colony area for the Red-cockaded woodpecker located greater than 1 mile to the southwest of the site. (Ref. B, p. 5-25)

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

No water supply intakes within 3 miles of the site. Water is too brackish for use. (Ref. B, p. 5-11)

Assigned Value = 0

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

Not computed, water not used.

Total population served:

Ø

Name/description of nearest of above-cited intake(s):

No intakes

Distance to above-cited intakes, measured in stream miles.

No distance calculated

***

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

No air data has been collected for this site. Since no evidence of a release exists, this pathway is scored as 0. (ref. HRS manual)

Date and location of detection of contaminants:

Methods used to detect the contaminants:

Rationale for attributing the contaminants to the site:

* * *

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

Most incompatible pair of compounds:

Toxicity

Most toxic compound:

Hazardous Waste Quantity

Total quantity of hazardous waste:

Basis of estimating and/or computing waste quantity:

* * *

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi 0 to 1 mi 0 to ½ mi 0 to ¼ mi

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species, if 1 mile or less:

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

Distance to residential area, if 2 miles or less:

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

DIRECT CONTACT ROUTE

1 OBSERVED INCIDENT

No documented incident in which contact with hazardous substances at the facility has caused illness, injury, or death.

Assigned value = 0

2 ACCESSIBILITY

This site is accessible to any persons or animals. There are no limiting restrictive barriers to the disposal area in the woods.

Assigned value = 3

3 CONTAINMENT

Mercury was present in all of the sediment samples and is documented to have been deposited at this site. Direct contact is accessible.

Assigned value = 15

4 WASTE CHARACTERISTICS
Toxicity

Mercury is the contaminant that was detected in the sediment sample. Metals have a toxicity rating of 3.

Assigned value = 3

5 TARGETS

Population Within a 1-Mile Radius

Based on a telephone conversation with Mr. Bob Alexander (Ref. R), the number of Officers, enlisted personnel, dependents, and civilian workers at Camp Lejeune approximates 6,500.

Assigned value = 4

Distance to Critical Habitat

There are no known endangered species habitats within 1 mile of the site.

Assigned value = 0

SITE NO. 54

Facility name: Site No. 54 - Crash Crew Fire Training Burn Pit at Air Station

Location: MCAS New River, Jacksonville, North Carolina

EPA Region: Region IV

Person(s) in charge of the facility: Commanding General, MCB Camp Lejeune

Name of Reviewer: Susan D. Levin, ESE, Inc. **Date:** April 1, 1988

General description of the facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

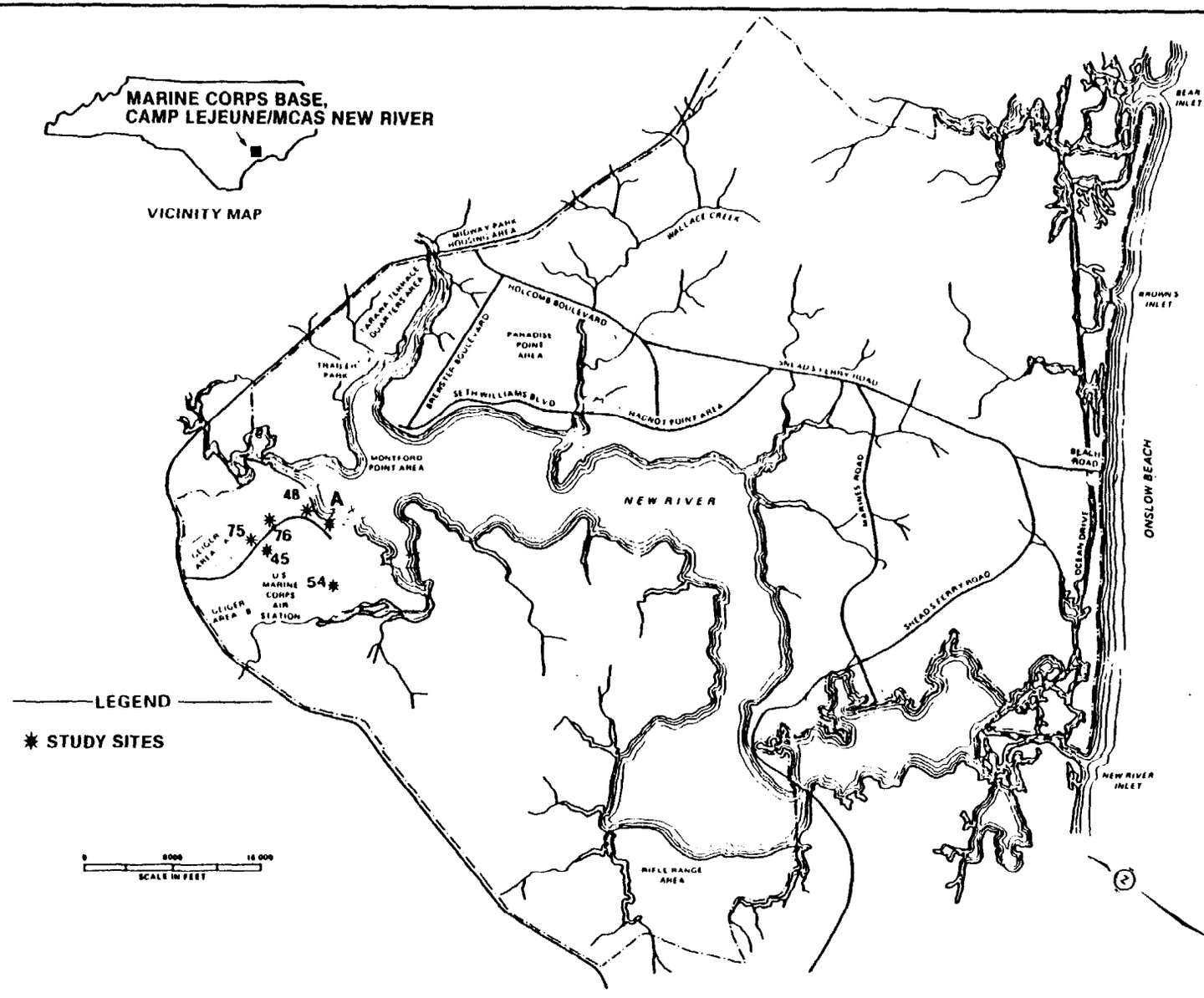
Contaminated fuels, including leaded fuel, and various POL compounds were burned in the pit during fire training exercises. Since the pit was unlined until 1975, contamination of soils below the pit is expected.

Scores: $S_M = 42.71$ ($S_{gw} = 73.08$ $S_{sw} = 10.91$ $S_a = 0$)

S_{FE} = Not scored

S_{DC} = 50

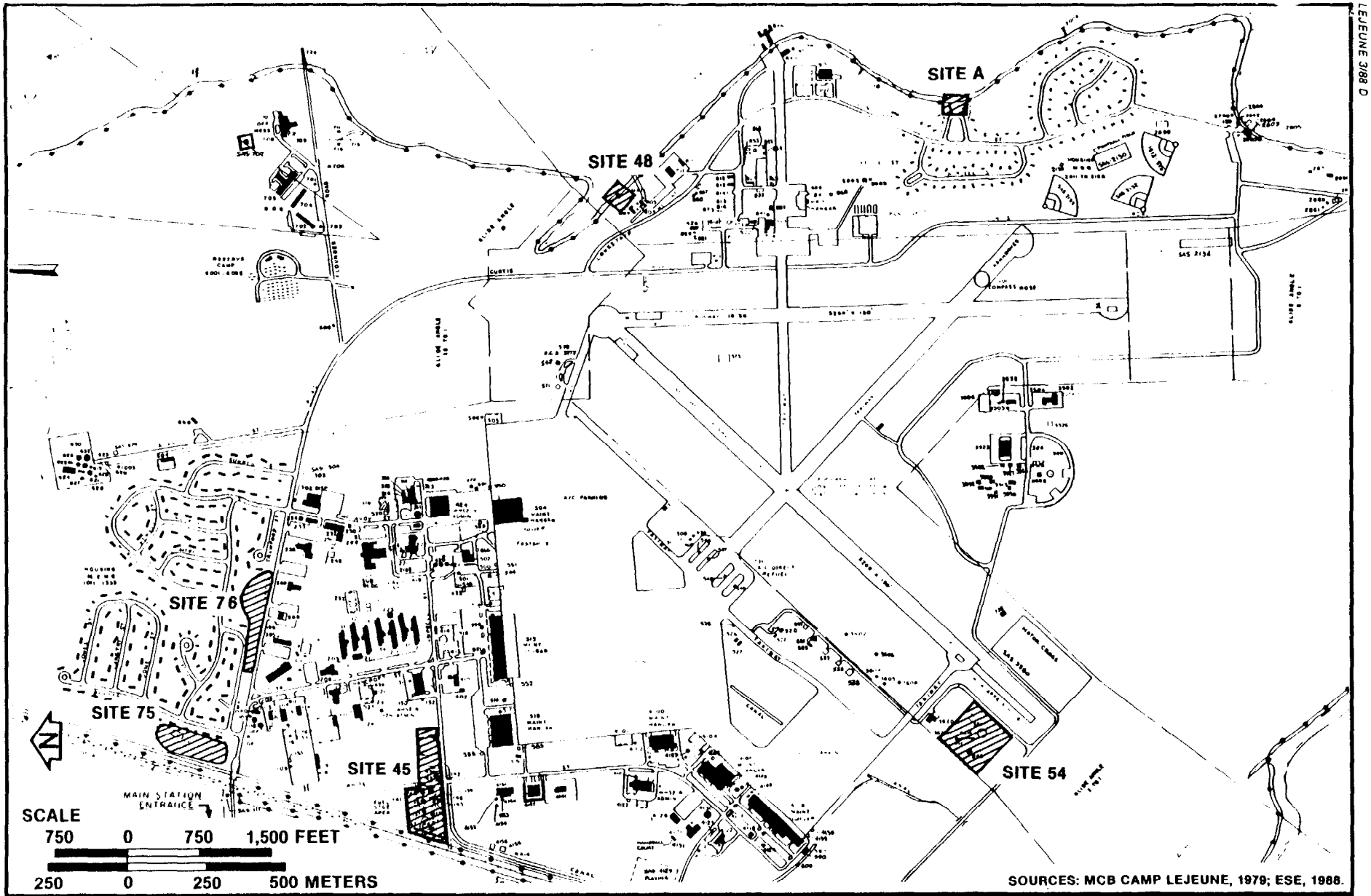
FIGURE 1
HRS COVER SHEET



SOURCES: WATER AND AIR RESEARCH, INC. 1983; ESE, 1988.

SITE MAP SHOWING LOCATIONS OF STUDY SITES

MCAS NEW RIVER, NC

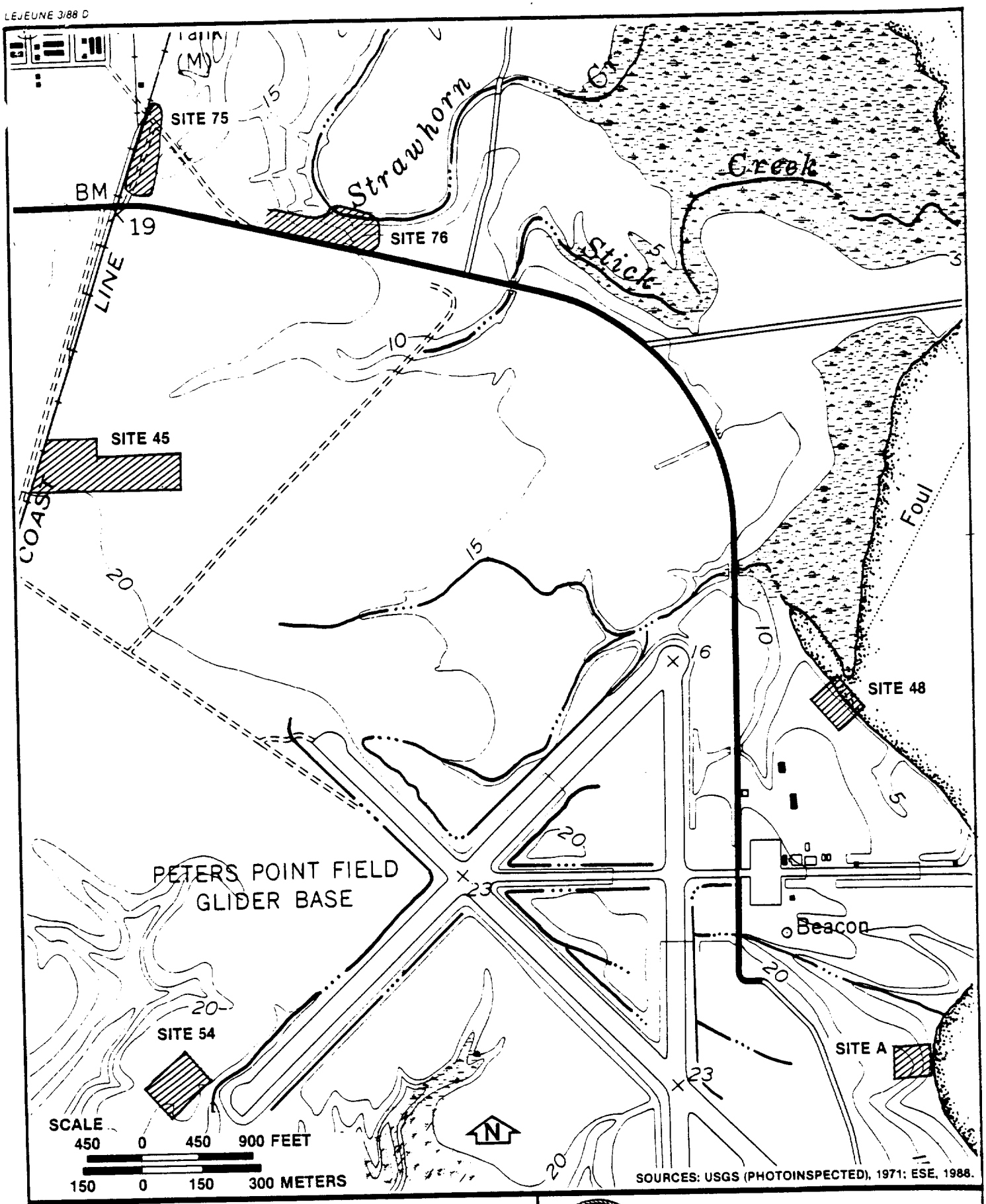


LEJEUNE 3/88 D

LOCATION OF STUDY SITES
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC

LEJEUNE 3/88 D



PREDEVELOPMENT LAND SURFACE CONTOURS
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: As briefly as possible, summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

FACILITY NAME:
Site No. 54 - Crash Crew Fire Training Burn Pit at Air Station

LOCATION:
Camp Lejeune, North Carolina

DATE SCORED:
February 26, 1988, Revised April 1, 1988

PERSON SCORING:
Susan D. Levin, Environmental Science and Engineering, Inc.

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):
See Below.

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:

Air Pathway Fire and Explosion

COMMENTS OR QUALIFICATIONS:

Sources:

Evaluation of Data from First Round of Verification Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1985.

Evaluation of Data from Second Round of Verification Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1987.

Initial Assessment Study of Marine Corps Base Camp Lejeune North Carolina. Water and Air Research, Inc. 1983.

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	0 (45)	1	45	45	3.1
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2 Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 2 3	2		6	
Net Precipitation	0 1 2 3	1		3	
Permeability of the Unsaturated Zone	0 1 2 3	1		3	
Physical State	0 1 2 3	1		3	
Total Route Characteristics Score				15	
3 Containment	0 1 2 3	1		3	3.3
4 Waste Characteristics					3.4
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			19	26	
5 Targets					3.5
Ground Water Use	0 1 2 (3)	3	9	9	
Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 18 20 / 24 30 32 35 (40)	1	40	40	
Total Targets Score			49	49	
6 If line 1 is 45, multiply 1 x 4 x 5 / If line 1 is 0, multiply 2 x 3 x 4 x 5			41895	57,330	
7 Divide line 6 by 57,330 and multiply by 100		S_{gw} =	73.08		

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	0 (45)	1	45	45	4.1
If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.					
2 Route Characteristics					4.2
Facility Slope and Intervening Terrain	0 1 2 3	1		3	
1-yr. 24-hr. Rainfall	0 1 2 3	1		3	
Distance to Nearest Surface Water	0 1 2 3	2		6	
Physical State	0 1 2 3	1		3	
Total Route Characteristics Score				15	
3 Containment	0 1 2 3	1		3	4.3
4 Waste Characteristics					4.4
Toxicity/Persistence	0 3 6 9 (12) 15 18	1	12	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			13	26	
5 Targets					4.5
Surface Water Use	0 1 (2) 3	3	6	9	
Distance to a Sensitive Environment	0 1 2 (3)	2	6	6	
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 / 12 16 18 20 / 24 30 32 35 40	1	0	40	
Total Targets Score			12	55	
6 If line 1 is 45, multiply 1 x 4 x 5 / If line 1 is 0, multiply 2 x 3 x 4 x 5			7020	64,350	
7 Divide line 6 by 64,350 and multiply by 100			S_{sw} = 10.91		

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line 1 is 0, the S_a = 0. Enter on line 5 If line 1 is 45, then proceed to line 2					
2 Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
3 Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
4 Multiply 1 x 2 x 3				35,100	
5 Divide line 4 by 35,100 and multiply by 100		S_a = 0			

	S	S^2
. Groundwater Route Score (S_{gw})	73.08	5340.69
Surface Water Route Score (S_{sw})	10.91	119.03
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		5459.72
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		73.89
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		42.71

WORKSHEET FOR COMPUTING S_M

Direct Contact Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Incident	(0) 45	1	0	45	8.1
If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2 Accessibility	0 1 2 (3)	1	3	3	8.2
3 Containment	0 (15)	1	15	15	8.3
4 Waste Characteristics Toxicity	0 1 2 (3)	5	15	15	8.4
5 Targets					8.5
Population Within a 1-Mile Radius	0 1 2 3 (4) 5	4	16	20	
Distance to a Critical Habitat	(0) 1 2 3	4	0	12	
Total Targets Score			16	32	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			10800	21,600	
7 Divide line 6 by 21,600 and multiply by 100			S_{DC} = 50		

Fire and Explosion Work Sheet

No certified threat. Not scored

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Containment	1 3	1		3	7.1
2 Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score				20	
3 Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Total Targets Score				24	
4 Multiply 1 x 2 x 3				1,440	

5 Divide line 4 by 1,440 and multiply by 100 S_{FE} =

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):
Chromium was identified in well 54GW2. (Ref. A, p. 2-251 and p. 2-255)

Rationale for attributing the contaminants to the facility:
The pit was used in crash crew training at the air station. Waste oils, fuels, and solvents were burned. (Ref. B, p. 6-75) Waste oils typically contain several heavy metals (Ref. B, p. 6-23).

Assigned Value = 45 ***

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

See Insert A.

Depth(s) from the ground surface to the highest seasonal level of the saturated zone (water table(s)) of the aquifer(s) of concern:
The surface of the shallow ground water at this site lies within the silty sand and coarse sand units at depths ranging from 1 to 10 ft below land surface. (Ref. A, p. 2-246) These numbers reflect April 1987 water level measurements and are not necessarily the highest seasonal level of the aquifer.

Depth from the ground surface to the lowest point of waste disposal/storage:

The depth of waste deposition cannot be documented. An estimate of one foot will be used for scoring purposes. Therefore, the depth to the aquifer of concern is approximated as 9 feet, if the 10 foot water table measurement is used.

INSERT A

Description of Aquifer of Concern
Castle Hayne Aquifer

The Castle Hayne Aquifer is the principal water-supply source for the southern coast and east central coastal plain of North Carolina. The aquifer consists of a series of sand and limestone beds that underlie the site to a depth of around 200 feet. Clay and silty clay confining beds are interlayered with the aquifer material but are generally thin and discontinuous beneath the Base.

A cross-section drawn up by the USGS-Raleigh, NC office running through the Marine Corps Air Station indicates that the traceable clay units are relatively thin (around 24 percent). The aquifer system seems only partially confined, and is therefore readily open to recharge from the surface.

(reference used: Draft Report - Ground-water Resources of the Camp Lejeune Marine Corps Base — Water-Use Data, A Preliminary Geohydrologic Framework, and Water-Level Data)

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):
From climatic atlas, normal annual total precipitation (in inches):
56 (Ref. C, p. 43)

Mean annual lake or seasonal evaporation (list months for seasonal):

From climatic atlas, lake evaporation (in inches):
42 (Ref. C, p. 63)

Net precipitation (subtract the above figures):
14 inches

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

The site is underlain primarily by silty sand and silty gravelly sand, with discontinuous layers of coarse sand and clay. (Ref. a, p. 2-246)

Permeability associated with soil type:

Hydraulic conductivity is 10^{-3} to 10^{-5} cm/sec. (Ref. HRS Manual)

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

The liquid materials used in the burn pit were contaminated fuels and waste solvents. (Ref. B, p. 6-75)

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:
Burn pit was lined around 1975. According to some reports, site was used unlined a number of years before this. (Ref. B, p. 6-75)

Method with highest score:
Surface impoundment with no liner.

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:
Chromium (Ref. A, p. 2-251 and 2-255)

Compound with highest score:

Chromium

Toxicity - Assigned Value = 3
Persistence - Assigned Value = 3
(Ref. HRS Manual)

Matrix Score = 18

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

There is no documentation on the amount of waste deposited at this site, therefore, the quantity of waste is unknown. Since contaminants were noted in the ground water (Ref. A, p. 2-251 and 2-255), hazardous waste quantity can be considered equal to 1.

Assigned Value = 1

Basis of estimating and/or computing waste quantity:

No waste quantity computed.

* * *

5 TARGETS

Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

See Insert B.

Assigned VAlue = 3

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Water supply well 5009 is located approximately 1,750 ft from the burn pit. (Ref. Map of Air Station Area, Marine Corps Air Station, October 1980)

Distance to above well or building:

1,750 ft

Assigned Value = 4

Population Served by Ground Water Wells Within a 3-Mile Radius

Identify water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

The Marine Corps Air Station water-treatment plant has 26 wells and services a population of 10,315. (Ref. D, p. 27) Although well fields on the east side of the New River may be within a three mile radius, the USGS has reported that the river acts as a ground water discharge point, thus precluding ground water movement below and across the river. (Ref. D)

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

Not computed.

Total population served by ground water within a 3-mile radius:

10, 315. (Ref. D, p. 27)

Assigned Value = 5

Matrix Score = 40

***

INSERT B

GROUND WATER USE

Since Camp Lejeune was first opened in the late 1930's, water supply has been derived from wells that tap freshwater-bearing aquifers. Over the years, more than 100 wells have been drilled and operated to satisfy increasing demands for water as the Base's functions and population grew. There are eight water-treatment plants at the Camp Lejeune Marine Base - one of which is located at the Marine Corps Air Station. (ref. D, pg. 12 and 27)

All of the water supply wells at the Marine Corps Air Station pump to a central treatment facility before going to users. If the wells were to become contaminated, an alternate source of water is not readily available. The users would have to tap into the County water system. (ref. N, telecon with Mack Frazelle)

SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):
No upgradient water samples collected.

Phenols were detected in sediment samples collected from drainage ditches on the sides of the burn pit. (Ref. A, p. 2-263)

Rationale for attributing the contaminants to the facility:

Phenols are typical constituents of the waste oils and fuels burned in the training pit. (Ref. a, p. 2-245 and Ref. B, p. 6-23)

* * *

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:
The generally flat topography of the Camp Lejeune complex is typical of the seaward portions of the North Carolina coastal plain. Elevations on the base vary from sea level to 72 feet above msl; however, the elevation of most of Camp Lejeune is between 20 and 40 feet above msl. (Ref. B, pl 5-3 and topographic map)
Average slope is less than 3%.

Name/description of nearest downslope surface water:

Unnamed ditch to Southwest Creek to New River. The New River receives drainage from most of the base. The New River flows in a southerly direction and empties into the Atlantic Ocean through the New River Inlet. (Ref. B, p. 5-11)

Average slope of terrain between facility and above-cited surface water body in percent:
Average slope is less than 3%. (Ref. B, p. 5-3 and topo map)

Is the facility located either totally or partially in surface water?
No. Detail figure of site 54. (Ref. B, p. 6-76)

Is the facility completely surrounded by areas of higher elevation?
No. (Ref. topo map)

1-Year 24-Hour Rainfall in Inches

3.5 inches (Ref. Figure 8 HRS Manual)

Distance to Nearest Downslope Surface Water

Southeast drainage ditch is located less than 1,000 feet from the burn pit. (Ref. A, p. 2-244)

Physical State of Waste

At time of disposal wastes were contaminated fuels and waste solvents. (Ref. B, p. 6-75)

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:
Based on telecon with Bob Alexander, Camp Lejeune, the burn pit currently has a two foot freeboard. Berm area would contain most storms, but not heavy, intense storm events. (Ref. J, telecon with Bob Alexander)At the time of waste disposal, there is no documentation available to determine the presence or absence of a containment structure.

Method with highest score:

Surface impoundment with potentially unsound containment (berm) system.

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:
Phenol - present in sediment samples. (Ref. A, 2-263)

Compound with highest score:
Phenol

Toxicity - Assigned Value = 3
Persistence - Assigned Value = 1
(Ref. Sax description in HRS Manual)

Matrix Score = 12

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

Unknown quantity, but hazardous constituents were observed in sediments. (Ref. A, p. 2-263) Therefore hazardous waste quantity is equal to 1.

Assigned Value = 1

Basis of estimating and/or computing waste quantity:

No quantity computed.

* * *

5 TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

The New River in the vicinity of Marine Corps Air Station is classified as SC according to Title 15 of the North Carolina Administrative Code. The best usage for class SC waters is "fishing, secondary recreation, and any other usage except primary recreation or shellfishing for marketing purposes". (Ref. B, p. 5-11, 5-12)

Assigned Value = 2

Is there tidal influence?

Yes. However, the tidal range diminishes to approximately 1 foot at Jacksonville, which is north of the Marine Corps Air Station. (Ref. B, p. 5-11)

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

The site is located within 2,000 feet of the wetlands associated with Southwest Creek. The drainage ditch west of the site could be a conduit for contaminated surficial materials.

Assigned value = 3

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

Colony area for the Red-cockaded woodpecker located greater than 1 mile to the southwest of the burn pit area. (Ref. B, p. 5-25)

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

No water-supply intakes within 3 miles of site. Water is too brackish for use. (Ref. B, p. 5-11)

Assigned Value = 0

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):
Not computed, water not used.

Total population served:
Ø

Name/description of nearest of above-cited intake(s):
No intakes

Distance to above-cited intakes, measured in stream miles.
No distance calculated.

***

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

No air data has been collected for this site. Since no evidence of a release exists, this pathway is scored as 0. (ref. HRS manual).

Date and location of detection of contaminants:

Methods used to detect the contaminants:

Rationale for attributing the contaminants to the site:

* * *

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

Most incompatible pair of compounds:

Toxicity

Most toxic compound:

Hazardous Waste Quantity

Total quantity of hazardous waste:

Basis of estimating and/or computing waste quantity:

* * *

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi 0 to 1 mi 0 to ½ mi 0 to ¼ mi

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species, if 1 mile or less:

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

Distance to residential area, if 2 miles or less:

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

DIRECT CONTACT ROUTE

1 OBSERVED INCIDENT

No documented incident in which contact with hazardous substances at the site has caused illness, injury, or death.

Assigned value = 0

2 ACCESSIBILITY

This site is accessible to any persons or animals. There are no limiting restrictive barriers to the burn pit.

Assigned value = 3

3 CONTAINMENT

Contaminants were detected in the samples collected from drainage ditches on the sides of the burn pit. Contaminated sediments are accessible to direct contact.

Assigned value = 15

4 WASTE CHARACTERISTICS

Toxicity

Phenol was detected in sediment samples from the drainage ditches. Phenol has a toxicity rating of 3.

Assigned value = 3

5 TARGETS

Population Within a 1-Mile Radius

Based on telephone conversation with Mr. Bob Alexander (Ref. R), the number of Officers, enlisted personnel, dependents, and civilian workers at Camp Lejeune approximates 6,500.

Assigned value = 4

Distance to a Critical Habitat

There are no known endangered species habitats within 1 mile of the site.

Assigned value = 0

SITE NO. 75/76

Facility name: Site No. 75 - MCAS Basketball Court; Site No. 76 - MCAS Curtis Road Site

Location: MCAS New River, Jacksonville, North Carolina

EPA Region: Region IV

Person(s) in charge of the facility: Commanding General, MCB Camp Lejeune

Name of Reviewer: Susan D. Levin, ESE, Inc. Date: April 1, 1988

General description of the facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

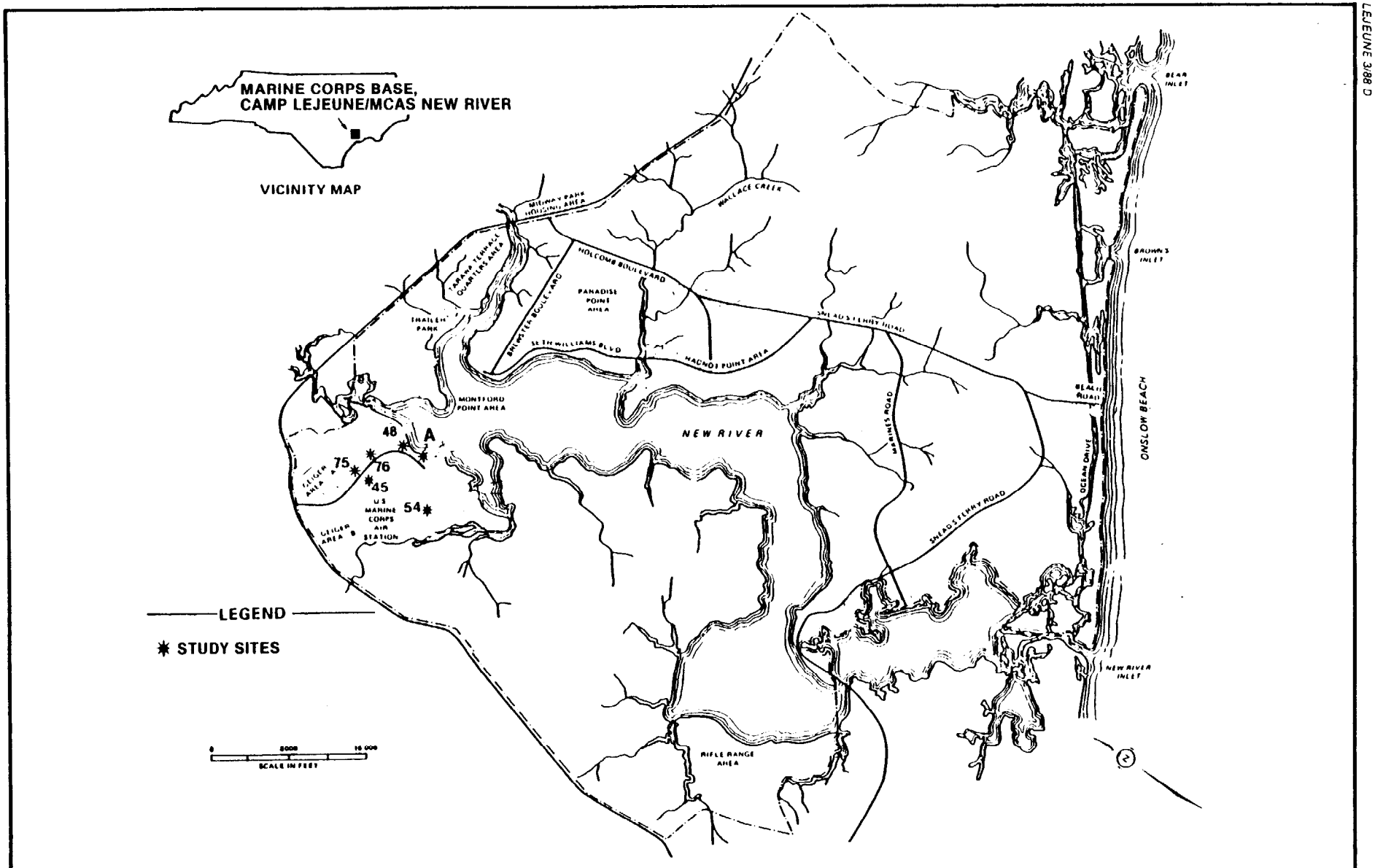
Disposal sites for buried drums containing "gas". Sites are located northwest of the air field.

Scores: $S_M = 1.28(S_{gw} = 2.22\ S_{sw} = 0\ \ S_a = 0\ \ )$

S_{FE} = Not Scored

$S_{DC} = 0$

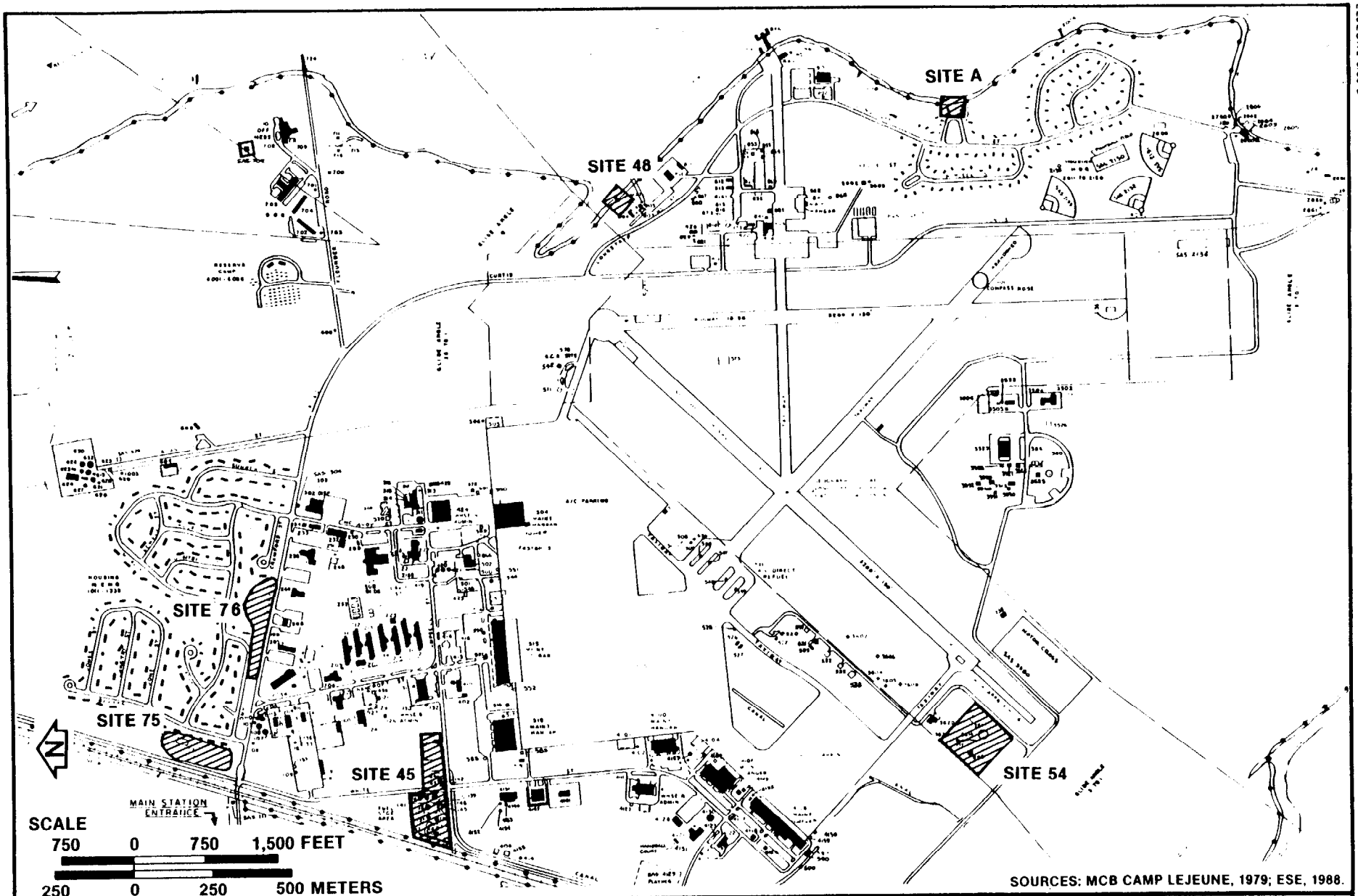
FIGURE 1
HRS COVER SHEET



SOURCES: WATER AND AIR RESEARCH, INC. 1983; ESE, 1988.

SITE MAP SHOWING LOCATIONS OF STUDY SITES

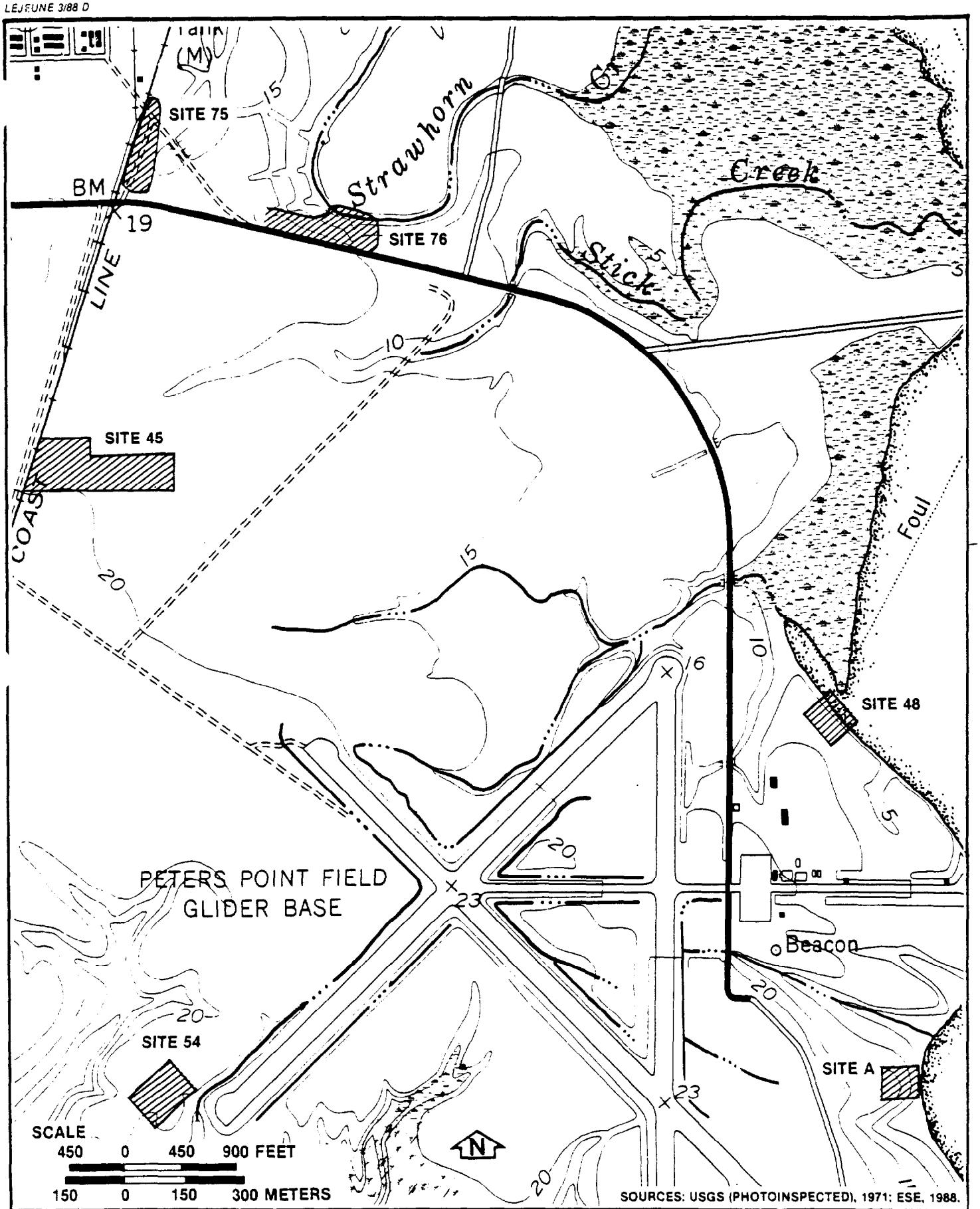
MCAS NEW RIVER, NC



LEJEUNE 3/88 D

LOCATION OF STUDY SITES
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC



PREDEVELOPMENT LAND SURFACE CONTOURS
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC

DOCUMENTATION RECORDS FOR HAZARD RANKING SYSTEM

INSTRUCTIONS: As briefly as possible, summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

FACILITY NAME:
Site 75 - MCAS Basketball Court Site
Site 76 - MCAS Curtis Road Site

LOCATION:
Camp Lejeune, North Carolina

DATE SCORED:
February 26, 1988, Revised April 1, 1988

PERSON SCORING:
Susan D. Levin, Environmental Science and Engineering, Inc.

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):
See Below.

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:
Air Pathway Fire and Explosion

COMMENTS OR QUALIFICATIONS:

Sources:

Evaluation of Data from First Round of Verification Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1985.

Evaluation of Data from Second Round of Verification Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1987.

Initial Assessment Study of Marine Corps Base Camp Lejeune North Carolina. Water and Air Research, Inc. 1983.

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	3.1
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2 Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 2 (3)	2	6	6	
Net Precipitation	0 1 (2) 3	1	2	3	
Permeability of the Unsaturated Zone	0 1 (2) 3	1	2	3	
Physical State	0 1 2 (3)	1	3	3	
Total Route Characteristics Score			13	15	
3 Containment	0 (1) 2 3	1	1	3	3.3
4 Waste Characteristics					3.4
Toxicity/Persistence	(0) 3 6 9 12 15 18	1	0	18	
Hazardous Waste Quantity	0 1 (2) 3 4 5 6 7 8	1	2	8	
Total Waste Characteristics Score			2	26	
5 Targets					3.5
Ground Water Use	0 1 2 (3)	3	9	9	
Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 18 20 / 24 30 32 35 (40)	1	40	40	
Total Targets Score			49	49	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			1274	57,330	
7 Divide line 6 by 57,330 and multiply by 100		S_{gw} =	2.22		

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	4.1
If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.					
2 Route Characteristics					4.2
Facility Slope and Intervening Terrain	(0) 1 2 3	1	0	3	
1-yr. 24-hr. Rainfall	0 1 2 (3)	1	3	3	
Distance to Nearest Surface Water	(0) 1 2 3	2	0	8	
Physical State	0 1 2 (3)	1	3	3	
Total Route Characteristics Score			6	15	
3 Containment	(0) 1 2 3	1	0	3	4.3
4 Waste Characteristics					4.4
Toxicity/Persistence	(0) 3 6 9 12 15 18	1	0	18	
Hazardous Waste Quantity	0 1 (2) 3 4 5 6 7 8	1	2	8	
Total Waste Characteristics Score			2	28	
5 Targets					4.5
Surface Water Use	0 1 (2) 3	3	6	9	
Distance to a Sensitive Environment	(0) 1 2 3	2	0	6	
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40	
Total Targets Score			6	55	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			0	64,350	
7 Divide line 6 by 64,350 and multiply by 100		S_{SW} =	0		

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line 1 is 0, the S_a = 0. Enter on line 5 If line 1 is 45, then proceed to line 2					
2 Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score				20	
3 Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
Total Targets Score				39	
4 Multiply 1 x 2 x 3				35,100	
5 Divide line 4 by 35,100 and multiply by 100		S_a = 0			

	S	S^2
Groundwater Route Score (S_{gw})	2.22	4.93
Surface Water Route Score (S_{sw})	0	0
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		4.93
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		2.22
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} \,/\, 1.73 = S_M =$		1.28

WORKSHEET FOR COMPUTING S_M

Direct Contact Work Sheet

	Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1	Observed Incident	(0) 45	1	0	45	8.1
	If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2	Accessibility	0 1 2 (3)	1	3	3	8.2
3	Containment	(0) 15	1	0	15	8.3
4	Waste Characteristics Toxicity	(0) 1 2 3	5	0	15	8.4
5	Targets					8.5
	Population Within a 1-Mile Radius	0 1 2 3 (4) 5	4	16	20	
	Distance to a Critical Habitat	(0) 1 2 3	4	0	12	
	Total Targets Score			16	32	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			0	21,600	
7	Divide line 6 by 21,600 and multiply by 100	S_{DC} = 0				

Fire and Explosion Work Sheet

No certified threats. Not scored

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Containment	1 3	1		3	7.1
2 Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score				20	
3 Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Total Targets Score				24	
4 Multiply 1 x 2 x 3				1,440	

5 Divide line 4 by 1,440 and multiply by 100 S_{FE} =

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):
No contaminants detected in ground water samples. (Ref. A, p. 2-335, 2-336, 2-337, 2-338, 2-342, and 2-344)

Assigned Value = 0

Rationale for attributing the contaminants to the facility:
No contaminants detected.

***

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

See Insert A.

Depth(s) from the ground surface to the highest seasonal level of the saturated zone (water table(s)) of the aquifer(s) of concern:

The area is underlain primarily by dipping layers of silty-sand, silty-clayey sand, and clay. The surface of the shallow ground water cuts across these sloping layers at depths ranging from 2 to 6 ft below land surface. (Ref. A, p. 2-329) These numbers reflect April 1987 water level measurements and are not necessarily the highest seasonal level of the aquifer.

Depth from the ground surface to the lowest point of waste disposal/storage:

Depth of waste deposit unknown. Record search indicated that the disposal area was at least 6 feet. (Ref. B, p. 6-92) Therefore, waste deposition could lie possibly within the aquifer of concern.

Assigned Value = 3

INSERT A

Description of Aquifer of Concern
Castle Hayne Aquifer

The Castle Hayne Aquifer is the principal water-supply source for the southern coast and east central coastal plain of North Carolina. The aquifer consists of a series of sand and limestone beds that underlie the site to a depth of around 200 feet. Clay and silty clay confining beds are interlayered with the aquifer material but are generally thin and discontinuous beneath the Base.

A cross-section drawn up by the USGS-Raleigh, NC office running through the Marine Corps Air Station indicates that the traceable clay units are relatively thin (around 24 percent). The aquifer system seems only partially confined, and is therefore readily open to recharge from the surface.

(reference used: Draft Report - Ground-water Resources of the Camp Lejeune Marine Corps Base -- Water-Use Data, A Preliminary Geohydrologic Framework, and Water-Level Data)

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

From climatic atlas, normal annual total precipitation (in inches):
56 (Ref. C, p. 43)

Mean annual lake or seasonal evaporation (list months for seasonal):

From climatic atlas, lake evaporation (in inches):
42 (Ref. C, p. 63)

Net precipitation (subtract the above figures):

14 inches

Assigned Value = 2

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

The site is underlain primarily by dipping layers of silty sand, silty-clayey sand, and clay. (Ref. A, p. 2-329)

Permeability associated with soil type:

Hydraulic conductivity is equal to 10^{-3} - 10^{-5} cm/sec (Ref. HRS Manual)

Assigned Value = 2

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Records search indicates that material was called "gas" by personnel who unloaded the drums. (Ref. B, p. 6-92)

Assigned Value = 3

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:
If drums were buried onsite, there is no evidence to suggest that the drums were not intact. (Ref. B, p. 6-92)

Method with highest score:
Container sealed and in sound condition, no liner or moderately permeable liner.

Assigned Value = 1

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

No compounds detected in any of the samples. Documentation is not conclusive from the Records Search to indicate exactly what compounds were in the drums. Wording in Records Search is very vague. (Ref. B, p. 6-92 and 6-94)

Compound with highest score:

No compound evaluated.

Assigned Value = 0

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

Quantity is based on fact that Records Search indicated that 75-100 drums were supposedly buried at Site 75 and 75 drums were buried at Site 76. (Ref. B, p. 6-92 and 6-94)

Basis of estimating and/or computing waste quantity:

Quantity computed on the number of drums reported in the Records Search.
Quantity = 175

Assigned Value = 2

* * *

5 TARGETS

Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:
See Insert B.

Assigned Value = 3

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Water supply wells 106 and 203 are located within 1,000 feet of the drum burial sites. (Ref. B, p. 6-92 and map of Air Station Area, October 1980)

Distance to above well or building:

1,000 feet.

Assigned Value = 4

Population Served by Ground Water Wells Within a 3-Mile Radius

Identify water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:
The Marine Corps Air Station water-treatment plant has 26 wells and services a population of 10,315. (Ref. D, p. 27) Although well fields on the east side of the New River may be within a 3 mile radius of the site, the USGS has reported that the river acts as a ground water discharge point, thus precluding ground water movement below and across the river. (Ref. D)
Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):
Not computed.

Total population served by ground water within a 3-mile radius:
10,315. (Ref. D, p. 27)

Assigned Value = 5

Matrix Score = 40

***

INSERT B

GROUND WATER USE

Since Camp Lejeune was first opened in the late 1930's, water supply has been derived from wells that tap freshwater-bearing aquifers. Over the years, more than 100 wells have been drilled and operated to satisfy increasing demands for water as the Base's functions and population grew. There are eight water-treatment plants at the Camp Lejeune Marine Base - one of which is located at the Marine Corps Air Station. (ref. D, pg. 12 and 27)

All of the water supply wells at the Marine Corps Air Station pump to a central treatment facility before going to users. If the wells were to become contaminated, an alternate source of water is not readily available. The users would have to tap into the County water system. (ref. N, telecon with Mack Frazell)

SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

No surface water samples were collected at this site. (Ref. A, p. 2-329)
No observed release.

Assigned Value = 0

Rationale for attributing the contaminants to the facility:

No compounds to attribute to site.

* * *

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:
The generally flat topography of the Camp Lejeune complex is typical of the seaward portions of the North Carolina coastal plain. Elevations on the base vary from sea level to 72 feet above msl; however, the elevation of most of Camp Lejeune is between 20 and 40 feet above msl. (Ref. B, p. 5-3 and topographic map)
Average slope is less than 3%.

Name/description of nearest downslope surface water:

Nearest downslope surface water body is an unnamed tributary of Edwards Creek which flows into the New River. The New River flows in a southerly direction and empties into the Atlantic Ocean through the New River Inlet. (Ref. B, p. 5-3 and topographic map)

Average slope of terrain between facility and above-cited surface water body in percent:
Average slope is less than 3%. (Ref. B, p. 5-3 and topographic map)

Assigned Value =0

Is the facility located either totally or partially in surface water?
No. Detail figure of Site 75/76. (Ref. A, p. 2-330)

Is the facility completely surrounded by areas of higher elevation?

No. (Ref topo map)

1-Year 24-Hour Rainfall in Inches

3.5 inches. (Ref. Figure 8 HRS Manual)

Assigned Value = 3

Distance to Nearest Downslope Surface Water

There is no known point of deposited waste, analysis has not revealed any contamination. (Ref. B, p. 6-92) Since wastes were believed to have been buried, surface migration would not be expected. (Ref. B, p. 6-92)

Assigned Value = 0

Physical State of Waste

Records Search indicates that material was called "gas" by personnel who unloaded the drums. (Ref. B, p. 6-92)

Assigned Value = 3

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

If the drums were buried onsite, there is no evidence to suggest that the drums were not intact. The drums were presumably covered with dirt minimizing any contact with the ground surface. (Ref. B, p. 6-92)

Method with highest score:

Containers sealed and in sound condition and covered.

Assigned Value = 0

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

No compounds to be evaluated. No documented analytical evidence to conclude that specific chemicals were deposited onsite. Wording in Records Search is very vague. (Ref. B, p. 6-92 and 6-94)

Compound with highest score:

No compound scored.

Assigned Value = 0

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

Quantity is based on fact that Records Search indicated that 75-100 drums were supposedly buried at Site 75 and 75 drums were buried at Site 76. (Ref. B, 6-92 and 6-94)

Basis of estimating and/or computing waste quantity:

Quantity computed based on the number of drums reported in the Records Search. Quantity = 175.

Assigned Value = 2

* * *

5 TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

The New River in the vicinity of Marine Corps Air Station is classified as SC according to Title 15 of the North Carolina Administrative Code. The best usage for class SC waters is "fishing, secondary recreation, and any other usage except primary recreation or shellfishing for marketing purposes". (Ref. B, pl 5-11, 5-12)

Assigned Value = 2

Is there tidal influence?

Yes. However, the tidal range diminishes to approximately 1 foot at Jacksonville which is north of the Marine Corps Air Station. (Ref. B, p. 5-11)

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Since the wastes were buried, contact with surface waters is not expected. Although the sites are within 2 miles of coastal wetlands, a migration pathway cannot be defined.

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Fresh-water wetlands located 3/4 mile from Site 76. (Ref. topographic map) However, since wastes were buried, contact with surface water is not anticipated.

Assigned Value = 0

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

Colony area for the Red-cockaded woodpecker located greater than 1 mile to the southwest of the site. (Ref. B, p. 5-25)

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

No water supply intakes within 3 miles of site. Water is too brackish for use. (Ref. B, p. 5-11)

Assigned Value = 0

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):
Not computed, water not used.

Total population served:
Ø

Name/description of nearest of above-cited intake(s):
No intakes.

Distance to above-cited intakes, measured in stream miles.
No distance calculated.

***

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

No air data has been collected for this site. Since no evidence of a release exists, this pathway is scored as 0. (ref. HRS manual)

Date and location of detection of contaminants:

Methods used to detect the contaminants:

Rationale for attributing the contaminants to the site:

* * *

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

Most incompatible pair of compounds:

Toxicity

Most toxic compound:

Hazardous Waste Quantity

Total quantity of hazardous waste:

Basis of estimating and/or computing waste quantity:

* * *

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi | 0 to 1 mi | 0 to ½ mi | 0 to ¼ mi

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species, if 1 mile or less:

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

Distance to residential area, if 2 miles or less:

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

DIRECT CONTACT ROUTE

1 OBSERVED INCIDENT

No documented incident in which contact with hazardous substances at the site has caused illness, injury, or death.

Assigned value = 0

2 ACCESSIBILITY

This site is accessible to any persons or animals. There are no limiting restrictive barriers to the disposal areas.

Assigned value = 3

3 CONTAINMENT

The drums containing the substance of concern are all buried; thus, direct contact with the contaminant in its current state is not probable.

Assigned value = 0

4 WASTE CHARACTERISTICS

Toxicity

Only a substance with a nonzero containment score can be evaluated.

Assigned value = 0

5 TARGETS

Population Within a 1-Mile Radius

Based on a telephone conversation with Mr. Bob Alexander (Ref. R), the number of Officers, enlisted personnel, dependents, and civilian workers at Camp Lejeune approximates 6,500.

Assigned value = 4

Distance to Critical Habitat

There are no known endangered species habitats within 1 mile of the site.

Assigned value = 0

SITE A

Facility name: Site A - MCAS(H) Officers' Housing Area

Location: MCAS New River, Jacksonville, North Carolina

EPA Region: Region IV

Person(s) in charge of the facility: Commanding General, MCB Camp Lejeune

Name of Reviewer: Susan D. Levin, ESE, Inc. **Date:** April 1, 1988

General description of the facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

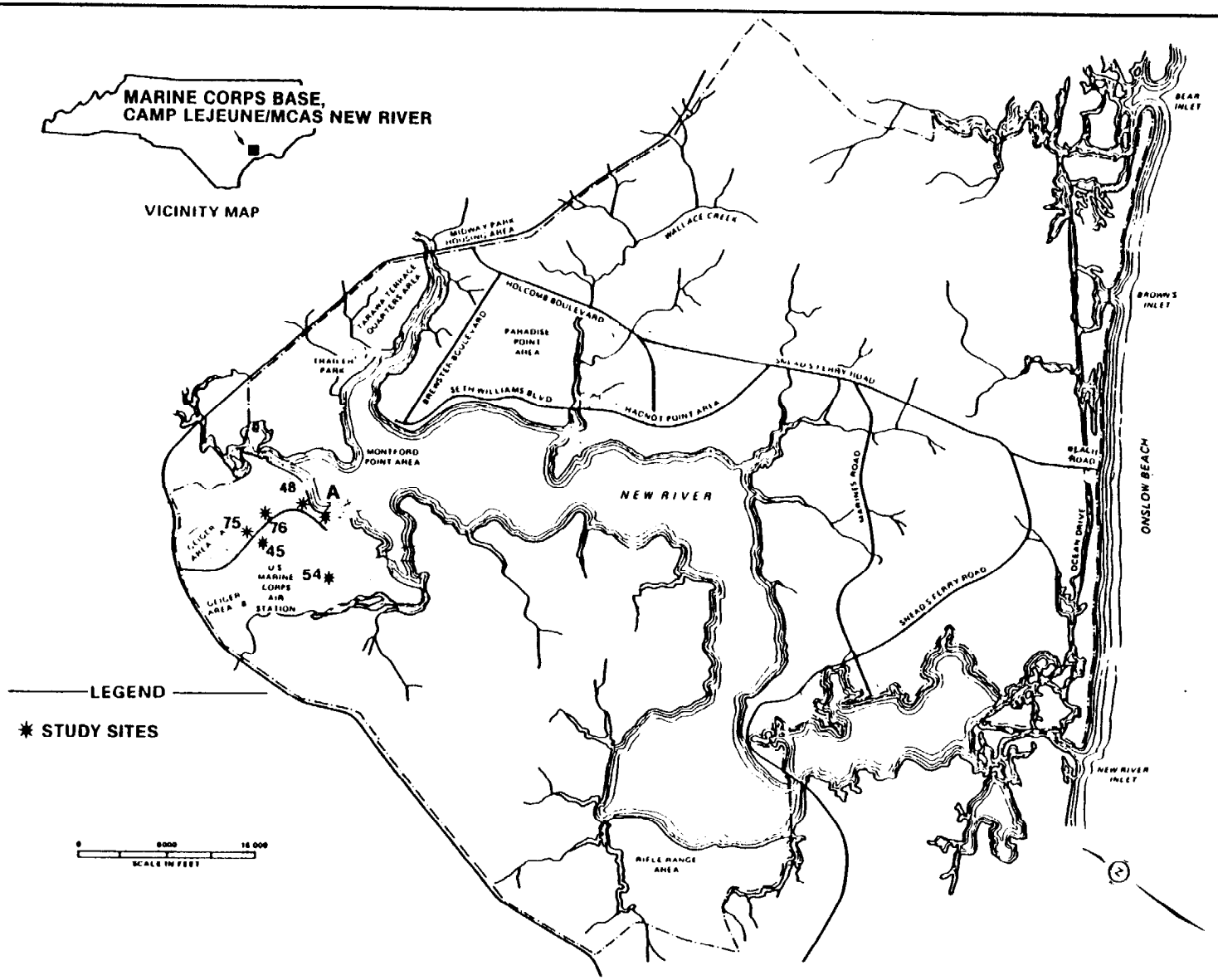
Site is located along the west bank of the New River. Sometime in the late 1940s to 1950s, 100 one to two ounce glass vials were buried at this site. In early 1985, the vials were found by children digging along the eroded shoreline.

Scores: $S_M = 13.51$ ($S_{gw} = 23.02$ $S_{sw} = 4.10$ $S_a = 0$)

S_{FE} = Not scored

$S_{DC} = 0$

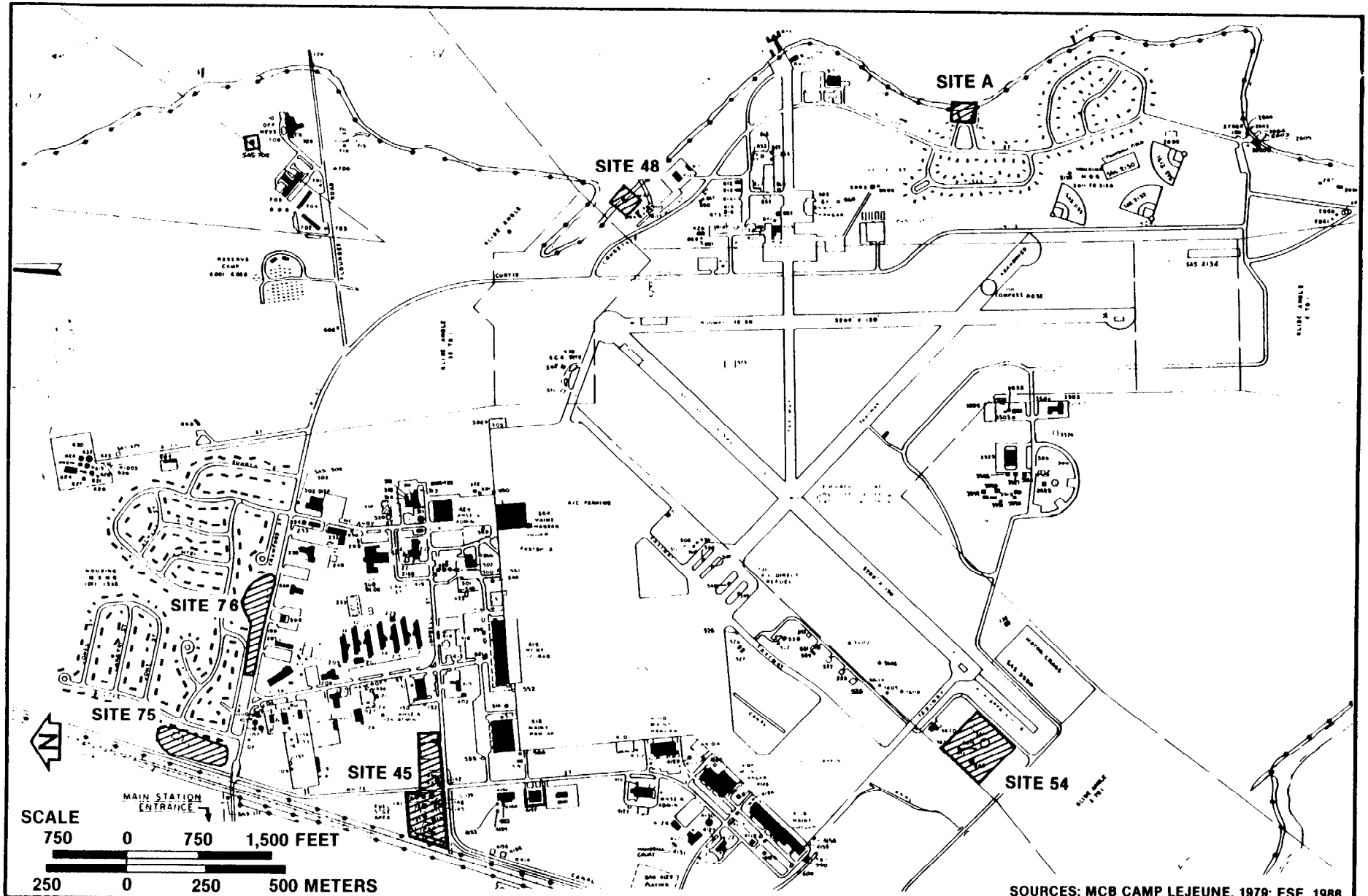
FIGURE 1
HRS COVER SHEET



SOURCES: WATER AND AIR RESEARCH, INC. 1983; ESE, 1988.

SITE MAP SHOWING LOCATIONS OF STUDY SITES

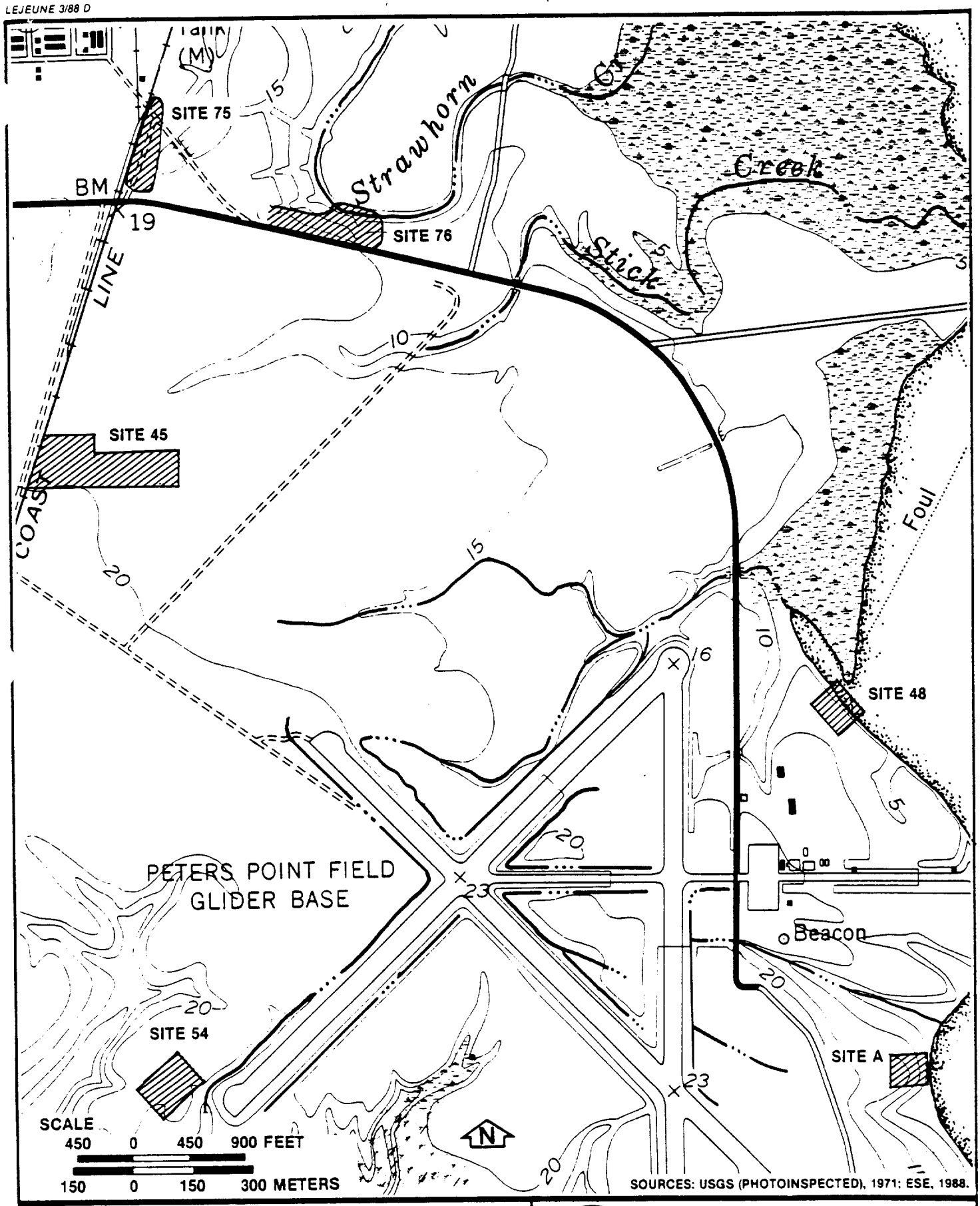
MCAS NEW RIVER, NC



LEJEUNE 3/88 D

LOCATION OF STUDY SITES
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC



PREDEVELOPMENT LAND SURFACE CONTOURS
MCAS NEW RIVER, NC

MCAS NEW RIVER, NC

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: As briefly as possible, summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

FACILITY NAME:
Site A - MCAS (H) Officers' Housing Area

LOCATION:
Camp Lejeune, North Carolina

DATE SCORED:
February 26, 1988, Revised April 1, 1988

PERSON SCORING:
Susan D. Levin, Environmental Science and Engineering, Inc.

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):
See Below.

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:
Air Pathway Fire and Explosion

COMMENTS OR QUALIFICATIONS:

Sources:

Evaluation of Data from First Round of Verification Sample Collection and Analysis Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1985.

Evaluation of Data from Second Round of Verification Sample Collection and Analysis Confirmation Study to determine Existence and Possible Migration of Specific Chemicals In Situ. ESE, 1987.

Initial Assessment Study of Marine Corps Base Camp Lejeune North Carolina. Water and Air Research, Inc. 1983.

Ground Water Route Work Sheet

	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Observed Release	(0) 45	1	0	45	3.1
	If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2	Route Characteristics					3.2
	Depth to Aquifer of Concern	0 1 2 (3)	2	6	6	
	Net Precipitation	0 1 (2) 3	1	2	3	
	Permeability of the Unsaturated Zone	(0) 1 2 3	1	0	3	
	Physical State	0 1 (2) 3	1	2	3	
	Total Route Characteristics Score			10	15	
3	Containment	0 1 2 (3)	1	3	3	3.3
4	Waste Characteristics					3.4
	Toxicity/Persistence	0 3 6 (9) 12 15 18	1	9	18	
	Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
	Total Waste Characteristics Score			10	26	
5	Targets					3.5
	Ground Water Use	0 1 2 (3)	3	9	9	
	Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 (35) 40	1	35	40	
	Total Targets Score			44	49	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			13200	57,330	
7	Divide line 6 by 57,330 and multiply by 100	S_{gw} = 23.02				

Surface Water Route Work Sheet

	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Observed Release	(0) 45	1	0	45	4.1
	If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.					
2	Route Characteristics					4.2
	Facility Slope and Intervening Terrain	(0) 1 2 3	1	0	3	
	1-yr. 24-hr. Rainfall	0 1 2 (3)	1	3	3	
	Distance to Nearest Surface Water	0 1 2 (3)	2	6	6	
	Physical State	0 1 (2) 3	1	2	3	
	Total Route Characteristics Score			11	15	
3	Containment	0 1 2 (3)	1	3	3	4.3
4	Waste Characteristics					4.4
	Toxicity/Persistence	0 3 6 (9) 12 15 18	1	9	18	
	Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
	Total Waste Characteristics Score			10	26	
5	Targets					4.5
	Surface Water Use	0 1 (2) 3	3	6	9	
	Distance to a Sensitive Environment	0 (1) 2 3	2	2	6	
	Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 / 12 16 18 20 / 24 30 32 35 40	1	0	40	
	Total Targets Score			8	55	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			2640	64,350	
7	Divide line 6 by 64,350 and multiply by 100		S_{SW} = 4.10			

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
[1] Observed Release	(0) 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line [1] is 0, the S_a = 0. Enter on line [5] If line [1] is 45, then proceed to line [2]					
[2] Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
[3] Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
[4] Multiply [1] x [2] x [3]				35,100	
[5] Divide line [4] by 35,100 and multiply by 100		S_a = 0			

	S	S^2
Groundwater Route Score (S_{gw})	23.02	529.92
Surface Water Route Score (S_{sw})	4.10	16.81
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		546.73
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		23.38
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} \,/\, 1.73 = S_M =$		13.51

WORKSHEET FOR COMPUTING S_M

Direct Contact Work Sheet

	Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1	Observed Incident	(0) 45	1	0	45	8.1
	If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2	Accessibility	0 1 2 (3)	1	3	3	8.2
3	Containment	(0) 15	1	0	15	8.3
4	Waste Characteristics Toxicity	(0) 1 2 3	5	0	15	8.4
5	Targets					8.5
	Population Within a 1-Mile Radius	0 1 2 3 (4) 5	4	16	20	
	Distance to a Critical Habitat	(0) 1 2 3	4	0	12	
	Total Targets Score			16	32	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			0	21,600	
7	Divide line 6 by 21,600 and multiply by 100	S_{DC} = 0				

Fire and Explosion Work Sheet

No certified threat. Not scored

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Containment	1 3	1		3	7.1
2 Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score				20	
3 Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Total Targets Score				24	
4 Multiply 1 x 2 x 3				1,440	

5 Divide line 4 by 1,440 and multiply by 100 S_{FE} =

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):
No contaminants identified in ground water samples (Ref. A, p. 2-352 through 2-356)

Rationale for attributing the contaminants to the facility:
No contaminants detected. (Ref. A, p. 2-352 through 2-356)

Assigned Value = 0

***

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

See Insert A.

Depth(s) from the ground surface to the highest seasonal level of the saturated zone (water table(s)) of the aquifer(s) of concern:

The surface of the shallow ground water at this site lies within the upper silty sand and sand at depths ranging from 7 to 11 ft below land surface. (Ref. A, p. 2-349) These numbers reflect April 1987 water level measurements and are not necessarily the highest seasonal level of the aquifer.

Depth from the ground surface to the lowest point of waste disposal/storage:

Wastes were reportedly deposited along the shoreline of the New River. (Ref. F) Depth to the aquifer of concern is 7-11 feet.

Assigned Value = 3

INSERT A

Description of Aquifer of Concern
Castle Hayne Aquifer

The Castle Hayne Aquifer is the principal water-supply source for the southern coast and east central coastal plain of North Carolina. The aquifer consists of a series of sand and limestone beds that underlie the site to a depth of around 200 feet. Clay and silty clay confining beds are interlayered with the aquifer material but are generally thin and discontinuous beneath the Base.

A cross-section drawn up by the USGS-Raleigh, NC office running through the Marine Corps Air Station indicates that the traceable clay units are relatively thin (around 24 percent). The aquifer system seems only partially confined, and is therefore readily open to recharge from the surface.

(reference used: Draft Report - Ground-water Resources of the Camp Lejeune Marine Corps Base -- Water-Use Data, A Preliminary Geohydrologic Framework, and Water-Level Data)

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

From climatic atlas, normal annual total precipitation (in inches):
56 (Ref. C, p. 43)

Mean annual lake or seasonal evaporation (list months for seasonal):

From climatic atlas, lake evaporation (in inches):
42 (Ref. C, p. 63)

Net precipitation (subtract the above figures):

14 inches

Assigned Value = 2

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Site is underlain by clay at the surface, followed by layers of silty sand, sand, and back to silty sand. (Ref. A, p. 2-345)

Permeability associated with soil type:

Hydraulic conductivity is less than 10^{-7} cm/sec (Ref. HRS Manual)

Assigned Value = 0

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

The wastes deposited were contained in glass ampules. The waste material reportedly was a white powder. (Ref. F)

Assigned Value = 2

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Waste materials were a powder contained in glass ampules. Breakage of some of the ampules is assumed to have occurred.

Method with highest score:

Containers that are not in sound condition

Assigned Value = 3

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Waste material was identified as calcium hypochlorite. (Ref. F)

Compound with highest score:

calcium hypochlorite (Ref. Sax Manual)

Toxicity - Assigned Value = 2
Persistence - Assigned Value = 1

Matrix Score = 9

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

There were 100 one to two ounce glass ampules found along the shoreline. (Ref. F)

Basis of estimating and/or computing waste quantity:

Waste quantity of 200 ounces.

Assigned Value = 1

* * *

5 TARGETS

Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

See Insert B.

Assigned value = 3

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Well 3506 is the nearest water supply well to the site. (Ref. Air Station Area Map)

Distance to above well or building:

The well is located approximately 3,000 feet from the site. (Ref. Air Station Area Map)

Assigned value = 3

Population Served by Ground Water Wells Within a 3-Mile Radius

Identify water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

The Marine Corps Air Station water-treatment plant has 26 wells and services a population of 10,315. (Ref D, pg. 27). Although well fields on the east side of the New River may be within a 3 mile radius of the site, the USGS has reported that the river acts as a ground water discharge point, thus precluding groundwater movement below and across the river (ref. D).

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

Not computed.

Total population served by ground water within a 3-mile radius:

10,315 (Ref. D, pg. 27)

Assigned value = 5

Matrix score = 35

***

INSERT B

GROUND WATER USE

Since Camp Lejeune was first opened in the late 1930's, water supply has been derived from wells that tap freshwater-bearing aquifers. Over the years, more than 100 wells have been drilled and operated to satisfy increasing demands for water as the Base's functions and population grew. There are eight water-treatment plants at the Camp Lejeune Marine Base - one of which is located at the Marine Corps Air Station. (ref. D, pg. 12 and 27)

All of the water supply wells at the Marine Corps Air Station pump to a central treatment facility before going to users. If the wells were to become contaminated, an alternate source of water is not readily available. The users would have to tap into the County water system. (ref. N, telecon with Mack Frazelle)

SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

No contaminants detected in surface water or sediment samples. (Ref. A, p. 2-358, 2-359 and 2-361)

Rationale for attributing the contaminants to the facility:

No contaminants detected.

Assigned Value = 0

* * *

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

The generally flat topography of the Camp Lejeune complex is typical of the seaward portions of the North Carolina coastal plain. Elevations on the base vary from sea level to 72 feet above msl; however, the elevation of most of Camp Lejeune is between 20 and 40 feet above msl. (Ref. B, p.5-3 and topographic map)
Average slope is less than 3%.

Name/description of nearest downslope surface water:

The New River receives drainage from most of the base. The New River flows in a southerly direction and empties into the Atlantic Ocean through the New River Inlet. (Ref. B, p. 5-11)

Average slope of terrain between facility and above-cited surface water body in percent:

Average slope is less than 3%. (Ref. B, p. 5-3 and topographic map)

Assigned Value = 0

Is the facility located either totally or partially in surface water?

No. Detail figure of Site A. (Ref. A, p. 2-346)

Is the facility completely surrounded by areas of higher elevation?
No. (Ref. topographic map)

1-Year 24-Hour Rainfall in Inches

3.5 inches. (Ref. Figure 8 HRS Manual)

Assigned Value = 3

Distance to Nearest Downslope Surface Water

New River is the nearest downslope surface water body from Site A. (Ref. topographic map) The ampules were found along the bank of the New River. (Ref. T)

Assigned Value = 3

Physical State of Waste

Wastes were reported as a white powder in glass ampules. (Ref. F)

Assigned Value = 2

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Wastes were contained within glass ampules. For scoring purposes, it has been assumed that some of the ampules had been broken.

Method with highest score:

Containers not sealed. Direct access to surface waters.

Assigned Value = 3

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:
Calcium hypochlorite is the white powder in the glass ampules. (Ref. F)

Compound with highest score:
calcium hypochlorite (Ref. Sax Manual)

Toxicity - Assigned Value = 2
Persistence - Assigned Value = 1 Matrix Score = 9

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum):

Reports estimate that 100 one to two ounce glass ampules were found along the bank of the New River. (Ref. F)

Basis of estimating and/or computing waste quantity:

200 ounces

Assigned Value = 1

* * *

5 TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

The New River in the vicinity of Marine Corps Air Station is classified as SC according to Title 15 of the North Carolina Administrative Code. The best usage for class SC waters is "fishing, secondary recreation, and any other usage except primary recreation or shellfishing for marketing purposes". (Ref. B, p. 5-11, 5-12)

Assigned Value = 2

Is there tidal influence?
Yes. However, the tidal range diminishes to approximately 1 foot at Jacksonville, which is north of the Marine Corps Air Station. (Ref. B, p. 5-11)

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Coastal wetlands associated with Southwest Creek are located approximately 1¼ miles downstream of Site A. (Ref. G)

Assigned Value = 1

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Freshwater wetlands not within one mile of the site. (Ref. G)

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

Colony area for the Red-cockaded woodpecker located greater than 1 mile to the southwest of the site. (Ref. B, p. 5-25)

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

No water supply intakes within 3 miles of Site A. Water is too brackish for use. (ref. B, p. 5-11)

Assigned Value = 0

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

Not computed, water not used.

Total population served:

Ø

Name/description of nearest of above-cited intake(s):

No intakes.

Distance to above-cited intakes, measured in stream miles.

No distance calculated.

***

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

No air data has been collected for this site. Since no evidence of a release exists, this pathway is scored as 0. (ref. HRS manual)

Date and location of detection of contaminants:

Methods used to detect the contaminants:

Rationale for attributing the contaminants to the site:

* * *

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

Most incompatible pair of compounds:

Toxicity

Most toxic compound:

Hazardous Waste Quantity

Total quantity of hazardous waste:

Basis of estimating and/or computing waste quantity:

* * *

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi | 0 to 1 mi | 0 to ½ mi | 0 to ¼ mi

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Distance to critical habitat of an endangered species, if 1 mile or less:

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

Distance to residential area, if 2 miles or less:

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

DIRECT CONTACT ROUTE

1 OBSERVED INCIDENT

No documented incident in which contact with hazardous substances at the site has caused illness, injury, or death.

Assigned value = 0

2 ACCESSIBILITY

This site is accessible to any persons or animals. There are no limiting restrictive barriers to the disposal area by the river.

Assigned value = 3

3 CONTAINMENT

This pathway is scored on current conditions at the site. Since the glass vials of calcium hypchlorite were removed, the substance is not accessible to direct contact.

Assigned value = 0

4 WASTE CHARACTERISTICS
Toxicity

Only a substance with a nonzero containment score can be evaluated.

Assigned value = 0

5 TARGETS

Population Within a 1-Mile Radius

Based on a telephone conversation with Mr. Bob Alexander (Ref. R), the number of Officers, enlisted personnel, dependents, and civilian workers at Camp Lejeune approximates 6,500.

Assigned value = 4

Distance to a Critical Habitat

There are no known endangered species habitats within 1 mile of the site.

Assigned value = 0

REFERENCE LIST

REFERENCE LIST

A Evaluation of Data from Second Round of Verification Step Sample Collection and Analysis, Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. Marine Corps Base, Camp Lejeune, North Carolina, July 1987.

B Initial Assessment of Marine Corps Base, Camp Lejeune, North Carolina, NEESA 13-011, April 1983.

C Climatic Atlas of the United States, U.S. Department of Commerce, National Climatic Center, Ashville, N.C. 1979.

D Ground-water Resources of the Camp Lejeune Marine Corps Base - Water-use Data, A Preliminary Geohydrologic Framework, and Water-level Data. USGS Draft Report.

E Evaluation of Data from First Round of Verification Sample Collection and Analysis, Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. Marine Corps Base, Camp Lejeune, North Carolina, January 1985.

F Report #60. Laboratory Analysis on Naval Samples, JTC Report #85-179. JTC Environmental Consultants, Inc. Rockville, Maryland 20850.

G National Wetlands Inventory. Jacksonville South, NC. U.S. Dept. of the Interior 1986.

H Environmental Science and Engineering, Inc. field notes collected on August 6, 1984.

I Jacksonville South Quadrangle North Carolina - Onslow County. 7.5 Minute Series 1952

J Telecon between Susan Levin and Bob Alexander, dated 2/22/88.

K Uncontrolled Hazardous Waste Site Ranking System, A Users Manual, USEPA 1984.

L Map of Air Station Area Marine Corps Air Station, New River, October 1, 1980.

M Sax, N.I., Dangerous Properties of Industrial Materials, Van Nostrand Rheinhold Co., New York 6th ed., 1984.

N Telecon between Susan Levin and Mack Frazelle, Camp Lejuene Utilities, dated 2/19/88.

O Telecon between Susan Levin and Doug Harned, USGS, dated 2/22/88.

REFERENCE LIST (Continued, 2 of 2)

P Telecon between Susan Levin and John Hefner, USFWS, dated 3/30/88.

Q Telecon between Susan Levin and Rick Shiver, NCNRCD, dated 3/31/88.

R Telecon between Susan Levin and Bob Alexander, Camp Lejeune, dated 3/31/88.

S Telecon between Susan Levin and Doug Harned, USGS, dated 3/31/88.

T Site A, Site Description, LANTDIV scope of work to ESE, undated.

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call : S Levin

To (or from) : Mack Frazelle, Supervisor Water and Wastewater Operations

of : Camp Lejuene Utilities

Telephone Number: 919-451-5988

Time and Date: 1145AM 2/19/88

Subject of Conversation: Marine Air Station Water Supply Wells

Project Number: 86601-1000-3120

COMMENTS: All water supply wells at Marine Air Station pump to central distribution treatment system before going to users.

If Marine Air Station wells were to become contamenation - alternate source of water not available. would have to tap into County municipal System.

Drilling logs for water supply wells are available but not readily obtainable. He indicated I would have to talk to Mr. Baker to get permission to copy the logs.

Mack told me to call Ron Kobel of US GS in Raleigh if I neided more information.

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NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call : S. Levin

To (or from) : Bob Alexander

of : Camp Lejuene

Telephone Number: 919 451-3034

Time and Date: 1145 AM 2-19-88

Subject of Conversation: Marine Air Station

Project Number: 86601-1000-3120

COMMENTS: out until Monday

(pm) 2/22/88 Called Bob Alexander

Said New River is not used for drinking within 3 miles of the Marine Air Base. Also the waters are not used for commercial shellfish harvesting- Waters classified as SC waters.

The waters are used for recreation, fishing and shrimping

Burn pit description - burn pit has 2 foot freeboard - will contain rainfalls except for hurricanes.

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NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S. Levin

To (or from): Bob Alexander

of: Camp Lejeune

Telephone Number: (919) 451-3034

Time and Date: March 31 1988 2:30 pm

Subject of Conversation: Population of marine Air Station

Project Number: 86601

COMMENTS:

I asked Bob what the population of the marine Air Base was to be used in calculation for Direct Contact Score.

Officers and enlisted: 5,306 Active duty - every day

Dependents (in housing units): 1,160

Civilian employees 103

Total 6569

Source: Monthly Camp Lejeune Area Population Report 1 Feb 88

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NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S. Levin

To (or from): Rick Shiver

of: NC Natural Resources and Community Development

Telephone Number: (919) 256-4161

Time and Date: 1:00 pm March 31, 1988

Subject of Conversation: Georgetown Community

Project Number: 86601

COMMENTS:

Asked Rick whether the Georgetown Community north of the site was on private wells.

He said that the community is connected to the County water supply. Several years ago there were several contaminated wells in the area. The county decided to extend their water lines.

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NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S. Levin

To (or from): John Hefner

of: US Fish and Wildlife Service

Telephone Number: 404-331-0295

Time and Date: 10:00am March 30, 1988

Subject of Conversation: wetlands definition

Project Number: 86601 Camp Lejeune

COMMENTS:

Mr. Hefner indicated that the brackish and tidally-influenced areas of the New River could be considered coastal wetlands based on location and salinity.

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NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S'Levin

To (or from): Doug Harned

of: USGS Raleigh, NC

Telephone Number: (919) 856-4791

Time and Date: 300 pm 2/22/88

Subject of Conversation: Camp Lejuene - Marine Air Station

Project Number: 86601 - 1000 - 3120

COMMENTS: Doug was out until Tuesday. Will call again.

1040am 2/23/88 Basically one aquifer system. No good confining layer. Will get me copies of some drilling logs in the areas of the sites of interest.

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P.O. Box ESE Gainesville, Florida 32602 904/332-3318

NOTES OF TELEPHONE CONVERSATION

ESE Personnel making (or receiving) call: S. Levin

To (or from): Doug Harned

of: USGS Raleigh NC

Telephone Number: (919) 856-4791

Time and Date: March 31, 1988 4:30pm

Subject of Conversation: Camp Lejeune - Marine Air Station

Project Number: 876601

COMMENTS: I talked to Doug about the possibility of ground water movement below the New River. He said that the New River acts as a discharge point for ground water and that ground water from the west side of the New River would discharge into the river and ground water from the east side of the river would likewise discharge to the river. There would be no movement of ground water across and below the river.

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