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INITIAL ASSESSMENT STUDY OF MARINE CORPS BASE CAMP LEJEUNE NORTH CAROLINA

NEESA 13–011

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY
Port Hueneme, California 93043

INITIAL ASSESSMENT STUDY

OF MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

UIC-M67001

Prepared for:

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY

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EXECUTIVE SUMMARY

This report presents the results of an Initial Assessment Study (IAS) conducted at Marine Corps Base (MCB) Camp Lejeune and outlying fields. The purpose of an IAS is to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous materials operations.

Based on information from historical records, aerial photographs, field inspections, and personnel interviews, a total of 76 potentially contaminated sites were identified. Each of the sites was evaluated with regard to contamination characteristics, migration pathways, and pollutant receptors.

The study concludes that, while none of the sites pose an immediate threat to human health or the environment, 22 warrant further investigation under the Navy Assessment and Control of Installation Pollutants (NACIP) Program, to assess potential long-term impacts. A confirmation study, involving actual sampling and monitoring of the 22 sites, is recommended to confirm or deny the existence of the suspected contamination and to quantify the extent of any problems which may exist. Since the on-site survey, MCB Camp Lejeune has taken action to evaluate or mitigate Site No. 2, the Former Nursery/Day-Care Center, and Site No. 16, the Montford Point Burn Dump. The 22 sites recommended for confirmation are listed below in order of priority.

1. Rifle Range Chemical Dump, Site No. 69;
2. Storage Lots 201 and 203, Site No. 6;
3. MCAS Mercury Dumpsite, Site No. 48;
4. Former Nursery/Day-Care Center, Site No. 2;
5. Transformer Storage Lot 140, Site No. 21;
6. Camp Geiger Dump, Site No. 41;
7. Mess Hall Grease Disposal Area, Site No. 74;
8. MCAS Basketball Court Site, Site No. 75;
9. MCAS Curtis Road Site, Site No. 76;
10. Courthouse Bay Liquids Disposal Area, Site No. 73;
11. Fire Fighting Training Pit, Site No. 9;
12. Industrial Area Fly Ash Dump, Site No. 24;
13. Campbell Street Underground Avgas Storage and Adjacent JP Fuel Farm at Air Station, Site No. 45;
14. Hadnot Point Burn Dump, Site No. 28;
15. French Creek Liquids Disposal Area, Site No. 1;
16. Rifle Range Dump, Site No. 68;
17. Montford Point Burn Dump, Site No. 16 (Mitigation undertaken);
18. Industrial Area Tank Farm, Site No. 22;
19. Crash Crew Fire Training Burn Pit; Site No. 54;
20. Sneads Ferry Road--Fuel Tank Sludge Area, Site No. 30;
21. Camp Geiger Area Dump, Site No. 36;
22. Camp Geiger Area Fuel Farm, Site No. 35.

The results of the Confirmation Study will be used to evaluate the necessity of conducting mitigating actions or clean-up operations.

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FOREWORD

The Navy initiated the Navy Assessment and Control of Installation Pollutants (NACIP) program in OPNAVNOTE 6240 ser 45/733503 of 11 September 1980 and Marine Corps Order 6280.1 of 30 January 1981. The purpose of the program is to systematically identify, assess, and control contamination of the environment resulting from past hazardous materials management operations.

An Initial Assessment Study (IAS) was performed at Marine Corps Base (MCB) Camp Lejeune, Jacksonville, North Carolina, by a team of specialists under the direction of the Naval Energy and Environmental Support Activity (NEESA), Port Hueneme, California. Further confirmation studies under the NACIP program were recommended at several areas at the activity. Sections dealing with significant findings, conclusions, and recommendations are presented in the report. Technical sections provide more in-depth discussion on important aspects of the study.

Questions regarding the NACIP program should be referred to the NACIP Program Director, NEESA (Code 112N), Port Hueneme, CA 93043, AUTOVON 360-3351, FTS 799-3351, or commercial (805) 982-3351. Further information regarding this study may be obtained from NACIP Program Director at the above numbers.

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INITIAL ASSESSMENT STUDY
OF MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

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SECTION 1. INTRODUCTION

1.1 PURPOSE OF INITIAL ASSESSMENT STUDY. The Naval Energy and Environmental Support Activity (NEESA) conducts Initial Assessment Studies (IASs) as directed by the Chief of Naval Operations (CNO). NEESA works in conjunction with the Ordnance Environmental Support Office (OESO) during IASs. The purpose of an IAS is to collect and evaluate evidence which indicates existance of pollutants that may have contaminated a site or that pose a potential health hazard for people located on or off an installation. The IAS is the first phase of the Navy Assessment and Control of Installation Pollutants (NACIP) program. The objective of the NACIP program is to identify, assess, and control environmental contamination from past hazardous materials storage, transfer, processing, and disposal operations. The NACIP program was initiated by OPNAVNOTE 6240 ser 45/733503 of 11 September 1980 and Marine Corps Order 6280.1 of 30 January 1981.

1.2 SEQUENCE OF EVENTS.

1.2.1 Marine Corps Base (MCB) Camp Lejeune was designated for an IAS by CNO letter ser 451/397464 of August 1981. Included in this IAS is Helicopter Outer Landing Field (HOLF) Oak Grove. The environmental consulting firm of Water and Air Research, Inc. (WAR) was selected to conduct the IAS in October 1981.

1.2.2 The Commanding Officer of MCB Camp Lejeune was notified via Atlantic Division, Naval Facilities Engineering Command (LANTNAVFACENGCOM) and by NEESA of the selection of MCB Camp Lejeune for an IAS. The NACIP Program Management Plan (Appendix A to NEESA 20.2-035) and Activity Support Requirements for IAS were forwarded to the installation to outline assessment scope, provide guidelines to personnel, and request advance information for review by the IAS team.

1.2.3 The LANTNAVFACENGCOM staff was briefed on the NACIP program and IAS on 25 January 1982 by Mr. Wallace Eakes, NEESA Contract Coordinator; Dr. Jerry Steinberg, WAR Project Coordinator; and Dr. Hugh Putnam, WAR Team Leader.

1.2.4 MCB Camp Lejeune Chief of Staff and other staff personnel were briefed by the same team on 28 January 1982.

1.2.5 Various government agencies were contacted during 8-25 February 1982 for documents pertinent to the IAS effort. Agencies contacted included:

1. NAVFACENGCOM Historian, Naval Construction Battalion Center (NCBC), Port Hueneme, California;
2. NEESA Information Management Department, NCBC, Port Hueneme, California;
3. NEESA Information Services Department, NCBC, Port Hueneme, California;

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4. Installations Planning Division and Real Estate Division of the LANTNAVFACENGCOM Facilities Planning and Real Estate Department;
5. Utilities, Energy, and Environmental Division of the LANTNAVFACENGCOM Facilities Management Department;
6. Federal Records Service Center, Southeast Regional Branch, East Point, Georgia;
7. National Archives, Washington, D.C.;
8. National Archives Annex, Suitland, Maryland;
9. Federal Records Service Center, Suitland, Maryland;
10. Operational Archives, Naval History Office, Washington Navy Yard, Washington, D.C.;
11. Aviation History Office, Washington Navy Yard, Washington, D.C.;
12. Naval History Division, Curator's Branch, Photographic Collection, Washington Navy Yard, Washington, D.C.;
13. Department of Defense Explosive Safety Board, Alexandria, Virginia;
14. Navy Bureau of Medicine and Surgery, Washington, D.C.;
15. Marine Corps History Office, Washington Navy Yard, Washington, D.C.;
16. Naval Sea Systems Command, Safety Ordnance File (SAFEORD), Naval Surface Weapons Center (NSWC), Dahlgren, Virginia;
17. Accident Incident Data Bank (AID), NSWC, Dahlgren, Virginia;
18. EPA Environmental Photo Interpretative Center, Vint Hill Farm, Virginia (aerial photos);
19. NAVFACENGCOM Real Estate Office, Alexandria, Virginia;
20. United States Geological Survey (USGS) Public Information Office, Reston, Virginia; and
21. National Cartographic Information Center (NCIC), Reston, Virginia.

1.2.6 On-site investigations were conducted during the periods of 15-24 March 1982 and 1 January-3 February 1983. The field team interviewed current and past employees, examined records, and visited potential disposal sites. Mr. Wallace Eakes of NEESA and the following WAR personnel participated in on-site work:

1. Dr. Hugh Putnam, Team Leader, Report Author, Biologist;
2. Mr. James Nichols, P.E., Environmental Engineer;
3. Mr. Michael Hein, Environmental Scientist;
4. Mr. William Adams, Hydrogeologist;
5. Mr. Charles Fellows, Environmental Chemist; and
6. Dr. Jerry Steinberg, P.E., Environmental Engineer.

Ground and aerial tours were made of MCB Camp Lejeune and HOLF Oak Grove. Efforts were made to corroborate specific information discovered during interviews. Verification sources included present and past employees with direct knowledge, aerial photographs, and documents. Substantiation has been obtained for most interview information affecting significant findings and recommendations.

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1.2.7 From 1 April 1982 through 7 March 1983, information, conclusions, and recommendations were developed into this final report document. This included review and comment by NEESA, LANTNAVFACENGCOM, Marine Corps Air Station (MCAS) New River, NAVFACENGCOM Headquarters, and Commandant Marine Corps (CMC) staff.

1.3 SUBSEQUENT NACIP STUDIES. Recommendations for a Confirmation Study phase of the NACIP program is based on the findings of an IAS. A Confirmation Study is recommended only if the following circumstances exist:

1. Sufficient evidence exists to suspect that the activity is contaminated; and
2. The potential contamination may present a danger to:
   a. The health of civilians in nearby communities or personnel within the activity fenceline, or
   b. The environment within or outside the installation.

No further studies are conducted under the NACIP program if these criteria are not met.

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SECTION 2. SIGNIFICANT FINDINGS

2.1 INTRODUCTION. Substantial information has been collected during this Initial Assessment Study (IAS). This chapter summarizes the information collected and it includes three sections:

1. Brief statements of significant facts;
2. Narrative discussion elaborating on the statements, and
3. Abbreviated descriptions of all sites judged to require further assessment (i.e., confirmation).

Information and data are presented in Section 6. Conclusions based on study findings are presented in Section 3.

2.2 GENERAL FINDINGS.

2.2.1 Potentially hazardous chemical wastes have been generated by military activities at Marine Corps Base (MCB) Camp Lejeune.

2.2.2 Seventy-six waste disposal sites have been identified; however, most (54) do not contain hazardous waste or do not pose a significant threat to human health or the environment.

2.2.3 Although sites were identified throughout the base, the air station and Hadnot Point areas had the largest number. Helicopter Outlying Landing Field (HOLF) Oak Grove does not contain any significant sites.

2.2.4 No industrial or municipal wastes were found to be migrating onto base property.

2.2.5 Past use of aircraft and tracked and wheeled vehicles has caused Petroleum, Oil, Lubricants (POL) contamination. These substances were involved in 10 of the 22 sites judged to require confirmation.

2.2.6 Contaminants from the chemical landfill (Site No. 69) are expected to move downgradient and away from the potable wells at the Rifle Range. (Defining movement of pollutants is addressed in more detail in Section 5.) On the basis of this preliminary study, these wells are not at risk from the chemical landfill wastes. The Rifle Range Dump (Site No. 68) west of Well Nos. RR-45 and RR-97, requires further investigation. Solvents buried at this site may have moved upgradient toward Well Nos. RR-45 and RR-97 during heavy groundwater withdrawal.

2.2.7 Ordnance operations are, in general, carefully controlled. However, there is evidence to indicate that limited disposal of some ordnance has occurred at one disposal site (Site No. 41). Potential adverse public health or environmental impacts can be minimized by carefully controlling any future digging or construction activities at the disposal area.

2.2.8 Confining beds separating the water table aquifer and the semiconfined aquifer are discontinuous at Camp Lejeune. This condition

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increases the chance of leachate from old disposal sites migrating into the semiconfined aquifer, the source of potable water.

2.2.9 Groundwater near the surface is not used for drinking water but is highly susceptible to contamination from hazardous waste disposal practices.

2.2.10 Surface water contamination is also possible because flow in the shallow unconfined aquifer generally follows land contours and discharges to the New River or its tributaries.

2.3 DISCUSSION. The Camp Lejeune complex covers approximately 170 square miles. Wastes have been disposed of in many areas during the existence of the base. Because it is so large, Camp Lejeune has used localized sites for waste disposal. However, all waste was not disposed of at authorized areas. Waste disposal occurred in many parts of the installation and included disposal on the ground surface; the use of borrow pits; and spreading of waste oils, solvents, and other POL compounds on roads for dust control.

Located on the Camp Lejeune complex (including Marine Corps Air Station (MCAS) New River and HOLF Oak Grove) are 76 sites at which some form of waste disposal took place. These sites were documented through past records and interviews with former employees. Sites at MCB Camp Lejeune and HOLF Oak Grove are indicated in Figures 2-1 and 6-37, respectively. Knowledge regarding the exact location of all base disposal sites is incomplete. Some sites may never be found and much information now known lacks detail.

Assessments of human health or environmental risk have been made by considering factors such as the type of material involved and the potential for contaminant migration. Fifty-four sites were judged to present no significant risk and do not need to be further evaluated. Twenty-two sites have potentially hazardous materials and reasonable potential for material migration. These 22 sites warrant more analysis, i.e., confirmation analysis.

Overall, most old disposal sites and areas which received wastes are in Hadnot Point area (location of much of the base industrial activity), and at MCAS New River. Many of the sites judged as needing confirmation contain buried POL compounds (e.g., contaminated fuels, waste oils, solvents, and hydraulic fluids). There have been unavoidable POL spills and leaks throughout the base. At Hadnot Point, the Air Station, and Camp Geiger fuel farms, there have been releases of either Avgas, Mogas, JP-4, or JP-5 in significant quantities to generate concern about the groundwater aquifer.

Training functions on the base require use of large numbers of tracked and wheeled vehicles. In the past, waste oils from maintenance operations were either poured on the ground or put into storm drains. This practice has been stopped and a pollution abatement program usi

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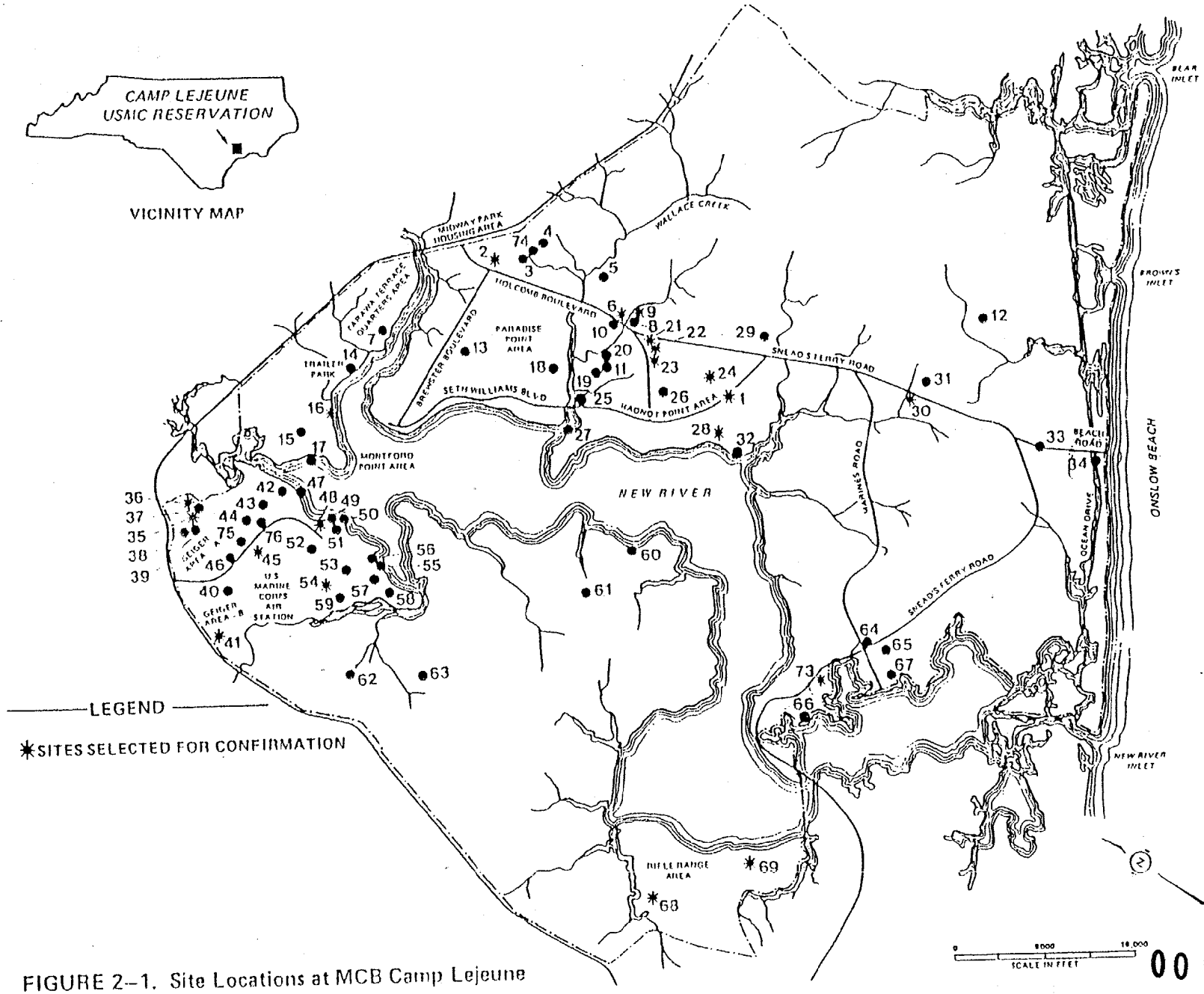

FIGURE 2–1. Site Locations at MCB Camp Lejeune

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oil-water separators has been instituted. At MCAS New River, waste oils, solvents and other compounds were often released to storm drains that entered the New River. Another practice was to store waste fuel, oils, and solvents and use them to control dust on unimproved roads. About 1,000 gallons per week of contaminated JP fuel, crankcase fluids, paint thinners, and other assorted POL compounds were used. Fuels and solvents were used during crash crew and firefighting training.

Since the base was constructed in the 1940s, large amounts of chemicals have been stored, used, and disposed of. One principal disposal site is the chemical landfill. The area is now closed, but all types of hazardous materials were buried here in the past. Although some of the chemicals are known, records identifying other chemicals have been lost. It is not known exactly how much material is involved, although it is recognized to involve hundreds of pounds of wastes. Because groundwater contamination is a concern, test wells have been installed and a sampling program instituted.

The mission of the base requires training using live ordnance. For this purpose, year-round impact areas have been set aside. Explosions have a local blast effect on the environment, but they are not thought to threaten the ground water. Skilled Explosive Ordnance Disposal (EOD) personnel have typically handled unexploded rounds in contained areas where ordnance is either burned or electrically exploded. However, some relatively small amounts of unexploded ordnance may have been disposed of in dumpsters and then buried in at least one landfill.

Potential for contamination of the aquifer varies at Camp Lejeune because of the discontinuous nature of confining layers. Therefore knowledge of nearby geological conditions is needed to completely evaluate a specific site. Geohydrology of the Camp Lejeune complex is such that groundwater generally moves toward the New River and its tributaries. Potable wells at the base are usually deep, but, due to voids in the confining layer, some wells may not be completely isolated from shallow groundwater. Also, heavy demands for water may at times produce an overall decline of pressure in the semiconfined aquifer. Therefore, contaminants can migrate laterally and vertically through gaps in the confining layer. Another factor possibly affecting groundwater quality is the unknown status of abandoned wells. Wells improperly sealed when abandoned may become pathways for contaminant migration.

2.4 SITES REQUIRING CONFIRMATION INVESTIGATION. The following sites warrant confirmation based on consideration of the type of material and the migration potential. Information in this section is extracted from one or more later sections in this report. As a minimum, reference should be made to detailed site information forms included in Section 6.7 for:

1. Cautions regarding estimate limitations of some quantities;
2. Supporting information regarding activities and dates of use;

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3. Locations according to streets or other known landmarks; and
4. References to figures which show site location and/or details.

Site locations are referenced to the 1979 edition of the Public Works Development Map (PWDM) which is a set of 24 sheets. Each sheet contains a locator system using a letter and a number to identify a specific grid. Throughout this report, locations are given using the following format: PWDM "sheet number", "grid letter and number." For example, a site situated in grid A17 on sheet 11 of 24 is rererenced as PWDM coordinates 11, A17.

2.4.1 Site No. 1: French Creek Liquids Disposal Area. This site (PWDM coordinates 11, C7/D7) has been used intermittently from the late 1940s to the mid-1970s. Liquid wastes from vehicle maintenance were poured on the ground as part of routine operations. Dead batteries were emptied of acid before disposal. Batteries and used battery acid usually were hand carried from maintenance buildings to a disposal point. Sometimes, holes were dug for waste acid disposal; these were immediately refilled with dirt. During oil changes, vehicles were driven to a disposal point before the used oil (or other fluid) was drained and replaced with new oil. Acid and oil disposal areas were not necessarily congruent. Suspected quantities involved are 5,000 to 20,000 gallons of waste POL and 1,000 to 10,000 gallons of battery acid. Comparing these quantities to better documented quantities for a similar site (i.e., Site No. 73) indicates that POL quantity estimates may be low at Site No. 1.

2.4.2 Site No. 2: Former Nursery/Day-Care Center (Building 712). This site is at PWDM coordinates 5, K10. This area had been recently operated as a day care center. From 1945 to 1958, pesticides of various kinds were stored, handled, and dispensed here. Residuals are present but reliable data from which to quantify residuals or spill volumes have not been found. Chemicals used in significant amounts include Chlordane, DDT, Diazinon, and 2,4-D. Stored only or used to a minor extent were Dieldrin, Lindane, Malathion, Silvex, and 2,4,5-T. Contaminated areas are the fenced playground, approximately 6,300 square feet; the mixing pad covering approximately 100 square feet; and the wash pad, approximately 225 square feet. An adjacent drainage ditch possibly received washout and spills. Table 2-1 presents results of a preliminary sampling program in April 1982. Based on test data, the day care activities were ceased in April 1982.

2.4.3 Site No. 6: Storage Lots 201 and 203. This site is at PWDM coordinates 6, F3-4/G3-4/H2-4/I2-4/J3. In the 1940s, the area occupied by Lot 203 was a waste disposal site. In the northeast corner, a site is marked where an unknown quantity of DDT was buried. Attempts to estimate the amount have been unsuccessful. The area where DDT was discharged is assumed to be within an 80- to 100-foot radius of the dump marker. The size of Storage Lots 201 and 203 is approximately 25 and 46 acres, respectively. DDT and transformers containing PCBs were stored her

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Table 2-1. Pesticide Levels in Soil at Camp Lejeune Day-Care Center (in ppm, mg/kg), 1982

Station No.	Location*	DDE	DDD	DDT	Chlordane
1	Front play area	0.022	0.240	6.30	0.170
2	Rear play area	0.805	0.850	6.70	0.105
3	Wash pad	27.36	83.10	518.7	36.42
4	Mixing area	68.68	643.60	7,500	45.68
5	Storage area	0.021	0.100	0.061	0.060

* See Figure 6-4.

NOTE 1: Data reported as received without regard for significant digits.

NOTE 2: Since these analyses were made, more testing has been performed.

Source: Jacobs Environmental Laboratories, 1982.

No information referring specifically to PCB leaks has been found. Reports of white powder on the ground indicate DDT spills have occurred.

2.4.4 Site No. 9: Fire Fighting Training Pit at Piney Green Road. This site (PWDM coordinates 6, K3/L3) has been in operation from the 1960s to the present. Pollution abatement devices, including an oil-water separator and an impermeable liner in the training pit (approximately 800 square feet), have been installed. About 30,000 gallons per year of used oil, solvents, and contaminated fuels are burned during training exercises. Until the mid- to late 1960s, the pit was unlined. The entire site is about 1 to 2 acres in size. The soils are sandy and without ground cover.

2.4.5 Site No. 16: Montford Point Burn Dump--The dump (PWDM coordinates 2, N11-12) was opened around 1958 and was closed in 1972, although unauthorized dumping has subsequently occurred. The site contains building debris, garbage, tires, and waste oils. The quantity of these wastes is unknown, but the amount of oil buried here is considered insignificant. Materials have been dumped on the surface and include asbestos insulating material (estimated at less than 1 cubic yard) for pipes. (Note: Mitigation has been undertaken.) The site covers about 4 acres.

2.4.6 Site No. 21: Transformer Storage Lot 140. This site is at PWDM coordinates 10, I15. In 1958, the Pest Control Shop moved from Building 712 to Building 1105 as a storage and administration area and to Lot 140 as a mixing and equipment cleanup area. This shop probably used similar pesticide handling and mixing practices as those used at Building 712. This suggests the possibility for pesticide contamination at this site. Additional information documents overland discharge of waste water generated by rinsing pesticide application equipment on a routine basis. Wastewater discharge was estimated at 350 gallons per week in 1977. Chemicals stored in Building 1105 were identified as Diazinon; Chlordane (dust); Lindane; DDT (dust); Malathion (46-percent solution); Mirex; 2,4-D; Silvex; Dalpon; and Dursban.

In the early 1950s, transformer oil was drained into a pit located at Lot 140. The quantity of oil drained into this pit, over about a 1-year period, is unknown.

Also, surface discharge of transformer oils has been reported. In response to this, the upper 4 inches of soil at Lot 140 was sampled for PCBs in 1980. One part per million PCB or less was found in this topsoil layer.

2.4.7 Site No. 22: Industrial Area Tank Farm. The tank farm (PWDM coordinates 10, J15) is currently in operation. In 1979, a fuel leak estimated at 20,000 to 50,000 gallons occurred. The leak was in an underground line slightly behind the tank truck loading facility, between the building and the large above-ground fuel tank. The site covers about 4 acres.

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2.4.8 Site No. 24: Industrial Area Fly Ash Dump. This site (PWDM coordinates 10, L16-17, M16-17) was first disturbed in the 1940s. The disposal area was used until approximately 1980, when transporting ash to the present sanitary landfill began. The site (estimated to be 20 to 25 acres) is adjacent to upstream portions of Cogdels Creek. Materials disposed of include fly ash, solvents, used paint stripping compounds, sewage sludge, and water treatment spiractor sludge. The amount of fly ash is estimated at 31,500 tons. The estimate of stripping compounds disposed of here is about 45,000 gallons over 7 years.

2.4 9 Site No. 28: Hadnot Point Burn Dump. This disposal site (PWDM coordinates 10, Q13-14) was used for industrial area waste from 1946 to 1971. A variety of industrial waste (estimated between 185,000 to 370,000 cubic yards) was burned and covered. The area has been graded, seeded with grass, and now supports a good ground cover. Its proximity to Cogdels Creek and the New River poses health and environmental risks. Leachate and seepage to Cogdels Creek have been observed.

2.4.10 Site No. 30: Sneads Ferry Road--Fuel Tank Sludge Area. This site (PWDM cooridnates 18, G12) contains sludge and/or washout from storage tanks at the industrial area fuel farm. When the contents of two 12,000-gallon tanks were changed from leaded to unleaded fuel in 1970, sludge and/or washout was drained from the tanks by a private contractor and disposed of along a tank trail which intersects Sneads Ferry Road. Based on knowledge of tank capacity below tank outflow ports, about 600 gallons of sludge and washout were disposed of. It is possible that the site has been used for similar wastes from other tanks. Therefore, the 600-gallon amount must be considered a minimum quantity estimate. Composition of sludge and/or washout is unknown and may vary from substantial amounts of tetraethyl lead to mostly cleaning compounds. Soils in the area are sandy and conducive to migration toward French Creek, about 1,500 feet away.

2.4.11 Site No. 35: Camp Geiger Area Fuel Farm. The site is at PWDM coordinates 12, C11. A leak in an underground fuel line occurred in the late 1950s (probably 1958) near the pad supporting the overhead tanks. Amount of fuel is estimated to be in the thousands of gallons and the fuel moved east toward Brinson Creek. Holes were dug to the water table. Where fuel was floating on the groundwater surface, it was ignited and burned. Fuel contaminating Brinson Creek also was ignited and burned. Distance from the fuel farm to Brinson Creek is approximately 400 feet.

2.4.12 Site No. 36: Camp Geiger Area Dump Near Sewage Treatment Plant. The site (PWDM coordinates 12, D13/E13) received mixed industrial and municipal wastes from 1950 and 1959. These were burned and later covered; however, some materials may have been deposited on the ground surface and covered unburned. The site is about 200 feet from Brinson Creek and a small roadside drainage ditch, located on the opposite side of the landfill, is less than 100 feet away. The site covers 25,000 square feet and rises 10 to 12 feet above grade. Estimated volume is 14,000 cubic yards. Wastes of concern are hydrocarbons (solvents, waste oils, and hydraulic fluids) that were generated at Camp Geiger

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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, CLW

Table 2-2. Volatile Organic Contaminant Levels in Potable Wells and WTP at the Rifle Range

Sampling Site	Date Sampled	Contaminant	Levels (in ppb)	
Well No. RR-45--Drinking Water Well	April 10, 1981	Methylene Chloride	4.0	
Well No. RR-47--Drinking Water Well	April 10, 1981	Clean		
Well No. RR-97--Drinking Water Well	April 10, 1981	Chloroform	16.6	
		Methylene Chloride	5.8	
		Trichloroethylene	1.8	
Bldg. No. RR-85--Water Treatment Plant--Treated Water	April 10, 1982	Chloroform	17.0	
		Methylene Chloride	3.0	
			Raw	Treated
RR Water Plant	May 20, 1981	1,1-Dichloroethane	5.40	3.40
		Chloroform	53.40	94.40
		Methylene Chloride	14.60	4.0

Note: Data reported as received without regard for significant digits.

Source: Jennings Laboratories, Inc., 1981.
Reports Dated: April 16, 1981
May 29, 1981

RR-97, and the WTP Bldg. No. RR85. Results are discussed in Section 2.4.18.

2.4.18 Site No. 69: Rifle Range Chemical Dump. This site (PWDM coordinate 16, L14-15/M14-15) was once designated for disposal of all hazardous chemicals. It has received much attention and is discussed in detail here. Although past records have been lost, it is known that pesticides, PCBs, pentachlorophenol, trichloroethylene (TCE), and many other compounds were buried here. This landfill was active from the early to mid-1950s to approximately 1976.

Tributaries to the New River (including Everett Creek and unnamed creeks and guts), the Rifle Range wells, and surface seeps are nearby. Test wells already exist and intermittent sampling has been done. Also, samples have been collected from a small tributary to Everett Creek and from pools on or near the site. Results of analyses for the presence of volatile organics are in Table 2-3.

Data on Table 2-3 show that water from Test Well Nos. 15 and 16 contains elevated levels of organic contaminants. Samples of surface water from a nearby pool also indicated a high concentration of volatile organic compounds. The pool is a pit 10 to 15 feet deep. It collects groundwater through its sides and bottom.

Because there is a risk of contaminating the potable water supply at the Rifle Range, samples were collected at three operating wells (RR-45, RR-47 and RR-97). The latter well is about 6,000 feet from the dump site. Analyses were run for organic contaminants in both raw and finished water. The results, shown in Table 2-2, indicate that Well No. RR-97 had three organic contaminants. No contaminants were detected in Well No. RR-47, but Well No. RR-45 had 4 parts per billion (ppb) of methylene chloride. Finished water (Well No. RR-85) showed levels of 17 ppb of chloroform and 3 ppb of methylene chloride. Possible sources of contamination are discussed in Secton 6.

Samples from the Rifle Range wells of raw and treated water have been analyzed for trihalomethane compounds. Results show that treated water in August of 1981 contained total trihalomethane (THM) in excess of 100 ppb. Further sampling in 1981 and 1982 indicates levels (except in December 1981) approximately half those observed in August. Reduction of trihalomethanes may be possible through changes in the water treatment process. Elimination or reduction of prechlorination has been successful in reducing trihalomethanes in other plants.

2.4.19 Site No. 73: Courthouse Bay Liquids Disposal Area. This site (PWDM coordinates 17, I11-12) was used from 1946 to 1977. The site is located about 200 feet from Courthouse Bay and 200 feet downgradient from the nearest well. About 13 acres have been identified as a possible POL disposal area, of which about 1 acre also has been used for waste acid disposal. Motor oil from vehicles was drained onto the ground during oil changes (potentially up to 400,000 gal of oil over 32 years). Dead batteries were drained of acid daily or weekly. The acid was poured [illegible]

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Table 2-3. Volatile Organic Contaminant Levels in Test Well Nos. 15 and 16 and Potable Wells at Rifle Range (in ppb), April 10, 1981 (Page 1 of 2)

Sampling Site	Contaminant	Levels (in ppb)
Test Well No. 15	Methylene chloride	2
Test Well No. 16	1,1-Dichloroethane	38
	Methylene chloride	13
	1,2-Dichloroethane	52
	1,1-Dichloroethylene	73.6
	Toluene	51.8
Pool Below Test Well No. 16	Methylene chloride	3.4
Rad Pool	1,1-Dichloroethane	2.0
	Methylene chloride	2.4
Pool with Barrel	Benzene	1.0
	Toluene	181
	1,1-Dichloroethane	176
	1,1,1-Trichloroethane	103
	1,2-Dichloroethane	101
	1,1-Dichloroethylene	258
	1,1,2-Trichloroethane	252
	Chloroform	34.6
	Methylene chloride	37
	Trichloroethylene	141
Stream Bed Below, Behind Dump about 100 yds SSE of Test Well No. 17	Methylene chloride	14
	Tetrachloroethylene	5.8
Tidal Marsh at End of Road	Clean	
Mouth of Stream at Everett Creek	Clean	
Well No. RR-45-- Drinking Water Well	Methylene chloride	4.0
Well No. RR-47-- Drinking Water Well	Clean	

Table 2-3. Volatile Organic Contaminant Levels in Test Well Nos. 15 and 16 and Potable Wells at Rifle Range (in ppb), April 10, 1982 (Continued, Page 2 of 2)

Sampling Site	Contaminant	Levels (in ppb)
Well No. RR-97-- Drinking Water Well	Chloroform	16.6
	Methylene chloride	5.8
	Trichloroethylene	1.8
Bldg. No. RR-85-- Water Treatment Plant--Treated Water	Chloroform	17
	Methylene chloride	3.0

Source: U.S. Navy, 1982.

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shallow, hand-shoveled holes in the disposal area. The holes were then refilled. It is estimated that 10,000 to 20,000 gallons of waste battery liquid were disposed of.

2.4.20 Site No. 74: Mess Hall Grease Pit Area. This site of 2 to 3 acres is at PWDM coordinates 5, N12/014 and was used from about 1950 to the early 1960s. A large pit at this site received waste grease from mess halls; however, this activity is not considered to pose a hazard to the environment or human health. Burial of pesticides and PCB-containing oil probably occurred near the grease pit. A nearby area (about 400 feet southeast) was the site of a pest control activity where bags of sawdust were soaked in DDT solution before being placed in swamp waters. Spillage, wastage, and rinse-out may have resulted in pesticide contamination of soil and groundwater. Estimates of quantities involved include: 1,100 gallons of PCB oil, 50 to 500 gallons of DDT solution, and 2,200 gallons of drummed pesticides. Both areas of this site are within 100 yards of an inactive potable water well.

2.4.21 Site No. 75: MCAS Basketball Court Site. This site is at PWDM coordinates 23, 08-9/P8-9 and was used at least once in the early 1950s for burial disposal of drums. Up to one hundred 55-gallon drums of chloroacetophenone (CN) training agent(s) (a tear-causing compound) are believed to be buried at this site. In addition to CN, chloropicrin (PS), chloroform, carbon tetrachloride, and benzene may also be present. This site is located within 100 yards of on-base housing and within 500 feet of two potable water wells. Another potable water well is located about 800 feet from this site.

2.4.22 Site No. 76: MCAS Curtin Road Site. This site is at PWDM coordinates 23, L10/M10/N10. Drums were buried at this site on two separate occasions in 1949. The drums are believed to have contained some type of chloroacetophenone training agent (CN, CNC, CNB, CNS). Depending upon training agent type, other chemicals may be present including chloroform, benzene, carbon tetrachloride, and chloropicrin. Up to seventy-five 55-gallon drums may be present at this site located next to a residential area and within 1,000 feet of two potable water wells.

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SECTION 3. CONCLUSIONS

3.1 INTRODUCTION. Based on findings of the Initial Assessment Study (IAS), general and site-specific conclusions can be drawn regarding potential for contamination from past disposal of hazardous wastes.

3.2 GENERAL. At 54 of the 76 sites identified, there is little or no potential for harm to public health or the environment. This is because:

1. Most sites contain no significant amount of hazardous substances;
2. Potential for migration of wastes is small, or
3. Waste movement is not reasonably expected to cause exposure to humans or biological resources.

Potential for adverse impact exists at 22 sites (Nos. 1, 2, 6, 9, 16, 21, 22, 24, 28, 30, 35, 36, 41, 45, 48, 54, 68, 69, 73, 74, 75, and 76). Documentation of pollutant movement does not exist at most of these sites. At least some limited field investigation is needed to confirm or deny pollutant migration from suspected past disposal sites of hazardous wastes.

3.3 SITES NOT REQUIRING FURTHER ASSESSMENT. Sites judged not to need additional work are discussed below.

3.3.1 Inert Wastes. Twenty-five sites contain wastes which are inert, such as scrap wood, metal, and construction debris. These sites are Nos. 3, 4, 13, 14, 15, 17, 20, 25, 27, 32, 37, 38, 39, 40, 42, 46, 47, 50, 55, 57, 58, 59, 61, 62, and 63.

3.3.2 Nonverification of Sites. Five sites (Nos. 8, 11, 23, 26, and 72) were reported as possible hazardous wastes sites prior to or during the IAS. However, further investigation has revealed that, while hazardous materials may have been stored there, no spills or disposal of materials occurred.

3.3.3 Petroleum, Oil, Lubricant (POL) Spills with Insigificant Migration Potential. Although spills of POL have occurred at 9 sites (Nos. 5, 31, 33, 34, 52, 53, 56, 64, and 66), significant contamination is not expected because of the small quantities involved or the considerable distance to receiving streams, or both.

3.3.4 Landfilled or Open Dumped Waste in Small Quantities. At 14 sites, quantities of wastes, whether hazardous or not, were judged to be insignificant. These sites are Nos. 7, 10, 12, 18, 19, 43, 44, 49, 51, 60, 65, 67, 70, and 71.

3.3.5 Permitted Sites. The existing base sanitary landfill (Site No. 29) is a permitted site and therefore requires no further NACIP action.

3.4 SITES REQUIRING FURTHER ASSESSMENT.

3.4.1 Site No. 1: French Creek Liquids Disposal Area. Waste POL and used battery acid may threaten a potable water well at Building 636. Potential also exists for pollutant migration off-site into Cogdels Creek and then into the New River. Hence, adverse public health and/or environmental impacts are possible.

3.4.2 Site No. 2: Former Nursery/Day-Care Center. Residual pesticides may exist in soils and drainage conveyance sediments. Potential exists for movement to potable groundwater and Overs Creek. Therefore, adverse public health and/or environmental impacts are possible.

3.4.3 Site No. 6: Storage Lots 201 and 203. Residual from past disposal and spills of DDT may be present in great enough amounts to move off-site to surface waters (Wallace and Bearhead Creeks) and impact the aquatic environment.

3.4.4 Site No. 9: Fire Fighting Training Pit at Piney Green Road. Residual POL from fire fighting training potentially threatens surface waters (Bearhead Creek) with possible adverse health and/or environmental impacts.

3.4.5 Site No. 16: Montford Point Burn Dump, Site A. Asbestos on the ground poses a public health threat to persons being exposed to it. (Note: Mitigation has been undertaken.)

3.4.6. Site No. 21: Transformer Storage Lot 140. Transformer oil, possibly containing PCBs, may have seeped into the groundwater table and may be migrating toward potable water wells. Residual pesticides in the soil and in the drainage ditch sediment may threaten human health by direct contact. Migration potential to Bearhead Creek exists, hence, adverse public health and/or environmental impacts are possible.

3.4.7 Site No. 22: Industrial Area Tank Farm. Fuel leakage may have produced residual contamination of soils with potential for movement to potable groundwater (e.g., Well No. 602).

3.4.8 Site No. 24: Industrial Area Fly Ash Dump. Past disposal of fly ash and solvents may result in migration of harmful substances to Cogdels Creek with adverse public health and/or environmental impacts.

3.4.9 Site No. 28: Hadnot Point Burn Dump. Residuals from past industrial waste disposal potentially threatens Cogdels Creek, the New River, and a recreation pond with adverse health and environmental impacts.

3.4.10 Site No. 30: Sneads Ferry Road--Fuel Tank Sludge Area. Sludge deposits from fuel storage may leach hazardous fuel additives. Subsequent migration to French Creek could result in environmental degradation.

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3.4.11 Site No. 35: Camp Geiger Area Fuel Farm. Hazardous chemicals in residuals from past fuel spills may presently exist in soils. Migration of these chemicals to nearby Brinson Creek could adversely impact the aquatic environment.

3.4.12 Site No. 36: Camp Geiger Area Dump Near Sewage Treatment Plant. Solvents, waste oils, and hydraulic fluids in the landfill may move through the soil to contaminate nearby Brinson Creek or roadside drainage ditches flowing to Brinson Creek. Adverse effects on stream biota could then occur.

3.4.13 Site No. 41: Camp Geiger Dump Near Former Trailer Park. POL, solvents, Mirex, and lead from batteries are among hazardous substances which were disposed of at this site. These substances may migrate to tributaries of Southwest Creek, thereby causing environmental harm. Some ordnance was disposed of at this site and may pose a health hazard during on-site investigations or construction.

3.4.14 Site No. 45: Campbell Street Underground Avgas Storage and Adjacent JP Fuel Farm at MCAC New River. As a result of fuel spillage/leakage, tetraethyl lead and hydrocarbons may move through the soils to nearby drainage ditches and eventually to Southwest Creek or potable water wells.

3.4.15 Site No. 48: MCAS New River Mercury Dump Site. Mercury dumped on or in the ground near the New River may be migrating to the river causing toxic effects to stream biota and persons consuming fish.

3.4.16 Site No. 54: Crash Crew Fire Training Burn Pit at MCAC New River. Harmful substances (e.g., lead) in waste fuels, oils, and solvents may still remain in the soils near the pit. Potentially, they could migrate toward and into drainage ditches flowing to Southwest Creek and cause adverse impacts on aquatic systems.

3.4.17 Site No. 68: Rifle Range Dump. Solvents may have been disposed of in large enough quantities to be migrating downgradient to Stone Creek or moving upgradient into potable wells (e.g., Well Nos. RR-45 and RR-97).

3.4.18 Site No. 69: Rifle Range Chemical Dump. Toxic substances (including pesticides, PCBs, pentachlorophenol, and TCE) may be moving toward and into waters of Everette Creek or other unnamed tributaries of the New River. This poses threats to human health, via fish consumption or direct contact, and the environment. Troop training in the area occurs and risks of direct exposure to persons exist.

3.4.19 Site No. 73: Courthouse Bay Liquids Disposal Area. Waste motor oil and battery acid potentially could migrate into Courthouse Bay. Phenolics and heavy metals (e.g., lead and antimony) may be associated with these materials. A small potential exists for contamination of a potable water well (i.e., near Building A-5). Therefore, adverse public health and/or environmental impacts are possible.

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3.4.20 Site No. 74: Mess Hall Grease Pit Area. Spilled DDT solution and buried drums of PCB oil, pesticides, and other wastes may cause groundwater contamination and pose a threat to human health via potable water well contamination.

3.4.21 Site No. 75: MCAS Basketball Court Site. Buried drums of waste, probably training agent(s), may threaten potable water wells and a water treatment plant pond with contamination by training agent and associated solvents.

3.4.22 Site No. 76: MCAS Curtis Road Site. Buried drums, possibly containing either dry or dissolved training agent(s), may contaminate groundwater and migrate to existing potable water wells.

SECTION 4. RECOMMENDATIONS

4.1 INTRODUCTION. No further work is recommended at 54 of the 76 sites identified during the Initial Assessment Study (IAS). In this section, specific suggestions are made for further study at the remaining 22 sites judged to require confirmation investigation. Recommendations for confirmation studies are made only for sites located on military property or adjacent surface waters where comingling of on and off property waters typically occurs. Specifically excluded are any recommendations regarding interim measures at prospective confirmation study siter and sites not located on military property.

Recommendations typically involve field work which varies in effort according to perceived magnitude and extent of contamination potential. Important information at sites may remain to be gathered during confirmation. This is because the purpose of the IAS study has been to determine contamination potential, and at many sites, this has been satisfactorily assessed without processing all information which may be relevent to a confirmation investigation. For example, at some sites, precise location of site boundaries remain inexact, and an important aspect of confirmation will be to better define them.

Hazardous waste sites identified by the IAS team were evaluated using a Confirmation Study Ranking System (CSRS) developed by Naval Energy and Environmental Support Activity (NEESA) for the Navy Assessment and Control of Installation Pollutants (NACIP) program. The system is a two-step procedure for systematically evaluating a site's potential hazard to human health and the environment, based on evidence collected during the IAS.

Step one of the system is a flowchart which eliminates innocuous sites from further consideration. Step two is a ranking model which assigns a numerical score within a range of 0 to 100, to indicate the potential severity of a site. Scores are a reflection of the characteristics of the wastes disposed of at a site, contaminant migration pathways, and potential contaminant receptors on and off the installation. CSRS scores and engineering judgment are then used to evaluate the need for a confirmation study based on the criteria stipulated in Section 1.3. CSRS scores assigned to sites recommended for confirmation studies also assist Navy managers to establish priorities for accomplishing the recommended actions.

A more detailed description of the Confirmation Study Ranking System is contained in NEESA Report 20.2-042.

4.2 OVERVIEW OF THE RECOMMENDATIONS PROCESS. Recommendations are presented in the following section for additional investigation at each site requiring confirmation. A confirmation study may require multiple sampling efforts before concluding that a problem does not exist. Movement of pollutants in groundwater may be very slow and/or nonuniform, so that sample wells may not draw from affected parts of the aquifers.

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Therefore, in addition to sampling results, recommendations and conclusions should be based on all facts known about a site, including the types and quantities of waste, hydrogeology, and potential routes of pollutants back into the environment. Detection of pollutants in groundwater samples is generally conclusive evidence, but negative results for a limited number of samples does not prove that pollutants are not and/or will not be present.

Recommendations (intended to be used as general guidance for subsequent investigation) are presented on a site-by-site basis using the following format:

Problem: A short statement indicating types of materials involved. Information regarding type of potential environmental contamination may also be given.

Goal: A concise statement addressing specific confirmation objectives.

Approach: An overview of general strategy applied.

Wells: General instructions for siting wells, if used.

Samples: General directions giving types and numbers of soil, sediment, groundwater, or surface water samples specified. General location for samples, other than wells, is often included.

Frequency: A brief specification of when, and over what period, to collect the various types of samples.

Analyses: Specification of information to be collected for each different type of sample. Generally, laboratory analyses are specified, but relevant supporting information may also be noted.

Frequency and analyses specifications are omitted if no samples are recommended.

4.3 SUMMARY OF RECOMMENDATIONS. Recommended principal activities are summarized in Table 4-1. For each site, the suggested number of well installations is shown. Total number of analyses required in well water, surface water, surface water sediments, and soils is shown for a 1-year period. Constituents recommended for analysis and frequency (where repetitive sampling is recommended) are also indicated.

Table 4-1 should be used with the detailed recommendations given for each site in Section 4.4.

4.4 SPECIFIC RECOMMENDATIONS BY SITE. Recommendations for confirmation work at specific sites are outlined below. Details for monitoring-well construction are given in Appendix A.

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Table 4-1. Summary of Recommended Field Work

Site No.	CSRS Score and Study Type*	Wells to be Installed	Samples				Frequency†	Constituents**
			Wells	Surface Water	Sediments - S or Tissues - T	Soil Cores		
1	17C	7	16	-	-	-	2	SC, pH, o & g, Antimony, Chromium, Lead, Zinc Phenolics
2	27C	0	8	-	-	-	2	Cl pest, P pest, herb.
			-	-	4S	8	1	Cl pest, P pest, herb.
6	37V	0	0	-	-	20	1	DDT-R
9	19C	3	8	-	-	-	2	Aromat, TOX, phenolics
16	17	0	-	-	-	-	-	-
21	27C	3	12	-	-	-	2	Cl pest, PCBs
			-	-	2S	8	1	Cl pest, P pest, herb.
22	15C	2	6	-	-	-	2	Aromat/Pb
24	19C		-	-	5S	-	1	Metals A
			-	2	-	-	1	Metals A, F, SC, pH
		6	12	-	-	-	2	Metals A, F, SC, pH, TOX
28	17C		-	-	3S	-	1	o & g, Metals C, PCBs, Cl pest,
					2T		1	Cl pest
		5	10	6	-	-	2	o & g, Metals C, GWCI
30	11C	3††	6	-	-	-	2	SC, o & g, Pb
			-	-	-	5	1	o & g, Pb
35	6V	0	-	-	-	24	1	o & g, Pb
36	9C	5	10	-	-	-	2	GWCI
41	26C	4	8	-	-	-	2	GWCI, Cl pest
45	18C	0	-	-	3S	30	1	o & g, Pb
			2	-	-	-	2	Pb, Aromat

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Table 4-1. Summary of Recommended Field Work (Continued, Page 2 of 2)

Site No.	CSRS Score and Study Type*	Wells to be Installed	Samples				Frequency†	Constituents**
			Wells	Surface Water	Sediments - S or Tissues - T	Soil Cores		
48	30C	6††	12	-	-	-	2	Total Hg
54	11V	0	-	-	-	24	1	o & g, Pb
68	17C	6	12	-	-	-	2	PHH, o & g
			8	-	-	-	4	PHH, o & g
69	47C	12††	36	3	-	-	3	GWCI, o & g, Cl pest, PCBs, Hg, Residual Chlorine, TCE, PCP
		6	18	-	-	-	3	GWCI, o & g, Cl pest, PCBs, Hg, Residual Chlorine, TCE, PCP
73	23C	4††	10	-	-	-	2	SC, pH, o & g, Antimony Chromium, Lead, Zinc Phenolics
74	24C	4	10	-	-	-	2	GWCI, Cl pest, PCBs
75	23C	4	14	2	-	-	2	GWCI, benzene
76	23C	3	10	-	-	-	2	GWCI, benzene

* Confirmation Study Ranking System Score is the numerical value; "C" indicates Characterization Study and "V" indicates Verification Study.

† Number of samplings during initial year of program. Additional sampling may be required.

** Key to constituent abbreviations:

Cl pest. - Organochlorine pesticides including DDT-R
P pest. - Organophosphorous pesticides
DDT-R - DDT and residues
o & g - Oil and grease
PHH - Purgeable halogenated hydrocarbons
TOC - Total organic carbon
SC - Specific conductance
Metals A - Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Selenium, and Zinc.
Metals B - Antimony, Chromium, Lead, and Zinc.
Metals C - Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel, and Zinc.
GWCI - Groundwater contamination indicators, i.e., SC, pH, TOC, TOX (total organic halogen)
TOX - Total organic halogen
TCE - Trichloroethylene
Herb. - Phenoxyalkanoic acid herbicides
PCP - Pentachorophenol
Aromat - Aromatics commonly found in fuels, e.g., benzene, toluene, xylene

†† Hand-augered wells.

Source: WAR, 1982.

4.4.1 Core sampling is generally specified as at 1- to 2-foot intervals down into the water table. This spacing is based on an assumed depth to groundwater of 5 to 10 feet (i.e., 4 or 5 total samples). If depth to groundwater is greater, intervals should be selected to yield 4 or 5 samples between the surface and 1 foot below the water table. Core holes should be filled with cement grout following samplings.

4.4.2 Lead analysis has been specified in certain instances of potential gasoline contamination. Other hazardous substances may also be present in fuels, e.g., benzene. However, lead is considered a useful indicator and is a toxicant in some fuels.

4.4.3 Upgradient wells to document background groundwater quality are specified at many sites. Where several sites are relatively close, one or two background wells may serve more than one site.

4.4.4 Static and dynamic (if appropriate) water levels should be measured whenever wells are sampled. Provisions should be made to permit referencing levels to appropriate data [e.g., mean sea level (msl)].

4.4.5 Whenever DDT-R is recommended for analyses, this refers to analyzing o,p' and p,p' isomers of each of the following: DDT, DDD, and DDE (i.e., a total of six individual compounds).

4.4.6 Analyses denoted as RCRA groundwater contamination indicators refer to specific conductance, pH, total organic carbon (TOC), and total organic halogen (TOX).

Site No. 1: French Creek Liquids Disposal Area

Problem: Uncontained disposal of POL and used battery acid has occurred. Radiator flushing containing dichromate probably occurred. There is potential for migration to groundwater and less potential for surface water contamination. A potable water well is located in the vicinity.

Goal: Determine magnitude of disposal area and assess potential for migration.

Approach: Conduct an inspection of the site to determine boundaries. Install wells and sample shallow groundwater.

Wells: Use existing well (Building 636). Install a total of seven shallow wells--three at downgradient edge of each disposal area and one background, shallow well east of Daly Road and south of Main Service Road.

Samples: Sample each well.

Frequency: Wells: Sample twice, separated by 2 to 3 months

Analyses: Test for specific conductance, pH, oil and grease, phenolics, antimony, chromium, lead, and zinc.

Site No. 2: Former Nursery/Day-Care Center at Building 712 (Formerly the Pest Control Shop)

Problem: This building (presently closed to use) and an adjacent area across the railroad tracks was formerly the pesticide storage and handling facility. Residual pesticides in the soil and the building may pose health risks to supervisory personnel and small children. Preliminary sampling results are shown in Table 2-1. An adjacent drainage creek (ditch) probably received washout and spills. A playground, an old wash pad, an old mixing area, and an old storage area are involved.

Goal: Determine types and amounts of pesticides in the building and playground area, remainder of the area, and in the creek sediments. Determine if pesticides have migrated to nearby wells.

Approach: Collect cores from three sites in the playground. Conduct a thorough inspection of other outdoor areas (both inside and outside the fence) where mixing and handling occurred and obtain three additional soil samples. Collect two soil samples from storage area east of railroad tracks. Examine the building thoroughly and sample for pesticide residue or volatile Chlordane. Sample creek sediments. Collect samples from water supply wells nearby.

Wells: Use existing Well Nos. 645, 646, 647, 616.

Samples: In playground, take 18-inch-deep cores of soil from three separate locations. In other outdoor areas (washing, mixing, and storing), take one 18-inch-deep core from each area (See Section 4.4.1). From building, sample air for volatiles plus, from most used rooms, the residue samples from places likely to harbor fugitive substances, e.g., behind moldings. In creek, take sediment samples at four places: immediately downstream of site, about 1,400 feet downstream near Well No. 646, about 4,000 feet downstream above confluence with Overs Creek, and in Overs Creek upstream of creek widening at Northeast Creek. In wells, sample each well.

Frequency: Sample sediments and soils once. In wells, sample twice, separated by three months. If residuals are present, then further intensive sampling is needed to determine extent and distribution of contamination.

Analyses: For soils, sediments, well, and residues, test for organochlorine pesticides, including DDT-R, phenoxy alkanoic acid herbicides (including 2,4,5-T), malathion, diazinon. For air in the building, test for volatile Chlordane and Dieldrin.

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Site No. 6: Transformer Storage Lots 201 and 203

Problem: DDT contamination of soils due to burial in northeast section of Lot 203 and spills.

Goal: Determine presence of DDT in soils.

Approach: Sample soils in vicinity of suspected dumping and spilling of DDT. Emphasize areas radially from the four DDT-related locations.

Samples: At each of the four spill locations, select five places to obtain cores (i.e., 20 samples total). Unless there are on-site indications to concentrate sampling places, encircle locations. At each of the five sampling places, within an approximately 3-foot-diameter circle, take approximately four shallow cores 12 inches deep to produce a single composite sample totaling about 3 kilograms (kg) of soil. At the DDT dump, deeper cores may be necessary (see Section 4.4.1).

Frequency: Sample once.

Analyses: Analyze for DDT-R.

Site No. 9: Fire Fighting Training Pit at Piney Green Road

Problem: Contaminated fuels and smaller amounts of solvents and other Petroleum, Oil, Lubricants (POL) compounds have been used at this site with potential contamination of soil and water table.

Goal: Determine if POL and solvent compounds are present and if migration has occurred.

Approach: Sample groundwater and determine contamination from fuel or solvents. Even though pit is now lined, a plume of material may have moved downgradient during approximately 20 years before lining. Therefore, collect samples adjacent to and downgradient of pit. Well HP-635 is approximately 500 feet away. Although not downgradient, it is pumping and should be sampled.

Wells: Use Well No. 635 and install two downgradient wells and one well adjacent to pit.

Samples: Sample each well. Static and dynamic water levels should be recorded referenced to datum (see Section 4.4.1).

Frequency: Sample each well twice, 3 months apart.

Analyses: Analyze for aromatics commonly found in fuels (e.g., benzene, toluene, xylene) TOX and phenolics. Measure thickness of any POL layer encountered.

Site No. 16: Montford Point Burn Dump

Problem: Unauthorized dumping of asbestos here.

Goal: Confirm quantity of asbestos on land surface in order to estimate cleanup effort. Alternately, proceed directly to clean up and remove friable asbestos to an appropriately operated landfill.

Approach: Conduct a careful inspection of the site. Alternately, collect asbestos material on ground surface and dispose in an approved manner.

Samples: None

NOTE: Corrective action has been initiated.

Site No. 21: Transformer Storage Lot 140

Problem: Pesticide handling and mixing, and cleaning of pesticide contaminated equipment occurred at this site and soil contamination is probable. Storm water runoff may carry pesticides into Bearhead Creek via a railroad track drainage ditch adjacent to Storage Lot 140. Potential PCB disposal in pit may have contaminated groundwater with subsequent movement to potable wells (Pump Houses 602, 634, and 637).

Goal: Determine types and amounts of pesticides at Storage Lot 140 (to include the rinse pad, mixing area, and adjacent areas), and in drainage ditch sediment. Determine PCB content in groundwater between pit site and wells. Sample existing wells.

Approach: Collect soil and ditch sediment samples and install monitoring wells. Inspect site to determine if the 1958 to 1977 surface material has been covered by new material. Emphasize areas adjacent to wash pad and in mixing area.

Wells: Install three monitoring wells approximately 100 feet from pit site in directions of potable wells. Also use existing wells.

Samples: Collect soil samples at two depths from each of four places (i.e., eight samples total). Locate four places as follows: two in lot near the southeast corner, plus two outside lot in areas apparently within surface drainage route. Sample two depths: upper 6 inches and 12 to 18 inches below the surface. Insure that sampled soil is not fill material.

Collect ditch sediment samples at two locations: downstream end of Storage Lot 140 and immediately upstream of Sneads Ferry Road.

Frequency: Sample each well. Soil and sediment: sample once. Wells: sample twice.

Analysis: For soils and sediments, test for organochlorine pesticides including DDT-R, organophosphorus pesticides, phenoxy alkanoic acid herbicides (including 2,4,5-T). For wells: test for organochlorine pesticide scans (including PCBs).

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Site No. 22: Industrial Area Tank Farm

Problem: Fuels amounting to 20,000 to 50,000 gallons leaked into soils around tank farm. There is potential for migration to a potable well, i.e., Well No. 602.

Goal: Determine whether fuel components are present in groundwater at Well No. 602 or between site and Well No. 602.

Approach: Sample groundwater from two new wells and from Well No. 602, which is 1,100 feet downgradient and pumping.

Wells: Use existing Well No. 602. Install two new wells at approximately third points between site and Well No. 602.

Samples: Sample all wells.

Frequency: Sample well water twice, separated by 2 to 3 months.

Analyses: Analyze for aromatics commonly found in fuels (e.g., benzene, toluene, xylene) and lead. Measure thickness of any POL layer present.

CLW

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Site No. 24: Industrial Area Fly Ash Dump

Problem: Disposal of fly ash, sludges from water and wastewater treatment plants, and solvents has occurred. There is potential for migration to groundwater and/or surface water.

Goal: Determine whether hazardous wastes are present and assess potential for migration.

Approach: Conduct an inspection of the site to determine boundaries. Install wells and sample groundwater. Sample sediments and water in adjacent creek.

Wells: Install five wells at the downgradient edge of the site and one upgradient to establish background.

Samples: Sample each well. For creek sediments, take samples from four places near site plus one place about 1,000 feet downstream. Sample creek water at two locations below site (approximately east of Building 1775 and about 1,000 feet further downstream).

Frequency: For wells, sample twice in wet season, separated by 2 months. For sediments and water, sample once.

Analyses: For surface water, analyze for specific conductance, pH, fluoride and heavy metals (see list below). For groundwater, analyze for TOX (as an indicator of paint stripping solvents) plus surface water constituents with static water levels in wells referenced to msl. For sediments, test for metals only.

Note: Metals: Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Selenium, and Zinc.

CLW

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Site No. 28: Hadnot Point Burn Dump

Problem: Domestic and industrial wastes were disposed of at this site.

Goal: Determine whether hazardous wastes are present in groundwater near creek and assess potential for migration. Check on potential impacts on recreational pond fishes.

Approach: Conduct a careful inspection of the site to better define boundaries to insure proper well siting. Install wells and sample surface water and sediment in Cogdels Creek. Sample fish from the pond for chlorinated organic compounds.

Wells: Install one well upgradient for background, one well downgradient of the dump on the east side of Cogdels Creek, and three wells between dump and either Cogdels Creek or the New River.

Samples: Sample each well. Sample water column and sediment from three creek locations: (1) upstream of dump, (2) adjacent to dump area, and (3) downstream at the mouth of Cogdels Creek. Sample one composite each for two edible fish species from recreation pond.

Frequency: For wells and water column, sample twice during the wet season, separated by 2 months. Sample sediments once.

Analyses: Analyze well and surface water for specific conductance, oil and grease, pH, metals, TOX and TOC. Analyze sediment for oil and grease, metals, PCBs, and pesticides. Static water level in wells should be referenced to common datum. Analyze fish composites for chlorinated pesticides.

Note: Metals--Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel, and Zinc.

CLW

Site No. 30: Sneads Ferry Road Fuel Tank Sludge Area

Problem: Sludge or bottom deposits from a large fuel tank were disposed of on the ground.

Goal: Determine whether hazardous waste is present and migrating toward groundwater

Approach: Define location of dumping. Sample soil for substantial residuals. Sample groundwater toward French Creek using simple wells.

Wells: Use three hand-augered wells downgradient toward French Creek.

Samples: Sample each well. Take surface cores at 5 places near dumping sites (see Section 4.4.1).

Frequency: Sample each well twice separated by 2 to 3 months. Sample sediments once.

Analyses: Analyze for specific conductance, oil and grease, and lead.

Site No. 35: Camp Geiger Area Fuel Farm

Problem: Fuel spills have contaminated soils. There is a possibility of groundwater contamination.

Goal: Determine if soils and groundwater remain contaminated with Mogas containing tetraethyl lead.

Approach: Sample soil between leak and Brinson Creek to assess extent and location of residual contamination, and to assess potential for movement into Brinson Creek. Surface gradient to creek is near due east; however, exact path of spill migration is not documented. Therefore, sample soil at points along the topographic gradient, but at locations on each side of the gradient line passing directly through the leak.

Samples: Collect a total of 24 soil cores down to 1 foot below the water table at 1- to 2-foot increments. At each of six points, collect cores at 4 depths. Determine the six points as follows: Establish a line parallel to the gradient passing through the leak. Establish three perpendicular crosslines along the line: near leak, near creek, and intermediate. Along each crossline, core at two points, 50 to 100 feet on each side of original line (see Section 4.4.1).

Frequency: Sample once.

Analyses: Analyze for oil and grease and lead.

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Site No. 36: Camp Geiger Area Dump near Sewage Treatment Plant

Problem: Industrial wastes have been disposed of at this site.

Goal: Determine whether hazardous wastes are present and if migration has occurred.

Approach: Establish monitoring wells to document groundwater quality

Wells: Install a total of five wells: one background plus four downgradient, close to boundary, surrounding mound clockwise from north to south.

Samples: Sample each well.

Frequency: Sample twice, separated by 2 to 3 months.

Analyses: Analyze for RCRA groundwater contamination indicators (GWCI) with static water level referenced to msl.

Site No. 41: Camp Geiger Dump near former Trailer Park

Problem: Industrial wastes and pesticides have been disposed of here, resulting in potential contamination of groundwater and two small tributaries to Southwest Creek.

Goal: Determine whether groundwater is contaminated and whether migration has occurred toward nearby surface water.

Approach: Install four monitor wells, one upgradient and three downgradient. Suitability of existing Test Well Nos. 18, 19, 20, and 21 will be determined by Phase II geologists (see Appendix A). If any existing wells are found unsuitable, then casings should be removed and holes plugged. Downgradient wells should address potential movement to each small tributary and wetland.

Wells: See above.

Samples: Sample each well.

Frequency: Sample twice in a 3-month period during wet season.

Analyses: Analyze for RCRA groundwater contamination indicators and organochlorine pesticides with static water levels referenced to msl.

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

Problem: There is potential migration and groundwater contamination from fuels containing tetraethyl lead. A potable water well is located near drainage canal.

Goals: Determine if JP fuel has contaminated soils outside of the fuel farm or the groundwater or surface drainage. Determine extent of contamination of soil and surface drainage due to Avgas leak.

Approach: Sample soils near both sites to define extent of impact. Sample surface drainage canal which parallels roadway south (downgradient) of fuel farm. This ditch should intercept most southward surface and subsurface flow. Sample Well No. 4140, which is about 700 to 800 feet downgradient of sites and lies near the drainage ditch/canal.

Wells: Use existing Well No. 4140.

Samples: Sample Well No. 4140. In the drainage ditch/canal, sample bottom sediments at three places, i.e., near sites on Campbell Street, near Well No. 4140, and south of Schmidt Street (i.e., about 3,000 feet from site). For soil cores, select 10 coring locations--five locations around perimeter of both sites. At each location, collect cores at three depths from surface down to 1 foot below water table (see Section 4.4.1).

Frequency: Sample soils and sediments once. Sample Well No. 4140 twice, separated by 2 to 3 months.

Analyses: Analyze every soil sample for lead and oil and grease. For well water, analyze for aromatics commonly found in fuels (e.g., benzene, toluene, xylene) and for lead. Static and dynamic water levels should be referenced to common datum.

CLW

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Site No. 48: MCAS New River Mercury Dumpsite

Problem: Metallic mercury may have been dumped over a 10-year period behind Building 804. No evidence has been found to indicate a central disposal place. It is surmised that disposal occurred at random places with each place containing relatively small amounts of mercury.

Goal: Determine whether mercury is in groundwater near river.

Approach: Install wells in line parallel to river. About 100 feet of shoreline is involved. Well spacing should be relatively close due to potential for several pockets of mercury to exist. Elaborate wells are not needed because mercury is only consitutent of interest.

Wells: Install six simple (hand-augered) monitoring wells.

Samples: Sample each well.

Frequency: Take initial samples, sample 6 months later, then sample annually.

Analyses: Analyze for total mercury.

Site No. 54: Crash Crew Fire Training Burn Pit at the Air Station

Problem: Contaminated fuels, including leaded fuel, and various POL compounds are used for training purposes. Spills may have contaminated the surrounding soil.

Goal: Determine whether soils in immediate area of site are contaminated and whether there is potential for POL to enter groundwater.

Approach: Sample the soil in immediate area.

Wells: None

Samples: Collect a total of 24 cores. Cores should be deep enough to extend 1 foot into groundwater table. Take samples at 1- to 2-foot intervals (i.e., four depths at each place). Locate cores six places around pit counter clockwise from northwest to southeast of the pit (i.e., between pit and drainage ditches). Core at places equidistant from pit and nearest ditch (see Section 4.4.1).

Frequency: Sample once.

Analyses: Analyze for oil and grease and lead.

Site No. 68: Rifle Range Dump

Problem: Solvents disposed of at this site may be affecting nearby potable wells.

Goal: Determine whether solvents are present and have moved upgradient to threatened potable wells.

Approach: Establish test wells upgradient and downgradient of dump site to be sampled in conjunction with nearby water supply wells. Upgradient wells used to assess possible migration toward potable water wells rather than to document background.

Wells: Install three wells downgradient of dump site to determine whether pollutants have moved toward Stone Creek. Install three wells upgradient between dump site and Well Nos. RR-45 and RR-97.

Sampling: Sample each well.

Frequency: Test wells are to be sampled twice, separated by 2 or 3 months. Well Nos. RR-45 and RR-97 are to be sampled quarterly.

Analyses: Analyze for volatile organic compounds and oil and grease with static and dynamic water levels referenced to msl datum.

Site No. 69: Rifle Range Chemical Dump

Problem: Hazardous wastes of various types were buried here over a period of years and may migrate to surface water or groundwater.

Goal: Determine whether wastes are migrating to groundwater or surface water in sufficient quantities to cause risk to health.

Approach: Remove old monitoring wells, plug holes, and put in properly installed wells. Because of multidirectional drainage, use a two-phase approach to help place final wells.

Surround site with simple observation wells (i.e., hand-augered, PVC) located about 100 feet outside site boundary. Use 12 wells about 250 feet apart. Collect soil strata data when installing bores. Soil data will be used to estimate hydraulic conductivities and potential groundwater movement patterns. Collect specific conductivity and pH data to provide general indicators of contaminant plume location. Obtain static water levels referenced to common datum to define potentiometric gradient. Use hydraulic conductivity, gradient, and quality data to locate areas (directions) of highest potential contaminant movement.

Based on this initial evaluation of three samplings (at 4 month intervals during 1 year), install approximately six monitoring wells to rigorously define contaminant migration, if any.

Document background from off-site wells. Sample some nearby surface seeps.

Wells: Install twelve initial observation wells down to 2 feet into water table, three in Everett Creek basin, three in basin to southeast plus six in basin to north, and six formal monitoring wells.

Samples: Sample each well and three seeps northward.

Frequency: Sample both wells and seeps every 4 months.

Analyses: Analyze for GWCI, oil and grease, organochlorine pesticides (including DDT-R), PCBs, TCE, pentachlorophenol, residual chlorine, mercury. Water levels are to be taken referenced to common datum.

Site No. 73: Courthouse Bay Liquids Disposal Area

Problem: Used vehicle battery acid and motor oil were disposed of at this site and may migrate to Courthouse Bay or a potable water well.

Goal: Determine presence and levels of metals, phenolics and oil in groundwater and determine if migration has occurred. Evaluate potential for corrosion damage to present or future structures (including underground pipes and cables) from acidic waste.

Approach: Sample groundwater between site and Courthouse Bay and at closest potable well.

Wells: Use existing Well Building A-5. Install four simple, hand-augered wells: one well up gradient of disposal area, three wells down gradient near the Courthouse Bay shoreline.

Samples: Sample each well.

Frequency: Sample twice, separated by 3 months.

Analyses: Test for antimony, chromium, lead, zinc, oil and grease, phenolics, specific conductance, and pH.