

APPENDIX INAVY ASSESSMENT AND CONTROL OF INSTALLATION
POLLUTANTS (NACIP) PROGRAMMarine Corps Base
Camp Lejeune, North Carolina

The NACIP program is implemented in the following phases:

Initial Assessment Study (IAS) of the existence of potential contamination problems, which was provided to NCDEM, Raleigh, in December 1983. (Note: A copy of the IAS will be forwarded to NCDEM, Wilmington, by separate correspondence.)

Confirmation Study for onsite work to confirm, qualify, and recommend correction of contamination problems, which is currently underway.

Corrective measures to control or mitigate contamination, and to be funded under the Department of the Navy Pollution Abatement Program.

The Confirmation Study is a sequentially phased effort as described below:

<u>Step</u>	<u>Description</u>
IA	Verification of existence of contamination.
IB	Characterization of extent and rate of migration of contaminants, geohydrological, geophysical and other factors.
II	Evaluate alternatives to achieve compliance, prepare cost estimates and project effectiveness of alternatives.
III	Prepare site operation and draft Government project documentation with cost estimate satisfactory for project funding requests.

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APPENDIX II

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.

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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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INITIAL ASSESSMENT STUDY OF MCB
CAMP LEJEUNE, APRIL 85 REPORT

Background

The framework whereby the Marine Corps can remediate groundwater pollution at problem sites is the NACIP program. This acronym stands for "Naval Assessment and Control of Institutional Pollutants". Begun in September 1980, the NACIP program is the Navy's "superfund" program (federal installations are exempt from CERCLA coverage).

The NACIP program, broadly defined, mandates the identification, study, and correction of pollution problems caused by past disposal practices of hazardous materials. Specifically, it consists of three phases: 1) the first phase requires the identification and prioritization of problem sites at the base (initial assessment study), 2) the second phase (confirmation study) authorizes technical studies at the priority sites to define the severity of the contamination problem, and 3) the third phase specifies remedial actions (corrective measures) at documented problem sites. Appendix I provides a detailed explanation of the NACIP program in progress at the MCB.

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Chronology of Events

The initial assessment study was performed at the MCB from February 1982 to February 1983. Conducted by consultants with Water and Air Research, Inc., the study emphasized groundwater contamination sites. The findings and recommendations were incorporated into an April 1983 document titled Initial Assessment Study of Marine Corps Base Camp Lejeune North Carolina. Although seventy-three (73) contamination sites were identified at the MCB, the investigators concluded that further studies could be justified only at twenty-two (22) priority sites. Figure 1 shows the location of these 73 sites, and Appendix II provides an executive summary of the report.

During July 1984, confirmation studies were begun at eighteen (18) priority sites. The results of these groundwater studies were documented in a report provided to the Marine Corps in February 1985. as the Marine Corps disagrees with the conclusions in this report, it will not release a copy of it to any outside agency. Recently, however, the Marine Corps did agree to provide DEM copies of the technical data for review and interpretation.

As part of this confirmation study, it was recommended that volatile organic analyses (VOA) samples be collected from any community water supply well that is located proximal to a priority site. In July 1984, solvents and gasoline were discovered present in well HP-602, and expanded quality studies eventually verified the presence of organic contaminants in ten (10) wells. The organic contaminants included: tetrachloroethylene, trichloroethylene, dichloroethylene, methylene chloride, 1,1 - dichloroethane, benzene, toluene, and dichlorobenzene. Although no safe drinking water

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standards have been established for these constituents, the Marine Corps nevertheless discontinued use of the contaminated wells during December 1984.

Believing that the ten contaminated wells obviated violations of 15 NCAC 2L regulations, DEM issued the MCB a notice of violation (NOV) to that effect on May 15, 1985. This NOV (see Appendix III) required the Marine Corps to submit to DEM a plan of action (with a schedule of compliance) that would: 1) identify the source(s) of contamination, 2) define the geometry of the plumes, 3) define the quality attributes of the plume(s), 4) project the future impacts of the source(s), and 5) propose remedial actions to restore the polluted groundwaters to GA standards. The Marine Corps response to this NOV was simply to expedite the implementation of the NACIP program: a copy of the 19 July 1985 response is Appendix IV.

Contamination of two of the ten wells on the MCB is related to civilian sources. The organic solvents present in the two wells at Tarawa Terrace I probably originate from nearby dry cleaner(s). During April 1985, DEM initiated a study to identify the source(s) of this plume(s), and while the field study is completed, the analytical studies are not, so no conclusions are yet possible.

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Discussion

The principal objective of the NACIP program is to correct the worst case hazardous waste sites at the MCB. Consequently, the NACIP program can not comply with DEM's mandate to remediate all significant sources of groundwater pollution. Broader in scope, the 15 NCAC 2L regulations allow for the management of non-hazardous as well as hazardous sites. After applying the 2L regulations to the 73 sites, there are thirty-eight sites that are of concern to DEM.

Table 1 summarizes the characteristics of each site. In order of priority, DEM is most concerned about the following sites:

1. Rifle Range Chemical Dump, Site No. 69
2. Camp Geiger Dump, Site No. 41
3. Industrial Area Tank Farm, Site No. 22
4. Storage Lots 201 and 203, Site No. 6
5. Transformer Storage Lot 140, Site No. 21
6. Former Day Care Center, Site No. 2
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. Fire Fighting Training Pit, Site No. 9
11. Base Sanitary Landfill, Site No. 29
12. Original Base Dump, Site No. 10
13. Campbell Street Avgas-JP Fuel Farm, Site No. 45
14. MCAS Direct Refuel Depot, Site No. 52
15. Camp Geiger Area Fuel Farm, Site No. 35
16. Rifle Range Dump, Site No. 68

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17. MCAS Mercury Dump, Site No. 48
18. Hadnot Point Burn Dump, Site No. 28
19. Montford Point Burn Dump, Site No. 16
20. Courthouse Bay Liquid Disposal Area, Site No. 73

Priority is based on a consideration of the toxicity of the waste, the probability of groundwater quality violations, the proximity of the site to community water supply wells, and the proximity of the site to surface waters.

The data do not suggest that any of the contaminant plumes from the 38 sites have migrated off the MCB. However, it is probable that in one case a contaminant plume(s) from a day cleaner(s) migrated onto the base and resulted in the contamination of two community water supply wells.

Eight (perhaps nine) community water supply wells at the MCB already have been impacted by these (and other unknown) waste sources. Additionally, another eighteen (18) wells are in jeopardy of being impacted.

It is evident, therefore, that DEM must commit the resources necessary to assure that the Marine Corps resolves its groundwater quality problems.

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Groundwater Resources Situation

Currently, the MCB extracts for use an average of 8.30 million gallons per day of groundwater from 103 wells. Except for the Rifle Range System, these wells are exposed to the Tertiary Sand Aquifer: at the Rifle Range the wells are exposed to the Tertiary Limestone Aquifer. Over all the MCB, the well depths range from 100 to 200 feet.

The Tertiary Sand Aquifer is highly vulnerable to contamination from pollution sources. Because the confining beds between the Water Table Aquifer and Tertiary Sand Aquifer are discontinuous (or absent), and because many sites are located close to active wells, the probability that potable water supplies can be contaminated is high. That this has happened already attests to the vulnerability of the aquifer for pollution.

The Marine Corps now experiences occasional problems in meeting peak water demand at the MCB. In part that is because ten (contaminated) wells were removed from the system, and in part because expansion of the MCB has resulted in increased demands for water. To evaluate the adequacy of the groundwater system to meet its long term demand, the Marine Corps is negotiating a quantity-related study with the United States Geological Survey.

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Conclusions and Recommendations

The principal conclusions are as follows:

1. There are thirty-eight (38) known pollution sites that are of concern to DEM;
2. The NACIP program is designed to remedy problems only at serious hazardous waste sites;
3. Eight (perhaps nine) community supply wells have been contaminated by on-base sources;
4. Two community supply wells have been contaminated by off-base sources;
5. Another eighteen community water supply wells are in jeopardy of being contaminated by on-base sources.
6. In part because of the contamination problem, the Marine Corps occasionally experiences problems in meeting peak water demand at the MCB.

Given the actual and potential severity of the quality problems at the MCB, the following recommendations are offered for consideration:

1. Require the Marine Corps to initiate confirmatory studies at sixteen sites that are not NACIP priority sites, but are sites of concern to DEM;
2. At priority sites 2, 6, 9, 21, 22, 54, 68, 69, 74 and 76, where confirmatory studies have been performed, require the Marine Corps to expand the study so that the presence or absence of a plume can be confirmed;
3. At sites where significant contamination is discovered present in the Water Table Aquifer, require the Marine Corps to conduct confirmatory studies in the underlying Tertiary Sand Aquifer;
4. At sites where significant contamination is documented, require the Marine Corps to define the direction and velocity of plume movement;
5. Request the Marine Corps to submit a revised schedule of work which realistically specifies when these technical evaluations will be completed;
6. Request that the Marine Corps explain what circumstances mandate corrective measures at a pollution site, and in fact what activities constitute remedial actions.

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Additionally, DEM will continue its effort to identify the off-base source which has contaminated the two Tarawa Terrace wells. Although the Solid and Hazardous Waste Management Branch, Department of Human Resources, is not actively involved in the NACIP program, it is requested that a copy of this report (when approved) be transmitted to Mr. Bill Meyer.

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<u>Milestone</u>	<u>Day</u>
Government Issuance of Change Order	0
Submit POA&M and Safety/Contingency Plan for Characterization Effort	10
Government Approval of POA&M and Safety/Contingency Plan	17
Initiate Characterization On-Site Investigations for Hadnot Point Industrial Area	45
Initiate Round Two Sampling, Verification Step	45
Initiate Potable Well Sampling	45
Submit Report with Round Two Results, Potable Well Results	125
Return of Government Comments	155
Complete Characterization On-Site Investigation	260
Submit Preliminary Report with Hadnot Point Characterization Step Results	290
Return of Government Comments	320
Submit Characterization Step Draft Report for Hadnot Point	350
Submit Preliminary Feasibility Step Report for Hadnot Point	380
Return of Government Comments	410
Submit Feasibility Step Draft Report for Hadnot Point	440

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Enclosure (3)

APPENDIX IVNAVY ASSESSMENT AND CONTROL OF INSTALLATION
POLLUTANTS (NACIP) PROGRAMMarine Corps Base
Camp Lejeune, North CarolinaSCOPE OF WORK FOR ROUND TWO SAMPLING
AND CHARACTERIZATION/FEASIBILITY, N62470-83-C-6106

1. Verification Step Efforts

a. Site 1, French Creek Liquids Disposal Area: Sample and test surface water and sediments in two locations on Cogdels Creek; sample and test the six shallow wells. Add o,m,p-xylene, MEK, MIBK, EDB, and hexavalent Cr to the analytical parameters for round one.

b. Site 2, Former Nursery/Day Care Center: Sample and test Well 2GWL. Sample soil at four locations in the vicinity of sample 2S4; sample surface water and sediment from the drainage ditch in two locations; install four shallow two-inch wells in locations directed by the EIC. Sample new wells twice at an interval of 60 days. Analyze each sample for OCP, OCH, dioxin, and VOA.

c. Site 6, Storage lots 201 and 203: Install eight shallow two-inch wells in locations directed by the EIC. Sample wells twice at a 60-day interval. Sample surface water and sediment from Bearhead and Wallace Creeks adjacent to the site. Analyze all samples for DDT-R and VOA.

d. Site 9, Fire Fighting Training Pit: Resample and test the two shallow wells. Install a third well in a location directed by the EIC and sample twice at a 60-day interval. Analyze all samples for o,m,p-xylene, MEK, MIBK, EDB and hexavalent Cr in addition to round one parameters.

e. Site 21, Transformer Storage Lot 140: Sample soil at eight locations around perimeter of site, including two samples from drainage ditch. Sample four depths at each location (0-1', 1-3', 3-5', and at 5') and analyze for OCP, OCH, PCB, dioxin. Resample well GW21-1 and analyze for VOA, OCP, OCH, PCB, dioxin, xylene, MEK, MIBK, EDB, and oil and grease.

f. Site 24, Industrial Area Fly Ash Dump: Install two downgradient wells in locations directed by the EIC. Sample new wells twice at a 60-day interval. Sample five shallow wells, existing surface water locations and two new surface water/sediment locations on tributaries to Cogdels Creek and analyze all samples for metals A, VOA, and hexavalent Cr.

g. Site 28, Hadnot Point Burn Dump: Install new upgradient well and sample twice at a 60 day interval. Sample three existing shallow wells, New River surface water and sediments in four locations, and one new surface water/sediment location in Cogdels Creek near new upgradient well. Analyze all samples for round one parameters, dioxin, o,m,p-xylene, MIBK, MEK, and hexavalent Cr.

h. Site 30, Combat Town Training Area: Install another well downgradient and sample twice at a 60-day interval. Sample shallow well, surface water/sediment in French Creek and analyze all samples for same parameters as listed for round one plus xylene, MEK, MIBK, and EDB.

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- i. Site 35, Camp Geiger Area Fuel Farm: Install three shallow two-inch wells in locations directed by the EIC. Sample twice at a 60-day interval. Sample surface water and sediments from Brinson Creek in two locations; analyze all samples for Pb, VOA, EDB, xylene, and O&G.
- j. Site 36, Camp Geiger Area Dump: Install new upgradient well; sample twice at a 60-day interval. Resample four shallow wells; sample surface water and sediments from Brinson Creek and unnamed creek south of site in two locations. Analyze all samples for parameters listed in round one, o,m,p-xylene, MEK, MIBK, EDB, and hexavalent Cr.
- k. Site 41, Camp Geiger Dump: Resample four shallow wells. Add new upgradient wells and sample twice at a 60-day interval. Sample surface water and sediment from Tank Creek in two locations and unnamed creek in two locations and analyze all samples for parameters listed in round one plus dioxin, o,m,p-xylene, MEK, MIBK, and hexavalent Cr.
- l. Site 45, Campbell Street Underground Fuel Storage Area: Install new well south of fuel farm; sample twice at 60-day interval. Resample three shallow wells and surface water/sediment from the drainage ditch in two locations. Analyze water samples for Pb, O&G, VOA, EDB, and xylene. Sample soil in six locations along perimeter of fuel farm and avgas storage. Composite 5' borings into 3 samples, 0-1', 1-3', and 3-5', analyze soil and sediment samples for Pb, O&G.
- m. Site 54, Crash Crew Fire Training Burn Pit: Install one upgradient and one downgradient well at site and sample twice at a 60-day interval. Resample Well 54GW1, drainage ditch surface water and sediments in three locations and analyze for round one parameters, o,m,p-xylene, MEK, MIBK, EDB, and hexavalent Cr.
- n. Site 68, Rifle Range Dump: Resample three shallow wells and analyze for round one constituents plus o,m,p-xylene, MEK, MIBK, and EDB.
- o. Site 69, Rifle Range Chemical Dump: Resample eight shallow wells and three surface water locations. Sample surface water and sediments from two unnamed guts southeast of site. Analyze all samples for parameters listed in round one plus dioxin, o,m,p-xylene, MEK, MIBK, and EDB.
- p. Site 73, Courthouse Bay Liquid Disposal Area: Relocate Well 73GW4 closer to Courthouse Bay to allow for construction activities in that area. Install new upgradient well and sample twice at a 60-day interval. Resample four shallow wells and sample Courthouse Bay surface water and sediments in three locations. Analyze all samples for parameters listed in round one, o,m,p-xylene, MEK, MIBK, EDB, and hexavalent Cr.
- q. Site 74, Grease Pit and Pest Control Area: Install a third well west of site; sample twice at a 60-day interval. Resample two shallow wells and analyze all samples for OCP, OCH, PCBs, dioxin, and VOA.

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r. Site 75, MCAS Basketball Court: Resample three shallow wells and analyze for VOA, chloropicrin, and dioxin.

s. Site 76, MCAS Curtis Road: Resample two shallow wells and analyze for VOA, chloropicrin, and dioxin.

t. Site A, MCAS (H) Officers Housing Area: Install three shallow wells along the perimeter of the site described in Attachment A. Sample wells twice at a 60-day interval; analyze for VOA, O&G, and free chlorine. Sample surface water and sediment and analyze for free chlorine (SW only), O&G, and VOA.

u. For all existing wells: Install two additional protective bollards and fill with concrete. Pour 5' x 5' concrete pad around well and bollards; paint well bollards day-glo orange. Use monitoring well construction specifications, Attachment B, for installation of new wells.

v. Sample all potable wells on MCB Camp Lejeune and MCAS New River (approx. 100). Composite samples from a maximum of ten wells serving the same water treatment plant (except for "contaminated" wells listed below) and analyze for priority pollutants, all the Safe Drinking Water Act (SDWA) parameters and xylene, MEK, MIBK, and EDB. If any parameter(s) from the composite exceed(s) regulatory limits or suggested guidelines for potable water, analyze samples for only that (those) parameter(s) from the individual wells in the composite to pinpoint the source of contamination. For cost estimating purposes, include VOA analysis on only 20 individual wells. Scope and analysis to be adjusted as needed by the EIC pending composite sample results. These "contaminated" wells have been shut down by MCB Camp Lejeune: 601, 602, 608, 634, 637, 651, 652, 653, TT26, and TT New. Sample these wells individually and analyze for priority pollutants, SDWA parameters, xylene, MEK, and MIBK.

w. For the contaminated wells TT26, TTNew, 651, 652, and 653, conduct an extensive physical survey and document review to identify potential sources of contamination. Perform a soil gas investigation within a one-mile radius of each well to delineate potential contamination source areas; install additional shallow wells (up to six per potable well for cost estimating purposes) to verify findings. Perform two rounds of sampling at these wells; analyze samples for volatile organics, xylene, MEK, and MIBK.

x. Close out contaminated wells at Sites 36, 41, and 68 in accordance with state regulations (15 NCAC 2C). Submit an abandonment report including round one data and evaluation for these wells, to MCB Camp Lejeune for forwarding to the appropriate state agency.

y. Within 80 days of initiation of the on-site verification investigations, evaluate all data generated with the two sampling events and discuss quantitatively whether contamination has the potential to or is presently affecting the environment or human health. Present the findings as part of the monthly progress reports. Furnish the EIC with two copies and the activity with three copies of the progress report with the study results. The report should include: a description of all sampling and chemical analytical methods used; a presentation and evaluation of the analytical data; an assessment of actual/potential contamination and migration; ground level

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elevations and water levels (0.01 ft. accuracy) in all wells; boring logs; a detailed surveyed site plan showing the location of suspected contaminant sources, wells, etc.; known toxicity information on contaminants found; current standards/criteria for acceptable levels of contaminants found, including those issued/published by EPA, CDC, NIOSH, OSHA, State and local regulatory/health agencies and/or any other established regulatory/advisory agencies as approved by the EIC; and recommendations for immediate site clean up or third round monitoring. Government comments and recommendations will be made via the EIC within 30 calendar days after receipt of the progress report.

2. Characterization/Feasibility Step Efforts

a. In accordance with the original scope of work, conduct Step IB, Characterization, for the Hadnot Point industrial area (bounded by Sneads Ferry Road, Coddgels Creek, the New River, and Wallace Creek) and for the deep potable water aquifer influenced by wells serving the Hadnot Point treatment plant. The pump houses for these wells are numbered:

601	613	633	642
602	614	634	650
603	615	635	651
606	616	636	652
608	620	637	653
609	621	638	654
610	626	639(2)	655
611	627	640	LCH-4006
612	632	641	LCH-4007

The objectives of the characterization step are as follows:

1. Locate source of VOCs detected in deep water supply wells 601, 602, 608, 634, 637, and 642.
2. Determine concentration of detected parameters in source area(s).
3. Determine aquifer characteristics: transmissivity, hydraulic conductivity, permeability, storage coefficients and degree of confinement for both deep and shallow aquifers.
4. Determine rate and direction of groundwater and contaminant flow for the deep potable water supply aquifer influenced by wells listed above, and for the shallow aquifer in the Hadnot Point industrial area.

Conduct an extensive physical survey and document review for activities within the industrial area to identify potential sources of contamination. Perform a soil gas investigation to delineate the source areas; install additional wells to verify findings. We estimate fourteen additional shallow wells may be required in this area, including seven which will form pairs with potable wells 601, 602, 603, 608, 634, 637, and 642. Perform an estimated three rounds of sampling at the seventeen Site 22 shallow wells at 60-day intervals; add xylene, MEK, MIBK, and EDB to the round one verification step parameters.

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Perform aquifer testing to determine aquifer characteristics and rate and direction of ground water and contaminant flow. Potable water wells shall be evaluated for various well pumping combinations. Access holes will be drilled, threaded and removable plugs installed in the tops of all potable wells to provide a means of logging the depths of the water levels in the wells. The elevations of these plug holes above mean-sea-level shall be accurately determined by surveying. The method described in Attachment C or another commonly used method/model, as approved by the EIC, shall be used to determine the flow characteristics and contaminant profiles of the aquifers under study.

Within 30 days of completion of the Characterization Step on-site investigation, submit the Step IB preliminary report of the study results. The report should include: a description of all sampling and chemical analytical methods used; a presentation and evaluation of the analytical and geotechnical data; an assessment of actual/potential migration; detailed surveyed site plan with surface elevations, well locations (horizontal and vertical) and water levels (0.01 ft. accuracy) in all wells; the location and levels of suspected contaminant plumes and/or contaminant sources; known toxicological information on contaminants found, and current standards/criteria for acceptable levels of contaminants found, including those issued/published by EPA, CDC, NIOSH, OSHA, State and local regulatory/health agencies, and/or any other established regulatory/advisory agencies as approved by the EIC. Requirements for preliminary and draft report submissions for Step IB are outlined in Section 3.

b. Conduct Step II Feasibility for the Hadnot Point industrial area. Specify and evaluate five each interim and long-term feasible alternatives for cleanup of contaminated aquifers; include projected effectiveness and cost estimate for each alternative in your evaluation.

Within 30 days of submission of the characterization step draft report, submit a preliminary report of the feasibility study. Preliminary and draft report submission requirements for Step II are outlined in Section 3.

3. Preliminary and Draft Confirmation Study Reports

In accordance with the completion dates established for each step, furnish the EIC with five copies and the activity with five copies of the preliminary report. Within 30 days, the Government will review and provide comments to the contractor via the EIC. Present EIC/Activity debriefing at the activity during the Government review period. Address the comments, and within 30 days provide five copies of the draft report to the EIC and five copies of the draft report to the activity for issuance to the regulatory agencies for their review.

Present the findings of the draft report for each study step to EPA Region IV and to the North Carolina Division of Environmental Management. These briefings shall be held at each agency's office as arranged by the EIC and in consort with the activity representative.

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APPENDIX IVSCOPE OF WORK FOR ADDITIONAL SOIL BORINGS,
MCAS (H) NEW RIVER FUEL PIPELINE INVESTIGATION

1. Perform 23 soil borings to depths of 10' at the locations shown in Attachment A. (The attached sketch is from a 1983 Soil and Materials Engineering Study which was forwarded to you on 8 February 1984). A drill rig will be required for this effort, since previous attempts at hand augering have been unsuccessful. Note the presence or absence of fuel by visual inspection during the drilling. After a period of 24 hours, measure and record the depth to water or fuel in each borehole; sample the liquid and note the presence or absence of fuel and the thickness of the fuel lens.
2. Prepare a separate report on this investigation, to include boring logs and sketches, and submit three copies to this Command and three copies to MCB Camp Lejeune.
3. This investigation should be completed within ninety days of contract award.

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APPENDIX IV

MILESTONE CHART

<u>Milestone</u>	<u>Day</u>
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DOC. NO. CLW-00231-111-111

APPENDIX II

EXECUTIVE SUMMARY

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22. Camp Geiger Area Fuel Farm, Site No. 35.

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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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INITIAL ASSESSMENT STUDY OF MCB
CAMP LEJEUNE, APRIL 83 REPORT

Background

The framework whereby the Marine Corps can remediate groundwater pollution at problem sites is the NACIP program. This acronym stands for "Naval Assessment and Control of Institutional Pollutants". Begun in September 1980, the NACIP program is the Navy's "superfund" program (federal installations are exempt from CERCLA coverage).

The NACIP program, broadly defined, mandates the identification, study, and correction of pollution problems caused by past disposal practices of hazardous materials. Specifically, it consists of three phases: 1) the first phase requires the identification and prioritization of problem sites at the base (initial assessment study), 2) the second phase (confirmation study) authorizes technical studies at the priority sites to define the severity of the contamination problem, and 3) the third phase specifies remedial actions (corrective measures) at documented problem sites. Appendix I provides a detailed explanation of the NACIP program in progress at the MCB.

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Chronology of Events

The initial assessment study was performed at the MCB from February 1982 to February 1983. Conducted by consultants with Water and Air Research, Inc., the study emphasized groundwater contamination sites. The findings and recommendations were incorporated into an April 1983 document titled Initial Assessment Study of Marine Corps Base Camp Lejeune North Carolina. Although seventy-three (73) contamination sites were identified at the MCB, the investigators concluded that further studies could be justified only at twenty-two (22) priority sites. Figure 1 shows the location of these 73 sites, and Appendix II provides an executive summary of the report.

During July 1984, confirmation studies were begun at eighteen (18) priority sites. The results of these groundwater studies were documented in a report provided to the Marine Corps in February 1985: as the Marine Corps disagrees with the conclusions in this report, it will not release a copy of it to any outside agency. Recently, however, the Marine Corps did agree to provide DEM copies of the technical data for review and interpretation.

As part of this confirmation study, it was recommended that volatile organic analyses (VOA) samples be collected from any community water supply well that is located proximal to a priority site. In July 1984, solvents and gasoline were discovered present in well HP-602, and expanded quality studies eventually verified the presence of organic contaminants in ten (10) wells. The organic contaminants included: tetrachloroethylene, trichloroethylene, dichloroethylene, methylene chloride, 1,1 - dichloroethane, benzene, toluene, and dichlorobenzene. Although no safe drinking water

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standards have been established for these constituents, the Marine Corps nevertheless discontinued use of the contaminated wells during December 1984.

Believing that the ten contaminated wells obviated violations of 15 NCAC 2L regulations, DEM issued the MCB a notice of violation (NOV) to that effect on May 15, 1985. This NOV (see Appendix III) required the Marine Corps to submit to DEM a plan of action (with a schedule of compliance) that would: 1) identify the source(s) of contamination, 2) define the geometry of the plumes, 3) define the quality attributes of the plume(s), 4) project the future impacts of the source(s), and 5) propose remedial actions to restore the polluted groundwaters to GA standards. The Marine Corps response to this NOV was simply to expedite the implementation of the NACIP program: a copy of the 19 July 1985 response is Appendix IV.

Contamination of two of the ten wells on the MCB is related to civilian sources. The organic solvents present in the two wells at Tarawa Terrace I probably originate from nearby dry cleaner(s). During April 1985, DEM initiated a study to identify the source(s) of this plume(s), and while the field study is completed, the analytical studies are not, so no conclusions are yet possible.

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Discussion

The principal objective of the NACIP program is to correct the worst case hazardous waste sites at the MCB. Consequently, the NACIP program can not comply with DEM's mandate to remediate all significant sources of groundwater pollution. Broader in scope, the 15 NCAC 2L regulations allow for the management of non-hazardous as well as hazardous sites. After applying the 2L regulations to the 73 sites, there are thirty-eight sites that are of concern to DEM.

Table 1 summarizes the characteristics of each site. In order of priority, DEM is most concerned about the following sites:

1. Rifle Range Chemical Dump, Site No. 69
2. Camp Geiger Dump, Site No. 41
3. Industrial Area Tank Farm, Site No. 22
4. Storage Lots 201 and 203, Site No. 6
5. Transformer Storage Lot 140, Site No. 21
6. Former Day Care Center, Site No. 2
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. Fire Fighting Training Pit, Site No. 9
11. Base Sanitary Landfill, Site No. 29
12. Original Base Dump, Site No. 10
13. Campbell Street Avgas-JP Fuel Farm, Site No. 45
14. MCAS Direct Refuel Depot, Site No. 52
15. Camp Geiger Area Fuel Farm, Site No. 35
16. Rifle Range Dump, Site No. 68

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17. MCAS Mercury Dump, Site No. 48
18. Hadnot Point Burn Dump, Site No. 28
19. Montford Point Burn Dump, Site No. 16
20. Courthouse Bay Liquid Disposal Area, Site No. 73

Priority is based on a consideration of the toxicity of the waste, the probability of groundwater quality violations, the proximity of the site to community water supply wells, and the proximity of the site to surface waters.

The data do not suggest that any of the contaminant plumes from the 38 sites have migrated off the MCB. However, it is probable that in one case a contaminant plume(s) from a day cleaner(s) migrated onto the base and resulted in the contamination of two community water supply wells.

Eight (perhaps nine) community water supply wells at the MCB already have been impacted by these (and other unknown) waste sources. Additionally, another eighteen (18) wells are in jeopardy of being impacted.

It is evident, therefore, that DEM must commit the resources necessary to assure that the Marine Corps resolves its groundwater quality problems.

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Groundwater Resources Situation

Currently, the MCB extracts for use an average of 8.30 million gallons per day of groundwater from 103 wells. Except for the Rifle Range System, these wells are exposed to the Tertiary Sand Aquifer: at the Rifle Range the wells are exposed to the Tertiary Limestone Aquifer. Over all the MCB, the well depths range from 100 to 200 feet.

The Tertiary Sand Aquifer is highly vulnerable to contamination from pollution sources. Because the confining beds between the Water Table Aquifer and Tertiary Sand Aquifer are discontinuous (or absent), and because many sites are located close to active wells, the probability that potable water supplies can be contaminated is high. That this has happened already attests to the vulnerability of the aquifer for pollution.

The Marine Corps now experiences occasional problems in meeting peak water demand at the MCB. In part that is because ten (contaminated) wells were removed from the system, and in part because expansion of the MCB has resulted in increased demands for water. To evaluate the adequacy of the groundwater system to meet its long term demand, the Marine Corps is negotiating a quantity-related study with the United States Geological Survey.

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Conclusions and Recommendations

The principal conclusions are as follows:

1. There are thirty-eight (38) known pollution sites that are of concern to DEM;
2. The NACIP program is designed to remedy problems only at serious hazardous waste sites;
3. Eight (perhaps nine) community supply wells have been contaminated by on-base sources;
4. Two community supply wells have been contaminated by off-base sources;
5. Another eighteen community water supply wells are in jeopardy of being contaminated by on-base sources.
6. In part because of the contamination problem, the Marine Corps occasionally experiences problems in meeting peak water demand at the MCB.

Given the actual and potential severity of the quality problems at the MCB, the following recommendations are offered for consideration:

1. Require the Marine Corps to initiate confirmatory studies at sixteen sites that are not NACIP priority sites, but are sites of concern to DEM;
2. At priority sites 2, 6, 9, 21, 22, 54, 68, 69, 74 and 76, where confirmatory studies have been performed, require the Marine Corps to expand the study so that the presence or absence of a plume can be confirmed;
3. At sites where significant contamination is discovered present in the Water Table Aquifer, require the Marine Corps to conduct confirmatory studies in the underlying Tertiary Sand Aquifer;
4. At sites where significant contamination is documented, require the Marine Corps to define the direction and velocity of plume movement;
5. Request the Marine Corps to submit a revised schedule of work which realistically specifies when these technical evaluations will be completed;
6. Request that the Marine Corps explain what circumstances mandate corrective measures at a pollution site, and in fact what activities constitute remedial actions.

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Additionally, DEM will continue its effort to identify the off-base source which has contaminated the two Tarawa Terrace wells. Although the Solid and Hazardous Waste Management Branch, Department of Human Resources, is not actively involved in the NACIP program, it is requested that a copy of this report (when approved) be transmitted to Mr. Bill Meyer.

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APPENDICES

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APPENDIX INAVY ASSESSMENT AND CONTROL OF INSTALLATION
POLLUTANTS (NACIP) PROGRAMMarine Corps Base
Camp Lejeune, North Carolina

The NACIP program is implemented in the following phases:

Initial Assessment Study (IAS) of the existence of potential contamination problems, which was provided to NCDEM, Raleigh, in December 1983. (Note: A copy of the IAS will be forwarded to NCDEM, Wilmington, by separate correspondence.)

Confirmation Study for onsite work to confirm, qualify, and recommend correction of contamination problems, which is currently underway.

Corrective measures to control or mitigate contamination, and to be funded under the Department of the Navy Pollution Abatement Program.

The Confirmation Study is a sequentially phased effort as described below:

<u>Step</u>	<u>Description</u>
IA	Verification of existence of contamination.
IB	Characterization of extent and rate of migration of contaminants, geohydrological, geophysical and other factors.
II	Evaluate alternatives to achieve compliance, prepare cost estimates and project effectiveness of alternatives.
III	Prepare site operation and draft Government project documentation with cost estimate satisfactory for project funding requests.

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