04.01-02/13/97-01863

DEPARTMENT OF THE NAVY
ATLANTIC DIVISON
NAVAL FACILITIES ENGINEERING COMMAND
1510 GILBERT ST
NORFOLK, VA 23511-2699

TELEPHONE NO:
(757) 322-4818
IN REPLY REFER TO:
5090
18232:KHL:cag
13 FEB 1997

CERTIFIED MAIL RETURN RECEIPT REQUESTED

North Carolina Department of Environment,
Health, and Natural Resources
Attn: Mr. Dave Lown
P.O. Box 27687
401 Oberlin Road
Raleigh, North Carolina 27611

Re: Response to Comments, Draft Feasibility Study Report, OU Number 6 (Sites 36 and 54), MCB Camp Lejeune, N.C.

Dear Mr. Lown:

Enclosed please find responses to your comments on the subject document. These responses are being submitted in lieu of a Draft Final version of the document. In order to allow outstanding issues to be discussed and resolved at the upcoming March 19-20 Partnering Meeting in Raleigh, N.C., please provide comments on these responses by March 17, 1997.

The Navy/Marine Corps appreciates your continued involvement in this project. Please direct any questions or comments to Ms. Katherine Landman at (757) 322-4818.

Sincerely,

L. G. SAKSVIG, P.E.
Head
Installation Restoration Section
(South)
Environmental Programs Branch
Environmental Division
By direction of the Commander

Attachment

Re: Response to Comments, Draft Feasibility Study Report, OU Number 6 (Sites 36 and 54), MCB Camp Lejeune, N.C.

Copy to:
EPA Region IV (Ms. Gena Townsend)
MCB Camp Lejeune (Mr. Neal Paul)
Baker Environmental, Inc. (Mr. Matt Bartman, Mr. Rich Bonelli)
Activity Admin Record File

RESPONSE TO COMMENTS
DRAFT FEASIBILITY STUDY (FS) - SITES 36, 54, AND 86
OU NO. 6, CTO 303

General

1. Attached to these responses are response-referenced tables and figures (labeled Attachment C). Also included (labeled Attachment D) is information requested by NCDEHNR regarding the input parameters for the 2-dimensional groundwater flow models presented in Sites 36 and 86 Draft FS documents. In addition, a cross-section through Site 86 (identified as Attachment E) is included which shows the geology of the site, groundwater flow (horizontal and vertical), and the trichloroethylene and 1,2-dichloroethene contaminant concentration distributions. A plan view is also included to identify the cross-section location. (Please note that there are no Attachments A or B to this document.)

Operable Unit 6 - Site 36

North Carolina Department of Environment, Health and Natural Resources (NC DEHNR)
Comments Dated August 6, 1996

1. The risk assessment performed within the Final RI included the evaluation of the future residential scenario for surface and subsurface soil. This risk assessment concluded that there were no unacceptable human health risks from surface soil to either children or adults under the future residential scenario. As concluded within the Final RI, a potential human health risk does exist and was primarily due to exposure to iron in the subsurface soil under the future child residential scenario. As discussed within the Final RI, the UBK Model indicated that exposure to the maximum concentration of lead in the surface soil (current scenario), subsurface soil (future scenario), and the ingestion of crab tissue (current & future scenarios) all indicate the potential for adverse health effects. (See Final RI Section 6.5.1 - Human Health Risks pgs. 6-35 to 37; Section 6.6 - Lead UBK Model Results pg. 6-37; and Section 6.8 - Conclusions of the BRA for Site 36, pgs. 6-41, 42 & 43.)

   Based on the results of the Final RI, recommendations to remediate the surface and/or subsurface soils due to the presence of iron and lead were not considered necessary. Similar to many sites at MCB, Camp Lejeune, the Final RI states that iron appears to be naturally-occurring in both the soil and the groundwater at Site 36. In addition, the potential human health risks associated with iron appear to be conservative and unrealistic for the following reasons:

   - Iron is an essential nutrient and the toxicity values associated with exposure to this metal are based on provisional studies.
   - Although iron was detected above the base background levels in both the surface and subsurface soils, only four of the surface detections exceeded the Region III Risk-Based Concentration (RBC) of 23,000 mg/kg. These four exceedances are scattered over an area of approximately six acres and do not reflect a discernible pattern (see Figure A).
   - The noncarcinogenic risk due to the ingestion of subsurface soil was calculated for the future child resident, HI = 2.3. However, if iron was removed from the calculation of risk, this noncarcinogenic risk would decrease to an acceptable HI of 0.9.
   - A comparison of the site iron levels to typical iron levels found in similar media will be incorporated into the Final FS. This comparison identified that the site iron levels detected in the surface soil, subsurface soil, sediment, fish tissue, and crab tissue were all within typical concentration ranges detected in similar media, (see

Table A). Although it appears that the iron levels associated with site groundwater and surface water are elevated, there were no unacceptable risks associated with exposure to surface water. Noncarcinogenic risks, primarily from iron, due to groundwater exposure were calculated for the future child resident (HI = 5.2) and future adult resident (HI = 2.2). However, if iron was removed from the risk calculations, the groundwater exposure noncarcinogenic risk for the child would decrease from 5.2 to 1.5 and, for the adult, from 2.2 to 0.7.

- Although documented within the Final RI and Draft FS, residential development of Site 36 is highly unlikely due to the proximity of the site to the New River and Brinson Creek. The majority of the eastern portion of the site is tidally influenced, and remains inundated and swampy much of the year. Substantial engineering controls would need to be incorporated to either raise the elevation of the site or protect against flooding, each at an anticipated excessive cost, should residential development of the site occur. In addition, the current Base Master Plan does not consider residential or recreational development for this site.

- Figure B identifies the best-known alignment of the U.S. Route 17 Bypass through Site 36. Residential/recreational development in close proximity to this highway is extremely unlikely, as typical setbacks would eliminate much of the developable property.

Figure C identifies the lead levels detected in surface soils, subsurface soils, and sediment. This figure will be included within the Final FS. As shown, surface soil detections at OA-SB04 and OA-SB08 were in excess of the OWSER value of 400 mg/kg for surface soil. These elevated surface soil detections are located approximately 920 feet apart; and therefore, do not identify a pattern of surface soil lead contamination. In addition, Section 6.8.3 of the Final RI identifies a range of natural lead levels in soil from 2 to 200 mg/kg and several literature values of street dust lead detections (from residential and commercial areas) of 1,000 to 2,400 mg/kg. Similar comparisons to site media are discussed for lead detected in shellfish, fish and other food. This comparison supports the conclusion that further action at Site 36, due solely to lead in soils and crab tissue, is not warranted.

The last two bullet items identified previously (iron discussion) also apply to the unlikelihood of future development and/or access to Site 36. In addition, lead was only detected three times in site groundwater. These detections were noted within wells located in the northern area of the site; 36GW-10DW, 36GW-12IW, and 36GW-13IW. Groundwater results from these locations were all below the NCWQS of 15 µg/L, and therefore, groundwater does not appear to be impacted by the site soil lead detections.

The Final RI acknowledges that there are some potential ecological impacts from exposure to the inorganics detected in the soils. More specifically, Section 7.12 of the Final RI, identifies both slight potential for metals in surface water, and a moderate potential for metals, pesticides, and diethylphthalate in the sediment to decrease the aquatic population at the salt and freshwater stations. However, sampling results indicated that the constituents do not appear to be significantly impacting the fish population in Brinson Creek.

2. The wording in the Final FS will be modified to better define the minimal risks associated with the groundwater volatile organic compounds (VOCs).

3. Wording related to lead, acidic soils, and the mobility of inorganics will be modified in the Final FS to state that the RI results indicate that lead has not leached to the groundwater. Additional testing (TCLP-lead) conducted in December of 1996 indicated a TCLP level (collected near the highest subsurface soil lead detection) of 115 µg/L. This result is below the federal TCLP action level of 5 mg/L; therefore, the conclusion that lead does not appear to be leaching to groundwater will remain.

(See Comment Response Number 1 for information related to iron and lead exceeding site background in the surface and subsurface soil.) The drums and steel containers discovered during the RI Scoping Investigation were noted at locations that differed from the locations of maximum soil detections. (See Final RI Figure 1-7.)

4. As noted in the Final RI, Section 4.4.1.1 and Section 1.4.1 of the Draft FS, the VOC soil contamination appears to be the result of limited site operations. The wording related to "not indicative of long-term site disposal operations" will be modified within the Final FS. This section will be modified as well to stress that although VOCs were detected in the surface and subsurface soils, none of these contaminants exceeded the corresponding Region III residential soil RBC (refer to Tables 6-1 and 6-2 of the Final RI). In addition, these VOCs were not selected as soil COPCs as they were detected infrequently, or were detected at concentrations below Region III residential screening levels (see Final RI Sections 6.2.4.1 and 6.2.4.2).

   The pesticides detected at the site were observed in surface and subsurface soil, with a number of higher pesticide detections observed in surface samples collected from the central area and the western site boundary. No risks were attributable to detected concentrations of pesticides, and the frequency and overall concentration of pesticides in soil does not suggest widespread pesticide disposal activities (see Final RI Section 4.4.1.3).

5. As discussed during the January 8, 1997 Partnering Meeting, a Time Critical Removal Action (TCRA) is planned for the PCB surface soil contamination. Results of the TCRA will be documented within the Final FS.

6. The wording within the Draft FS Section 4.4.4.4, related to the unnamed tributary, will be modified. The maximum concentration of lead within the sediment occurred at station 36-SW/SD06. This station is located somewhat upstream of the elevated lead detections in the surface and subsurface soil. Upstream sediment exceedances (36-SW/SD06) also support the notion that off-site sources may be the primary contributors to the elevated lead levels within the sediments. In conclusion, the existing marsh/wetland conditions within and adjacent to the elevated soil and sediment detections are likely addressing the natural degradation and adsorption of various inorganics under the present site conditions.

7. Wording within the Final FS will be modified to clarify any unintended misinterpretations related to mobility of inorganics. As outlined within the Final RI, the inorganics in the surface and subsurface soils do not appear to be leaching to the groundwater. More likely, the iron concentrations are the result of the naturally-occurring elevated concentrations noted throughout the MCB, Camp Lejeune vicinity. However, in relation to the mobility of inorganics and the risks noted within the fish and crabs, the Final RI specifies that the human health risks evaluated for the fish and crabs were generally attributable to arsenic and mercury. Risk calculations computed following submission of the Final RI document that there are no unacceptable risks from exposure to or ingestion of the sediment for the fisherman, child/adult trespasser, or child/adult resident.

   Based on the lead UBK Model, the lead detections within the crabs did generate a potential risk to children. Literature shows, however, that the levels detected in site media are of the same magnitude and within the range of lead levels detected in similar media (see Final RI Section 6.8.3). A similar comparison of the iron levels detected at Site 36 to iron concentrations detected in food showed similar results/concentrations, see attached Table A.

8. A risk evaluation for exposure to surface soil under the future residential scenario was completed and included within the Final RI (see Section 6.3.1). In addition, a comparison of typical levels of iron in similar media to the maximum iron concentrations detected on site was conducted. This comparison will be added to the Final FS.

9. As shown on Figure C, the locations of the elevated lead within the surface soil and the location of

the highest lead detection in sediment (36-SW/SD06) are in two different topographic flow areas. The majority of the elevated lead detections in soil were encountered in the southeastern and south central areas of Site 36. These areas drain toward the unnamed tributary, which converges with Brinson Creek approximately 700 feet down stream of sediment station 36-SW/SD06. Thus, it is unlikely that the elevated soil concentrations at Site 36 are the source of the elevated lead detection in sediment due to the different topographic flow areas. In addition, the sediment located immediately adjacent to 36-SW/SD06 was resampled and the results indicated lead concentrations below the 35 µg/kg screening value. Therefore, the conclusion that the original sediment detection of lead may be an anomaly still applies. Note that attached Figures A, B, and C will be added to the Final FS.

10. At this time, the Region III RBC values and the Base Background numbers will not be added to Table 1-1. However, Section 6.2.3.7 of the Final RI describes the various federal and state criteria and standards, including the Region III RBC values, that are referenced and used for comparison throughout the Final RI and Draft FS text.

11. The NCWQS standard for lead will be added to Table 2-2.

NC DEHNR Division of Water Quality, Groundwater Section
Comments Dated October 11, 1996

Groundwater Comments

1. Contract Required Quantitation Limits were identified for various compounds within the Final RI/FS Project Plans for Operable Unit No. 6 (Sites 36, 43, 44, 54, and 86) dated December, 1994. The detection limit of TCE in groundwater, when analyzed during the RI, was 10 µg/L. This limit was reflected on Table 4-7; however, TCE was reported in 36-GW10, 36-GW12, 36-GW13, and 36-GW13IW at 8J, 9J, 6J, and 3J (all µg/L) respectively.

2. One additional groundwater well (36-GW15) was installed during December, 1996. This well will be shown on Figure 1-4 of Final FS. Results of the volatile compounds and PCB analyses detected 1,2-DCE (total) at a concentration of 12 µg/L. This 1,2-DCE concentration, as well as the 1,2-DCE detected in nearby monitoring wells 36-GW4 (4J µg/L) and 36-GW8 (5 µg/L), were all below the corresponding federal MCL of 70 µg/L. Additionally, the location of wells 36-GW05, 36-GW06DW, and 36-GW14 are all considered off-site with respect to the Site 36 boundary. These locations are also considered site-specific background locations and groundwater samples collected from these wells indicated non-detectable levels of organic compounds. Therefore, it is the conclusion of the RI/FS that sufficient data exists to consider the 1,2-DCE detections at 36-GW4, 36-GW8, and 36-GW15 as isolated.

3. Air sparging was not fully developed as an alternative for Site 36 mainly due to the consideration of depth to groundwater. The first paragraph of Section 4.1.4 identifies the approach of the Draft FS and states that the alternative evaluation did not intend to eliminate air sparging from future consideration, (see page 4-3). As for an active form of remediation, the PRAP/ROD documents for Site 36 present the preferred remedial action for Site 36 as Institutional Controls. The Institutional Controls presented approach the remediation actively via groundwater/surface water monitoring, aquifer use restrictions, and acknowledgment of natural attenuation. Groundwater models presented in the Draft FS show how natural attenuation, over time, will remediate the groundwater concerns identified at Site 36 (see Draft FS Appendix B). In addition, the Draft FS clearly states that no human health risks exist due to ingestion/exposure of the groundwater volatile contamination. Therefore, the Final PRAP/ROD will continue to support and recommend Institutional Controls.

Operable Unit 6 - Site 54

NC DEHNR
Comments Dated August 20, 1996

1. The wording related to the location of the VOC/SVOC detections will be modified on pages ES-1, 1-7 (Section 1.4.2), and 2-10 (Section 2.4) within the Final FS for Site 54. In addition, the NCWQS for lead (15 µg/L) will be added to Tables 2-2 and 2-8.

2. Wording on page 2-10, Section 2.4 will be modified to reflect the need for compliance with the North Carolina 2L groundwater standards.

3. As noted in the Final RI, arsenic is a contaminant of concern. Information related to the arsenic detections at Site 54 will be included within the Final FS.

4. Provisions to include placement restrictions related to new groundwater supply wells will be added to the aquifer use restrictions discussed within the alternative descriptions presented for RAAs 2, 3, and 4 of the Final FS.

1823 KHL

P 212 484 441

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PS Form 3800, June 1991

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P 212 484 441

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- Complete items 1 and/or 2 for additional services.
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NC DEPT OF ENVIRONMENT HEALTH
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ATTN MR DAVE LOWN
PO BOX 27687
401 OBERLIN RD
RALEIGH NC 27611

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P 212 484 441

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8. Addressee's Address (Only if requested and fee is paid)

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ATTACHMENT C
RESPONSE - REFERENCED TABLES AND FIGURES

TABLE A

COMPARISON OF SITE IRON LEVELS TO LITERATURE VALUES
SITE 36, CAMP GEIGER AREA DUMP
REMEDIAL INVESTIGATION CTO-0303
MCB, CAMP LEJEUNE, NORTH CAROLINA

Parameter	Minimum	Maximum
Iron in Site Media		
Groundwater (mg/L)	0.0033	16.9
Surface Soil (mg/kg)	863	86,200
Subsurface Soil (mg/kg)	408	132,000
Surface Water (mg/L)	0.967	4.84
Sediment (mg/kg)	1,090	15,900
Fish Tissue (mg/kg)	28.00	53.60
Crab Tissue (mg/kg)	20.40	40.20
Levels in the Environment [2]		
Freshwater & Public Water Supplies (mg/L)	0.01	1.0
Rivers (mg/L)	--	0.67
Seawater (mg/L)	0.001	0.06
Soil (mg/kg)	7,000	550,000
Other Levels		
Total Body Stores[1] (mg/L)	0.012	0.3
Lethal Doses[1] (mg/kg)	200	300
Food[2,3] (mg/kg)	30	150
Grains and Fruits[2] (mg/kg)	1	20
Human and Cow Milk [2] (mg/L)	-	0.5
Reported Daily Intake[2] (mg/d)	9	35
NOEL Chronic Daily Intake [2] (mg/kg/day)	0.15	0.27

Notes:

1 Risk Assessment Issue Paper for Derivation of a Provisional RfD for Iron. September 1993.

2 Handbook on the Toxicology of Metals Volume II, Friberg et al. 1990.

3 Includes liver, kidney, beef, ham, egg yolk, and soybeans in mg Fe/kg fresh weight.

36-GW14 SHALLOW MONITORING WELL
36-GW12W INTERMEDIATE MONITORING WELL
36-GW08DW DEEP MONITORING WELL
36-TW01 TEMPORARY MONITORING WELL
SG01 STAFF GAUGE
OA-SB02 SOIL BORING LOCATION
36-SW/SD01 SURFACE WATER AND SEDIMENT SAMPLE LOCATION
36-SW/SD05 36-BN05 SURFACE WATER, SEDIMENT AND BENTHIC SAMPLE LOCATION
43-TP01 EXPLORATORY TEST PIT LOCATION
36-FS01 AQUATIC ORGANISM SAMPLING LOCATION
FLOW DIRECTION OF SURFACE WATER FLOW
EOE OVERHEAD ELECTRIC LINE & UTILITY POLE
FENCE
ASPHALT ROAD
GRAVEL ROAD
EDGE OF DRAINAGE DITCH
TREE LINE

4600 SURFACE IRON DETECTIONS mg/kg
23,000 SURFACE IRON DETECTIONS EXCEEDING RESIDENTIAL REGION III RBC (23,000 mg/kg)
475 (3-5') SUBSURFACE IRON DETECTIONS (SAMPLE DEPTH) mg/kg
23,000 SUBSURFACE IRON DETECTIONS EXCEEDING RESIDENTIAL REGION III RBC (23,000 mg/kg)

ESTUARINE, INTERTIDAL, SUBSHRUB, BROAD-LEAVED EVERGREEN, NEEDLE-LEAVED EVERGREEN, IRREGULARLY FLOODED, WETLAND

PALUSTRINE, FORESTED, BROAD-LEAVED DECIDUOUS, NEEDLE-LEAVED EVERGREEN, TEMPORARILY FLOODED WETLAND

S.S. PIPE ABOVE CREEK
36-SW/SD07
36-BN07
36-FS01
36-FS02
36-FS03
EDGE OF BANK
GATE
SEWAGE TREATMENT PLANT
DRAINAGE
EOE
SOIL ROAD
GS-SB01
GS-SB02
GS-SB03
GS-SB04
GS-SB05
GS-SB06
36-GW13
36-GW13W
36-GW10W
36-GW10DW
36-GW10D
1330J
3360 (5-7')
36-SW/SD06
36-BN06
BRINSON CREEK
36-GW14
DIRT ROAD
36-GW08DW
36-GW08
36-GW12W
36-GW12
GRAVEL ROAD
36-GW03
CULVERT
APPROXIMATE SITE BOUNDARY
OA-SB01A
4500
4280 (1-3')
OA-SB01
4660
1570 (1-3')
OA-SB01B
1380
2000 (1-3')
OA-SB01D
2590
3670 (1-3')
OA-SB01C
2410
3180 (1-3')
OA-SB04
10,900
475 (3-5')
OA-SB06
2280
5320 (3-5')
IMPROVED GRAVEL ROAD
36-GW04
36-GW05
36-SW/SD03
36-SW/SD04
NEW RIVER
EDWARDS CREEK
UNNAMED TRIBUTARY
SB-SB02
SB-SB01
OA-SB02
4060
2450 (5-7')
OA-SB03
2870
8940 (5-7')
OA-SB05
5100
408 (5-3')
OF-SB01
1140
2490 (7-9')
OF-SB02
5520
695 (3-5')
OF-SB03
5220
7430 (5-7')
OF-SB04
6370
22,800 (7-9')
OF-SB05
5260
65,400 (5-7')
OF-SB06A
3450J
28,400J (1-3')
OF-SB06B
3010
46,100 (3-5')
OF-SB06C
29,700
2130 (3-5')
OF-SB06D
4920
97,400 (3-5')
TP01
TP02
TP03
TP04
TP05
TP06A
TP06B
TP07
36-GW09
3690J
89,900J (7-9')
FDA-SB01
5300
81,900 (3-5')
FDA-SB02
1740
18,100 (7-9')
FDA-SB03
1210
529 (7-9')
FDA-SB04
1390
13,100 (1-3')
FDA-SB05
583
70,500 (1-3')
FDA-SB06
1680
47,700 (13-15')
36-GW11
2050
132,000 (7-9')
2880 (11-13')
36-GW11DW
36-GW02
36-GW01
OA-SB07
32,200
64,600 (1-3')
72"CMP
SS01
OA-SB03
88,200
1360 (1-3')
DAD-SB01
84,600
DAD-SB02
5020J
3500 (1-3')
DAD-SB03
13,100
DAB-SB01
7190J
4070J (1-3')
DAB-SB02
4190J
7090J (3-5')
DAB-SB03
5810
3240 (1-3')
36-TW02
36-SW/SD05
FCA-SB01
3370
3480 (7-9')
FCA-SB02
7100
2540 (7-9')
FCA-SB03
5930
8820 (3-5')
FCA-SB04
2240
3140 (3-5')
FCA-SB05
18,100
3000 (3-5')
FCA-SB06
14,300J
5290J (5-7')
FCA-SB07
1210
9450 (1-3')
FCA-SB08
6470
1670 (1-3')
FCA-SB09
14,500
3500 (3-5')
FCA-SB10
4070
520 (3-5')
FCA-SB11
5400J
2550J (5-7')
FCA-SB12
1220
788 (3-5')
FCA-SB13
3210
2590 (1-5')
FCA-SB14
3520
2970 (1-3')
36-GW07
2960J
2720J (1-3')
36-GW07DW
36-GW08
36-SW/SD01
36-SW/SD02
24"CMP
DIRT ROAD
SWALE FLOW

1 inch = 80 ft.

SOURCE: LANTDIV, 1992

REVISIONS

DRAWN	REL
REVIEWED	TFT/JEZ
S.O.#	62470-303
CADD#	303703PM

NORTH

FEASIBILITY STUDY, CTO-0303
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

BAKER ENVIRONMENTAL, Inc.
Coraopolis, Pennsylvania

Baker
Baker Environmental, Inc.

DETECTED IRON CONCENTRATIONS IN SURFACE AND SUBSURFACE SOILS
SITE 36, CAMP GIEGER AREA DUMP

SCALE 1" = 80'

DATE OCTOBER 1996

FIGURE No.
A

303702PM

NOTES:
1)THE US ROUTE 17 BY-PASS ALIGNMENT TAKEN FROM N.C. STATE HIGHWAY PLANS DATED OCTOBER 1995; PROJECT REFERENCE NUMBER 2107B.
2)BEARING AND DISTANCE HIGHWAY ALIGNMENT SLIGHTLY ROTATED COUNTER CLOCKWISE TO BETTER MATCH EXISTING MAPPING/PHYSICAL FEATURES.

35MW35B
35MW36A
35MW35A
35MW-34A
SITE 35 SUPPLEMENTAL GROUNDWATER INVESTIGATION STUDY AREA (PROPOSED)
35-TW10B
35-MW41B
36-GW06DW
35-TW11B
35-TW11
35-TW13B
U.S. ROUTE 17 BY-PASS
CHASTLINE
SITE 36
TOE OF SLOPE (TYP)
36-GW13IW
36-GW10IW
36-GW10DW
36-GW11DW
TP01
TP02
TP03
TP04
TP05
TP06A
TP06B
TP07
36-TW02
36-GW12DW
APPROXIMATE SITE BOUNDARY
DIRT ROAD
GRAVEL ROAD
UNNAMED TRIBUTARY
BRINSON CREEK
PUMP STATION (SEWAGE)

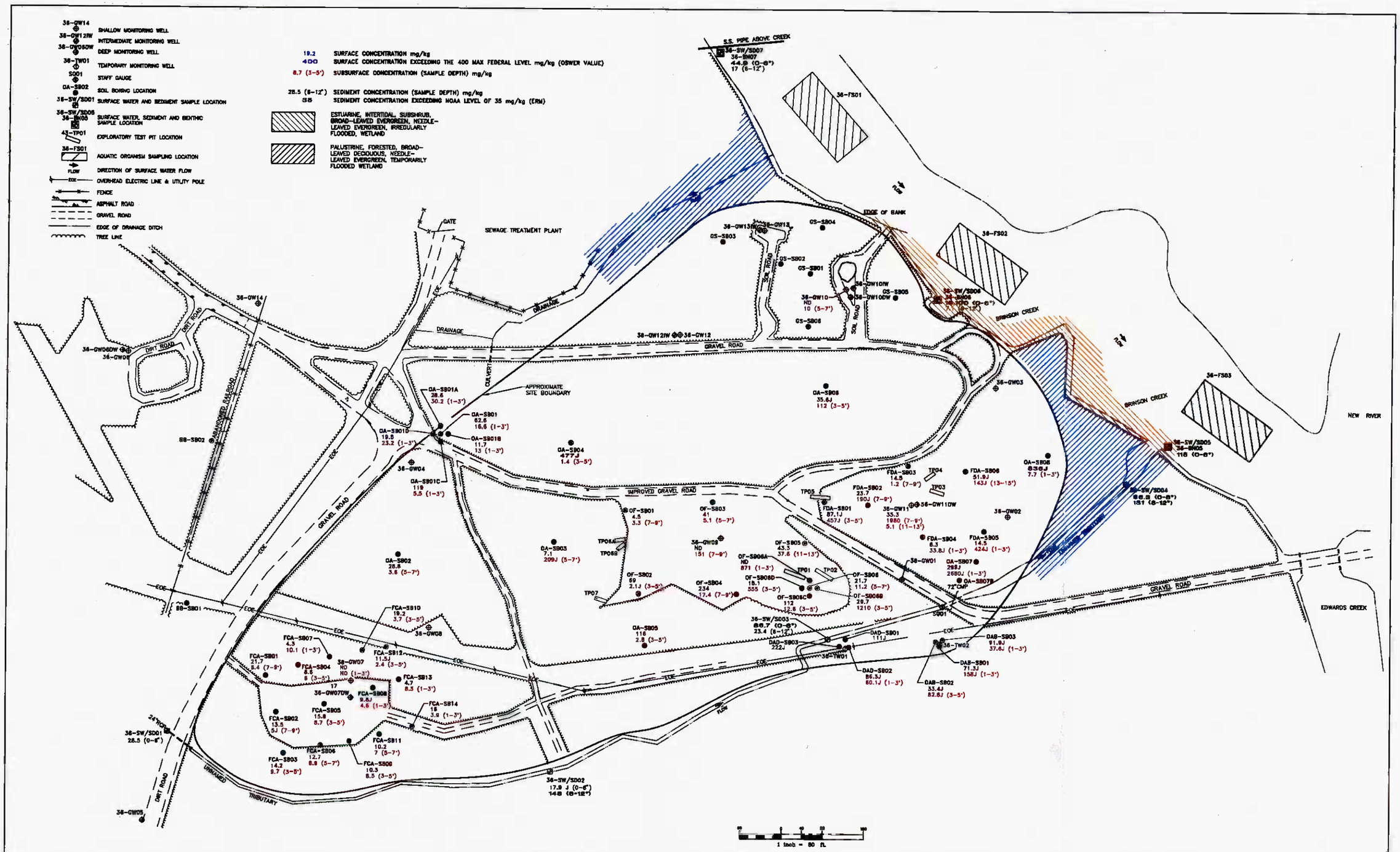
200 0 100 200
1 inch = 200 ft.

Baker
Baker Environmental, Inc.

FIGURE B
U.S. ROUTE 17 BY-PASS IMPACT TO SITE 36-CAMP GIEGER AREA DUMP

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01863EE02Z



REVISIONS	DRAWN REL REVIEWED TFT/JEZ S.O.# 62470-303 CADD# 303705PM	NORTH		FEASIBILITY STUDY, CTO-0303 MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA BAKER ENVIRONMENTAL, Inc. Coraopolis, Pennsylvania	Baker Baker Environmental, Inc.	DETECTED LEAD IN SURFACE SOILS, SUBSURFACE SOILS, AND SEDIMENTS SITE 36, CAMP GIEGER AREA DUMP SCALE 1"= 80' DATE OCTOBER 1996	FIGURE No. C

SOURCE: LANTDIV, 1992

ATTACHMENT D
SUMMARY OF JDB-MOC 2D FLOW AND TRANSPORT MODEL SITE 36 AND SITE 86 INPUT PARAMETERS

TABLE 1

SUMMARY OF JDB-MOC 2D FLOW AND TRANSPORT MODEL INPUT PARAMETERS
OU NO. 6, SITE 36 FEASIBILITY STUDY
MCAS, NEW RIVER, NORTH CAROLINA

Input Parameter	Value
Aquifer Thickness	(1)
Hydraulic Conductivity	(1)
Annual Rainfall Recharge	16 inches/year
Longitudinal Dispersivity	35
Transverse Dispersivity	0.35
TCEKd	0.5418
Total DCEKd	0.2322

Notes:

(1) Parameter varies - refer to attached array

Surficial Aquifer Thickness Array

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
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0. 36. 36. 35. 34. 32. 31. 30. 29. 28. 27. 27. 26. 26. 25. 24. 24. 23. 0. 0.
0. 36. 36. 35. 33. 32. 31. 30. 29. 28. 27. 27. 27. 27. 27. 24. 24. 23. 23. 0.
0. 36. 36. 34. 33. 32. 31. 30. 29. 28. 28. 27. 27. 26. 25. 24. 24. 23. 23. 0.
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Surficial Aquifer Transmissivity Array

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TABLE 2

SUMMARY OF JDB-MOC 2D FLOW AND TRANSPORT MODEL INPUT PARAMETERS
OU NO. 6, SITE 86 FEASIBILITY STUDY
MCAS, NEW RIVER, NORTH CAROLINA

Input Parameter	Value
Aquifer Thickness	48 feet
Hydraulic Conductivity	3.4 feet/day
Annual Rainfall Recharge	16 inches/year
Longitudinal Dispersivity	40
Transverse Dispersivity	0.4
TCEKd	0.5418
Total DCEKd	0.2322

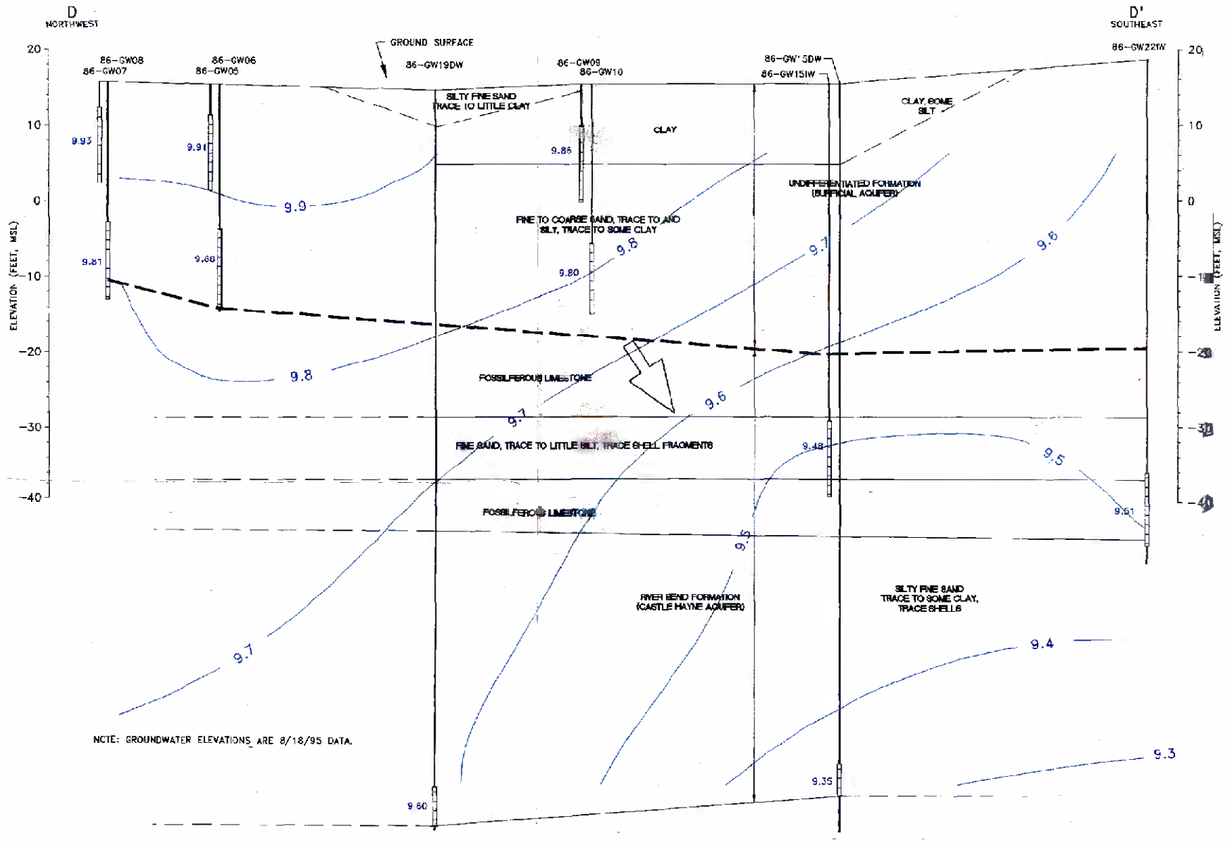
ATTACHMENT E
SITE 86 GROUNDWATER CROSS SECTION

Discussion of Cross Section

Figure 1 contains cross-section D-D' from the Baker RI report. Section D-D' runs perpendicular to the groundwater flow of the Castle Hayne aquifer (Figure 2). Groundwater elevations from May 1995 and their corresponding iso-elevation contour lines are displayed on the left-hand cross-section. TCE and DCE concentrations from October 1995 and their corresponding iso-concentration contour lines are displayed on the right-hand cross-section.

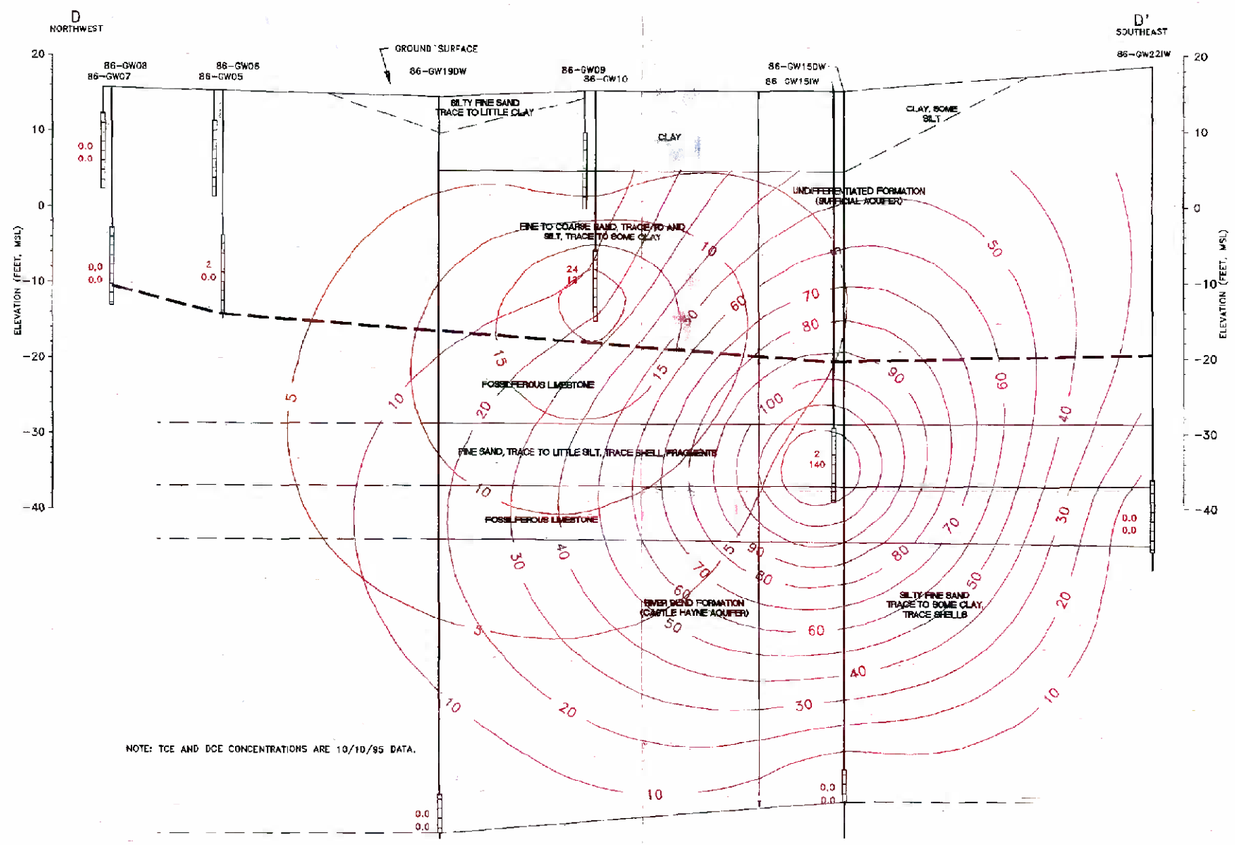
These cross-sections provide evidence that the source of the VOC groundwater contamination originated within the Site 86 boundary. The left-hand section supports the RI conclusion that the Site 86 area is a recharge area exhibiting a downward flow potential. Moreover, this section shows that at least in May 1995, there is a southeastern component to the downward flow potential. Note that on the right-hand cross-section the DCE plume is slightly downgradient of the TCE plume, with respect to the groundwater flow potential. DCE is a more mobile daughter product of TCE. Accordingly, the contaminant distribution of TCE and DCE appear to be the result of the downward flow components.

VERTICAL GROUNDWATER FLOW PATTERN



NOTE: GROUNDWATER ELEVATIONS ARE 8/18/95 DATA.

SELECT CONTAMINANT VERTICAL DISTRIBUTION PATTERN



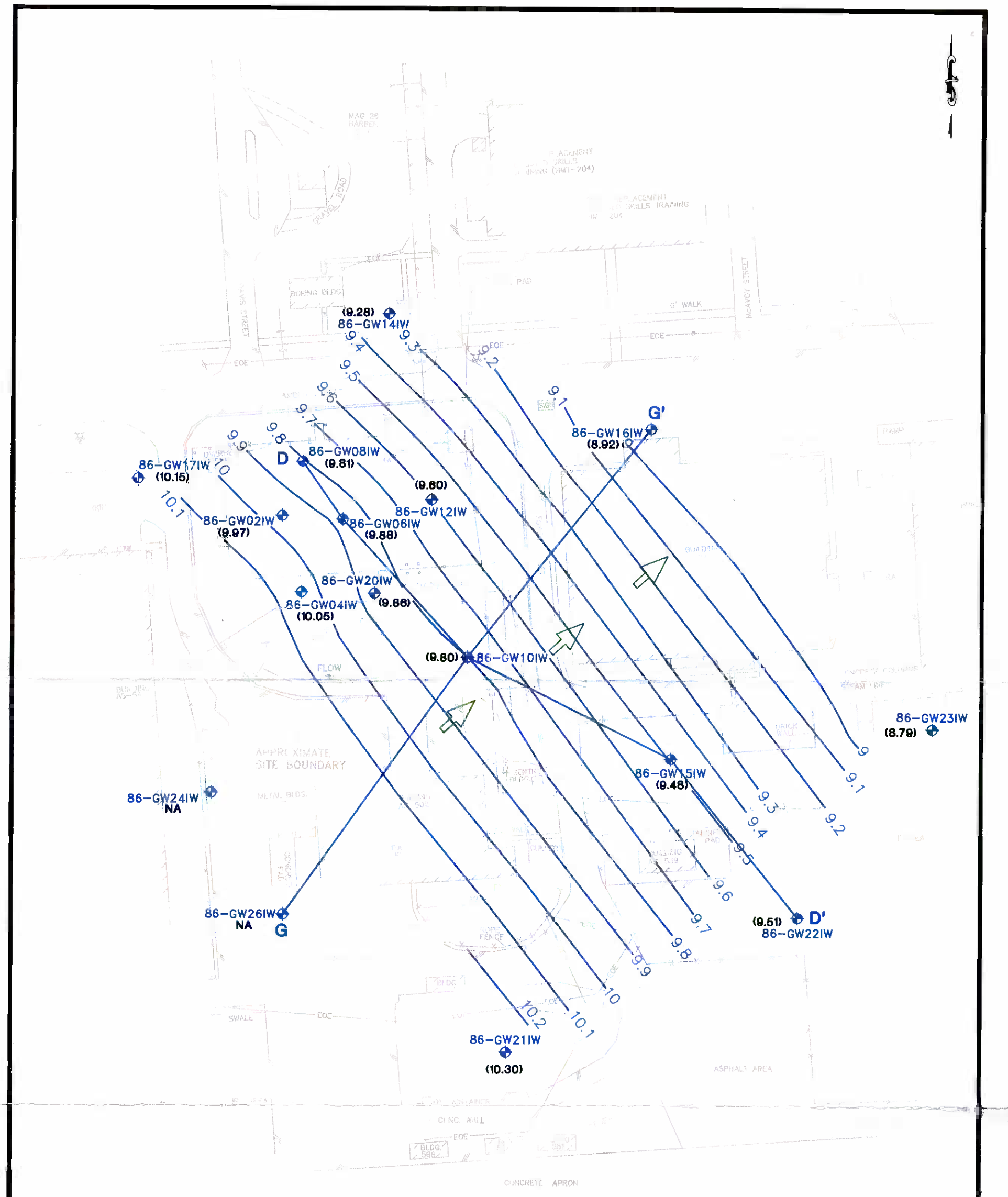
NOTE: TCE AND DCE CONCENTRATIONS ARE 10/10/95 DATA.

LEGEND

- WELL SCREEN INTERVAL
- ESTIMATED CONTACTS
- PROJECTED CONTACTS
- 9.80 GROUNDWATER ELEVATION IN WELL
- 24 TCE CONCENTRATION
- 10 TOTAL DCE CONCENTRATION
- 9.8 GROUNDWATER ISOELEVATION CONTOUR
- 5 TCE ISOCONCENTRATION CONTOUR
- 10 DCE ISOCONCENTRATION CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

REVISIONS	DRAWN WJH REVIEWED MKD S.O.# 62470-303-0000-07000 CADD# 303506WP	NORTH		CTO-0303 MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA BAKER ENVIRONMENTAL, Inc. Coraopolis, Pennsylvania	Baker Environmental, Inc.	GROUNDWATER FLOW AND SELECT CONTAMINANT DISTRIBUTION PATTERNS IN CROSS SECTION D-D' SCALE AS SHOWN DATE JANUARY 1997	FIGURE NO. 1

01863EE04X



303507WP

LEGEND

- 86-GW04IW — INTERMEDIATE MONITORING WELL
- 10.2 — GROUNDWATER ELEVATION CONTOUR
- (10.30) — GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION
- DIRECTION OF SURFACE WATER FLOW
- OVERHEAD ELECTRIC LINE & UTILITY POLE
- ASPHALT ROAD
- GRAVEL ROAD
- CENTERLINE OF DRAINAGE SWALE
- FENCE
- LIGHTPOLE
- GUY WIRE
- STRUCTURE
- FIRE HYDRANT
- D—D' CROSS-SECTION TRAVERSE

NA NOT APPLICABLE (WELLS WERE NOT INSTALLED AT THAT TIME)

SOURCE: LANTDIV, OCT. 1991

80 0 40 80
1 inch = 80 ft.

Baker Environmental, Inc.

FIGURE 2
LOWER SURFICIAL AQUIFER/UPPER CASTLE HAYNE AQUIFER GROUNDWATER CONTOUR MAP (MAY 1995) SITE 86, ABOVE GROUND STORAGE TANK AREA

MARINE CORPS AIR STATION, NEW RIVER
NORTH CAROLINA

01863EE05Y