

3 November 2004

Mr. JC Wade
ROICC
1005 Michael Road
Camp Lejeune, North Carolina 28547

Subject: Contract No.: N62470-03-D-4000
Contract Task Order 0009
Quarterly Groundwater Monitoring Report, Site H28, Marine Corps Base, Camp
Lejeune, North Carolina, Revision 1

On behalf of the Department of the Navy, Atlantic Division, Naval Facilities Engineering Command (NAVFACENGCOM), Engineering and Environment, Inc. (EEI) has prepared this quarterly groundwater monitoring report for Site H-28, Marine Corps Base (MCB) Camp Lejeune. The report presents the findings of groundwater monitoring activities conducted in September 2004, which included gauging of site monitoring wells for this monitoring period.

The site has been assigned incident number 23333 by the North Carolina Department of Environment and Natural Resources (NCDENR). Previous site investigations have indicated the site meets criteria associated with NCDENR's Intermediate Risk classification.

Background

The site is located on MCB Camp Lejeune in Onslow County, North Carolina (N34 degrees, 40.636 minutes, W77 degrees, 22.151 minutes) (Figure 1). Within Camp Lejeune, the site is located on Julian C. Smith Drive in a residential area of the base and includes Building H-28 (Figure 2). Building H-28 is a detached, single family officer's residence.

The nearest mapped body of water is Wallace Creek. The creek is located approximately 200 feet north of the site. No potable water supply wells are located within 1500 feet of the site.

In May 1990, a 550-gallon Number 2 fuel oil Underground Storage Tank (UST) was excavated and removed from site. Work conducted during the UST removal indicated petroleum constituents had been released from the UST. Subsequent investigations indicated petroleum constituent concentrations in soil were below Maximum Soil Contaminant Concentrations. Groundwater quality data from previous investigations indicated few constituents have been present above North Carolina Groundwater Quality Standards, and all constituents have been substantially below Gross Contaminant Levels. Constituent concentrations generally were observed to decrease over time. Previous well gauging data indicated only a minor thickness of measurable free product has been intermittently present at monitoring well MW-11, located near the former UST.

The current groundwater monitoring program was initiated in June 2004. The program includes quarterly gauging at all site wells and semi-annual groundwater sampling at wells MW-6, MW-8,

and MW-9. During the initial (first quarter) monitoring event conducted in June 2004, well gauging was conducted by EEI at the 10 monitoring wells present at the site, and groundwater samples were collected from monitoring wells MW-6 and MW-9. Well MW-8 was not sampled as free product was detected at the well at a thickness of 0.05 foot. No free product was observed in well MW-11, although a sorbent sock was found to be present in the well. Consequently, as the sock was present in the well immediately prior to gauging, the gauging data for this well were considered compromised. After completion of gauging and sampling, sorbent socks were installed in well MW-8 (due to the presence of measurable free product) and well MW-11 (as the well historically has exhibited free product). Analysis of groundwater samples collected in June 2004 indicated target analytes were not present at detectable levels, indicating continued reduction in petroleum constituent concentration over time.

For the current (September 2004) monitoring event, EEI conducted well gauging at the 10 site monitoring wells. A discussion of the methods and results of the current gauging event is presented below. A more extensive discussion of the site history is presented in the previous quarterly monitoring report (Quarterly Groundwater Monitoring Report, Site H28, Marine Corps Base, Camp Lejeune, North Carolina, 4 August 2004, prepared for the Department of the Navy by EEI).

Field Methods

On 30 September 2004, 10 site monitoring wells (MW-1 through MW-3, and MW-5 through MW-11) were gauged. Well gauging was conducted using an electronic interface probe to measure the depth to water and depth to product (if present). Data were recorded to the nearest 0.01 foot and referenced to the surveyed top of casing. Approximately two weeks prior to the gauging event (on 15 September 2004), the sorbent socks installed previously (after completing the June 2004 event) in wells MW-8 and MW-11 were removed. Upon completion of well gauging, sorbent socks were reinstalled in these two wells. Down-hole gauging equipment was decontaminated after each use by washing with an Alconox/deionized water mixture, followed by a deionized water rinse.

Well Gauging Results

The well gauging is used to calculate groundwater elevations from which groundwater flow directions can be estimated. Additionally, the data are used to check for the possible presence of the free product and, if present, the extent of free product is estimated.

Groundwater Elevations

All of the monitoring wells installed at the site are shallow wells (total depths of approximately 17 feet below ground surface for most wells) screened in the saturated shallow fine sands of the surficial aquifer. Using the top-of-casing elevations and gauging data recorded 30 September 2004, groundwater elevations for the site monitoring wells were calculated (Table 1). For wells exhibiting measurable free product, the groundwater elevation was corrected by adding 80 percent of the product thickness to the calculated groundwater elevation. (The product thickness was multiplied by 80 percent as the specific gravity of the product is assumed to be 0.8.)

The elevation data for the shallow wells were used to construct a surficial aquifer groundwater elevation map from which groundwater flow direction can be estimated (Figure 3). From the map, surficial aquifer groundwater flows to the north-northwest and to the northeast towards the center of the site. A minor flow component to the south also is observed. Away from the center of the site, groundwater flows to the north-northwest and to the northeast. This flow direction is somewhat different than observed in June 2004, where flow was generally to the northwest. Previous investigations suggest some variability in groundwater flow direction.

Product Thickness

During the current gauging event, measurable free product was observed only at wells MW-8 and MW-11, at a thickness of 0.01 foot and 0.10 foot, respectively (Table 1) summarizes the current quarter gauging data. The estimated extent of free product for September 2004 is presented in Figure 4. The map illustrates the limited lateral extent of free product, with free product restricted to the area in the immediate vicinity of the former UST.

Gauging data recorded prior to the current quarter have identified intermittent measurable free product at well MW-11 (Table 2). Six gauging events conducted from August 1999 to April 2001 identified measurable free product at this well. Over this period, the product thickness declined from a maximum of 0.85 foot in October 2000 to 0.02 foot in January and April 2001. Five gauging events conducted since April 2001, from October 2002 to the June 2004, have not detected measurable free product at well MW-11, although three of the five events reported the presence of a sorbent sock in the well immediately prior to gauging, reducing the reliability of the gauging data at well MW-11 for those events. At well MW-8, the previous (June 2004) gauging event indicated free product was present at a thickness of 0.05 foot. Free product was not observed at this well during two gauging events conducted in May 1992 or in four gauging events conducted between July 2000 and April 2001.

The current gauging event indicated a minor product thickness was present in well MW-11, which historically has intermittently exhibited free product. At well MW-8, the current data indicate a reduction in the minor thickness of free product observed in June 2004.

EEI appreciates the opportunity to work with the Department of the Navy on this project. If you have any questions regarding this report or other matters, please contact me at (910) 989-3214 (bmorris@eemail.com) or Mr. Chris Murray at (910) 265-2403 (cmurray@eemail.com).

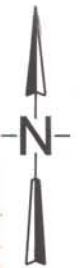
Yours sincerely,

ENGINEERING AND ENVIRONMENT, INC.

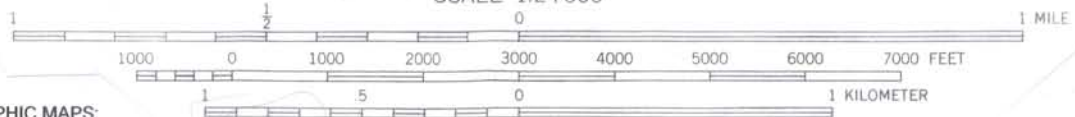
Mr. William C. Morris
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Mr. Chris Murray / EEI – VBO

attachments



SCALE 1:24 000



U.S.G.S TOPOGRAPHIC MAPS:
 JACKSONVILLE SOUTH, N.C.
 1952
 PHOTOINSPECTED 1988
 and
 CAMP LEJEUNE SOUTH, N.C.
 1952
 PHOTOREVISED 1971

(Map adapted from Law, 2000a)

	FIGURE	1	SITE LOCATION
	DATE	7/30/04	
	REVISION	0	
	DRAWN BY	WCM	
	FILE	H28_TOPO	



LEGEND

- SHALLOW MONITORING WELL

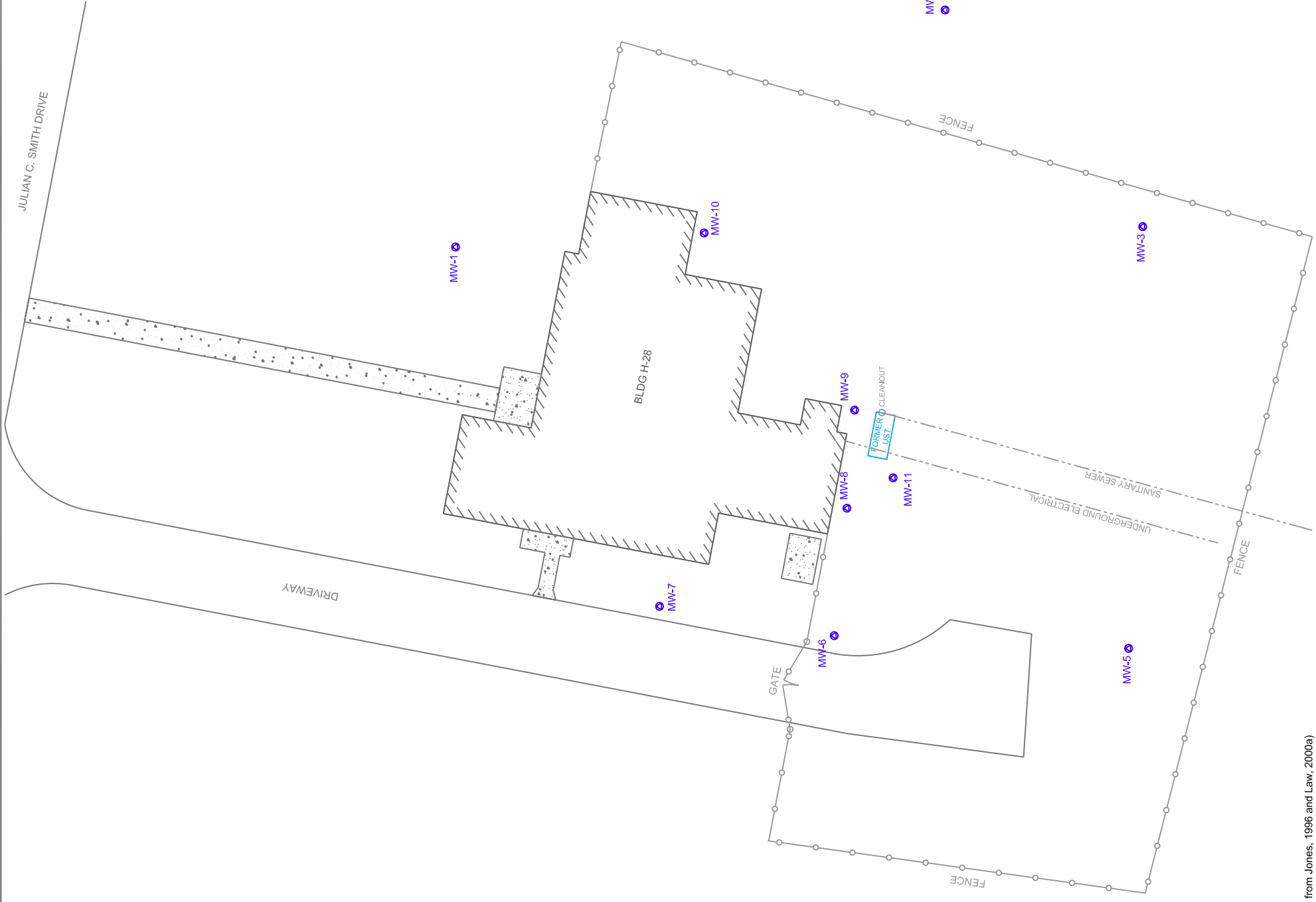


	FIGURE	2	SITE LAYOUT AND WELL LOCATIONS
	DATE	10/12/04	SITE H-28
	REVISION	0	QUARTERLY MONITORING REPORT
	DRAWN BY	WCM	MCB CAMP LEJEUNE, NC
	FILE	H28_MAP	

(Base map adapted from Jones, 1996 and Law, 2000a)



LEGEND

- SHALLOW MONITORING WELL
 - 1.51 SURFICIAL AQUIFER GROUNDWATER ELEVATION
 - 3.0 SURFICIAL AQUIFER GROUNDWATER ELEVATION CONTOUR
- (GROUNDWATER ELEVATIONS EXPRESSED IN FEET ABOVE/BELOW MEAN SEA LEVEL)

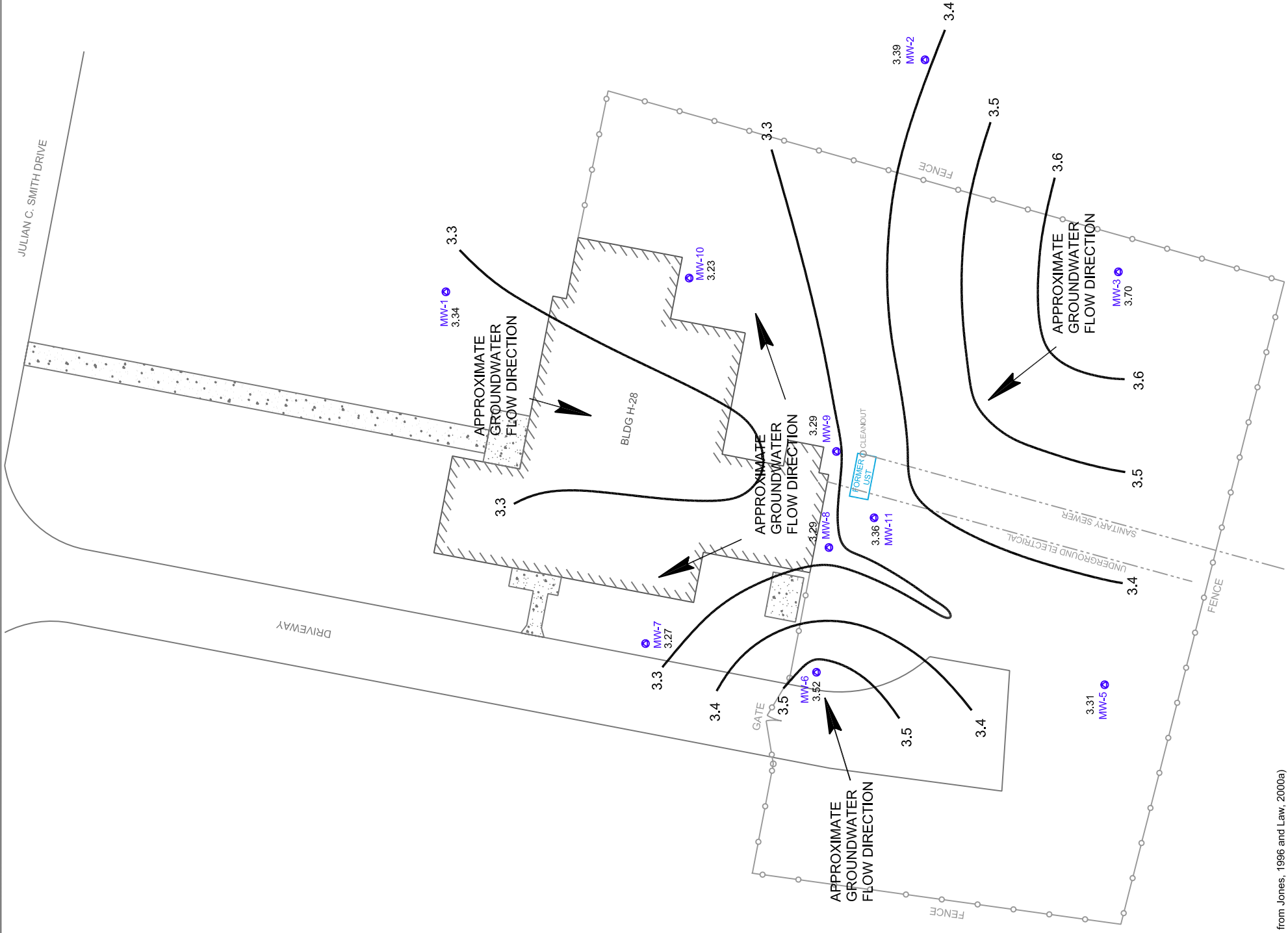


	FIGURE	3	SURFICIAL AQUIFER GROUNDWATER ELEVATIONS FOR 30 SEPTEMBER 2004
	DATE	10/12/04	SITE H-28
	REVISION	0	QUARTERLY MONITORING REPORT
	DRAWN BY	WCM	MCB CAMP LEJEUNE, NC
	FILE	H28_MAP	

(Base map adapted from Jones, 1996 and Law, 2000a)



LEGEND

- SHALLOW MONITORING WELL
- 0.05 ● FREE PRODUCT THICKNESS
- ESTIMATED EXTENT OF FREE PRODUCT
(THICKNESS EXPRESSED IN FEET)
(NP: MEASURABLE FREE PRODUCT NOT PRESENT)

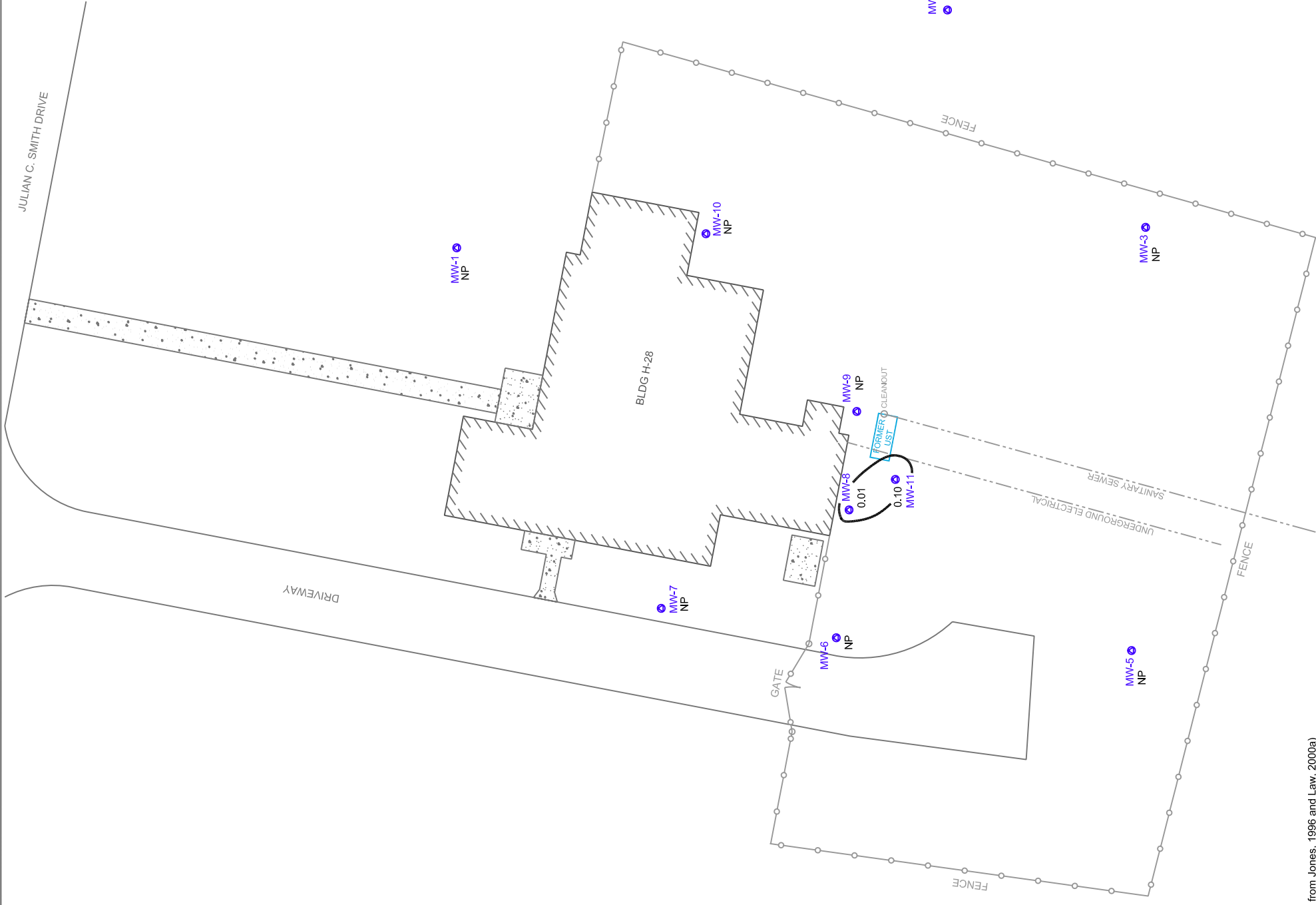


	FIGURE	4	ESTIMATED EXTENT OF FREE PRODUCT FOR SEPTEMBER 2004
	DATE	10/12/04	SITE H-28
	REVISION	0	QUARTERLY MONITORING REPORT
	DRAWN BY	WCM	MCB CAMP LEJEUNE, NC
	FILE	H28_MAP	

Table 1
Gauging Data for 30 September 2004
Site H-28

Well Identification	Top of Casing Elevation (feet msl)	Depth to Water (feet btoc)	Depth to Product (feet btoc)	Product Thickness (feet)	Uncorrected Groundwater Elevation (feet msl)	Corrected Groundwater Elevation ⁽¹⁾ (feet msl)
MW-1	11.72	8.38	NP	NP	3.34	3.34
MW-2	12.00	8.61	NP	NP	3.39	3.39
MW-3	12.18	8.48	NP	NP	3.70	3.70
MW-4	12.29	Not Located - Assumed Abandoned				
MW-5	12.31	9.00	NP	NP	3.31	3.31
MW-6	11.96	8.44	NP	NP	3.52	3.52
MW-7	11.62	8.35	NP	NP	3.27	3.27
MW-8	12.07	8.79	8.78	0.01	3.28	3.29
MW-9	12.20	8.91	NP	NP	3.29	3.29
MW-10	11.57	8.34	NP	NP	3.23	3.23
MW-11	12.21	8.93	8.83	0.10	3.28	3.36

⁽¹⁾ Corrected Groundwater Elevation = Top of Casing Elevation - Depth to Water + 0.8 x Product Thickness

feet msl - feet above/below mean sea level

feet btoc - feet below top of casing

NP - Not Present - no measurable product detected

Table 2
Summary of Product Thickness Data Over Time
Site H-28

Date	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11
12 May 1992	ni	ni	ni	ni	ni	ni	ni	NP	NP	NP	ni
20 May 1992	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	ni
29 January 1998	NP	NP	NP	nl	NP	NP	NP	nm	NP	nl	ni
3 April 1998	nm	nm	nm	nl	nm	NP	NP	nm	nm	nm	ni
7 July 1998	nm	nm	nm	nl	nm	NP	NP	nm	nm	nm	ni
13 August 1999	nm	nm	nm	nl	nm	NP	NP	nm	NP	nm	NP
20 August 1999	nm	nm	nm	nl	nm	NP	NP	nm	NP	nm	0.27
22 October 1999	nm	nm	nm	nl	nm	nm	nm	nm	NP	nm	0.85
20 July 2000	NP	NP	NP	nl	NP	NP	NP	NP	NP	NP	0.30
17 October 2000	NP	NP	NP	nl	NP	NP	NP	NP	NP	NP	0.33
16 January 2001	NP	NP	NP	nl	NP	NP	NP	NP	NP	NP	0.02
12 April 2001	NP	NP	NP	nl	NP	NP	NP	NP	NP	NP	0.02
21 October 2002	nm	nm	nm	nl	nm	nm	nm	nm	nm	nm	NP ⁽¹⁾
30 January 2003	nm	nm	nm	nl	nm	nm	nm	nm	nm	nm	NP
30 April 2003	nm	nm	nm	nl	nm	nm	nm	nm	nm	nm	NP ⁽¹⁾
21 August 2003	nm	nm	nm	nl	nm	nm	nm	nm	nm	nm	NP
15 June 2004	NP	NP	NP	nl	NP	NP	NP	0.05	NP	NP	NP ⁽¹⁾
30 September 2004	NP	NP	NP	nl	NP	NP	NP	0.01	NP	NP	0.10

⁽¹⁾ Sorbent sock present in well immediately prior to gauging; product thickness data is considered compromised

Product thickness data expressed in feet

ni: Not Installed; well not installed at the time gauging was conducted

nl: Not Located; well could not be located

nm: Not Measured; well not measured during the gauging event

NP: Not Present; no measurable thickness of free product present in the well