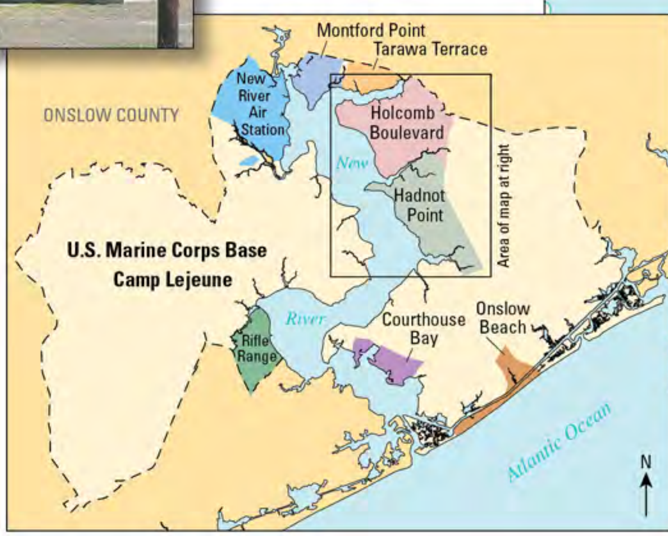
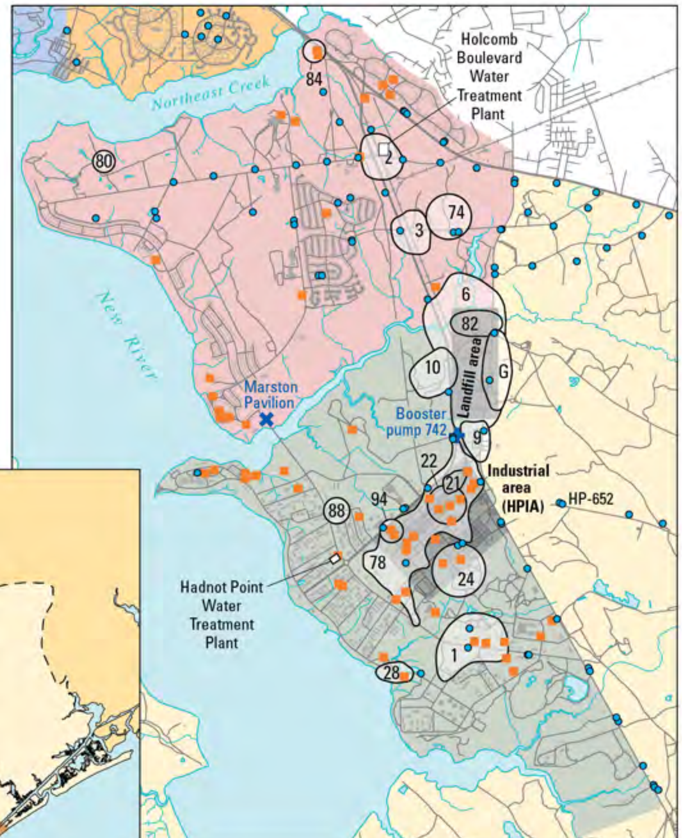
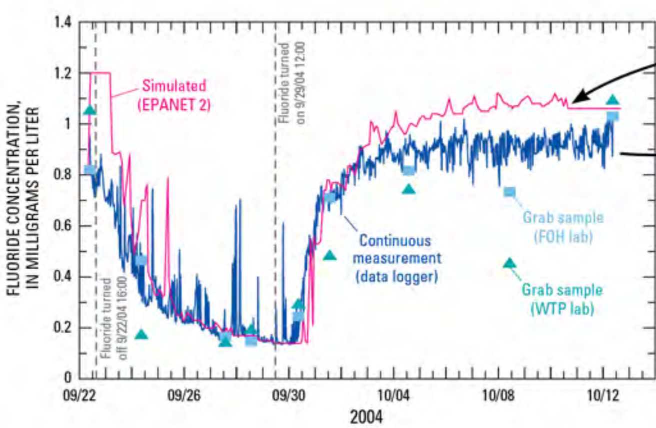
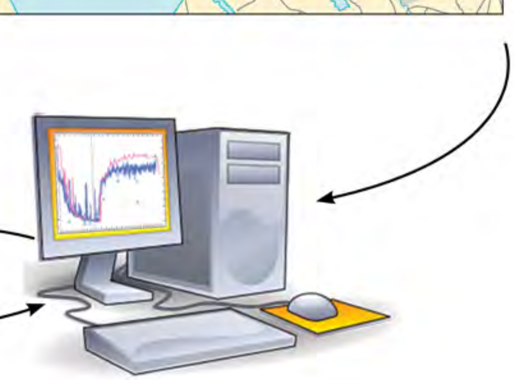
Analyses and Historical Reconstruction of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water Within the Service Areas of the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities, U.S. Marine Corps Base Camp Lejeune, North Carolina

Chapter A–Supplement 3
Descriptions and Characterizations of Water-Level Data and Groundwater Flow for the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer









DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Atlanta, Georgia – March 2013

Front cover: Historical reconstruction process using data, information sources, and water-modeling techniques to estimate historical contaminant concentrations.

Maps: U.S. Marine Corps Base Camp Lejeune, North Carolina; Holcomb Boulevard and Hadnot Point areas showing extent of sampling at Installation Restoration Program sites (white numbered areas), above-ground and underground storage tank sites (orange squares), and water-supply wells (blue circles).

Photograph (upper): Hadnot Point water treatment plant (Building 20).

Photograph (lower): Well house building for water-supply well HP-652.

Graph: Measured fluoride data and simulation results for Paradise Point elevated storage tank (S-2323) for tracer test of the Holcomb Boulevard water-distribution system, September 22–October 12, 2004; simulation results obtained using EPANET 2 water-distribution system model assuming last-in first-out plug flow (LIFO) storage tank mixing model. [WTP lab, water treatment plant water-quality laboratory; FOH lab, Federal Occupational Health Laboratory]

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By Robert E. Faye, L. Elliott Jones, and René J. Suárez-Soto

Agency for Toxic Substances and Disease Registry
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Tables (Tables S3.3–S3.5 are in back of report)

See the Glossary section in Chapter A of this report for definitions of terms and abbreviations used throughout this supplement.

Analyses and Historical Reconstruction of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water Within the Service Areas of the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities, U.S. Marine Corps Base Camp Lejeune, North Carolina

Chapter A–Supplement 3 Descriptions and Characterizations of Water-Level Data and Groundwater Flow for the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer

By Robert E. Faye,[1] L. Elliott Jones,[2] and René J. Suárez-Soto[3]

Introduction

This supplement of Chapter A (Supplement 3) summarizes results of analyses of groundwater-level data and describes corresponding elements of groundwater flow such as vertical hydraulic gradients useful for groundwater-flow model calibration. Field data as well as theoretical concepts indicate that potentiometric surfaces within the study area are shown to resemble to a large degree a subdued replica of surface topography. Consequently, precipitation that infiltrates to the water table flows laterally from highland to lowland areas and eventually discharges to streams such as Northeast and Wallace Creeks and New River. Vertically downward hydraulic gradients occur in highland areas resulting in the transfer of groundwater from shallow relatively unconfined aquifers to underlying confined or semi-confined aquifers. Conversely, in the vicinity of large streams such as Wallace and Frenchs Creeks, diffuse upward leakage occurs from underlying confined or semi-confined aquifers. Point water-level data indicating water-table altitudes, water-table altitudes estimated using a regression equation, and estimates of stream levels determined from a digital elevation model (DEM) and topographic maps were used to estimate a predevelopment water-table surface in the study area. Approximate flow lines along hydraulic gradients are shown on a predevelopment potentiometric surface map and extend from highland areas where potentiometric levels are greatest toward streams such as Wallace Creek and Northeast Creek. The distribution of potentiometric levels and corresponding groundwater-flow directions conform closely to related descriptions of the conceptual model.

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Background

U.S. Marine Corps Base (USMCB) Camp Lejeune is located in the Coastal Plain of North Carolina, in Onslow County, south of the City of Jacksonville and about 70 miles northeast of the City of Wilmington, North Carolina (Figure S3.1). The area of investigations reported herein is inclusive of the water-distribution networks supplied by the Hadnot Point and Holcomb Boulevard water-treatment plants (HPWTP and HBWTP, respectively) (Faye et al. 2010, Plate 1), herein called the study area or the Hadnot Point–Holcomb Boulevard (HPHB) study area. In general, the study area is bordered on the north by Northeast Creek and North Carolina Highway 24 (SR24), to the west by New River, to the south by Frenchs Creek, and generally to the east by the drainage divides of the upstream tributaries of Wallace Creek and Frenchs Creek (Faye et al. 2010, Plate 1). Total study area is approximately 50 square miles (mi^2).

Eight water-distribution systems have supplied or currently (2012) are supplying drinking water to family housing and other facilities at USMCB Camp Lejeune, North Carolina. The three water-distribution systems of interest to this study—Tarawa Terrace, Hadnot Point, and Holcomb Boulevard—historically supplied drinking water to a majority of family housing at the Base (Table S3.1). Two of the three water-distribution systems were contaminated with volatile organic compounds (VOCs). Groundwater supplied to the Tarawa Terrace water treatment plant (WTP), and

Table S3.1. Chronology of Hadnot Point and Holcomb Boulevard family and bachelor housing construction and contemporary populations, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NA, not available; ?, information or data not definitive]

Housing area	Year built	Number of units	Type of units	Resident population[1]
Bachelor Housing	NA	NA	NA	NA/13,427
Berkeley Manor	1962/1963	677	Single	2,721/2,486
Hospital Point	1947	24	Single (?)	NA/86
Midway Park	1942/1943	699	Single and duplex	1,726/1,809
Paradise Point	1942	5	Single	
	1947	100	Single	
	1948	67	Single	
	1962	123	Single	
	1999	(total) 510	Single	1,854/1,665
Watkins Village	1978/1979	250	Townhouses	1,342/1,347

[1] The first number is the resident population indicated by hand-written notes on the maps listed below under Data sources. The second number is the resident population in 1999 reported by ECG, Inc. (1999, Appendix 2)

Data sources:

ECG, Inc. 1999

U.S. Marine Corps Base Camp Lejeune
Map of Berkeley Manor area, June 30, 1979
Map of Midway Park housing area and Naval Hospital, July 31, 1984
Map of Officer Quarters, Paradise Point area, July 31, 1984
Map of Watkins Village, June 30, 1979

Scott R. Williams, U.S. Marine Corps Base Camp Lejeune, written communication, September 9, 2008 subsequently to the Tarawa Terrace water-distribution system, was contaminated with tetrachloroethylene (PCE) and related degradation products such as trichloroethylene (TCE) and vinyl chloride. Similarly, groundwater supplied to the HPWTP was contaminated with TCE, as well as PCE and refined petroleum products such as benzene, toluene, ethylbenzene, and xylenes (BTEX). Groundwater supplied to the HBWTP was mostly uncontaminated (Faye et al. 2010, Tables C11–C12). The HPWTP was constructed probably during 1941 and 1942, along with much of the original infrastructure of the Base. Construction of the HBWTP was completed during the summer of 1972 (Scott A. Brewer, USMCB Camp Lejeune, written communication, September 29, 2005).[4] For the period of interest to this study (1942–2008), 97 water-supply wells have historically or are currently (2008) providing groundwater to the HPWTP and HBWTP. The operational chronology of water-supply wells during the period of interest to the study (1942–2008) is shown in Figure S3.2.

[4] Based on information contained in the written communication from USMCB Camp Lejeune, the start of continuous operations at the HBWTP is estimated to be about June 1972.

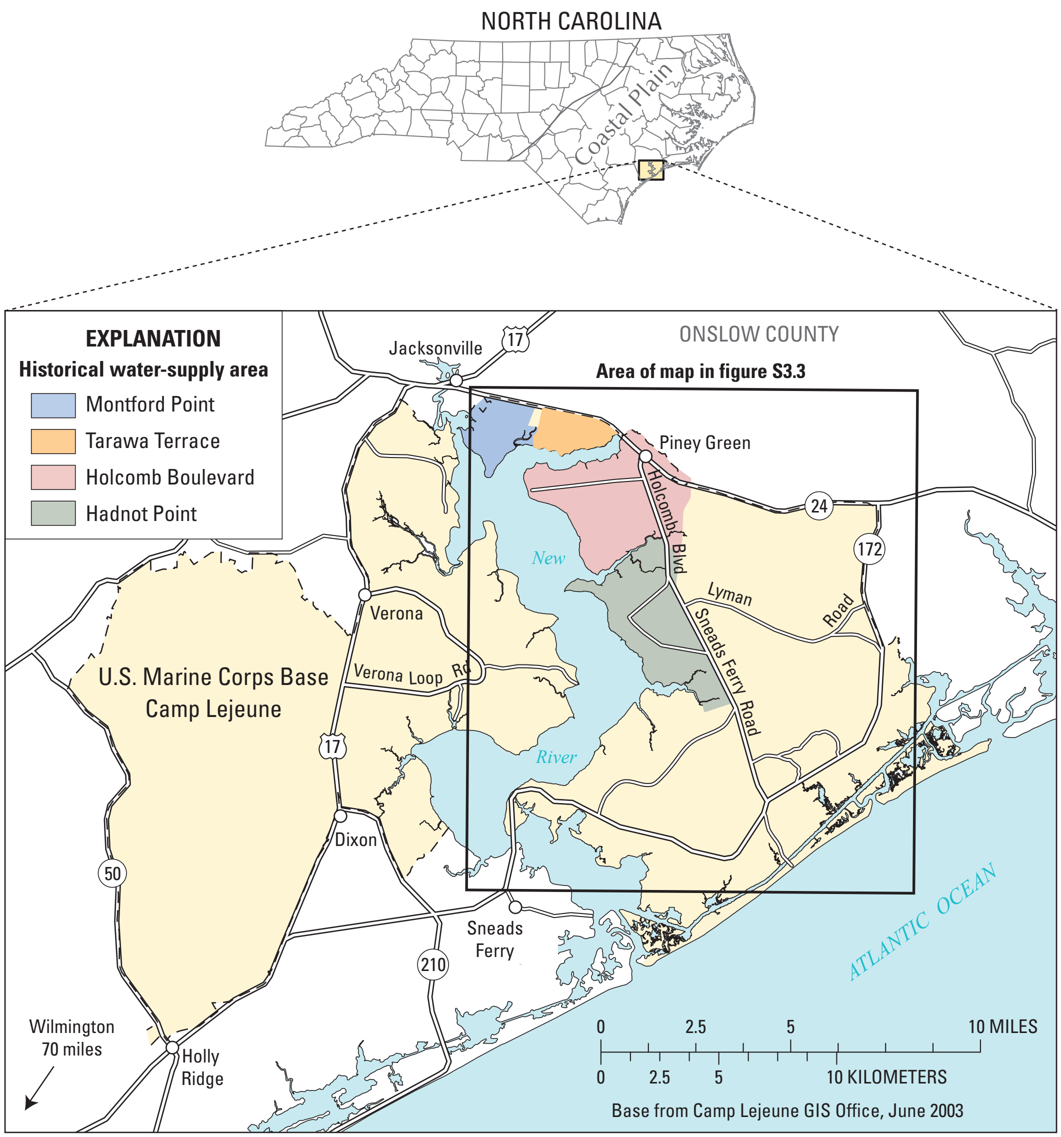


Figure S3.1. Study area and cultural and geographic features at U.S. Marine Corps Base Camp Lejeune, North Carolina.

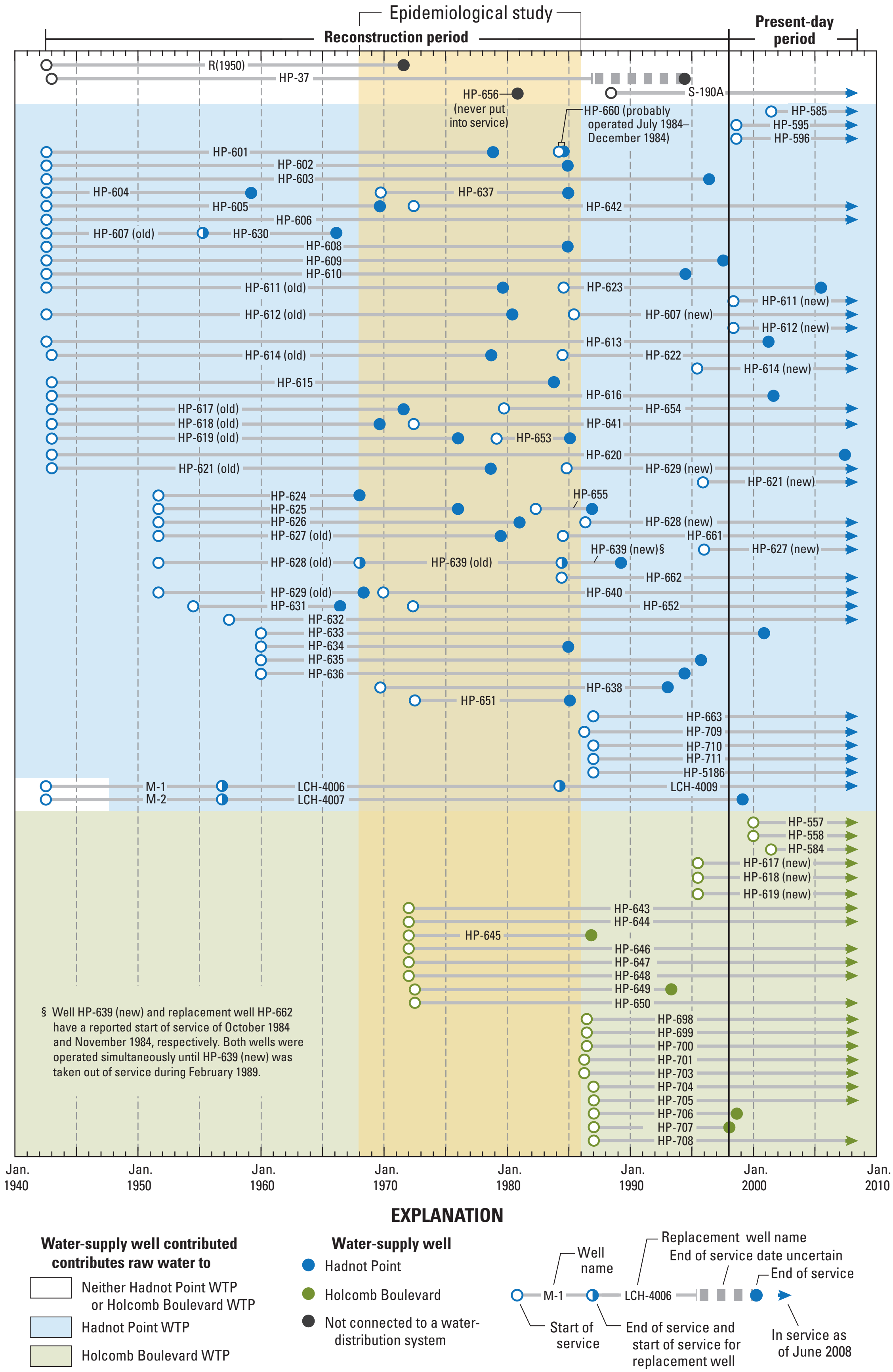


Figure S3.2. Operational chronology of Hadnot Point and Holcomb Boulevard water-supply wells, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina, 1942–2008.

Hydrogeologic Framework

A total of 14 aquifers and confining units were identified for this study within the HPHB study area and were named after local cultural features where the units were first identified or as subdivisions of the Castle Hayne Formation (Harned et al. 1989; Geophex, Ltd. 1994, Appendixes E, F; Faye 2012). Named hydrogeologic units and unit thicknesses are listed in Table S3.2. Sediments correlated with the Brewster Boulevard aquifer and confining unit (Faye 2007) between Northeast and Wallace Creeks thicken considerably south of Wallace Creek and were subdivided, for purposes of this study, into two aquifers and two confining units, all assigned to the Brewster Boulevard aquifer system. With the exception of the Brewster Boulevard aquifer system, hydrogeologic units listed in Table S3.2 correspond, with minor changes, one-to-one to units previously identified and described by Faye (2007) between Northeast and Wallace Creeks (Faye 2012).

The base of the Lower Castle Hayne aquifer is at the top of the Beaufort confining unit and corresponds, within most of the study area, to the base of freshwater flow. Freshwater is defined herein as water containing a concentration of total dissolved solids less than 5,000 milligrams per liter. The top of freshwater flow occurs everywhere at the water table, which fluctuates seasonally over a range of about 10 feet (ft) or less. Depending on location, whether north or south within the study area or highland or lowland, the water table generally occurs in the lower or upper part of the Brewster Boulevard aquifer system, respectively, or within the Tarawa Terrace aquifer.

Aquifers of the Castle Hayne aquifer system comprise the major water-bearing units of the study area and are composed mostly of fine silty and clayey sand and sandy limestone. Confining units are clay, sandy clay, or silty clay. For detailed descriptions of framework geometry and well, borehole, and geophysical data used to define the hydrogeologic framework, refer to Chapter B (Faye 2012).

Table S3.2. Hydrogeologic units, unit correlations, and unit thickness, Hadnot Point-Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

GEOLOGIC UNITS			HYDROGEOLOGIC UNITS	Thickness
System	**Series**	**Formation**	**Aquifer and confining unit**	**Range, in feet**
Quaternary	Holocene Pleistocene	Undifferentiated	Brewster Boulevard upper aquifer	4 to 42
Tertiary	Pliocene	Absent	Absent	—
	Miocene	Pungo River Formation, undifferentiated	Brewster Boulevard upper confining unit	1 to 22
			Brewster Boulevard lower aquifer	4 to 48
		Belgrade Formation, undifferentiated	Brewster Boulevard lower confining unit	2 to 30
			Tarawa Terrace aquifer (upper part)	8 to 86
	Oligocene	River Bend Formation, undifferentiated	Tarawa Terrace aquifer (middle and lower parts)	
			Upper Castle Hayne confining unit (previously designated the Tarawa Terrace confining unit in Faye (2007)	4 to 40
	Late Eocene	Unnamed	Upper Castle Hayne aquifer–River Bend unit	16 to 70
	Middle Eocene	Castle Hayne Formation	Local confining unit	8 to 23
			Upper Castle Hayne aquifer–Lower unit	10 to 48
			Middle Castle Hayne confining unit	12 to 27
			Middle Castle Hayne aquifer	62 to 122
			Lower Castle Hayne confining unit	18 to 38
			Lower Castle Hayne aquifer	64 to 86
	Paleocene	Beaufort Formation, undifferentiated	Beaufort confining unit (generally occurs at top of Beaufort Formation)	—

Purpose of Study

This study summarizes characterizations and analyses of groundwater-level data collected at numerous monitor and supply wells within the study area in a manner sufficient to augment and support development and calibration of groundwater-flow models.

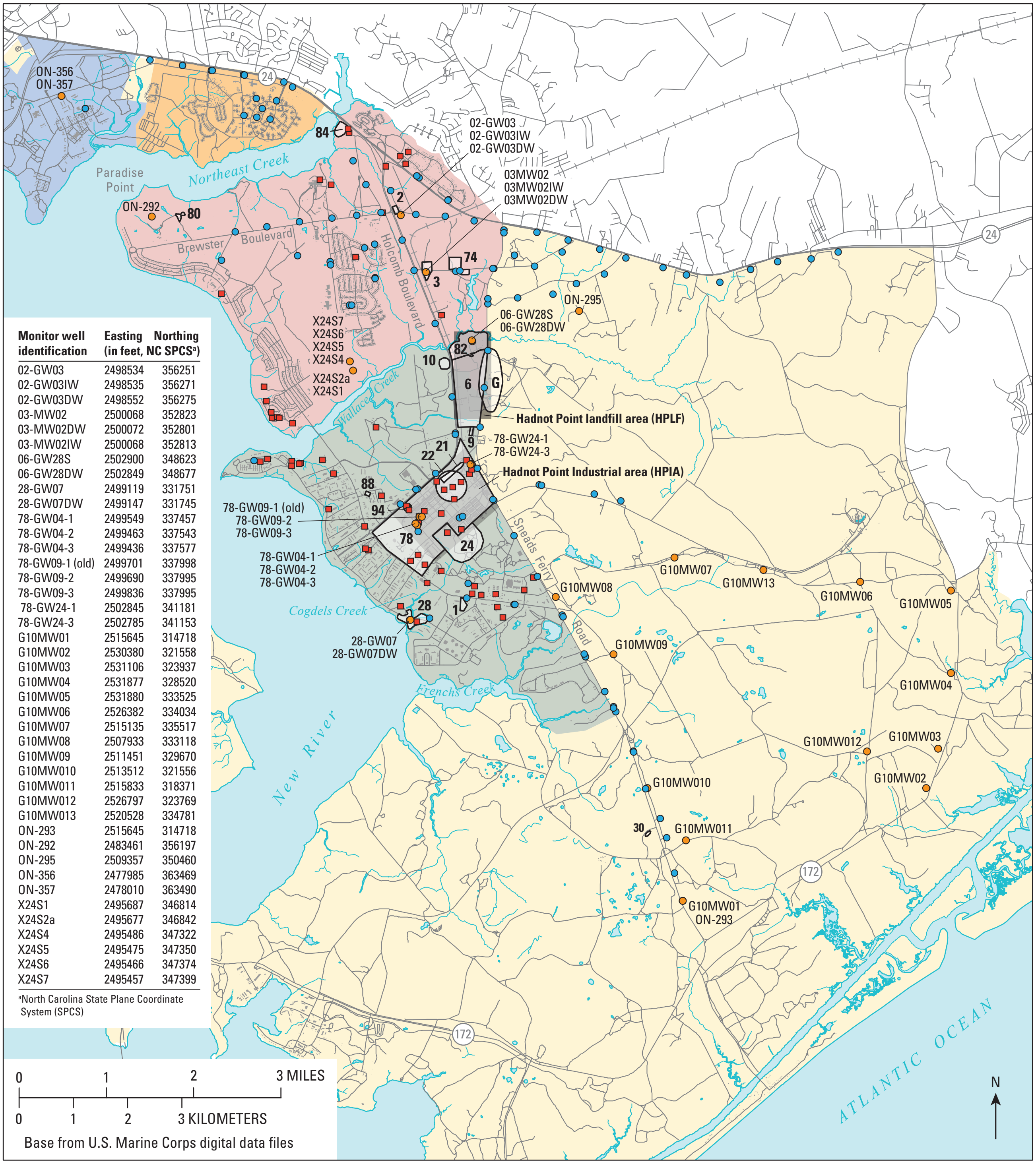
Previous Investigations

Multiple assessments and characterizations of groundwater contamination at numerous Resource Conservation and Recovery Act of 1976 (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) sites throughout the study area (Faye et al. 2010, Plate 1; Figure S3.3) resulted in the writing of hundreds of reports that contain lists of water-level data and related potentiometric surface maps. As such, these documents are too numerous to individually discuss herein. However, an appropriate citation for every report from which data were extracted for this study is included in the list of references, and relevant data sources are listed on tables included herein (Tables S3.3, S3.4, back of report). The results of four hydrologic investigations that contain relevant water-level data and related information are discussed in the following paragraphs: Legrand (1959), Harned et al. (1989), Harden et al. (2004), and Faye and Valenzuela (2007).

Legrand (1959) noted that pumping at water-supply wells in the Hadnot Point area had caused a gradual decline in water levels in the vicinity of several water-supply wells as early as 1958. He also cautioned against the use of airlines as an unreliable method of measuring water levels in water-supply wells. Monthly airline measurements of so-called “static” water levels and drawdown are available at many water-supply wells in the study area beginning at about 1970 for several wells and ending about 1986 (Camp Lejeune Water [CLW] Documents: #3559–#3561, #3569–#3570, #3573–#3575, #3585–#3592, #3641–#3648, #3772–#3779, #3996–#4002, #4044–4051, #6620–#6627, #6628–#6635, #6688–#6690, #6692–#6694, #6696–#6697, #6700–#6702, #6704–#6706, #6708–#6710, #6712–#6714, #6716–#6718). Based on comparisons with historical water-level data collected in many of these wells using traditional tape-down rather than airline methods, the authors have determined that most of the monthly airline data poorly represent static water-level conditions; therefore, the discussion and descriptions of such data are avoided in this report.

Harned et al. (1989, Table A) conducted a detailed reconnaissance of water-supply wells throughout USMCB Camp Lejeune and the New River Air Station (Faye et al. 2010, Plate 1), including the collection of water-level measurements in active and abandoned water-supply wells. Continuous water-level measurements were recorded in several wells during July 1986 to January 1987. Two “shallow” wells (NC-52 and Y25Q6) equipped with continuous recorders were constructed open to depths ranging from about 18 to 66 ft below ground surface (bgs). The designated “shallow” wells were located outside the study area on the west side of the New River, and hydrogeologic units are, accordingly, not assigned herein. Corresponding hydrographs indicated relatively frequent water-level fluctuations generally ranging from less than 0.5 ft to about 1 ft and probably caused by rainfall recharge. Seasonal fluctuations in the “shallow” wells ranged to about 4 ft. Water levels in “shallow” well NC-52 also were shown to respond to barometric pressure, with declines in barometric pressure corresponding to contemporaneous water-level peaks (Harned et al. 1989, Figure 20). Continuous water-level records at abandoned water-supply well HP-630 (Faye et al. 2010, Plate 1), located in the south-central part of the Hadnot Point Industrial Area (HPIA) and constructed open to the Upper Castle Hayne aquifer between about 60 and 160 ft bgs, also indicate fluctuations caused by rainfall recharge as well as seasonal changes in recharge. Maximum seasonal fluctuations were about 2.5 ft. Water-level fluctuations caused by relatively short-term rainfall recharge were generally less than 0.5 ft. Fluctuations caused by pumping at nearby water-supply wells were also evident in these records. Continuous water-level records obtained from a deep water-supply well at the Rifle Range area, located southwest of the study area and west of the New River (Faye et al. 2010, Plate 1), indicated small (less than 0.5 ft) but frequent fluctuations, probably caused by nearby pumping wells. A relatively large seasonal increase in water levels of about 1 ft was noted between the end of November 1986 and the end of January 1987. The Rifle Range area well was constructed open to the Tarawa Terrace aquifer and possibly to part of the Upper Castle Hayne aquifer between about 365 and 425 ft bgs (Harned et al. 1989, Figures 12–19).

Harden et al. (2004) summarize the results of studies of groundwater flow and water-level measurements within two ordinance impact areas at USMCB Camp Lejeune. The easternmost impact area, designated G-10, is the area of interest to this study and is located partially within the southernmost part of the study area, east of Sneads Ferry Road and mostly within the drainage area of Frenchs Creek (Faye et al. 2010, Plate 1). Continuous water-level records collected at a single monitor well, ON-293, during the 10-year period October 1994 to October 2004 were analyzed for trends. Thirteen additional monitor wells (G10MW01–G10MW13) were also constructed for this study during November and December 2003 as an effort to estimate groundwater-flow directions and were located generally around the perimeter of the impact area (Figure S3.3). Long-term monitor well ON-293 was constructed open to a depth of 225–235 ft bgs, probably entirely within the Tarawa Terrace aquifer. Monitor wells G10MW01–G10MW13 were constructed open to the Brewster Boulevard aquifer system at depths ranging from 6.0 to 20.0 ft bgs. Seasonal fluctuations in water levels in monitor well ON-293 ranged to a maximum of about 4 ft (Figure S3.4). In addition, no discernable trends were evident in the record between October 1994 and October 2000.



Monitor well identification	Easting (in feet, NC SPCS[a])	Northing
02-GW03	2498534	356251
02-GW03IW	2498535	356271
02-GW03DW	2498552	356275
03-MW02	2500068	352823
03-MW02DW	2500072	352801
03-MW02IW	2500068	352813
06-GW28S	2502900	348623
06-GW28DW	2502849	348677
28-GW07	2499119	331751
28-GW07DW	2499147	331745
78-GW04-1	2499549	337457
78-GW04-2	2499463	337543
78-GW04-3	2499436	337577
78-GW09-1 (old)	2499701	337998
78-GW09-2	2499690	337995
78-GW09-3	2499836	337995
78-GW24-1	2502845	341181
78-GW24-3	2502785	341153
G10MW01	2515645	314718
G10MW02	2530380	321558
G10MW03	2531106	323937
G10MW04	2531877	328520
G10MW05	2531880	333525
G10MW06	2526382	334034
G10MW07	2515135	335517
G10MW08	2507933	333118
G10MW09	2511451	329670
G10MW010	2513512	321556
G10MW011	2515833	318371
G10MW012	2526797	323769
G10MW013	2520528	334781
ON-293	2515645	314718
ON-292	2483461	356197
ON-295	2509357	350460
ON-356	2477985	363469
ON-357	2478010	363490
X24S1	2495687	346814
X24S2a	2495677	346842
X24S4	2495486	347322
X24S5	2495475	347350
X24S6	2495466	347374
X24S7	2495457	347399

[a]North Carolina State Plane Coordinate System (SPCS)

EXPLANATION

Historical water-supply areas of Camp Lejeune Military Reservation
- Montford Point
- Tarawa Terrace
- Holcomb Boulevard
- Hadnot Point

Other areas of Camp Lejeune Military Reservation

28 **Approximate extent of sampling during contaminant delineation and Installation Restoration Program site number**

RCRA (Resource Conservation and Recovery Act of 1976)—Above-ground and underground storage tank site (refer to Maslia et al. 2010, Faye et al. 2011)

G10MW02 **Monitor well and identifier**

Water-supply well

Figure S3.3. Monitor well locations discussed in this report, supply-well locations, Installation Restoration Program (CERCLA) site locations, and above-ground and underground storage tank (RCRA) site locations, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Between October 2000 and October 2004, a downward trend in the seasonal maximum and minimum water levels is apparent. Harden et al. (2004) acknowledge this trend as an exception to other long-term continuous data but offer no explanation other than that groundwater was removed from storage. Water-supply wells HP-595 and HP-596 were constructed during 1997 and were probably placed in service during 1998 (Faye et al. 2010, Plate 1). These wells are located approximately 1 mile north of monitor well ON-293, and pumping at these wells possibly caused the decline noted in the hydrograph record by Harden et al. (2004) and probably, as well, the frequent on and off fluctuations noted in the record post-1998. The G-10 area is mostly within topographic highlands. Periodic water-level data collected at monitor wells G10MW01–GWMW13 indicate that groundwater within the unconfined aquifer at the G-10 area flows outward in all directions to tributaries of Frenchs Creek and to small streams that drain to the Intercoastal Waterway (not shown on Faye et al. 2010, Plate 1) and the Atlantic Ocean (Faye et al. 2010, Plate 1). Harden et al. (2004, Figure 6) also report that water-table altitudes and land-surface altitudes are highly correlated, based on a linear regression of 23 paired data. The coefficient of determination of the regression relation was 0.95.

Water-level data collection in monitor well ON-293 was apparently discontinued following the study by Harden et al. (2004) and was initiated again during December 2007 (Figure S3.4). The relatively extreme water-level fluctuations in monitor well ON-293 shown on Figure S3.4 during this latter part of the period of record are also highly indicative of a water-level response to operational water-supply wells. Water-supply well HP-585 was constructed during 2000 (Faye et al. 2010, Table C4) and is located about 1,700 ft north of monitor well ON-293. The relatively large fluctuations in water levels after 2007 are probably caused by the operation of water-supply well HP-585, augmented to a substantially lesser degree by operations at water-supply wells HP-595 and HP-596.

While investigating groundwater flow and contamination in the Tarawa Terrace area, which is northwest of the HPHB study area (Faye et al. 2010, Plate 1), Faye and Valenzuela (2007) plotted groundwater levels at 59 locations to estimate a predevelopment potentiometric surface map for the Tarawa Terrace area. As interpreted from the configuration of contour lines of equal potentiometric levels, groundwater was shown to flow from highland areas south and east toward the New River and Northeast Creek (Faye and Valenzuela 2007, Figure C5).

During 2007–2008, McSwain (2010) collected continuous water-level, specific conductance, and temperature data in several monitor wells within the HPHB study area, including wells at the X24S well cluster (Faye et al. 2010, Plate 1) and in well ON-293 studied by Harden et al. (2004). Seasonal changes in water levels, vertical hydraulic gradients, and water-quality characteristics were described for water-year 2008 (October 1, 2007–September 30, 2008), and comparisons of 2008 and long-term water levels were accomplished at the X24S well cluster. Based on these comparisons, water-year 2008 water levels within the Castle Hayne aquifer system were considered "normal."

Methods and Approach

The methods and approach discussed herein include (1) the compilation of water-level data, (2) the estimation and analysis of predevelopment groundwater-level data, (3) determination of vertical hydraulic gradients, and (4) analysis of continuous water-level data. The data discussed in the following sections were obtained from numerous CERCLA and RCRA site assessments and characterizations and are documented in Tables S3.3 and S3.4 and in the list of References. Site names listed in Tables S3.3 and S3.4 bearing prefixes with numbers ranging from 01 to 94 or "G" indicate monitor wells located at sites of CERCLA (Installation Restoration Program [IRP]) investigations (Faye et al. 2010, Plate 1; Figure S3.3). In the list of References, reports that summarize the results of investigations at CERCLA sites, or that otherwise refer to CERCLA sites, are assigned a CERCLA Administrative Record file number. Site names prefixed with "Bldg" or "HPFF" indicate monitor wells located at sites of RCRA investigations (Faye et al. 2010, Plate 1). In the list of References, reports that summarize the results of investigations at RCRA sites or that otherwise refer to RCRA sites are assigned a UST Web Portal file number. Monitor well names prefixed with "G10" indicate wells constructed during the investigation at impact site G-10 (Harden et al. 2004). Water-supply well names are prefixed by "HP." In addition, CERCLA and IRP are used synonymously in this supplement.

More than 12,000 water-level measurements were obtained from well-data files and reports published to document and summarize the results of CERCLA and RCRA groundwater contaminant investigations and were assembled and organized into spreadsheet databases. Most measurements were reported as an altitude referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29) or the North American Vertical Datum of 1988 (NAVD 88). An NGVD 29 datum was assumed where altitudes were reported just as "mean sea level." The relatively few water levels reported using an NAVD 88 datum were converted to an NGVD 29 datum. Where water levels were reported as depth to water, a water-level altitude was determined based on the altitude reported for the measuring point, either the top of casing (TOC) or land surface. Land-surface altitudes were estimated at many locations by using a DEM. The terms "water level" and "potentiometric level" are sometimes used synonymously. However, "water level" is strictly used with respect to data, and "potentiometric level" or "groundwater altitude" is used with respect to the height of a water level above or below NGVD 29. A potentiometric surface represents a continuum of potentiometric levels. The water table is a particular potentiometric surface that occurs almost exclusively in the study area within the Brewster Boulevard aquifer system.

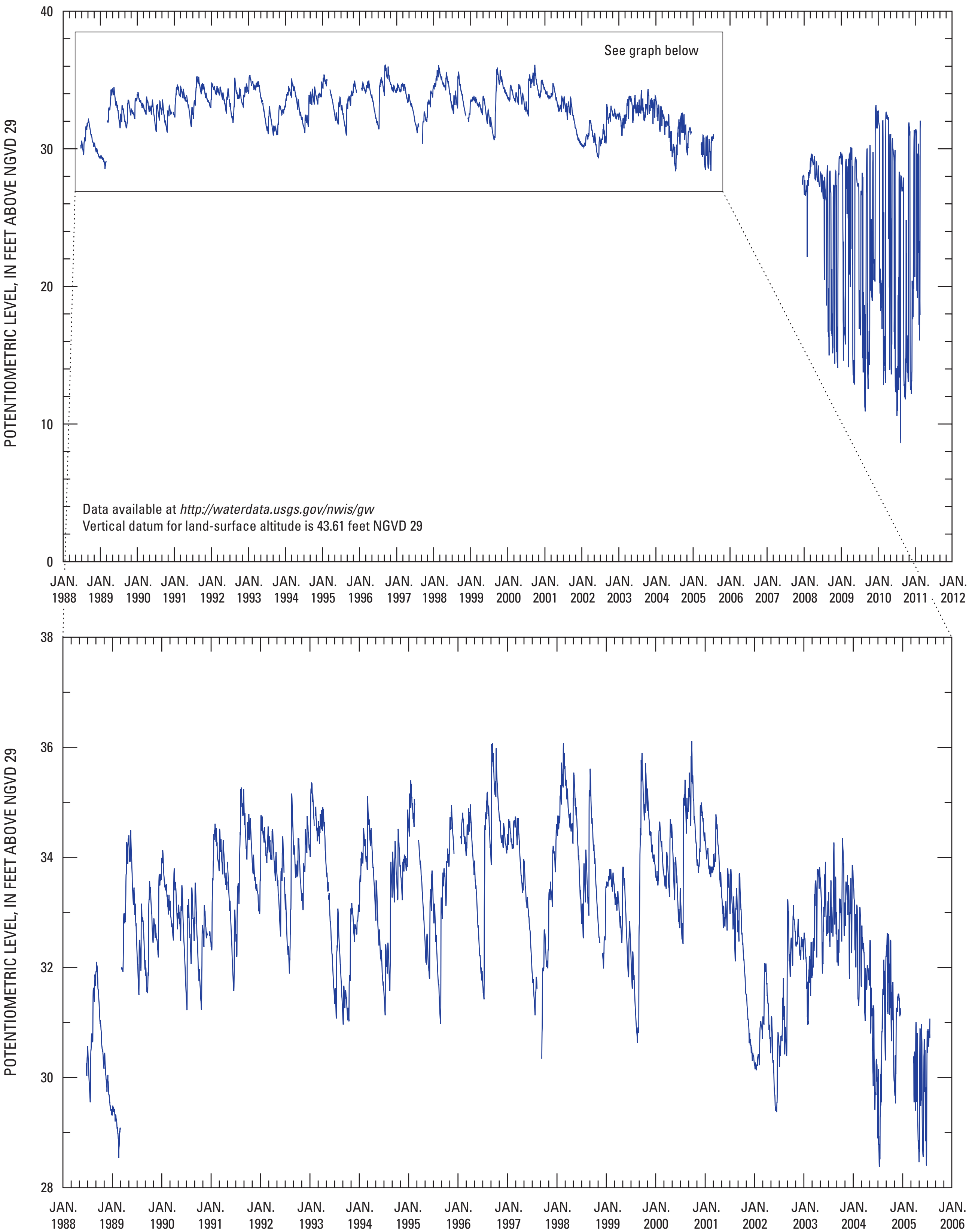


Figure S3.4. Hydrographs of water levels in well ON-293, May 1988–July 2011, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Vertical hydraulic gradients were calculated at paired monitor wells at most CERCLA and RCRA sites within the study area to determine respective directions of vertical groundwater flow (Faye et al. 2010, Plate 1; Figure S3.3). The screened intervals of the paired wells correspond to an upper and lower vertical position within the hydrogeologic framework (Table S3.3). The mid-screen altitude of each screened interval was determined based on reported construction data (Faye et al. 2010, 2012). The quotient calculated by dividing the difference in mid-level screen altitudes into the corresponding difference between measured potentiometric levels is the dimensionless vertical hydraulic gradient determined at each well pair. A positive gradient indicates downward groundwater flow; a negative gradient indicates upward flow.

Groundwater-level data at 773 monitor and water-supply wells within the study area were selected to estimate predevelopment potentiometric conditions; that is water levels prior to the onset of water-supply well or remediation pumping. Water-level data selected were collected in CERCLA and RCRA program monitor wells and HPWTP and HBWTP supply wells (Faye et al. 2010, Plate 1; Figure S3.3, Table S3.4). In general, for supply wells, the earliest data for the period of record were selected. Such data included a variety of measurement frequencies, ranging from only a single measurement at a site to periodic measurements sufficiently numerous to indicate seasonal water-level variations. Where numerous periodic measurements were encountered, an average groundwater level was computed as the estimated potentiometric level. A subset of these data composed of 551 potentiometric levels in the Brewster Boulevard aquifer system (not including the Brewster Boulevard lower confining unit) was paired with the corresponding land-surface altitude and evaluated using regression analyses to determine an equation useful for estimating potentiometric levels in parts of the study area where monitor well data were unavailable. Land-surface altitude applied to the regression analyses was based on estimates determined using a DEM of the study area and land-surface altitude at monitor wells reported in various CERCLA and RCRA reports.

Long-term hourly or daily water-level measurements (termed herein “continuous data”) were also available from several monitor wells within the study area—the X24S well cluster north of Wallace Creek in the west-central part of the study area, monitor well ON-292 at Paradise Point, and monitor well ON-295 north of Wallace Creek in the east-central part of the study area (Faye et al. 2010, Plate 1; Figure S3.3). Wells at the X24S cluster were constructed open to the Brewster Boulevard aquifer system, the Upper Castle Hayne aquifer, and the Lower Castle Hayne aquifer. Monitor wells ON-292 and ON-295 were constructed open to the Lower and Middle Castle Hayne aquifers, respectively. Long-term continuous water-level data were subjected to a variety of analyses, including comparisons of daily mean departure and cumulative departure with corresponding contemporaneous precipitation data (Figures S3.5–S3.12).

Conceptual Model of Groundwater Flow

To better integrate the numerous and disparate water-level data available within the study area into a general understanding of hydrologic processes, a conceptual model that addresses groundwater flow, occurrences of recharge, and stream-aquifer relations was developed and based on similar descriptions and analyses by Hubbard (1940), Toth (1962, 1963), and Freeze and Witherspoon (1966, 1967).

The spatial configuration of the water table prior to development of groundwater supplies in the study area probably closely resembled a subdued replica of surface topography (Faye et al. 2010, Plate 1). Except in areas of water-supply well or remediation pumping, a similar configuration probably occurs to the present day (2013). Recharge to the Brewster Boulevard aquifer system occurs originally as infiltration of precipitation to the water table. Where topography is substantially elevated, such as in the northern and western parts of the study area, groundwater-flow gradients at the highest elevations are substantially downward, possibly through most or all of the Middle Castle Hayne aquifer. Generally, maximum rates of recharge occur within highland areas and progressively decline toward lowlands and stream valleys. Consequently, groundwater within the unconfined and poorly confined parts of the Brewster Boulevard aquifer system flows laterally from highland to lowland areas and eventually discharges to Northeast, Wallace, and Frenchs Creeks, the New River, and smaller streams and tributaries (Harden et al. 2004; Faye and Valenzuela 2007). Downstream reaches of major streams such as Wallace, Northeast, and Frenchs Creeks and the New River are probably incised within the Tarawa Terrace aquifer and possibly within the Castle Hayne aquifer system, as well. Where incisement is incomplete, substantial vertical continuity of permeable sediments is likely maintained across relatively thick sections of paleochannel sands (Faye 2012). Accordingly, groundwater-flow directions within the Tarawa Terrace and Upper Castle Hayne aquifer probably mimic, to a large degree, flow within the Brewster Boulevard aquifer system, an exception occurring in the immediate vicinity of the large streams mentioned previously where flow directions are upward and discharge occurs as diffuse upward leakage. Discharge from the Middle and Lower Castle Hayne aquifers also occurs as diffuse upward leakage, probably mostly within the western and southwestern parts of the study area.

Faye and Valenzuela (2007) described groundwater-flow conditions in the Tarawa Terrace area following the onset of pumping at water-supply wells. With minor changes, and particularly regarding pumping at remediation wells, similar descriptions probably also apply to the HPHB study area. With the routine operation of water-supply wells, groundwater flow that under predevelopment conditions was entirely directed toward streams and rivers was partially diverted to pumping wells. As a consequence, (1) predevelopment potentiometric levels in the vicinity of pumping wells declined in all water-bearing units contributing to the wells, (2) predevelopment flow directions changed preferentially toward pumping wells and away from natural points of discharge such as Wallace Creek, and (3) potentiometric levels near the predevelopment flow boundaries possibly declined, causing the boundaries to migrate further away from the study area. Declines in potentiometric levels in the vicinity of New River and tidally affected reaches of Northeast and Wallace Creeks possibly caused a reversal from upward to downward vertical flow, creating the possibility of inducing salt or brackish water landward into actively pumped aquifers.

References to this conceptual model of groundwater flow in the following text are simply termed "the conceptual model."

Groundwater-Level Data

The majority of water-level data obtained for this project are periodic measurements in monitor wells at CERCLA and RCRA sites. At a few locations, only one measurement was obtained per well. At many locations, however, numerous measurements were obtained over periods of a decade or longer. In addition, many monitor wells were deliberately constructed in sufficiently close proximity and screened at alternate depths in order to obtain water-level data within discrete intervals of the hydrogeologic column at a single location. These data are especially useful when applied to flow model calibration (Tables S3.3 and S3.4). Continuous water-level data were analyzed at four locations within the study area—monitor wells X24S6, from the X24S well cluster; ON-292; ON-295; and paired wells ON-356 and ON-357 in the Montford Point area (Figure S3.3). Continuous water-level data in monitor well ON-293 were discussed in the "Previous Investigations" section of this report. These wells were constructed open to the upper, lower, and middle parts of the Castle Hayne aquifer system (Faye 2012), respectively, and were analyzed to determine sensitivity to precipitation (recharge) and to nearby pumping at water-supply wells. Well X24S6 is located approximately midway, east to west, between wells ON-292 and ON-295 (Faye et al. 2010, Plate 1; Figure S3.3).

Potentiometric levels in wells X24S1, X24S6, and X24S7 are similar with respect to both altitude and trends (Figure S3.5). Accordingly, only potentiometric levels in a single well, X24S6, were selected for additional analysis.

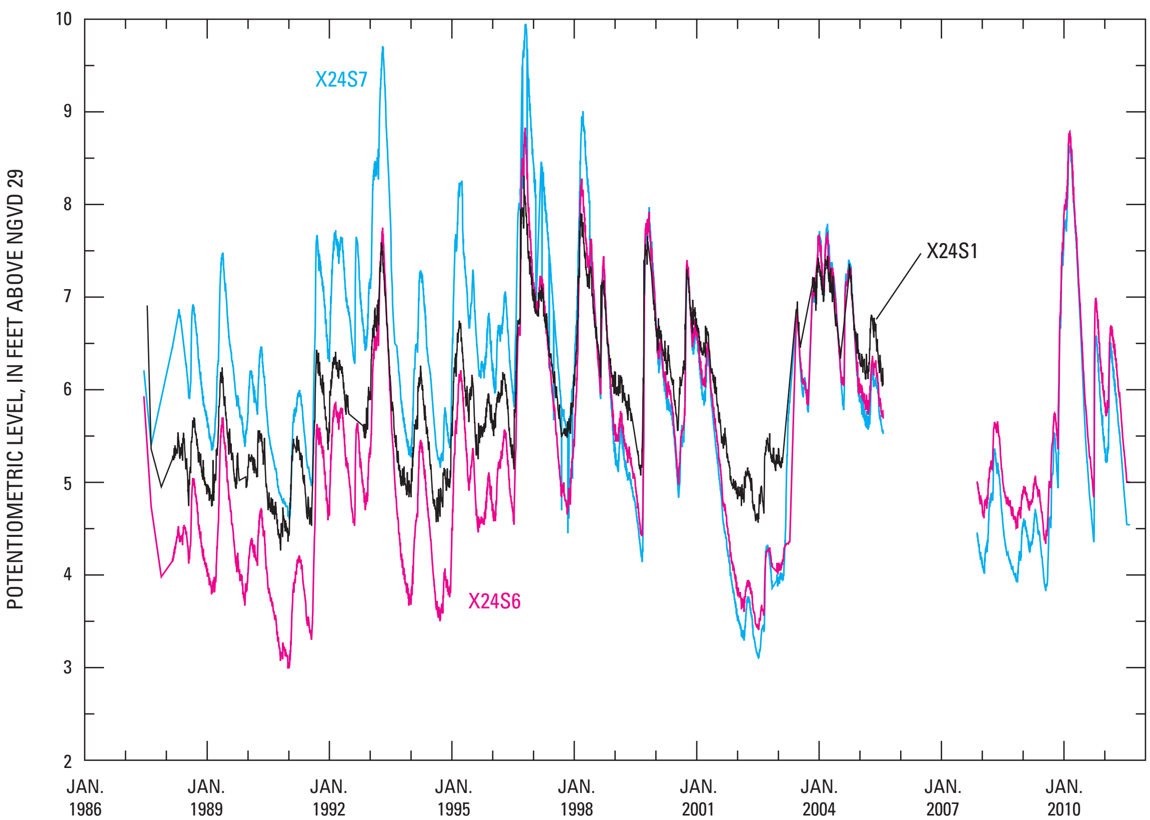


Figure S3.5. Hydrograph of water levels in monitor wells X24S1 (July 1987–July 2005), X24S6 (June 1987–August 2011), and X24S7 (June 1987–August 2011), Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Vertical Hydraulic Gradients

Vertical hydraulic gradients were calculated for paired wells at 10 CERCLA investigation sites and 19 RCRA investigations sites and are described herein to partially corroborate the conceptual model and to provide a dataset useful for groundwater-flow model calibration (Table S3.3). In order to evaluate “natural” or unstressed flow conditions as much as possible, gradients were calculated at most CERCLA and RCRA sites prior to the onset of remediation-related pumping (Faye et al. 2010, 2012).

Vertical hydraulic gradients within the study area vary substantially and are influenced largely by (1) the vertical proximity of screened intervals at paired wells, (2) the competency of any intervening confining unit or units, (3) the location of the paired wells with respect to topographic features, and (4) the time of year, particularly regarding seasonal changes in rainfall or drought. Calculated gradients are typically small; most are less than 0.10 foot per foot (ft/ft). Where gradients are large, for example between the upper and lower aquifers of the Brewster Boulevard aquifer system at parts of CERCLA site 88, the intervening Brewster Boulevard upper confining unit is known to be highly competent (Tables S3.2 and S3.3) (Faye et al. 2010, Figures C28–C29). Examples of seasonal variations in recharge to the water table possibly affecting vertical hydraulic gradients occurred in monitor wells 78-GW04-1, 2, 3 and 78-GW09-2, 3 during May 1993 and February 1991, respectively (Table S3.3). Well pairs at both locations are located in highland areas, and gradients should be vertically downward according to the conceptual model. However, calculated vertical gradients were upward, albeit only slightly upward, between the Upper Castle Hayne aquifer–River Bend unit and the Tarawa Terrace aquifer and the Tarawa Terrace aquifer and the Brewster Boulevard upper aquifer (Tables S3.2 and S3.3). Measurements of potentiometric levels at both locations occurred during periods of low or declining cumulative rainfall departure (Figure S3.10), indicating little or no antecedent recharge to the water table and, consequently, lower-than-average water-table conditions. The period of February 1991 is near the lowest cumulative departure for rainfall for the period January 1988–June 2008, probably affecting potentiometric levels within the Brewster Boulevard aquifer system and the Tarawa Terrace aquifer, and possibly within the Upper Castle Hayne aquifer.

Most sites of CERCLA and RCRA investigations are located in highland areas and are poorly drained. Exceptions to highland locations are the northern part of CERCLA site 6, which is near Wallace Creek; CERCLA site 28, which is drained by Cogdels Creek; RCRA site Building 331, which is drained by an unnamed tributary to New River; and RCRA site Building H30, which is located at Hospital Point near the confluence of Wallace Creek and New River (Faye et al. 2010, Plate 1; Figure S3.3). Vertical hydraulic gradients calculated at these locations are generally vertically upward. Otherwise, with several exceptions that are probably caused by near-term recharge to the water table, vertical hydraulic gradients are downward everywhere else. The descriptions of most vertical hydraulic gradients listed in Table S3.3 conform well to previous conceptual descriptions of groundwater flow within the study area and probably can be applied directly to the predevelopment calibration of flow models.

Continuous Water-Level Records—Analysis and Trends

Comparisons of mean daily precipitation and corresponding groundwater-level departures for wells X24S6, ON-292, and ON-295 normalized to a single year are shown in Figure S3.6. Departures of water levels and precipitation are based on a 30-day moving average and are cyclical. Maximum positive water-level departures occur during an approximately 2-month interval between April and June (Figure S3.6, Bar A). Secondary positive maximums occur between mid-October and mid-November (Figure S3.6, Bar B). Maximum negative water-level departures occur between the end of July and the middle of August (Figure S3.6, Bar C). Secondary negative departures occur between the middle of December and early January (Figure S3.6, Bar D). Maximum positive and negative precipitation departures occur about mid-July and early November, respectively, approximately 3 to 4 months after corresponding water-level departures (Figure S3.6, Bars E, F). Secondary maximum positive and negative precipitation departures occur in early February and about mid-April, respectively. The interval between maximum water-level and precipitation departures and the fact that maximum water-level departures lag maximum precipitation departures on an annual basis indicate that, on average, recharge to the Upper, Middle, and Lower Castle Hayne aquifers occurs 8 to 9 months following infiltration of precipitation to the water table in areas of recharge. In addition, the relatively frequent water-level fluctuations in well ON-295 indicate a possible influence from nearby pumping wells, possibly water-supply wells HP-710 and HP-711 (Faye et al. 2010, Plate 1; Figure S3.3).

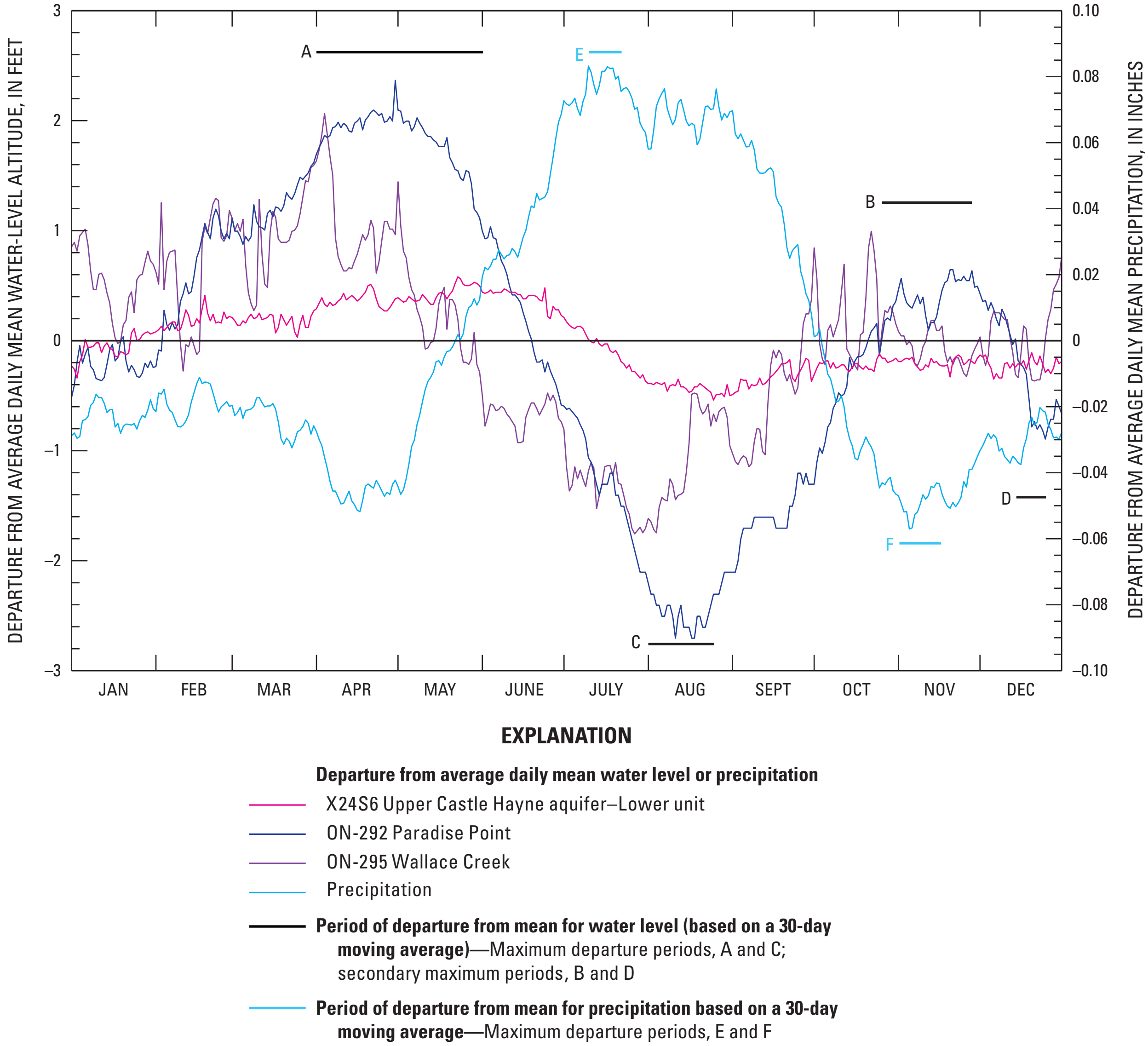


Figure S3.6. Departure from mean daily water levels in monitor wells X24S6, ON-292, and ON-295 and corresponding precipitation departure, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Bar graphs of monthly precipitation, in inches, between January 1988 and June 2008 are shown on Figures S3.7 through S3.9 in combination with hydrographs of monthly average potentiometric levels at monitor wells X24S6, ON-292, and ON-295. Water-level data are incomplete for several years at all locations. Precipitation data also are missing or partial for several months. Although precipitation amounts are highly variable month-to-month and year-to-year, monthly precipitation rates, in general, appear greatest during spring and summer and least during fall and early winter. On the other hand, annual maximum potentiometric levels occur with a high degree of variability year-to-year, especially in wells X24S6 and ON-295, and are poorly correlated, at best, with high monthly rates of precipitation (Figures S3.7 and S3.9). Adjusting monthly precipitation rates backwards in time by several months or longer, as suggested by the previous discussion of water-level and precipitation departures, does not improve this correlation. In contrast to monthly water-level fluctuations in wells X24S6 and ON-295, monthly water-levels in well ON-292 are cyclical on an annual basis, reaching a maximum during the winter and

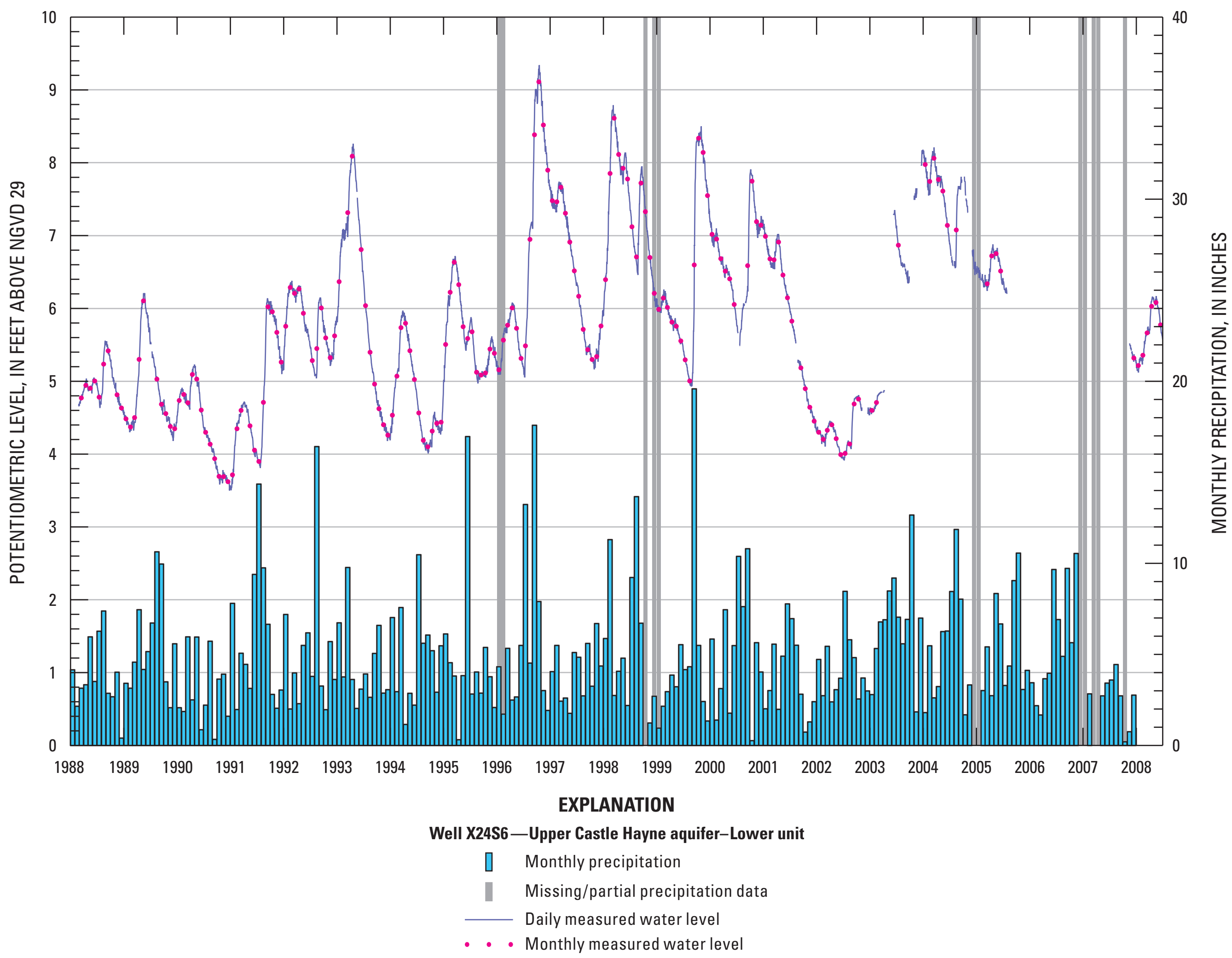


Figure S3.7. Hydrograph of water levels in monitor well X24S6 and monthly precipitation, January 1988–June 2008, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

early spring and a minimum during the late summer and early fall (Figure S3.8). Well ON-292 is located at Paradise Point in the vicinity of two Base golf courses, and water levels are probably influenced by seasonal groundwater pumping to augment golf course irrigation.

Long-term temporal trends in potentiometric levels are apparent in wells X24S6 and ON-295. Based on annual maxima, levels at both locations appear to slightly increase between 1988 and 1997 and decline slightly between 1998 and 2001. Although water-level data are incomplete for several years between 2002 and 2008, potentiometric levels appear to stabilize during this period. Trends are also apparent in the record at well ON-292. Annual maximum and minimum potentiometric levels decline in well ON-292 between 1988 and 1998 and stabilize at a generally consistent level between 2000 and 2008. Level trends are possibly related to increases and subsequent decreases in or stabilization of groundwater pumping for golf course irrigation.

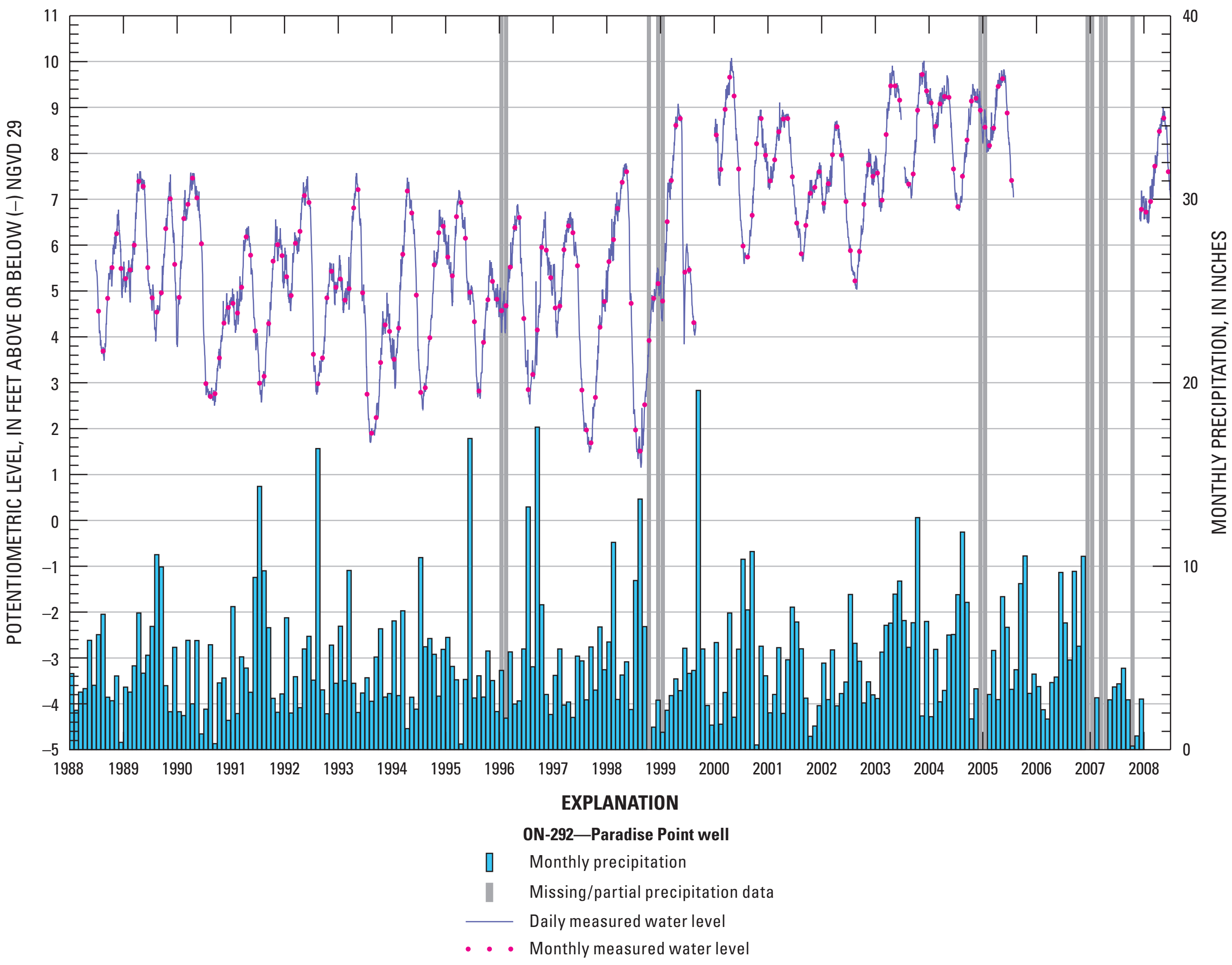


Figure S3.8. Hydrograph of water levels in monitor well ON-292 and monthly precipitation, January 1988–June 2008, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

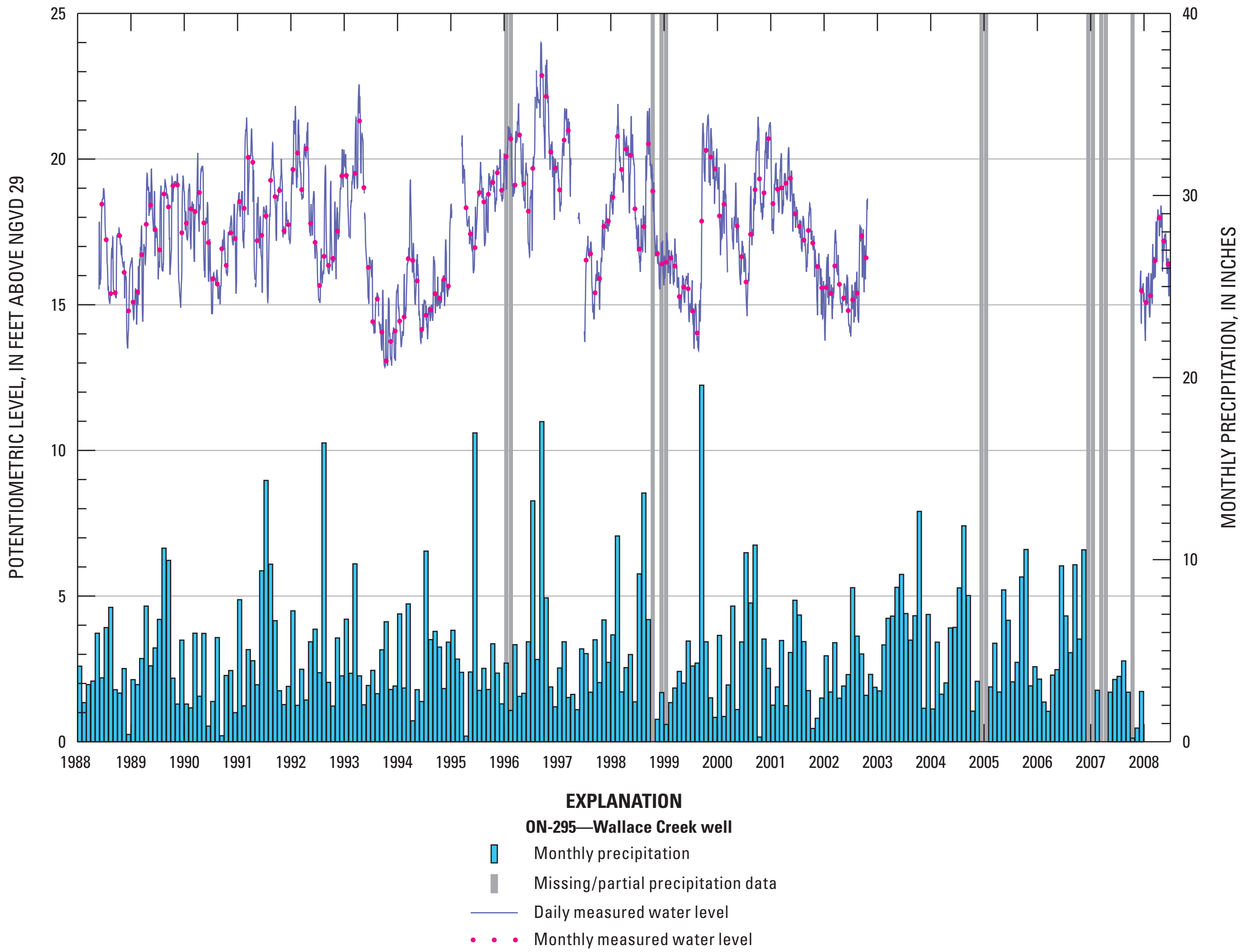


Figure S3.9. Hydrograph of water levels in monitor well ON-295 and monthly precipitation, January 1988–June 2008, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Graphs of cumulative monthly precipitation departure, in inches, between January 1988 and June 2008 are shown on Figures S3.10 through S3.12 in combination with hydrographs of monthly average potentiometric levels in monitor wells X24S6, ON-292, and ON-295. Long-term temporal trends and annual maxima and minima of potentiometric levels in well X24S6 are somewhat to highly similar to corresponding cumulative precipitation departures, particularly during 1988–1997 (Figure S3.10). Such similarities indicate that recharge to the Upper Castle Hayne aquifer from infiltration of precipitation to the water table occurred relatively rapidly during that period in the vicinity of monitor well X24S6 and that anthropogenic influences on the water-level record, such as pumping at water-supply wells, were minor or did not occur. Between 1998 and 2008, the long-term increasing trend of cumulative precipitation departure continues; however, potentiometric levels, as represented by annual maxima, appear to slightly decline or are relatively static. Several years of water-level records are missing during this period, preventing a complete comparison of the departure and water-level records; however, the apparent shift in directional similarity between the records indicates some influence on the water-level record probably caused by pumping at water-supply wells, possibly HP-623, located in the southern part of the Watkins Village housing

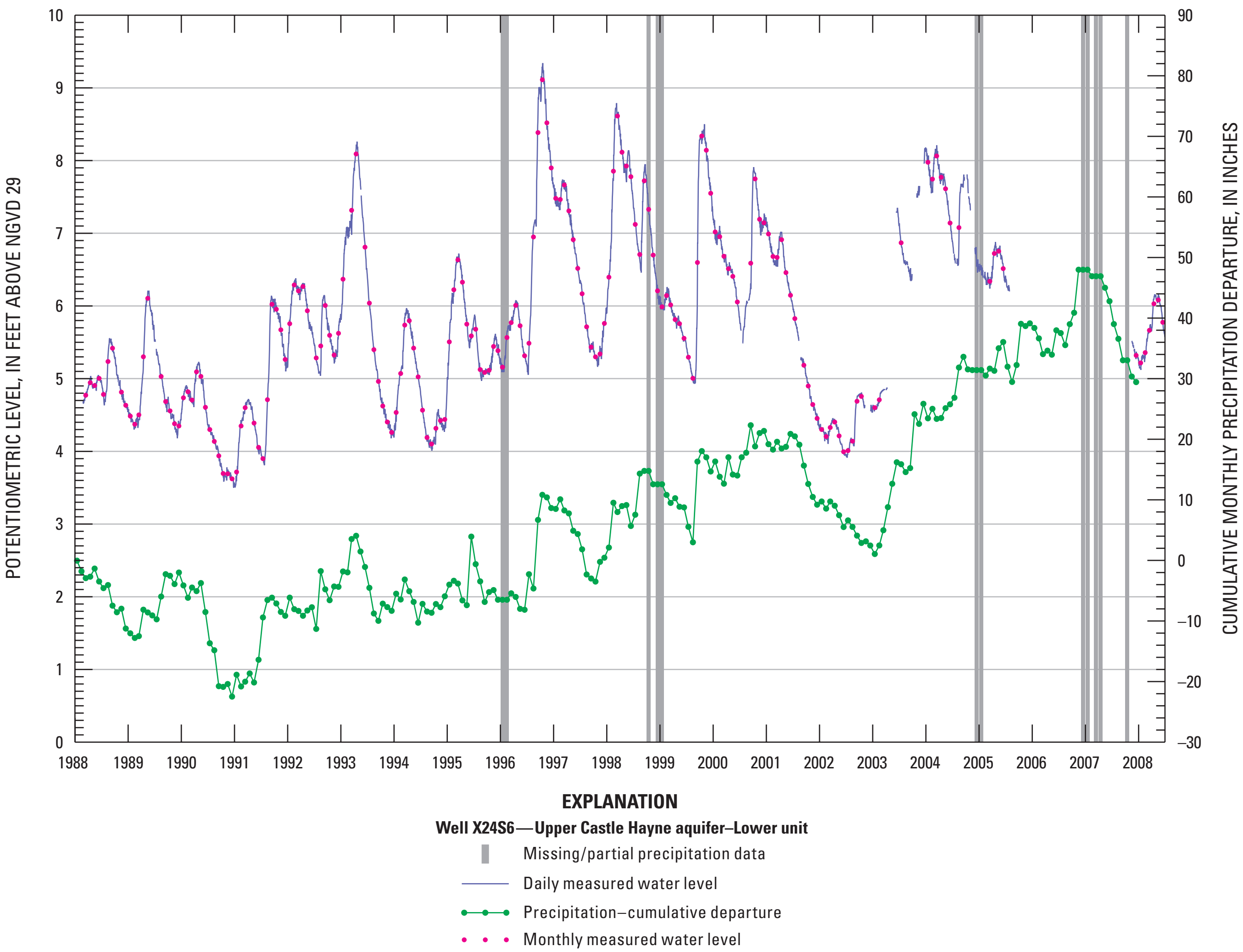


Figure S3.10. Hydrograph of water levels in monitor well X24S6 and cumulative monthly precipitation departure, January 1988–June 2008, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

area (Faye et al. 2010, Plate 1). Comparisons of long-term and annual temporal trends between potentiometric levels and precipitation departures are similar in well ON-295 to trends noted at well X24S6. However, water-level fluctuations are more frequent and larger in well ON-295 on an annual basis compared to similar occurrences in well X24S6, indicating a substantial influence on the water-level record caused by pumping at nearby water-supply wells, probably HP-710 and HP-711 (Faye et al. 2010, Plate 1; Figure S3.12). Annual potentiometric level maxima in well ON-292 decline between

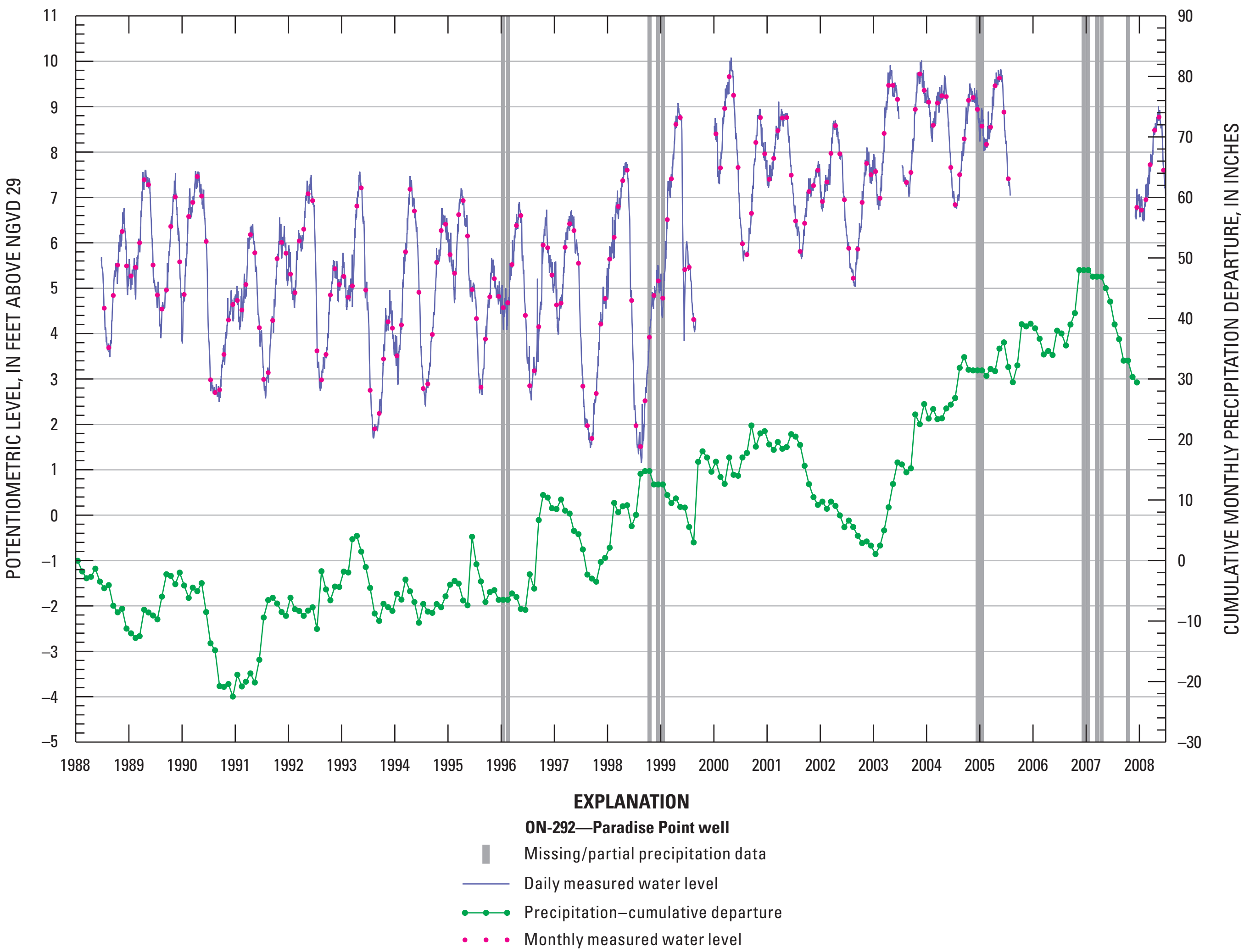


Figure S3.11. Hydrograph of water levels in monitor well ON-292 and cumulative monthly precipitation departure, January 1988–June 2008, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

1988 and 1997, whereas, corresponding elements of cumulative precipitation departure consistently increase during most of the same period (Figures S3.8 and S3.11). Comparisons of annual maxima and minima in well ON-292 to corresponding cumulative precipitation departures are similarly inconsistent. Groundwater pumping to augment golf course irrigation was previously discussed as the likely cause of cyclical water-level fluctuations in well ON-292 and is probably equally responsible for the lack of similarity between long-term and annual trends between potentiometric levels in this well and cumulative precipitation departure.

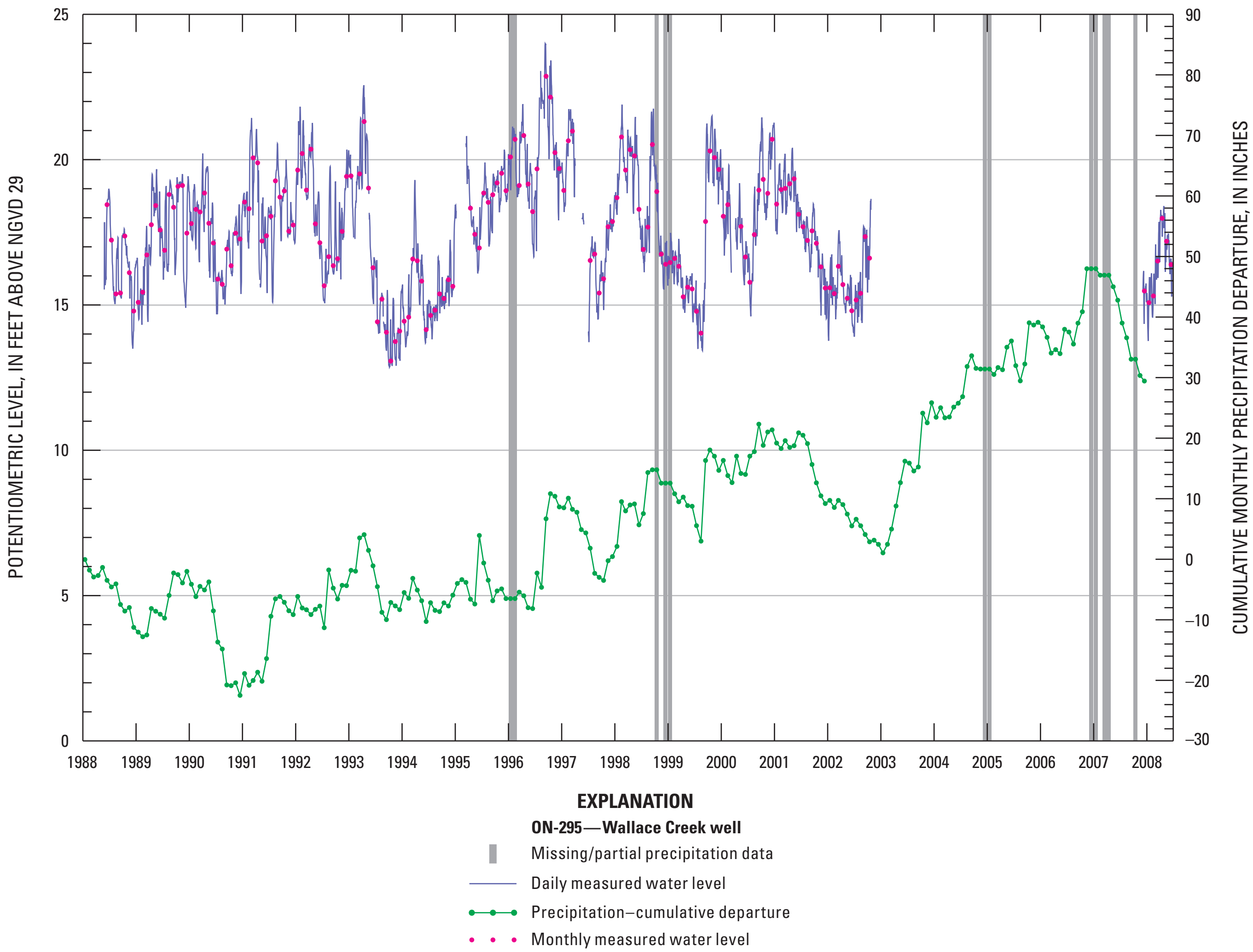


Figure S3.12. Hydrograph of water levels in monitor well ON-295 and cumulative monthly precipitation departure, January 1988–June 2008, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Continuous water-level measurements in monitor wells ON-356 and ON-357 are shown in Figure S3.13. Measurements begin during the winter of 2008 and end during the summer of 2011. Both wells are located in a highland area north of the Camp Johnson complex of buildings and between former Montford Point water-supply wells M-627 and M-168 (Faye et al. 2010, Plate 1; Figure S3.3). Well ON-357 was constructed open to the Lower Castle Hayne aquifer between 200 and 230 ft bgs. Well ON-356 was constructed open to the Peedee aquifer of Cretaceous age between 316 and 336 ft bgs. The Peedee aquifer underlies the Castle Hayne aquifer system in the study area (Faye 2012, Figure B5). Potentiometric levels in both wells varied seasonally following the onset of measurements and were probably influenced by groundwater pumping at water-supply wells in the vicinity of Jacksonville, North Carolina (Faye et al. 2010, Plate 1), as well as by seasonal variations in precipitation and recharge. Potentiometric levels in the Peedee aquifer were consistently higher than corresponding levels in the Lower Castle Hayne aquifer during the entire period of measurement. Differences in potentiometric levels ranged to a maximum of about 3.5 ft until the early summer of 2010. At this time, substantial declines in potentiometric levels in the Lower Castle Hayne aquifer occurred and continued with only partial interruption until the end of the period of record during August 2011. Such declines are indicative of nearby, relatively large-scale pumping from the Castle Hayne aquifer system, probably in conjunction with water supplies to Jacksonville. Potentiometric levels in the Peedee aquifer also declined coincident with the declines in the Lower Castle Hayne aquifer indicating the occurrence of diffuse upward leakage between the aquifers across one or more confining units, including the Beaufort confining unit. Maximum differences in potentiometric levels between the aquifers during August 2011 ranged to about 6.0 ft.

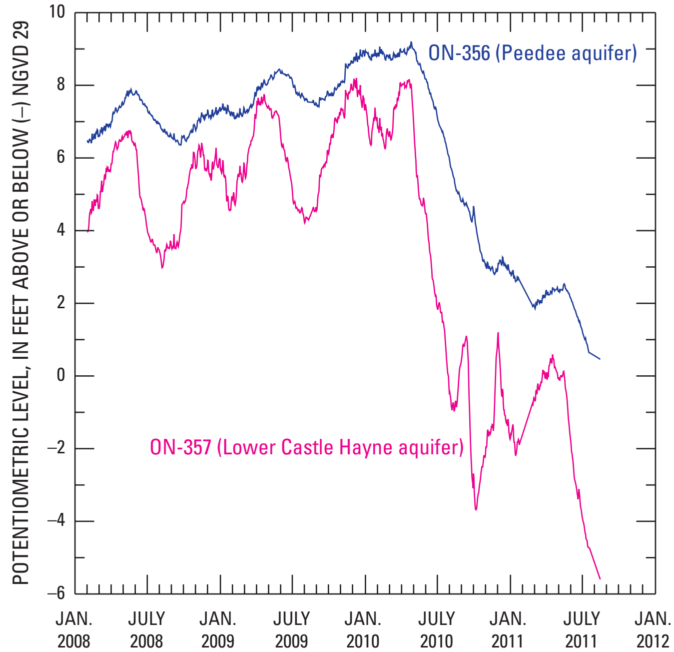


Figure S3.13. Hydrograph of water levels in monitor wells ON-356 and ON-357, February 2008–August 2011, Montford Point area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Periodic Water-level Measurements—Analysis and Trends

Collection of periodic water-level data in monitor wells in the study area began with the inception of the Navy Assessment and Control of Installation Pollutants Program in 1984 and continues to the present day (2013) at many CERCLA and RCRA investigation sites (Faye et al. 2010, Plate 1; Figure S3.3). Water-level records for several monitor wells are of sufficient duration to serve as adjuncts to model calibration and to partially corroborate the conceptual model. Examples of records in the form of water-level hydrographs in monitor wells at six CERCLA sites are presented herein for those purposes. Each example consists of at least two hydrographs of periodic potentiometric levels in adjacent monitor wells constructed open to a “shallow,” and/or “intermediate” or “deep” interval of the hydrogeologic column (Figures S3.14 through S3.19). Maps showing the location of monitor wells discussed in this section are published in Faye et al. (2010) in individual sections that summarize groundwater contamination at CERCLA sites 2, 3, 6, 28, and 78. Open intervals of monitor wells discussed in this section are described as a range between the depth below ground surface to the top of the uppermost interval and the bottom of the lowermost interval. This range is not meant to imply that a well was constructed open for that entire interval, but only to indicate the total section of the hydrogeologic column traversed by the open intervals. Typically monitor wells at USMCB Camp Lejeune were constructed with open intervals ranging from 5 to 20 ft.

Hydrographs of potentiometric levels in wells 02-GW03, 02-GW03IW, and 02-GW03DW at CERCLA site 2 are shown in Figure S3.14 and correspond, respectively, to intervals open to the Brewster Boulevard lower aquifer, Tarawa Terrace aquifer, and the Upper Castle Hayne aquifer–River Bend unit. Open intervals range between 10 ft and 100 ft bgs (Faye et al. 2010). CERCLA site 2 is located in a highland area at the intersection of Brewster and Holcomb Boulevards (Faye et al. 2010, Plate 1; Figure S3.3) and is poorly drained by local, ephemeral streams. According to the conceptual model, potentiometric levels would be expected to decline with depth at this location, which appears to be the case; however, a consistent difference in potentiometric levels between wells 02-GW03IW and 02-GW03DW cannot be determined because the data are not coincident in time (Figure S3.14). Potentiometric levels in well 02-GW03 mostly correspond to water-table conditions and range between about 17 ft and 30 ft. Coincident levels in well 02-GW03IW range between about 3 and 10 ft and generally increase during the period of record, similar to levels in well 02-GW03 and probably in response to increased recharge to the water table. Changes in water levels in wells 02-GW03 and 02-GW03IW are directionally similar and apparently occur simultaneously, or nearly so. Potentiometric levels in well 02-GW03DW are available only during 1993 and 1996 and range between about 3 ft and –11 ft. The sharp decline in potentiometric levels shown during 1996 is also reflected in levels in well 02-GW03 during 1993–1996 and may be related to water-level measurements made during operation of pumping at nearby water-supply wells, possibly wells HP-646 or HP-647 (Faye et al. 2010, Plate 1).

Characterizations of potentiometric levels and the vertical differentiation of levels at CERCLA site 3 are highly similar to those at CERCLA site 2. CERCLA site 3 is also located in a highland area immediately east of Holcomb Boulevard and about midway between the intersection of Holcomb Boulevard with Brewster Boulevard and Wallace Creek. The area is drained by the headwaters of a tributary to Wallace Creek (Faye et al. 2010, Plate 1; Figure S3.3).

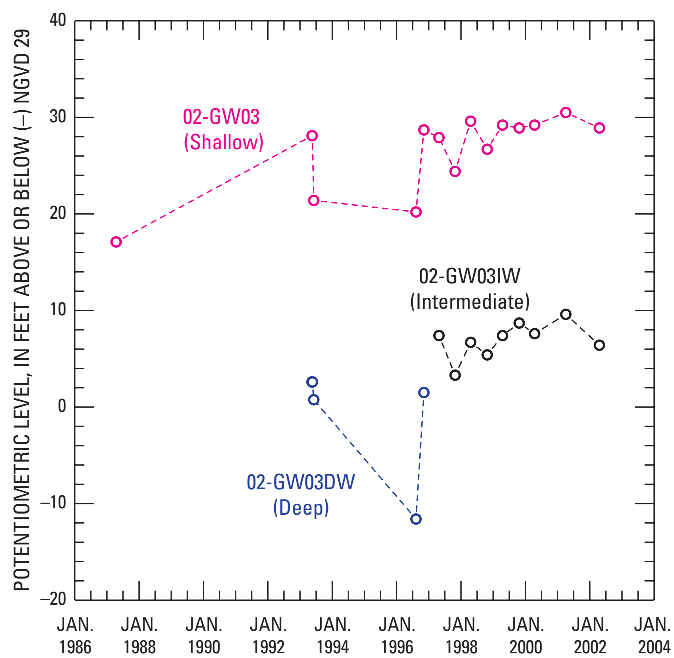


Figure S3.14. Hydrograph of water levels in monitor wells 02-GW03, 02-GW03IW, and 02-GW03DW, CERCLA site 2, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Hydrographs of potentiometric levels in monitor wells 03-MW02, 03-MW02IW, and 03-MW02DW are shown in Figure S3.15. Wells were constructed open, respectively, to the Brewster Boulevard upper aquifer, the Tarawa Terrace aquifer, and the Upper Castle Hayne aquifer–River Bend and –Lower units. Open intervals ranged between about 7 ft and 140 ft bgs (Faye et al. 2010). Vertical hydraulic gradients between wells are consistently downward during the period of record, partially corroborating the conceptual model for highland areas. Potentiometric levels in well 03-MW02 mostly represent water-table conditions and range from about 23 to 30 ft. A consistent water-level trend is not apparent. Potentiometric levels in well 03-MW02IW are substantially lower than levels in well 03-MW02 and range from about 4 to 13 ft. Potentiometric levels in well 03-MW02DW are consistently lower than levels in well 03-MW02IW, but only by 2 ft or less, and range from about 4 to less than 9 ft. Changes in water levels in both wells are directionally similar and apparently occur simultaneously, or nearly so. Note, as well, that potentiometric levels in wells 03-MW02IW and 03-MW02DW generally increase during their periods of record (1995–2003), probably in response to increased recharge to the water table and similar to conditions at CERCLA site 2.

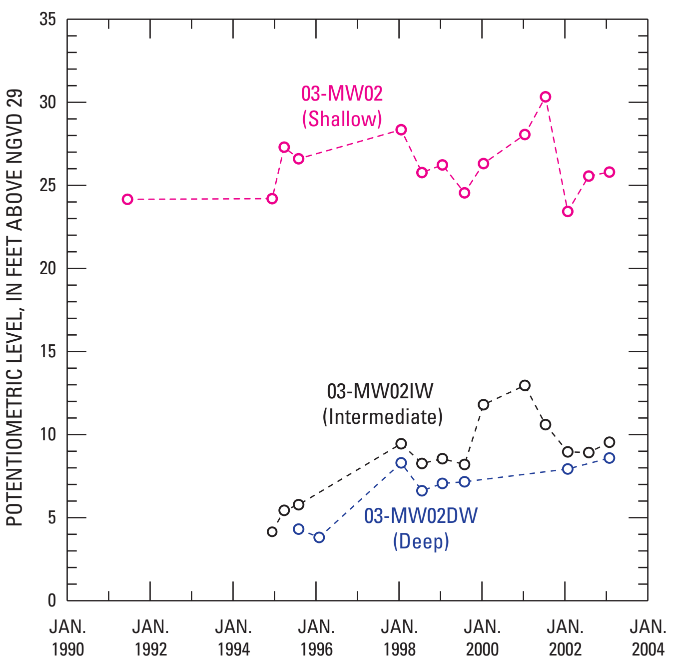


Figure S3.15. Hydrograph of water levels in monitor wells 03-MW02, 03-MW02IW, and 03-MW02DW, CERCLA site 3, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

CERCLA site 6 is located west of Piney Green Road and immediately south of Wallace Creek and is co-located with CERCLA site 82 (Faye et al. 2010, Plate 1; Figure S3.3). Monitor wells 06-GW28S and 06-GW28DW are located about 500 ft south of Wallace Creek near the edge of the Wallace Creek floodplain and were constructed open to the Brewster Boulevard lower aquifer and the Upper Castle Hayne aquifer–River Bend unit, respectively. Open intervals range between about 18 and 114 ft bgs. Hydrographs of potentiometric levels in these wells are shown in Figure S3.16. The conceptual model suggests that potentiometric gradients in similar wells located near a major tributary to the New River, such as Wallace Creek, should be vertically upward. This is the case for the first paired measurements in these wells made during the fall of 1992 (Table S3.3). However, with one exception, subsequent measurements indicate vertically downward potentiometric gradients. Beginning in October 1996, groundwater extraction for remediation purposes began at CERCLA site 6, and several extraction wells were constructed open to the Brewster Boulevard lower aquifer and the Upper Castle Hayne aquifer–River Bend unit (Faye et al. 2010, Figures C20–C24). Pumping at the extraction wells probably sufficiently influenced potentiometric levels at both wells to cause a reversal in potentiometric gradient from vertically upward to vertically downward for most of the period of record. Potentiometric levels in well 06-GW28S ranged from about 4 to 12 ft. Changes in potentiometric levels in this well probably occurred in response to extraction well pumping and to periods of increased and diminished recharge, and a consistent trend in water-level changes is not apparent. Corresponding levels in well 06-GW28DW ranged from about –3 to 10 ft. Potentiometric levels in well 06-GW28DW generally declined during the early part of the period of record between 1992 and 2000, probably in response to increased pumping at extraction wells after 1996. Subsequent increases and then decreases in potentiometric levels in this well probably also were in response to changes in pumping at extraction wells, including periods of no pumping.

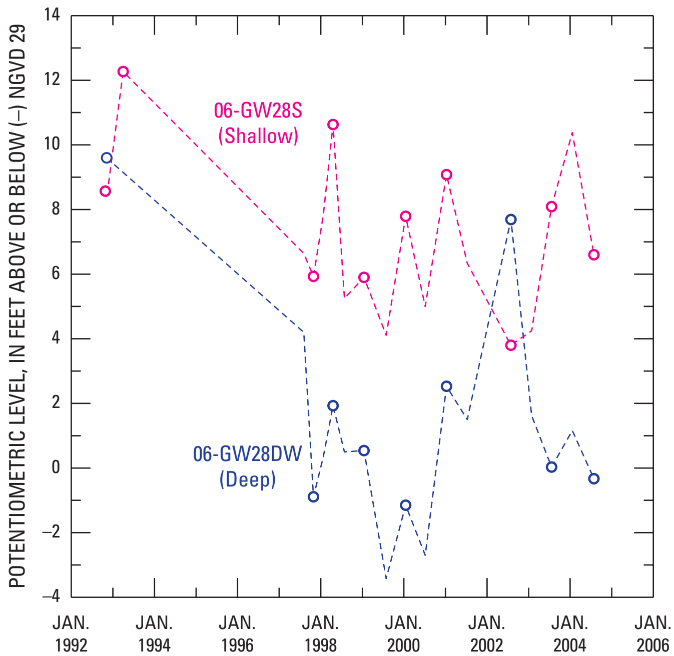


Figure S3.16. Hydrograph of water levels in monitor wells 06-GW28S and 06-GW28DW, CERCLA site 6, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

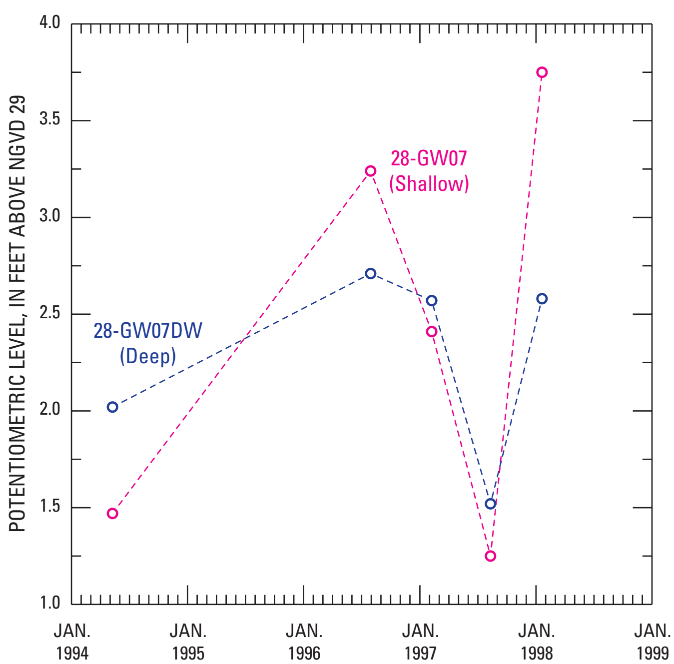


Figure S3.17. Hydrograph of water levels in monitor wells 28-GW07 and 28-GW07DW, CERCLA site 28, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Hydrographs of potentiometric levels in wells 28-GW07 and 28-GW07DW at CERCLA site 28 are shown in Figure S3.17. CERCLA site 28 is located adjacent to the New River in the southwestern part of the study area (Faye et al. 2010, Plate 1; Figure S3.3). Monitor well 28-GW07 was constructed open to the Brewster Boulevard aquifer system; monitor well 28-GW07DW was constructed open to the Upper Castle Hayne aquifer–River Bend unit. Open intervals ranged between about 3 ft to 129 ft bgs. Based on the conceptual model, potentiometric gradients in most of site 28 should be vertically upward. Of the five contemporaneous measurements used to construct the hydrographs shown in Figure S3.17, potentiometric gradients are vertically upward during three measurements and downward during two measurements. Regardless, potentiometric levels in both wells are nearly equal and, with one exception, differ by only 0.5 ft or less. Such similarity in potentiometric levels suggests that vertical potentiometric gradients can frequently reverse based on seasonal high or low water-table conditions or during periods of relatively excessive recharge to the water table. Note, as well, that changes in water levels in both wells are directionally similar and apparently occur simultaneously, or nearly so. Open intervals in both wells extend well below the surface of the nearby New River, and respective hydrogeologic units possibly are directly or nearly directly hydraulically connected to the river. Cardinell et al. (1993) describe stacked and buried paleochannels that extend to depths greater than 200 ft below the New River opposite the confluence with Wallace Creek. Similar conditions may also occur beneath the New River opposite CERCLA site 28 and facilitate landward hydraulic continuity between the river and the deep subsurface at the site. Such continuity would explain not only the small differences in potentiometric levels observed in wells 28-GW07 and 28-GW07DW but also the simultaneous or near simultaneous and directionally similar water-level changes in the wells.

Potentiometric levels at two well-cluster locations were plotted and analyzed to characterize groundwater-flow conditions at CERCLA site 78. Well cluster #9 is located in the far southwestern part of the HPIA in the general vicinity of water-supply well HP-608. Well cluster #24 is located near the northeastern boundary of the HPIA just west of Sneads Ferry Road and water-supply well HP-634 (Faye et al. 2010, Plate 1; Figure S3.3).

Hydrographs of potentiometric levels in monitor wells 78-GW09-1 and 78-GW09-3 are shown in Figure S3.18. These wells were constructed open to the Brewster Boulevard aquifer system and the Upper Castle Hayne aquifer–River Bend unit, respectively, between about 5 and 150 ft bgs (Faye et al. 2010). Potentiometric levels in well 78-GW09-1 (old) generally represent the water table and range between about 11 and 14 ft. Data are missing between 1991 and 2000, and a consistent water-level trend is not apparent; however, potentiometric levels consistently increase in well 78-GW09-3 during most of the period of record, probably in response to an increase in recharge as noted previously at CERCLA sites 2 and 3, and range between about 11 and 16 ft. Vertical hydraulic gradients between the wells are apparently upward during the latter part of the period of record during 2000–2002.

Hydrographs of potentiometric levels in monitor wells 78-GW24-1 and 78-GW24-3 are shown in Figure S3.19. Well 78-GW24-1 was constructed open to the Brewster Boulevard aquifer system; well 78-GW24-3 was constructed open to the Upper Castle Hayne aquifer–River Bend unit. Open intervals of both wells range between 5 and 148 ft bgs (Faye et al. 2010). Potentiometric levels in well 78-GW24-1 represent water-table conditions, for the most part, and range between about 24 and 27 ft. Corresponding levels in well 78-GW24-3 range between 18 and 22 ft. No apparent water-level trends are noted in either well. Well cluster #24 is located in a highland area, and the conceptual model suggests that vertical hydraulic gradients between the open intervals of wells 78-GW24-1 and 78-GW24-3 should be downward. This is the case as shown in Figure S3.19. In addition, changes in water levels in both wells are directionally similar and frequently occur simultaneously, or nearly so, suggesting a relatively rapid response at depth to recharge to the water table or to pumping at nearby extraction well networks (Faye et al. 2010, Figure C15).

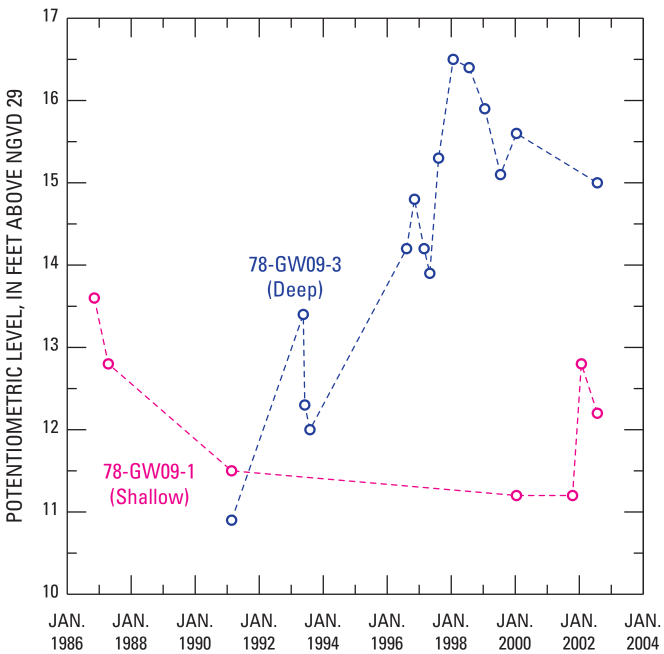


Figure S3.18. Hydrograph of water levels in monitor wells 78-GW09-1 and 78-GW09-3, CERCLA site 78, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

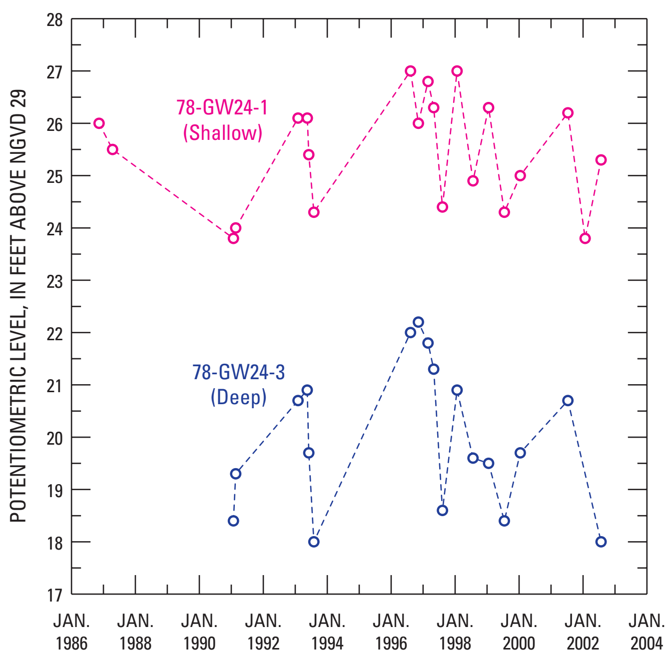


Figure S3.19. Hydrograph of water levels in monitor wells 78-GW24-1 and 78-GW24-3, CERCLA site 78, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Relation Between Water-Table and Land-Surface Altitudes

Potentiometric levels in 732 monitor wells from the Brewster Boulevard aquifer system were initially selected to analyze the relation between water-table and land-surface altitudes (Table S3.4). Land-surface altitude was selected as the independent variable, and water-table altitude was selected as the dependent variable. Both variables ranged in altitude between near sea level (0.0 ft) to about 40 ft. Land-surface altitudes for each location were estimated using a DEM from the U.S. Geological Survey Seamless Data Warehouse (National Elevation Dataset 1/9-arc resolution) or were reported in various CERCLA and RCRA site reports. Uncertainty caused by measurement error and anthropogenic factors such as leakage from water distribution systems probably affected water-level measurements at several locations but could not be definitively assigned to individual measurements. Accordingly, the selected data were subjected to further analysis by (1) computing the difference in feet between the respective land-surface and water-table altitudes, (2) determining the mean difference, (3) computing the standard deviation about the mean difference, and (4) excluding paired data from the regression analysis where the difference between the land-surface and water-table altitudes exceeded the standard deviation. The remaining total of 551 paired data for the Brewster Boulevard aquifer system (excluding the Brewster Boulevard lower confining unit) were then subjected to a variety of transformations and regression analyses. Based on residual statistics and comparisons of predicted water-table altitudes to topographic maps in areas of little or no water-level data, the following regression equation was selected:

$$\ln(WT) = 1.869 \ln(LS) - 3.344 \tag{S3.1}$$

where

- ln is the natural logarithm;
- WT is the water-table altitude, in feet above NGVD 29; and
- LS is the land-surface altitude, in feet above NGVD 29.

Equation S3.1 was selected as the best relation to apply to estimate water-table altitude using land-surface altitude in the study area (Figure S3.20). The adjusted coefficient of determination of the regression relation is 0.823. The intercept and slope coefficients fall within the 95 percent confidence interval as determined from the t-statistics. The F-statistic equals 2,552, indicating that the overall regression is significant at the 1-percent level. The sum of squares of the arithmetic residuals equals 6,114 ft^2. A summary of the regression analysis per individual monitor well is listed in Table S3.5 (back of report) along with residual heads, which represent the difference between the observed and predicted potentiometric level. The absolute mean residual head equals 2.7 ft, the standard deviation about this mean equals 2.0 ft, and the root-mean-squared residual of the absolute residuals equals 3.3 ft. The number of negative residuals equals 230, which is 42 percent of the total of 551 paired data. Negative residuals occurred consistently in specific areas such as CERCLA sites 78 and 28 and RCRA sites Buildings 331 and 820. The largest negative residual equals –11.7 ft and relates to an estimated potentiometric level of 8.2 ft at monitor well 78-GW03 (Figure C14, Faye et al. 2010) (Table S3.5). The smallest negative residual is about –0.1 ft and relates to a potentiometric level of 15.4 ft at monitor well 94Bldg1613_GW01 (monitor well 94-1613-01, Figure C30, Faye et al. 2010; Table S3.5). The maximum positive residual equals 7.4 ft and relates to a potentiometric level of 13.2 ft at monitor well BldgFC201E_MW16 (Table S3.5). The number of positive residuals equals 321, or 58 percent of the total number of paired measurements (Table S3.5). Only three data pairs represent conditions where land-surface altitude is greater than 40 ft. At two of these locations, the regression relation returned relatively large residuals of –8.2 and –10.1, indicating that estimates of potentiometric levels using land-surface altitudes greater than 40 ft may be biased high.

The conceptual model suggests that predevelopment potentiometric levels at the water table in the study area closely resemble a subdued replica of topography. The regression relation of water-table and land-surface altitudes and related residual statistics substantially corroborate this element of the conceptual model.

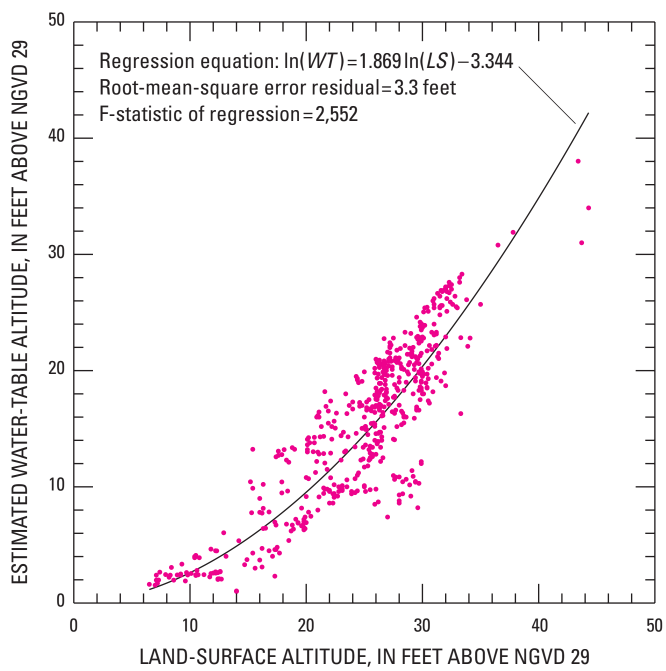


Figure S3.20. Transformed linear regression of land-surface altitude and estimated predevelopment water-table altitude, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Estimated Predevelopment Potentiometric Surface and Related Groundwater Flow

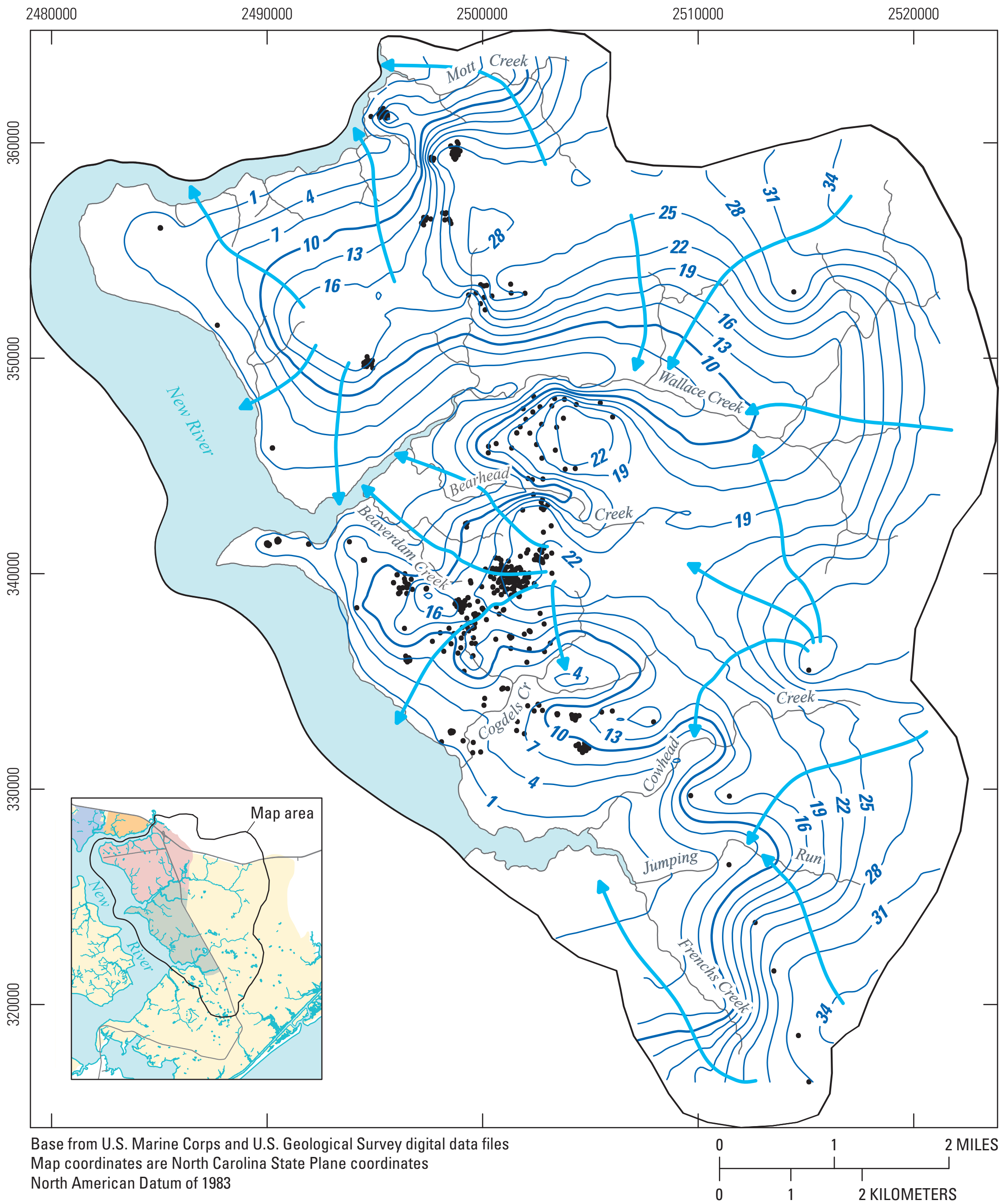
Point water-level data indicating water-table altitudes, water-table altitudes estimated using Equation 1, and estimates of stream levels determined from a DEM and topographic maps were used to estimate a predevelopment water-table surface in the study area (Figure S3.21). Approximate flow lines along hydraulic gradients are shown in Figure S3.21 and extend from highland areas where potentiometric levels are greatest toward streams such as Wallace Creek and Northeast Creek. The distribution of potentiometric levels and corresponding groundwater-flow directions conform closely to related descriptions of the conceptual model.

Discussion

Several points are worth noting when considering limitations assigned to water-level data, determining screened intervals of paired monitor wells, computing potentiometric levels, and determining the generalized directions of groundwater flow. Water-level data extracted from CERCLA and RCRA site reports and other USMCB Camp Lejeune files were obtained using two measurement methods: (1) airlines and (2) traditional tape-down. As pointed out by LeGrand (1959), the use of airlines is an unreliable method of measuring water levels in water-supply wells; therefore, in this report, water-level measurements obtained using the airline method were avoided and are not reported.

Some errors should be noted for water-level measurements that were obtained by using the traditional tape-down methods but that are not quantifiable with available data (Tables S3.3–S3.5). For paired monitor wells, the screened intervals correspond to the upper and lower positions within the hydrogeologic framework (Table S3.3). Construction data and land-surface altitudes were used to determine the mid-screen altitude of each screened interval. Thus, any error implicit to the construction or land-surface altitude data would also compromise the accuracy of the reported vertical hydraulic gradients. In computing a potentiometric level, the average groundwater level was computed where numerous periodic measurements were encountered. Other levels were obtained from single measurements and, for supply wells, the earliest tape-down measurement was generally used (Table S3.4). Periodic water-level measurements in the Brewster Boulevard aquifer system (not including the Brewster Boulevard lower confining unit) were paired with corresponding land-surface altitudes and were evaluated using regression analyses. The resulting regression equation was used for parts of the study area where monitor well data were unavailable for estimating potentiometric levels and corresponding directions of groundwater flow. Potentiometric levels estimated using the regression equation were compared to field data (Table S3.5). Of the 551 residuals listed in Table S3.5, the absolute mean residual equals 2.7 ft, and the standard deviation equals 2.0 ft. Such statistics indicate that generally small errors are obtained using the regression equation to estimate potentiometric levels in the study area.

The conceptual model of groundwater flow developed for the study area is based on similar descriptions and analyses by Hubbard (1940), Toth (1962, 1963), and Freeze and Witherspoon (1966, 1967). This conceptual model assumes homogenous, isotropic conditions for determining directions of groundwater flow. Although these assumptions are not always valid at some local scales, for the purpose of the current analyses and the scale of the study area, these assumptions are viewed as being acceptable to the general understanding of the hydrologic processes within the study area.



EXPLANATION

— *10* — **Potentiometric contour**—Shows altitude at which water level would have stood in tightly cased wells, predevelopment. Contour interval 3 feet. Datum is NGVD 29

General direction of groundwater flow

• **Water measurement used as control point**

Figure S3.21. Estimated predevelopment potentiometric surface, Brewster Boulevard aquifer system, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune.

Summary and Findings

A conceptual model that describes various elements of groundwater flow in the study area, including qualitative discussions of recharge and stream-aquifer relations, is presented and partially corroborated by analyses of vertical hydraulic gradients, periodic water-level data at paired wells, and the regression of paired water-table and land-surface altitudes. Vertical hydraulic gradients were determined at numerous paired monitor wells located at 19 sites of CERCLA and RCRA investigations of groundwater contamination. Vertical gradients in lowland areas near streams and rivers were generally upward between the Upper Castle Hayne aquifer and Brewster Boulevard aquifer system or Tarawa Terrace aquifer and downward in highland areas, as suggested by the conceptual model. Similar vertical flow conditions were determined from the analyses of hydrographs at six locations of paired wells using periodic water-level data with relatively long periods of record. Further corroboration of the conceptual model was accomplished by the regression of 551 paired water-table and land-surface altitudes. Land-surface altitude was assigned as the independent variable; water-table altitude was assigned as the dependent variable. Both variables ranged in altitude between near sea level (0.0 ft) to more than 40 ft. The coefficient of determination of the regression relation was 0.823, and the F statistic equaled 2,552, indicating the regression relation is significant at the 1-percent level. This result substantially corroborates the conceptual model that suggests that the water table is probably a subdued replica of topography.

Water-level hydrographs at three monitor well locations were analyzed in conjunction with monthly precipitation data and precipitation departure data to evaluate the contemporaneity of precipitation and recharge to groundwater. Monthly data were available for most of the period January 1988 to June 2008. Water-level data were collected at monitor wells located in the northeastern, central, and west-central parts of the study area. Wells were constructed open to the Upper, Middle, and Lower Castle Hayne aquifers. Analysis of water-level and precipitation departure from the monthly mean, normalized to a single year, indicated that recharge to the monitored aquifers lags corresponding precipitation events by 8 to 9 months. A comparison of water-level and cumulative monthly precipitation departure trends for the period of record indicates a general directional similarity in trends, except where water-supply well or irrigation well pumping substantially influences water-level records.

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Tables S3.3 – S3.5

Table S3.3. Vertical hydraulic gradients at paired monitor wells at sites of CERCLA (IRP) and RCRA investigations, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act of 1980; IRP, Installation Restoration Program; RCRA, Resource Conservation and Recovery Act of 1976; BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Well pair (site names)[1]	Location coordinates[2]		Date	Contributing aquifer or confining unit	Potentiometric level, in feet NGVD 29	Mid-screen altitude, in feet NGVD 29	Vertical hydraulic gradient, dimensionless
	Northing	Easting					
01-GW16	332660	2501994	5/9/1994	BBAQSYS	6.47	1.4	
01-GW16DW	332642	2501970	5/9/1944	TTAQ	7.57	–93.7	–0.01
01-GW17	333651	2502776	7/30/1996	BBAQSYS	8.71	3.0	
01-GW17DW	333674	2502775	7/30/1996	TTAQ	8.67	–93.4	0.0004
01-GW17	333651	2502776	8/8/1997	BBAQSYS	7.26	3.0	
01-GW17DW	333674	2502775	8/8/1997	TTAQ	7.33	–93.4	–0.0007
02-GW03	356251	2498534	4/26/1997	BBLAQ	27.9	3.0	
02-GW03IW	356271	2498535	4/26/1997	TTAQ	7.4	–22.0	0.82
02-GW03	356251	2498534	5/17/1993	BBLAQ	28.1	20.5	
02-GW03DW	356275	2498552	5/17/1993	UCHRBU	2.6	–61.9	0.31
03-MW02	352823	2500068	8/1/1995	BBUAQ	26.6	20.6	
03-MW02IW	352813	2500068	8/1/1995	TTAQ	5.8	–46.5	0.31
03-MW02IW	352813	2500068	8/1/1995	TTAQ	5.8	–46.5	
03-MW02DW	352801	2500072	8/1/1995	UCHRBU&LU	4.3	–100.3	0.028
03-MW11	352531	2499898	8/1/1995	BBLAQ	9.9	6.7	
03-MW11IW	352544	2499897	8/1/1995	TTAQ	5.2	–49.2	0.084
06-GW01S	348127	2503343	8/5/1997	BBAQSYS	13.8	17.8	
06G_W01D	348137	2503363	8/5/1997	UCHRBU	6.6	–74.8	0.078
06-GW01D	348137	2503363	8/5/1997	UCHRBU	6.6	–74.8	
06-GW01DA	348142	2503388	8/5/1997	MCHAQ	5.7	–192.1	0.008
06-GW02S	347214	2503751	1/17/2000	BBAQSYS	25.0	21.2	
06-GW02DW	347220	2503760	1/17/2000	UCHRBU	15.3	–78.0	0.10
06-GW27DW	348316	2502449	1/17/2000	UCHRBU	1.2	–82.1	
06-GW27DA	348303	2502436	1/17/2000	MCHAQ	5.1	–208.1	–0.031
06-GW28S	348623	2502900	11/7/1992	BBLAQ	8.4	0.1	
06-GW28DW	348677	2502849	11/7/1992	UCHRBU	9.6	–80.4	–0.15
06-GW30S	349553	2503728	4/1/1993	BBAQSYS	9.0	–2.6	
06-GW30DW	349532	2503730	4/1/1993	UCHRBU	10.1	–84.9	–0.013
06-GW40DW	348563	2503536	8/5/1997	UCHRBU	2.7	–90.9	
06-GW40DA	348584	2503544	8/5/1997	MCHAQ	12.9	–211.7	–0.084
09-GW07S	343321	2502720	9/30/1992	BBUAQ	17.6	12.1	
09-GW07D	343333	2502729	9/30/1992	UCHRBU	15.5	–77.9	0.023
22-MW15	339367	2501442	7/16–17/2002	BBAQSYS	21.20	15.5	
HPFF_MW66	339379	2501437	7/16–17/2002	BBLAQ	17.33	–20.1	0.11
22-MW15	339367	2501442	7/16–17/2002	BBAQSYS	21.20	15.5	
HPFF_MW67	339384	2501436	7/16–17/2002	TTAQ	16.28	–50.1	0.08
28-GW01 (new)	331849	2498323	5/10/1994	BBAQSYS	1.6	–4.6	
28-GW01DW	331870	2498323	5/10/1994	UCHRBU	1.4	–119	0.002
28-GW07	331751	2499119	5/10/1994	BBAQSYS	1.5	–6.2	
28-GW07DW	331745	2499147	5/10/1994	UCHRBU	2.0	–117.9	–0.004

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[CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act of 1980; IRP, Installation Restoration Program; RCRA, Resource Conservation and Recovery Act of 1976; BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Well pair (site names)[1]	Location coordinates[2]		Date	Contributing aquifer or confining unit	Potentiometric level, in feet NGVD 29	Mid-screen altitude, in feet NGVD 29	Vertical hydraulic gradient, dimensionless
	Northing	Easting					
78-GW04-1	337457	2499549	5/18/1993	BBUAQ	11.6	14.6	
78-GW04-2	337543	2499463	5/18/1993	TTAQ	11.8	–42.8	–0.003
78-GW04-2	337543	2499463	5/18/1993	TTAQ	11.8	–42.8	
78-GW04-3	337577	2499436	5/18/1993	UCHLU	11.9	–117.8	–0.001
78-GW09-1	337998	2499701	2/20/1991	BBAQSYS	11.5	11.8	
78-GW09-2	337995	2499690	2/20/1991	TTAQ	10.6	–39.7	0.02
78-GW09-2	337995	2499690	2/20/1991	TTAQ	10.6	–39.7	
78-GW09-3	337995	2499836	2/20/1991	UCHRBU	10.9	–115.2	–0.004
78-GW13	339567	2499458	7/16-17/2002	BBAQSYS	13.07	10.8	
HPFF_MW44	339663	2499432	7/16-17/2002	BBLAQ	12.77	–24.5	0.01
78-GW13	339567	2499458	7/16-17/2002	BBAQSYS	13.07	10.8	
HPFF_MW43	339657	2499441	7/16-17/2002	TTAQ	12.39	–54.5	0.01
78-GW24-1	341181	2502845	2/1/1993	BBAQSYS	26.1	15.8	
78-GW24-2	341169	2502808	2/1/1993	TTAQ	21.0	–35.8	0.10
78-GW24-2	341169	2502808	2/1/1993	TTAQ	21.0	–35.8	
78-GW24-3	341153	2502785	2/1/1993	UCHRBU	20.7	–107.6	0.004
78-GW31-2	338998	2500434	5/18/1993	TTAQ	16.0	–45.0	
78-GW31-3	338983	2500417	5/18/1993	LocalCU	15.9	–120.1	0.001
78-GW32-2	339494	2501261	1/25/1991	TTAQ	15.2	–43.5	
78-GW32-3	339474	2501278	1/25/1991	UCHRBU	14.7	–119.2	0.007
88-MW02	339347	2496489	7/27/1999	BBAQSYS	15.8	11.1	
88-MW02IW	339353	2496481	7/27/1999	BBLAQ	8.1	–20.9	0.24
88-MW02IW	339353	2496481	7/27/1999	BBLAQ	8.1	–20.9	
88-MW02DW	339364	2496466	7/27/1999	TTAQ	8.1	–67.9	0.0
88-MW03	339503	2496545	7/27/1999	BBUAQ	17.9	15.9	
88-MW03IW	339499	2496563	7/27/1999	BBLAQ	8.9	–21.6	0.24
88-MW03IW	339499	2496563	7/27/1999	BBLAQ	8.9	–21.6	
88-MW03DW	339508	2496540	7/27/1999	TTAQ	8.8	–56.6	0.003
88-MW04	339076	2496489	7/27/1999	BBAQSYS	9.3	5.5	
88-MW04IW	339079	2496481	7/27/1999	BBLAQ	9.1	–22.5	0.007
88-MW04IW	339079	2496481	7/27/1999	BBLAQ	9.1	–22.5	
88-MW04DW	339090	2496474	7/27/1999	TTAQ	9.1	–57.5	0.0
88-MW05	339618	2496406	7/27/1999	BBAQSYS	16.0	9.1	
88-MW05IW	339608	2496405	7/27/1999	BBLAQ	8.8	–22.8	0.23
88-MW05IW	339608	2496405	7/27/1999	BBLAQ	8.8	–22.8	
88-MW05DW	339601	2496397	7/27/1999	TTAQ	8.8	–57.8	0.0
88-MW06	339340	2496286	7/24/1997	BBAQSYS	11.4	9.1	
88-MW06IW	339346	2496294	7/24/1997	BBLAQ	10.0	–22.9	0.04
88-MW07	339944	2496027	7/27/1999	BBAQSYS	14.0	9.1	
88-MW07IW	339945	2496042	7/27/1999	BBLAQ	8.3	–23.8	0.17

Table S3.3. Vertical hydraulic gradients at paired monitor wells at sites of CERCLA (IRP) and RCRA investigations, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act of 1980; IRP, Installation Restoration Program; RCRA, Resource Conservation and Recovery Act of 1976; BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Well pair (site names)[1]	Location coordinates[2]		Date	Contributing aquifer or confining unit	Potentiometric level, in feet NGVD 29	Mid-screen altitude, in feet NGVD 29	Vertical hydraulic gradient, dimensionless
	Northing	Easting					
88-MW08	339583	2495865	7/27/1999	BBAQSYS	12.9	10.7	
88-MW08IW	339572	2495868	7/27/1999	BBLAQ	8.6	–24.5	0.12
88-MW09	339080	2496100	7/27/1999	BBAQSYS	11.8	8.6	
88-MW09IW	339071	2496110	7/27/1999	BBLAQ	8.8	–25.5	0.09
94_Bldg1613_MW07	338882	2499329	5/17/1995	BBUAQ	14.0	9.9	
94_Bldg1613_MW13	338881	2499314	5/17/1995	BBLCU	12.6	–23.9	0.04
94_Bldg1613_MW08	338347	2498639	5/17/1995	BBUAQ	21.1	14.1	
94_Bldg1613_MW15	338356	2498629	5/17/1995	BBLAQ	10.0	–10.3	0.45
Bldg33_MW04	359188	2497697	4/5/1995	BBLAQ	26.38	25.19	
Bldg33_MW10	359188	2497704	4/5/1995	TTAQ	0.19	3.22	0.92
Bldg331_MW05	336065	2496646	4/13/1995	BBUAQ	8.80	9.07	
Bldg331_MW13	336060	2496650	4/13/1995	BBLAQ	9.69	–23.17	–0.03
Bldg331_MW03	335995	2496595	4/13/1995	BBUAQ	9.12	7.78	
Bldg331_MW14	335991	2496590	4/13/1995	BBLAQ	9.71	–15.36	–0.03
Bldg331_MW01	335906	2496507	4/13/1995	BBUAQ	8.91	6.06	
Bldg331_MW15	335911	2496513	4/13/1995	BBLAQ	9.36	–12.95	–0.02
Bldg645_MW03	356458	2497372	4/24/1995	TTAQ	4.65	13.86	
Bldg645_MW09	356464	2497375	4/24/1995	TTAQ	–0.70	–17.72	0.17
Bldg645_MW14	356192	2497263	4/24/1995	TTAQ	–1.02	0.60	
Bldg645_MW10	356193	2497271	4/24/1995	TTAQ	–1.02	–19.64	0.00
Bldg645_MW13	356534	2497400	4/24/1995	TTAQ	–0.21	–0.19	
Bldg645_MW11	356536	2497400	4/24/1995	TTAQ	–0.75	–15.78	–0.03
Bldg645_MW09	356464	2497375	1/31/1996	TTAQ	0.82	–20.22	
Bldg645_MW15	356445	2497372	1/31/1996	UCHRBU	–0.44	–49.96	0.04
Bldg645_MW03	356458	2497372	4/18/2008	TTAQ	15.27	13.23	
Bldg645_MW09	356464	2497375	4/18/2008	TTAQ	9.37	–17.97	0.19
Bldg820_MW02	349804	2494711	12/22/1992	BBLAQ	16.01	20.38	
Bldg820_MW09	349798	2494713	12/22/1992	TTAQ	11.21	–15.55	0.13
Bldg820_MW08	349545	2494901	4/27/1994	BBLAQ	10.53	10.60	
Bldg820_MW07	349549	2494901	4/27/1994	TTAQ	11.33	–20.32	–0.03
Bldg820_MW16	349785	2494489	4/27/1994	BBLAQ	17.81	12.37	
Bldg820_MW17	349785	2494495	4/27/1994	TTAQ	10.46	–14.42	0.27
Bldg820_MW18	349626	2494497	4/27/1994	BBLAQ	16.87	13.58	
Bldg820_MW19	349622	2494493	4/27/1994	TTAQ	10.77	–18.77	0.19
Bldg820_MW20	349434	2494602	4/27/1994	BBLAQ	13.05	14.35	
Bldg820_MW21	349431	2494608	4/27/1994	TTAQ	10.82	–15.20	0.08
Bldg820_MW22	349326	2494768	4/27/1994	BBLAQ	11.26	13.42	
Bldg820_MW23	349319	2494766	4/27/1994	TTAQ	11.07	–15.8	0.01

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Well pair (site names)[1]	Location coordinates[2]		Date	Contributing aquifer or confining unit	Potentiometric level, in feet NGVD 29	Mid-screen altitude, in feet NGVD 29	Vertical hydraulic gradient, dimensionless
	Northing	Easting					
Bldg820_MW24	349311	2494966	4/27/1994	BBLAQ	11.06	11.88	
Bldg820_MW25	349307	2494961	4/27/1994	TTAQ	10.63	–17.49	0.01
Bldg900_MW02	340581	2502741	8/9/1996	BBUAQ	26.49	20.1	
Bldg900_MW01	340573	2502732	8/9/1996	BBLAQ	22.65	–17.4	0.10
Bldg900_MW04	340642	2502667	8/9/1996	BBUAQ	25.73	21.2	
Bldg900_MW03	340639	2502664	8/9/1996	BBLAQ	22.54	–17.5	0.08
Bldg1115_MW02	339870	2500370	7/18/1995	BBAQSYS	16.87	17.47	
Bldg1115_MW21	339867	2500374	7/18/1995	BBLAQ	15.80	–21.61	0.03
Bldg1115_MW03	339712	2500787	7/18/1995	BBAQSYS	17.77	13.67	
Bldg1115_MW20	339715	2500794	7/18/1995	BBLAQ	16.82	–21.26	0.03
Bldg1115_MW04	340266	2500465	7/18/1995	BBUAQ	19.41	17.31	
Bldg1115_MW17	340247	2500467	7/18/1995	BBLAQ	15.44	–21.31	0.1
Bldg1115_MW07	339897	2501006	7/18/1995	BBAQSYS	18.85	13.78	
Bldg1115_MW19	339902	2501013	7/18/1995	BBLAQ	18.45	–21.39	0.01
Bldg1115_GT09	340432	2500868	7/18/1995	BBUAQ	20.26	11.98	
Bldg1115_MW18	340143	2501041	7/18/1995	BBLAQ	17.32	–19.89	0.09
Bldg1115_MW10	340074	2500690	7/18/1995	BBUAQ	19.20	17.42	
Bldg1115_MW25	340077	2500691	7/18/1995	TTAQ	15.58	–51.34	0.05
Bldg1115_MW21	339867	2500374	7/18/1995	BBLAQ	15.8	–21.61	
Bldg1115_MW24	339864	2500373	7/18/1995	TTAQ	14.53	–51.32	0.04
Bldg1115_MW13	340077	2500689	7/18/1995	BBLAQ	16.32	–22.60	
Bldg1115_MW25	340077	2500691	7/18/1995	TTAQ	15.58	–51.34	0.03
Bldg1115_MW17	340247	2500467	7/18/1995	BBLAQ	15.44	–21.31	
Bldg1115_MW22	340244	2500473	7/18/1995	TTAQ	13.93	–50.02	0.05
Bldg1115_MW18	340143	2501041	7/18/1995	BBLAQ	17.32	–19.89	
Bldg1115_MW23	340138	2501039	7/18/1995	TTAQ	16.25	–49.6	0.04
Bldg1115_MW07	339897	2501006	7/16-17/2002	BBAQSYS	18.66	–21.4	
Bldg1115_MW19	339902	2501013	7/16-17/2002	BBLAQ	16.54	13.8	0.06
Bldg1115_MW10	340074	2500690	7/16-17/2002	BBUAQ	19.01	–22.6	
Bldg1115_MW13	340077	2500689	7/16-17/2002	BBLAQ	15.48	16.9	0.09
Bldg1115_MW10	340074	2500690	7/16-17/2002	BBUAQ	19.01	16.9	
Bldg1115_MW25	340077	2500691	7/16-17/2002	TTAQ	15.03	–51.3	0.06
Bldg1450_MW03	337131	2501303	10/31/1996	BBLAQ	13.92	9.69	
Bldg1450_MW02	337127	2501307	10/31/1996	BBLAQ	13.50	–12.00	0.19
Bldg1854_MW01	334686	2500938	2/27/1996	BBLAQ	4.58	0.60	
Bldg1854_MW06	334681	2500965	2/27/1996	BBLAQ	4.33	–28.85	0.01
Bldg1854_MW03	334667	2500826	2/27/1996	BBLAQ	4.53	2.90	
Bldg1854_MW07	334692	2500856	2/27/1996	BBLAQ	4.39	–28.00	0.004
Bldg1854_MW04	334732	2501206	2/27/1996	BBLAQ	4.34	–1.78	
Bldg1854_MW08	334659	2501165	2/27/1996	BBLAQ	4.33	–31.01	0.01

Table S3.3. Vertical hydraulic gradients at paired monitor wells at sites of CERCLA (IRP) and RCRA investigations, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act of 1980; IRP, Installation Restoration Program; RCRA, Resource Conservation and Recovery Act of 1976; BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Well pair (site names)[1]	Location coordinates[2]		Date	Contributing aquifer or confining unit	Potentiometric level, in feet NGVD 29	Mid-screen altitude, in feet NGVD 29	Vertical hydraulic gradient, dimensionless
	Northing	Easting					
Bldg1880_MW01	335334	2499167	3/14/1996	BBLAQ	6.72	6.21	
Bldg1880_MW03	335328	2499165	3/14/1996	BBLAQ	6.65	–21.97	0.002
Bldg1880_MW04	335349	2499333	3/14/1996	BBLAQ	6.65	5.85	
Bldg1880_MW05	335345	2499327	3/14/1996	BBLAQ	6.66	–21.57	–0.0004
BldgFC201E_MW08	333406	2504266	3/29/1994	BBUAQ	13.31	11.61	
BldgFC201E_MW10	333405	2504271	3/29/1994	BBLAQ	12.77	–27.81	0.01
BldgFC251_MW01 (new)	332319	2504263	5/16/1995	BBUAQ	12.78	10.07	
BldgFC251_MW06	332312	2504275	5/16/1995	BBLAQ	12.53	–19.79	0.008
BldgFC251_MW03 (old)	332540	2504365	5/16/1995	BBUAQ	12.96	10.41	
BldgFC251_MW07	332541	2504350	5/16/1995	BBLAQ	12.81	–21.27	0.005
BldgFC263_MW06	331702	2504632	4/5/1995	BBUAQ	9.07	7.25	
BldgFC263_MW13	331706	2504639	4/5/1995	BBLAQ	8.60	–25.19	0.01
BldgFC263_MW04	332117	2504737	4/5/1995	BBUAQ	9.72	6.47	
BldgFC263_MW14	332124	2504732	4/5/1995	BBLAQ	9.74	–25.99	–0.0006
BldgFC263_MW12	331928	2504678	4/5/1995	BBUAQ	10.60	8.00	
BldgFC263_MW15	331932	2504684	4/5/1995	BBLAQ	9.61	–24.63	0.03
BldgH19_MW13	341385	2490037	3/27/1987	TTAQ	2.44	–26.61	
BldgH19_MW05	341392	2490027	3/27/1987	BBUAQ	2.44	5.01	0.00
BldgH19_MW11	341301	2490071	3/27/1987	TTAQ	2.46	–26.99	
BldgH19_MW10	341305	2490070	3/27/1987	BBLAQ	2.47	1.32	0.0004
BldgH30_MW01	341377	2491946	5/5/1995	BBUCU	1.70	2.27	
BldgH30_MW05	341373	2491944	5/5/1995	BBLAQ	2.22	–15.58	–0.03
BldgH30_MW08	341431	2491898	5/5/1995	BBUAQ	0.96	–1.35	
BldgH30_MW06	341426	2491897	5/5/1995	BBLAQ	2.16	–18.79	–0.07
BldgS1856_MW12	335657	2499666	6/25/1997	BBUAQ	17.39	17.19	
BldgS1856_DMW13	335657	2499674	6/25/1997	BBLAQ	7.42	–3.70	0.48
BldgS2633_MW01	351494	2487697	1/28/1998	BBLAQ	3.32	–2.04	
BldgS2633_MW06DW	351498	2487694	1/28/1998	TTAQ	3.35	–25.66	–0.001

Table S3.3. Vertical hydraulic gradients at paired monitor wells at sites of CERCLA (IRP) and RCRA investigations, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act of 1980; IRP, Installation Restoration Program; RCRA, Resource Conservation and Recovery Act of 1976; BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Well pair (site names)[1]	Location coordinates[2]		Date	Contributing aquifer or confining unit	Potentiometric level, in feet NGVD 29	Mid-screen altitude, in feet NGVD 29	Vertical hydraulic gradient, dimensionless
	Northing	Easting					
BldgLCH4015_MW12	359763	2498768	7/7/1995	BBLAQ	25.86	21.98	
BldgLCH4015_MW13	359756	2498774	7/7/1995	TTAQ	–1.65	–18.24	0.68
BldgLCH4015_MW18	359524	2498761	7/7/1995	BBLAQ	28.38	22.61	
BldgLCH4015_MW19	359521	2498765	7/7/1995	TTAQ	–2.04	–17.52	0.76
BldgLCH4015_MW02	359406	2498671	7/7/1995	BBLAQ	27.81	21.94	
BldgLCH4015_MW20	359412	2498673	7/7/1995	TTAQ	–2.40	–18.34	0.75
BldgLCH4022_MW15	359622	2498955	2/14/1994	BBLAQ	30.26	24.35	
BldgLCH4022_MW18	359524	2498761	2/14/1994	BBLAQ	13.38	13.60	1.57
BldgLCH4022_MW02	359406	2498671	2/14/1994	BBLAQ	29.76	22.43	
BldgLCH4022_MW17	359374	2498810	2/14/1994	BBLAQ	18.26	14.31	1.42
BldgLCH4022_MW14	359689	2498847	2/14/1994	BBLAQ	28.50	25.91	
BldgLCH4022_MW16	359441	2498871	2/14/1994	BBLAQ	16.10	16.17	1.27
BldgSLCH4019_MW05	360040	2498817	7/7/1995	BBLAQ	28.28	25.14	
BldgSLCH4019_MW10	360034	2498812	7/7/1995	TTAQ	2.73	–12.46	0.68
BldgSLCH4019_MW09	360144	2499093	7/7/1995	BBLAQ	28.65	24.04	
BldgSLCH4019_MW04	360151	2499082	7/7/1995	TTAQ	3.40	–16.46	0.62
HPFF_MW05	339612	2501160	11/29/1995	BBAQSYS	19.60	17.83	
HPFF_MW09	339614	2501162	11/29/1995	BBLAQ	17.93	–19.87	0.04
HPFF_MW04	339386	2501999	7/16-17/2002	BBAQSYS	20.01	21.0	
HPFF_MW70	339398	2501988	7/16-17/2002	BBLAQ	18.34	–16.7	0.04
HPFF_MW04	339386	2501999	7/16-17/2002	BBAQSYS	20.01	21.0	
HPFF_MW71	339389	2501979	7/16-17/2002	TTAQ	16.95	–46.8	0.05
HPFF_MW15	339659	2501560	7/16-17/2002	BBAQSYS	19.87	17.7	
HPFF_MW64	339668	2501566	7/16-17/2002	BBLAQ	17.56	–19.9	0.06
HPFF_MW14	339850	2501344	7/16-17/2002	BBAQSYS	22.15	17.0	
HPFF_MW61	339887	2501360	7/16-17/2002	BBLAQ	16.05	–20.2	0.16
HPFF_MW14	339850	2501344	7/16-17/2002	BBAQSYS	22.15	17.0	
HPFF_MW12	339867	2501359	7/16-17/2002	TTAQ	16.22	–80.4	0.06

Table S3.3. Vertical hydraulic gradients at paired monitor wells at sites of CERCLA (IRP) and RCRA investigations, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act of 1980; IRP, Installation Restoration Program; RCRA, Resource Conservation and Recovery Act of 1976; BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Well pair (site names)[1]	Location coordinates[2]		Date	Contributing aquifer or confining unit	Potentiometric level, in feet NGVD 29	Mid-screen altitude, in feet NGVD 29	Vertical hydraulic gradient, dimensionless
	Northing	Easting					
HPFF_MW14	339850	2501344	7/16-17/2002	BBAQSYS	22.15	17.0	
HPFF_MW60	339869	2501342	7/16-17/2002	LocalCU	16.97	–120.3	0.04
HPFF_MW39	340219	2500180	7/16-17/2002	BBAQSYS	20.37	14.9	
HPFF_MW47	340208	2500129	7/16-17/2002	BBLAQ	13.47	–22.5	0.18
HPFF_MW39	340219	2500180	7/16-17/2002	BBAQSYS	20.37	14.9	
HPFF_MW45	340193	2500149	7/16-17/2002	TTAQ	13.61	–52.7	0.10
HPFF_MW39	340219	2500180	7/16-17/2002	BBAQSYS	20.37	14.9	
HPFF_MW46	340216	2500150	7/16-17/2002	LocalCU	13.46	–123.0	0.05
HPFF_MW54	340581	2501190	7/16-17/2002	BBUAQ	22.07	17.9	
HPFF_MW53	340585	2501197	7/16-17/2002	BBLAQ	15.81	–19.8	0.17
HPFF_MW54	340581	2501190	7/16-17/2002	BBUAQ	22.07	17.9	
HPFF_MW55	340583	2501202	7/16-17/2002	TTAQ	17.07	–50.0	0.07
HPFF_MW54	340581	2501190	7/16-17/2002	BBUAQ	22.07	17.9	
HPFF_MW52	340580	2501196	7/16-17/2002	LocalCU	16.29	–119.1	0.04
HPFF_MW48	340727	2500616	7/16-17/2002	BBUAQ	15.22	13.8	
HPFF_MW50	340730	2500598	7/16-17/2002	BBLAQ	14.48	–24.0	0.02
HPFF_MW48	340727	2500616	7/16-17/2002	BBUAQ	15.22	13.8	
HPFF_MW49	340709	2500603	7/16-17/2002	TTAQ	14.15	–54.1	0.02

[1] See Plate C1 (Faye et al. 2010) and Figure A.2–3 for CERCLA (IRP) and RCRA site locations.

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #76, #90, #125, #1271, #1273, #1499, #1500, #1503, #1516, #1699, #1749, #1772, #1774, #1781, 2609A, #2020

Leaking Underground Storage Tank Program files #63, #67, #78, #86, #99, #139, #152, #200, #237, #276, #346, #370, #374, #410, #457, #508, #543, #710, #715, #716, #717, #750, #758, #645_Addl_SiteAssess, #900_2005MON

Baker Environmental, Inc. 1993lo, 1994cd, 1995de, 1996cj, 1997ceg, 1998b

Catlin Engineers and Scientists, 1998a, 2002c, 2008

CH2M Hill Federal Group, Ltd and Baker Environmental, Inc. 2000b

Environmental Science and Engineering, Inc. 1992a

Engineering and Environment, Inc. 2006b

Law Engineering, Inc. 1994b, 1995ac, 1996ab

Law Engineering and Environmental Services, Inc. 1996aghi, 1997deg

Richard Catlin and Associates, Inc. 1995abc, 1996abcde, 1997c, 1998a, 2001

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system							
01-GW02	333936	2502570	16.0	7.8	July 1984–Jan. 1998	–0.3	BBAQSYS[3]
01-GW03	333627	2502391	16.2	7.7	July 1984–Jan. 1998	3.7	BBAQSYS
01-GW05	332567	2501935	20.4	7.5	July 1984–Apr. 1987	–1.6	BBAQSYS
01-GW08	332716	2501579	18.5	5.4	May 9, 1994	2.2	BBAQSYS
01-GW09	333130	2501612	14.2	5.4	May 9, 1994	1.6	BBAQSYS
01-GW10	333867	2502095	12.9	6.0	May 1994–Jan. 1998	–1.0	BBAQSYS
01-GW15	333895	2502616	15.3	7.8	Mar. 1994–May 1994	–2.2	BBAQSYS
01-GW17	333651	2502776	19.6	8.2	May 1994–Jan. 1998	2.9	BBAQSYS
02-GW01	356697	2498264	31.6	25.6	July 1984–Nov. 1996	14.8	BBAQSYS
02-GW02	356743	2498140	32.1	21.9	Apr. 15, 1987	14.4	BBAQSYS
02-GW03	356251	2498534	32.8	26.4	Apr. 1987–Apr. 2002	15.5	BBAQSYS
02-GW04	356457	2498435	30.8	23.3	May 1993–Nov. 1996	13.2	BBAQSYS
02-GW05	356421	2498248	31.0	24.0	Apr. 1987–Apr. 2002	14.3	BBAQSYS
02-GW10	356749	2498310	31.3	26.6	Aug. 1996–Apr. 2001	24.0	BBLAQ
02-GW12	356375	2498488	32.4	25.9	Apr. 1999–Apr. 2002	18.5	BBAQSYS
03-MW02	352823	2500068	32.1	26.2	June 1991–Jan. 2003	20.6	BBAQSYS
03-MW03	353411	2499911	30.8	21.8	June1991–Aug. 1995	16.6	BBAQSYS
03-MW06	352246	2500114	26.8	20.0	Dec. 1994–Jan. 2003	13.4	BBAQSYS
03-MW08	353356	2500064	31.5	24.8	Dec. 1994–Aug. 1995	19.6	BBAQSYS
03-MW09	353376	2500187	31.0	26.2	Aug. 1995–Jan. 2003	20.0	BBAQSYS
03-MW10	352883	2500432	32.3	27.6	Aug. 1995–Jan. 2003	21.4	BBAQSYS
03-MW11	352531	2499898	29.9	12.0	Aug. 1995–Jan. 2003	6.7	BBAQSYS
03-MW12	353025	2499695	25.0	11.7	Aug. 1995–Jan. 2003	15.2	BBAQSYS
03-MW13	352933	2499347	20.0	10.8	Aug. 1995–Jan. 2003	6.8	BBAQSYS
06-GW01S	348127	2503343	31.9	19.8	Apr. 4, 1993	17.8	BBAQSYS
06-GW02S	347214	2503751	35.0	25.7	Oct. 1986–July 2004	21.2	BBAQSYS
06-GW03	347739	2502666	28.4	15.5	Oct. 1986–July 2004	14.1	BBAQSYS
06-GW06	345360	2502750	24.4	19.2	Oct. 1986–Apr. 1998	9.4	BBAQSYS
06-GW07S	344414	2502106	18.3	12.3	Oct. 1986–Apr. 1998	0.6	BBAQSYS
06-GW08	344392	2502799	20.9	16.0	Oct. 1986–Apr. 1998	5.5	BBAQSYS
06-GW09	343675	2502352	18.5	12.1	Sept. 1992–Apr. 1993	6.5	BBLAQ
06-GW11	347504	2502329	33.3	16.3	Oct. 1992–July 2004	21.2	BBUAQ
06-GW12	344362	2502314	17.6	12.7	Sept. 1992–Apr. 1998	6.3	BBUAQ
06-GW15S	347784	2503211	26.1	19.4	Oct. 1992–Apr. 1993	13.6	BBAQSYS
06-GW18	345731	2503377	27.8	21.8	Sept. 1992–Apr. 1993	15.3	BBAQSYS
06-GW20	346519	2502192	25.0	19.9	Oct. 1992–Apr. 1993	12.9	BBAQSYS
06-GW21	346816	2501743	28.0	17.0	Sept. 1992–Jan. 2004	13.2	BBAQSYS

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
06-GW22	345993	2502502	24.8	19.1	Sept. 1992–Apr. 1993	12.7	BBAQSYS
06-GW23	346933	2502738	24.5	19.0	Aug. 1997–July 2004	9.0	BBAQSYS
06-GW25	346792	2503435	30.0	22.9	Oct. 1992–July 2003	16.1	BBAQSYS
06-GW26	347656	2501883	21.6	12.0	Oct. 1992–July 2003	9.3	BBAQSYS
06-GW31	347162	2502005	28.2	16.5	Apr. 1993–July 2004	8.8	BBAQSYS
09-GW01	342970	2502820	29.1	21.7	July 1984–Apr. 1993	11.0	BBUAQ
09-GW02	343192	2503020	24.4	19.3	July 1984–Apr. 1993	13.2	BBUAQ
09-GW03	343432	2502781	24.0	16.7	Apr. 1987–Apr. 1993	6.4	BBUAQ
09-GW04	342217	2503183	26.7	22.8	Sept. 1992–Apr. 1993	15.0	BBUAQ
09-GW05	343113	2502785	28.0	21.1	Sept. 1992–Apr. 1993	16.7	BBUAQ
09-GW06	343041	2502726	28.7	21.4	Sept. 1992–Apr. 1993	16.6	BBUAQ
09-GW07S	343321	2502720	26.9	18.2	Sept. 1992–Apr. 1993	12.2	BBUAQ
09-GW08	343070	2502890	26.0	21.0	Sept. 1992–Apr. 1993	15.3	BBUAQ
10-MW02	346534	2501587	26.8	17.4	Feb. 27, 2001	15.0	BBUAQ
10-MW03	345831	2501347	21.0	16.1	Feb. 27, 2001	13.6	BBUAQ
10-MW04	346037	2500627	17.6	13.1	Feb. 28, 2001	10.1	BBUAQ
10-MW08	345608	2500261	17.4	12.6	Feb. 27, 2001	11.8	BBUAQ
10-TW02 (new)	346530	2501583	26.7	20.8	Mar. 22, 1998	18.0	BBUAQ
10-TW07	345909	2500273	21.9	16.5	Mar. 22, 1998	15.0	BBUAQ
21-GW01	340959	2502039	29.5	21.1	July 1984–Aug. 1993	12.2	BBAQSYS
21-GW02	341099	2502100	31.4	21.0	June 1993–Aug. 1993	17.1	BBAQSYS
21-GW03	340805	2501753	28.9	21.9	May 1993 –Aug. 1993	16.4	BBAQSYS
21-GW04	340307	2501140	27.6	20.9	May 1993 –Aug. 1993	18.1	BBAQSYS
22-MW01	339573	2501718	28.2	20.3	Mar. 1988–Feb. 2008	16.3	BBUAQ
22-MW02	339809	2501960	30.0	19.5	Mar. 1988–Mar. 2009	18.0	BBUAQ
22-MW03	339367	2501802	28.9	20.7	Mar. 1988–Oct. 2008	19.0	BBUAQ
22-MW04	339588	2502080	29.9	21.5	Mar. 1988–Oct. 2008	19.8	BBUAQ
22-MW05	339792	2501434	28.1	21.9	Mar. 1988–July 2002	18.5	BBUAQ
22-MW06	340026	2501789	27.8	20.7	Mar. 1988–Mar. 2009	17.8	BBUAQ
22-MW07	340071	2501495	27.2	20.9	Apr. 1988–Dec. 1989	18.4	BBUAQ
22-MW08	339959	2501383	26.7	20.6	Mar. 1988–Aug. 1992	17.8	BBUAQ
22-MW09	339116	2501482	29.4	19.4	Mar. 1988–Oct. 2008	18.8	BBUAQ
22-MW10	340033	2501940	28.8	20.5	Mar. 1988–Mar. 2009	18.1	BBUAQ
22-MW11	340014	2501237	26.4	20.6	Mar. 1988–Aug. 2007	11.5	BBAQSYS
22-MW12	340158	2501386	26.8	20.6	Mar. 1988–Mar. 2009	11.9	BBAQSYS
22-MW13	340281	2501716	29.8	21.3	Mar. 1988–Dec. 1989	13.8	BBAQSYS
22-MW14	339578	2501217	27.4	19.6	Mar. 1988–Dec. 1989	12.7	BBAQSYS

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
22-MW15	339367	2501442	29.5	20.7	Mar. 1988–Mar. 2009	13.3	BBAQSYS
22-MW16	339951	2501560	32.0	18.7	Mar. 1988–Aug. 2001	13.4	BBAQSYS
22-MW17	339717	2501638	30.0	19.9	Mar. 1988–Mar. 2009	14.5	BBAQSYS
22-MW18	339635	2501874	29.7	19.9	Mar. 1988–Mar. 2008	14.9	BBAQSYS
22-MW19	339838	2502137	29.3	20.1	Mar. 1988–Oct. 2008	14.4	BBAQSYS
22-MW22	340326	2501329	27.1	20.4	Dec. 15, 1989	17.5	BBUAQ, BBUCU
22-MW23	339433	2501686	27.9	20.9	Dec. 1989–June 1997	14.3	BBUAQ, BBUCU
22-RW01	339830	2501477	28.6	19.0	Dec. 1989–Mar. 2009	7.1	BBAQSYS
22-RW02	339541	2501714	27.5	17.7	Dec. 15, 1989	8.5	BBAQSYS
24-GW02	336531	2501313	17.9	9.5	July 1984–Aug. 1993	–1.1	BBAQSYS
24-GW03	336501	2502167	15.2	10.4	July 1984–Aug. 1997	0.3	BBAQSYS
24-GW04	336772	2503141	16.3	10.2	July 1984–Apr. 1997	0.0	BBAQSYS
24-GW05	337190	2501933	27.5	14.1	July 1984–Apr. 1987	12.1	BBAQSYS
24-GW07 (new)	337662	2502854	26.0	14.6	May 1993–Aug. 1997	15.0	BBUAQ, BBUCU
24-GW09	336379	2502872	15.4	9.9	May 1993–Aug. 1997	6.7	BBUAQ
24-GW10	335884	2502053	16.8	7.8	May 1993–Aug. 1997	4.7	BBUAQ, BBUCU
28-GW04	332165	2499566	7.4	2.7	Apr. 1987–Jan. 1998	–17.1	BBAQSYS
28-GW05	331719	2499911	13.1	4.0	May 1994–Jan. 1998	0.1	BBAQSYS
28-GW06	332194	2498094	17.3	2.3	May 1994–Jan. 1998	–5.0	BBAQSYS
28-GW08 (new)	332239	2499096	14.0	1.0	July 1996–Aug. 1997	–5.9	BBAQSYS
28-GW08 (old)	332239	2499096	14.0	1.0	May 10, 1994	–3.7	BBAQSYS
74-GW02	353013	2501971	33.8	26.1	July 4, 1984	14.6	BBAQSYS
74-GW04	353437	2501304	31.2	22.2	Feb. 1994–Apr. 1994	18.2	BBUAQ
74-GW05	353028	2501327	32.0	27.0	Feb. 1994–Apr. 1994	21.6	BBUAQ
78-Bldg902_P01	341270	2502816	30.1	23.9	Feb. 1, 1993	10.1	BBUAQ, BBUCU
78-GW01	337222	2499145	29.9	12.2	Oct. 1986–July 2002	15.6	BBAQSYS
78-GW02	337018	2499576	29.0	23.2	Nov. 1986–July 2002	17.5	BBAQSYS
78-GW03	336765	2499494	29.6	8.2	Nov. 1986–July 2002	14.7	BBAQSYS
78-GW04-1	337457	2499549	29.1	11.4	Nov. 1986–July 2002	14.6	BBAQSYS
78-GW05	338211	2499027	27.1	17.1	Nov. 1986–July 2002	11.5	BBAQSYS
78-GW06	338641	2498839	26.1	13.7	Nov. 1986–Dec. 2008	10.5	BBAQSYS
78-GW07	338538	2499392	25.4	13.2	Nov. 1986–Sept. 2002	10.7	BBAQSYS
78-GW08	338709	2499778	25.1	15.2	Nov. 1986–Sept. 2002	10.6	BBAQSYS

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
78-GW09-1 (old)	337998	2499701	26.4	12.2	Nov. 1986–July 2002	11.8	BBAQSYS
78-GW10	338309	2500046	25.8	15.5	Nov. 1986–July 2002	11.0	BBAQSYS
78-GW11	337865	2500178	25.3	14.5	Nov. 1986–July 2002	10.8	BBAQSYS
78-GW12	338457	2500632	27.6	17.8	Apr. 1987–Oct. 2008	12.7	BBAQSYS
78-GW13	339567	2499458	24.2	13.4	Nov. 1986–Oct. 2008	8.6	BBAQSYS
78-GW14	339391	2499956	24.6	16.9	Nov. 1986–Oct. 2008	10.1	BBAQSYS
78-GW15	339109	2500535	26.4	18.3	Nov. 1986–July 2002	11.8	BBAQSYS
78-GW16	339006	2501332	29.9	19.7	Nov. 1986–Oct. 2008	15.2	BBAQSYS
78-GW17-1	339371	2500975	27.8	18.5	Nov. 1986–July 2002	12.9	BBAQSYS
78-GW18	340215	2500626	26.3	16.6	Nov. 1986–Apr. 1987	12.0	BBAQSYS
78-GW19	340220	2500628	26.3	20.3	Nov. 1986–Oct. 2008	12.0	BBAQSYS
78-GW20	340704	2500752	26.6	16.1	Nov. 1986–Nov. 2008	7.8	BBAQSYS
78-GW21	339539	2502400	32.0	22.9	Nov. 1986–Oct. 2008	16.4	BBAQSYS
78-GW23	340686	2502468	29.9	22.9	Nov. 1886–Mar. 2007	15.3	BBAQSYS
78-GW24-1	341181	2502845	30.4	25.5	Nov. 1986–July 2002	15.8	BBAQSYS
78-GW25	340951	2503205	29.9	24.0	Apr. 1987–July 2002	15.4	BBAQSYS
78-GW26	342950	2501860	33.3	22.8	Nov. 1986–Feb. 1991	17.6	BBAQSYS
78-GW29	335465	2499141	26.0	9.8	Nov. 1986–Feb. 1991	11.4	BBAQSYS
78-GW33	340015	2503216	29.9	22.5	June 1993–July 2002	21.4	BBUAQ
78-GW35	338155	2502669	30.9	18.2	June 1993–July 2002	14.9	BBUAQ
78-GW36	338123	2500767	27.4	16.5	June 1993–July 2002	14.3	BBUAQ
78-GW37	336951	2500612	17.9	10.4	June 1993–July 2002	9.8	BBUAQ
78-GW39	334207	2500098	17.1	4.0	June 1993–July 2002	1.8	BBAQSYS
78-GW40	340651	2502400	29.3	20.5	July 1999–July 2002	15.1	BBAQSYS
78-GW41	340991	2502751	30.0	22.8	July 1999–July 2002	14.7	BBAQSYS
78-GW42	337497	2499302	29.4	10.5	July 1999–July 2002	14.5	BBAQSYS
78-GW43	341094	2502655	30.1	19.7	July 2001–July 2002	2.7	BBLAQ
78-GW44	341133	2502739	29.9	20.2	July 2001–July 2002	1.2	BBLAQ
78-GW45	341921	2502820	28.2	20.2	July 2001–July 2002	6.4	BBLAQ
78-GW46	340618	2502618	30.5	20.2	July 2001–July 2002	10.2	BBUCU
78-GW47	340644	2502481	29.7	19.8	July 2001–July 2002	2.6	BBLAQ
78-GW48	340855	2502482	30.8	20.6	July 2001–July 2002	8.9	BBUCU
78-GW49	337800	2499623	26.0	12.8	Oct. 16, 2001	–2.1	BBLAQ
78-GW50	337500	2499057	29.2	10.9	Oct. 2001–July 2002	9.1	BBUCU
78-GW51	337929	2499266	27.5	11.0	Oct. 2001–Jan. 2002	5.8	BBLAQ
78-GW52	337716	2499418	27.7	10.8	Oct. 2001–July 2002	–1.9	BBLAQ
78-GW53	337500	2499620	28.0	10.9	Oct. 2001–Jan. 2002	3.7	BBLAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
78-GW54	337465	2498441	29.4	10.4	Oct. 2001–July 2002	8.0	BBUCU
78-GW55	337213	2498668	29.7	10.3	Oct. 2001–July 2002	8.4	BBLAQ
78-GW56	336753	2499673	28.3	10.4	Oct. 2001–July 2002	2.4	BBLAQ
78-GW57	337344	2499351	28.6	10.7	Oct. 2001–Jan. 2002	4.1	BBLAQ
78-GW59	337012	2499008	28.9	10.2	Oct. 2001–July 2002	5.9	BBLAQ
78-GW60	337987	2499685	26.6	12.5	July 26, 2002	–0.9	BBLAQ
78-GW61	336184	2499555	22.7	9.2	July 26, 2002	–2.1	BBLAQ
78-GW63	336394	2498200	28.0	8.6	July 26, 2002	1.7	BBLAQ
78-GW64	336857	2497671	27.0	7.4	July 26, 2002	1.6	BBLAQ
78-GW65	336309	2498856	28.0	8.8	July 26, 2002	–1.4	BBLAQ
78-GW66	336559	2498989	28.0	9.3	July 26, 2002	0.5	BBLAQ
78-GW67	336742	2498540	29.0	9.2	July 26, 2002	–0.3	BBLAQ
78-GW68	337253	2498035	28.3	9.4	July 26, 2002	2.7	BBLAQ
78-RW-10N	340676	2502626	30.4	21.7	Jan. 2004–Mar. 2007	5.4	BBLAQ
82-MW03	348220	2502375	22.0	8.6	June 1991–July 2004	6.0	BBLAQ
82-MW30	348087	2503799	29.7	22.4	Sept. 1992–May 1992	9.7	BBLAQ(?)
84-MW18 (Baker)	361204	2495590	22.5	15.1	Aug. 7, 2001	12.8	BBLAQ
88-MW01	339268	2496740	26.5	19.4	May 1997–July 2002	12.0	BBAQSYS
88-MW02	339347	2496489	26.6	16.4	May 1997–July 2002	11.1	BBAQSYS
88-MW02IW	339353	2496481	26.2	8.7	May 1997–July 2002	–20.9	BBLAQ
88-MW03	339503	2496545	25.9	17.9	May 1997–July 2002	13.4	BBUAQ
88-MW03IW	339499	2496563	25.1	9.6	May 1997–July 2002	–21.6	BBLAQ
88-MW04	339076	2496489	25.0	10.1	May 1997–July 2002	5.6	BBAQSYS
88-MW04IW	339079	2496481	25.0	10.0	May 1997–July 2002	–22.6	BBLAQ
88-MW05	339618	2496406	24.6	17.2	May 1997–July 2002	9.1	BBAQSYS
88-MW05IW	339608	2496405	23.9	9.6	May 1997–July 2002	–22.8	BBLAQ
88-MW06	339340	2496286	24.2	10.7	May 1997–July 2002	9.1	BBAQSYS
88-MW06IW	339346	2496294	24.2	9.5	May 1997–Jan. 2001	–22.9	BBLAQ
88-MW07	339944	2496027	23.6	14.3	May 1997–Jan. 2001	9.1	BBAQSYS
88-MW07IW	339945	2496042	23.9	9.4	May 1997–July 2002	–23.8	BBLAQ
88-MW08	339583	2495865	23.2	14.7	May 1997–Jan. 2001	10.7	BBAQSYS
88-MW08IW	339572	2495868	22.8	9.6	July 1999–July 2002	–24.5	BBLAQ
88-MW09	339080	2496100	22.1	12.9	May 1997–July 2002	8.6	BBAQSYS
88-MW09IW	339071	2496110	21.6	9.8	May 1997–July 2002	–25.5	BBLAQ
88-MW10IW	339442	2496487	25.9	8.5	July 22, 2002	–10.5	BBLAQ
88-TW20	339139	2496176	23.0	12.3	May 1997	5.5	BBAQSYS

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
88-TW21	339333	2496128	23.5	10.6	May 1997	6.3	BBAQSYS
88-TW23	339756	2496376	24.4	9.7	May 1997	6.5	BBAQSYS
88-TW25	339995	2496391	23.5	10.0	May 1997	7.2	BBAQSYS
88-TW26	339738	2496689	25.5	9.8	May 1997	8.3	BBAQSYS
94-Bldg1613_GW01	338789	2498888	25.9	15.4	May 1995–Sept. 2004	13.2	BBUAQ, BBUCU
94-Bldg1613_GW02	338744	2499181	26.1	17.6	May 1995–Sept. 2004	13.8	BBUAQ, BBUCU
94-Bldg1613_GW03	338531	2499191	25.9	14.0	May 1995–Oct. 2004	16.6	BBUAQ, BBUCU
94-Bldg1613_GW04	338475	2498807	24.3	19.5	May 1995–Oct. 2004	14.2	BBUAQ, BBUCU
94-Bldg1613_GW05	338592	2498715	23.4	18.0	May 1995–Dec. 2008	12.8	BBUAQ, BBUCU
94-Bldg1613_GW06	338731	2498760	26.2	14.6	May 1995–Dec. 2008	10.9	BBUAQ
94-Bldg1613_GW07	338882	2499329	24	17.3	May 1995–Sept. 2004	9.9	BBUAQ
94-Bldg1613_GW09	338334	2498918	25.9	20.2	May 1995–Oct. 2004	15.9	BBUAQ, BBUCU
94-Bldg1613_GW10	338641	2499016	26.5	14.0	May 1995–Dec. 2008	13.7	BBUAQ, BBUCU
94-Bldg1613_GW11	338563	2498818	25.1	13.6	May 1995–Dec. 2008	10.4	BBUAQ, BBUCU
94-Bldg1613_GW12	338377	2499089	26.5	14.3	May 1995–Oct. 2004	11.6	BBUAQ, BBUCU
94-Bldg1613_GW13	338881	2499314	24.3	14.6	May 1995–Sept. 2004	–26.4	BBLAQ
94-Bldg1613_GW14	338646	2499013	26.4	14.7	May 1995–Oct. 2004	–21.4	BBLAQ
94-Bldg1613_GW16	338653	2499022	26.4	13.4	May 1995–Apr. 2006	5.0	BBAQSYS
94-Bldg1613_GW17	338663	2498850	26.1	13.9	Nov. 1999–Dec. 2008	11.1	BBLAQ
94-Bldg1613_GW18	338618	2498855	25.5	12.9	Nov. 1999–Dec. 2008	10.5	BBLAQ
94-Bldg1613_GW19	338631	2498881	24.9	13.4	Nov. 1999–Dec. 2008	9.9	BBLAQ
94-Bldg1613_GW20	338548	2499061	25.7	13.4	Sept. 2000–Dec. 2008	13.7	BBUAQ, BBUCU
94-Bldg1613_GW21	338455	2498977	26.2	13.9	Sept. 2000–Dec. 2008	13.2	BBUAQ, BBUCU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
94-Bldg1613_GW22	338543	2498967	25.5	13.5	Sept. 2000–Dec. 2008	13.5	BBUAQ, BBUCU
Bldg20_MW01	337457	2496375	26.5	16.1	Nov. 27, 2000	14.0	BBUAQ, BBUCU
Bldg21_DW01	332689	2498545	7.1	2.0	May 19, 1992	–20.5	BBLAQ
Bldg21_DW02	332686	2498564	7.3	2.0	May 19, 1992	–20.0	BBLAQ
Bldg21_DW04	332600	2498520	9.6	1.9	May 19, 1992	–14.3	BBLAQ
Bldg21_MW01	332635	2498568	8.9	2.4	Aug. 1991–May 1992	–4.6	BBUAQ, BBUCU
Bldg21_MW02	332659	2498558	8.4	3.1	Aug. 1991–May 1992	–2.6	BBUAQ, BBUCU
Bldg21_MW03	332667	2498643	11.7	2.3	May 19, 1992	2.1	BBUAQ
Bldg21_MW04	332621	2498600	10.5	2.4	May 19, 1992	1.7	BBUAQ
Bldg21_MW05	332668	2498494	7.0	1.5	May 19, 1992	–1.1	BBUAQ, BBUCU
Bldg21_MW06	332644	2498507	8.2	2.2	May 19, 1992	0.5	BBUAQ, BBUCU
Bldg21_MW08	332700	2498534	6.5	1.6	May 19, 1992	–0.9	BBUAQ, BBUCU
Bldg21_MW09	332682	2498606	7.9	2.5	May 19, 1992	–1.2	BBUAQ
Bldg21_RW01	332659	2498573	8.6	2.0	May 19, 1992	–3.3	BBUAQ, BBUCU
Bldg24_MW01	341481	2493820	27.6	10.6	Sept. 25, 2001	7.1	BBUAQ, BBUCU
Bldg33_MW01	359259	2497657	31.2	23.2	Aug. 8, 1994	19.3	BBLAQ, BBLCU
Bldg33_MW02	359242	2497658	31.2	23.3	Aug. 8, 1994	21.7	BBLAQ, BBLCU
Bldg33_MW03	359237	2497640	31.0	23.1	Aug. 8, 1994	20.1	BBLAQ, BBLCU
Bldg33_MW04	359188	2497697	31.5	26.4	Apr. 5, 1995	23.0	BBLAQ
Bldg33_MW05	359194	2497631	31	25.4	Apr. 5, 1995	22.5	BBLAQ, BBLCU
Bldg33_MW06	359273	2497742	31.7	26.8	Apr. 5, 1995	22.7	BBLAQ
Bldg33_MW07	359256	2497618	31.5	25.4	Apr. 5, 1995	23.0	BBLAQ
Bldg33_MW08	359327	2497618	31.5	25.5	Apr. 5, 1995	23.0	BBLAQ
Bldg33_MW11	359234	2497649	31.7	25.6	Apr. 5, 1995	22.7	BBLAQ
Bldg45_MW01 (ATEC)	361246	2495574	22.6	16.3	Aug. 28, 1991	15.6	BBLAQ, BBLCU, TTAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of upper-most open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
Bldg45_MW01 (Wright)	361275	2495385	20.9	12.2	June 1994–May 2006	8.8	BBLAQ, BBLCU, TTAQ
Bldg45_MW02 (ATEC)	361260	2495563	22.4	15.6	Aug. 1991–May 2001	14.8	BBLAQ, BBLCU, TTAQ
Bldg45_MW02 (Wright)	361255	2495374	20.2	7.8	June 21, 1994	6.5	BBLAQ, BBLCU, TTAQ
Bldg45_MW03 (ATEC)	361269	2495590	21.9	15.5	June 15, 2000	9.6	BBLAQ, BBLCU, TTAQ
Bldg45_MW03 (Wright)	361279	2495482	22.1	10.8	June 21, 1994	10.1	BBLAQ, BBLCU, TTAQ
Bldg45_MW04 (Law)	361145	2495545	21.6	18.2	Jan. 1993–May 2006	11.1	BBLAQ, BBLCU, TTAQ
Bldg45_MW04 (Wright)	361300	2495192	16.2	4.7	July 1994–May 2006	2.5	BBLAQ, BBLCU, TTAQ
Bldg45_MW05 (Law)	361406	2495558	21.0	13.0	Jan. 1993–May 2006	7.5	BBLAQ, BBLCU, TTAQ
Bldg45_MW07 (Law)	361308	2495583	21.1	16.4	Aug. 11, 1998	6.8	BBLAQ, BBLCU, TTAQ
Bldg45_MW10 (Law)	361308	2495552	21.3	15.2	Nov. 2, 1998	10.8	BBLAQ, BBLCU, TTAQ
Bldg45_MW12 (Law)	361166	2495527	21.7	16.9	Apr. 2004–Aug. 2005	10.7	BBLAQ, BBLCU, TTAQ
Bldg45_MW13 (Law)	361207	2495416	20.7	13.8	July 1998–May 2006	9.7	BBLAQ, BBLCU, TTAQ
Bldg45_MW14 (Law)	361254	2495286	18.4	9.6	Sept. 2003–May 2006	7.4	BBLAQ, BBLCU, TTAQ
Bldg45_MW15 (Law)	361316	2495343	20.8	11.2	July 1998–May 2006	9.6	BBLAQ, BBLCU, TTAQ
Bldg45_MW16 (Law)	361277	2495399	21.1	12.8	July 1994–Sept. 2003	10.1	BBLAQ, BBLCU, TTAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
Bldg45_MW17 (Law)	361365	2495544	20.7	14.3	Mar. 1, 2001	11.5	BBLAQ, BBLCU, TTAQ
Bldg45_MW18 (Law)	361272	2495544	22.2	15.2	July 1998–May 2006	12.1	BBLAQ, BBLCU, TTAQ
Bldg45_MW23 (E&E)	361263	2495584	22.1	17.4	Mar. 2005–May 2006	13.6	BBLAQ, BBLCU, TTAQ
Bldg45_PW01 (Law)	361295	2495567	21.5	14.3	July 7,1999	6.9	BBLAQ, BBLCU, TTAQ
Bldg61_MW01	339284	2497385	27.1	21.0	Oct. 13, 1993	19.6	BBUAQ
Bldg61_MW02	339300	2497374	27.2	22.0	Oct. 13, 1993	19.3	BBUAQ
Bldg61_MW03	339318	2497402	27.0	21.6	Oct. 13, 1993	19.2	BBUAQ
Bldg311_MW06	336170	2496433	21.0	8.0	Nov. 10, 2000	8.5	BBAQSYS
Bldg331_MW01	335906	2496507	17.4	6.7	Apr. 13, 1995	3.9	BBAQSYS
Bldg331_MW02	335956	2496560	18.3	6.8	Apr. 13, 1995	4.1	BBAQSYS
Bldg331_MW03	335995	2496595	19.3	6.9	Apr. 13, 1995	5.7	BBAQSYS
Bldg331_MW04	336012	2496628	20.0	6.9	Apr. 13, 1995	6.3	BBAQSYS
Bldg331_MW06	336049	2496609	19.7	6.7	Apr. 13, 1995	5.3	BBAQSYS
Bldg331_MW07	336093	2496580	18.8	6.7	Apr. 13, 1995	5.3	BBAQSYS
Bldg331_MW08	335988	2496442	16.3	6.4	Apr. 13, 1995	4.0	BBAQSYS
Bldg331_MW09	336037	2496514	18.7	6.2	Apr. 13, 1995	4.7	BBAQSYS
Bldg331_MW10	336064	2496542	18.9	6.4	Apr. 13, 1995	4.6	BBAQSYS
Bldg331_MW11	335960	2496474	16.5	6.4	Apr. 13, 1995	4.0	BBAQSYS
Bldg331_MW12	335968	2496619	19.3	6.9	Apr. 13, 1995	5.5	BBAQSYS
Bldg331_MW14	335991	2496590	19.1	7.2	Apr. 13, 1995	–17.9	BBLAQ
Bldg331_MW15	335911	2496513	17.3	7.0	Apr. 13, 1995	–15.7	BBLAQ
Bldg331_PW16	336065	2496598	19.6	6.6	Apr. 13, 1995	–0.9	BBAQSYS
Bldg575_MW01	333891	2500063	14.7	3.3	Aug. 18, 1997	19.7	BBUAQ
Bldg645_MW04	356535	2497267	23.0	14.4	Nov. 1994–Apr. 2008	14.5	BBLAQ, BBLCU
Bldg645_MW06	356462	2497593	29.8	17.5	Nov. 1994–Apr. 2008	10.3	BBLCU, TTAQ(?)
Bldg645_MW07	356192	2497267	28.4	16.1	Mar. 10, 2004	8.4	BBLCU, TTAQ(?)
Bldg645_MW08	356542	2497397	27.7	16.6	Nov. 1994–Apr. 2008	7.7	BBLCU, TTAQ(?)
Bldg645_MW12	356469	2497374	27.4	20.3	Mar. 9, 2004	0.3	BBLCU, TTAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
Bldg645_MW19	356271	2497164	28.3	16.4	Mar. 9, 2004	4.9	BBLCU, TTAQ
Bldg645_MW24	356418	2497260	26.8	19.7	Jan. 8, 2007	11.8	BBLCU, TTAQ(?)
Bldg645_MW25	356405	2497348	25.9	16.4	Jan. 8, 2007	9.5	BBLCU, TTAQ(?)
Bldg820_MW02	349804	2494711	30.1	18.0	Dec. 1992–Mar. 2009	17.6	BBUCU, BBLAQ
Bldg820_MW03	349773	2494676	30.6	17.2	Dec. 1992–Mar. 2009	17.3	BBUCU, BBLAQ
Bldg820_MW04	349794	2494639	30.4	18.5	Dec. 1992–Mar. 2009	17.9	BBUCU, BBLAQ
Bldg820_MW05	349848	2494580	29.9	19.7	Dec. 1992–Oct. 2007	12.4	BBUCU, BBLAQ
Bldg820_MW06	349724	2494733	29.7	16.6	Dec. 1992–Mar. 2009	11.2	BBLAQ, BBLCU
Bldg820_MW08	349545	2494901	25.4	12.3	Dec. 1992–Mar. 2009	11.7	BBUCU, BBLAQ
Bldg820_MW10	349615	2494623	29.2	18.0	Dec. 1992–Mar. 2009	11.6	BBUCU, BBLAQ
Bldg820_MW11	349886	2494705	29.9	18.3	Dec. 1992–Mar. 2009	11.6	BBUCU, BBLAQ
Bldg820_MW12	349729	2494666	30.5	17.4	Apr. 1994–Mar. 2009	14.2	BBUCU, BBLAQ
Bldg820_MW13	349724	2494778	28.6	16.0	Apr. 1994–Mar. 2009	13.3	BBUCU, BBLAQ
Bldg820_MW14	349894	2494889	29.5	16.6	Apr. 1994–Oct. 2007	13.0	BBUCU, BBLAQ
Bldg820_MW15	350068	2494638	30.0	18.0	Apr. 1994–Mar. 2009	13.9	BBUCU, BBLAQ
Bldg820_MW16	349785	2494489	29.9	19.1	Apr. 1994–Mar. 2009	14.7	BBUCU, BBLAQ
Bldg820_MW18	349626	2494497	29.7	18.3	Apr. 1994–Mar. 2009	14.2	BBUCU, BBLAQ
Bldg820_MW26	349754	2494849	26.3	14.7	Apr. 1994–Mar. 2009	11.2	BBUCU, BBLAQ
Bldg820_MW27	349916	2494683	30.4	19.7	Sept. 2001–Oct. 2007	21.4	BBUAQ, BBUCU
Bldg900_MW01	340573	2502732	31.1	22.1	Aug. 1996–Mar. 2007	–17.4	BBUCU, BBLAQ
Bldg900_MW02	340581	2502741	31.0	25.7	Aug. 1996–Mar. 2007	21.2	BBUAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of upper-most open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
Bldg900_MW03	340639	2502664	30.6	22.2	Aug. 1996–Mar. 2007	–17.8	BBUCU, BBLAQ
Bldg900_MW04	340642	2502667	30.5	25.1	Aug. 1996–Mar. 2007	20.7	BBUAQ
Bldg900_MW05	340635	2502768	30.2	25.4	Aug. 1996–Mar. 2007	20.8	BBUAQ
Bldg900_MW07	340513	2502794	30.9	26.0	Aug. 1996–Mar. 2007	21.1	BBUAQ
Bldg900_MW08	340792	2502546	30.2	23.9	Oct. 2003–Mar. 2007	21.4	BBUAQ
Bldg900_MW09	340674	2502724	29.8	24.2	Oct. 2003–Mar. 2007	21.1	BBUAQ
Bldg900_MW10	340698	2502672	30.1	25.0	Nov. 2003–Mar. 2007	21.4	BBUAQ
Bldg903_MW01	340814	2502969	29.9	23.5	Apr. 1993–Sept. 1993	17.4	BBUAQ, BBUCU
Bldg903_MW02	340781	2502964	29.8	23.8	Apr. 1993–Sept. 1993	18.1	BBUAQ, BBUCU
Bldg903_MW03	340789	2502940	29.9	24.0	Apr. 1993–Sept. 1993	18.9	BBUAQ, BBUCU
Bldg903_MW04	340798	2502953	29.5	24.6	Sept. 25, 1997	19.5	BBUAQ, BBUCU
Bldg1101_MW01	339569	2501017	29.9	19.0	Nov. 2000–Oct. 2008	19.3	BBUAQ
Bldg1101_MW02	339554	2500961	29.8	18.6	Nov. 2000–Oct. 2008	18.8	BBUAQ
Bldg1101_MW03	339665	2500864	29.9	18.5	Nov. 2000–Oct. 2008	18.3	BBUAQ
Bldg1106_PZ01	338943	2501677	29.5	22.9	Sept. 20, 1996	21.7	BBUAQ
Bldg1106_PZ02	338970	2501696	29.2	22.0	Sept. 20, 1996	22.8	BBUAQ
Bldg1106_PZ03	338934	2501696	29.6	23.0	Sept. 20, 1996	21.9	BBUAQ
Bldg1106_PZ04	338968	2501712	29.1	21.2	Sept. 20, 1996	22.1	BBUAQ
Bldg1115_GT02	340187	2500785	26.9	20.0	June 1993–July 2002	14.4	BBAQSYS
Bldg1115_GT03	340152	2500718	26.7	20.2	June 1993–Mar. 2009	14.6	BBAQSYS
Bldg1115_GT04	340152	2500706	26.9	20.2	June 1993–Mar. 2009	14.5	BBAQSYS
Bldg1115_GT05	340161	2500701	27.0	19.6	June 1993–July 2002	14.5	BBAQSYS
Bldg1115_GT06	340236	2500805	26.2	20.6	June 1993–Mar. 2009	14.6	BBAQSYS
Bldg1115_GT07	340299	2500881	26.2	19.7	June 1993–Oct. 2008	15.2	BBAQSYS
Bldg1115_GT08	340215	2500960	26.6	20.5	June 1993–Oct. 2008	15.5	BBAQSYS
Bldg1115_GT09	340138	2501027	26.7	20.6	June 1993–Oct. 2008	14.5	BBAQSYS
Bldg1115_MW01	339765	2500525	26.1	17.8	Jan. 1994–Oct. 2008	16.2	BBUAQ, BBUCU
Bldg1115_MW02	339870	2500370	26.0	17.6	Jan. 1994–Oct. 2008	16.7	BBUAQ, BBUCU
Bldg1115_MW03	339712	2500787	26.3	18.1	Jan. 1994–Oct. 2008	13.2	BBAQSYS

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
Bldg1115_MW05	340161	2500701	26.1	20.8	Jan. 1994–Oct. 2008	14.1	BBUAQ, BBUCU
Bldg1115_MW06	340097	2500518	26.7	17.9	Jan. 1994–Oct. 2008	13.3	BBAQSYS
Bldg1115_MW07	339897	2501006	26.3	18.9	Jan. 1994–Mar. 2009	13.3	BBAQSYS
Bldg1115_MW08	340151	2500439	25.4	17.5	Jan. 1994–Oct. 2008	13.4	BBUAQ, BBUCU
Bldg1115_MW09	340432	2500868	26.1	18.2	Jan. 1994–Mar. 2009	13.0	BBUAQ, BBUCU
Bldg1115_MW10	340074	2500690	25.9	19.8	Jan. 1994–Oct. 2008	16.6	BBUAQ, BBUCU
Bldg1115_MW11	340000	2500606	26.4	18.9	Jan. 1994–Oct. 2008	13.1	BBUAQ, BBUCU
Bldg1115_MW12	340172	2500846	26.1	20.7	Jan. 1994–Mar. 2009	15.6	BBAQSYS
Bldg1115_MW13	340077	2500689	25.9	16.9	Jan. 1994–Mar. 2009	–22.9	BBLAQ
Bldg1115_MW14	340002	2500600	26.3	17.1	Jan. 1994–Mar. 2009	–22.9	BBLAQ
Bldg1115_MW15	340176	2500843	26.1	17.5	Jan. 1994–Oct. 2008	–22.9	BBLAQ
Bldg1115_MW16	340128	2500697	26.9	18.1	Jan. 1994–July 2002	5.2	BBAQSYS
Bldg1115_MW17	340247	2500467	25.0	16.0	July 1995–Mar. 2009	–24.1	BBLAQ
Bldg1115_MW18	340143	2501041	26.3	17.1	July 1995–Oct. 2008	–22.8	BBLAQ
Bldg1115_MW19	339902	2501013	26.3	18.1	July 1995–Oct. 2008	–21.1	BBLAQ
Bldg1115_MW20	339715	2500794	26.3	16.9	July 1995–Mar. 2009	–20.9	BBLAQ
Bldg1115_MW21	339867	2500374	26.0	17.0	July 1995–Oct. 2008	–21.5	BBLAQ
Bldg1310_MW02	338306	2500960	29.5	16.7	Nov. 3, 1993	17.3	BBUAQ, BBUCU
Bldg1310_MW03	338328	2500985	29.5	16.9	Nov. 3, 1993	16.5	BBUAQ, BBUCU
Bldg1323_MW01	337304	2502214	28.2	15.3	Nov. 11, 2000	15.7	BBAQSYS
Bldg1323_MW02	337334	2502187	27.8	15.2	Nov. 11, 2000	15.3	BBAQSYS
Bldg1323_TMW01	337350	2502160	27.6	14.1	Nov. 11, 2000	12.6	BBUCU, BBLAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
Bldg1450_MW01	337070	2501301	25.5	12.4	Oct. 1996–Aug. 1999	12.5	BBAQSYS
Bldg1450_MW02	337127	2501307	25.7	12.6	Oct. 1996–Aug. 1999	–11.6	BBLAQ
Bldg1450_MW03	337131	2501303	25.7	12.8	Oct. 1996–Aug. 1999	12.9	BBAQSYS
Bldg1450_MW04	337086	2501243	24.9	12.4	Oct. 1996–Aug. 1999	10.8	BBAQSYS
Bldg1450_MW05	337009	2501298	24.7	12.3	Oct. 1996–Aug. 1999	12.5	BBAQSYS
Bldg1450_MW06	337060	2501360	25.5	12.5	Oct. 1996–Aug. 1999	12.5	BBAQSYS
Bldg1502_MW01 (new)	338081	2499813	25.9	15.2	Nov. 29, 2001	13.4	BBAQSYS
Bldg1502_MW01 (old)	338378	2499982	25.2	14.9	June 14, 1995	17.2	BBUAQ
Bldg1502_MW02 (new)	337953	2499669	26.7	15.1	Nov. 29, 2001	14.2	BBAQSYS
Bldg1502_MW02 (old)	338382	2499986	25.1	15.0	June 14, 1995	16.6	BBUAQ
Bldg1502_MW03	338386	2499984	25.1	15.0	June 14, 1995	16.7	BBUAQ
Bldg1502_MW04	338386	2499999	24.8	15.0	June 14, 1995	14.4	BBUAQ
Bldg1601_DP01	338066	2499681	25.2	16.6	Oct. 25, 1996	14.2	BBUAQ, BBUCU
Bldg1601_DP02	338057	2499653	26.3	16.8	Oct. 25, 1996	15.3	BBUAQ, BBUCU
Bldg1601_DP03	338058	2499638	26.4	17.0	Oct. 25, 1996	15.4	BBUAQ, BBUCU
Bldg1601_DP04	338014	2499678	26.7	16.9	Oct. 25, 1996	15.7	BBUAQ, BBUCU
Bldg1601_DP05	338039	2499670	26.4	17.0	Oct. 25, 1996	15.4	BBUAQ, BBUCU
Bldg1601_DP06	338047	2499684	25.6	16.5	Oct. 25, 1996	14.6	BBUAQ, BBUCU
Bldg1601_DP07	338072	2499664	25.4	16.7	Oct. 25, 1996	14.4	BBUAQ, BBUCU
Bldg1601_DP08	338054	2499666	25.9	16.9	Oct. 25, 1996	14.9	BBUAQ, BBUCU
Bldg1601_DP09	337988	2499699	26.3	16.7	Oct. 25, 1996	15.3	BBUAQ, BBUCU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
Bldg1601_DP10	338018	2499721	25.2	17.3	Oct. 25, 1996	14.2	BBUAQ, BBUCU
Bldg1601_DP11	338037	2499748	24.6	17.3	Oct. 25, 1996	13.6	BBUAQ, BBUCU
Bldg1601_DP12	338086	2499704	25.2	16.8	Oct. 25, 1996	14.2	BBUAQ, BBUCU
Bldg1601_DP13	338140	2499660	25.7	16.9	Oct. 25, 1996	14.7	BBUAQ, BBUCU
Bldg1601_DP14	338089	2499647	25.6	15.5	Oct. 25, 1996	14.7	BBUAQ, BBUCU
Bldg1601_DP15	338119	2499628	26.0	17.5	Oct. 25, 1996	15.8	BBUAQ, BBUCU
Bldg1601_DP16	338112	2499588	26.2	17.8	Oct. 25, 1996	14.8	BBUAQ, BBUCU
Bldg1607_MW01	337695	2499646	26.8	19.2	Oct. 20, 1993	16.2	BBUAQ, BBUCU
Bldg1607_MW02	337686	2499624	26.6	19.9	Oct. 20, 1993	18.0	BBUAQ, BBUCU
Bldg1607_MW03	337707	2499620	26.7	19.7	Oct. 20, 1993	18.3	BBUAQ, BBUCU
Bldg1854_MW01	334686	2500938	17.5	4.8	Feb. 1996–May 1998	0.6	BBLAQ
Bldg1854_MW02	334642	2500891	17.4	4.6	Feb. 1996–May 1998	0.4	BBLAQ
Bldg1854_MW06	334681	2500965	17.3	4.6	Feb. 1996–May 1998	–28.9	BBLAQ
Bldg1854_MW08	334659	2501165	12.2	4.5	Feb. 1996–May 1998	–31.0	BBLAQ
Bldg1919-1_MW01	345830	2490240	12.4	2.0	Aug. 22, 1994	1.6	BBLAQ
Bldg1919-1_MW02	345835	2490258	12.5	2.1	Aug. 22, 1994	1.6	BBLAQ
Bldg1919-1_MW03	345830	2490249	12.4	2.1	Aug. 22, 1994	1.5	BBLAQ
Bldg1932_MW01	356041	2485062	15.4	4.3	June 22, 1994	7.2	BBLAQ
Bldg1932_MW02	356036	2485036	16.2	3.1	June 22, 1994	5.8	BBLAQ
Bldg1932_MW03	356058	2485042	15.6	3.0	June 22, 1994	1.9	BBLAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
BldgFC102_ MW01 (new)	333482	2503486	21.8	9.8	Nov. 12, 1993	8.7	BBUAQ, BBUCU
BldgFC102_ MW01 (old)	333444	2503463	23.3	13.0	Mar. 25, 1993	10.8	BBUAQ, BBUCU
BldgFC102_ MW02 (new)	333487	2503461	22.0	9.6	Nov. 12, 1993	8.8	BBUAQ, BBUCU
BldgFC102_ MW02 (old)	333494	2503444	21.2	14.3	Mar. 25, 1993	8.7	BBUAQ, BBUCU
BldgFC102_ MW03 (new)	333460	2503472	23.1	9.8	Nov. 12, 1993	9.2	BBUAQ, BBUCU
BldgFC102_ MW03 (old)	333490	2503479	21.1	16.0	Mar. 25, 1993	8.6	BBUAQ, BBUCU
BldgFC201E_ E01	333362	2504283	20.3	13.8	Apr. 1993–Mar. 1994	6.7	BBAQSYS
BldgFC201E_ E02	333346	2504294	20.1	14.1	Apr. 1993–Mar. 1994	7.0	BBAQSYS
BldgFC201E_ E03	333340	2504280	20.1	13.6	Apr. 1993–Mar. 1994	7.0	BBAQSYS
BldgFC201E_ MW04	333321	2504238	20.6	13.0	Mar. 29, 1994	10.8	BBUAQ, BBUCU
BldgFC201E_ MW05	333306	2504336	19.0	13.2	Mar. 29, 1994	10.1	BBUAQ, BBUCU
BldgFC201E_ MW07	333411	2504321	18.1	13.2	Mar. 29, 1994	9.6	BBUAQ, BBUCU
BldgFC201E_ MW10	333405	2504271	17.9	12.8	Mar. 29, 1994	–29.8	BBLAQ
BldgFC201E_ MW13	333406	2504482	18.8	13.4	Mar. 29, 1994	11.8	BBUAQ
BldgFC201E_ MW14	333201	2504297	23.4	13.1	Mar. 29, 1994	13.1	BBUAQ
BldgFC201E_ MW15	333275	2504170	21.5	12.9	Mar. 29, 1994	11.6	BBUAQ
BldgFC201E_ MW16	333448	2504132	15.4	13.2	Mar. 29, 1994	8.4	BBUAQ, BBUCU
BldgFC201W_ MW01	333373	2504174	20.1	13.2	Apr. 1, 1993	7.6	BBAQSYS
BldgFC201W_ MW02	333372	2504159	20.2	14.2	Apr. 1, 1993	7.7	BBAQSYS
BldgFC201W_ MW03	333355	2504165	20.1	13.0	Apr. 1, 1993	7.6	BBAQSYS

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
BldgFC263_ MW01	332081	2504450	20	9.2	Apr. 1995–May 1999	5.0	BBUAQ, BBUCU
BldgFC263_ MW02	332010	2504811	23.1	10.1	Apr. 1995–May 1999	8.1	BBUAQ, BBUCU
BldgFC263_ MW03	331892	2504581	22.4	9.4	Apr. 1995–May 1999	7.4	BBUAQ, BBUCU
BldgFC263_ MW04	332117	2504737	21.5	9.9	Apr. 1995–May 1999	6.5	BBUAQ, BBUCU
BldgFC263_ MW05	331786	2504800	22	9.7	Apr. 1995–May 1999	7.0	BBUAQ, BBUCU
BldgFC263_ MW06	331702	2504632	22.3	9.4	Apr. 1995–May 1999	7.3	BBUAQ, BBUCU
BldgFC263_ MW07	331841	2504506	22.4	9.1	Apr. 1995–May 1999	7.4	BBUAQ, BBUCU
BldgFC263_ MW08	332002	2504462	21.1	9.1	Apr. 1995–May 1999	6.1	BBUAQ, BBUCU
BldgFC263_ MW09	332015	2504334	16	9.0	Apr. 1995–May 1999	1.0	BBUAQ, BBUCU
BldgFC263_ MW10	331901	2504931	22.4	10.2	Apr. 1995–May 1999	7.4	BBUAQ, BBUCU
BldgFC263_ MW11	332006	2504753	22.8	10.0	Apr. 1995–May 1999	7.8	BBUAQ, BBUCU
BldgFC263_ MW12	331928	2504678	23	9.7	Apr. 1995–May 1999	8.0	BBUAQ, BBUCU
BldgFC263_ MW13	331706	2504639	22.3	8.6	Apr. 1995–May 1999	–25.2	BBLAQ
BldgFC263_ MW14	332124	2504732	21.5	9.4	Apr. 1995–May 1999	–26.0	BBLAQ
BldgFC263_ MW16	331940	2504681	23.1	9.7	Apr. 1995–May 1999	–1.0	BBLAQ
BldgFC280_ MW01	333576	2505522	23.0	14.4	Aug. 15, 1997	16.0	BBUAQ
BldgFC281_ MW01	333623	2506017	24.8	17.0	Aug. 12, 1999	15.8	BBUAQ
BldgH19_ MW01	341413	2489976	10.5	2.4	July 2000–Apr. 2001	2.7	BBAQSYS
BldgH19_ MW02	341409	2490000	10.5	4.1	July 2000–Apr. 2001	2.7	BBUCU
BldgH19_ MW03	341408	2490011	10.4	4.0	July 2000–Apr. 2001	2.8	BBUCU
BldgH19_ MW04	341429	2490024	10.5	4.0	July 2000–Apr. 2001	3.5	BBUAQ, BBUCU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
BldgH19_ MW05	341392	2490027	10.4	3.9	July 2000–Apr. 2001	3.0	BBUAQ, BBUCU
BldgH19_ MW06	341401	2490043	10.8	3.9	July 2000–Apr. 2001	3.8	BBUAQ, BBUCU
BldgH19_ MW07	341371	2490017	10.1	2.5	July 2000–Apr. 2001	2.4	BBUAQ, BBUCU
BldgH19_ MW08	341369	2489969	9.7	2.6	Oct. 2000–Jan. 2001	1.2	BBAQSYS
BldgH19_ MW09	341325	2490006	9.8	2.4	July 2000–Apr. 2001	1.3	BBAQSYS
BldgH19_ MW10	341305	2490070	10.7	2.4	July 2000–Apr. 2001	1.4	BBAQSYS
BldgH19_ MW14	341358	2490112	11.2	2.4	July 2000–Apr. 2001	2.5	BBAQSYS
BldgH28_ MW01	341600	2490503	12.0	2.6	May 1992–Apr. 2007	0.6	BBUCU, BBLAQ
BldgH28_ MW02	341532	2490561	12.6	2.7	May 1992–Apr. 2007	1.3	BBUAQ, BBUCU
BldgH28_ MW03	341491	2490534	12.6	2.7	May 1992–Apr. 2007	1.7	BBUAQ, BBUCU
BldgH28_ MW04	341469	2490493	12.7	2.1	May 20, 1992	1.4	BBUAQ, BBUCU
BldgH28_ MW05	341475	2490465	12.2	2.6	May 1992–Apr. 2007	1.2	BBUAQ, BBUCU
BldgH28_ MW06	341524	2490456	12.2	2.7	May 1992–Apr. 2007	4.0	BBUAQ, BBUCU
BldgH28_ MW07	341552	2490454	11.8	2.5	May 1992–Apr. 2007	3.8	BBUAQ, BBUCU
BldgH28_ MW08	341527	2490477	12.3	2.6	Aug. 1991–Apr. 2007	4.6	BBUAQ, BBUCU
BldgH28_ MW09	341529	2490493	12.2	2.7	Aug. 1991–Apr. 2007	4.7	BBUAQ, BBUCU
BldgH28_ MW10	341561	2490515	12.2	2.6	Aug. 1991–Apr. 2007	4.4	BBUAQ, BBUCU
BldgH28_ MW11	341521	2490483	12.4	2.6	July 2000–Apr. 2007	2.8	BBUAQ, BBUCU
BldgH30_ MW01	341377	2491946	8.3	2.4	Apr. 1993–Apr. 2001	2.3	BBUCU
BldgH30_ MW02	341366	2491926	9.2	2.5	Apr. 1993–Apr. 2001	3.2	BBUCU
BldgH30_ MW05	341373	2491944	9.2	2.4	May 1995–Apr. 2001	–18.3	BBLAQ
BldgH30_ MW12	341382	2491928	7.1	2.4	July 2000–Apr. 2001	–0.9	BBUAQ, BBUCU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
BldgHP100_PZ01	340621	2494486	19.8	6.3	Oct. 1, 1998	5.1	BBUCU
BldgHP100_PZ03	340634	2494524	19.9	6.4	Oct. 1, 1998	4.0	BBUCU
BldgHP100_PZ04	340652	2494525	19.8	7.2	Oct. 1, 1998	5.8	BBUCU
BldgHP100_PZ06	340642	2494472	19.8	7.0	Oct. 1, 1998	5.5	BBUCU
BldgHP100_PZ07	340629	2494481	19.8	6.5	Oct. 1, 1998	6.0	BBUCU
BldgHP100_PZ08	340621	2494470	19.9	7.4	Oct. 1, 1998	6.3	BBUCU
BldgHP250_MW01	338414	2494164	20.2	10.7	Aug. 14, 1997	10.2	BBLAQ
BldgLCH4015_MW03	359316	2498658	32.3	27.3	Nov. 1994–Jan. 2008	26.1	BBLAQ, BBLCU
BldgLCH4015_MW04	359298	2498767	32.5	27.4	Nov. 1994–Jan. 2008	26.5	BBLAQ, BBLCU
BldgLCH4015_MW05	359470	2498579	32.0	27.2	Nov. 1994–Jan. 2008	26.6	BBLAQ, BBLCU
BldgLCH4015_MW06	359579	2498605	32.3	26.7	July 1995–Jan. 2008	24.8	BBLAQ, BBLCU
BldgLCH4015_MW07	359549	2498885	33.2	27.6	July 1995–Jan. 2008	25.7	BBLAQ, BBLCU
BldgLCH4015_MW08	359237	2498717	31.6	26.9	July 1995–Jan. 2008	24.1	BBLAQ, BBLCU
BldgLCH4015_MW11	359683	2498682	32.1	25.1	July 1995–Jan. 2008	24.6	BBLAQ, BBLCU
BldgLCH4015_MW12	359763	2498768	33.0	25.4	July 1995–Jan. 2008	25.5	BBLAQ, BBLCU
BldgLCH4015_MW14	359689	2498847	32.9	25.5	July 1995–Jan. 2008	25.4	BBLAQ, BBLCU
BldgLCH4015_MW15	359622	2498955	32.6	25.7	July 1995–Jan. 2008	25.1	BBLAQ, BBLCU
BldgLCH4015_MW16	359441	2498871	33.2	28.0	July 1995–Jan. 2008	25.7	BBLAQ, BBLCU
BldgLCH4015_MW18	359524	2498761	33.4	28.3	July 1995–Jan. 2008	25.9	BBLAQ, BBLCU
BldgLCH4022_MW01	359847	2498526	32.0	27.2	Mar. 1993–July 2001	23.1	BBLAQ, BBLCU
BldgLCH4022_MW03	359824	2498525	32.0	27.1	Mar. 1993–July 2001	22.2	BBLAQ, BBLCU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
BldgLCH4022_MW19	359849	2498517	31.8	26.9	Feb. 1994–July 2001	21.7	BBLAQ, BBLCU, TTAQ
BldgPT5_MW02	342160	2499259	25.3	11.8	Mar. 1995–Nov. 1998	10.3	BBUAQ
BldgPT5_MW03	342350	2499283	24.4	11.0	Mar. 1995–Nov. 1998	9.4	BBUAQ
BldgPT5_MW04	342285	2499240	21.8	11.5	Mar. 1995–Nov. 1998	6.8	BBUAQ
BldgPT5_MW09	342317	2499204	24.5	11.2	Mar. 1995–Nov. 1998	9.5	BBUAQ
BldgS688_MW01	331689	2499543	9.3	3.3	June 24, 1999	2.3	BBUAQ
BldgS2633_MW02	351528	2487691	7.2	1.7	Aug. 1996–Jan. 1998	1.4	BBLAQ, BBLCU
BldgSLCH4019_MW05	360040	2498817	32.1	26.8	May 1995–Feb. 1998	25.1	BBLAQ
BldgSLCH4019_MW06	359958	2498865	32.5	27.0	May 1995–July 1995	25.9	BBLAQ
G-BP06	344876	2504300	34.1	22.8	Aug. 1991–Apr. 1993	16.4	BBUAQ
G-MW03S	347850	2504348	31.3	21.2	Apr. 1992–July 2004	9.0	BBUCU, BBLAQ(?)
G-MW04	347925	2505460	27.6	16.3	Apr. 1992–May 1992	6.1	BBUCU, BBLAQ(?)
G-MW05	347274	2506033	33.9	22.1	Apr. 1992–May 1992	15.3	BBUAQ, BBUCU
G-MW08	344849	2503833	28.5	22.2	Apr. 1992–Apr. 1993	8.6	BBUAQ, BBUCU
G10_MW10	321556	2513512	36.5	30.8	Aug. 23, 2004	22.6	BBUAQ
G10_MW7	335517	2515135	43.4	38.0	Aug. 23, 2004	29.0	BBUAQ
G10_MW8	333118	2507933	30.4	18.6	Aug. 23, 2004	16.2	BBUAQ
G10_MW9	329670	2511451	30.3	18.9	Aug. 23, 2004	15.9	BBUAQ
HP-585	316410	2515140	43.7	31.0	Oct. 10, 2000	–61.4	BUCU, BBLAQ
HP-596	318559	2514652	44.3	34.0	May 27, 1997	–60.7	BBLAQ, BBLCU, TTAQ
HP-629 (old)	323807	2512647	30.0	23.7	1951	–40.2	BBLAQ, BBLCU, TTAQ
HP-661	329695	2509656	28.4	16.0	Mar. 29, 1983	–28.5	BBLAQ, BBLCU, TTAQ
HP-708-4	353080	2514437	37.8	31.9	Oct. 26, 1988	7.3	BBUAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
HPFF_MW01	340257	2501610	28.5	23.3	Nov. 1995–Oct. 2008	18.5	BBAQSYS
HPFF_MW02	340199	2501767	29.6	22.7	Nov. 1995–Oct. 2008	19.5	BBAQSYS
HPFF_MW03	340019	2502168	29.1	21.4	Nov. 1995–Oct. 2008	17.8	BBAQSYS
HPFF_MW04	339386	2501999	31.4	21.5	Nov. 1995–Oct. 2008	21.0	BBAQSYS
HPFF_MW05	339612	2501160	26.8	20.2	Nov. 1995–Oct. 2008	17.4	BBAQSYS
HPFF_MW06	339981	2502015	28.4	20.1	Nov. 1995–Oct. 2008	–19.1	BBLAQ
HPFF_MW07	340211	2501550	28.0	19.0	Nov. 1995–Oct. 2008	–18.6	BBLAQ
HPFF_MW09	339614	2501162	26.9	18.4	Nov. 1995–Oct. 2008	–20.3	BBLAQ
HPFF_MW14	339850	2501344	27.2	21.5	Aug. 1997–Mar. 2009	16.9	BBAQSYS
HPFF_MW15	339659	2501560	27.7	21.1	Aug. 1997–Oct. 2008	17.4	BBAQSYS
HPFF_MW16	340056	2500995	28.1	20.6	Aug. 1997–Mar. 2009	17.2	BBAQSYS
HPFF_MW17	339858	2501207	28.0	19.4	Aug. 1997–Mar. 2009	17.6	BBAQSYS
HPFF_MW18	339779	2500856	26.3	18.9	Aug. 1997–Jan. 2000	16.1	BBAQSYS
HPFF_MW19	339607	2501329	26.3	20.9	Aug. 1997–Mar. 2009	16.2	BBAQSYS
HPFF_MW20	339934	2502088	29.6	21.0	Aug. 1997–Mar. 2009	18.3	BBAQSYS
HPFF_MW21	340069	2501314	27.5	22.8	Jan. 2000–Oct. 2008	17.9	BBAQSYS
HPFF_MW22	340042	2501490	27.2	22.4	Jan. 2000–Mar. 2009	17.9	BBAQSYS
HPFF_MW23	339929	2501093	26.5	18.4	Jan. 2000–Oct. 2008	18.6	BBAQSYS
HPFF_MW24	339901	2501117	27.4	20.1	Jan. 2000–Mar. 2009	20.6	BBAQSYS
HPFF_MW25	339823	2501146	28.8	19.7	Jan. 2000–May 2003	20.6	BBAQSYS
HPFF_MW26	339647	2501002	31.6	19.1	Jan. 2000–Aug. 2001	21.3	BBAQSYS
HPFF_MW27	340011	2500932	30.5	19.3	Feb. 2000–July 2002	21.5	BBAQSYS
HPFF_MW28	339720	2501282	27.3	20.8	Jan. 2000–Mar. 2009	18.1	BBAQSYS
HPFF_MW29	339656	2501478	27.2	21.1	Jan. 2000–Mar. 2009	18.5	BBAQSYS
HPFF_MW30	339554	2501472	27.3	22.2	Jan. 2000–Mar. 2009	19.3	BBAQSYS
HPFF_MW31	339288	2501158	28.7	19.9	Jan. 2000–Oct. 2008	19.0	BBAQSYS
HPFF_MW32	339169	2501038	29.7	19.8	Jan. 2000–May 2003	19.7	BBAQSYS
HPFF_MW33	339024	2500863	29.4	19.1	Jan. 2000–July 2002	21.3	BBAQSYS
HPFF_MW34	339220	2500685	26.2	18.0	Jan. 2000–May 2003	16.7	BBAQSYS
HPFF_MW35	339385	2500872	27.6	18.8	Feb. 2000–Oct. 2008	17.2	BBAQSYS
HPFF_MW36	339593	2500732	26.8	18.8	Feb. 2000–Oct. 2008	17.3	BBAQSYS
HPFF_MW37	339386	2500484	26.0	18.5	Feb. 2000–Oct. 2008	17.0	BBAQSYS
HPFF_MW38	339662	2502012	30.1	22.8	Feb. 2000–Aug. 2007	19.9	BBAQSYS
HPFF_MW40	339443	2501509	27.2	22.1	Mar. 2000–Oct. 2008	17.4	BBAQSYS
HPFF_MW41	339300	2501450	29.4	21.2	Mar. 2000–Mar. 2009	19.1	BBAQSYS
HPFF_MW42	339297	2501352	28.9	21.4	Mar. 2000–Mar. 2009	17.2	BBAQSYS
HPFF_MW44	339663	2499432	22.2	14.1	July 2002–Oct. 2008	–24.9	BBLAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Brewster Boulevard aquifer system—Continued							
HPFF_MW47	340208	2500129	25.0	15.1	July 2002–Oct. 2008	–22.5	BBLAQ
HPFF_MW48	340727	2500616	23.7	17.0	July 2002–Oct. 2008	13.5	BBUAQ
HPFF_MW50	340730	2500598	23.5	16.3	July 2002–Oct. 2008	–24.4	BBLAQ
HPFF_MW51	340629	2500855	26.9	17.7	July 2002–Oct. 2008	17.8	BBUAQ
HPFF_MW53	340585	2501197	27.6	17.7	July 2002–Oct. 2008	–19.6	BBLAQ
HPFF_MW57	339369	2500476	26.3	16.8	July 2002–Oct. 2008	–21.5	BBLAQ
HPFF_MW61	339887	2501360	27.0	17.6	July 2002–Oct. 2008	–20.0	BBLAQ
HPFF_MW63	339021	2500874	29.3	15.9	July 2002–Oct. 2008	–19.8	BBLAQ
HPFF_MW64	339668	2501566	27.9	18.3	July 2002–May 2003	–19.4	BBLAQ
HPFF_MW66	339379	2501437	28.4	18.3	July 2002–Oct. 2008	–20.0	BBLAQ
HPFF_MW68	339441	2501492	27.1	20.8	July 2002–Oct. 2008	12.2	BBAQSYS
HPFF_MW69	339650	2501863	29.9	18.3	July 2002–Oct. 2008	–17.6	BBLAQ
HPFF_MW70	339398	2501988	31.2	19.4	July 2002–Oct. 2008	–16.7	BBLAQ
HPGW22-1	339740	2501585	29.7	20.6	July 1984–Mar. 2009	12.5	BBAQSYS
HPGW22-2	340154	2501031	26.3	20.4	July 1984–Mar. 2009	11.2	BBAQSYS
TankS781_ MW01 (O&G)	361436	2495348	17.7	4.3	Jan. 31, 1992	5.2	BBLAQ, BBLCU
TankS781_ MW03 (O&G)	361430	2495235	14.9	3.7	Dec. 1991–Jan. 1992	4.9	BBLAQ, BBLCU
TankS781_ MW05 (O&G)	361589	2495398	16.0	3.7	Dec. 1991–Jan. 1992	6.0	BBLAQ, BBLCU
TankS781_ MW09 (O&G)	361217	2494823	10.6	2.8	Dec. 1991–Jan. 1992	0.7	BBLAQ
TankS781_ MW11 (O&G)	361168	2495225	16.3	8.2	Dec. 1991–Jan. 1992	6.3	BBLAQ, BBLCU
TankS781_ MWA (D&D)	361523	2495253	12.3	4.5	Jan. 31, 1992	–4.2	BBLAQ
TankS781_ MWB (D&D)	361560	2495277	11.8	4.6	Jan. 31, 1992	0.2	BBLAQ
Tarawa Terrace aquifer							
01-GW16DW	332642	2501970	20.5	6.5	May 9, 1994	–93.7	TTAQ
01-GW17DW	333674	2502775	19.0	8.3	July 1996–Jan. 1998	–93.4	TTAQ
78-GW04-2	337543	2499463	29.1	10.2	Jan. 1991–July 2002	–42.4	TTAQ
78-GW09-2	337995	2499690	26.7	12.8	Jan. 1991–Jan. 1999	–39.7	BBLCU, TTAQ
78-GW17-2	339198	2501229	29.6	17.3	Nov. 1986–Oct. 2008	–33.6	BBLCU TTAQ
78-GW24-2	341169	2502808	29.8	20.3	Jan. 1991–July 2002	–35.8	BBLCU TTAQ
78-GW30-2	340967	2502302	29.9	18.1	Jan. 1991–Feb. 1993	–41.5	TTAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Tarawa Terrace aquifer—Continued							
78-GW31-2	338998	2500434	26.2	15.1	Jan. 1991–Oct. 2008	–45.0	TTAQ
78-GW32-2	339494	2501261	26.2	17.1	Jan. 1991–Mar. 2009	–43.5	TTAQ
80-MW01	356371	2485201	15.3	3.3	June 1991–Dec. 1995	0.7	BBLCU, TTAQ
80-MW02	356456	2485245	16.1	2.7	June 1991–Dec. 1995	0.2	BBLCU, TTAQ
80-MW03	356013	2485194	14.4	5.1	June 1991–Dec. 1995	4.8	BBLCU, TTAQ
80-MW04	356067	2484971	14.5	3.2	Dec. 1994–Dec. 1995	–5.3	BBLCU, TTAQ
80-MW05	356293	2485251	16.0	3.4	Dec. 1994–Dec. 1995	–3.3	BBLCU, TTAQ
80-MW06	356415	2485411	17.0	3.2	Dec. 1994–Dec. 1995	–1.9	BBLCU, TTAQ
80-MW07	355886	2485254	15.7	3.9	Dec. 1994–Dec. 1995	–3.8	BBLCU, TTAQ
80-MW08	356233	2484893	11.6	2.6	July 1995–Dec. 1995	–2.5	BBLCU, TTAQ
84-MW16 (Baker)	361519	2495466	20.2	5.0	Aug. 7, 2001	5.1	TTAQ
88-MW02DW	339364	2496466	26.4	8.6	May 1997–July 2002	–67.9	TTAQ, UCHCU
88-MW03DW	339508	2496540	25.1	9.4	May 1997–July 2002	–56.6	TTAQ
88-MW04DW	339090	2496474	24.9	9.8	May 1997–July 2002	–57.5	TTAQ, UCHCU
88-MW05DW	339601	2496397	23.8	9.4	May 1997–July 2002	–57.8	TTAQ, UCHCU
Bldg45_MW06 (Law)	361360	2495631	20.0	5.3	Jan. 1993–May 2006	–27.0	TTAQ
Bldg45_MW09 (Law)	361312	2495579	21.1	5.2	Jan. 1993–May 2006	–27.4	TTAQ
Bldg45_MW21 (Law)	361260	2495281	18.2	5.0	Dec. 2003–May 2006	–28.1	TTAQ
Bldg45_MW22 (Law)	361111	2495586	22.5	4.0	July 1998–May 2002	–25.7	TTAQ
Bldg645_MW01	356452	2497349	26.1	16.0	Nov. 1994–Apr. 2008	9.9	BBLCU, TTAQ
Bldg645_MW02	356437	2497363	26.6	16.1	Nov. 1994–Apr. 2008	10.0	BBLCU, TTAQ
Bldg645_MW03	356458	2497372	27.3	16.1	Nov. 1994–Apr. 2008	11.9	BBLCU, TTAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Tarawa Terrace aquifer—Continued							
Bldg645_MW05	356621	2497448	27.9	17.0	Nov. 1994–Apr. 2008	10.8	BBLCU, TTAQ
Bldg645_MW09	356464	2497375	27.4	16.1	Mar. 9, 2004	–19.3	TTAQ
Bldg645_MW10	356193	2497271	28.3	16.1	Mar. 9, 2004	–19.0	TTAQ
Bldg645_MW11	356536	2497400	27.8	16.3	Mar. 9, 2004	–17.7	TTAQ
Bldg645_MW13	356534	2497400	27.8	16.5	Mar. 9, 2004	–2.1	TTAQ
Bldg645_MW14	356192	2497263	28.3	16.1	Mar. 9, 2004	1.2	TTAQ
Bldg645_MW20	356277	2497148	27.5	16.3	Mar. 9, 2004	–18.5	TTAQ
Bldg645_MW23	356453	2497413	29.2	18.0	Dec. 2005–July 2007	9.1	BBLCU, TTAQ
Bldg820_MW07	349549	2494901	25.5	12.7	Dec. 1992–Mar. 2009	–22.4	TTAQ
Bldg820_MW09	349798	2494713	30.1	11.2	Dec. 1992–Mar. 2009	–17.8	TTAQ
Bldg820_MW17	349785	2494495	29.9	11.8	Apr. 1994–Mar. 2009	–16.6	TTAQ
Bldg820_MW19	349622	2494493	29.8	11.9	Apr. 1994–Oct. 2007	–17.5	TTAQ
Bldg820_MW21	349431	2494608	29.8	11.7	Apr. 1994–Mar. 2009	–17.2	TTAQ
Bldg820_MW23	349319	2494766	28.9	13.0	Apr. 1994–Mar. 2009	–17.6	TTAQ
Bldg820_MW25	349307	2494961	28.4	13.0	Apr. 1994–Mar. 2009	–19.2	TTAQ
Bldg1115_MW22	340244	2500473	25.1	15.7	July 1995–Mar. 2009	–53.4	TTAQ
Bldg1115_MW23	340138	2501039	26.5	17.1	July 1995–Oct. 2008	–53.0	TTAQ
Bldg1115_MW24	339864	2500373	26.1	15.8	July 1995–Oct. 2008	–51.6	TTAQ
Bldg1115_MW25	340077	2500691	25.9	16.4	July 1995–Oct. 2008	–51.7	TTAQ
BldgH19_MW11	341301	2490071	10.8	2.6	July 2000–Apr. 2001	–27.0	TTAQ
BldgH19_MW13	341385	2490037	10.5	2.6	July 2000–Apr. 2001	–26.6	TTAQ
BldgLCH4015_MW13	359756	2498774	33.0	10.5	July 1995–Jan. 2008	–14.5	TTAQ
BldgLCH4015_MW19	359521	2498765	33.4	6.6	July 1995–Jan. 2008	–14.1	TTAQ
BldgLCH4015_MW20	359412	2498673	32.4	6.4	July 1995–Jan. 2008	–15.1	TTAQ
BldgLCH4015_MW21	359517	2498758	33.1	7.8	June 2001–Jan. 2008	4.4	TTAQ
BldgLCH4015_MW22	359410	2498679	32.4	7.7	June 2001–Jan. 2008	3.0	TTAQ
BldgLCH4015_MW23	359413	2498754	33.2	7.8	June 2001–Jan. 2008	3.7	TTAQ
BldgS2633_MW06DW	351498	2487694	5.9	3.4	Jan. 28, 1998	–25.7	TTAQ
BldgSLCH4019_MW04	360151	2499082	31.0	3.2	May 1995–July 1995	–16.5	TTAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Tarawa Terrace aquifer—Continued							
BldgSLCH4019_MW10	360034	2498812	32.0	2.6	May 1995–July 1995	–12.5	TTAQ
HP-595	319705	2514271	40.1	33.0	Aug. 12, 1997	–130.5	TTAQ
HP-620	353181	2506668	34.6	14.0	Sept. 28, 1944	–15.1	TTAQ
HPFF_MW10	339828	2501690	33.4	18.2	Aug. 1997–Oct. 2008	–45.1	TTAQ
HPFF_MW43	339657	2499441	22.8	13.2	July 2002–Oct. 2008	–54.9	TTAQ
HPFF_MW45	340193	2500149	25.2	15.2	July 2002–Mar. 2009	–52.5	TTAQ
HPFF_MW49	340709	2500603	23.4	15.8	July 2002–Oct. 2008	–53.6	TTAQ
HPFF_MW55	340583	2501202	27.6	18.4	July 2002–Oct. 2008	–49.5	TTAQ
HPFF_MW58	339890	2500999	26.2	17.4	July 2002–Oct. 2008	–51.2	TTAQ
HPFF_MW59	340220	2501522	27.6	18.4	July 2002–Oct. 2008	–49.5	TTAQ
HPFF_MW65	339743	2501580	29.6	18.1	July 2002–Oct. 2008	–47.4	TTAQ
HPFF_MW67	339384	2501436	28.0	17.3	July 2002–Nov. 2008	–50.1	TTAQ
HPFF_MW71	339389	2501979	31.2	17.9	July 2002–Oct. 2008	–46.8	TTAQ
TankS781_MW02 (O&G)	361436	2495348	17.7	3.8	Dec. 1991–Jan. 1992	–7.3	TTAQ
TankS781_MW04 (O&G)	361430	2495235	14.9	3.6	Dec. 1991–Jan. 1992	–10.1	TTAQ
TankS781_MW06 (O&G)	361589	2495398	16.0	3.5	Dec. 1991–Jan. 1992	–9.0	TTAQ
TankS781_MW08 (O&G)	361717	2495105	7.1	2.9	Dec. 1991–Jan. 1992	–17.9	TTAQ
TankS781_MW10 (O&G)	361217	2494823	10.6	2.7	Dec. 1991–Aug. 2001	–14.4	TTAQ
TankS781_MW12 (O&G)	361168	2495225	16.3	4.3	Dec. 1991–Jan. 1992	–8.7	TTAQ
TankS781_MW14 (O&G)	361610	2494936	5.9	2.7	Dec. 1991–Jan. 1992	–16.1	TTAQ
Upper Castle Hayne confining unit							
06-GW01D	348137	2503363	31.3	12.0	Nov. 7, 1992	–76.3	UCHCU
06-GW02DW	347220	2503760	35.5	15.7	Nov. 1992–Jan. 2004	–78.0	UCHCU, UCHRBU
Upper Castle Hayne aquifer							
06-GW07DW	344336	2502082	17.0	13.1	Nov. 1992–Apr. 1998	–77.6	UCHCU(?), UCHRBU
06-GW15D	347767	2503174	25.2	7.0	Aug. 1997–July 2003	–124.6	UCHLU
06-GW27DW	348316	2502449	22.6	9.3	Nov. 7, 1992	–82.1	UCHRBU
06-GW28DW	348677	2502849	28.4	9.6	Nov. 7, 1992	–80.7	UCHRBU
06-GW30DW	349532	2503730	9.6	10.1	Apr. 1, 1993	–84.9	UCHRBU
06-GW35D	349394	2501254	13.0	9.1	Apr. 1, 1993	–87.8	UCHRBU
06-GW37DW	348037	2501703	14.1	9.1	Apr. 1, 1993	–71.4	UCHCU(?), UCHRBU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Upper Castle Hayne aquifer—Continued							
06-GW40DW	348563	2503536	16.6	6.2	July 30, 2002	–90.9	UCHRBU
06-GW43DW	347960	2501527	8.2	7.0	July 2001–July 2004	–72.5	UCHCU(?), UCHRBU
09-GW07D	343333	2502729	26.8	13.4	Sept. 1992–Apr. 1993	–77.9	UCHRBU
28-GW01DW	331870	2498323	1.1	1.4	May 1994–Jan. 1998	–119.0	UCHCU(?), UCHRBU
28-GW07DW	331745	2499147	5.8	2.3	May 1994–Jan. 1998	–117.9	UCHCU(?), UCHRBU
28-GW09DW	332857	2498262	6.5	2.5	May 10, 1994	–114.0	UCHCU(?), UCHRBU
78-642-1	339211	2504048	28.9	21.0	Apr. 9, 1987	–121.1	UCHAQ[4], MCHCU
78-642-2	338741	2504161	30.1	20.0	Apr. 9, 1987	–119.9	UCHAQ, MCHCU
78-GW04-3	337577	2499436	28.4	10.5	Feb. 1991–Aug. 1993	–117.8	Local CU, UCHLU
78-GW09-3	337995	2499836	24.6	14.4	Feb. 1991–July 2002	–115.2	UCHRBU, Local CU
78-GW17-3	339236	2501288	29.5	18.0	July 19, 1987	–110.5	UCHRBU, Local CU
78-GW24-3	341153	2502785	29.9	20.0	Jan. 1991–July 2002	–107.6	UCHRBU, Local CU
78-GW30-3	340929	2502409	30.7	17.9	Jan. 1991–Feb. 1993	–116.5	Local CU
78-GW31-3	338983	2500417	26.0	15.4	Jan. 1991–Oct. 2008	–120.1	Local CU
78-GW32-3	339474	2501278	26.6	17.4	Jan. 1991–Oct. 2008	–119.2	UCHRBU
80-MW03IW	355988	2485152	14.7	2.8	Dec. 1994–Dec. 1995	–50.1	UCHRBU
Bldg645_MW15	356445	2497372	27.0	15.1	Mar. 9, 2004	–49.7	UCHRBU
Bldg645_MW16	356255	2497229	28.8	15.7	Mar. 9, 2004	–48.3	UCHRBU
Bldg645_MW17	356418	2497205	27.7	15.5	Mar. 9, 2004	–49.0	UCHRBU
Bldg645_MW18	356462	2497584	29.6	18.5	Mar. 9, 2004	–47.3	UCHRBU
Bldg645_MW21	356530	2497270	23.4	16.0	Mar. 9, 2004	–54.1	UCHRBU
Bldg645_MW22	356450	2497412	29.1	15.6	Mar. 9, 2004	–48.3	UCHRBU
Bldg645_MW26	356309	2497438	27.8	15.6	Jan. 8, 2007	–49.7	UCHRBU
Bldg645_MW27	356328	2497664	30.7	14.8	Jan. 8, 2007	–47.7	UCHRBU
Bldg645_MW28	356538	2497414	27.7	15.0	Jan. 8, 2007	–51.1	UCHRBU
Bldg645_MW29	356533	2497577	26.6	14.7	Jan. 8, 2007	–50.1	UCHRBU
Bldg645_MW30	356479	2497692	30.0	23.2	Jan. 8, 2007	–47.2	UCHRBU
Bldg645_MW31	356470	2497589	29.3	13.1	Jan. 8, 2007	–69.6	UCHRBU
Bldg645_MW32	356213	2497539	29.7	15.0	Jan. 8, 2007	–47.0	UCHRBU
Bldg820_MW09D	349790	2494709	30.1	12.4	Sept. 2001–Mar. 2009	–65.4	UCHRBU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Upper Castle Hayne aquifer—Continued							
HP-5186	354532	2496971	31.1	12.0	Oct. 17, 1988	–72.4	UCHRBU
HP-611 (new)	339383	2510267	38.7	33.6	Apr. 1, 1997	–112.5	UCHAQ, MCHCU
HP-612 (new)	338959	2511877	40.3	32.9	Apr. 29, 1007	–118.0	UCHAQ, MCHCU
HP-614 (new)	353675	2512183	37.1	28.0	Dec. 20, 1994	–90.9	UCHAQ
HP-627 (new)	354035	2508321	34.2	19.0	May 7, 1995	–85.8	UCHRBU &LU, MCHCU
HP-650	354220	2510613	37.3	26.9	Nov. 1971–Apr. 1987	–93.1	UCHRBU &LU
HP-652	339894	2507078	32.3	26.5	Jan. 1972–Apr. 1987	–100.1	UCHRBU &LU
HP-663	352709	2510880	36.0	19.0	May 5, 1986	–119.0	UCHAQ
HP-698	355871	2492416	23.3	10.0	Dec. 16, 1985	–80.7	UCHAQ
HP-699	355567	2490438	23.1	8.0	Jan. 22, 1986	–80.9	UCHAQ
HP-700	355278	2488526	23.0	4.5	Feb. 1986–Apr. 1987	–92.0	UCHRBU &LU
HP-701	353547	2487696	20.8	5.0	Feb. 26, 1986	–64.2	UCHRBU &LU
HP-704	359582	2495665	26.5	6.0	Mar. 1986–Apr. 1987	–72.5	UCHAQ
HP-705	356209	2501256	39.3	16.0	May 15, 1986	–100.7	UCHAQ
HP-706	355944	2502989	39.6	19.0	Apr. 21, 1986	–111.4	UCHAQ
HP-707	353837	2492298	25.1	10.0	May 15, 1986	–85.0	UCHAQ
HP-708	353096	2514446	38.1	31.1	Apr. 1986–Apr. 1987	–111.2	UCHAQ
HP-709	351280	2505651	28.0	13.0	Mar. 20, 1986	–97.0	UCHAQ
HP-710	351493	2507772	32.1	13.5	Apr. 1986–Oct. 1986	–92.9	UCHRBU &LU
HP-711	352140	2509201	34.9	17.5	May 1986–Oct. 1986	–95.1	UCHCU, UCHRBU
HPFF_MW46	340216	2500150	25.3	15.0	July 2002–Oct. 2008	–122.4	Local CU
HPFF_MW52	340580	2501196	27.6	18.2	July 2002–Oct. 2008	–119.6	Local CU
HPFF_MW56	340102	2500509	26.6	17.1	July 2002–Oct. 2008	–121.1	Local CU
HPFF_MW60	339869	2501342	27.0	18.1	July 2002–Mar. 2009	–120.2	Local CU
HPFF_MW62	339476	2501269	27.4	15.1	July 2002–Oct. 2008	–125.1	Local CU
LCH-4009	358539	2499677	33.0	16.8	May 16, 1983	–69.2	UCHRBU, Local CU
R(1950)	353534	2484804	20.4	8.0	Mar. 25, 1942	–35.0	UCHRBU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of upper-most open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Upper Castle Hayne aquifer—Continued							
S190A	353872	2487628	21.4	2.0	June 6, 1988	–80.6	UCHRBU, Local CU
SOW4	343470	2503238	20.0	15.0	Apr. 7, 1987	–85.0	UCHRBU
X24S1	346814	2495687	20.7	3.6	July 1987–Oct. 2004	–66.4	UCHRBU
X24S6	347374	2495466	25.5	5.8	June 1987–July 2005	–101.5	UCHLU
Middle Castle Hayne aquifer							
HP-618 (new)	352211	2517893	33.0	20.0	Mar. 31, 1997	–172.0	MCHAQ
06-GW01DA	348320	2503384	29.1	10.3	July 11, 2001	–195.7	MCHAQ
06-GW01DB	348124	2503419	32.3	7.5	Jan. 20, 2004	–219.4	MCHAQ
06-GW27DA	348303	2502436	22.5	7.1	July 30, 2002	–208.2	MCHAQ
06-GW38D	347788	2502571	29.1	8.7	Aug. 1997–Jan. 2004	–235.7	MCHAQ
06-GW39D	347729	2501175	11.8	5.9	July 2000–July 2003	–182.7	MCHAQ
06-GW40DA	348584	2503544	16.1	11.5	July 11, 2001	–211.7	MCHAQ
Multi-aquifer data							
84-MW17 (Baker)	361448	2495309	16.4	5.9	Aug. 7, 2001	4.0	BBLAQ, TTAQ
84-MW19 (Baker)	361296	2495251	17.6	4.4	Aug. 7, 2001	4.3	BBLAQ, TTAQ
84-MW20 (Baker)	361584	2495131	8.4	3.2	Aug. 7, 2001	1.6	BBLAQ, TTAQ
84-MW21 (Baker)	361258	2495406	21.2	12.1	Aug. 7, 2001	11.4	BBLAQ, TTAQ
84-MW22 (Baker)	361414	2495374	19.5	4.7	Aug. 7, 2001	4.9	BBLAQ, TTAQ
84-MW23 (Baker)	361951	2494960	5.2	2.0	Aug. 7, 2001	–1.7	BBLAQ, TTAQ
BldgPT37_ MW01	343290	2497150	21.1	4.9	June 24, 1999	1.1	BBLAQ, TTAQ
HP-37	341418	2489651	10.5	0.9	Aug. 2, 1942	–57.8	TTAQ, UCHRBU
HP-557	352980	2519748	34.8	26.0	Dec. 9, 1988	–107.7	UCHLU, MCHAQ
HP-558	353451	2521375	39.3	28.0	Jan. 20, 1999	–125.2	UCHLU, MCHCU, MCHAQ
HP-601	339693	2499568	22.7	15.4	Sept. 1, 1941	–29.5	BBLCU, UCHCU, UCHRBU &LU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of upper-most open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Multi-aquifer data—Continued							
HP-602	340638	2500652	24.6	14.1	Nov. 1941–Apr. 1987	–50.0	TTAQ, UCHCU UCHRBU &LU, MCHAQ
HP-603	338762	2498518	25.1	11.6	Dec. 23, 1958	–50.2	TTAQ, UCHCU UCHRBU &LU, MCHAQ
HP-604	343071	2501865	31.5	16.0	1941(?)	–66.3	UCHRBU &LU, MCHAQ
HP-605	338997	2504185	30.7	19.0	Nov. 1, 1941	–42.0	BBLCU, TTAQ, UCHCU, UCHRBU &LU, MCHCU, MCHAQ
HP-606	336849	2505409	31.9	17.3	Dec. 1, 1941	–53.2	TTAQ, UCHRBU &LU, MCHAQ
HP-607 (new)	352494	2496994	31.1	8.0	Aug. 21, 1984	–93.9	UCHRBU &LU, MCHAQ
HP-607 (old)	337925	2502102	27.0	15.0	1942(?)	–36.0	BBLCU, UCHCU, UCHRBU &LU, MCHCU
HP-608	337098	2499607	29.9	10.2	1942(?)–Apr. 1987	–41.6	TTAQ, UCHCU, UCHRBU &LU
HP-609	334393	2506828	29.7	18.7	Apr. 1942–Apr. 1987	–43.2	BBLAQ, TTAQ
HP-610	345268	2501654	27.5	12.4	Apr. 1942–Apr. 1987	–37.1	TTAQ, UCHRBU &LU, MCHAQ
HP-611 (old)	350816	2495437	30.5	15.5	June 27, 1942	–35.0	TTAQ, UCHRBU &LU, MCHAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Multi-aquifer data—Continued							
HP-612 (old)	352428	2496995	30.6	15.0	June 22, 1942	–33.2	TTAQ, UCHRBU &LU, MCHAQ
HP-613	352946	2499350	20.1	9.3	May 14, 1986	–43.8	TTAQ, UCHRBU &LU
HP-614 (old)	353455	2494270	31.9	13.4	Aug. 1, 1942	–31.6	UCHRBU &LU, MCHAQ
HP-615	354285	2496367	30.6	14.7	July 2, 1942	–34.3	UCHCU, UCHRBU &LU, Local CU
HP-616	354772	2498638	32.8	13.3	Aug. 3, 1942	–71.7	UCHRBU &LU, MCHAQ
HP-619 (new)	352646	2515872	38.3	30.0	Nov 1, 1994	–101.7	UCHAQ, MCHAQ
HP-621 (new)	353846	2505434	40.9	8.0	May 17, 1995	–89.1	UCHRBU &LU
HP-622	353257	2494310	30.9	16.1	May 19, 1983	–81.4	UCHRBU, MCHAQ
HP-623	350823	2495593	30.2	14.6	Sept. 1986–Apr. 1987	–40.2	TTAQ, UCHRBU &LU, Local CU, MCHAQ
HP-624	333975	2502633	15.5	4.5	Sept. 11, 1951	–38.5	BBLAQ, BBLCU, TTAQ, UCHRBU
HP-625	332687	2505415	26.7	9.0	Sept. 4, 1969	–60.8	BBLCU, TTAQ, UCHCU, UCHRBU
HP-628 (new)	331932	2508385	23.6	10.0	Oct. 2, 1984	–41.4	BBLAQ, TTAQ
HP-630	338021	2502304	28.0	16.0	Oct. 1985–Aug. 1986	–30.7	BBLCU, UCHCU, UCHRBU &LU, Local CU
HP-631	339933	2506952	32.4	25.8	Mar. 1953–June 1953	–36.1	BBLCU, TTAQ, Local CU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of upper-most open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Multi-aquifer data—Continued							
HP-633	349702	2500647	25.2	7.6	Oct.1986–Apr. 1987	–34.4	TTAQ, UCHRBU &LU, MCHAQ
HP-634	340948	2503179	30.6	20.3	Oct.1986–Apr. 1987	–39.2	TTAQ, UCHCU, UCHRBU &LU, Local CU
HP-635	343426	2503346	19.4	17.0	Apr. 7, 1987	–49.8	TTAQ, UCHRBU &LU, Local CU, MCHCU, MCHAQ
HP-636	345819	2503608	28.5	15.8	Oct. 22, 1959	–66.2	UCHCU, UCHRBU &LU, MCHCU, MCHAQ
HP-637	342990	2501856	32.4	14.2	May 1986–Apr. 1987	–60.9	UCHRBU &LU, MCHAQ
HP-638	333067	2502563	24.8	5.8	Oct. 21, 1986	–84.1	TTAQ, UCHRBU
HP-641	353038	2504147	34.8	15.2	Oct.1986–Apr. 1987	–76.8	UCHCU, UCHRBU &LU
HP-642	339034	2504141	31.4	22.7	Apr. 8, 1987	–85.5	UCHAQ, MCHCU, MCHAQ
HP-643	356093	2494391	28.5	13.2	Mar. 1971–Apr. 1987	–64.0	UCHRBU &LU, LCHAQ
HP-644	356265	2495875	30.5	10.4	July 1971–Apr. 1987	–61.8	UCHRBU, LCHAQ
HP-645	356438	2497358	26.3	10.1	Aug. 1971–Apr. 1987	–67.6	UCHRBU &LU, MCHAQ
HP-646	357770	2497948	28.9	8.0	June 23, 1971	–65.5	UCHRBU, MCHAQ, LCH-CU(?)
HP-647	356335	2499469	30.7	10.3	Jan. 1972–Apr. 1987	–79.7	UCHRBU, MCHAQ

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Multi-aquifer data—Continued							
HP-648	355229	2506806	33.4	23.1	Aug. 1971–Apr. 1987	–81.2	UCHRBU, MCHAQ
HP-649	354769	2508706	37.3	20.9	Oct.1971–Apr. 1987	–93.1	UCHRBU &LU, MCHAQ
HP-651	348083	2503829	30.1	13.7	Dec. 1971–Apr. 1987	–98.0	UCHRBU &LU, MCHAQ
HP-653	351211	2503838	30.4	14.9	July 15, 1978	–91.2	UCHRBU &LU, MCHAQ
HP-654	352912	2502123	32.1	19.2	May 16, 1978	–50.8	TTAQ, UCHRBU &LU, MCHAQ
HP-660	339652	2499482	23.5	11.5	Nov. 21, 1983	–71.7	UCHCU, UCHRBU &LU
HP-662	327419	2510912	13.7	14.0	Aug. 18, 1983	–112.3	TTAQ, UCHRBU &LU
HP-703	358143	2496446	29.5	9.0	Mar. 1985–Feb. 1986	–63.0	UCHRBU &LU
SOW2	335879	2496215	12.1	9.0	Apr. 8, 1987	–15.5	BBLAQ, UCHRBU
SOW3	352931	2499346	19.9	9.0	July 1, 1980	–5.1	BBLAQ, TTAQ
HPFF_MW11	339809	2501708	33.3	18.3	Aug. 1997–Oct. 2008	–75.4	TTAQ, UCHCU
HPFF_MW12	339867	2501359	27.2	17.6	Aug. 1997–Oct. 2008	–80.8	TTAQ, UCHCU
HPFF_MW13	340106	2500518	26.5	15.9	Aug. 1997–Oct. 2008	–81.4	TTAQ, UCHCU
06-GW36D	350271	2502282	14.6	12.4	Apr. 1, 1993	–70.3	TTAQ, UCHCU, UCHRBU
LCH-4007	357219	2501452	41.3	13.4	Dec. 1956–Apr. 1987	–19.4	TTAQ, UCHCU, UCHAQ, MCHCU
M-1	358656	2499538	32,6	22.8	Sept. 16, 1941	0.2	BBLCU, TTAQ, UCHCU, UCHRBU

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of upper-most open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					
Multi-aquifer data—Continued							
M-2	357175	2501411	40.9	17.4	Mar. 30, 1942	–13.1	TTAQ, UCHCU, UCHAQ
G-MW03D	347811	2504501	33.2	15.3	Apr. 1993–Jan. 2004	–73.4	UCHCU, UCHRBU

[1] See Plate C1 (Faye et al. 2010) and Figure A.2–3 for CERCLA (IRP) and RCRA site locations.

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983.

Data sources:

Well data files of the U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

CERCLA Administrative Record files #125, #258, #269, #329, #331, #345, #382, #387, #388, #522, #1271, #1272, #1273, #1499, #1500, #1503, #1516, #1543, #1697, #1699, #1749, #1771, #1772, #1774, #1777, #1778, #1779, #1793, #1977, #2017, #2296, #2300, #2304, #2310, #2320, #2321, #2328, #2334, #2338, #2608A, #2609A, #2610A, #2613, #2802, #3061, #3159, #3165, #3187, #3266, #3268, #3272, #3273, #3276, #3288, #3290, #3293, #3325, #3327, #3330, #3332, #3342, #3409, #3491, #3637

UST WEB Portal files #45, #49, #59, #63, #64, #67, #70, #71, #76, #78, #86, #99, #100, #102, #139, #142, #145, #152, #155, #158, #160, #163, #187, #192, #195, #200, #214, #216, #230, #237, #245, #246, #261, #267, #268, #269, #276, #345, #346, #359, #368, #370, #373, #374, #376, #383, #384, #390, #392, #397, #398, #404, #405, #407, #410, #418, #420, #435, #456, #457, #468, #470, #482, #485, #508, #527, #528, #532, #539, #543, #547, #548, #550, #551, #555, #571, #659, #664, #672, #693, #710, #715, #716, #717, #718, #724, #728, #730, #733, #737, #747, #750, #755, #756, #758, #759, #761, #1185, #1186, #1201, #1LM00563, #45_2005MON, #645_2006AMR, #645_2008FinalAMR, #645_Addl_SiteAssess, #645_DeepZone_ROF, #820_2007AMR, #900_2005MON, #900_2006AMR, #900AMRFinal2007, #1613_2006AMR, #1613_FinalAMR2008, #1994_REW_FiveWellSiteCheck, #2003_Final_Hadnot_Point, #2005AMR_LCH4015, #2005AMR_645, #2008_AMR_BM_820, #2009_AMR_Bldg645, #201130_ORG_Soils, #20070727_002, #20070730_001, #20070730_008, #20070730_009, #20070802_010, #Annual_Groundwater_Monitoring_Report_Site_H-28_Revision_0, #Bldg45_2006AMR, #Bldg452008FinalAMR, #Bldg645FinalAMR2007, #Bldg645_2009FinalAMR_Shaw, #BM820_2009FinalAMR_Shaw, #Building_820_Final_2004_Annual_Monitoring_Report, #Building_1613_ Final_2004_Annual_Monitoring_Report, #Final_AMRCatlin_Bldg1613, #Final_UST_MANRPT_Year2006, #H28_2006MON, #H28AMRFinal_2007, #H-28_REV0_2-4-05, #H-28-REV1_11-3-04, #Hadnot_Pt_1115_Sites_Final_2004_Annual_AS-SVE_Monitoring_Report, #HPFF_2005ASSVEMONRPT, #HPFF_2007AMR, #HPFF_20072008_AMR_061608, #HPFF_2009FINALAMR_Shaw, #LCH4015_2005MON, #LCH4015_2006AMR, #LCH40152008FinalAMR, #LCH4015OCT2007InvestReport, #LCH4022_NFA_Request, #RAO_820, #S2633_2006AMR, #S2633_2006MON, #S2633AMRJune2008Final, #USGSSIR_2004–5270

Table S3.4. Estimated predevelopment potentiometric levels at selected locations within the Hadnot Point–Holcomb Boulevard study area and related hydrogeologic units, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBAQSYS, Brewster Boulevard aquifer system; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; LocalCU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Date or date range of water-level measurement(s)	Altitude at midpoint of uppermost open interval, in feet above or below(–) NGVD 29	Contributing aquifer or confining unit
	Easting	Northing					

ATEC Environmental Consultants, Inc. 1992ab

Baker Environmental, Inc. 1992b, 1993jlno, 1994bcde, 1995bde, 1996bcefj, 1997bcefg, 1998bcdghijk, 1999bcfghi, 2001ab, 2002a

Baker Environmental, Inc. and CH2M Hill Federal Group, Ltd. 2000abc, 2001a, 2002a, 2003a

Baker Environmental, Inc. and CH2M Hill, Inc. 2001a, 2000a, 2002ac

Catlin Engineers and Scientists, 1997, 1998ab, 1999ab, 2000ac, 2001af, 2002bcd, 2003d, 2006c, 2007a, 2008, 2009b

CH2M Hill, Inc. 2003, 2004

CH2M Hill, Inc. and Baker Environmental, Inc. 2001ab

CH2M Hill Federal Group, Ltd and Baker Environmental, Inc. 2000ab, 2002

CH2M Hill Federal Group, Ltd. And Michael Baker JR, Inc. 2002

Duke Engineering and Services, Inc. and Baker Environmental, Inc. 1999b

Environmental Science and Engineering, Inc. 1985, 1987, 1988, 1990,1992a

Engineering and Environment, Inc. 2003, 2004b, 2005abc, 2006abcdeg

Groundwater Technology Government Services, Inc. 1993abcdefgh

Haliburton NUS 1992abc

Harden et al. 2004

J.A. Jones Environmental Services Company 1999ab, 2000ab, 2001b, 2002b

Law Engineering, Inc. 1994ab, 1995abc, 1996ab

Law Engineering and Environmental Services, Inc. 1996acghij, 1997deg, 1998b, 2000abcdefg, 2001dce, 2002b

Michael Baker JR, Inc. and Engineering and Environment, Inc. 2004

Mid-Atlantic Associates, Inc. 2003b

O'Brien and Gere Engineers, Inc. 1990, 1992b

OHM Remediation Services Corp. 2000acd, 2001abde, 2002ab

R.E. Wright Associates, Inc. 1994bcdefghij, 1994a, 1995bcd

Richard Catlin and Associates, Inc. 1994, 1995abc, 1996abcdef, 1997abc, 1998a, 2001

Rhea Engineers and Consultants, Inc. 2010ab

S&ME, Inc. 1998a

Shaw Environmental, Inc. 2002, 2003ab, 2004abc, 2005abc, 2006a, 2007ab, 2008abe, 2009abd

Sovereign Consulting, Inc. 2006bcdefh, 2007abcf, 2008abcd

U.S. Marine Corps Camp Lejeune 2003ab

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
01-GW02	16.0	7.8	6.3	1.5
01-GW03	16.2	7.7	6.4	1.3
01-GW05	20.4	7.5	9.9	–2.4
01-GW08	18.5	5.4	8.2	–2.9
01-GW09	14.2	5.4	5.0	0.3
01-GW10	12.9	6.0	4.2	1.8
01-GW15	15.3	7.8	5.8	2.0
01-GW17	19.6	8.2	9.2	–1.0
02-GW01	31.6	25.6	22.4	3.2
02-GW02	32.1	21.9	23.1	–1.2
02-GW03	32.8	26.4	24.1	2.3
02-GW04	30.8	23.3	21.4	1.9
02-GW05	31.0	24.0	21.6	2.4
02-GW10	31.3	26.6	22.0	4.6
02-GW12	32.4	25.9	23.5	2.4
03-MW02	32.1	26.2	23.1	3.1
03-MW03	30.8	21.8	21.4	0.4
03-MW06	26.8	20.0	16.5	3.5
03-MW08	31.5	24.8	22.3	2.5
03-MW09	31.0	26.2	21.6	4.6
03-MW10	32.3	27.6	23.4	4.2
03-MW11	29.9	12.0	20.2	–8.2
03-MW12	25.0	11.7	14.5	–2.8
03-MW13	20.0	10.8	9.5	1.3
06-GW01S	31.9	19.8	22.8	–3.0
06-GW02S	35.0	25.7	27.2	–1.5
06-GW03	28.4	15.5	18.4	–2.9
06-GW06	24.4	19.2	13.8	5.4
06-GW07S	18.3	12.3	8.1	4.2
06-GW08	20.9	16.0	10.4	5.6
06-GW09	18.5	12.1	8.2	3.9
06-GW11	33.3	16.3	24.7	–8.4
06-GW12	17.6	12.7	7.5	5.2
06-GW15S	26.1	19.4	15.7	3.7
06-GW18	27.8	21.8	17.7	4.1
06-GW20	25.0	19.9	14.5	5.4
06-GW21	28.0	17.0	17.9	–0.9
06-GW22	24.8	19.1	14.3	4.8
06-GW23	24.5	19.0	13.9	5.0
06-GW25	30.0	22.9	20.4	2.5
06-GW26	21.6	12.0	11.0	1.0
06-GW31	28.2	16.5	18.1	–1.6
09-GW01	29.1	21.7	19.2	2.4
09-GW02	24.4	19.3	13.8	5.5
09-GW03	24.0	16.7	13.4	3.3
09-GW04	26.7	22.8	16.4	6.4
09-GW05	28.0	21.1	17.9	3.2
09-GW06	28.7	21.4	18.7	2.7
09-GW07S	26.9	18.2	16.6	1.6
09-GW08	26.0	21.0	15.6	5.4
10-MW02	26.8	17.4	16.5	0.9
10-MW03	21.0	16.1	10.5	5.7
10-MW04	17.6	13.1	7.5	5.6
10-MW08	17.4	12.6	7.4	5.2
10-TW02 (new)	26.7	20.8	16.4	4.5
10-TW07	21.9	16.5	11.3	5.2
21-GW01	29.5	21.1	19.7	1.3
21-GW02	31.4	21.0	22.2	–1.1
21-GW03	28.9	21.9	19.0	3.0
21-GW04	27.6	20.9	17.4	3.4
22MW01	28.2	20.3	18.1	2.2
22-MW02	30.0	19.5	20.4	–0.9
22-MW03	28.9	20.7	19.0	1.7
22-MW04	29.9	21.5	20.2	1.3
22-MW05	28.1	21.9	18.0	3.9
22-MW06	27.8	20.7	17.7	3.0
22-MW07	27.2	20.9	16.9	4.0
22-MW08	26.7	20.6	16.4	4.2
22-MW09	29.4	19.4	19.6	–0.2
22-MW10	28.8	20.5	18.9	1.6
22-MW11	26.4	20.6	16.0	4.6
22-MW12	26.8	20.6	16.5	4.1
22-MW13	29.8	21.3	20.1	1.2
22-MW14	27.4	19.6	17.2	2.4
22-MW15	29.5	20.7	19.7	1.0
22-MW16	32.0	18.7	23.0	–4.3
22-MW17	30.0	19.9	20.4	–0.5
22-MW18	29.7	19.9	20.0	–0.1

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
22-MW19	29.3	20.1	19.5	0.6
22-MW22	27.1	20.4	16.8	3.6
22-MW23	27.9	20.9	17.8	3.1
22-RW01	28.6	19.0	18.6	0.4
22-RW02	27.5	17.7	17.3	0.4
24-GW02	17.9	9.5	7.8	1.7
24-GW03	15.2	10.4	5.7	4.7
24-GW04	16.3	10.2	6.5	3.7
24-GW05	27.5	14.1	17.3	–3.2
24-GW07 (new)	26.0	14.6	15.6	–1.0
24-GW09	15.4	9.9	5.9	4.0
24-GW10	16.8	7.8	6.9	1.0
28-GW04	7.4	2.7	1.5	1.2
28-GW05	13.1	4.0	4.3	–0.3
28-GW06	17.3	2.3	7.3	–5.0
28-GW08 (new)	14.0	1.0	4.9	–3.9
28-GW08 (old)	14.0	1.0	4.9	–3.9
74-GW02	33.8	26.1	25.4	0.7
74-GW04	31.2	22.2	21.9	0.3
74-GW05	32.0	27.0	23.0	4.0
78-Bldg902_P01	30.1	23.9	20.5	3.4
78-GW01	29.9	12.2	20.2	–8.1
78-GW02	29.0	23.2	19.1	4.1
78-GW03	29.6	8.2	19.9	–11.7
78-GW04-1	29.1	11.4	19.2	–7.8
78-GW05	27.1	17.1	16.8	0.3
78-GW06	26.1	13.7	15.7	–2.0
78-GW07	25.4	13.2	14.9	–1.7
78-GW08	25.1	15.2	14.6	0.6
78-GW09-1 (old)	26.4	12.2	16.0	–3.8
78-GW10	25.8	15.5	15.4	0.1
78-GW11	25.3	14.5	14.8	–0.3
78-GW12	27.6	17.8	17.4	0.4
78-GW13	24.2	13.4	13.6	–0.2
78-GW14	24.6	16.9	14.0	2.9
78-GW15	26.4	18.3	16.0	2.3
78-GW16	29.9	19.7	20.2	–0.5
78-GW17-1	27.8	18.5	17.7	0.8
78-GW18	26.3	16.6	15.9	0.7
78-GW19	26.3	20.3	15.9	4.4
78-GW20	26.6	16.1	16.3	–0.1
78-GW21	32.0	22.9	23.0	–0.1
78-GW23	29.9	22.9	20.2	2.6
78-GW24-1	30.4	25.5	20.9	4.6
78-GW25	29.9	24.0	20.2	3.8
78-GW26	33.3	22.8	24.7	–1.9
78-GW29	26.0	9.8	15.6	–5.8
78-GW33	29.9	22.5	20.2	2.3
78-GW35	30.9	18.2	21.5	–3.3
78-GW36	27.4	16.5	17.2	–0.7
78-GW37	17.9	10.4	7.8	2.7
78-GW39	17.1	4.0	7.1	–3.1
78-GW40	29.3	20.5	19.5	1.0
78-GW41	30.0	22.8	20.4	2.5
78-GW42	29.4	10.5	19.6	–9.1
78-GW43	30.1	19.7	20.5	–0.8
78-GW44	29.9	20.2	20.2	–0.1
78-GW45	28.2	20.2	18.1	2.0
78-GW46	30.5	20.2	21.0	–0.8
78-GW47	29.7	19.8	20.0	–0.2
78-GW48	30.8	20.6	21.4	–0.8
78-GW49	26.0	12.8	15.6	–2.8
78-GW50	29.2	10.9	19.4	–8.5
78-GW51	27.5	11.0	17.3	–6.3
78-GW52	27.7	10.8	17.5	–6.7
78-GW53	28.0	10.9	17.9	–7.0
78-GW54	29.4	10.4	19.6	–9.2
78-GW55	29.7	10.3	20.0	–9.7
78-GW56	28.3	10.4	18.3	–7.8
78-GW57	28.6	10.7	18.6	–8.0
78-GW59	28.9	10.2	19.0	–8.8
78-GW60	26.6	12.5	16.3	–3.8
78-GW61	22.7	9.2	12.1	–2.9
78-GW63	28.0	8.6	17.9	–9.3
78-GW64	27.0	7.4	16.7	–9.3

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentiometric level, in feet above NGVD 29	Predicted potentiometric level, in feet above NGVD 29	Residual head, in feet
78-GW65	28.0	8.8	17.9	–9.1
78-GW66	28.0	9.3	17.9	–8.6
78-GW67	29.0	9.2	19.1	–9.9
78-GW68	28.3	9.4	18.3	–8.9
78-RW-10N	30.4	21.7	20.9	0.8
82-MW03	22.0	8.6	11.4	–2.8
82-MW30	29.7	22.4	20.0	2.4
84-MW18 (Baker)	22.5	15.1	11.9	3.2
88-MW01	26.5	19.4	16.1	3.3
88-MW02	26.6	16.4	16.3	0.1
88-MW02IW	26.2	8.7	15.8	–7.1
88-MW03	25.9	17.9	15.5	2.4
88-MW03IW	25.1	9.6	14.6	–5.0
88-MW04	25.0	10.1	14.5	–4.4
88-MW04IW	25.0	10.0	14.5	–4.5
88-MW05	24.6	17.2	14.0	3.2
88-MW05IW	23.9	9.6	13.3	–3.7
88-MW06	24.2	10.7	13.6	–2.9
88-MW06IW	24.2	9.5	13.6	–4.1
88-MW07	23.6	14.3	13.0	1.3
88-MW07IW	23.9	9.4	13.3	–3.9
88-MW08	23.2	14.7	12.6	2.1
88-MW08IW	22.8	9.6	12.2	–2.6
88-MW09	22.1	12.9	11.5	1.4
88-MW09IW	21.6	9.8	11.0	–1.2
88-MW10IW	25.9	8.5	15.5	–7.0
88-TW20	23.0	12.3	12.4	–0.1
88-TW21	23.5	10.6	12.9	–2.3
88-TW23	24.4	9.7	13.8	–4.2
88-TW25	23.5	10.0	12.9	–2.9
88-TW26	25.5	9.8	15.0	–5.3
94-Bldg1613_GW01	25.9	15.4	15.5	–0.1
94-Bldg1613_GW02	26.1	17.6	15.7	1.9
94-Bldg1613_GW03	25.9	14.0	15.5	–1.5
94-Bldg1613_GW04	24.3	19.5	13.7	5.8
94-Bldg1613_GW05	23.4	18.0	12.8	5.2
94-Bldg1613_GW06	26.2	14.6	15.8	–1.2
94-Bldg1613_GW07	24	17.3	13.4	3.9
94-Bldg1613_GW09	25.9	20.2	15.5	4.7
94-Bldg1613_GW10	26.5	14.0	16.1	–2.1
94-Bldg1613_GW11	25.1	13.6	14.6	–1.0
94-Bldg1613_GW12	26.5	14.3	16.1	–1.8
94-Bldg1613_GW13	24.3	14.6	13.7	0.9
94-Bldg1613_GW14	26.4	14.7	16.0	–1.3
94-Bldg1613_GW16	26.4	13.4	16.0	–2.6
94-Bldg1613_GW17	26.1	13.9	15.7	–1.8
94-Bldg1613_GW18	25.5	12.9	15.0	–2.1
94-Bldg1613_GW19	24.9	13.4	14.4	–1.0
94-Bldg1613_GW20	25.7	13.4	15.2	–1.8
94-Bldg1613_GW21	26.2	13.9	15.8	–1.9
94-Bldg1613_GW22	25.5	13.5	15.0	–1.5
Bldg20_MW01	26.5	16.1	16.1	–0.0
Bldg21_DW01	7.1	2.0	1.4	0.6
Bldg21_DW02	7.3	2.0	1.5	0.5
Bldg21_DW04	9.6	1.9	2.4	–0.5
Bldg21_MW01	8.9	2.4	2.1	0.3
Bldg21_MW02	8.4	3.1	1.9	1.2

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
Bldg21_ MW03	11.7	2.3	3.5	–1.3
Bldg21_ MW04	10.5	2.4	2.9	–0.5
Bldg21_ MW05	7.0	1.5	1.3	0.2
Bldg21_ MW06	8.2	2.2	1.8	0.4
Bldg21_ MW08	6.5	1.6	1.2	0.4
Bldg21_ MW09	7.9	2.5	1.7	0.8
Bldg21_ RW01	8.6	2.0	2.0	0.0
Bldg24_ MW01	27.6	10.6	17.4	–6.8
Bldg33_ MW01	31.2	23.2	21.9	1.2
Bldg33_ MW02	31.2	23.3	21.9	1.4
Bldg33_ MW03	31.0	23.1	21.6	1.4
Bldg33_ MW04	31.5	26.4	22.3	4.1
Bldg33_ MW05	31	25.4	21.6	3.8
Bldg33_ MW06	31.7	26.8	22.6	4.2
Bldg33_ MW07	31.5	25.4	22.3	3.1
Bldg33_ MW08	31.5	25.5	22.3	3.2
Bldg33_ MW11	31.7	25.6	22.6	3.0
Bldg45_ MW01 (ATEC)	22.6	16.3	12.0	4.4
Bldg45_ MW01 (Wright)	20.9	12.2	10.4	1.8
Bldg45_ MW02 (ATEC)	22.4	15.6	11.8	3.9
Bldg45_ MW02 (Wright)	20.2	7.8	9.7	–1.9
Bldg45_ MW03 (ATEC)	21.9	15.5	11.3	4.2
Bldg45_ MW03 (Wright)	22.1	10.8	11.5	–0.7
Bldg45_ MW04 (Law)	21.6	18.2	11.0	7.2
Bldg45_ MW04 (Wright)	16.2	4.7	6.4	–1.7
Bldg45_ MW05 (Law)	21.0	13.0	10.5	2.5
Bldg45_ MW07 (Law)	21.1	16.4	10.5	5.9
Bldg45_ MW10 (Law)	21.3	15.2	10.7	4.5
Bldg45_ MW12 (Law)	21.7	16.9	11.1	5.8
Bldg45_ MW13 (Law)	20.7	13.8	10.2	3.6
Bldg45_ MW14 (Law)	18.4	9.6	8.2	1.5
Bldg45_ MW15 (Law)	20.8	11.2	10.3	1.0
Bldg45_ MW16 (Law)	21.1	12.8	10.5	2.3
Bldg45_ MW17 (Law)	20.7	14.3	10.2	4.1
Bldg45_ MW18 (Law)	22.2	15.2	11.6	3.6

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
Bldg45_MW23 (E&E)	22.1	17.4	11.5	5.9
Bldg45_PW01 (Law)	21.5	14.3	10.9	3.4
Bldg61_MW01	27.1	21.0	16.8	4.2
Bldg61_MW02	27.2	22.0	16.9	5.0
Bldg61_MW03	27.0	21.6	16.7	4.9
Bldg311_MW06	21.0	8.0	10.5	–2.5
Bldg331_MW01	17.4	6.7	7.4	–0.6
Bldg331_MW02	18.3	6.8	8.1	–1.3
Bldg331_MW03	19.3	6.9	8.9	–2.0
Bldg331_MW04	20.0	6.9	9.5	–2.6
Bldg331_MW06	19.7	6.7	9.3	–2.6
Bldg331_MW07	18.8	6.7	8.5	–1.8
Bldg331_MW08	16.3	6.4	6.5	–0.1
Bldg331_MW09	18.7	6.2	8.4	–2.2
Bldg331_MW10	18.9	6.4	8.6	–2.2
Bldg331_MW11	16.5	6.4	6.7	–0.2
Bldg331_MW12	19.3	6.9	8.9	–2.0
Bldg331_MW14	19.1	7.2	8.8	–1.5
Bldg331_MW15	17.3	7.0	7.3	–0.3
Bldg331_PW16	19.6	6.6	9.2	–2.5
Bldg575_MW01	14.7	3.3	5.4	–2.1
Bldg645_MW04	23.0	14.4	12.4	2.0
Bldg645_MW06	29.8	17.5	20.1	–2.6
Bldg645_MW07	28.4	16.1	18.4	–2.3
Bldg645_MW08	27.7	16.6	17.5	–0.9
Bldg645_MW12	27.4	20.3	17.2	3.1
Bldg645_MW19	28.3	16.4	18.3	–1.9
Bldg645_MW24	26.8	19.7	16.5	3.2
Bldg645_MW25	25.9	16.4	15.5	0.9
Bldg820_MW02	30.1	18.0	20.5	–2.5
Bldg820_MW03	30.6	17.2	21.1	–3.9
Bldg820_MW04	30.4	18.5	20.9	–2.4
Bldg820_MW05	29.9	19.7	20.2	–0.5
Bldg820_MW06	29.7	16.6	20.0	–3.4
Bldg820_MW08	25.4	12.3	14.9	–2.6
Bldg820_MW10	29.2	18.0	19.4	–1.4
Bldg820_MW11	29.9	18.3	20.2	–1.9
Bldg820_MW12	30.5	17.4	21.0	–3.6
Bldg820_MW13	28.6	16.0	18.6	–2.6
Bldg820_MW14	29.5	16.6	19.7	–3.1
Bldg820_MW15	30.0	18.0	20.4	–2.4
Bldg820_MW16	29.9	19.1	20.2	–1.1
Bldg820_MW18	29.7	18.3	20.0	–1.7

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
Bldg820_MW26	26.3	14.7	15.9	–1.2
Bldg820_MW27	30.4	19.7	20.9	–1.2
Bldg900_MW01	31.1	22.1	21.8	0.3
Bldg900_MW02	31.0	25.7	21.6	4.1
Bldg900_MW03	30.6	22.2	21.1	1.0
Bldg900_MW04	30.5	25.1	21.0	4.1
Bldg900_MW05	30.2	25.4	20.6	4.8
Bldg900_MW07	30.9	26.0	21.5	4.5
Bldg900_MW08	30.2	23.9	20.6	3.3
Bldg900_MW09	29.8	24.2	20.1	4.1
Bldg900_MW10	30.1	25.0	20.5	4.6
Bldg903_MW01	29.9	23.5	20.2	3.3
Bldg903_MW02	29.8	23.8	20.1	3.7
Bldg903_MW03	29.9	24.0	20.2	3.8
Bldg903_MW04	29.5	24.6	19.7	4.9
Bldg1101_MW01	29.9	19.0	20.2	–1.2
Bldg1101_MW02	29.8	18.6	20.1	–1.5
Bldg1101_MW03	29.9	18.5	20.2	–1.7
Bldg1106_PZ01	29.5	22.9	19.7	3.1
Bldg1106_PZ02	29.2	22.0	19.4	2.6
Bldg1106_PZ03	29.6	23.0	19.9	3.1
Bldg1106_PZ04	29.1	21.2	19.2	2.0
Bldg1115_GT02	26.9	20.0	16.6	3.4
Bldg1115_GT03	26.7	20.2	16.4	3.8
Bldg1115_GT04	26.9	20.2	16.6	3.6
Bldg1115_GT05	27.0	19.6	16.7	2.9
Bldg1115_GT06	26.2	20.6	15.8	4.8
Bldg1115_GT07	26.2	19.7	15.8	3.9
Bldg1115_GT08	26.6	20.5	16.3	4.2
Bldg1115_GT09	26.7	20.6	16.4	4.2
Bldg1115_MW01	26.1	17.8	15.7	2.1
Bldg1115_MW02	26.0	17.6	15.6	2.0
Bldg1115_MW03	26.3	18.1	15.9	2.2
Bldg1115_MW05	26.1	20.8	15.7	5.1
Bldg1115_MW06	26.7	17.9	16.4	1.5
Bldg1115_MW07	26.3	18.9	15.9	3.0
Bldg1115_MW08	25.4	17.5	14.9	2.6
Bldg1115_MW09	26.1	18.2	15.7	2.5
Bldg1115_MW10	25.9	19.8	15.5	4.3
Bldg1115_MW11	26.4	18.9	16.0	2.9
Bldg1115_MW12	26.1	20.7	15.7	5.0
Bldg1115_MW13	25.9	16.9	15.5	1.4
Bldg1115_MW14	26.3	17.1	15.9	1.2
Bldg1115_MW15	26.1	17.5	15.7	1.8

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
Bldg1115_ MW16	26.9	18.1	16.6	1.5
Bldg1115_ MW17	25.0	16.0	14.5	1.5
Bldg1115_ MW18	26.3	17.1	15.9	1.2
Bldg1115_ MW19	26.3	18.1	15.9	2.2
Bldg1115_ MW20	26.3	16.9	15.9	1.0
Bldg1115_ MW21	26.0	17.0	15.6	1.4
Bldg1310_ MW02	29.5	16.7	19.7	–3.0
Bldg1310_ MW03	29.5	16.9	19.7	–2.9
Bldg1323_ MW01	28.2	15.3	18.1	–2.8
Bldg1323_ MW02	27.8	15.2	17.7	–2.5
Bldg1323_ TMW01	27.6	14.1	17.4	–3.4
Bldg1450_ MW01	25.5	12.4	15.0	–2.6
Bldg1450_ MW02	25.7	12.6	15.2	–2.6
Bldg1450_ MW03	25.7	12.8	15.2	–2.4
Bldg1450_ MW04	24.9	12.4	14.4	–2.0
Bldg1450_ MW05	24.7	12.3	14.2	–1.9
Bldg1450_ MW06	25.5	12.5	15.0	–2.5
Bldg1502_ MW01 (new)	25.9	15.2	15.5	–0.3
Bldg1502_ MW01 (old)	25.2	14.9	14.7	0.2
Bldg1502_ MW02 (new)	26.7	15.1	16.4	–1.3
Bldg1502_ MW02 (old)	25.1	15.0	14.6	0.4
Bldg1502_ MW03	25.1	15.0	14.6	0.4
Bldg1502_ MW04	24.8	15.0	14.3	0.8
Bldg1601_ DP01	25.2	16.6	14.7	1.9
Bldg1601_ DP02	26.3	16.8	15.9	0.9
Bldg1601_ DP03	26.4	17.0	16.0	1.0
Bldg1601_ DP04	26.7	16.9	16.4	0.5
Bldg1601_ DP05	26.4	17.0	16.0	1.0
Bldg1601_ DP06	25.6	16.5	15.1	1.4
Bldg1601_ DP07	25.4	16.7	14.9	1.8
Bldg1601_ DP08	25.9	16.9	15.5	1.4
Bldg1601_ DP09	26.3	16.7	15.9	0.8
Bldg1601_ DP10	25.2	17.3	14.7	2.6
Bldg1601_ DP11	24.6	17.3	14.0	3.2
Bldg1601_ DP12	25.2	16.8	14.7	2.1
Bldg1601_ DP13	25.7	16.9	15.2	1.7
Bldg1601_ DP14	25.6	15.5	15.1	0.3
Bldg1601_ DP15	26.0	17.5	15.6	2.0
Bldg1601_ DP16	26.2	17.8	15.8	2.0
Bldg1607_ MW01	26.8	19.2	16.5	2.7
Bldg1607_ MW02	26.6	19.9	16.3	3.6
Bldg1607_ MW03	26.7	19.7	16.4	3.3

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
Bldg1854_MW01	17.5	4.8	7.4	–2.6
Bldg1854_MW02	17.4	4.6	7.4	–2.8
Bldg1854_MW06	17.3	4.6	7.3	–2.7
Bldg1854_MW08	12.2	4.5	3.8	0.7
Bldg1919-1_MW01	12.4	2.0	3.9	–1.9
Bldg1919-1_MW02	12.5	2.1	4.0	–1.9
Bldg1919-1_MW03	12.4	2.1	3.9	–1.8
Bldg1932_MW01	15.4	4.3	5.9	–1.6
Bldg1932_MW02	16.2	3.1	6.4	–3.3
Bldg1932_MW03	15.6	3.0	6.0	–3.0
BldgFC102_MW01 (new)	21.8	9.8	11.2	–1.4
BldgFC102_MW01 (old)	23.3	13.0	12.7	0.3
BldgFC102_MW02 (new)	22.0	9.6	11.4	–1.8
BldgFC102_MW02 (old)	21.2	14.3	10.6	3.7
BldgFC102_MW03 (new)	23.1	9.8	12.5	–2.7
BldgFC102_MW03 (old)	21.1	16.0	10.5	5.5
BldgFC201E_E01	20.3	13.8	9.8	4.0
BldgFC201E_E02	20.1	14.1	9.6	4.5
BldgFC201E_E03	20.1	13.6	9.6	4.0
BldgFC201E_MW04	20.6	13.0	10.1	2.9
BldgFC201E_MW05	19.0	13.2	8.7	4.6
BldgFC201E_MW07	18.1	13.2	7.9	5.3
BldgFC201E_MW10	17.9	12.8	7.8	5.0
BldgFC201E_MW13	18.8	13.4	8.5	4.9
BldgFC201E_MW14	23.4	13.1	12.8	0.3
BldgFC201E_MW15	21.5	12.9	10.9	1.9
BldgFC201E_MW16	15.4	13.2	5.9	7.4
Bldg-FC201W_MW01	20.1	13.2	9.6	3.6
Bldg-FC201W_MW02	20.2	14.2	9.7	4.5
Bldg-FC201W_MW03	20.1	13.0	9.6	3.4
BldgFC263_MW01	20	9.2	9.5	–0.4
BldgFC263_MW02	23.1	10.1	12.5	–2.4
BldgFC263_MW03	22.4	9.4	11.8	–2.4
BldgFC263_MW04	21.5	9.9	10.9	–1.0
BldgFC263_MW05	22	9.7	11.4	–1.7
BldgFC263_MW06	22.3	9.4	11.7	–2.3
BldgFC263_MW07	22.4	9.1	11.8	–2.7
BldgFC263_MW08	21.1	9.1	10.5	–1.4
BldgFC263_MW09	16	9.0	6.3	2.7
BldgFC263_MW10	22.4	10.2	11.8	–1.6

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
BldgFC263_MW11	22.8	10.0	12.2	–2.2
BldgFC263_MW12	23	9.7	12.4	–2.7
BldgFC263_MW13	22.3	8.6	11.7	–3.1
BldgFC263_MW14	21.5	9.4	10.9	–1.5
BldgFC263_MW16	23.1	9.7	12.5	–2.8
BldgFC280_MW01	23.0	14.4	12.4	2.0
BldgFC281_MW01	24.8	17.0	14.3	2.7
BldgH19_MW01	10.5	2.4	2.9	–0.4
BldgH19_MW02	10.5	4.1	2.9	1.2
BldgH19_MW03	10.4	4.0	2.8	1.2
BldgH19_MW04	10.5	4.0	2.9	1.1
BldgH19_MW05	10.4	3.9	2.8	1.1
BldgH19_MW06	10.8	3.9	3.0	0.9
BldgH19_MW07	10.1	2.5	2.7	–0.1
BldgH19_MW08	9.7	2.6	2.5	0.2
BldgH19_MW09	9.8	2.4	2.5	–0.1
BldgH19_MW10	10.7	2.4	3.0	–0.5
BldgH19_MW14	11.2	2.4	3.2	–0.8
BldgH28_MW01	12.0	2.6	3.7	–1.1
BldgH28_MW02	12.6	2.7	4.0	–1.3
BldgH28_MW03	12.6	2.7	4.0	–1.3
BldgH28_MW04	12.7	2.1	4.1	–2.0
BldgH28_MW05	12.2	2.6	3.8	–1.2
BldgH28_MW06	12.2	2.7	3.8	–1.1
BldgH28_MW07	11.8	2.5	3.6	–1.0
BldgH28_MW08	12.3	2.6	3.8	–1.2
BldgH28_MW09	12.2	2.7	3.8	–1.1
BldgH28_MW10	12.2	2.6	3.8	–1.2
BldgH28_MW11	12.4	2.6	3.9	–1.3
BldgH30_MW01	8.3	2.4	1.8	0.6
BldgH30_MW02	9.2	2.5	2.2	0.3
BldgH30_MW05	9.2	2.4	2.2	0.2
BldgH30_MW12	7.1	2.4	1.4	1.0
BldgHP100_PZ01	19.8	6.3	9.4	–3.1
BldgHP100_PZ03	19.9	6.4	9.5	–3.1
BldgHP100_PZ04	19.8	7.2	9.4	–2.2
BldgHP100_PZ06	19.8	7.0	9.4	–2.4
BldgHP100_PZ07	19.8	6.5	9.4	–2.9
BldgHP100_PZ08	19.9	7.4	9.5	–2.1
BldgHP250_MW01	20.2	10.7	9.7	1.0
Bldg-LCH4015_MW03	32.3	27.3	23.4	3.9
Bldg-LCH4015_MW04	32.5	27.4	23.6	3.8
Bldg-LCH4015_MW05	32.0	27.2	23.0	4.2

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
Bldg-LCH4015_MW06	32.3	26.7	23.4	3.3
Bldg-LCH4015_MW07	33.2	27.6	24.6	3.0
Bldg-LCH4015_MW08	31.6	26.9	22.4	4.5
Bldg-LCH4015_MW11	32.1	25.1	23.1	2.0
Bldg-LCH4015_MW12	33.0	25.4	24.3	1.1
Bldg-LCH4015_MW14	32.9	25.5	24.2	1.3
Bldg-LCH4015_MW15	32.6	25.7	23.8	1.9
Bldg-LCH4015_MW16	33.2	28.0	24.6	3.4
Bldg-LCH4015_MW18	33.4	28.3	24.9	3.4
Bldg-LCH4022_MW01	32.0	27.2	23.0	4.2
Bldg-LCH4022_MW03	32.0	27.1	23.0	4.1
Bldg-LCH4022_MW19	31.8	26.9	22.7	4.2
BldgPT5_MW02	25.3	11.8	14.8	–3.0
BldgPT5_MW03	24.4	11.0	13.8	–2.8
BldgPT5_MW04	21.8	11.5	11.2	0.3
BldgPT5_MW09	24.5	11.2	13.9	–2.7
BldgS688_MW01	9.3	3.3	2.3	1.1
BldgS2633_MW02	7.2	1.7	1.4	0.3
Bldg-SLCH4019_MW05	32.1	26.8	23.1	3.7
Bldg-SLCH4019_MW06	32.5	27.0	23.6	3.4
G-BP06	34.1	22.8	25.9	–3.1
G-MW03S	31.3	21.2	22.0	–0.8
G-MW04	27.6	16.3	17.4	–1.1
G-MW05	33.9	22.1	25.6	–3.5
G-MW08	28.5	22.2	18.5	3.7
G10-MW10	36.5	30.8	29.4	1.4
G10-MW7	43.4	38.0	40.6	–2.6
G10-MW8	30.4	18.6	20.9	–2.3
G10-MW9	30.3	18.9	20.7	–1.8
HP-585	43.7	31.0	41.1	–10.1
HP-596	44.3	34.0	42.2	–8.2
HP-629 (old)	30.0	23.7	20.4	3.3
HP-661	28.4	16.0	18.4	–2.4
HP-708-4	37.8	31.9	31.4	0.5
HPFF_MW01	28.5	23.3	18.5	4.8
HPFF_MW02	29.6	22.7	19.9	2.8
HPFF_MW03	29.1	21.4	19.2	2.2
HPFF_MW04	31.4	21.5	22.2	–0.7
HPFF_MW05	26.8	20.2	16.5	3.7
HPFF_MW06	28.4	20.1	18.4	1.7
HPFF_MW07	28.0	19.0	17.9	1.1
HPFF_MW09	26.9	18.4	16.6	1.8
HPFF_MW14	27.2	21.5	16.9	4.6
HPFF_MW15	27.7	21.1	17.5	3.6
HPFF_MW16	28.1	20.6	18.0	2.6
HPFF_MW17	28.0	19.4	17.9	1.5
HPFF_MW18	26.3	18.9	15.9	3.0
HPFF_MW19	26.3	20.9	15.9	5.0
HPFF_MW20	29.6	21.0	19.9	1.1
HPFF_MW21	27.5	22.8	17.3	5.5
HPFF_MW22	27.2	22.4	16.9	5.5
HPFF_MW23	26.5	18.4	16.1	2.3

Table S3.5. Summary of regression analysis using paired data representing land-surface and water-table altitude at individual monitor wells.—Continued

[NGVD29, National Geodetic Vertical Datum of 1929]

Site name[1]	Land-surface altitude, in feet above NGVD 29	Estimated potentio-metric level, in feet above NGVD 29	Predicted potentio-metric level, in feet above NGVD 29	Residual head, in feet
HPFF_MW24	27.4	20.1	17.2	2.9
HPFF_MW25	28.8	19.7	18.9	0.8
HPFF_MW26	31.6	19.1	22.4	–3.3
HPFF_MW27	30.5	19.3	21.0	–1.7
HPFF_MW28	27.3	20.8	17.1	3.7
HPFF_MW29	27.2	21.1	16.9	4.2
HPFF_MW30	27.3	22.2	17.1	5.1
HPFF_MW31	28.7	19.9	18.7	1.2
HPFF_MW32	29.7	19.8	20.0	–0.2
HPFF_MW33	29.4	19.1	19.6	–0.5
HPFF_MW34	26.2	18.0	15.8	2.2
HPFF_MW35	27.6	18.8	17.4	1.4
HPFF_MW36	26.8	18.8	16.5	2.3
HPFF_MW37	26.0	18.5	15.6	2.9
HPFF_MW38	30.1	22.8	20.5	2.3
HPFF_MW40	27.2	22.1	16.9	5.2
HPFF_MW41	29.4	21.2	19.6	1.6
HPFF_MW42	28.9	21.4	19.0	2.4
HPFF_MW44	22.2	14.1	11.6	2.5
HPFF_MW47	25.0	15.1	14.5	0.6
HPFF_MW48	23.7	17.0	13.1	3.9
HPFF_MW50	23.5	16.3	12.9	3.4
HPFF_MW51	26.9	17.7	16.6	1.1
HPFF_MW53	27.6	17.7	17.4	0.3
HPFF_MW57	26.3	16.8	15.9	0.9
HPFF_MW61	27.0	17.6	16.7	0.9
HPFF_MW63	29.3	15.9	19.5	–3.6
HPFF_MW64	27.9	18.3	17.8	0.5
HPFF_MW66	28.4	18.3	18.4	–0.1
HPFF_MW68	27.1	20.8	16.8	4.0
HPFF_MW69	29.9	18.3	20.2	–1.9
HPFF_MW70	31.2	19.4	21.9	–2.5
HPGW22-1	29.7	20.6	20.0	0.6
HPGW22-2	26.3	20.4	15.9	4.5
TankS781_MW01 (O&G)	17.7	4.3	7.6	–3.3
TankS781_MW03 (O&G)	14.9	3.7	5.5	–1.8
TankS781_MW05 (O&G)	16.0	3.7	6.3	–2.6
TankS781_MW09 (O&G)	10.6	2.8	2.9	–0.1
TankS781_MW11 (O&G)	16.3	8.2	6.5	1.6
TankS781_MWA (D&D)	12.3	4.5	3.8	0.6
TankS781_MWB (D&D)	11.8	4.6	3.6	1.1

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Analyses and Historical Reconstruction of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water Within the Service Areas of the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities, U.S. Marine Corps Base Camp Lejeune, North Carolina—Chapter A–Supplement 3: Descriptions and Characterizations of Water-Level Data and Groundwater Flow for the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer