Lower Castle Hayne Aquifer

The lithology of the Lower Castle Hayne aquifer is poorly described or undifferentiated in the relatively few electric logs and drillers' logs obtained at sufficient depth to intercept the top of the aquifer. In the vicinity of borehole T-10, north and west of Tarawa Terrace, the aquifer is apparently comprised of very fine gray sand and clay "mixed." At borehole T-13, north of Montford Point the upper part of the unit apparently consists of fine sand and interbedded clays while the lower part of the aquifer is largely limestone. At borehole T-12, near the southern extremity of Montford Point, the entire aquifer appears to consist of shell limestone. In the vicinity of borehole T-1 near SR 24 and the southern limit of the study area, the Lower Castle Hayne aquifer is described as clayey sand that grades with depth to a sandy clay and sand with lenses and beds of shell limestone.

Contours of equal altitude at the top of the Lower Castle Hayne aquifer are shown in Figure B25 and range from a high of about –150 ft northwest of Montfort Point to a low of about –280 ft near the southeastern limit of the study area (Table B13). The surface as shown generally declines uniformly northwest to southeast. However, such uniformity may be misleading and is the result of a limited number of point data used for interpolation (Table B9).

Thickness of the Lower Castle Hayne aquifer generally increases southward and northwest to southeast from a minimum of about 45 ft northwest of Tarawa Terrace near SR 24 to a maximum of about 85 ft north of the headwaters of Wallace Creek near the southeastern limit of the study area (Figure B26). The regularity and uniformity of thickness trends as shown is probably not representative of actual unit thickness but rather is the result of using a small number of point data for interpolation.

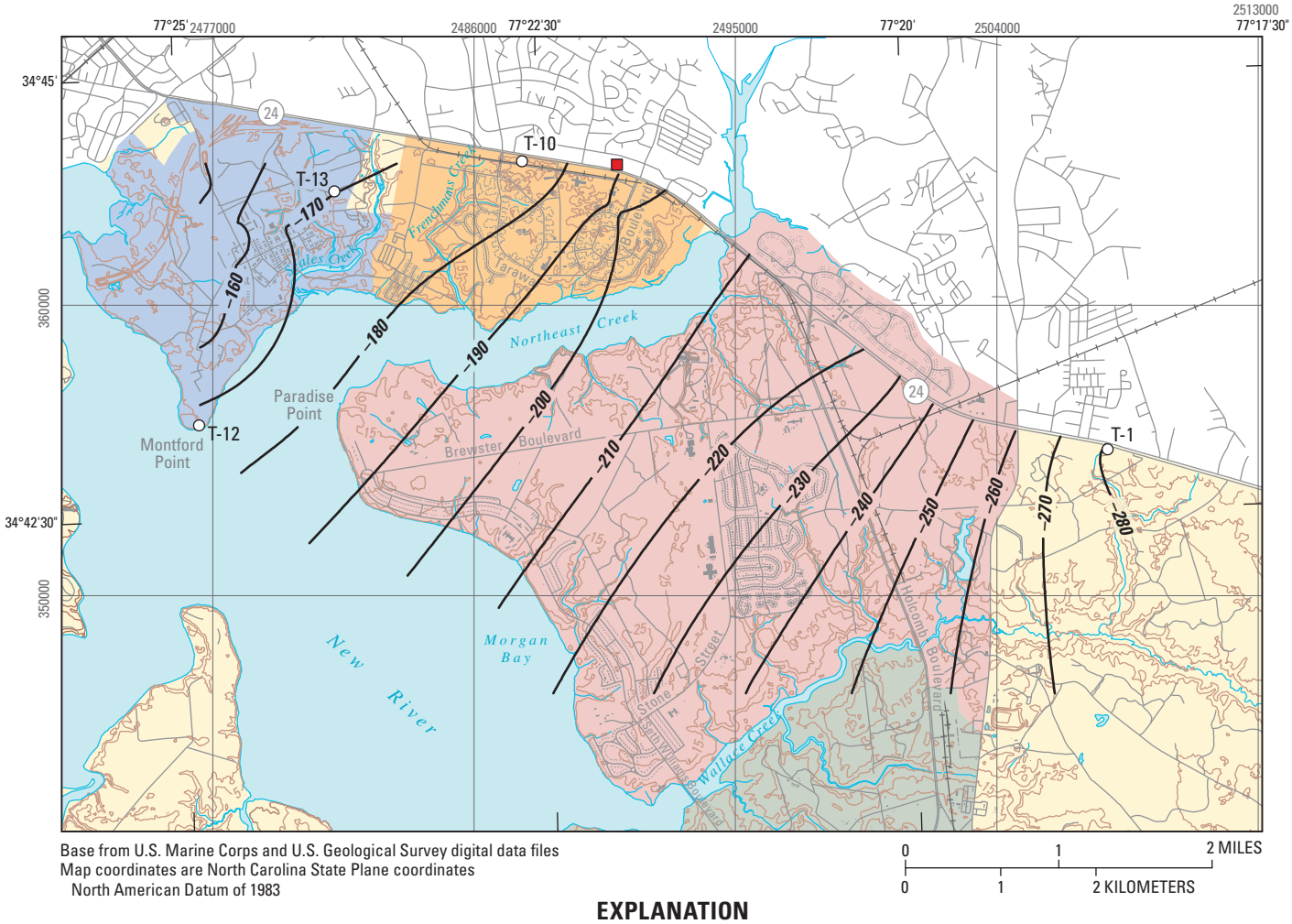
Table B13. Altitude at the top of the Lower Castle Hayne aquifer, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	East	North	
HP-614 (new)	2512180	353670	–286
LCH-4009	2499585	358589	–220
M-161	2477550	362560	–149
M-168	2477602	362723	–160
M-197	2477626	361621	–159
M-267	2476609	359232	–157
M-628	2479434	362735	–170
T-1	2507870	355030	–282
T-10	2487680	364960	–173
T-12	2476550	355830	–174
T-13	2481170	363930	–170
T-14	2476788	364170	–149
TT-23	2491024	363208	–201
X24C2	2490640	363540	–190
X24S2	2495523	347221	–241

[1]See Plate 1 for location

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



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

—220— **Line of equal altitude**—Shows top of Lower Castle Hayne aquifer. Contour interval 10 feet. Datum is National Geodetic Vertical Datum of 1929

— 25 — **Topographic contour**—Interval 10 feet

ABC One-Hour Cleaners

T-1 **Borehole and name**

Figure B25. Altitude at the top of the Lower Castle Hayne aquifer, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

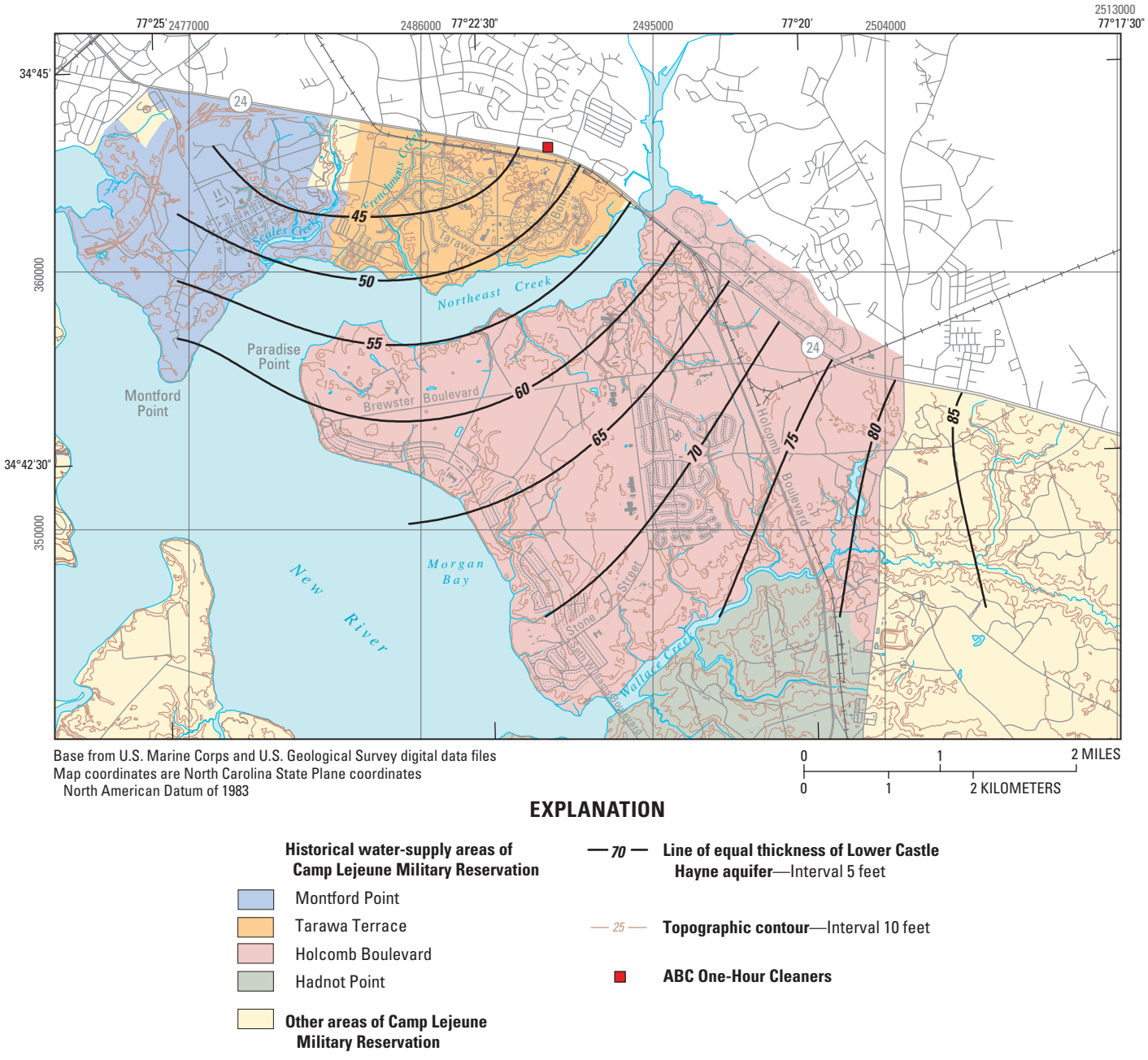


Figure B26. Thickness of the Lower Castle Hayne aquifer, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Beaufort Confining Unit

The base of the Castle Hayne aquifer system and the base of groundwater flow of interest to this study were previously described as the base of the Lower Castle Hayne aquifer and are delimited by the top of the Paleocene age Beaufort confining unit (Figure B27). According to the few descriptions of this confining unit available at Camp Lejeune, the lithology is apparently a sandy clay in the southern part of the study area and is characterized as limestone and possibly sandstone in the vicinity of Montford Point and northwest of Tarawa Terrace.

Cardinell and others (1993) placed the Beaufort confining unit significantly lower in the Tarawa Terrace area than interpretations of borehole and lithologic data used for this study would suggest. The altitudes reported at the top of the Beaufort confining unit by Cardinell and others (1993 Table 3) are far below the bottom hole depth of any borehole geophysical or lithologic log available in the Tarawa Terrace area and were estimates, probably based on interpretations of surface resistivity or seismic surveys. Considerable uncertainty is attached to these data as acknowledged by Cardinell and others (1993) in their heading notes attached to their Table 3 and by questioning the depth of the top of the Beaufort confining unit shown in sections on their Plate 1. The geophysical data utilized by Cardinell and others (1993) to estimate the depth of the Beaufort confining unit were not available to this study. Accordingly, the base of the confining unit for this study was based only on interpolations of data listed in Table B14.

Table B14. Altitude at the top of the Beaufort confining unit, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	East	North	
M-628	2479434	362735	–216
T-1	2507870	355030	–366
T-10	2487680	364960	–214
T-12	2476550	355830	–238
T-13	2481170	363930	–212
X24S2	2495523	347221	–314

[1]See Plate 1 for location

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

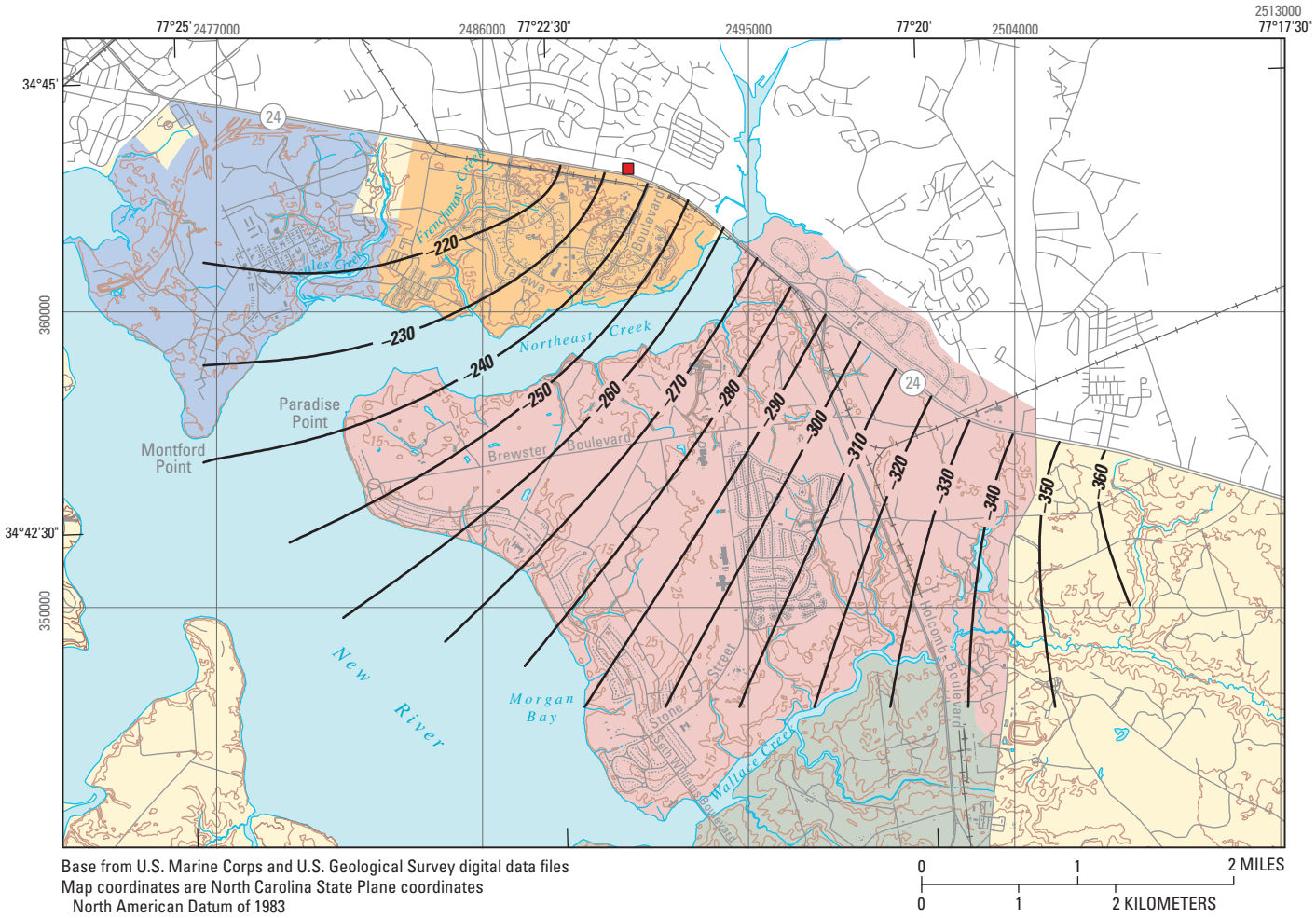


Figure B27. Altitude at the top of the Beaufort confining unit, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Horizontal Hydraulic Conductivity

Results of 32 aquifer-test analyses at Camp Lejeune are summarized in Table B15. Computed horizontal hydraulic conductivity ranged from about 5 to 40 ft/d and averaged about 18 ft/d. Standard deviation of test results was about 10 ft/d. The lowest hydraulic conductivity of 5 ft/d was observed at one site (HP-648) where the water-bearing units are generally described as "limestone and sand" in the driller's log. A maximum horizontal hydraulic conductivity of about 40 ft/d occurred at wells HP-650 and HP-708 (Plate 1). Aquifer lithology at these sites is generally described as sand and limestone or sand and rock.

Most tests included wells with open intervals installed in more than one aquifer. However, tests of a sufficient number of wells open only to the Upper Castle Hayne aquifer were available to allow a highly generalized interpolation of results to other parts of the study area. Interpolation results are shown

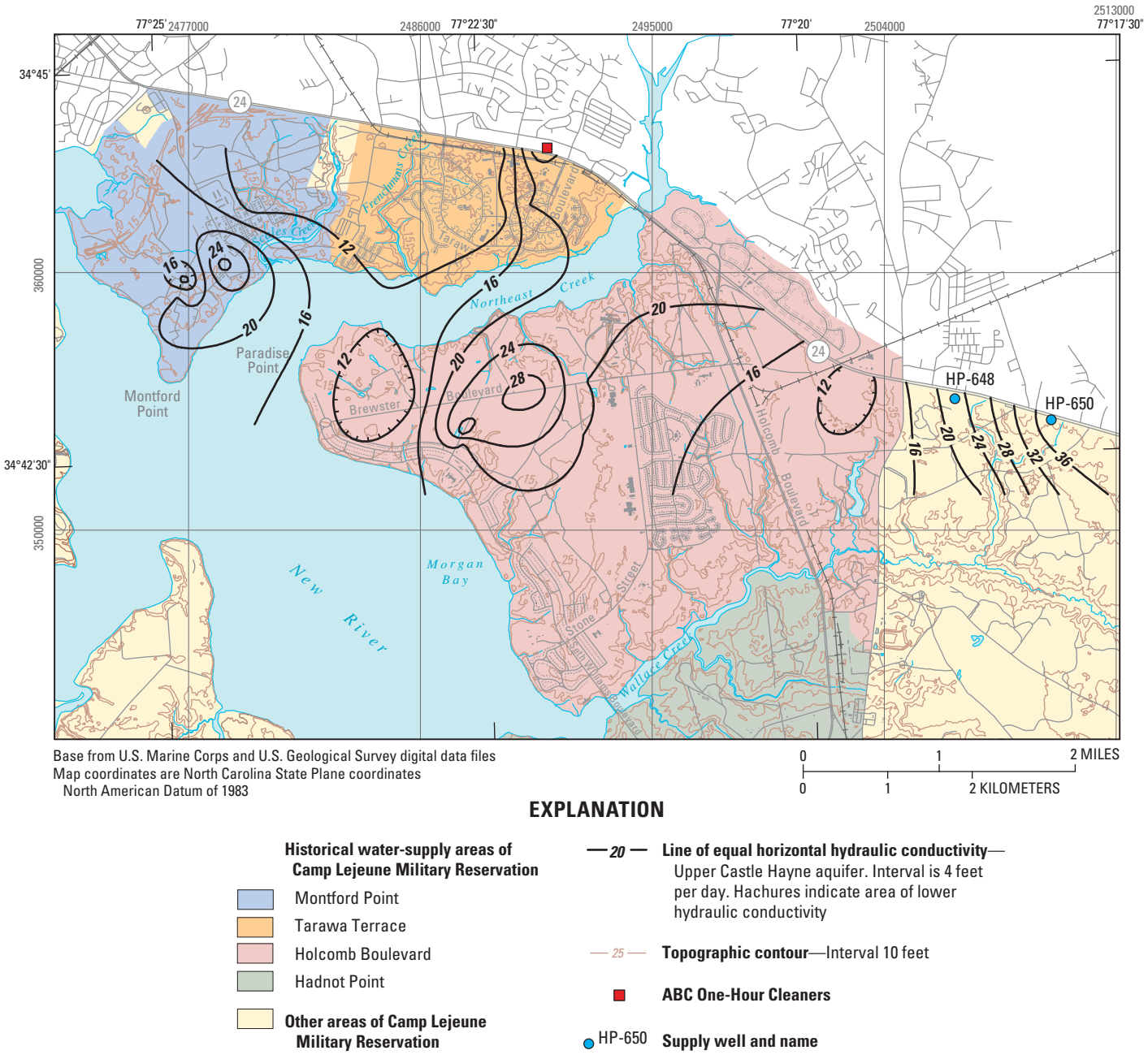


Figure B28. Horizontal hydraulic conductivity of the Upper Castle Hayne aquifer, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

in Figure B28. Horizontal hydraulic conductivity of the Upper Castle Hayne aquifer in the vicinity of Tarawa Terrace appears to range between 10 and 20 ft/d. Horizontal hydraulic conductivity of the Upper Castle Hayne aquifer in the eastern part of the study area appears to increase from about 16 to 40 ft/d north of the headwaters of Wallace Creek and near SR 24, although data are sparse and poorly distributed in this area. Contour patterns in the vicinity of Montford Point and near Paradise Point are inconsistent and reflect significant changes in horizontal hydraulic conductivity across relatively short distances.

About one-fifth of all aquifer-test analyses refer to wells open to both the Upper and Middle Castle Hayne aquifers. The horizontal hydraulic conductivity determined from these analyses also was interpolated areally (Figure B29). Highly generalized results are somewhat different from those observed uniquely for the Upper Castle Hayne aquifer (Figure B28)

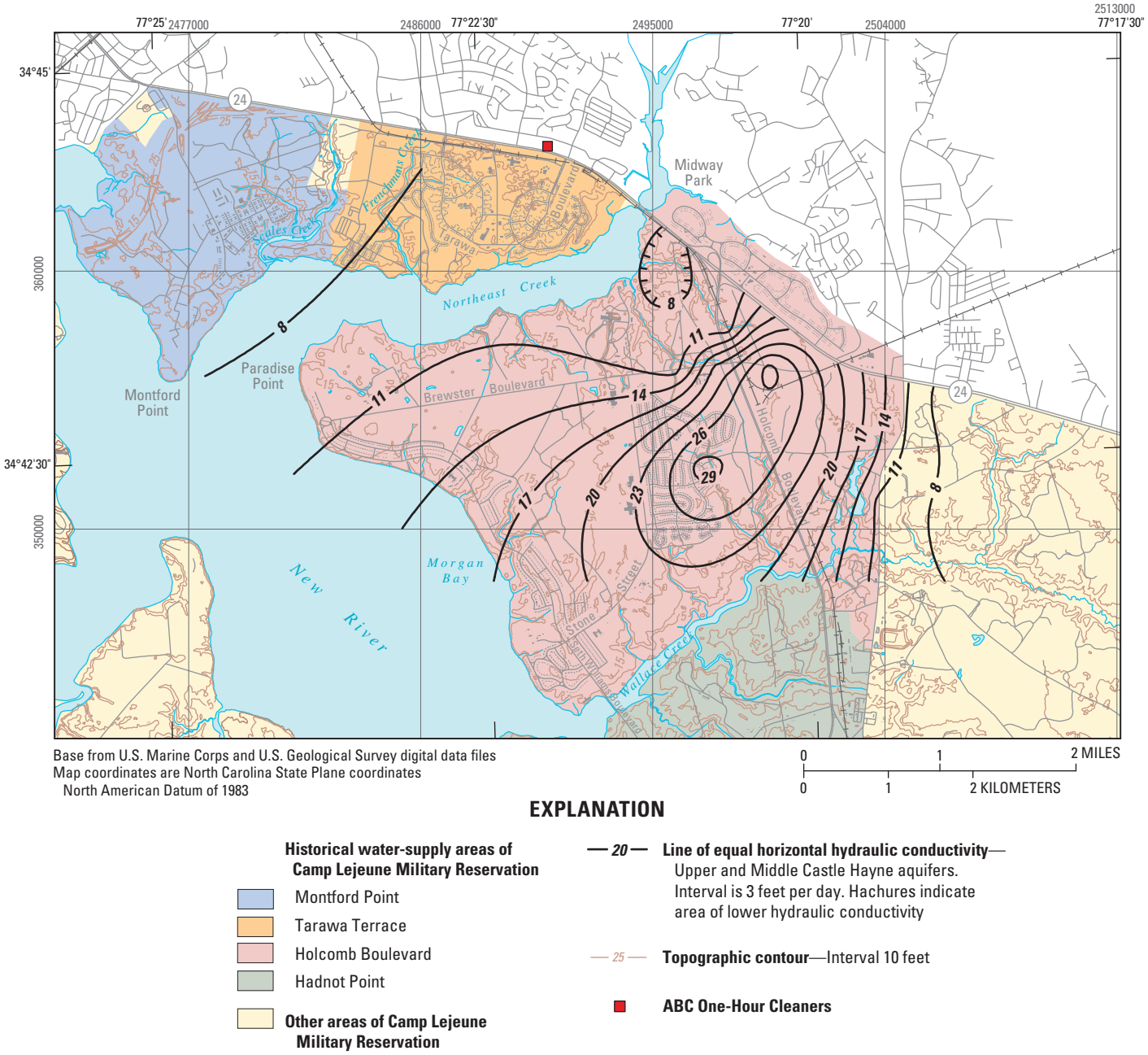


Figure B29. Horizontal hydraulic conductivity of the combined Upper and Middle Castle Hayne aquifers, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

and indicate that the distribution of hydraulic conductivity shown in Figure B29 may largely represent the Middle Castle Hayne aquifer. If so, horizontal hydraulic conductivity of the Middle Castle Hayne aquifer ranges from less than 8 ft/d west of Midway Park to about 30 ft/d east and south of Brewster Boulevard. Comparison of contours shown on Figures B28 and B29 indicates that horizontal hydraulic conductivity of the Middle Castle Hayne aquifer is somewhat to substantially lower than the corresponding conductivity of the Upper Castle Hayne aquifer throughout most of the study area.

The horizontal hydraulic conductivity of the Lower Castle Hayne aquifer was not uniquely determined at any site. Previous descriptions of the lithology of this aquifer, however, indicate a preponderance of fine sands and clayey sands, when compared to lithologies reported for the Upper and Middle Castle Hayne aquifers. Accordingly, the average horizontal hydraulic conductivity of the Lower Castle Hayne aquifer is estimated to be half or less of the average computed for all analyses summarized herein (Table B15).

Well C2 listed in Table B15 refers to a monitor well installed during investigations of groundwater contamination. The location of this well is shown on Plate 1 in the immediate vicinity of ABC One-Hour Cleaners. Well S190A is an irrigation well located near Brewster Boulevard in the vicinity of Paradise Point. Location coordinates of other wells are listed in several tables in this report and also are included in Faye and Green (In press 2007).

Table B15. Summary of aquifer-test analyses, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Contributing aquifer: UCHLU, Upper Castle Hayne aquifer–Lower unit; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; MCH, Middle Castle Hayne aquifer; UCH, Upper Castle Hayne aquifer–undifferentiated; TT, Tarawa Terrace aquifer; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and –Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; test method: SD, step drawdown; CJD, Cooper-Jacob, drawdown; CJR, Cooper-Jacob, recovery]

Site name[1]	Horizontal hydraulic conductivity, in feet per day	Contributing aquifers	Test method
C2	30	UCHLU	SD
HP-607 (new)	30	UCHRBU, MCH	CJD
HP-622	20	UCHRBU, MCH	CJR
HP-644	10	UCHRBU, MCH	SD
HP-645	20	UCHRBU, MCH	SD
HP-646	10	UCHRBU, MCH	SD
HP-647	30	UCHRBU, MCH	SD
HP-648	5	UCHRBU, MCH	SD
HP-649	8	UCHRBU, MCH	SD
HP-650	40	UCH	SD
HP-651	10	UCHRBU, MCH	SD
HP-653	10	UCHRBU, MCH	CJR
HP-654	20	TT, UCHRBU&LU	CJR
HP-699	30	UCHRBU	CJR
HP-700	8	UCH	CJD
HP-706	20	UCHRBU	CJR
HP-707	20	UCH	SD
HP-708	40	UCHRBU&LU	CJD
HP-710	20	UCH	CJD
LCH-4009	20	UCHRBU	CJR
M-142	30	UCHRBU, karst	CJD
M-243	10	UCHLU	CJD
M-267	10	UCHRBU&LU	SD
M-628	10	UCH	SD
M-630	20	UCHLU	SD
S190A	30	UCHRBU	CJD
TT-23	10	UCHRBU&LU, MCH	CJR
TT-25	9	UCHRBU&LU, MCH	CJR
TT-26	20	UCHLU, karst(?)	SD
TT-52	10	UCH	CJR
TT-55	10	UCHLU(?)	SD
TT-67	20	UCHLU	SD

[1]See Plate 1 for location

Statistics:

Average horizontal conductivity = 18 feet/day
Standard deviation of horizontal hydraulic conductivity = 10 feet/day

Potentiometric Surfaces

The oldest and/or highest water-level measurements out of a total data set of about 1,300 measurements were selected at 107 locations in the study area to estimate the predevelopment potentiometric surface of the Upper Castle Hayne aquifer (Table B16). Contours of equal potentiometric level based on these measurements are shown in Figure B30. Water levels obtained from supply wells in the Tarawa Terrace and Montford Point areas represent, for the most part, the Upper and Middle Castle Hayne aquifers. Corresponding water levels obtained from monitor wells represent mostly the Tarawa Terrace and Upper Castle Hayne aquifers. Water levels obtained between Northeast and Wallace Creeks are generally a composite of heads in the Upper and Middle Castle Hayne aquifers as well as the Tarawa Terrace aquifer. Detailed water-level data obtained from several investigations of groundwater contamination at Tarawa Terrace and vicinity (Roy F. Weston, Inc. 1992, 1994; Law Engineering, Inc. 1995; O'Brien & Gere Engineers, Inc. 1992) indicate only slight head differences between the River Bend and Lower units of the Upper Castle Hayne aquifer. Water-level data collected at a well cluster representing the Tarawa Terrace and Upper, Middle, and Lower Castle Hayne aquifers at site X24S1-S7, north of Wallace Creek, indicate only a 3-ft head difference between the Tarawa Terrace and Lower Castle Hayne aquifers, although the head measured in the Lower Castle Hayne aquifer was possibly influenced by pumping.

Assuming that lines orthogonal to the potentiometric level contours shown in Figure B30 approximate directions of groundwater flow, groundwater flows from east to west from the vicinity of SR 24 toward Northeast Creek and the New River and generally south and southwest from the vicinity of Tarawa Terrace and Montford Point toward Northeast Creek. The influence of New River and Northeast Creek as lines of discharge from the Castle Hayne aquifer system is clearly indicated. Note that contours shown in Figure B30 were based entirely on point data and as such were not adjusted to completely account for the expected influences of streams and highland areas on potentiometric levels. In particular, contours in the vicinity of Wallace Creek probably would trend upstream to a greater degree, compared to those shown, if water-level data proximate to the creek were sufficiently numerous. In addition, several contours, such as the 5-ft contour in the vicinity of Montford Point and the 15- and 20-ft contours in the southeastern part of the study area were possibly influenced by local pumping.

Site names listed in Table B16 prefaced by "C," "PZ," "S," "STT6," and "TTUST" refer to monitor wells installed during investigations of groundwater contamination or similar groundwater investigations. Locations of some of these wells are not shown on Plate 1; however, all are located at or in the immediate vicinity of Tarawa Terrace. Location coordinates are listed in several tables in this report and are also included in Faye and Green (In press 2007).

Table B16. Estimated predevelopment water levels, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD 29, National Geodetic Vertical Datum of 1929; contributing aquifers: UCHLU, Upper Castle Hayne aquifer–Lower unit; MCH, Middle Castle Hayne aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; TT, Tarawa Terrace aquifer; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and –Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; LCH, Lower Castle Hayne aquifer; UCH, Upper Castle Hayne aquifer–undifferentiated; BB, Brewster Boulevard aquifer]

Site name[1]	Water-level altitude, in feet above NGVD 29	Measurement date	Contributing aquifers
C1	21.5	4/22/92	UCHLU
C2	19.6	4/22/92	UCHLU
C3	15.8	4/22/92	UCHLU
C4	11.9	4/22/92	MCH
C5	15.7	4/22/92	UCHLU
C9	13.0	11/18/93	UCHLU
C10	12.6	11/18/93	MCH
C11	6.3	10/1/93	UCHLU
CCC-1	3.3	9/17/41	UCHRBU
CCC-2	5.2	6/19/42	UCHRBU
HP-37	0.9	8/2/42	TT(?)
HP-611 (old)	15.5	6/27/42	TT
HP-612 (old)	15.0	6/22/42	TT, UCHRBU&LU, MCH
HP-614 (old)	13.4	8/1/42	TT, UCHRBU&LU, MCH
HP-615	14.7	7/2/42	TT, UCHRBU&LU
HP-616	13.3	8/3/42	UCHRBU&LU, MCH
HP-620	14.0	9/28/44	TT, karst
HP-621 (old)	22.8	9/14/53	TT

Table B16. Estimated predevelopment water levels, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD 29, National Geodetic Vertical Datum of 1929; contributing aquifers: UCHLU, Upper Castle Hayne aquifer–Lower unit; MCH, Middle Castle Hayne aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; TT, Tarawa Terrace aquifer; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and –Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; LCH, Lower Castle Hayne aquifer; UCH, Upper Castle Hayne aquifer–undifferentiated; BB, Brewster Boulevard aquifer]

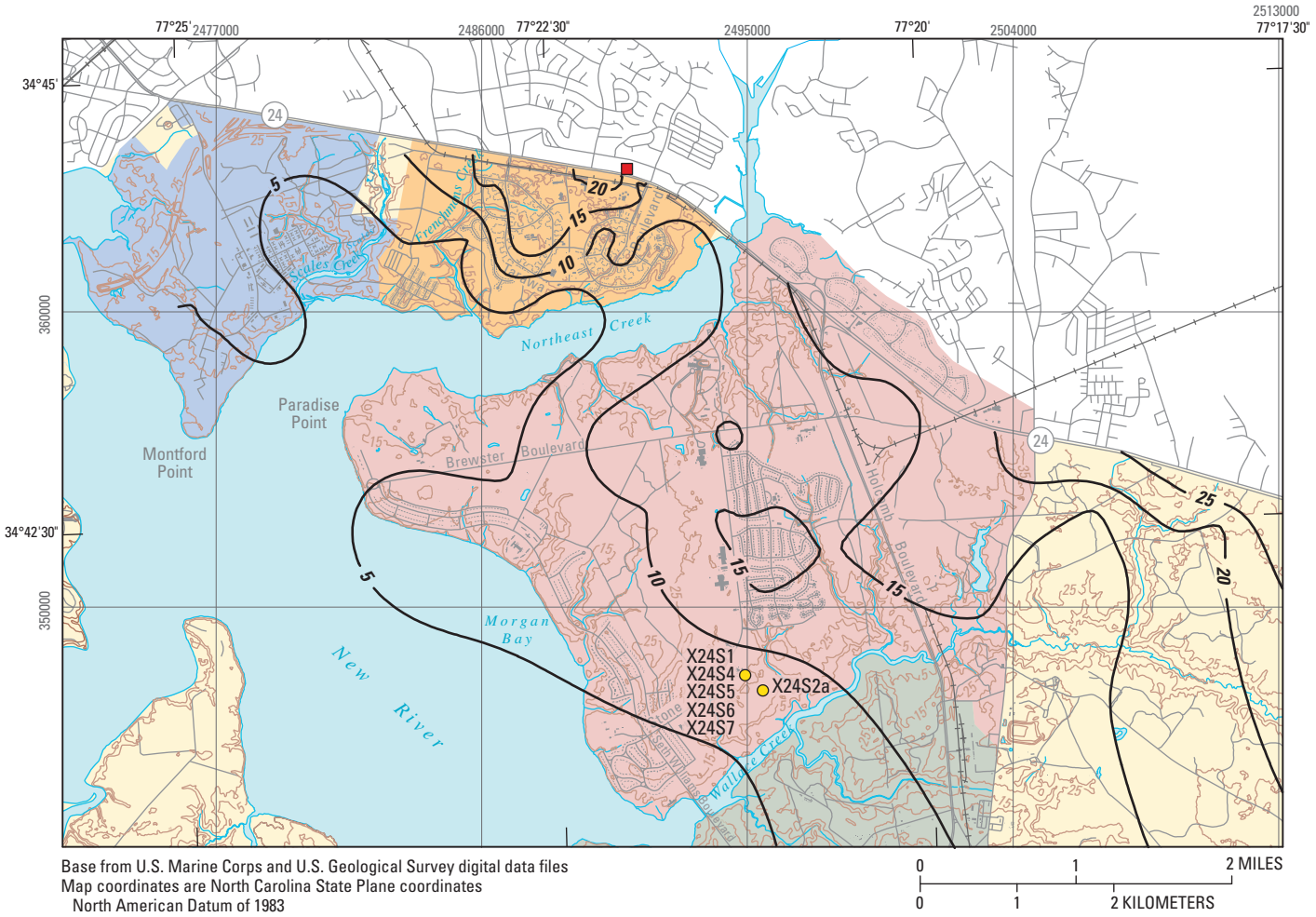
Site name[1]	Water-level altitude, in feet above NGVD 29	Measurement date	Contributing aquifers
HP-622	16.1	5/19/83	UCHRBU, MCH
HP-623	15.5	4/8/87	TT, UCHRBU, MCH
HP-629 (new)	23.0	3/8/83	TT, UCHRBU&LU, MCH
HP-641	16.8	4/18/87	TT, UCHRBU
HP-643	15.8	5/14/86	UCHRBU&LU, LCH
HP-645	11.5	4/9/87	UCHRBU, MCH
HP-647	11.5	4/8/87	UCHRBU, MCH
HP-648	23.9	4/7/87	UCHRBU, MCH
HP-649	25.0	4/7/87	UCHRBU, MCH
HP-650	28.7	11/10/71	UCHRBU&LU
HP-651	15	4/7/87	UCHRBU, MCH
HP-653	14.9	7/15/78	UCHRBU, MCH
HP-654	19.2	5/16/78	TT, UCHRBU&LU
HP-663	19	5/15/86	UCHRBU&LU
HP-698	10	4/9/87	UCHRBU
HP-699	13	4/9/87	UCHRBU
HP-700	3	2/20/86	UCH
HP-701	5	3/3/86	UCH
HP-703	10	3/6/85	UCHRBU&LU
HP-704	5	4/9/87	UCHRBU
HP-705	16	5/15/86	BB, UCH
HP-706	19	4/21/86	UCHRBU
HP-707	10	5/15/86	UCH
HP-708	34	5/30/86	UCHRBU&LU
HP-709	13	3/20/86	TT, UCH
HP-710	15	4/8/86	UCH
HP-711	19	4/14/86	TT, UCH
LCH-4007	16.1	4/7/87	TT, UCHRBU&LU
LCH-4009	16.8	5/16/83	UCHRBU
M-1	22.8	9/16/41	TT, UCHRBU
M-2	17.4	3/30/42	TT, UCHRBU&LU
M-142	9.0	11/2/42	UCHRBU
M-168	8.9	6/23/53	UCHRBU&LU, MCH
M-243	6.2	6/1/42	UCHLU
M-244	7.4	5/16/42	UCHRBU&LU
M-267	3	4/10/87	UCHRBU&LU
M-629	5	4/9/87	UCHLU, MCH
M-630	7	4/9/87	UCHLU
SOW3	9.3	5/14/86	BB, TT
PZ-01	16.7	11/18/93	UCHLU
PZ-02	16.7	11/18/93	UCHRBU
PZ-03	16.6	11/18/93	UCHLU
PZ-04	16.4	11/18/93	UCHRBU
PZ-05	15.7	10/1/93	UCHLU
PZ-06	16.1	10/1/93	UCHRBU
R(1950)	8.0	3/25/42	UCH

Table B16. Estimated predevelopment water levels, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD 29, National Geodetic Vertical Datum of 1929; contributing aquifers: UCHLU, Upper Castle Hayne aquifer–Lower unit; MCH, Middle Castle Hayne aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; TT, Tarawa Terrace aquifer; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and –Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; LCH, Lower Castle Hayne aquifer; UCH, Upper Castle Hayne aquifer–undifferentiated; BB, Brewster Boulevard aquifer]

Site name[1]	Water-level altitude, in feet above NGVD 29	Measurement date	Contributing aquifers
S1	23.7	4/22/92	TT, UCHRBU(?)
S2	19.9	4/22/92	UCHRBU
S3	16.0	4/22/92	TT, UCHRBU
S4	13.6	4/22/92	TT, UCHRBU(?)
S5	16.4	4/22/92	TT, UCHRBU(?)
S6	20.6	4/22/92	TT, UCHRBU
S7	19.8	4/22/92	TT, UCHRBU
S8	20.9	4/22/92	TT, UCHRBU
S9	15.4	4/22/92	TT, UCHRBU
S10	13.3	6/25/92	TT, UCHRBU
S11	19.0	11/18/93	TT, UCHRBU
STT61to66-MW02	21.6	1/29/92	TT, UCHRBU
STT61to66-MW08	20.8	1/29/92	TT, UCHRBU
STT61to66-MW10	20.7	1/9/92	TT, UCHRBU
STT61to66-MW12	20.6	1/29/92	TT, UCHRBU
STT61to66-MW14	20.5	1/29/92	TT, UCHRBU
STT61to66-MW20	20.1	12/17/92	TT, UCHRBU
T-9	23.4	4/87	UCHRBU&LU
TT-25	10.9	4/7/87	UCHRBU&LU, MCH
TT-26	14.0	5/16/51	UCHLU
TT-27	16.6	1/10/63	UCHLU
TT-52	12.9	10/17/61	UCH
TT-53	14	7/22/61	UCHRBU&LU
TT-54	12.1	6/30/61	UCH
TT-55	18.9	11/1/61	UCHLU(?)
TT-67	8.4	4/7/87	UCHLU
TT Dump MW01	2.4	6/26/91	TT
TT Dump MW02	6.2	6/26/91	TT
TTUST-2453 A-2	6.6	6/7/89	TT
TTUST-2453 OB-11	7.4	6/7/89	TT
TTUST-44-MW01	6	11/15/01	TT, UCHRBU
TTUST-48-MW01	19	9/1/98	TT, UCHRBU
TTUST-779-MW01	9	7/25/02	TT
TTUST-2254-MW01	13	7/24/02	TT
TTUST-2258-MW01	12	7/24/02	TT
TTUST-2302-MW01	12	7/24/02	TT
TTUST-TTSC-15	11.2	12/28/94	UCHRBU
TTUST-2478-MW08	12.6	11/22/93	TT
TTUST-3140-MW01	15	7/24/02	TT, UCHRBU(?)
TTUST-3165-MW01	16	7/24/02	TT, UCHRBU(?)
TTUST-3233-MW01	12	7/24/02	TT, UCHRBU(?)
TTUST-3524-MW01	6	7/25/02	TT
TTUST-3546-MW01	5	7/25/02	TT
X24S6	6.4	6/15/87	UCH
X24S7	6.3	6/15/87	TT

[1]See Plate 1 for location



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

— 10 — **Line of equal potentiometric level**—Upper Castle Hayne aquifer. Contour interval 5 feet. Datum is National Geodetic Vertical Datum of 1929

— 25 — **Topographic contour**—Interval 10 feet

ABC One-Hour Cleaners

X24S2a **Monitoring well and name**

Figure B30. Estimated predevelopment potentiometric surface of the Upper Castle Hayne aquifer, Tarawa Terrace and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Discussion

Point data used for interpolation control when plotting unit tops and thickness generally decrease in number and density with unit depth, increasing the subjectivity of interpolated results. For example, a total of 39 data points were used to define the top of the Tarawa Terrace aquifer; whereas, only 6 data points were available to define the top of the Beaufort confining unit (Tables B5 and B14, respectively). Nevertheless, these maps (Figures B4–B27) are considered integral elements of the groundwater-flow model necessary for historical reconstruction, and were used to assign layers and layer geometry during flow model construction.

Limitations and qualifications pertinent to point data used to assign geohydrologic unit tops apply, as well, to hydraulic characteristic data (Table B15). Most test results refer to the shallowest aquifers, namely the Tarawa Terrace and Upper Castle Hayne aquifers. No test results refer uniquely to the Middle or Lower Castle Hayne aquifers. Accordingly, horizontal hydraulic conductivity data assigned to the flow model layers that represent these aquifers (Faye and Valenzuela, In press 2007) was somewhat subjective.

Summary and Findings

Potentiometric levels, horizontal hydraulic conductivity, and the geohydrologic framework of the Castle Hayne aquifer system at Marine Corps Base Camp Lejeune, east of the New River and north of Wallace Creek, are described and quantified. The geohydrologic framework is comprised of 11 units, 7 of which correspond to the Upper, Middle, and Lower Castle Hayne aquifers and related confining units. Overlying the Upper Castle Hayne aquifer are the Brewster Boulevard and Tarawa Terrace aquifers and confining units. Much of the Castle Hayne aquifer system is comprised of fine, fossiliferous sand, limestone, and shell limestone. The sands are frequently silty and contain beds and lenses of clay. Limestone units are probably discontinuous and occasionally cavernous. Confining units are characterized by clays and silty clays of significant thickness and are persistent across much of the study area. Maximum thickness of the Castle Hayne aquifer system within the study area is about 300 ft. In general, geohydrologic units thicken from northwest to the south and southeast. The limestones and sands of the Castle Hayne aquifer system readily yield water to wells. Aquifer-test analyses indicate that horizontal hydraulic conductivities of water-bearing units at supply wells commonly range from 10 to 30 ft/d. Estimated predevelopment potentiometric levels of the Upper and Middle Castle Hayne aquifers indicate that groundwater flow directions are from highland areas north and east of the study area toward the major drainages of New River and Northeast Creek.

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Analyses of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water at Tarawa Terrace and Vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina: Historical Reconstruction and Present-Day Conditions—
Chapter B: Geohydrologic Framework of the Castle Hayne Aquifer System