WATER-LEVEL CONDITIONS IN THE UPPER PERMEABLE ZONE OF THE FLORIDAN AQUIFER IN THE SOUTH CAROLINA LOW COUNTRY, MARCH 1985

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I Introduction

Water levels in selected wells finished in the upper permeable zone of the Floridan aquifer in Beaufort, Jasper, Colleton, and Hampton Counties were measured during March 1985. The data obtained were plotted on detailed maps of Hilton Head Island, the Port Royal Island area, Ladies/St. Helena Islands; and on a generalized map of the Low Country. All data were plotted in terms of mean sea level (msl). The following is a report based upon the data obtained.

Prior to this water-level run, measurement of water levels in the Low Country required 2-3 weeks. Water levels can change significantly during this time span, and inconsistencies were introduced. In March 1985 the run took only 4 days, owing to increased manpower. This greatly improves the accuracy of the maps produced from the data. Accuracy was also improved by making tidal corrections to water levels near tidal bodies.

II Summary

1) Ground-water flow is generally toward the southeast in Colleton, Hampton, and northern Jasper and Beaufort Counties. This is representative of the regional flow from outcrop to coast.

2) The direction of flow deviates from natural conditions southwest of the Broad River. The deviation is due to withdrawals in the Savannah area. The potentiometric contours illustrate a cone of depression with Savannah as the center.

3) Most islands in Beaufort County are areas of recharge, with ground water moving towards the tidal bodies. This is due to the relatively high land surface and leaky confining beds.

4) Small cones of depression caused by pumping exist in the Hampton and Lobeco areas.

5) The overall gradient between the entrance of the Broad River and the Savannah River is 3.8 ft/mile. The gradient steepens from 1.0 ft/mile on northern Hilton Head Island to over 10 ft/mile near the Savannah River.

6) Potentiometric contours indicate a potentiometric trough along a portion of the Coosawhatchie River. There appears to be no other hydrogeological evidence for such a trough and a preliminary USGS flow model of the area has been unable to match the contours. The shape of the contours cannot be explained presently and a more detailed investigation of this area is warranted.

7) Coverage in northeastern Colleton County remains poor. Considerable differences in spacing and shape of contours are apparent when the March 1985 map is compared to earlier maps of the potentiometric surface. This is probably a result of poor coverage rather than physical changes in the system.

III Localized Conditions

1) Beaufort Area (Fig. 4) - The Beaufort area is dominated by a large potentiometric high. Water levels centered near the Marine Corps Air Station were measured as high as 26 ft msl. The cone of impression extends approximately 6 miles north and south and 4 miles east and west of its center.

   A preliminary flow net analysis of the area shows recharge to the entire area to be approximately 4.5 million gallons per day based on an average transmissivity (T) of 5,000 ft/day. This transmissivity is an average of values calculated from aquifer tests in the recharge mound. The calculated value of recharge is very sensitive to transmissivity; therefore, this recharge value is only as accurate as the transmissivity value. The T value is considered reliable, since several aquifer tests have been analyzed in the area and give consistent results. A more detailed flow net analysis will be done after wells in the area are leveled.

2) Ladies/St. Helena Islands (Fig. 3) - This area is characterized by freshwater lenses under land areas, with flow moving radially outward toward tidal bodies. The potentiometric surface parallels the topographic surface, indicating the aquifer is poorly confined or unconfined.

   Datha Island appears to be the center of a small cone of depression with water levels -1 ft msl at the center. East of Datha is a recharge mound with a gentle hydraulic gradient. The peak water level was 4.5 ft msl.

   The dominant feature on Ladies Island is a large recharge mound with water levels approaching 15 ft msl at the center. This mound extends westward to Brickyard Creek where it meets the downgradient section of the Beaufort potentiometric high. This meeting of the mounds indicates discharge is occurring near Brickyard Creek.

3) Parris Island (Fig. 4) - A small potentiometric high exists on Parris Island. Although small, it has a steep hydraulic gradient of 10 ft/mile.

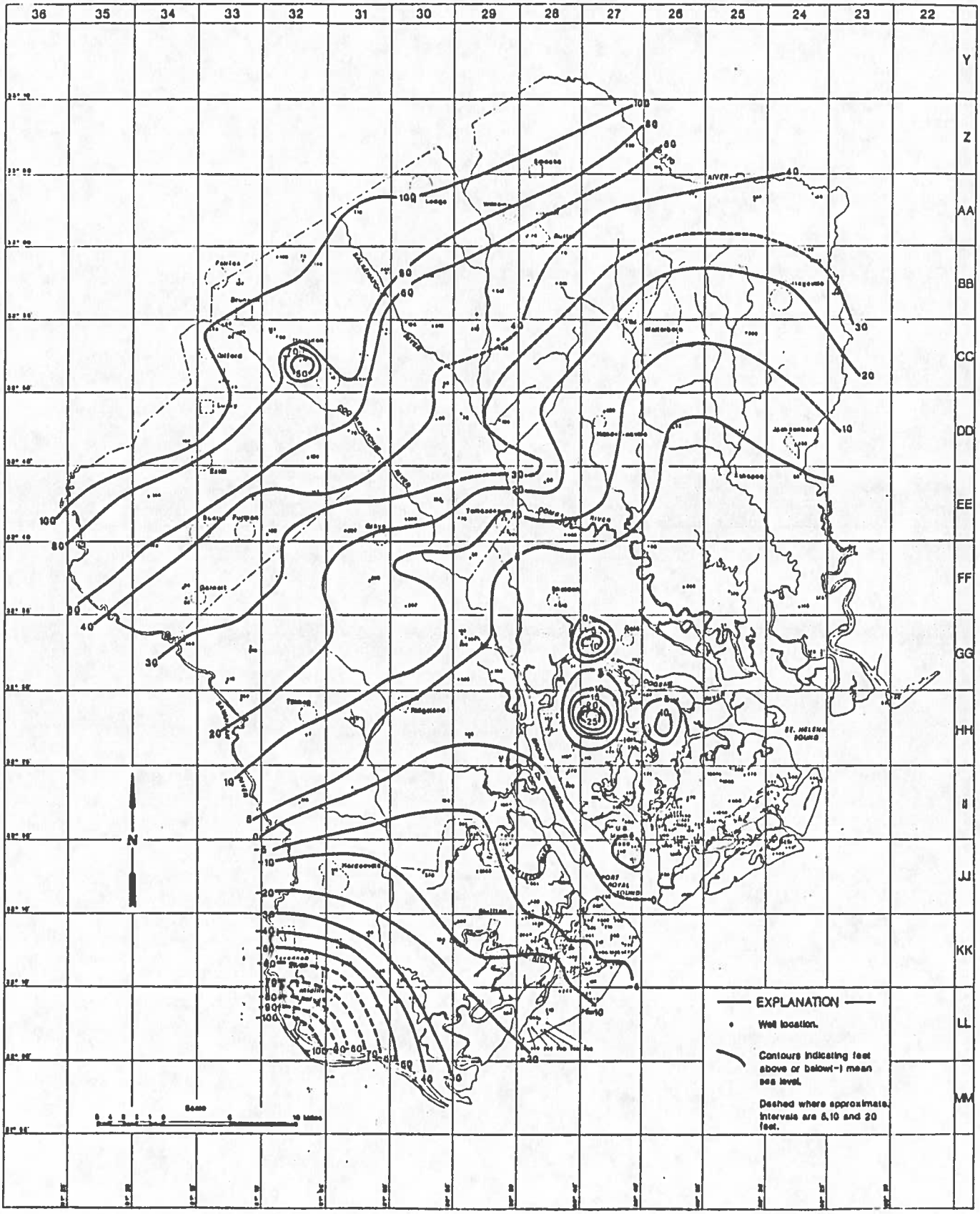

Figure 1. Potentiometric surface of the Floridan aquifer in March, 1985.

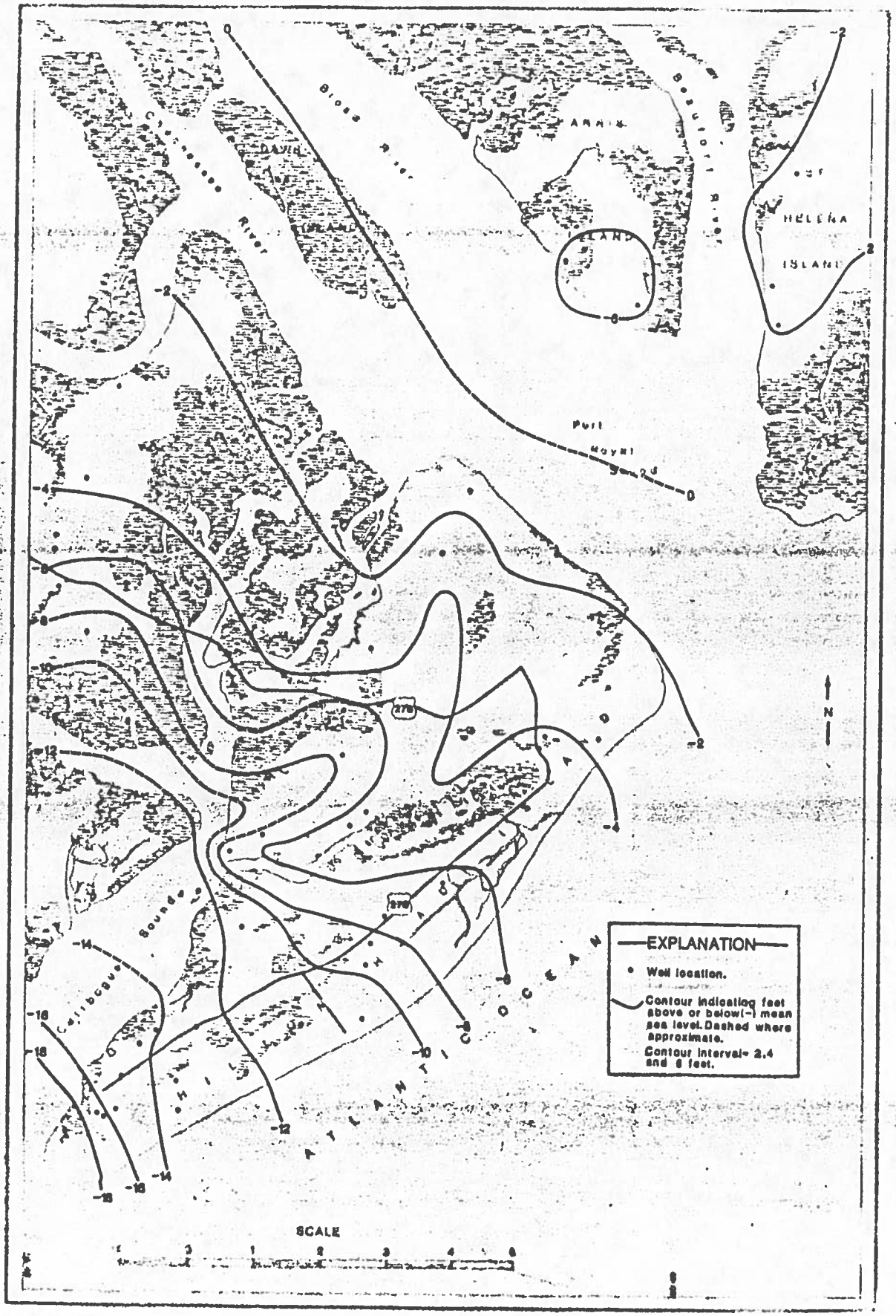

Figure 2. Water level contours of the upper Floridan aquifer, March 1985, Hilton Head Island area.

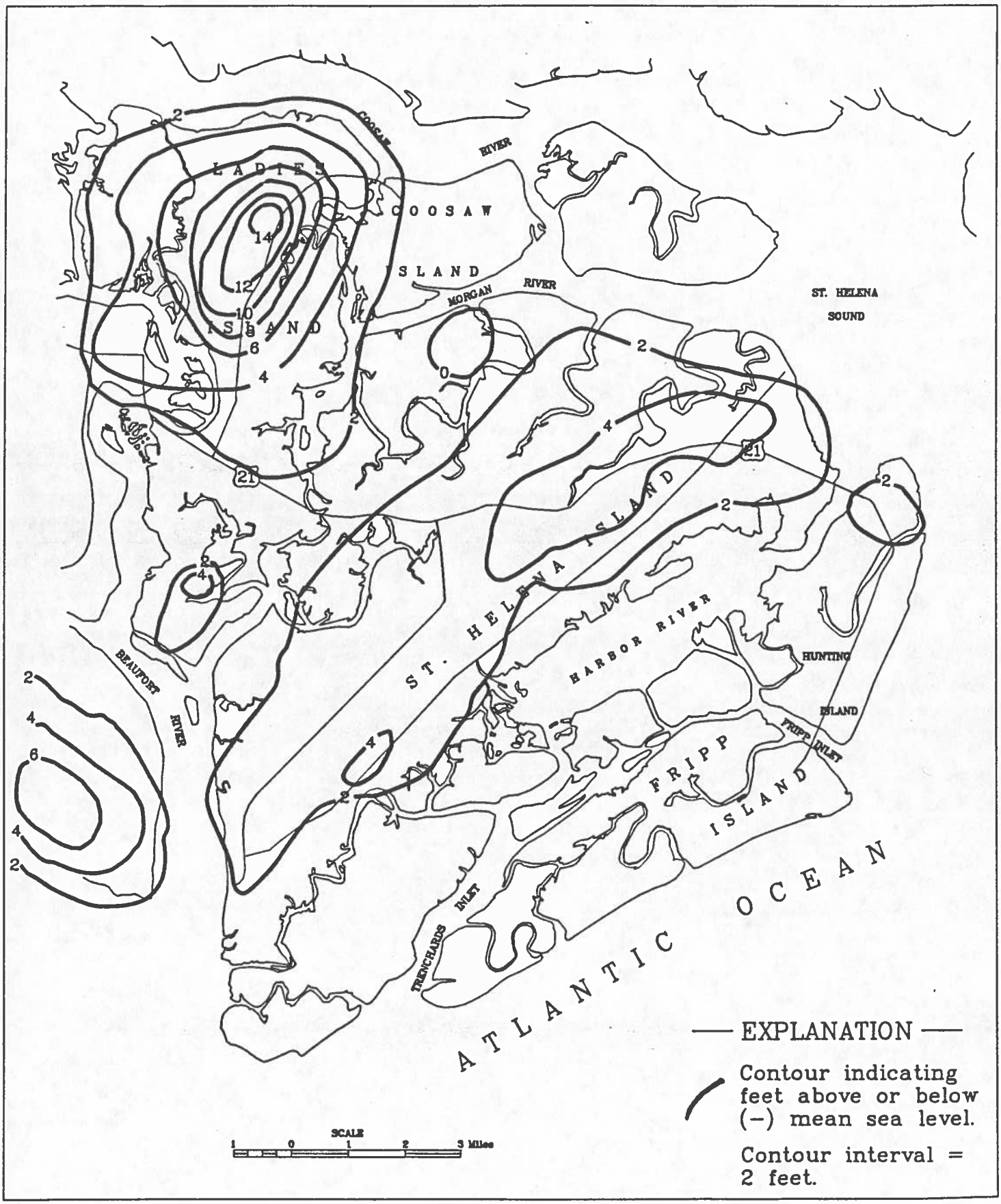

Figure 3. Water levels in the Floridan Aquifer, March 1985.

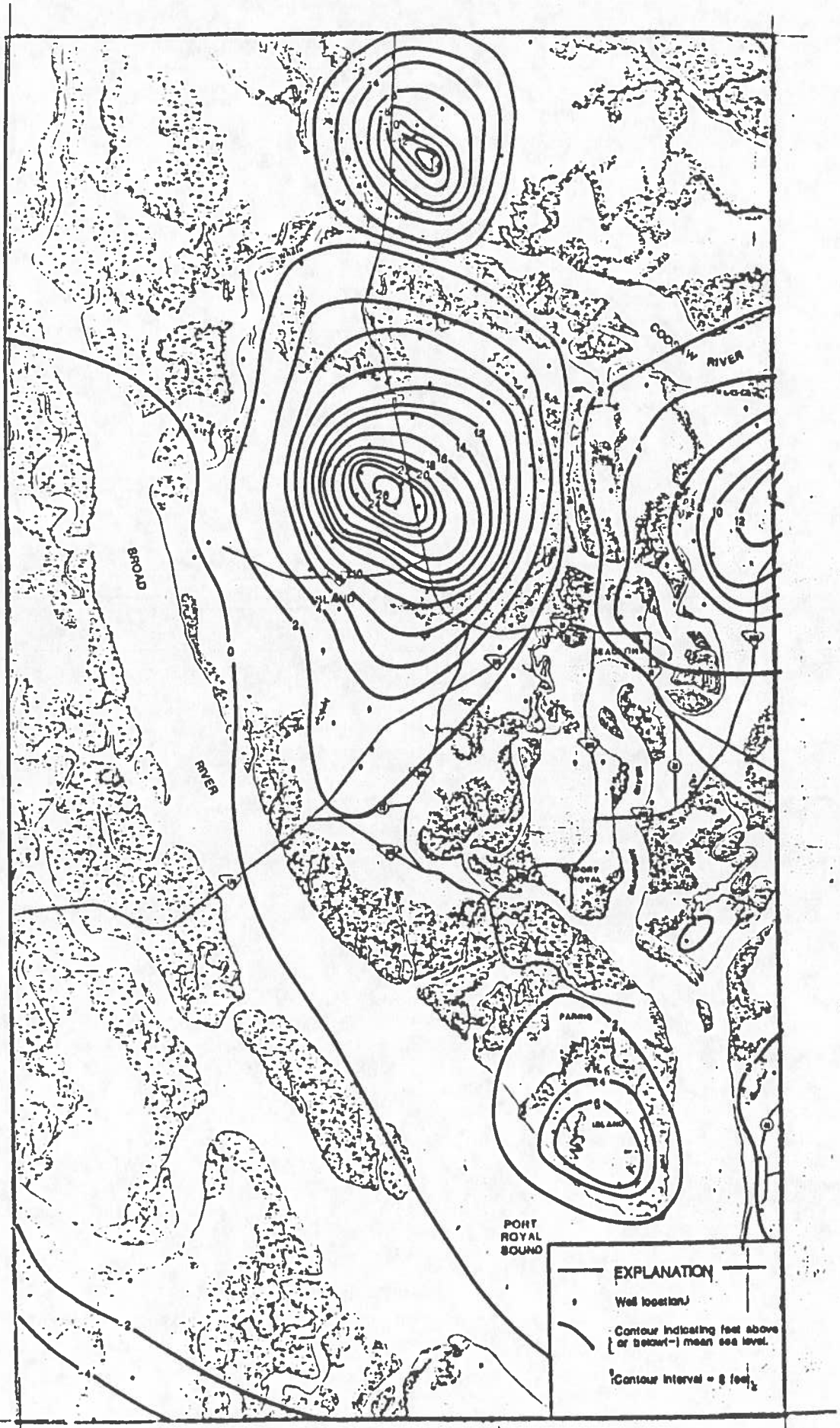

Figure 4. Potentiometric surface of the Floridan aquifer, Port Royal Island, March 1985.

4) Lobeco (Fig. 4) - A cone of depression exists in the Lobeco area. Alternate pumping of two closely spaced wells causes the depression. Discharge averaged 334,000 gpd in March. A preliminary flow net analysis indicates a low transmissivity of approximately 1,200 ft^2/day. This deep depression is typical for a confined aquifer with low transmissivity.

5) Yemassee (Fig 1) - The hydraulic gradient is 2.5 ft/mile in a southerly direction. West of Yemassee the potentiometric surface dips toward the east with the same gradient.

6) Walterboro (Fig. 1) - This area needs much better coverage in order to determine gradients and hydrologic conditions.

7) Hilton Head Island/Bluffton (Fig. 2) - Coverage is good in the Hilton Head area but needs to be improved to construct a reliable 1 foot contour map.

   The gradient is 1.0 ft/mile on northern Hilton Head Island and steepens to 5.0 ft/mile at the southwest tip of the island. Local pumping seems to be the major factor affecting the shape of the potentiometric contours and pumping in Savannah is the significant factor affecting the general gradient.

   The zero contour is located 1-2 miles east of Hilton Head Island in Port Royal Sound and the -2 foot contour roughly follows the northeast shoreline. This shows that there exists a potential for saltwater movement downward into the Floridan aquifer.

IV Comparison to Hayes (1976; Fig. 19) Potentiometric Map

The March 1985 potentiometric map (Fig. 1) was compared to an equivalent map for December 1976 constructed by Larry Hayes for his report entitled "The ground-water resources of Beaufort, Colleton, Hampton, and Jasper Counties, South Carolina"(U.S. Geological Survey, Water Resources Division, 91p. 1979). Differences in the maps can be attributed to differences in coverage, interpretation, different stresses on the system at different times, and physical changes in the hydrology of the area.

1) The northeast sections of the maps are much different, and this is probably due to differences in well coverage. The contours are shifted northward approximately 4 miles on the 1985 map, but coverage is poor in this area and it is difficult to verify physical changes.

2) Hayes shows 5- and 10- ft contours bending southward along the Combahee River, whereas the 1985 map shows much more gentle bends.

3) The large recharge mound centered near the Marine Corps Air Station is not as extensive as shown on the 1976 map. The 1985 map probably is more representative of fact, owing to the increase in the number of monitoring wells in the Port Royal Island area since 1976. The 1985 map also shows a small but steep recharge mound on the southern end of Parris Island.

4) The size and shape of the Ladies Island potentiometric high has been better defined since 1976. The area is now monitored closely.

5) The zero contour near Hilton Head Island has apparently moved northeastward 1 to 2 miles since 1976. The -10 and -5 contours have also moved northeastward, which indicates that Savannah's cone of depression is spreading or local pumping is producing an effect.

V Review of Water Level Network

A) 295 wells were measured in March 1985.

1) 27 wells in Hampton County.
2) 36 wells in Colleton County.
3) 51 wells in Hilton Head Island/Bluffton area.
4) 82 wells in Ladies/St. Helena Island area.
5) 29 wells in Jasper County.
6) 70 wells in Port Royal Island study area.

B) 5-minute grids requiring additional wells are listed below, along with the number of additional wells required. Asterisks indicate high priority areas.

1)	24CC (1)	14)	28CC (2*)	26)	31EE (1)
2)	25BB (1)	15)	28DD (2*)	27)	31FF (1)
3)	25EE (1)	16)	28EE (1)	28)	31GG (2*)
4)	26BB (1*)	17)	28FF (1)	29)	32DD (1)
5)	26CC (1)	18)	29Z (1)	30)	32FF (1)
6)	26DD (1)	19)	29AA (1)	31)	32GG (2*)
7)	26EE (1)	20)	29FF (1*)	32)	32HH (1*)
8)	27AA (1)	21)	29GG (1*)	33)	33DD (1)
9)	27BB (1)	22)	29JJ (1)	34)	33FF (1)
10)	27CC (1*)	23)	29KK (1*)	35)	33GG (1*)
11)	27EE (1)	24)	30GG (1)	36)	35EE (1)
12)	27FF (1)	25)	30II (1)	37)	35FF (1)
13)	28Z (1)				

38) Hilton Head Island's monitoring network should be increased to approximately 80 wells in order to construct a reliable 1 foot contour map.

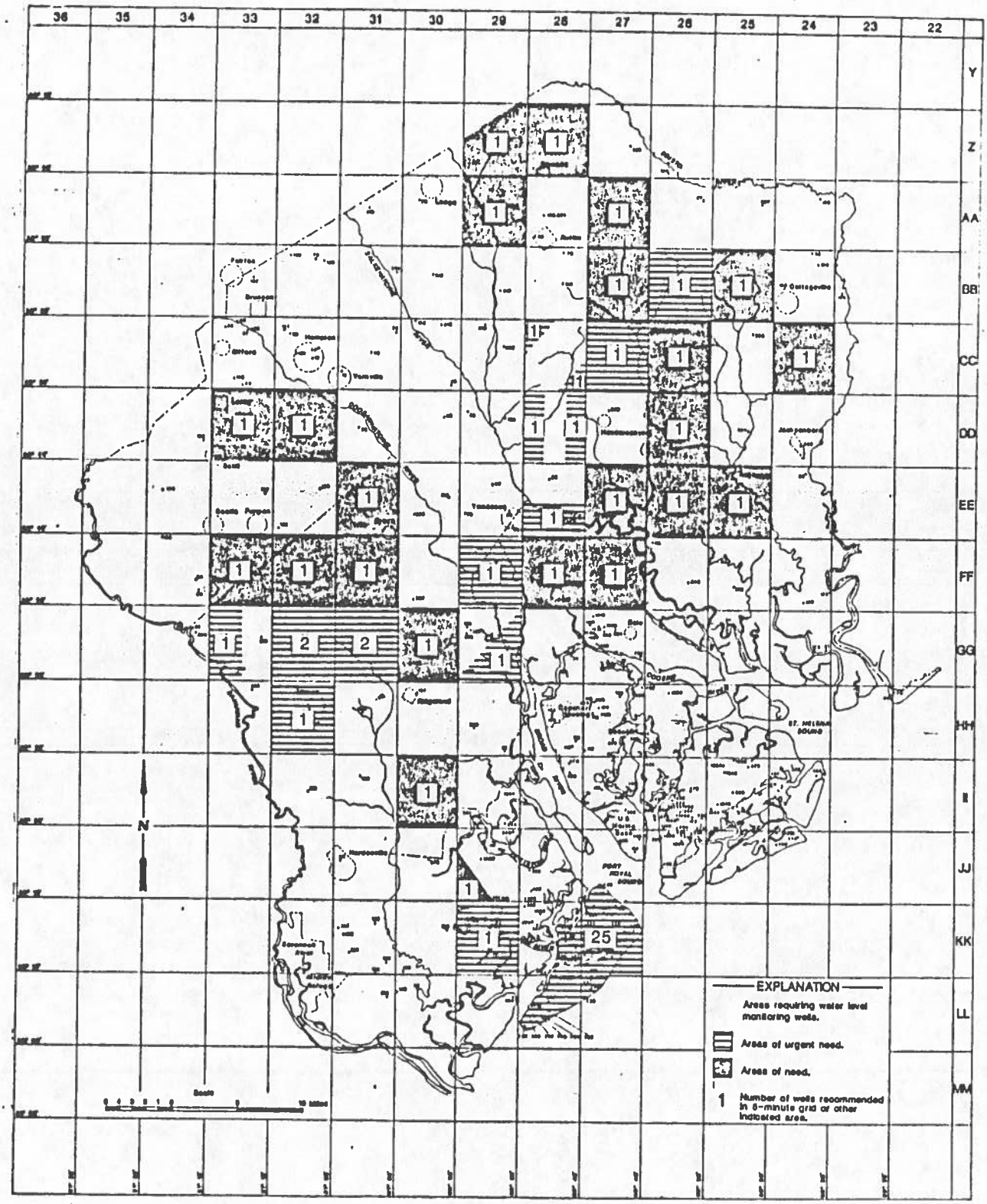

Figure 5. Areas needing water level monitoring wells as of March, 1985.

C) 5-minute grids with no monitoring wells are:

1)	24CC	9)	27EE	17)	31GG
2)	25BB	10)	27FF	18)	32GG
3)	25EE	11)	28Z	19)	33DD
4)	26BB	12)	28CC	20)	33FF
5)	26CC	13)	28DD	21)	35EE
6)	26EE	14)	29AA	22)	35FF
7)	27AA	15)	29Z		
8)	27BB	16)	30II		

D) The 5-minute grids requiring wells are shown on the enclosed map (Fig. 5). Numerals in the grids indicate the number of additions desired.

E) All wells to be used in constructing potentiometric maps with contours of 5 feet or less should be leveled. Many wells in the Low Country monitoring network are not leveled. The following is a summary of leveled and unleveled wells measured in March 1985.

	Leveled	Unleveled
Colleton County	0	36
Hilton Head Area	25	24
Hampton County	1	26
Jasper County	1	28
Port Royal Island	31	33
Ladies/St. Helena Islands	79	1

All wells in the Hilton Head and Port Royal Island area should be leveled as well as several wells in Jasper County. Although potentiometric maps drawn for Jasper County only have 5 or 10 foot contours, leveling is desirable due to the poor quality of the topographic maps in the area, thus making it difficult to pick accurate altitudes for the data points.

F) Water levels for March 1985 were corrected for tidal effects. This improves the accuracy of the potentiometric maps. However, the data concerning tidal effects in different areas need to be improved. Graphs of tidal efficiency versus distance to tidal body are poor for Hilton Head and nonexistent elsewhere with the exception of Ladies/St. Helena Islands where tide gauging was performed for an earlier study. An extensive study is planned for the Hilton Head area concerning tidal effects on the ground water regime.

G) There is some doubt as to the validity of data from various wells in the network. These wells are as follows:

a) 31HH-h1 Data indicates open above and below confining unit.
b) 34GG-i1 Open interval = 40-185 ft. Probably open to shallow

c) 32FF-n1 Lack of data concerning construction.
d) 29GG-y1 Open interval = 80-160 below LSD. Gamma log indicates limestone occurs at a depth of 125 ft.
e) 31HH-n1 May be open at shallow depth. Poor records.
f) 29HH-n5 Open interval = 60-178 ft. Limestone occurs at depth of 130 ft.
g) 29HH-v1 Open interval = 86-149 ft. Depth to limestone = 120 feet.
h) 32CC-e3 Well may be too shallow.
i) 33CC-d1 Too shallow

H) The following wells are open to deeper permeable zones within the Floridan aquifer. The heads therefore may be affected although some believe the difference to be minor in the various permeable zones.

a) 26FF-e1
b) 26FF-c3
c) 25FF-q2
d) 24FF-w1
e) 24GG-k2
f) 24GG-l1
g) 24EE-c1
h) 24DD-r1
i) 30AA-v1
j) 30CC-e2
k) 32CC-e1
l) 32BB-i1
m) 32FF-s2
n) 34GG-h1

I) The following wells normally on the network presented problems in obtaining measurements.

a) 31KK-i2 Well covered with insulation
b) 33GG-x1 Flowing. Pressure gauge will not fit casing
c) 26FF-c3 Chickens in well house
d) 24FF-v1 Taken off run at owner's request
e) 26DD-n2 Welded shut
f) 29FF-e1 Flowing. Cannot measure pressure.
g) 33CC-d1 Flowing. Cannot measure pressure.
h) 33CC-h2 Flowing. Cannot measure pressure.
i) 34FF-s2 Flowing. Cannot measure pressure.
j) 33CC-h1 Filled with sand.
k) 32BB-m1 Owner says not to disturb chickens in pump house.
l) 29JJ-g2 Need key.
m) 28KK-l3 Could not find.
n) 27JJ-g1 Blocked at 40 feet.
o) 27KK-p4 Pump house locked.
p) 27KK-h2 Need key.
q) 27KK-b12 Cannot get tape down.
r) 27LL-e2 Cannot get tape down.
s) 28LL-m6 Tape broke in well.
t) 28LL-m2 Tape broke in well.
u) 28JJ-n1 Well blocked at 50 feet.
v) 29II-t2 Dogs
w) 28II-a3 Cannot get tape down.
x) 27HH-s1 Cannot locate.

y)	27II-il	Need air pump.
z)	27HH-d2	Dogs
aa)	27GG-y4	Need key.
bb)	27GG-p3	Need key.
cc)	26HH-s2	Well under pressure.
dd)	25HH-x7	Cannot locate.
ee)	25HH-v5	Pump on well.
ff)	24II-dl	Need key.

J) The following wells had anomalous water levels:

	WELL NUMBER		REMARKS
a)	JAS 154	(29GG-r2)	Very low; new information indicates well finished in Hawthorn and Floridan.
b)	COL 164	(29DD-l1)	Very low; not leveled
c)	COL 190	(23BB-p2)	Slightly high
d)	COL 194	(26Z-x2)	Very low; historically higher levels until 1984.
e)	COL 213	(29BB-xl)	Too low; not leveled; ignored
f)	COL 217	(29BB-sl)	Too low; not leveled; ingnored
g)	COL 222	(29CC-i3)	Too high
h)	COL 225	(24DD-rl)	Slightly low; pumping well
i)	BFT 19	(27II-n2)	Too low; not leveled; many other wells in area.
j)	BFT 476	(28II-bl)	" " " " " "
k)	BFT 1702	(27II-b15)	" " " " " "
l)	BFT 1714	(27HH-w3)	" " " " " "
m)	BFT 1721	(27II-f4)	" " " " " "
n)	BFT 1736	(28II-b4)	" " " " " "

K) A list of all wells measured for 1985 and their respective water levels is included as the appendix.

VI Ground Water Use

Ground-water pumpage is a controlling factor of the shape and distribution of the potentiometric surface. It is valuable to know areas of high pumpage in order to understand why the potentiometric surface looks as it does.

The SCWRC monitors Class-A water users. Class-A users are those who, on at least one day in the year, pump 100,000 gallons. These users are required to report pumpage. The total pumpage for January through March, 1985 is tabulated in Table 1. Hampton County data were unavailable for 1985 so data for the equivalent period in 1984 were used. It is believed pumpage was similar. The distribution of pumpage for January - March 1985 is shown on figure 6.

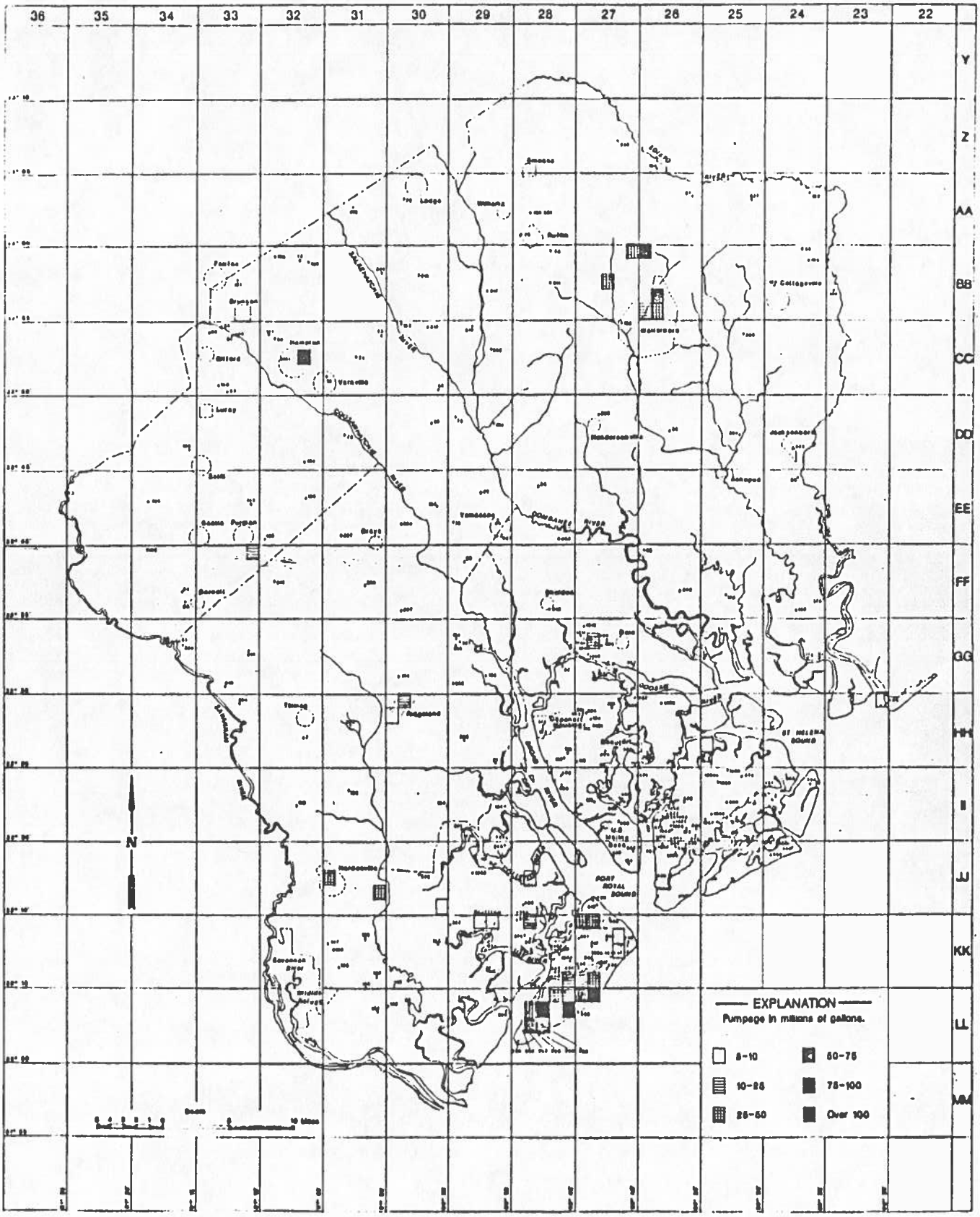

Figure 6. Distribution of pumpage from Floridan aquifer, Jan.-March 1985.

TABLE 1. Total Ground Water Use January-March 1985 (in million gallons)

	Beaufort County	Jasper County	Colleton County	Hampton County*
Hilton Head	579.6	54.2	243.7	140.4
Bluffton	58.7			
Ladies Island	.30			
St. Helena Island	16.0			
Port Royal Island	1.3			
Other	24.4			
	670.5			
Total Use		1,108.7		

*1984 Data

APPENDIX

SCWRC#	COUNTY#	LAT-LONG	MARCH	MAY	JUNE
23BB-p2	COL-0190	325740 802653	33.64	34.43	33.96
24BB-c1	COL-0052	325930 802752	35.68	35.53	35.01
24BB-h2	COL-0185	325807 802757	23.92	23.61	22.06
24BB-o1	COL-0186	325111 802917	17.44		16.42
24DD-r1	COL-0225	324625 802734	2.31	0.63	0.50
24EE-c1	COL-0096	324411 802709	4.41	5.35	5.22
24FF-w1	COL-0149	323533 802750	4.76	5.09	4.97
24GG-k2	COL-0173	323226 802555		4.78	5.31
24GG-l1	COL-0051	323234 802613	1.84	2.09	2.24
24HH-q4	BFT-1604	322611 802826	1.34	0.23	0.12
24HH-x5	BFT-1542	302528 802831	3.97	2.52	3.02
24II-d1	BFT-0562	322428 802805	3.14		3.02
24II-e3	BFT-0412	322447 802936	4.04	3.07	2.72
24II-f3	BFT-0497	322345 802450	1.41	0.52	0.60
24II-i1	BFT-0452	322353 802615	2.29	4.52	3.32
24JJ-c1	BFT-0449	321930 802737	1.44	1.83	0.89
24JJ-d1	BFT-0455	321953 802803	1.20	1.90	1.26
24JJ-e1	BFT-0456	321812 802913	1.42	1.60	1.18
25AA-l1	COL-0227	330258 803130	38.80	38.75	37.75
25CC-i1	COL-0226	325400 803155	13.00	12.73	12.26
25DD-l1	COL-0224	324702 803155	5.27	5.03	4.25
25FF-q2	COL-0170	323645 803321	-.50	-1.18	
25GG-d1	COL-0094	323405 803329	-1.65	-1.87	-1.98
25HH-n2	BFT-1609	322852 803333	0.82	1.97	2.60
25HH-p2	BFT-1645	322605 803445	0.15	1.02	0.23
25HH-p3	BFT-1457	322639 803441	-.92	0.90	
25HH-p4	BFT-1458	322659 803428		1.35	-.08
25HH-p5	BFT-1459	322617 803432	-.99	-.86	-.79
25HH-r8	BFT-1538	322628 803233	2.48	2.15	2.22
25HH-s3	BFT-1540	322600 803159	2.67	2.76	2.56
25HH-v3	BFT-0595	322515 803133		2.78	
25HH-w5	BFT-1537	322540 803257	2.61	2.46	2.35
25HH-x7	BFT-1535	322553 803316	2.06		
25II-a7	BFT-0488	322431 803048	3.72	2.03	2.49
25II-a8	BFT-1548	322253 803423	3.58	3.20	2.66
25II-c1	BFT-0473	322408 803210	4.49	3.01	3.02
25II-c18	BFT-1260	322445 803258	3.68	3.02	2.94
25II-d4	BFT-1252	322410 803317	4.57	3.38	3.36
25II-h2	BFT-1514	322331 803243	4.58	3.75	3.48
25II-i3	BFT-1550	322253 803423	2.86	2.24	2.61
25II-m2	BFT-0563	322228 803250	0.97		2.78
25II-p3	BFT-1247	322121 803435		1.23	0.51
25II-q3	BFT-0600	322145 803359	3.16	2.52	2.30
26AA-k1	COL-0097	330251 803556	38.10	37.52	37.15
26DD-n2	COL-0032	324712 803752			1.80
26FF-c3	COL-0243	323908 803710			9.32
26FF-e1	COL-0092	323942 803920	3.95	4.26	3.90
26HH-d2	BFT-0782	322915 803813	7.57	8.06	8.08
26HH-d4	BFT-0837	322933 803827	4.40	3.34	3.51
26HH-g2	BFT-0585	322812 803819			15.39
26HH-g8	BFT-1489	322836 803857	8.91	7.81	8.28

APPENDIX

SCWRC#	COUNTY#	LAT-LONG	MARCH	MAY	JUNE
26HH-g9	BFT-1598	322833 803814	13.88		
26HH-h3	BFT-1599	322833 803758	14.05	12.35	11.78
26HH-j13	BFT-1463	322852 803506	1.60	1.65	2.51
26HH-l4	BFT-1605	322702 803646	2.75	2.22	1.54
26HH-m1	BFT-1466	322712 803724	4.93	4.33	4.66
26HH-o2	BFT-1031	322737 803925	6.22	5.33	4.16
26HH-o4	BFT-0830	322725 803903	11.46	7.21	10.17
26HH-p7	BFT-1583	322645 803916	4.66	3.25	3.65
26HH-u3	BFT-1618	322513 803534	1.40	1.92	0.40
26II-a1	BFT-1496	302403 803517	2.57	2.33	1.63
26II-b2	BFT-1511	322441 803617	1.15	1.62	1.31
26II-b4	BFT-1513	322458 803626	2.47	1.72	1.37
26II-e1	BFT-1526	322403 803726	2.24	2.27	2.22
26II-h11	BFT-1417	322319 803702	2.36	2.48	2.97
26II-h3	BFT-1400	322316 803714	1.59	1.27	3.44
26II-h7	BFT-1404	322308 803707	2.39	2.63	2.26
26II-i3	BFT-1518	322304 803645	2.44	2.69	3.08
26II-i5	BFT-1520	322324 803620	5.28	1.96	3.04
26II-i6	BFT-1530	322350 803627	2.53	2.17	1.87
26II-j7	BFT-1527	322350 803540	2.67	1.63	1.46
26II-k3	BFT-1551	322223 803515	2.32	2.04	1.30
26II-l1	BFT-0470	322213 803615	1.29		2.66
26II-m1	BFT-0977	322202 803754	1.65	-5.76	-6.34
26II-o4	BFT-1610	322208 803906		-4.23	0.59
26II-o5	BFT-1633	322202 803913		1.54	2.37
26II-p1	BFT-0982	322155 803936	2.66	1.58	1.95
26II-r12	BFT-1290	322107 803729	2.32	-.52	0.45
26II-r6	BFT-1292	322128 803722	2.77	0.19	0.34
26II-r7	BFT-0447	322145 803704	2.40	0.35	0.04
26II-t3	BFT-1592	322135 803543	1.93	-.37	-.07
26II-u3	BFT-0535	322050 803527	3.74		
26II-u3	BFT-0535	322050 803527	3.74		
26II-u5	BFT-0976	322025 803514	2.74	0.98	-.59
26II-u9	BFT-1234	322035 803559	2.96	-8.25	-2.00
26II-v1	BFT-0192	322022 803604	3.16	-2.05	-.82
26II-w2	BFT-0564	322008 803725	2.23	-.92	-.83
26II-w3	BFT-1289	322044 803729	2.28	-.80	-.69
26II-x2	BFT-1199	322006 803819	2.26	0.17	2.75
26JJ-b3	BFT-0538	321948 803624	5.46		1.70
26JJ-b6	BFT-1203	321944 803656	2.38	-2.45	-1.86
26JJ-d4	BFT-1288	321958 803806	1.97	-.15	-.86
26JJ-g5	BFT-1554	321841 803828	2.11	1.30	1.19
26JJ-g6	BFT-1555	321803 803827	2.06	1.58	1.13
26JJ-h4	BFT-1556	321850 803719	1.85		
26JJ-n1	BFT-0430	321724 803843	1.14	0.92	0.62
26JJd1	BFT-0791	321943 803840	2.42	1.06	0.94
27CC-b1	COL-0198	325436 804158	6.66	11.09	2.10
27DD-g1	COL-0209	324834 804335	15.93	14.38	13.16
27GG-c5	BFT-1313	323449 804241	-6.80	-7.79	-6.99
27GG-e1	BFT-1212	323436 804429	-2.85	-3.78	-2.35
27GG-f1	BFT-0145	323300 804430	-8.19	-7.18	-7.21

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SCWRC#	COUNTY#	LAT-LONG	MARCH	MAY	JUNE
27GG-f7	BFT-1210	323340 804405	-8.54	-8.59	-6.41
27GG-f8	BFT-1211	323355 804434	-8.09	-6.14	-5.04
27GG-g1	BFT-0420	323310 804342	-14.25	-12.37	-15.15
27GG-g4	BFT-1209	323354 804340	-6.90	-6.99	-5.76
27GG-h1	BFT-0504	323318 804235	-.64	-.82	-.08
27GG-o3	BFT-1208	323233 804404	17.65	16.15	18.24
27GG-p4	BFT-1743	323200 804500	-.73	-1.27	
27GG-q1	BFT-0133	323125 804307	2.50	2.05	0.78
27GG-q2	BFT-1534	323150 804400	1.33	1.20	0.14
27GG-r1	BFT-1709	323109 804249	3.82	3.34	3.35
27GG-t3	BFT-0797	323144 804006	1.78	0.74	1.20
27GG-v1	BFT0834	323018 804150	3.15	2.50	2.98
27GG-w3	BFT-1311	323005 804211	3.40	2.73	3.23
27GG-w4	BFT-1734	323040 804247	-1.42	-1.22	-2.38
27GG-y1	BFT-1204	323020 804444	2.96	2.38	2.78
27GG-y3	BFT-1733	323038 804402	6.03	4.83	3.12
27HH-a1	BFT-0467	322955 804010	3.34	1.51	1.90
27HH-b2	BFT-0569	322934 804110	2.95	1.75	2.44
27HH-c2	BFT-1746	322934 804256	10.39	10.60	10.84
27HH-d2	BFT-1708	322958 804353	17.35		14.65
27HH-e4	BFT-0798	322930 804412	14.15	13.70	13.60
27HH-e6	BFT-1732	322902 804453	18.32	15.82	17.02
27HH-e7	BFT-1735	322958 804437	6.78	6.22	6.85
27HH-f1	BFT-0981	322830 804421	25.94	24.96	25.19
27HH-f14	BFT-1690	322813 804433	26.13	26.08	27.55
27HH-f4	BFT-0124	322750 804445	25.64	24.69	25.14
27HH-h1	BFT-0170	322844 804208	6.23	6.29	7.19
27HH-j2	BFT-1506	322823 804047	3.89	-2.43	-1.61
27HH-k3	BFT-1509	322805 804048	2.32	0.58	2.38
27HH-o1	BFT-0121	322748 804405	21.03	19.78	20.68
27HH-o9	BFT-1728	322744 804447	14.16	12.11	12.93
27HH-q10	BFT-1717	322627 804322	2.76	2.80	2.32
27HH-r1	BFT-0474	322603 804245	2.92	1.36	2.50
27HH-t1	BFT-0801	322631 804040	4.75		
27HH-t1	BFT-0801	322631 804040	4.75	4.45	4.99
27HH-t1	BFT-1515	322612 804019	3.58	3.15	3.47
27HH-t7	BFT-0198	322631 804019	1.13	0.84	1.02
27HH-u1	BFT-0559	322552 804024	1.89	1.78	2.26
27HH-w3	BFT-1714	322546 804231	-3.37	-3.54	-4.20
27HH-w4	BFT-1718	322523 804217	0.83	-.44	-.04
27HH-y1	BFT-0118	322518 804459	-4.32	-4.88	-5.08
27II-a1	BFT-0471	322408 804003	-.08	0.43	-.18
27II-a6	BFT-1602	322423 804003		-.60	-.15
27II-a7	BFT-1611	322356 804058	1.64		
27II-a7	BFT-1611	322356 804058	1.64	1.00	1.69
27II-b15	BFT-1702	322426 804128	-4.94	-5.20	-5.19
27II-e1	BFT-0109	322446 804457	2.66	2.16	2.07
27II-f3	BFT-0331	322307 804420	-.33	-.58	-.74
27II-f4	BFT-1721	322357 804447	-2.85	-3.00	-3.20
27II-h8	BFT-1701	322313 804214	0.84	0.48	0.58
27II-j1	BFT-0557	322815 803730	-.56	0.62	-.90

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27II-l6	BFT-0800	322219 804134	2.28	3.62	3.64
27II-n2	BFT-0019	322249 804343	-4.05	-2.82	-2.66
27II-s1	BFT-0566	322108 804136	2.00	1.88	1.76
27JJ-a1	BFT-0565	321918 804025	5.36	5.13	4.76
27JJ-i1	BFT-0459	321852 804154	6.42	5.18	6.01
27JJ-j1	BFT-0181	321823 804048	6.05	5.91	5.86
27JJ-q1	BFT-0739	321601 804316	-4.50	-5.44	-6.46
27JJ-x1	BFT-0315	321512 804505	-.57	-1.45	-1.68
27KK-b2	BFT-0787	321456 804157	-1.79	-2.39	-3.31
27KK-c2	BFT-0714	321411 804255	-2.69	-3.81	-4.97
27KK-d2	BFT-0441	321457 804340	-3.40	-3.11	-5.32
27KK-d4	BFT-0697	321434 804324			-4.94
27KK-e5	BFT-0561	321403 804447	-10.37		-12.30
27KK-f11	BFT-0651	321334 804451	-3.61	-3.93	-4.96
27KK-f12	BFT-0738	321308 804408		-6.78	-9.94
27KK-f13	BFT-0779	321332 804415		-4.15	-5.14
27KK-g3	BFT-0696	321301 804321		-4.88	-6.29
27KK-i2	BFT-0771	321312 804129	-7.32		
27KK-l10	BFT-1335	321237 804158	-4.92	-6.65	-7.47
27KK-l2	BFT-0342	321247 804109		-4.56	
27KK-l3	BFT-0777	321235 804112	-3.16	-4.46	-5.29
27KK-m1	BFT-0767	321220 804210	-4.99	-5.93	-7.08
27KK-m7	BFT-1334	321233 804204	-5.09	-6.58	-5.59
27KK-n15	BFT-1685	321204 804337		-9.08	-10.34
27KK-n4	BFT-0717	321244 804330			-5.59
27KK-o1	BFT-0317	321359 804459			-12.06
27KK-o3	BFT-0808	321253 804455			-6.43
27KK-p2	BFT-0835	321127 804447	-6.81	-7.18	-8.03
27KK-q4	BFT-0833	321153 804328	-5.00	-6.01	-6.94
27KK-r13	BFT-1742	321130 804227			-7.74
27KK-r8	BFT-0832	321134 804224			-7.41
27KK-x1	BFT-0444	321035 804337		-11.29	-9.70
27KK-y1	BFT-0101	321005 804426	-6.88	-10.39	-11.28
27LL-e2	BFT-0437	320911 804418		-13.57	-12.74
27LL-e3	BFT-0349	320927 804445	-9.87	-12.25	-13.20
27LL-e8	BFT-1239	320941 804451	-7.11	-9.18	-10.04
27LL-f1	BFT-0436	320842 804448	-10.45	-12.07	-14.95
27Z-r1	COL-0228	330648 804210	92.99	92.20	91.65
28AA-h1	COL-0159	330304 804727	66.92	66.66	
28AA-h2	COL-0221	330304 804727	55.46	54.37	
28BB-b1	COL-0073	325959 804640	39.24	45.11	44.67
28BB-m1	COL-0211	325721 804742	34.48	33.75	33.45
28EE-g1	COL-0093	324350 804820	30.70	29.94	31.43
28GG-s1	BFT-0037	323144 804602	3.47	2.53	0.58
28GG-w3	BFT-1712	323026 804710	0.33		
28HH-b4	BFT-0392	322940 804643	-2.73	-2.98	-4.18
28HH-j1	BFT-1395	322803 804519	20.10	17.50	18.80
28HH-j11	BFT-1730	322845 804505	24.35	21.82	23.21
28HH-j2	BFT-1396	322803 804519	19.52		10.80
28HH-k11	BFT-1727	322708 804527	8.72	7.34	7.43
28HH-k12	BFT-1731	322722 804557	5.90	4.88	4.72

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SCWRC#	COUNTY#	LAT-LONG	MARCH	MAY	JUNE
28HH-k5	BFT-1306	322747 804535	11.78	9.67	10.74
28HH-m2	BFT-0173	322730 804756	-1.50	-4.93	0.41
28HH-m3	BFT-0174	322743 804740	1.18	1.42	2.51
28HH-t1	BFT-0112	322645 804528	5.56	4.40	4.27
28HH-t3	BFT-0116	322607 804547	2.65	2.45	2.30
28HH-u4	BFT-1705	322507 804536	2.33	1.75	1.35
28II-a3	BFT-1725	322427 804508	0.50		
28II-b1	BFT-0476	322409 804611	-4.18		
28II-b4	BFT-1736	322427 804616	-1.18	-2.32	-2.80
28II-i1	BFT-0453	322343 804603	1.55	1.08	0.31
28II-j3	BFT-1274	322414 804515	20.35		
28JJ-i1	BFT-1689	321822 804657	-3.52	-5.20	
28JJ-n1	BFT-0501	321711 804849	-.01	-.33	
28JJ-y1	BFT-0429	321551 804912	-3.59	-4.66	
28JJ-y3	BFT-0500	321502 804943	-5.00	-6.84	-6.51
28KK-d6	BFT-1330	321424 804834	-8.96	-9.49	-11.05
28KK-e1	BFT-0358	321454 804943	-5.30	-6.99	-6.80
28KK-f3	BFT-0374	321353 804902	-13.06	-10.98	
28KK-i1	BFT-0718	321320 804616	-3.80	-4.85	-5.24
28KK-j12	BFT-1748	321317 804531			-10.25
28KK-k8	BFT-1294	321213 804508	-8.09	-9.17	-10.06
28KK-l3	BFT-0580	321256 804610		-5.66	-5.71
28KK-sl3	BFT-0824	321125 804613		-7.90	-8.78
28KK-s2	BFT-0799	321109 804624	-14.37	-8.53	-8.36
28KK-t2	BFT-0668	321115 804506	-9.10	-9.11	-9.91
28KK-v2	BFT-0712	321033 804608		-7.90	-8.67
28KK-v4	BFT-0805	321055 804654	-6.98	-7.81	-8.18
28KK-w1	BFT-0337	321025 804724	-12.87	-11.67	-12.28
28LL-b1	BFT-0744	320957 804640	-13.77		-11.84
28LL-g3	BFT-0754	320824 804811	-13.73	-15.25	-16.06
28LL-h1	BFT-0210	320835 804722	-11.76	-13.31	-14.41
28LL-h2	BFT-0439	320835 804757	-14.11	-15.57	-16.47
28LL-j2	BFT-0435	320838 804546	-11.03	-11.48	-12.94
28LL-j4	BFT-0343	320828 804539	-13.30		
28LL-m1	BFT-0706	320728 801739	-13.49		-15.72
28LL-m3	BFT-0750	320739 804738		-16.82	-17.85
28LL-m5	BFT-0709	320754 804740	-13.54	-14.86	-15.55
28LL-n4	BFT-0747	320733 804845	-15.38	-17.16	-17.71
28LL-n5	BFT-0751	320759 804811		-14.07	-15.04
28LL-n6	BFT-0753	320756 804830	-14.63	-16.40	-17.20
28LL-n8	BFT-0346	320725 804850	-17.61	-17.61	-18.12
29BB-s1	COL-0217	325649 805131	30.43	29.84	29.40
29BB-x1	COL-0213	325503 805142	27.40	25.30	24.70
29CC-g1	COL-0214	325343 805340	42.89	41.75	41.67
29CC-i3	COL-0222	325314 805115	46.33	44.81	45.01
29DD-f2	HAM-0076	324821 805435	38.35	37.74	37.25
29DD-l1	COL-0164	324755 805120	16.56	14.35	14.66
29EE-h1	HAM-0077	324330 805249	26.10	26.20	25.90
29EE-p1	HAM-0078	324131 805447	16.90	16.72	16.33
29EE-s1	HAM-0083	324152 805104	10.55	10.81	10.68
29GG-f2	JAS-0166	322226 805438	9.52	9.37	9.05

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SCWRC#	COUNTY#	LAT-LONG		MARCH	MAY	JUNE
29GG-s1	JAS-0330	323115	805152			5.73
29GG-y1	JAS-0322	323059	805459	4.78	4.22	3.64
29HH-n5	JAS-0298	322733	805348	1.23	0.57	0.04
29HH-v1	JAS-0094	322515	815125	-.97	-1.65	-2.17
29II-l2	BFT-0154	322218	805111	-2.80	-3.07	-4.00
29II-v1	BFT-0844	322013	805118	-3.65	-4.50	
29JJ-e12	BFT-1767	321952	805440		-12.88	-13.95
29JJ-q2	BFT-1418	321657	805307			
29JJ-r3	BFT-1422	321651	805259	-6.04	-6.55	-6.29
29KK-a1	BFT-0357	321419	805056	-8.36	-9.41	-10.22
29ii-x1	BFT-0301	322043	805358	-6.80		
30AA-n1	COL-0072	330227	805820	98.15	97.59	97.16
30AA-v1	COL-0220	330049	810156	101.47		
30BB-h1	COL-0216	325802	805733	73.57	70.63	68.72
30CC-b1	COL-0215	325430	805622	51.16	50.00	49.03
30CC-e2	COL-0183	325451	805919	49.44	49.27	49.15
30CC-u1	HAM-0099	325014	805535	34.48	33.88	32.40
30DD-i1	HAM-0098	324801	805640	39.42	38.82	37.99
30EE-q1	JAS-0305	324115	805842	25.24	24.69	23.92
30FF-x2	JAS-0297	323530	805839	18.41	17.83	17.14
30GG-g1	JAS-0360	323150	805846		17.89	17.11
30HH-d1	JAS-0157	322906	805808	4.93	-6.17	3.68
30JJ-g2	BFT-0570	321805	805814	-7.94	-8.59	-9.26
30KK-y1	JAS-0139	321005	805935	-36.25	-38.61	-39.13
30LL-d1	JAS-0080	320922	805414	-30.24	-31.60	-32.44
30LL-e1	JAS-0136	320907	805946	-39.53	-41.13	-41.55
31AA-r1	COL-0219	330150	810248	96.10	92.13	93.33
31CC-i2	HAM-0073	325305	810011	54.70	54.45	53.88
31CC-m1	HAM-0074	325242	810224	82.62	81.25	79.70
31CC-p1	HAM-0018	325109	810457	78.80	78.48	77.94
31DD-n1	HAM-0079	324709	810329	59.56	58.47	57.48
31EE-s2	JAS-0364	324153	810147		5.89	6.50
31FF-l1	JAS-0308	323735	810135	9.86	10.73	
31GG-x1	JAS-0358	323004	810310		14.11	13.54
31HH-a2	JAS-0357	322955	810054		4.45	3.66
31HH-n1	JAS-0303	322754	800306	8.84	7.77	7.18
31II-h1	JAS-0109	322314	810251	-.10	-.74	-1.36
31JJ-o2	JAS-0111	321737	810440	-14.90	-16.13	-15.81
31KK-e1	JAS-0122	321417	810428		-26.62	
31KK-f2	JAS-0147	321330	810441	-40.44	-41.22	-41.32
31KK-i2	JAS-0159	321245	810151		-34.52	-34.70
31KK-o1	JAS-0128	321139	810329	-50.69	-51.83	-52.90
31KK-o4	JAS-0126	321344	810402	-44.86	-44.50	-45.86
31KK-u2	JAS-0138	321054	810038	-33.95	-34.29	-34.67
31KK-v1	JAS-0150	321001	810132	-47.19	-46.84	-47.32
31LL-j2	JAS-0134	320844	810040	-47.93	-48.77	-51.18
32BB-h1	HAM-0130	325857	810731	108.85	109.03	108.82
32BB-i1	HAM-0072	325843	810651	101.85	100.92	99.35
32BB-i3	HAM-0129	325830	810612	95.22	95.69	94.20
32CC-e1	HAM-0090	325404	810919	91.30	89.34	88.01
32CC-e3	HAM-0141	325435	811009	105.65	103.59	102.37

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32CC-l1	HAM-0019	325201 810632	67.40	66.93	67.75
32CC-l5	HAM-0043	325238 810642	47.60	45.47	46.99
32CC-n1	HAM-0151	325220 810801	94.50	92.64	90.95
32EE-i1	HAM-0105	324320 810627	46.70	45.15	43.68
32EE-t1	JAS-0366	324143 810503		8.59	
32EE-y2	HAM-0132	324029 810940	32.65	32.85	31.31
32FF-n1	JAS-0314	323735 810838	17.35	15.65	14.39
32FF-v1	JAS-0359	323548 810524	23.45	22.94	22.12
32GG-m1	JAS-0367	323255 810737		23.32	22.61
32HH-i4	JAS-0369	322822 810647		13.24	12.72
32HH-s1	JAS-0007	322659 810627		-3.00	8.57
32II-m2	JAS-0316	322215 810719	3.22	3.51	1.78
32LL-b1	JAS-0112	320945 810700		-43.47	-43.31
33CC-p2	HAM-0080	325357 811414	97.56	95.80	95.61
33CC-w1	HAM-0082	325109 811223		94.10	92.68
33CC-x1	HAM-0142	325034 811321	105.35	102.67	101.00
33EE-k1	HAM-0147	324246 811029	39.62	57.49	56.36
33GG-c1	JAS-0368	323459 811208	29.20	29.01	27.03
33GG-l1	JAS-0319	323216 811135	7.17	4.73	4.93
33GG-x1	JAS-0310	323050 811340	-		20.99
33HH-b2	JAS-0304	322913 811141	28.24	27.10	27.23
34DD-s1	HAM-0108	324623 811623	100.95	97.37	94.97
34EE-n4	HAM-0144	324248 811852	75.22	71.92	70.37
34FF-e2	HAM-0122	323949 811930	59.52	57.61	57.19
34GG-i1	JAS-0309	323009 801605	28.74	27.43	30.79