FINAL TECHNICAL REPORT

Network Maintenance and Improvements in Support of the NGWMN

USGS Cooperative Agreement G23AC00311-00
($171,389)
9/1/2023 - 8/31/2025

Prepared by

NC Department of Environmental Quality
Division of Water Resources
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Overview of Work Planned and Accomplished

On 7/25/2023, the US Geological Survey (USGS) awarded the NC Department of Environmental Quality (DEQ) Ground Water Resources Branch (GWRB) a $171,389 grant in support of the National Ground-Water Monitoring Network (NGWMN) for performance period 9/1/2023 to 8/31/2025 (USGS Cooperative Agreement G23AC00311-00). Funding from this grant covered work under NGWMN Objectives 2A, 2B, and 6 as follows:

Objective 2A: $22,332.00
Objective 2B: $22,332.00
Objective 6: $126,725.00

The purpose of this project has been to support, maintain, and improve persistent water level and water quality web services under Objectives 2A and 2B, and to replace aging data loggers greater than five years old under Objective 6. As part of this project, DEQ committed to a 50% Agency In-Kind match for Objective 6.

Deliverables and expected outcomes consisted of continued water level and water quality web services, web service maintenance and improvements, and the addition of new wells and data to the NGWMN Registry. Additionally, the project provided for the purchase and replacement of 185 data loggers which are essential to the network (and an additional 185 loggers using DEQ matching funds) for a total of 370 loggers. The outcome of the project was that all work was accomplished as planned and fully supported NGWMN objectives.

Detailed Description of Work Accomplished

Work accomplished over the two-year grant period has equaled or exceeded all goals and expectations.

Goals and accomplishments for each objective are summarized in the following table.

Objective - Description of Work	Goal	Actual	Accomplished
2A - maintain and improve water level web services	655 wells	672 wells	Goal exceeded
2B - maintain and improve water quality web services	616 wells	655 wells	Goal exceeded
6 - purchase 185 Onset data loggers (USGS funds)	185 wells	185 wells	Met goal
6 - purchase 185 Onset data loggers (NC DEQ funds)	185 wells	185 wells	Met goal

Description of Work Done to Support the NGWMN as a Data Provider for Each Objective

Under Objective 2A, DEQ contracted outside services to maintain water level web services and add data from new wells to the NGWMN. The maintenance and addition of

well construction details and well lithology were also added under this objective. Nat Wilson, independent consultant, and former head of the DEQ Ground Water Management Branch (now Ground Water Resources Branch), was retained to perform work under this objective. No in-kind services were required for Objective 2A.

Under Objective 2B, DEQ contracted outside services to maintain water-quality web services and add new data from recently sampled wells to the NGWMN. Water quality data collected under this objective consisted of pH, chloride, specific conductance, and salinity for each well, and organic and inorganic chemical data, including per- and polyfluoroalkyl substances (PFAS) for selected wells. The addition of new analytical data was also provided under this objective. Nat Wilson was retained to perform work under this objective also. No in-kind services were required for Objective 2B.

Under Objective 6, DEQ used USGS and state matching funds to purchase Onset Hobo data loggers for 370 NGWMN wells. These loggers were used to replace existing loggers five years or more in age. The new data loggers are used for collecting persistent groundwater level data which is served to the NGWMN.

Data Collection Description, Methods Used, and Quality Assurance

Data collection details are provided in the Data Management Plan in the report attachments. Work under each objective was performed in accordance with standards provided in the NGWMN Framework Guidance Document, NGWMN Tip Sheets, and other NGWMN documents, as applicable.

Web Service Maintenance and Updates

The maintenance of web services and the NGWMN Well Registry under Objectives 2A and 2B required upkeep of software designed to process and store raw data. Regular updates were required to MariaDB and PHP, which are the primary software packages of the DEQ Ground Water Resources Branch. Also, DEQ security software, such as Cloudflare, requires changes to underlying code related to timeout and content standards.

Under Objective 2A, web service improvements were made to many scripts used to upload and perform integrity checks on groundwater level data. These changes led to alteration and improvement of scripts which form GWRB's public web pages, especially those associated with automated real time data used on the Ground Water Resource Branch’s map interface.

One aspect of GWRB's automated data collection program uses Solinst telemetry equipment and software for data collection at selected wells. Administrative server scripts were developed to enable staff to review and process data from this system and thereby limit the need for an IT employee with direct server access.

GWRB's web services use Plotly to graph individual and multiple water levels associated with DEQ's multi-well monitoring stations. This interface allows users to adjust the time frame of the plot and select which wells are viewable. It also allows users to reset the plot to show all data over the water level history of a site or to plot one or more wells on a second y-axis to highlight water level changes.

Under Objective 2B, web service improvements were made to provide the NGWMN with organic and inorganic chemical data, and when available, PFAS data. A series of alterations were made to scripts associated with public display of groundwater quality data. Intermediate database tables were created to index the data collected and stored in a separate database to the groundwater level database. Finally, the web service script was adapted to perform the required query which brings together all groundwater quality data collected by GWRB.

Description of Problems Encountered in Serving Data to the NGWMN Portal

During the grant period, routine testing and monitoring of web service connectivity minimized or eliminated problems encountered in serving data to the NGWMN portal.

Well Logger Replacement Locations and Details

During the grant period, Onset Hobo data loggers were purchased for 370 wells using USGS and NC DEQ matching funds under Objective 6. Onset logger models were selected based on well depth and consisted of one of the following model types for each well: Hobo13 (Model U20-001-04), Hobo30 (Model U20-001-01), or Hobo 100 (Model U20-001-02). The installation of new loggers was performed by DEQ field staff. A map and table of wells which received new Onset data loggers under Objective 6 are provided in the report attachments.

Description of Problems Encountered in Replacing Data Loggers

Problems encountered in replacing loggers included predicting the remaining internal battery life of each Hobo. Battery life was approximated for each logger unit based on overall logger age from date of production, in-well use time, and battery level at time of most recent data collection, as recorded by the Hobo Shuttle data download tool. Periodically, estimated battery life was over- or under-estimated, resulting in the need for expedited or delayed logger replacement, thus requiring additional well visits and field work.

Hobo battery life begins to decline from date of production, not just when installed in a well. Consequently, scheduling logger orders to minimize time between delivery and installation is an important consideration since it directly affects network operation cost.

Based on DEQ's collection and analysis of logger usage records over the past twenty years or more, a range of between 5 to 10 percent estimated remaining battery life has been determined as the optimal time for logger replacement. DEQ logger records indicate that battery life may vary from logger to logger for no apparent reason. A suspected reason might include variations in materials used from batch to batch during logger manufacture. Given the many variables affecting logger battery life, the careful and meticulous collection and monitoring of logger age, in-well use time, and battery level over the lifetime of each logger helps assure uninterrupted, persistent data collection while minimizing Hobo replacement.

References

1) Subcommittee on Ground Water of the Advisory Committee on Water Information, 2009 (revised 2013), *A national framework for ground water monitoring in the United States*: Advisory Committee on Water Information, at http://acwi.gov/sogw/ngwmn_framework_report_july2013.pdf.

2) USGS NGWMN Tip Sheets.

3) NC DEQ Ground Water Resources Branch website at https://www.deq.nc.gov/about/divisions/water-resources/groundwater-resources.

ATTACHMENTS

Figure 1. Onset Logger Locations

370 new Onset Hobo loggers were purchased under Objective 6 to replace aging loggers greater than five years old. Map ID numbers for each location correspond to Map ID column on Table 1.

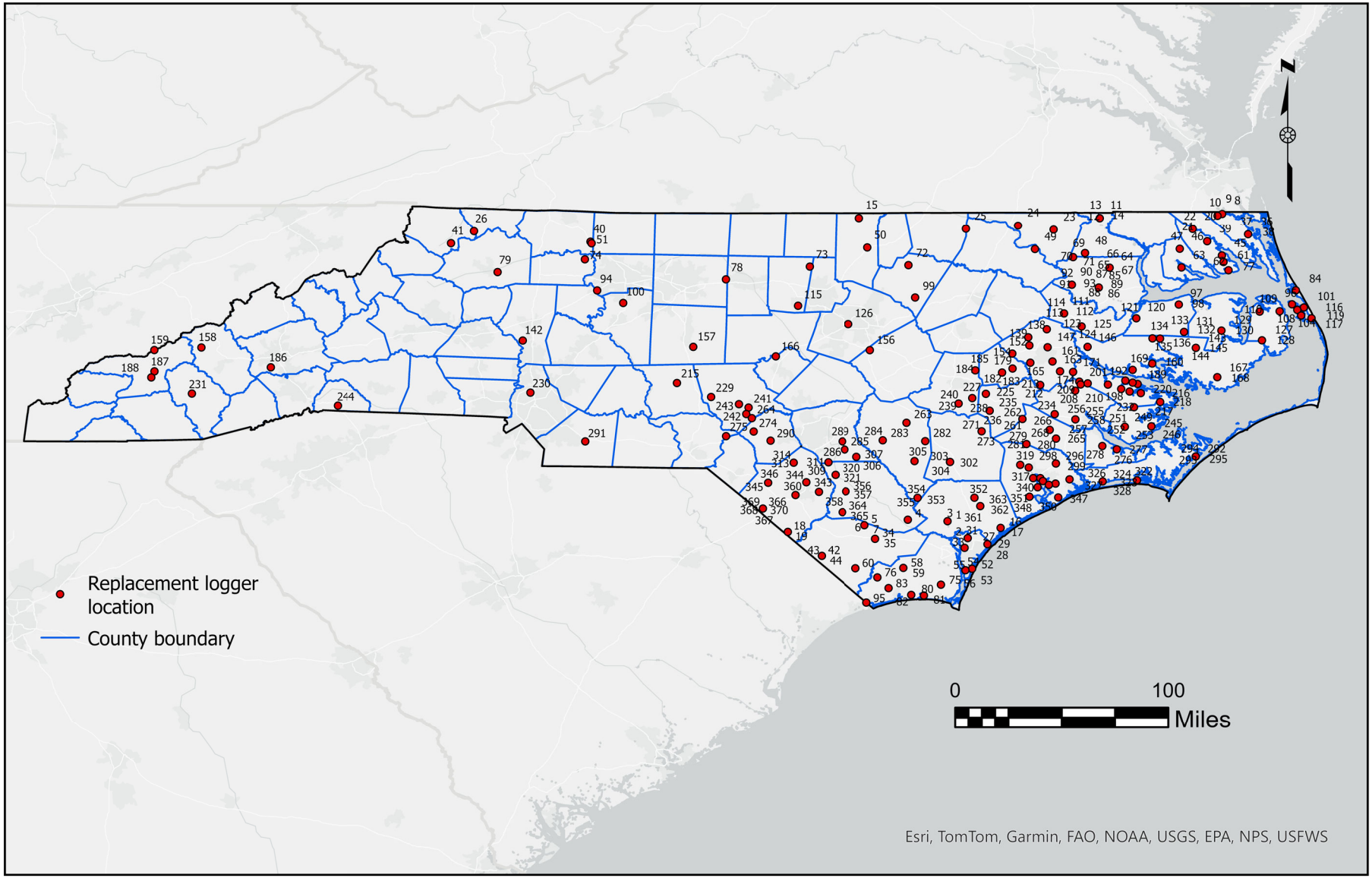

Table 1. Onset Logger List

USGS funds and a 50% funding match from NC DEQ were used to purchase Onset Hobo loggers for the 370 NGWMN wells listed below under USGS Cooperative Agreement G23AC00311-00 from 9/1/23 to 8/31/25.

Map ID	NGWMN ID	Well Name	County	Well Depth (feet)	NC Aquifer	USGS Aquifer	New Hobo Model	Old Hobo Acquired	Latitude	Longitude
1	NCDWR:AA 32R1	Long Creek	Pender	31	Surficial	S	13	2/16/2016	34.44595	-78.03817
2	NCDWR:AA 32R3	Long Creek	Pender	235	Peedee	NACP	30	9/8/2017	34.44595	-78.03817
3	NCDWR:AA 32R4	Long Creek	Pender	405	Upper Black Creek	NACP	13	10/24/2014	34.44595	-78.03817
4	NCDWR:AA 35N3	Kelly	Bladen	84	Peedee	NACP	13	1/2/2013	34.455982	-78.307832
5	NCDWR:AA 39V1	Carver Moore	Columbus	78	Surficial	S	13	1/2/2013	34.418763	-78.602503
6	NCDWR:AA 39V2	Carver Moore	Columbus	506	Upper Cape Fear	NACP	30	5/24/2013	34.418763	-78.602503
7	NCDWR:AA 39V4	Carver Moore	Columbus	280	Upper Black Creek	NACP	30	3/7/2014	34.418763	-78.602503
8	NCDWR:B 10K1	Shingle Landing	Currituck	710	Beaufort	NACP	30	2/16/2016	36.536716	-76.17539
9	NCDWR:B 10K2	Shingle Landing	Currituck	27	Surficial	S	30	2/16/2016	36.536716	-76.17539
10	NCDWR:B 10R1	Moyock	Currituck	840	Upper Cape Fear	NACP	13	10/24/2014	36.523704	-76.206839
11	NCDWR:B 20U5	Como	Hertford	260	Upper Cape Fear	NACP	30	1/2/2013	36.507222	-77.005833
12	NCDWR:B 20U6	Como	Hertford	575	Lower Cape Fear	NACP	30	1/11/2012	36.507222	-77.005833
13	NCDWR:B 20U7	Como	Hertford	500	Lower Cape Fear	NACP	30	2/16/2016	36.507222	-77.005833
14	NCDWR:B 20U8	Como	Hertford	33	Surficial	S	13	6/26/2012	36.507222	-77.005833
15	NCDWR:B 39X1	Wallace Vaughan	Granville	146	Basement rock	PBR	30	10/24/2014	36.50738	-78.64017
16	NCDWR:BB 28J3	Topsail Beach	Pender	612	Black Creek	NACP	13	6/26/2012	34.399976	-77.67817
17	NCDWR:BB 28J4	Topsail Beach	Pender	160	Castle Hayne	CH	13	1/11/2012	34.399976	-77.67817
18	NCDWR:BB 45M2	Marietta	Robeson	552	Upper Cape Fear	NACP	30	10/24/2014	34.373223	-79.127359
19	NCDWR:BB 45M4	Marietta	Robeson	194	Black Creek	NACP	30	10/24/2014	34.373223	-79.127359
20	NCDWR:C 12W2	Morgans Corner	Pasquotank	40	Yorktown	NACP	30	6/26/2012	36.431549	-76.375628
21	NCDWR:C 12W4	Morgans Corner	Pasquotank	428	Castle Hayne	CH	30	12/13/2010	36.431549	-76.375628
22	NCDWR:C 12W6	Morgans Corner	Pasquotank	648	Upper Cape Fear	NACP	30	1/11/2012	36.431549	-76.375628
23	NCDWR:C 23Y1	Northampton East High School	Northampton	25.15	Surficial	S	30	2/16/2016	36.42726	-77.31878
24	NCDWR:C 26N2	Garysburg Well 2	Northampton	45	Surficial	S	13	5/24/2013	36.45535	-77.56018
25	NCDWR:C 30P1	Littleton	Halifax	500	Basement rock	PBR	13	1/2/2013	36.433399	-77.91389
26	NCDWR:C 71U1	Laurel Springs	Alleghany	74	Basement rock	PBR	13	5/24/2013	36.416674	-81.258856
27	NCDWR:CC 29L1	Eagle Point	New Hanover	105	Castle Hayne	CH	30	2/16/2016	34.289688	-77.767845
28	NCDWR:CC 29L3	Eagle Point	New Hanover	24	Surficial	S	30	6/26/2012	34.289688	-77.767845
29	NCDWR:CC 29L4	Eagle Point	New Hanover	178	Peedee	NACP	13	1/2/2013	34.289688	-77.767845
30	NCDWR:CC 30E1	Northern Regional Park	New Hanover	45	Surficial	S	30	10/24/2014	34.3306	-77.90123
31	NCDWR:CC 30E2	Northern Regional Park	New Hanover	330	Peedee	NACP	13	2/16/2016	34.3306	-77.90123
32	NCDWR:CC 30E3	Northern Regional Park	New Hanover	110	Peedee	NACP	30	10/24/2014	34.3306	-77.90123
33	NCDWR:CC 31U1	New Hanover Correctional Institute	New Hanover	30	Surficial	S	13	1/2/2013	34.26499	-77.92259

USGS Principal Aquifer

Surficial aquifer system (S)
Castle Hayne aquifer (CH)
Northern Atlantic Coastal Plain aquifer system (NACP)
Piedmont and Blue Ridge crystalline-rock aquifers (PBR)

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Map ID	NGWMN ID	Well Name	County	Well Depth (feet)	NC Aquifer	USGS Aquifer	New Hobo Model	Old Hobo Acquired	Latitude	Longitude
34	NCDWR:CC 38B6	Lake Waccamaw	Columbus	122	Peedee	NACP	30	1/11/2012	34.325959	-78.529773
35	NCDWR:CC 38B8	Lake Waccamaw	Columbus	386	Black Creek	NACP	30	2/16/2016	34.325959	-78.529773
36	NCDWR:D 7F1	Maple	Currituck	30	Surficial	S	30	10/24/2014	36.3954	-75.9998
37	NCDWR:D 7F2	Maple	Currituck	200	Yorktown	NACP	30	9/8/2017	36.3954	-75.9998
38	NCDWR:D 7F3	Maple	Currituck	760	Castle Hayne	CH	13	2/16/2016	36.3954	-75.9998
39	NCDWR:D 11V5	N.C. Forestry HQ	Pasquotank	130	Yorktown	NACP	13	6/4/2010	36.347527	-76.277474
40	NCDWR:D 61X1	Pilot Mtn. Well 2	Surry	297	Basement rock	PBR	30	10/24/2014	36.343972	-80.467563
41	NCDWR:D 72Y1	Beaver Creek	Ashe	270	Basement rock	PBR	13	12/13/2010	36.333751	-81.415068
42	NCDWR:DD 42N1	Clarendon	Columbus	51	Surficial	S	30	1/11/2012	34.210698	-78.896111
43	NCDWR:DD 42N2	Clarendon	Columbus	795	Lower Cape Fear	NACP	30	10/24/2014	34.210698	-78.896111
44	NCDWR:DD 42N3	Clarendon	Columbus	577	Upper Cape Fear	NACP	30	10/24/2014	34.210698	-78.896111
45	NCDWR:E 10U5	Elizabeth City USCGS	Pasquotank	55	Yorktown	NACP	30	3/7/2014	36.250825	-76.177299
46	NCDWR:E 13M1	Four Mile Desert	Perquimans	49	Yorktown	NACP	30	10/24/2014	36.295645	-76.463015
47	NCDWR:E 13M2	Four Mile Desert	Perquimans	1019	Lower Cape Fear	NACP	30	3/7/2014	36.295645	-76.463015
48	NCDWR:E 21S1	St. John	Hertford	33	Surficial	S	30	1/2/2013	36.267494	-77.105959
49	NCDWR:E 25L1	Caledonia Prison Farm	Halifax	278	Lower Cape Fear	NACP	13	6/4/2010	36.29416	-77.4454
50	NCDWR:E 38F1	Oxford	Granville	496	Basement rock	PBR	13	3/7/2014	36.30473	-78.5829
51	NCDWR:E 61C1	Grassy Ridge Well	Surry	183	Basement rock	PBR	30	6/18/2014	36.33285	-80.46027
52	NCDWR:EE 30M1	Myrtle Grove	New Hanover	41	Surficial	S	30	2/16/2016	34.123109	-77.871875
53	NCDWR:EE 30M2	Myrtle Grove	New Hanover	320	Peedee	NACP	30	10/24/2014	34.123109	-77.871875
54	NCDWR:EE 30M3	Myrtle Grove	New Hanover	175	Peedee	NACP	30	9/27/2016	34.123109	-77.871875
55	NCDWR:EE 30P1	Presidio	New Hanover	312	Peedee	NACP	30	2/16/2016	34.113155	-77.91664
56	NCDWR:EE 30P2	Presidio	New Hanover	30	Surficial	S	30	9/8/2017	34.113155	-77.91664
57	NCDWR:EE 30P3	Presidio	New Hanover	170	Peedee	NACP	13	2/16/2016	34.113155	-77.91664
58	NCDWR:EE 36K3	Bear Pen	Brunswick	52	Peedee	NACP	13	10/24/2014	34.128756	-78.338547
59	NCDWR:EE 36K6	Bear Pen	Brunswick	110	Peedee	NACP	30	2/1/2017	34.128756	-78.338547
60	NCDWR:EE 39O3	Nakina	Columbus	375	Black Creek	NACP	13	1/11/2012	34.125932	-78.663792
61	NCDWR:F 10K3	Weeksville Elementary	Pasquotank	60	Surficial	S	30	1/2/2013	36.205757	-76.166895
62	NCDWR:F 10K4	Weeksville Elementary	Pasquotank	75	Yorktown	NACP	13	2/16/2016	36.205757	-76.166895
63	NCDWR:F 13W1	Perquimans	Perquimans	339	Castle Hayne	CH	30	3/7/2014	36.169167	-76.451667
64	NCDWR:F 19V2	Cremo	Bertie	80	Yorktown	NACP	30	1/11/2012	36.16752	-76.938703
65	NCDWR:F 19V3	Cremo	Bertie	285	Upper Cape Fear	NACP	13	1/11/2012	36.16752	-76.938703
66	NCDWR:F 19V4	Cremo	Bertie	1038	Lower Cretaceous	NACP	30	3/7/2014	36.16752	-76.938703

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67	NCDWR:F 19V5	Cremo	Bertie	568	Lower Cape Fear	NACP	30	5/24/2013	36.16752	-76.938703
68	NCDWR:F 19V6	Cremo	Bertie	431	Upper Cape Fear	NACP	13	6/4/2010	36.16752	-76.938703
69	NCDWR:F 22B1	Roxobel	Bertie	325	Upper Cape Fear	NACP	100	1/11/2012	36.238763	-77.18695
70	NCDWR:F 22B2	Roxobel	Bertie	441	Lower Cape Fear	NACP	100	7/12/2010	36.238763	-77.18695
71	NCDWR:F 22B5	Roxobel	Bertie	610	Lower Cretaceous	NACP	13	6/26/2012	36.238763	-77.18695
72	NCDWR:F 35Q1	Fillingim Property	Franklin	29	Basement saprolite	PBR	13	10/24/2014	36.1843	-78.30331
73	NCDWR:F 43X1	Caldwell	Orange	83	Basement rock	PBR	13	1/2/2013	36.174625	-78.977615
74	NCDWR:F 62J1	East Bend VFD	Yadkin	603	Basement rock	PBR	13	2/16/2016	36.22421	-80.50564
75	NCDWR:FF 32Y2	Boiling Springs RS 2	Brunswick	14	Surficial	S	30	1/2/2013	34.014423	-78.083039
76	NCDWR:FF 38J8	Waccamaw School	Brunswick	40	Surficial	S	30	5/24/2013	34.063787	-78.513984
77	NCDWR:G 9C4	Big Flatty Creek	Pasquotank	622	Castle Hayne	CH	13	6/4/2010	36.150033	-76.132485
78	NCDWR:G 50W2	Gibsonville	Guilford	493	Basement rock	PBR	30	12/13/2010	36.088262	-79.547915
79	NCDWR:G 69J1	Wilkesboro	Wilkes	260	Basement rock	PBR	30	6/18/2014	36.137777	-81.099093
80	NCDWR:GG 34S4	Sunset Harbor North	Brunswick	322	Peedee	NACP	13	5/24/2013	33.941368	-78.19865
81	NCDWR:GG 34S5	Sunset Harbor North	Brunswick	102	Peedee	NACP	30	1/11/2012	33.941368	-78.19865
82	NCDWR:GG 35R3	Stanbury	Brunswick	25	Surficial	S	13	3/7/2014	33.94492	-78.28477
83	NCDWR:GG 37B4	Shallotte	Brunswick	70	Peedee	NACP	30	12/13/2010	33.991779	-78.43801
84	NCDWR:H 4U2	Wright Memorial	Dare	266	Yorktown	NACP	30	3/7/2014	36.013384	-75.675696
85	NCDWR:H 20T1	Windsor	Bertie	1001	Lower Cretaceous	NACP	13	10/24/2014	36.03293	-77.01276
86	NCDWR:H 20T3	Windsor	Bertie	335	Upper Cape Fear	NACP	30	8/27/2015	36.03293	-77.01276
87	NCDWR:H 20T4	Windsor	Bertie	280	Upper Cape Fear	NACP	30	3/7/2014	36.03293	-77.01276
88	NCDWR:H 20T7	Windsor	Bertie	60	Surficial	S	13	6/4/2010	36.03293	-77.01276
89	NCDWR:H 20T8	Windsor	Bertie	35	Surficial	S	13	6/26/2012	36.03293	-77.01276
90	NCDWR:H 22I3	Lewiston	Bertie	20	Surficial	S	30	6/26/2012	36.051577	-77.194707
91	NCDWR:H 22I4	Lewiston	Bertie	600	Lower Cretaceous	NACP	13	1/11/2012	36.051577	-77.194707
92	NCDWR:H 22I5	Lewiston	Bertie	380	Lower Cape Fear	NACP	30	10/24/2014	36.051577	-77.194707
93	NCDWR:H 22I6	Lewiston	Bertie	150	Upper Cape Fear	NACP	30	9/8/2017	36.051577	-77.194707
94	NCDWR:H 61U1	Clemmons	Davie	400	Basement rock	PBR	13	12/13/2010	36.012442	-80.422293
95	NCDWR:HH 39J4	Calabash	Brunswick	516	Black Creek	NACP	13	6/26/2012	33.892777	-78.589421
96	NCDWR:I 4W5	Manteo Airport	Dare	20	Surficial	S	30	9/8/2017	35.918385	-75.701641
97	NCDWR:I 13X2	Scuppernong	Washington	421	Castle Hayne	CH	30	10/24/2014	35.916795	-76.469963
98	NCDWR:I 13X4	Scuppernong	Washington	557	Beaufort	NACP	13	3/1/2018	35.916795	-76.469963
99	NCDWR:I 35K2	Bunn	Franklin	345	Basement rock	PBR	30	2/16/2016	35.965026	-78.258289

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100	NCDWR:I 58Y2	Welcome	Davidson	293	Basement rock	PBR	13	3/7/2014	35.927592	-80.245938
101	NCDWR:J 3H3	Nags Head	Dare	207	Yorktown	NACP	30	6/26/2012	35.896805	-75.621381
102	NCDWR:J 3O3	Skyco Road	Dare	220	Yorktown	NACP	30	1/2/2013	35.880959	-75.665774
103	NCDWR:J 3O4	Skyco Road	Dare	13	Surficial	S	30	1/2/2013	35.880944	-75.665799
104	NCDWR:J 3X10	Wanchese Community Center	Dare	500	Yorktown	NACP	30	1/2/2013	35.8423	-75.639888
105	NCDWR:J 3X11	Wanchese Community Center	Dare	98	Yorktown	NACP	13	10/24/2014	35.8423	-75.639888
106	NCDWR:J 3X12	Wanchese Community Center	Dare	84	Yorktown	NACP	30	6/4/2010	35.8423	-75.639888
107	NCDWR:J 3X13	Wanchese Community Center	Dare	183	Yorktown	NACP	13	3/7/2014	35.8423	-75.639888
108	NCDWR:J 5M2	Spencer Creek	Dare	150	Yorktown	NACP	13	1/2/2013	35.871094	-75.786051
109	NCDWR:J 7K5	East Lake	Dare	315	Yorktown	NACP	30	2/16/2016	35.869044	-75.921232
110	NCDWR:J 7K8	East Lake	Dare	15	Surficial	S	30	1/11/2012	35.869044	-75.921232
111	NCDWR:J 22P3	Gold Point	Martin	18	Surficial	S	30	10/24/2014	35.856521	-77.248202
112	NCDWR:J 22P4	Gold Point	Martin	50	Yorktown	NACP	30	10/24/2014	35.856521	-77.248202
113	NCDWR:J 22P6	Gold Point	Martin	611	Lower Cape Fear	NACP	30	1/2/2013	35.856521	-77.248202
114	NCDWR:J 22P7	Gold Point	Martin	512	Upper Cape Fear	NACP	30	5/24/2013	35.856521	-77.248202
115	NCDWR:J 44D1	Chi Psi Fraternity, UNC	Orange	48	Basement saprolite	PBR	13	12/13/2010	35.908611	-79.058056
116	NCDWR:K 2E2	Bodie Island	Dare	214	Yorktown	NACP	30	3/7/2014	35.823721	-75.569477
117	NCDWR:K 2E3	Bodie Island	Dare	190	Yorktown	NACP	30	1/2/2013	35.823721	-75.569477
118	NCDWR:K 2E4	Bodie Island	Dare	134	Yorktown	NACP	13	1/2/2013	35.823721	-75.569477
119	NCDWR:K 2E7	Bodie Island	Dare	10	Surficial	S	13	10/24/2014	35.823721	-75.569477
120	NCDWR:K 17A5	Plymouth	Washington	230	Castle Hayne	CH	30	3/7/2014	35.82388	-76.758325
121	NCDWR:K 17A8	Plymouth	Washington	185	Castle Hayne	CH	13	1/2/2013	35.82388	-76.758325
122	NCDWR:K 21R2	Bear Grass School	Martin	112	Beaufort	NACP	30	2/1/2017	35.7686	-77.129022
123	NCDWR:K 21R4	Bear Grass School	Martin	267	Black Creek	NACP	30	1/2/2013	35.7686	-77.129022
124	NCDWR:K 21R5	Bear Grass School	Martin	935	Lower Cretaceous	NACP	30	6/26/2012	35.7686	-77.129022
125	NCDWR:K 21R6	Bear Grass School	Martin	744	Lower Cape Fear	NACP	30	1/2/2013	35.7686	-77.129022
126	NCDWR:K 40M1	Powell Drive	Wake	133.5	Basement rock	PBR	13	1/11/2012	35.784086	-78.712269
127	NCDWR:L 6Y3	Stumpy Point	Dare	145	Yorktown	NACP	30	2/16/2016	35.674282	-75.905311
128	NCDWR:L 6Y4	Stumpy Point	Dare	24	Surficial	S	13	10/24/2014	35.674282	-75.905311
129	NCDWR:L 10A2	Gum Neck	Tyrrell	85	Yorktown	NACP	30	3/7/2014	35.739773	-76.180591
130	NCDWR:L 10A3	Gum Neck	Tyrrell	701	Castle Hayne	CH	30	3/7/2014	35.739773	-76.180591
131	NCDWR:L 13I1	Lake Phelps	Washington	510	Castle Hayne	CH	30	2/1/2017	35.730718	-76.43438
132	NCDWR:L 13I2	Lake Phelps	Washington	130	Yorktown	NACP	30	10/24/2014	35.730718	-76.43438

USGS Principal Aquifer

Surficial aquifer system (S)
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Map ID	NGWMN ID	Well Name	County	Well Depth (feet)	NC Aquifer	USGS Aquifer	New Hobo Model	Old Hobo Acquired	Latitude	Longitude
133	NCDWR:L 13I4	Lake Phelps	Washington	14	Surficial	S	30	5/24/2013	35.730718	-76.43438
134	NCDWR:L 15Q1	Ed Ellis house	Beaufort	263	Castle Hayne	CH	13	5/24/2013	35.68759	-76.64817
135	NCDWR:L 15T4	D Canal Road	Hyde	360	Castle Hayne	CH	30	6/4/2010	35.68587	-76.5971
136	NCDWR:L 15T5	D Canal Road	Hyde	295	Castle Hayne	CH	30	1/2/2013	35.68587	-76.5971
137	NCDWR:L 24B2	North Pitt High School	Pitt	108	Upper Black Creek	NACP	13	10/24/2014	35.74958	-77.36498
138	NCDWR:L 25P1	Falkland	Pitt	454	Lower Cape Fear	NACP	13	6/18/2014	35.694659	-77.49045
139	NCDWR:L 25P2	Falkland	Pitt	198	Upper Cape Fear	NACP	30	10/24/2014	35.694659	-77.49045
140	NCDWR:L 25P3	Falkland	Pitt	88	Black Creek	NACP	30	9/8/2017	35.694659	-77.49045
141	NCDWR:L 25P4	Falkland	Pitt	52	Yorktown	NACP	30	2/16/2016	35.694659	-77.49045
142	NCDWR:L 67U2	Troutman	Iredell	354	Basement rock	PBR	13	10/24/2014	35.672084	-80.92762
143	NCDWR:M 12L1	New Lake	Hyde	550	Castle Hayne	CH	13	5/24/2013	35.622783	-76.354005
144	NCDWR:M 12L4	New Lake	Hyde	680	Castle Hayne	CH	30	6/4/2010	35.622783	-76.354005
145	NCDWR:M 12L6	New Lake	Hyde	213	Yorktown	NACP	13	6/4/2010	35.622783	-76.354005
146	NCDWR:M 21K2	Washington	Beaufort	82	Castle Hayne	CH	30	1/11/2012	35.629622	-77.088938
147	NCDWR:M 24L1	River Park North	Pitt	656	Lower Cape Fear	NACP	30	3/7/2014	35.626957	-77.359692
148	NCDWR:M 25F1	West Research Campus	Pitt	35	Surficial	S	30	1/11/2012	35.639564	-77.483596
149	NCDWR:M 25F2	West Research Campus	Pitt	161	Black Creek	NACP	30	6/18/2014	35.639564	-77.483596
150	NCDWR:M 25F3	West Research Campus	Pitt	243	Upper Cape Fear	NACP	30	12/13/2010	35.639564	-77.483596
151	NCDWR:M 25F6	West Research Campus	Pitt	565	Lower Cape Fear	NACP	13	2/1/2017	35.639564	-77.483596
152	NCDWR:M 27U13	Farmville Marlboro Rd.	Pitt	329	Upper Cape Fear	NACP	30	9/8/2017	35.58361	-77.59893
153	NCDWR:M 27U14	Farmville Marlboro Rd.	Pitt	245	Upper Cape Fear	NACP	30	1/11/2012	35.58361	-77.59893
154	NCDWR:M 27U16	Farmville Marlboro Rd.	Pitt	55	Surficial	S	30	3/7/2014	35.58361	-77.59893
155	NCDWR:M 27U17	Farmville Marlboro Rd.	Pitt	30	Surficial	S	13	1/11/2012	35.58361	-77.59893
156	NCDWR:M 38Q1	Cleveland	Johnston	407	Basement rock	PBR	30	3/7/2014	35.606899	-78.565459
157	NCDWR:M 53L1	NC Zoo	Randolph	100	Basement rock	PBR	13	1/11/2012	35.629546	-79.769778
158	NCDWR:M 93L1	Beach Grove School Field Well	Haywood	172	Basement rock	PBR	13	2/1/2017	35.62516	-83.11589
159	NCDWR:M 97S1	Oconaluftee Overlook	Swain	50	Basement rock	PBR	13	2/16/2016	35.60802	-83.435688
160	NCDWR:N 15X5	Hubs Rec	Beaufort	400	Beaufort	NACP	13	1/2/2013	35.51658	-76.650011
161	NCDWR:N 23P2	D H Conley High School	Pitt	496	Upper Cape Fear	NACP	30	2/16/2016	35.529964	-77.326652
162	NCDWR:N 23P3	D H Conley High School	Pitt	132	Peedee	NACP	30	2/16/2016	35.529964	-77.326652
163	NCDWR:N 23P4	D H Conley High School	Pitt	570	Upper Cape Fear	NACP	30	1/11/2012	35.529964	-77.326652
164	NCDWR:N 23P5	D H Conley High School	Pitt	333	Black Creek	NACP	30	1/2/2013	35.529964	-77.326652
165	NCDWR:N 25Q2	Winterville	Pitt	99	Peedee	NACP	13	3/7/2014	35.521734	-77.476964

USGS Principal Aquifer

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Table 1. Onset Logger List

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Map ID	NGWMN ID	Well Name	County	Well Depth (feet)	NC Aquifer	USGS Aquifer	New Hobo Model	Old Hobo Acquired	Latitude	Longitude
166	NCDWR:N 46H1	General Timber	Chatham	342	Basement rock	PBR	30	1/2/2013	35.56524	-79.20924
167	NCDWR:O 10W2	Hydeland	Hyde	857	Castle Hayne	CH	13	6/4/2010	35.423562	-76.208471
168	NCDWR:O 10W3	Hydeland	Hyde	700	Castle Hayne	CH	30	12/13/2010	35.423562	-76.208471
169	NCDWR:O 17I1	Bath	Beaufort	55	Yorktown	NACP	30	1/11/2012	35.473171	-76.78261
170	NCDWR:O 17I2	Bath	Beaufort	190	Castle Hayne	CH	30	1/11/2012	35.473171	-76.78261
171	NCDWR:O 22L1	Voice of America	Pitt	80	Castle Hayne	CH	13	3/1/2018	35.459348	-77.186854
172	NCDWR:O 22L2	Voice of America	Pitt	35	Surficial	S	30	1/2/2013	35.459348	-77.186854
173	NCDWR:O 23L3	Chicod	Pitt	564	Upper Cape Fear	NACP	30	2/16/2016	35.46364	-77.275232
174	NCDWR:O 23L4	Chicod	Pitt	445	Black Creek	NACP	30	6/18/2014	35.46364	-77.275232
175	NCDWR:O 23L5	Chicod	Pitt	319	Upper Black Creek	NACP	30	12/13/2010	35.46364	-77.275232
176	NCDWR:O 23L6	Chicod	Pitt	87	Castle Hayne	CH	30	1/11/2012	35.46364	-77.275232
177	NCDWR:O 23L7	Chicod	Pitt	175	Peedee	NACP	13	1/2/2013	35.46364	-77.275232
178	NCDWR:O 23L8	Chicod	Pitt	836	Lower Cape Fear	NACP	30	1/11/2012	35.46364	-77.275232
179	NCDWR:O 27J10	Eastern Correctional Institution	Greene	125	Black Creek	NACP	30	9/8/2017	35.482494	-77.597095
180	NCDWR:O 27J11	Eastern Correctional Institution	Greene	325	Upper Cape Fear	NACP	13	1/2/2013	35.482494	-77.597095
181	NCDWR:O 27J9	Eastern Correctional Institution	Greene	55	Yorktown	NACP	30	3/7/2014	35.482494	-77.597095
182	NCDWR:O 28K3	Snow Hill	Greene	415	Lower Cape Fear	NACP	30	5/24/2013	35.455055	-77.668767
183	NCDWR:O 28K6	Snow Hill	Greene	25	Surficial	S	30	6/11/2015	35.455055	-77.668767
184	NCDWR:O 30J1	Saulston	Wayne	45	Upper Black Creek	NACP	30	1/2/2013	35.469778	-77.849778
185	NCDWR:O 30J3	Saulston	Wayne	175	Upper Cape Fear	NACP	30	6/26/2012	35.469778	-77.849778
186	NCDWR:O 87D1	Bent Creek	Buncombe	25	Basement saprolite	PBR	13	10/24/2014	35.490833	-82.644167
187	NCDWR:O 97L1	Deep Creek Campground	Swain	112	Basement rock	PBR	13	3/7/2014	35.463206	-83.435249
188	NCDWR:O 97W2	Bryson City	Swain	555	Basement rock	PBR	13	3/1/2018	35.421774	-83.456734
189	NCDWR:P 16O2	Southside Ferry	Beaufort	47	Yorktown	NACP	30	2/1/2017	35.377191	-76.749237
190	NCDWR:P 16O3	Southside Ferry	Beaufort	370	Castle Hayne	CH	13	6/4/2010	35.377191	-76.749237
191	NCDWR:P 16O4	Southside Ferry	Beaufort	250	Castle Hayne	CH	100	6/26/2012	35.377191	-76.749237
192	NCDWR:P 17E1	Whitley Farms	Beaufort	186	Castle Hayne	CH	13	6/26/2012	35.400578	-76.832719
193	NCDWR:P 17E3	Whitley Farms	Beaufort	49	Yorktown	NACP	30	10/24/2014	35.400578	-76.832719
194	NCDWR:P 17I12	Lee Creek	Beaufort	494	Beaufort	NACP	30	6/26/2012	35.386451	-76.783141
195	NCDWR:P 17I13	Lee Creek	Beaufort	41	Surficial	S	30	5/24/2013	35.386451	-76.783141
196	NCDWR:P 17I7	Lee Creek	Beaufort	72	Yorktown	NACP	30	2/16/2016	35.386451	-76.783141
197	NCDWR:P 17I9	Lee Creek	Beaufort	946	Black Creek	NACP	13	3/7/2014	35.38645	-76.783141
198	NCDWR:P 18V3	Bonnerton	Beaufort	30	Surficial	S	30	5/24/2013	35.34361	-76.86087

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Map ID	NGWMN ID	Well Name	County	Well Depth (feet)	NC Aquifer	USGS Aquifer	New Hobo Model	Old Hobo Acquired	Latitude	Longitude
199	NCDWR:P 18V8	Bonnerton	Beaufort	457	Beaufort	NACP	13	1/2/2013	35.34361	-76.86087
200	NCDWR:P 19M5	Cox Crossroads	Beaufort	390	Peedee	NACP	30	1/2/2013	35.373479	-76.951008
201	NCDWR:P 21G1	Wilmar Fire Tower	Craven	106	Castle Hayne	CH	13	3/1/2018	35.393509	-77.144768
202	NCDWR:P 21K4	Wilmar	Beaufort	200	Castle Hayne	CH	30	1/2/2013	35.381484	-77.087762
203	NCDWR:P 21K5	Wilmar	Beaufort	918	Black Creek	NACP	30	9/8/2017	35.381484	-77.087762
204	NCDWR:P 21K6	Wilmar	Beaufort	200	Castle Hayne	CH	30	9/8/2017	35.381484	-77.087762
205	NCDWR:P 21N1	Purser	Craven	172	Castle Hayne	CH	30	2/1/2017	35.373997	-77.135278
206	NCDWR:P 21N2	Purser	Craven	44	Yorktown	NACP	30	2/1/2017	35.373997	-77.135278
207	NCDWR:P 21N3	Purser	Craven	20	Surficial	S	30	2/1/2017	35.373997	-77.135278
208	NCDWR:P 22U10	Palmetto Swamp	Craven	85	Castle Hayne	CH	30	2/16/2016	35.332429	-77.17249
209	NCDWR:P 22U6	Palmetto Swamp	Craven	619	Black Creek	NACP	30	1/2/2013	35.332429	-77.17249
210	NCDWR:P 22U7	Palmetto Swamp	Craven	350	Peedee	NACP	30	1/11/2012	35.332429	-77.17249
211	NCDWR:P 22U9	Palmetto Swamp	Craven	25	Surficial	S	13	1/2/2013	35.332429	-77.17249
212	NCDWR:P 24O1	Grifton Ball Field	Pitt	705	Lower Cape Fear	NACP	13	3/7/2014	35.371097	-77.409819
213	NCDWR:P 24O2	Grifton Ball Field	Pitt	490	Upper Cape Fear	NACP	30	10/24/2014	35.371097	-77.409819
214	NCDWR:P 24O4	Grifton Ball Field	Pitt	128	Peedee	NACP	30	10/24/2014	35.371097	-77.409819
215	NCDWR:P 54H1	Densons Creek Park	Montgomery	250	Basement rock	PBR	13	3/7/2014	35.38378	-79.88012
216	NCDWR:Q 15U3	Hobucken	Pamlico	570	Castle Hayne	CH	30	10/24/2014	35.255031	-76.595863
217	NCDWR:Q 15U6	Hobucken	Pamlico	105	Yorktown	NACP	30	6/4/2010	35.255031	-76.595863
218	NCDWR:Q 15U7	Hobucken	Pamlico	973	Peedee	NACP	30	10/24/2014	35.255031	-76.595863
219	NCDWR:Q 15U8	Hobucken	Pamlico	25	Surficial	S	13	12/13/2010	35.255031	-76.595863
220	NCDWR:Q 16G5	Godley	Beaufort	40	Yorktown	NACP	30	6/11/2015	35.315752	-76.727595
221	NCDWR:Q 16G7	Godley	Beaufort	810	Peedee	NACP	30	10/24/2014	35.315752	-76.727595
222	NCDWR:Q 17D1	Aurora II	Beaufort	168	Castle Hayne	CH	30	1/11/2012	35.3261	-76.803341
223	NCDWR:Q 17D2	Aurora II	Beaufort	18	Surficial	S	13	1/2/2013	35.3261	-76.803341
224	NCDWR:Q 29I2	La Grange	Lenoir	90	Upper Black Creek	NACP	30	1/11/2012	35.310242	-77.778333
225	NCDWR:Q 29I3	La Grange	Lenoir	247	Black Creek	NACP	13	1/2/2013	35.310242	-77.778333
226	NCDWR:Q 29I4	La Grange	Lenoir	358	Upper Cape Fear	NACP	30	1/11/2012	35.310242	-77.778333
227	NCDWR:Q 30R2	Spring Creek Elementary School	Wayne	132	Black Creek	NACP	30	3/7/2014	35.28194	-77.8708
228	NCDWR:Q 30R3	Spring Creek Elementary School	Wayne	100	Black Creek	NACP	30	10/24/2014	35.28194	-77.8708
229	NCDWR:Q 51N1	Williams Tenant House	Moore	41	Surficial	S	13	2/16/2016	35.28888	-79.64824
230	NCDWR:Q 66C1	Hornets Nest Park	Mecklenburg	17.1	Basement saprolite	PBR	13	6/26/2012	35.318611	-80.875555
231	NCDWR:Q 94J1	Stillwell Building	Jackson	201	Basement rock	PBR	30	3/7/2014	35.31221	-83.1806

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232	NCDWR:R 17I2	Bay City	Pamlico	461	Castle Hayne	CH	30	10/24/2014	35.219985	-76.773926
233	NCDWR:R 23X5	Cove City	Craven	13	Surficial	S	30	1/2/2013	35.172305	-77.311178
234	NCDWR:R 23X8	Cove City	Craven	507	Black Creek	NACP	30	5/24/2013	35.172305	-77.311178
235	NCDWR:R 29T4	Moss Hill	Lenoir	415	Upper Cape Fear	NACP	30	6/26/2012	35.19616	-77.752824
236	NCDWR:R 29T5	Moss Hill	Lenoir	25	Surficial	S	30	3/7/2014	35.19616	-77.752824
237	NCDWR:R 29T6	Moss Hill	Lenoir	115	Peedee	NACP	30	4/7/2016	35.19616	-77.752824
238	NCDWR:R 29T8	Moss Hill	Lenoir	197	Black Creek	NACP	13	1/11/2012	35.19616	-77.752824
239	NCDWR:R 31C1	Sleepy Creek	Wayne	72	Black Creek	NACP	30	10/24/2014	35.244508	-77.963034
240	NCDWR:R 31C3	Sleepy Creek	Wayne	178	Upper Cape Fear	NACP	30	3/7/2014	35.244508	-77.963034
241	NCDWR:R 48G2	Southern Pines Water Plant	Moore	30	Surficial	S	30	6/26/2012	35.21693	-79.394197
242	NCDWR:R 48Y4	Southern Pines 1	Moore	100	Surficial	S	13	6/4/2010	35.17381	-79.409516
243	NCDWR:R 49C3	Eastwood	Moore	160	Surficial	S	13	6/18/2014	35.239973	-79.4594
244	NCDWR:R 82I1	Columbus	Polk	245	Basement rock	PBR	13	1/11/2012	35.23009	-82.188257
245	NCDWR:S 15Y1	Whortonsville	Pamlico	59	Yorktown	NACP	30	10/24/2014	35.089831	-76.655676
246	NCDWR:S 15Y3	Whortonsville	Pamlico	590	Castle Hayne	CH	30	1/2/2013	35.089831	-76.655676
247	NCDWR:S 15Y4	Whortonsville	Pamlico	450	Castle Hayne	CH	13	6/26/2012	35.089831	-76.655676
248	NCDWR:S 15Y7	Whortonsville	Pamlico	14	Surficial	S	30	9/8/2017	35.089831	-76.655676
249	NCDWR:S 18U10	Arapahoe	Pamlico	125	Yorktown	NACP	30	3/7/2014	35.086676	-76.835587
250	NCDWR:S 18U11	Arapahoe	Pamlico	22	Surficial	S	30	2/1/2017	35.086676	-76.835587
251	NCDWR:S 18U12	Arapahoe	Pamlico	492	Castle Hayne	CH	13	1/11/2012	35.086676	-76.835587
252	NCDWR:S 18U3	Arapahoe	Pamlico	83	Yorktown	NACP	30	6/26/2012	35.086676	-76.835587
253	NCDWR:S 18U5	Arapahoe	Pamlico	380	Castle Hayne	CH	30	1/2/2013	35.086676	-76.835587
254	NCDWR:S 18U7	Arapahoe	Pamlico	120	Yorktown	NACP	13	3/7/2014	35.086676	-76.835587
255	NCDWR:S 22J10	Clarks	Craven	726	Black Creek	NACP	30	10/24/2014	35.137475	-77.171389
256	NCDWR:S 22J12	Clarks	Craven	1057	Upper Cape Fear	NACP	30	10/24/2014	35.137475	-77.171389
257	NCDWR:S 22J5	Clarks	Craven	80	Castle Hayne	CH	30	6/4/2010	35.137475	-77.171389
258	NCDWR:S 22J8	Clarks	Craven	338	Beaufort	NACP	30	6/18/2014	35.137475	-77.171389
259	NCDWR:S 22J9	Clarks	Craven	530	Peedee	NACP	30	2/16/2016	35.137475	-77.171389
260	NCDWR:S 26I2	Beaver Creek	Jones	785	Lower Cape Fear	NACP	30	3/7/2014	35.139489	-77.530205
261	NCDWR:S 26I3	Beaver Creek	Jones	14	Surficial	S	30	3/7/2014	35.139489	-77.530205
262	NCDWR:S 26I6	Beaver Creek	Jones	485	Black Creek	NACP	30	3/7/2014	35.139489	-77.530205
263	NCDWR:S 35Q9	Halls	Sampson	280	Upper Cape Fear	NACP	13	1/2/2013	35.113686	-78.316614
264	NCDWR:S 48H2	Weymouth Woods	Moore	45	Surficial	S	13	1/11/2012	35.145158	-79.371585

USGS Principal Aquifer

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Map ID	NGWMN ID	Well Name	County	Well Depth (feet)	NC Aquifer	USGS Aquifer	New Hobo Model	Old Hobo Acquired	Latitude	Longitude
265	NCDWR:T 23X1	Olivers Crossroad	Jones	167	Castle Hayne	CH	13	3/7/2014	35.00664	-77.30248
266	NCDWR:T 24J1	Jones Middle School	Jones	1005	Lower Cape Fear	NACP	30	1/11/2012	35.06575	-77.34527
267	NCDWR:T 24J2	Jones Middle School	Jones	175	Beaufort	NACP	30	1/2/2013	35.06575	-77.34527
268	NCDWR:T 24J3	Jones Middle School	Jones	95	Surficial	S	30	6/4/2010	35.06575	-77.34527
269	NCDWR:T 24J5	Jones Middle School	Jones	355	Peedee	NACP	30	9/27/2016	35.06575	-77.34527
270	NCDWR:T 24J6	Jones Middle School	Jones	530	Black Creek	NACP	30	6/4/2010	35.06575	-77.34527
271	NCDWR:T 29G10	Pink Hill	Duplin	592	Lower Cape Fear	NACP	30	1/11/2012	35.056327	-77.807143
272	NCDWR:T 29G11	Pink Hill	Duplin	25	Surficial	S	30	10/24/2014	35.056327	-77.807143
273	NCDWR:T 29G5	Pink Hill	Duplin	256	Black Creek	NACP	13	3/7/2014	35.056327	-77.807143
274	NCDWR:T 48I2	McCain Sanitorium	Hoke	92	Black Creek	NACP	13	9/8/2017	35.05481	-79.359448
275	NCDWR:T 50R3	Hoffman	Richmond	140	Black Creek	NACP	13	10/24/2014	35.023181	-79.546755
276	NCDWR:U 18Q5	Cherry Point	Craven	80	Yorktown	NACP	30	5/24/2013	34.933879	-76.890064
277	NCDWR:U 18Q6	Cherry Point	Craven	30	Surficial	S	30	9/8/2017	34.933879	-76.890064
278	NCDWR:U 19O5	Croatan	Craven	80	Surficial	S	13	3/7/2014	34.956514	-76.988776
279	NCDWR:U 26J4	Comfort	Jones	545	Black Creek	NACP	30	2/16/2016	34.969429	-77.503222
280	NCDWR:U 26J5	Comfort	Jones	284	Peedee	NACP	30	1/11/2012	34.969429	-77.503222
281	NCDWR:U 26J9	Comfort	Jones	131	Beaufort	NACP	13	6/18/2014	34.969429	-77.503222
282	NCDWR:U 34B14	Turkey	Sampson	446	Lower Cape Fear	NACP	13	3/7/2014	34.988899	-78.189357
283	NCDWR:U 37D1	Pondberry Bay	Sampson	38	Surficial	S	30	1/11/2012	34.995133	-78.478227
284	NCDWR:U 37D3	Pondberry Bay	Sampson	199	Black Creek	NACP	13	10/24/2014	34.995133	-78.478227
285	NCDWR:U 40Y1	Cedar Creek Fire Tower	Cumberland	200	Upper Cape Fear	NACP	13	1/2/2013	34.932655	-78.739156
286	NCDWR:U 40Y2	Cedar Creek Fire Tower	Cumberland	140	Black Creek	NACP	30	1/11/2012	34.932655	-78.739156
287	NCDWR:U 40Y3	Cedar Creek Fire Tower	Cumberland	65	Upper Black Creek	NACP	30	6/26/2012	34.932655	-78.739156
288	NCDWR:U 40Y4	Cedar Creek Fire Tower	Cumberland	25	Surficial	S	30	1/11/2012	34.932655	-78.739156
289	NCDWR:U 41A1	Seabrook School	Cumberland	29	Surficial	S	13	2/16/2016	34.987708	-78.75479
290	NCDWR:U 46E6	Raeford	Hoke	101	Surficial	S	13	10/24/2014	34.992801	-79.24488
291	NCDWR:U 62A1	Monroe	Union	397	Basement rock	PBR	13	1/2/2013	34.987809	-80.503237
292	NCDWR:V 12I3	Atlantic	Carteret	832	Castle Hayne	CH	13	2/16/2016	34.88528	-76.354791
293	NCDWR:V 12I4	Atlantic	Carteret	1140	Castle Hayne	CH	13	1/11/2012	34.88528	-76.354791
294	NCDWR:V 12I5	Atlantic	Carteret	17	Surficial	S	13	9/8/2017	34.88528	-76.354791
295	NCDWR:V 12I6	Atlantic	Carteret	165	Yorktown	NACP	13	10/24/2014	34.88528	-76.354791
296	NCDWR:V 23X1	Deppe	Onslow	120	Surficial	S	30	5/24/2013	34.837042	-77.303278
297	NCDWR:V 23X2	Deppe	Onslow	640	Peedee	NACP	30	10/24/2014	34.837042	-77.303278

USGS Principal Aquifer

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Map ID	NGWMN ID	Well Name	County	Well Depth (feet)	NC Aquifer	USGS Aquifer	New Hobo Model	Old Hobo Acquired	Latitude	Longitude
298	NCDWR:V 23X3	Deppe	Onslow	300	Beaufort	NACP	30	6/26/2012	34.837042	-77.303278
299	NCDWR:V 23X4	Deppe	Onslow	35	Surficial	S	30	1/2/2013	34.837042	-77.303278
300	NCDWR:V 23X6	Deppe	Onslow	85	Surficial	S	30	6/26/2012	34.837042	-77.303278
301	NCDWR:V 23X7	Deppe	Onslow	873	Black Creek	NACP	13	1/11/2012	34.837042	-77.303278
302	NCDWR:V 32V1	Rose Hill	Duplin	98	Peedee	NACP	30	2/16/2016	34.847826	-78.021278
303	NCDWR:V 32V10	Rose Hill	Duplin	495	Lower Cape Fear	NACP	30	6/4/2010	34.84829	-78.02155
304	NCDWR:V 32V6	Rose Hill	Duplin	218	Black Creek	NACP	13	5/24/2013	34.847826	-78.021278
305	NCDWR:V 35T10	Slx Runs	Sampson	20	Surficial	S	30	9/8/2017	34.853611	-78.2625
306	NCDWR:V 39O1	Bushy Lake	Cumberland	190	Upper Cape Fear	NACP	13	10/24/2014	34.882533	-78.657536
307	NCDWR:V 39O2	Bushy Lake	Cumberland	27	Surficial	S	30	5/24/2013	34.882533	-78.657536
308	NCDWR:V 42V1	Du Pont	Bladen	133	Black Creek	NACP	13	1/2/2013	34.845259	-78.850955
309	NCDWR:V 42V2	Du Pont	Bladen	35	Surficial	S	30	1/11/2012	34.845259	-78.850955
310	NCDWR:V 42V4	Du Pont	Bladen	268	Upper Cape Fear CU	NACP	30	9/8/2017	34.845259	-78.850955
311	NCDWR:V 42V5	Du Pont	Bladen	325	Upper Cape Fear	NACP	30	1/2/2013	34.845259	-78.850955
312	NCDWR:V 42V6	Du Pont	Bladen	95	Surficial	S	30	1/11/2012	34.845259	-78.850955
313	NCDWR:V 45U4	Rex Rennert School	Robeson	132	Black Creek	NACP	13	1/11/2012	34.843151	-79.087593
314	NCDWR:V 45U7	Rex Rennert School	Robeson	30	Black Creek	NACP	30	10/24/2014	34.843151	-79.087593
315	NCDWR:W 25F10	Well Field 258	Onslow	17	Surficial	S	30	9/27/2016	34.810394	-77.487225
316	NCDWR:W 25F11	Well Field 258	Onslow	303	Peedee	NACP	30	2/16/2016	34.810394	-77.487225
317	NCDWR:W 25F6	Well Field 258	Onslow	110	Surficial	S	13	1/2/2013	34.810394	-77.487225
318	NCDWR:W 25F8	Well Field 258	Onslow	600	Black Creek	NACP	30	2/1/2017	34.810394	-77.487225
319	NCDWR:W 26C6	Onslow Quarry 14	Onslow	105	Castle Hayne	CH	13	2/16/2016	34.828017	-77.545416
320	NCDWR:W 41X1	Smithfield McNair House	Bladen	200	Black Creek	NACP	13	3/7/2014	34.760652	-78.802587
321	NCDWR:W 41X2	Smithfield McNair House	Bladen	420	Upper Cape Fear	NACP	100	1/11/2012	34.760652	-78.802587
322	NCDWR:X 17J5	Camp Glenn	Carteret	191	Castle Hayne	CH	13	1/11/2012	34.723029	-76.753385
323	NCDWR:X 17J7	Camp Glenn	Carteret	17	Surficial	S	13	1/2/2013	34.723018	-76.753503
324	NCDWR:X 19O1	WCWC	Carteret	460	Castle Hayne	CH	13	2/16/2016	34.715696	-76.98606
325	NCDWR:X 19O2	WCWC	Carteret	355	Castle Hayne	CH	30	1/11/2012	34.715696	-76.98606
326	NCDWR:X 19O3	WCWC	Carteret	290	Castle Hayne	CH	30	1/2/2013	34.715696	-76.98606
327	NCDWR:X 19O4	WCWC	Carteret	170	Castle Hayne	CH	30	3/7/2014	34.715696	-76.98606
328	NCDWR:X 19O5	WCWC	Carteret	110	Yorktown	NACP	30	6/18/2014	34.715696	-76.98606
329	NCDWR:X 19O6	WCWC	Carteret	35	Surficial	S	30	1/11/2012	34.715696	-76.98606
330	NCDWR:X 22H1	Parkertown Road	Onslow	387	Castle Hayne	CH	30	6/26/2012	34.72964	-77.2104

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Map ID	NGWMN ID	Well Name	County	Well Depth (feet)	NC Aquifer	USGS Aquifer	New Hobo Model	Old Hobo Acquired	Latitude	Longitude
331	NCDWR:X 22H6	Parkertown Road	Onslow	1043	Black Creek	NACP	30	12/13/2010	34.72964	-77.2104
332	NCDWR:X 23N1	Wallace Creek	Onslow	253	Castle Hayne	CH	13	6/26/2012	34.701212	-77.305598
333	NCDWR:X 24E1	Montford Point	Onslow	341	Castle Hayne	CH	13	10/24/2014	34.738	-77.409222
334	NCDWR:X 24E2	Montford Point	Onslow	240	Castle Hayne	CH	30	12/13/2010	34.738056	-77.409139
335	NCDWR:X 24G1	Paradise Point	Onslow	232	Castle Hayne	CH	30	3/7/2014	34.717963	-77.391888
336	NCDWR:X 24G2	Paradise Point	Onslow	16.4	Surficial	S	30	3/7/2014	34.717963	-77.391888
337	NCDWR:X 24S2	Hadnot Point	Onslow	918	Black Creek	NACP	13	2/1/2017	34.692198	-77.35118
338	NCDWR:X 24S6	Hadnot Point	Onslow	130	Castle Hayne	CH	30	10/24/2014	34.692738	-77.351433
339	NCDWR:X 24S7	Hadnot Point	Onslow	40	Surficial	S	30	2/1/2017	34.692738	-77.351433
340	NCDWR:X 25C1	Camp Geiger	Onslow	68	Surficial	S	13	1/2/2013	34.738396	-77.457525
341	NCDWR:X 25C3	Camp Geiger	Onslow	170	Castle Hayne	CH	30	1/2/2013	34.738396	-77.457525
342	NCDWR:X 25U1	Ragged Point	Onslow	180	Castle Hayne	CH	13	1/2/2013	34.676463	-77.427538
343	NCDWR:X 44K8	Magnolia School	Robeson	350	Upper Cape Fear	NACP	30	1/11/2012	34.709867	-79.001589
344	NCDWR:X 44K9	Magnolia School	Robeson	440	Upper Cape Fear	NACP	30	1/11/2012	34.709867	-79.001589
345	NCDWR:X 47K3	Red Bank	Robeson	453	Upper Cape Fear	NACP	13	3/7/2014	34.706562	-79.260885
346	NCDWR:X 47K4	Red Bank	Robeson	40	Surficial	S	30	2/16/2016	34.706562	-79.260885
347	NCDWR:Y 23R1	Sneads Ferry	Onslow	235	Castle Hayne	CH	30	6/26/2012	34.60716	-77.28795
348	NCDWR:Y 25Q1	Folkstone	Onslow	80	Upper Tertiary	NACP	30	1/2/2013	34.611365	-77.482799
349	NCDWR:Y 25Q6	Folkstone	Onslow	22	Surficial	S	30	10/24/2014	34.611365	-77.482799
350	NCDWR:Y 25Q7	Folkstone	Onslow	462	Castle Hayne	CH	30	3/7/2014	34.611365	-77.482799
351	NCDWR:Y 25Q8	Folkstone	Onslow	800	Black Creek	NACP	30	10/24/2014	34.611365	-77.482799
352	NCDWR:Y 30S3	Burgaw	Pender	145	Peedee	NACP	30	3/7/2014	34.604749	-77.85607
353	NCDWR:Y 34P2	Ivanhoe	Sampson	220	Black Creek	NACP	13	2/16/2016	34.60453	-78.241805
354	NCDWR:Y 34P3	Ivanhoe	Sampson	33	Surficial	S	13	1/11/2012	34.60453	-78.241805
355	NCDWR:Y 34P9	Ivanhoe	Sampson	458	Upper Cape Fear	NACP	13	1/11/2012	34.604516	-78.24184
356	NCDWR:Y 40G1	Dublin	Bladen	421	Upper Cape Fear	NACP	13	1/11/2012	34.647775	-78.730947
357	NCDWR:Y 40G2	Dublin	Bladen	292	Black Creek	NACP	30	1/11/2012	34.647775	-78.730947
358	NCDWR:Y 42F10	Littlefield School	Robeson	330	Black Creek	NACP	30	1/11/2012	34.644442	-78.915974
359	NCDWR:Y 42F12	Littlefield School	Robeson	20	Surficial	S	30	6/4/2010	34.644442	-78.915974
360	NCDWR:Y 44O6	Robeson Correctional Center	Robeson	495	Upper Cape Fear	NACP	13	3/7/2014	34.623512	-79.075071
361	NCDWR:Z 29N2	Holly Shelter	Pender	710	Upper Cape Fear	NACP	30	9/27/2016	34.548333	-77.816111
362	NCDWR:Z 29N3	Holly Shelter	Pender	150	Peedee	NACP	30	2/16/2016	34.548333	-77.816111
363	NCDWR:Z 29N4	Holly Shelter	Pender	445	Black Creek	NACP	30	9/27/2016	34.548333	-77.816111

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364	NCDWR:Z 41U1	Bladenboro	Bladen	35	Surficial	S	13	1/11/2012	34.506753	-78.754306
365	NCDWR:Z 41U2	Bladenboro	Bladen	500	Hybrid	NACP	30	1/11/2012	34.506753	-78.754306
366	NCDWR:Z 47R1	Rowland	Robeson	556	Upper Cape Fear	NACP	30	9/27/2016	34.532009	-79.296151
367	NCDWR:Z 47R2	Rowland	Robeson	270	Black Creek	NACP	100	6/26/2012	34.532009	-79.296151
368	NCDWR:Z 47R3	Rowland	Robeson	190	Black Creek	NACP	100	4/4/2014	34.532009	-79.296151
369	NCDWR:Z 47R4	Rowland	Robeson	78	Peedee	NACP	30	1/11/2012	34.532009	-79.296151
370	NCDWR:Z 47R5	Rowland	Robeson	44	Surficial	S	30	1/2/2013	34.532009	-79.296151

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NC DEQ
Ground Water Resources Branch
Data Management Plan

Effective: January 5, 2023

Updated: October 20, 2025

Project: G23AC00311-00 DEQ-USGS Cooperative Agreement in Support of the National Ground-Water Monitoring Network (NGWMN)

Contacts: USGS
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NC DEQ Principal Investigator
Mark Durway, (919) 707-9018, mark.durway@deq.nc.gov

Budget: NC DEQ and USGS Funding Sources

Types of Data Collected

Four data types are routinely collected by the NC DEQ Ground Water Resources Branch (GWRB), formerly called Ground Water Management Branch. Data types consist of groundwater levels, groundwater quality analyses, well drilling data, and locational data. Currently, GWRB provides persistent water level data to the NGWMN from 672 wells, and water quality data from 655 wells.

Groundwater levels are acquired hourly or at other regular intervals, validated, and downloaded to the appropriate GWRB database. Water quality data are collected at less frequent intervals and may consist of chlorides and other inorganic and organic parameters including PFAS and similar compounds.

Drilling data consisting of lithology, geophysical logs, and well construction specifications are acquired during the drilling and well completion process. Lithology is typically determined from drill cuttings collected at 10 ft intervals during well drilling. Lithologic data and well specifications including total depth, casing and screen dimensions, and other information are used to produce a drilling log once the well has been completed. Typically, wells are also logged using open-hole geophysical techniques. Geophysical data typically consists of gamma, spontaneous potential (SP), single-point resistivity (SPR), 16" normal resistivity, and 64" normal resistivity logs. Work is overseen by a geologist and drilling is performed by a certified well contractor in accordance with state requirements.

Accuracy of locational data is accomplished using survey grade GPS equipment to determine latitude, longitude, and altitude. Accuracy and geodetic reference systems used by GWRB are state plane coordinates and latitude/longitude (<0.05 ft), altitude (<0.1 ft), horizontal datum (NAD83), and altitude datum (NAVD88).

Data and Metadata Standards

GWRB stores data in the following databases:

Data Type	Database Tables
Groundwater Levels	gwb.dwr, gwb.dwrwatlev, gwb.dwrwatlevhourly
Groundwater Quality	gwb.dwrchloride, gwquality (multiple tables)
Well Logs	gwb.logs, gwb.logdata, gwb.resstafr
Location, Latitude/Longitude, Altitude	gwb.dwr

The GWRB groundwater monitoring network uses the MariaDB database management platform. This platform is supported by branch and division level IT staff. The GWRB website is hosted by Apache web server. Internal database tables are used to maintain database quality control and allow for editing. Water level and water quality data meeting standards are unloaded to public tables listed above.

Policies for Access and Sharing

Project data is available without restriction through the NGWMN Data Portal.

Policies and Provisions for Re-Use and Re-Distribution

There is no restriction on the use and distribution of project data acquired through the NGWMN Data Portal. Project data obtained through the portal and redistributed is expected to reference NC DEQ Ground Water Resources Branch as the original data source and DEQ-USGS Cooperative Agreement G23AC00311-00 as the source of funding.

Plans for Archiving and Preservation of Access

Paper copies of field data and other records are scanned and stored by GWRB and included in regular system backups. This data and all databases are backed up at least weekly.