

**Geological and Geophysical Investigation
Ronald Gary Strickland Testamentary Trust
Granville County, North Carolina**

INTRODUCTION

Purpose

The subject of this investigation is the Strickland property, located in southern Granville County, North Carolina, between Creedmoor and Wilton and south of NC Highway 56, along Walters Road. Fieldwork included reconnaissance and detailed geological mapping, magnetic mapping and analysis, and a 48-hour aquifer pump and recovery test. These studies involved seven separate visits to the site between September 2012 and July 2013. The objective of the investigation was to identify and locate promising sites for water wells to serve the homes in a proposed new community.

Geological Background

Geologically, southern Granville County lies predominantly within the northern Durham sub-basin of the Deep River basin, a major rift structure of early Mesozoic age (NCGS, 1985; See Figure 1). The basin is separated from crystalline basement rocks to the east by the Jonesboro fault. Rocks of the basin are sedimentary rocks of Triassic age, mostly sandstone, siltstone, and conglomerate. These sedimentary rocks and the surrounding older crystalline rocks are cut by hundreds of separate intrusions of Jurassic-age diabase. Diabase is a hard, black, igneous rock, and occurs in the area as a geologic structure called a dike. Diabase dikes are narrow bands of rock, usually between two and twenty feet wide, that typically run in a general north-south or northwest-southeast direction; however, some run in other directions. These dikes extend underground at a steep angle, commonly near vertical. Water wells drilled in or adjacent to diabase dikes generally yield more water than wells in the surrounding rock, due to an increase in the number and density of fractures. Depending on the size of the diabase dike, well yields typically average from 10 to 25 gallons per minute, values that are generally considerably higher than those found in the surrounding rock.

Pertinent Previous Work

The Strickland property lies in the northwest corner of the Grissom 7.5-minute quadrangle, whose geology has been mapped at a scale of 1:24,000 (Blake and others, in revision). See Figure 2. The map indicates that the property is underlain entirely by unit Trcs/si2 - sandstone with interbedded siltstone, with no diabase shown. However, there are no data points in the area in question. Due to budget and time limitations, geologic maps of this scale are not able to show all rock exposures. Thus, many unmapped diabase dikes occur within the Triassic basins and throughout the Piedmont but were not encountered by the authors of the published map. However, there is a diabase dike shown on the map about one km to the south of Walters Road near the intersection of Brassfield and Lawrence Roads.

Earlier water well investigations by us had identified a diabase dike, previously unmapped, just to the north of Walters Road, and trending approximately north to south

through the property of Landmark Baptist Church. The water well that serves the church has been drilled along this dike, and is located about 300 feet north of Walters Road.

Methods

Field mapping involved walking over the area to locate and identify any rock outcrops or float (loose pieces of rock). This was concentrated along all roads, trails, paths, and creeks, but included all parts of the area to some degree. A geological (Brunton) compass and hand-held GPS unit were employed. Without the use of a GPS, early data were plotted approximately on a topographic base map. Later GPS data were downloaded onto a digital topographic map, and in some cases directly onto a georeferenced topographic map (GeoPDF) using an iPad tablet computer with integrated GPS in the field. Emphasis was on locating diabase, but sedimentary rocks were noted as well. Because diabase is a highly magnetic rock type, its presence below the surface of the ground can be detected with a magnetometer, which measures the magnetic field of the earth with high precision. Ground magnetometer investigations were performed using a Geometrics G-856 Proton Precession Magnetometer. The hydrogeological behavior of the site was studied with an aquifer pump test, in which water was withdrawn from one well at a known rate for 24 hours. The effect of this pumping on depth to the water table was measured at the pumped well and at two neighboring wells, as was the recovery of the water table after pumping ceased.

RESULTS

Geological and Geophysical Mapping and Analysis

Preliminary geological and magnetic mapping in September 2012 confirmed that the previously known dike extended southward from the church property across Walters Road to the Strickland tract. Mainly on the basis of sporadic diabase float (loose pebbles, cobbles, or boulders at the surface), it was traced southward to an old east-west dirt path that crosses Lots 6 and 14 of the proposed subdivision. The approximate location of the inferred trace of the dike ("confirmed dike") is shown on Figure 3a and b.

This period of mapping also explored the remainder of the area to determine whether there might be additional dikes present. Figure 4 shows the locations of sandstone (green dots) and diabase (red) that were identified throughout the area. GPS data for these locations are shown in Appendix A. Diabase float was found in several locations, including one in Lot 8 and two well south of the proposed subdivision near the major creek (an unnamed tributary of Beaverdam Creek) bordering the Strickland property. Diabase was also found in the extreme west, west of the subdivision boundaries but within the Strickland tract. cursory magnetic prospecting was conducted as well, but did not detect any obvious strong linear anomalies except for the confirmed dike in the east. In the area just southwest of the farm pond, near where Lots 7, 8 and 10 meet, there is an old dug well and a profusion of diabase boulders. The possible existence of a western dike near this location was proposed as a result of this early work, but later work could not confirm it. The loose pieces of diabase were possibly brought to this site to line the

old well, and/or to serve as a building foundation. Magnetic prospecting has not been done near the diabase occurrences in the extreme west.

In October 2012 a detailed, 600-foot-long magnetic transect was made perpendicular to the dike in the northern part of Lots 14 and 11. Magnetic measurements were made every two feet and the results plotted as shown in Figure 5a. The strong peak (350 nT anomaly) and nearly symmetrical shape of the profile indicates a sizable, steeply dipping dike. The slight "shoulder" on the left side of the peak implies that the dike dips toward the west, but very steeply. In fact, computer modeling gives a best fit for a dip of 85° and a dike width of about 20 feet. A second shorter traverse was also conducted across the peak (Figure 5b) to refine its shape. Magnetic intensity data measured are shown in Appendix B. The interpretation of the subsurface expression of the dike and the surrounding rocks is shown in Figure 6.

In early 2013, a well was drilled just south of Walters Road on the confirmed dike. Its reported yield was exceptionally high compared with other wells in the area. Then, in April 2013, the magnetometer was used to locate and map the confirmed dike with more precision. It was traced in detail all the way south to the big creek. Figure 7 shows the location of the magnetic highs that were measured, and they are flagged in the field. (Appendix C shows the GPS coordinates of these points.)

Aquifer Pump Test

In late June 2013, arrangements were made to conduct an aquifer pump test along the confirmed dike. A pump was installed in the new well just south of Walters Road. Its water level was measured, as was the level in the church well, located to the north along the dike, and the level was also measured in an unused well that formerly served the trailer, located to the west in the northeastern part of Lot 7. A generator was connected and the pump turned on at about 9:00 a.m. on June 26. Water was pumped from the well at a rate of 24 gpm, continuously for 24 hours (total discharge of over 34,000 gallons). Water levels were measured in all three wells following a specific protocol (e.g. Ministry of the Environment, British Columbia; also Singhal and Gupta, 2010), with frequent measurements at the beginning of pumping, and less frequent as pumping continued. In this way, a plot of drawdown of the water table could be constructed, and the degree of water communication between wells along the dike and across the dike might be ascertained. (Measurements were not made as frequently in the trailer well, due to the fact that only two measuring devices were available.) After 24 hours of pumping, the pump was shut down and the measurements continued, still following the protocol, in order to gauge the recovery of water levels in all three wells.

Drawdown phase. Before pumping began, water level measurements showed that the water table sloped downward from the pumping well south of Walters Road, toward the church well to the north. Figure 8 shows the relative positions of the three wells, and the inferred water table and gradient prior to pumping. As soon as pumping began, drawdown was immediate at the pumping well, and the water table gradient reversed, so that water from the area of the church well (and the trailer well) flowed toward the pumping well. As the pumping continued, the rate of drawdown lessened. The same effects were observed at the remote wells (church well and trailer well), but on a delayed

basis. Total drawdown after 24 hours was about 56 feet in the pumping well, 34 feet in the church well, and 42 feet in the trailer well. A drawdown curve for the pumping well is shown in Figure 9. The other two wells (church well and trailer well) gave curves with a similar shape. Appendix D shows data from the drawdown (pumping) phase of the test. Recovery phase. After 24 hours, the pump was shut down, and the water table began to rise toward its starting level. After one day of recovery, the pumping well had recovered to within 14 feet of its starting level, the church well to within 5.5 feet, and the trailer well to within 6 feet. Some further recovery was noted over the next two days. A recovery curve for the trailer well is shown in Figure 10; the other two wells showed a similar pattern of recovery. Appendix E shows data from the recovery phase of the test.

Figure 11 shows schematically the sequence of drawdown in the area of the three wells. As anticipated, the pump test shows clearly that there is a strong degree of communication along the dike, as shown by the quick and continued response of the church dike's water level during both phases of the test. Unanticipated was that there appears to be a similar communication to the west, beyond the dike to the trailer well. The reason for this is not known, but two possibilities have occurred to us. First, the diabase may extend to this location, not as a vertical dike but as a nearly horizontal sill or appendage off the dike. Another possibility is that the dike may dip at a steep angle toward the west, and may be acting as a dam for groundwater on that side, but not on the east. If the dike dips steeply west, as inferred from the magnetic modeling, this hypothesis is strengthened.

RECOMMENDATIONS

Assuming residential water use is not extreme, sufficient ground-water resources appear to be available on site to provide for the needs of the proposed subdivision. Subsurface water appeared to move easily between the three wells during the pump test, and recharge of the groundwater supply was efficient. However, care must be taken in locating water wells. Wells should probably be located no closer than 300 feet from one another, and groundwater withdrawals should not exceed reasonable residential needs.

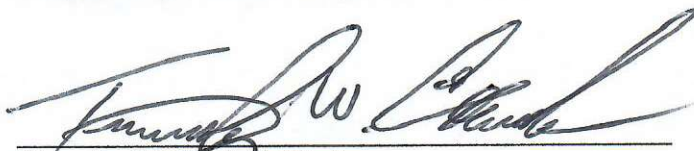
We recommend that a well be drilled along the dike near the southern edge of the subdivision property, possibly south of the southern boundary of Lot 6. We also recommend that the old trailer well be re-occupied. If both of these wells give good yields (say 20 gpm or more), then this may be sufficient to serve all lots. If another well is needed, it could be drilled along the dike halfway between the existing well and the proposed southern well. Figure 12 shows the locations of the proposed wells. If these wells cannot supply the needs of the westernmost parts of the property (Lot 10 for example), then perhaps additional magnetic prospecting could be conducted in the west in search of another possible dike related to the diabase occurrences shown near the western edge of the area, as shown in Figure 4.

REFERENCES

REFERENCES

- Blake, D. E., Phillips, C. M., Grosser, B. D., Robitaille, K. R., and Witanachchi, C., in revision, Geologic map of the Grissom 7.5-minute quadrangle, Granville, Franklin, and Wake Counties, North Carolina: North Carolina Geological Survey Open File Report 2003-XX, scale 1:24,000, in color.
- British Columbia Ministry of Environment, undated, Guide to Conducting Well Pumping Tests, Water Stewardship Information Series (on-line brochure), http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/guide_to_conducting_pumping_tests.pdf, accessed June 25, 2013.
- North Carolina Geological Survey, 1985, Geological map of North Carolina, scale 1:500,000, in color.
- Singhal, B.B.S., and Gupta, R.P., 2010, Applied Hydrogeology of Fractured Rocks (2nd Ed.): Springer, 408 p.

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APPENDICES

APPENDIX A: GPS coordinates of outcrops and other features from Figure 4.

station	comment	lat deg	long deg
CSS5	coarse sandstone	36.11423	-78.61815
2	other	36.11478	-78.60972
14A	lot corner	36.11607	-78.61342
14B	lot corner	36.11625	-78.61357
14C	lot corner	36.11630	-78.61337
14D	lot corner	36.11605	-78.61427
1DAM	sandstone ledge @ dam	36.11432	-78.60772
7%8	lot corner	36.11583	-78.61452
7RW	lot corner	36.11647	-78.61442
DB1	diabase	36.11187	-78.61433
DB2	diabase	36.11087	-78.61412
DB3	diabase	36.11503	-78.61962
DB4	diabase	36.11508	-78.61967
EEND	east end traverse	36.11600	-78.60377
MAG1	mag high	36.11547	-78.61562
MAG2	mag high	36.11590	-78.61545
MAG3	mag high	36.11668	-78.61345
MAG4	mag high	36.11627	-78.61335
MAG5	mag high	36.11582	-78.61335
MAG5W	west end	36.11577	-78.61350
MAG6	mag high	36.11508	-78.61320
MAG7E	east end mag high	36.11527	-78.61315
MAG7W	west end mag high	36.11525	-78.61330
MAG8	mag high	36.11642	-78.61503
PSS3	pebbly sandstone	36.11283	-78.60885
PSS4	pebbly sandstone	36.11160	-78.61020
QY1	sandstone quarry	36.11255	-78.61470
QY2	sandstone quarry	36.11268	-78.61465
TQI1	other	36.11143	-78.61112

APPENDIX B: Magnetic intensity values along traverses 1 and 2 (Figures 5a,b).

TRAVERSE #1	Anomaly		Anomaly		Anomaly		Anomaly
Station (ft)	Reading (nT)	Station (ft)	Reading (nT)	Station (ft)	Reading (nT)	Station (ft)	Reading (nT)
0	440.1	168	455.3	336	783.2	504	448.1
2	429.9	170	466.1	338	785.5	506	442.2
4	429.7	172	486.2	340	783.2	508	443.8
6	430.1	174	469	342	777.9	510	451.9
8	440.8	176	466.2	344	774.7	512	452.4
10	429.4	178	464.8	346	760.2	514	453.5
12	440.6	180	473.1	348	748.3	516	453.6
14	433.4	182	472.4	350	726.2	518	449.0
16	428.8	184	476.6	352	700.6	520	450.5
18	428.1	186	463.7	354	682.7	522	451.6
20	432	188	466	356	673.1	524	450.3
22	424.7	190	455.3	358	654.0	526	451.7
24	432.3	192	465.4	360	634.7	528	455.1
26	426.4	194	474.3	362	619.4	530	451.5
28	426.5	196	470	364	600.3	532	450.5
30	437.7	198	477.2	366	590.6	534	442.2
32	448.1	200	476.9	368	575.6	536	449.0
34	438.7	202	459.6	370	562.9	538	453.7
36	444.1	204	473.4	372	541.0	540	453.4
38	440.9	206	477.8	374	543.7	542	450.3
40	439.7	208	476	376	538.3	544	449.6
42	440.2	210	477.2	378	528.2	546	450.7
44	423.4	212	471	380	522.0	548	453.8
46	438.8	214	471.6	382	519.2	550	453.6
48	439	216	464.4	384	513.8	552	456.9
50	435.4	218	463.3	386	509.1	554	444.2
52	429.2	220	468	388	505.4	556	444.8
54	441.8	222	465.7	390	501.8	558	451.4
56	436	224	466	392	498.9	560	445.6
58	436.7	226	466.5	394	494.2	562	452.8
60	427	228	474.5	396	490.8	564	455.9
62	423.3	230	482.5	398	490.2	566	451.5
64	434.9	232	490.9	400	486.3	568	454.9
66	444.2	234	492.9	402	489.3	570	451.3
68	438.9	236	489.3	404	481.2	572	456.8
70	447.8	238	492.7	406	473.7	574	453.3
72	435.1	240	498	408	473.2	576	453.2
74	443	242	499.9	410	473.3	578	445.2
76	449.4	244	501	412	471.2	580	456.4
78	443.3	246	504.5	414	471.1	582	449.3
80	448.1	248	512.1	416	471.8	584	451.2
82	454.6	250	515.6	418	468.1	586	456.1
84	453.5	252	523.9	420	471.0	588	455.2
86	449.4	254	518.6	422	470.3	590	451.4
88	440.6	256	523.4	424	462.5	592	454.4
90	448.5	258	526.9	426	461.3	594	451.6
92	435.1	260	532.6	428	472.9	596	450.3
94	432	262	536.7	430	476.6	598	439.7
96	439.8	264	533.1	432	473.1	600	450.0
98	437.1	266	541.3	434	470.0		
100	437.4	268	551.3	436	464.5		
102	437.3	270	557.1	438	463.6		
104	443.3	272	566.7	440	463.3		
106	461.1	274	572	442	465.8		
108	463.2	276	580.6	444	456.9		
110	462.4	278	581	446	459.1		
112	463.1	280	593.8	448	463.9		
114	460.3	282	610.8	450	464.1		
116	463.6	284	627.4	452	463.0		
118	466	286	639.7	454	465.2		
120	466.7	288	652	456	460.6		
122	460.6	290	664.7	458	460.3		
124	461.5	292	678.2	460	461.7		
126	450.8	294	693.6	462	462.5		
128	454.5	296	687.4	464	455.0		
130	444.2	298	708.7	466	455.7		
132	470.5	300	728.1	468	461.8		
134	436.8	302	726.7	470	460.0		
136	469.2	304	732.0	472	453.1		
138	458.4	306	751.5	474	457.3		
140	464	308	775.5	476	453.1		
142	455.2	310	768.6	478	457.7		
144	468.1	312	781.3	480	459.9		
146	466.5	314	788.6	482	457.5		
148	460.9	316	798.4	484	446.9		
150	467.7	318	798.3	486	453.0		
152	461.5	320	799.0	488	454.8		
154	472.2	322	800.1	490	458.3		
156	465.6	324	797.6	492	458.0		
158	465.4	326	798.1	494	456.3		
160	462.6	328	794.0	496	454.1		
162	458.9	330	791.9	498	447.3		
164	469.3	332	790.0	500	449.5		
166	460.6	334	788.2	502	442.0		

TRAVERSE #2	Anomaly
Station (ft)	Reading (nT)
0	536.4
2	540.0
4	550.0
6	553.4
8	564.3
10	573.2
12	576.0
14	577.7
16	588.5
18	602.0
20	617.9
22	629.0
24	649.1
26	660.8
28	683.1
30	691.7
32	705.5
34	718.3
36	728.7
38	742.8
40	748.3
42	747.5
44	755.8
46	750.4
48	765.9
50	775.3
52	777.0
54	776.8
56	776.3
58	777.9
60	780.4
62	782.1
64	780.6
66	775.7
68	777.5
70	772.9
72	766.0
74	756.2
76	739.9
78	732.0
80	715.5
82	702.6
84	688.6
86	678.8
88	665.4
90	649.9
92	639.1
94	626.5
96	615.8
98	604.1
100	586.7

APPENDIX C: GPS coordinates of magnetic highs recorded to trace dike (Figure 7).

StationID	y_lat	x_long
Church	36.11750	-78.61365
Well 1	36.11664	-78.61340
7	36.11628	-78.61337
8	36.11585	-78.61315
9	36.11530	-78.61317
20	36.11123	-78.61314
19	36.11164	-78.61310
18	36.11195	-78.61297
17	36.11257	-78.61293
16	36.11327	-78.61297
15	36.11356	-78.61300
Dbf	36.11344	-78.61300
14	36.11399	-78.61296
13	36.11434	-78.61322
12	36.11466	-78.61325
11	36.11484	-78.61328
10	36.11518	-78.61323

APPENDIX D: Water levels recorded during drawdown phase of pump test (Figs. 9, 11).

PUMPING WELL			CHURCH WELL			TRAILER WELL		
Time since pumping began (minutes)	Measured water level (in feet) from top of casing	Drawdown	Time since pumping began (minutes)	Measured water level (in feet) from top of casing	Drawdown	Time since pumping began (minutes)	Measured water level (in feet) from top of casing	Drawdown
0	12.65	0	0	14.12	0	0	7.01	0
1	24.22	11.57	1	16.23	2.11	53	18.6	11.59
2	25.1	12.45	2	16	1.88	75	19.98	12.97
3	26	13.35	3	15.74	1.62	85	20.99	13.98
4	26.75	14.1	4	15.68	1.56	95	21.91	14.9
5	27.33	14.68	5	15.7	1.58	105	22.75	15.74
6	27.88	15.23	6	15.78	1.66	130	24.65	17.64
7	28.43	15.78	7	15.87	1.75	164	26.82	19.81
8	28.76	16.11	8	15.98	1.86	205	28.9	21.89
9	29.22	16.57	9	16.12	2	260	31.15	24.14
10	29.59	16.94	10	16.25	2.13	468	36.51	29.5
12	30.37	17.72	12	16.54	2.42	610	40	32.99
14	31.6	18.95	14	16.84	2.72	725	42.18	35.17
16	31.62	18.97	16	17.14	3.02	875	44.1	37.09
18	32.23	19.58	18	17.43	3.31	982	44.72	37.71
20	32.72	20.07	20	17.72	3.6	1173	46.88	39.87
25	33.93	21.28	25	18.42	4.3	1342	48.35	41.34
30	34.81	22.16	30	19.06	4.94	1425	48.77	41.76
35	35.8	23.15	35	19.71	5.59			
40	36.74	24.09	40	20.3	6.18			
45	37.35	24.7	45	20.84	6.72			
50	38	25.35	50	21.3	7.18			
60	38.97	26.32	60	22.13	8.01			
70	40.13	27.48	70	22.92	8.8			
80	41.15	28.5	80	23.65	9.53			
90	42.05	29.4	90	24.32	10.2			
100	42.87	30.22	100	24.96	10.84			
120	44.35	31.7	120	26.07	11.95			
140	45.64	32.99	140	27.07	12.95			
160	46.88	34.23	160	29.02	14.9			
180	47.88	35.23	180	29.01	14.89			
200	48.75	36.1	200	29.66	15.54			
250	50.73	38.08	250	31.21	17.09			
300	52.88	40.23	300	32.62	18.5			
350	54.6	41.95	350	34.02	19.9			
400	56.25	43.6	400	34.99	20.87			
450	57.41	44.76	450	36.11	21.99			
500	57.26	44.61	460	35.84	21.72			
600	60.05	47.4	500	36.66	22.54			
700	62.43	49.78	600	38.68	24.56			
800	63.93	51.28	700	40.32	26.2			
900	65.27	52.62	800	41.14	27.02			
1000	65	52.35	900	42.64	28.52			
1200	66.82	54.17	995	42.55	28.43			
1355	68.6	55.95	1200	43.98	29.86			
1440	68.85	56.2	1392	45.35	31.23			
			1400	45.48	31.36			
			1440	48.1	33.98			

APPENDIX E: Water levels recorded during recovery phase of pump test (Fig. 10).

PUMPING WELL			CHURCH WELL			TRAILER WELL		
Time since pumping stopped (minutes)	Measured water level (in feet) from top of casing)	Residual Drawdown	Time since pumping stopped (minutes)	Measured water level (in feet) from top of casing)	Residual Drawdown	Time since pumping stopped (minutes)	Measured water level (in feet) from top of casing)	Residual Drawdown
0	68.85	56.2	0	48.1	33.98	0	48.77	41.76
1	64.25	51.6	1	47.05	32.93	50	37.92	30.91
2	63.95	51.3	2	46.79	32.67	122	32.62	25.61
3	63.3	50.65	3	46.5	32.38	142	31.4	24.39
4	62.55	49.9	4	46.2	32.08	162	29.77	22.76
5	62.05	49.4	5	45.96	31.84	182	28.64	21.63
6	61.4	48.75	6	45.42	31.3	275	25.3	18.29
7	60.96	48.31	7	45.43	31.31	322	23.8	16.79
8	60.5	47.85	8	45.28	31.16	372	22.64	15.63
9	60.12	47.47	9	45.1	30.98	420	21.55	14.54
10	59.73	47.08	10	44.9	30.78	471	20.57	13.56
12	59	46.35	12	44.52	30.4	524	19.82	12.81
14	58.32	45.67	14	44.16	30.04	622	18.5	11.49
16	57.81	45.16	16	43.81	29.69	713	17.47	10.46
18	57.54	44.89	18	43.49	29.37	815	16.47	9.46
20	56.88	44.23	20	43.21	29.09	915	15.75	8.74
25	55.59	42.94	25	42.47	28.35	1016	15.13	8.12
30	54.5	41.85	30	41.85	27.73	1218	14.02	7.01
35	53.58	40.93	35	41.27	27.15	1413	13.19	6.18
40	52.75	40.1	40	40.4	26.28	1461	13	5.99
45	51.89	39.24	45	40.14	26.02	3341	9.69	2.68
50	51.2	38.55	50	39.63	25.51			
60	49.86	37.21	60	38.6	24.48			
70	48.7	36.05	70	37.81	23.69			
80	47.69	35.04	80	37.01	22.89			
90	46.75	34.1	90	36.32	22.2			
100	45.8	33.15	100	35.69	21.57			
120	44.4	31.75	120	34.5	20.38			
140	43.22	30.57	140	33.58	19.46			
160	42.13	29.48	160	35	20.88			
180	41.25	28.6	180	32.12	18			
200	40.26	27.61	200	31.3	17.18			
218	40.02	27.37	250	29.88	15.76			
250	38.66	26.01	300	28.63	14.51			
300	37.13	24.48	350	27.78	13.66			
350	36	23.35	400	26.77	12.65			
400	34.94	22.29	450	25.99	11.87			
450	34.01	21.36	500	25.7	11.58			
500	33.35	20.7	600	24.37	10.25			
600	32.01	19.36	700	23.47	9.35			
700	30.95	18.3	800	22.55	8.43			
800	30.03	17.38	900	22	7.88			
900	29.33	16.68	1000	21.61	7.49			
1000	28.75	16.1	1200	20.52	6.4			
1200	27.64	14.99	1400	19.84	5.72			
1400	26.79	14.14	1440	19.62	5.5			
1440	26.63	13.98	3338	16.88	2.76			
3338	23.31	10.66						

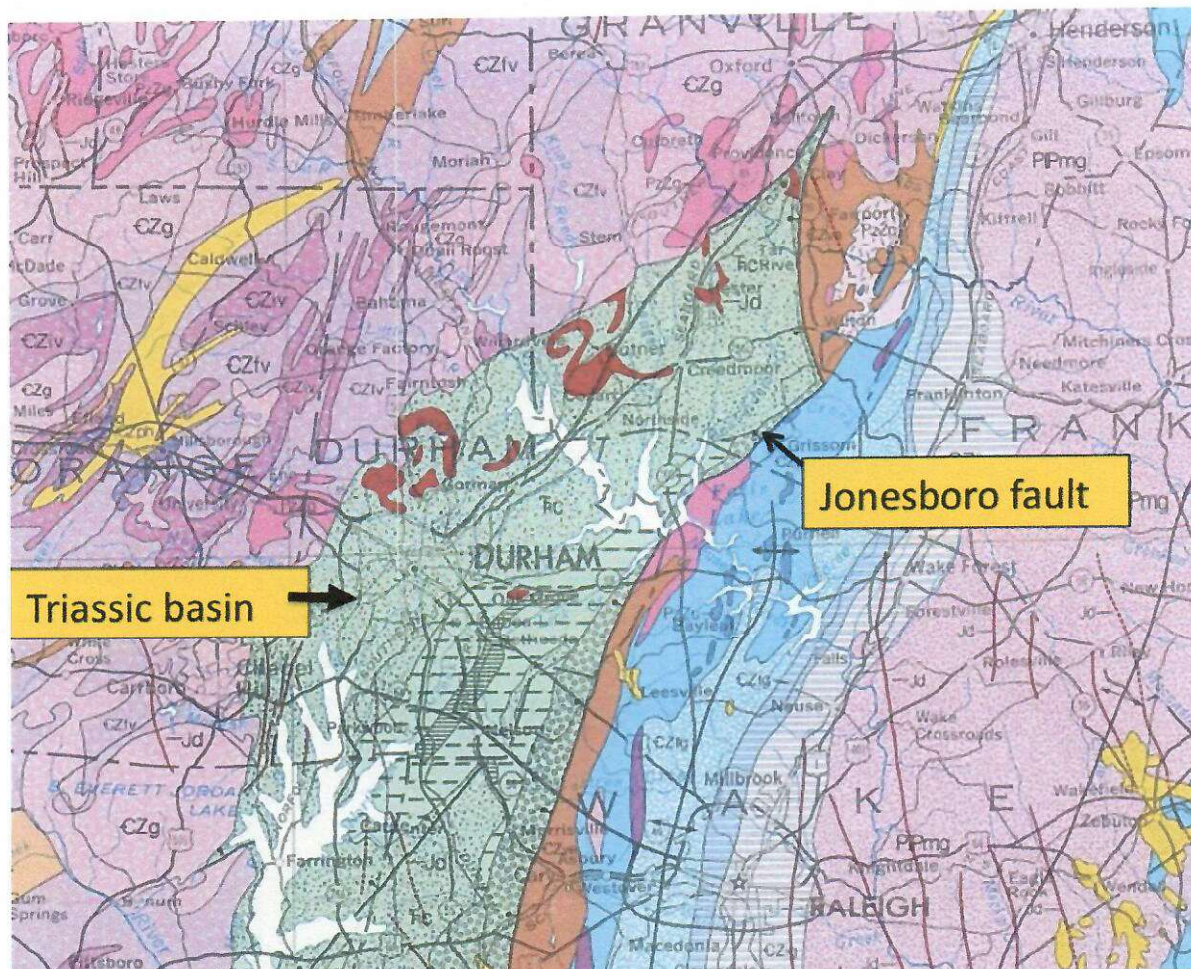


Figure 1. Excerpt from Geological Map of North Carolina (NCGS, 1985), showing location of the Durham Triassic sub-basin (green) and its bounding Jonesboro fault.

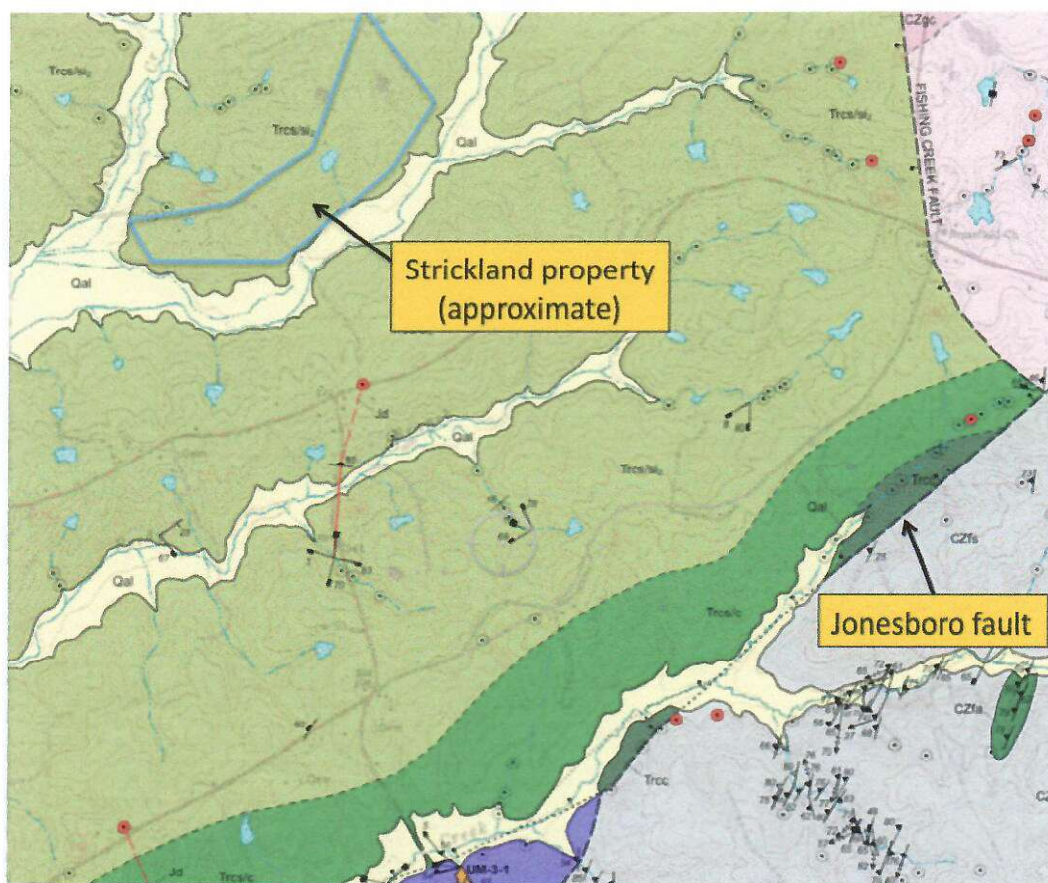


Figure 2. Detail from Geologic Map of the Grissom Quad (Blake and others, 2003)

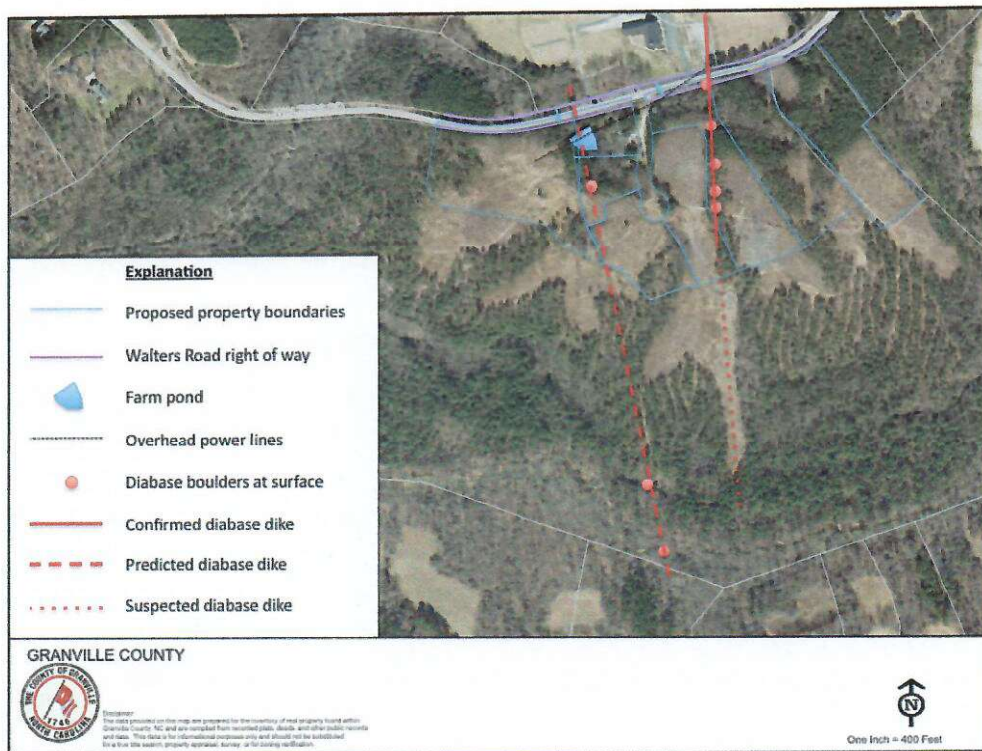


Figure 3. Partial view (a: overview; b: detail) of proposed subdivision lots showing approximate location of confirmed dike (solid red line) and possible dike (dashed line). Photographic base is from Granville County GIS Services.

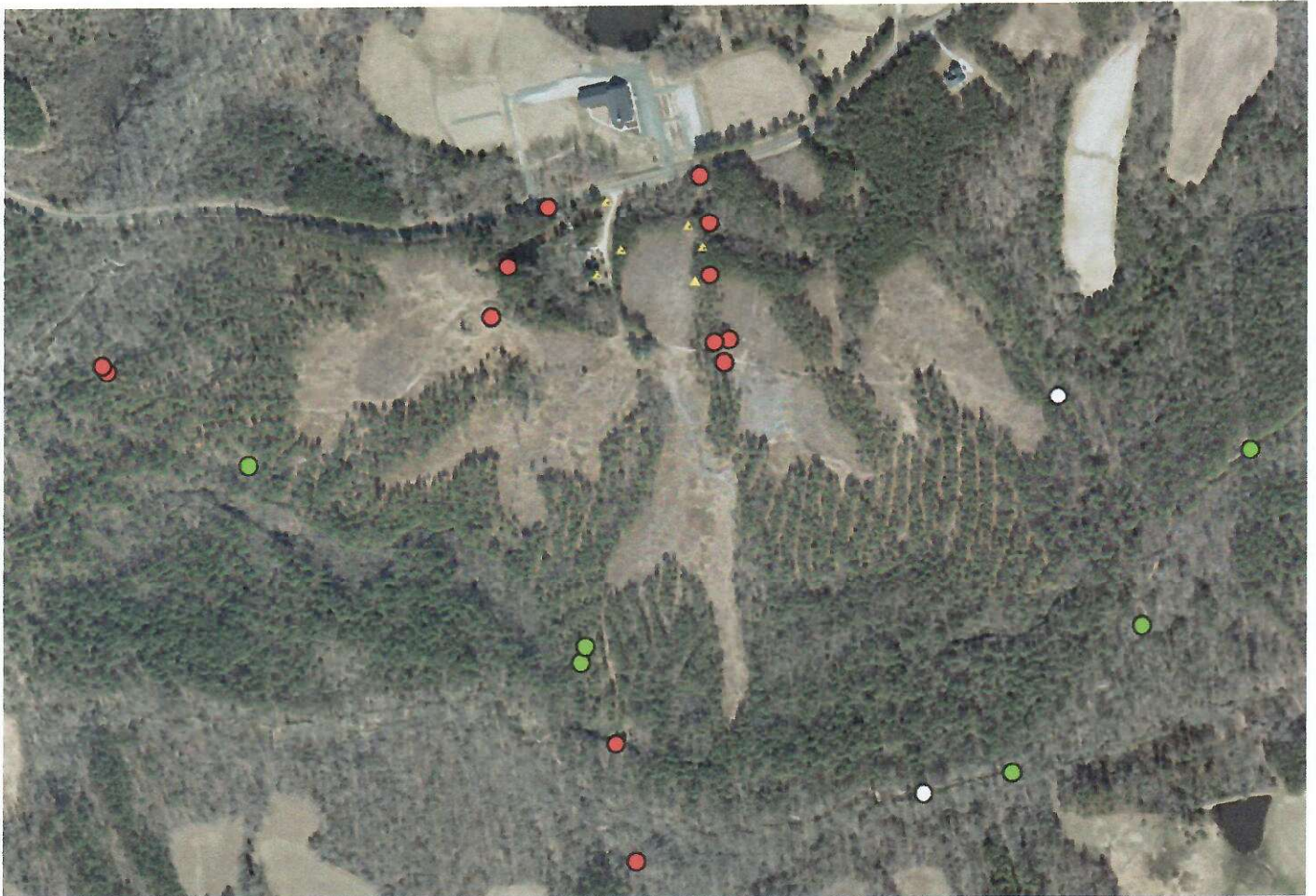


Figure 4. Overview of the area showing results of geological mapping. Red dots are known or suspected diabase occurrences, and green dots are outcrops of sedimentary rocks, primarily red pebbly sandstone.

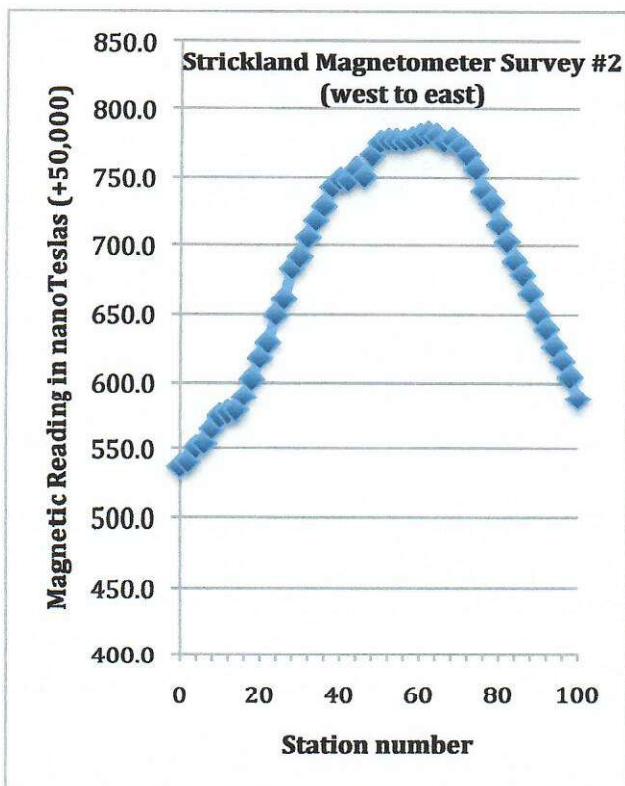
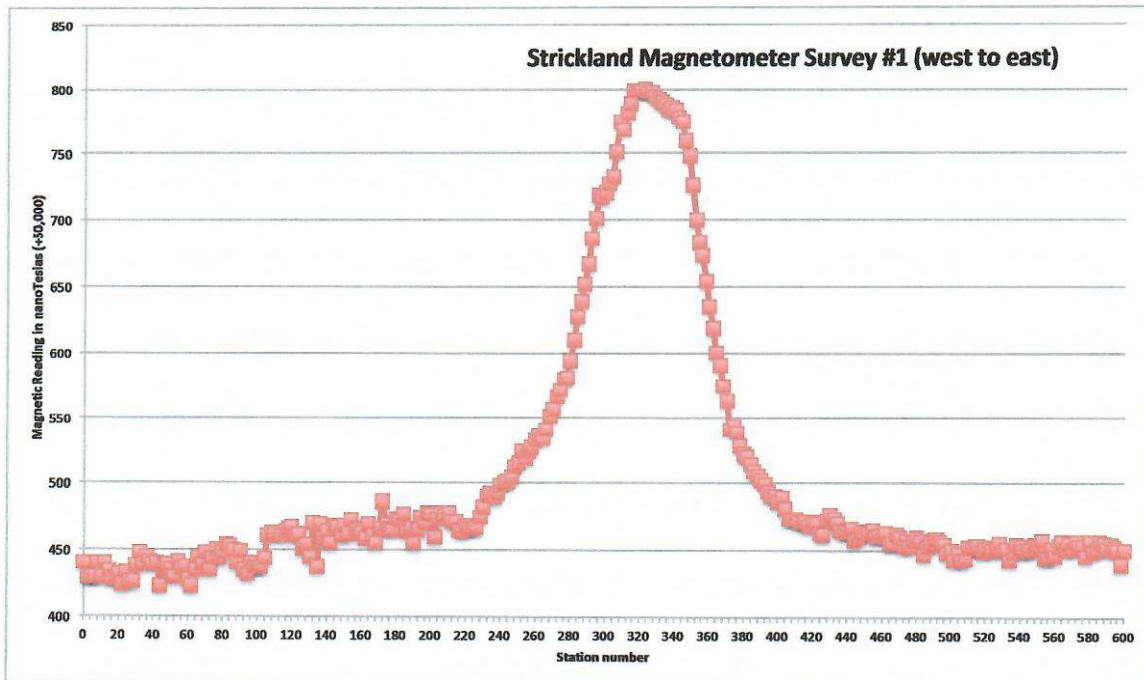


Figure 5a and b. Magnetic surveys across diabase dike.

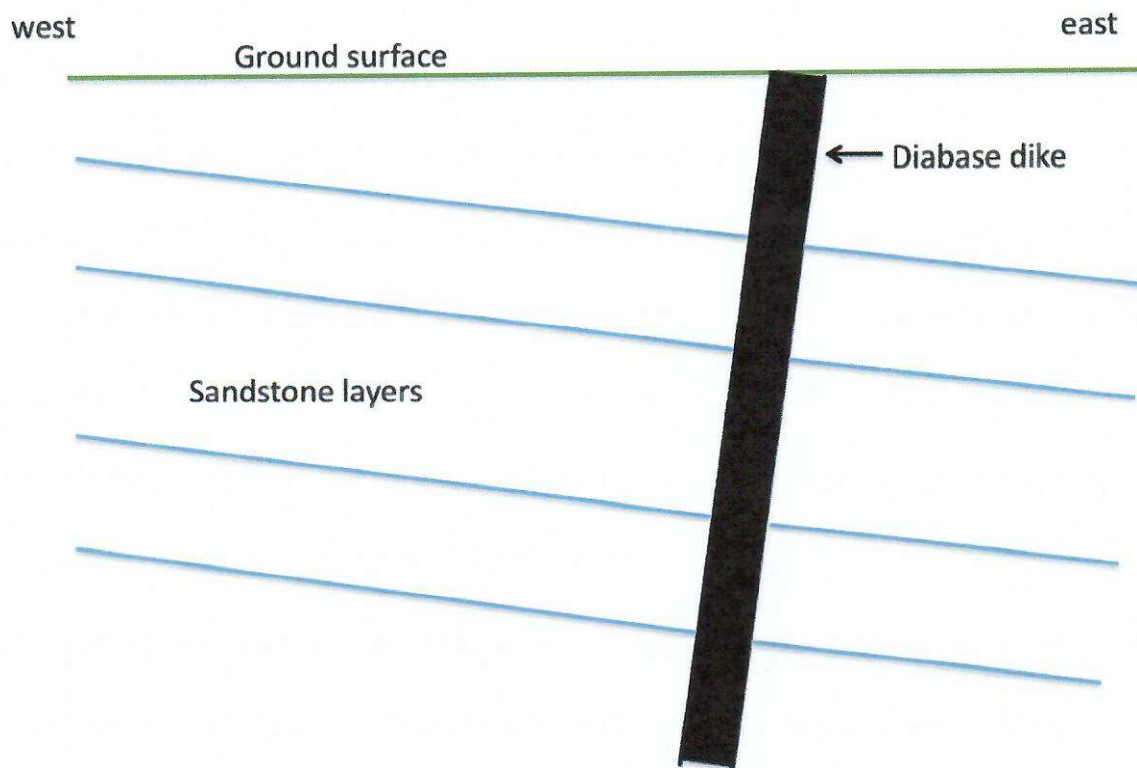


Figure 6. Schematic cross-section showing the inferred subsurface geological relationship between sedimentary layers of Triassic sandstone and the Jurassic diabase dike.



Figure 7. Locations of magnetic highs along the dike from Walters Road south to the big creek. Locations are at the base of each mark; locations of the two wells are also shown. They are flagged in the field. The Appendix contains GPS coordinates. The dike strikes approximately 355° and dips west at about 85° .

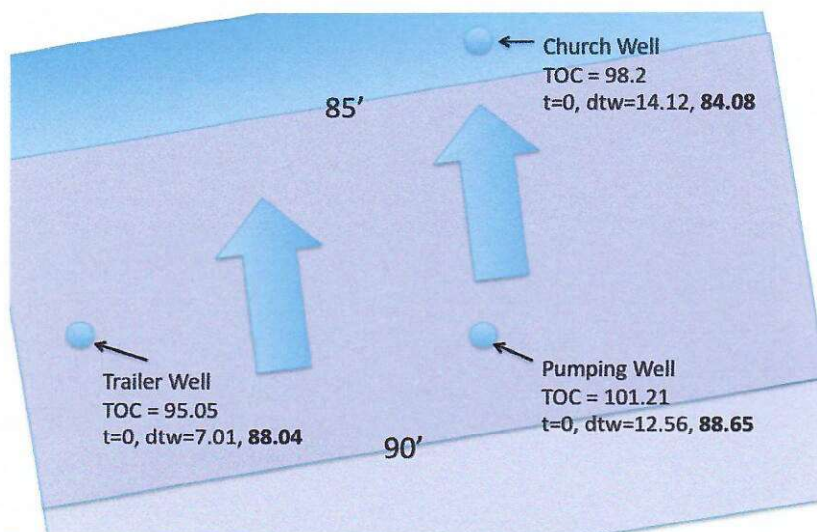


Figure 8. Relative locations of the three wells and inferred water table prior to pump test.

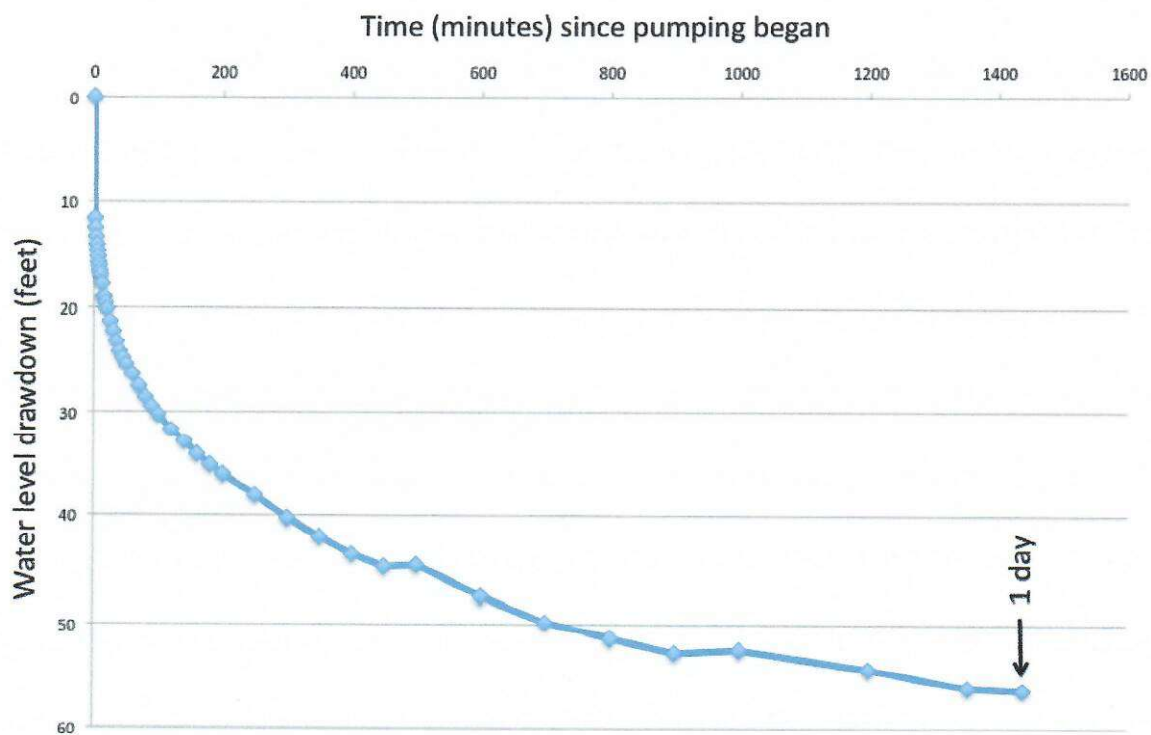


Figure 9. Water levels in pumping well during drawdown phase.

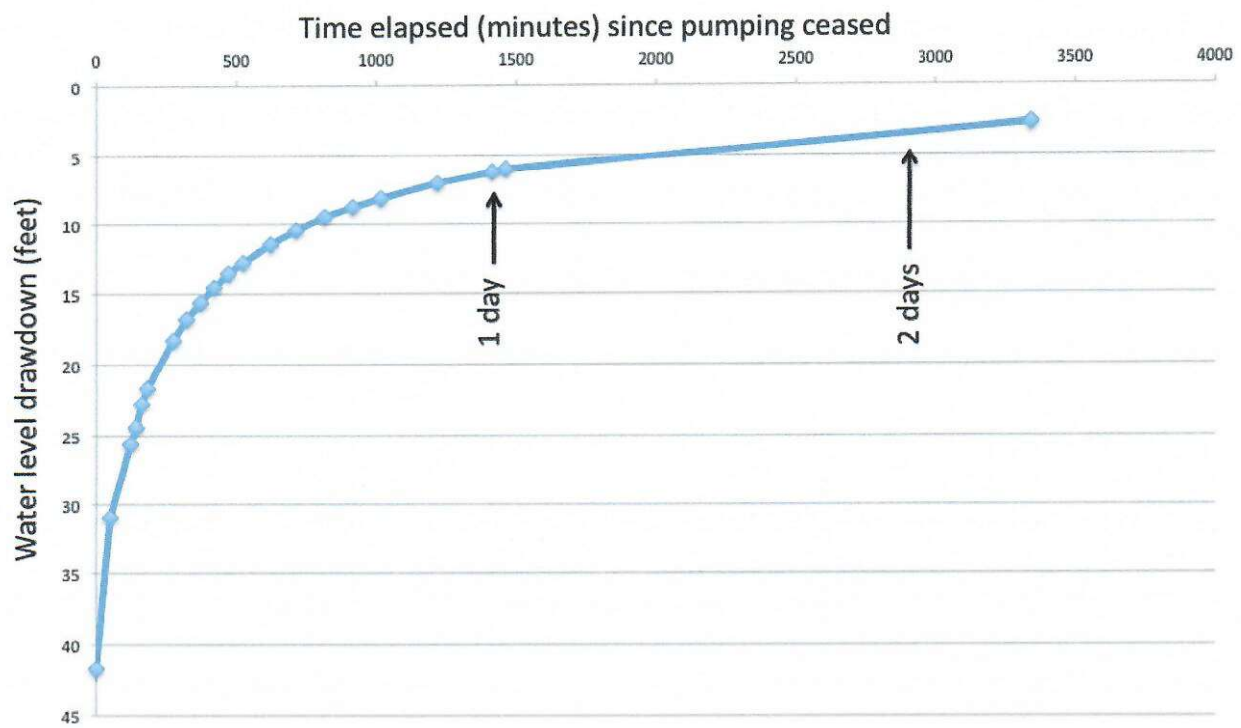


Figure 10. Water levels in trailer well during recovery phase.

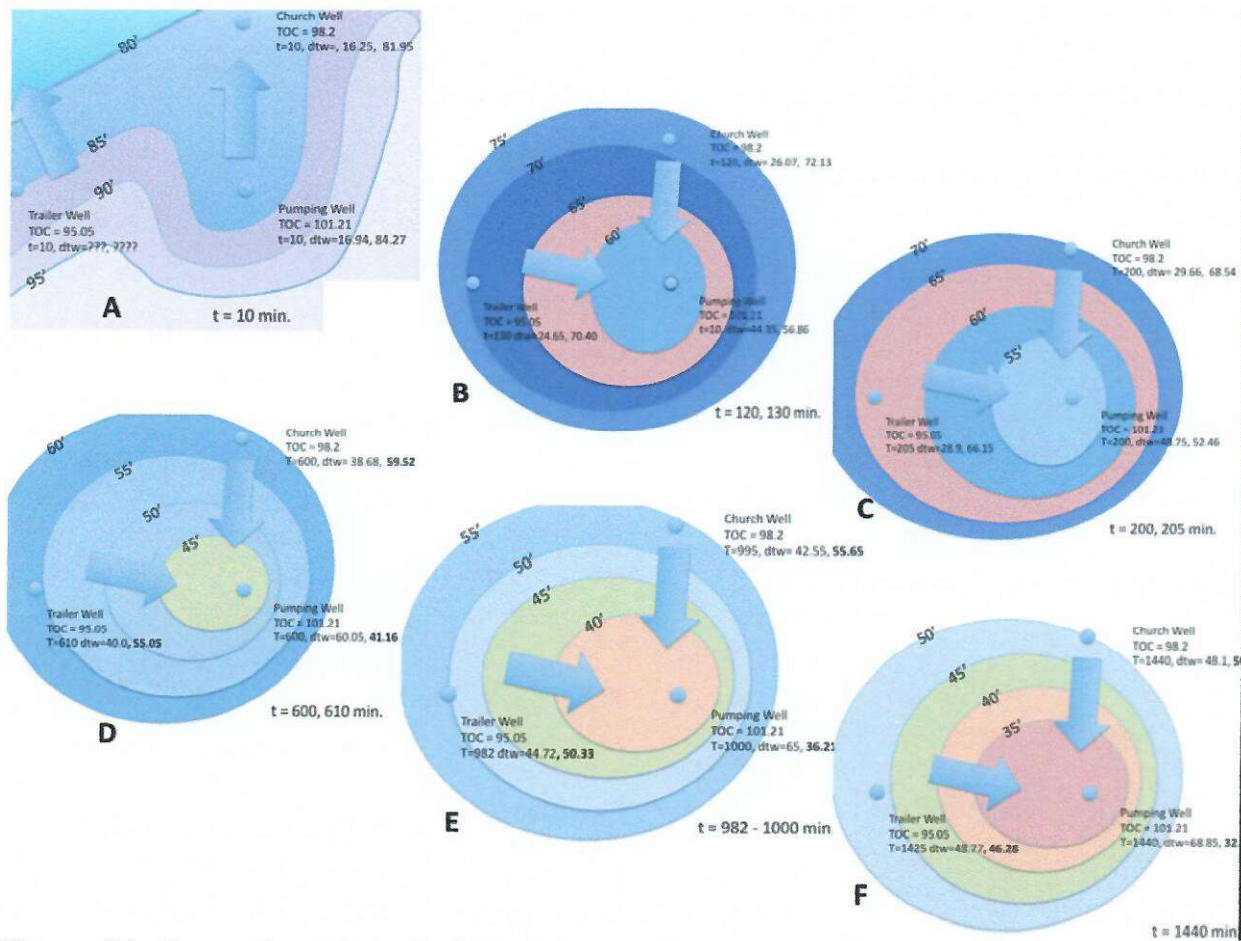


Figure 11. Synoptic series of schematic drawdown maps. Contours show elevation of water table relative to an arbitrary datum.



Figure 12. Schematic map of proposed well locations