GROUNDWATER DIVISION
WATER INVESTIGATIONS BRANCH
B. C. WATER RESOURCES SERVICE
DEPT. OF LANDS, FORESTS & WATER RESOURCES
VICTORIA,B.C.

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File: 0239016

NOTES ON A PUMPING TEST ON WHITE ROCK WELL NO. 3, SITUATED ON MacBETH ROAD, WHITE ROCK, AND OWNED BY PACIFIC WATER WELLS LTD.

At the request of Mr. E. Livingston, Chief, Groundwater Division, Mr. J. Gulliver and I were present to observe a pumping test carried out by Pacific Water Wells Ltd., on their White Rock Well No. 3, situated on McBeth Road, White Rock. This test was carried out on the 25th and 26th of October.

Well No.3 is located 38 feet* from Observation Well No. 1, and 450 feet from Well No. 2. (See Appendix 1 for further details). Some days prior to the commencement of the pumping test, I had requested Mr. Nelson of Pacific Water Wells Ltd. to arrange for wells Nos. 1 and 2 to be shut off for the duration of the test. Well No. 2, however, was required for the supply systems and could not be shut off; as a result, interference due to pumping from this well, has to be large extent, masked the readings obtained from the No. 3 well during the test.

The highest pumping rate carried out during the test was 932 Imperial gallons per minute. This last pumping level was only held for 227 minutes, but the results obtained in this time indicate a drop off in the efficiency of the well to 56.6% from 62.3% obtained at the previous pumping rate of 719 Imperial gallons per minute. By referring to Table 1, it can be seen that for a pumping rate of 1,667 Imperial gallons per minute (2,000 U.S. gallons per minute) there is a theoretical drawdown after 100 days of continuous pumping of 17.35 feet. At this rate of pumping, we can expect a further drop off in well efficiency to a value somewhat less than 50%, and this would mean that the actual drawdown at this higher rate could be more than twice the theoretical drawdown of 17.35 feet. If we add to this drawdown, the inteference caused by pumping simultaneously in Wells Nos. 1 and 2 (see Appendix 1 for a discussion on the performance of these two wells), then the total drawdown in Well No. 3 could, after 100 days of pumping continuously at 1,667 Imperial gallons per minute, approach the top of the well screen located at 373 feet or 45.8 feet below zero drawdown datum. It should be noted however, that theoretical values for drawdown, even when corrected for well losses, interference, etc., can differ considerably from values measured in the field, due to assumptions that have to be made in the theoretical model, and in the heterogeneous nature of the geological formations, etc. Consequently, if Well No. 3 is to be pumped for extended periods at rates of say 1,500 Imperial gallons per minute, it would be advisable to carry out another test at this pumping rate and to cut off both Wells Nos. 1 and 2 for the test period.

The pump test results make it apparent that some device should be installed now to observe any downward trends in the static water level on the aquifer. It is suggested that this equipment could be installed in any one of the existing three wells, which ever is the most convenient for this purpose.

One method is to install a simple "air pressure bubbler system" such as is used by our Groundwater Division. A simple line of 1/8-inch O.D. copper tubing would be easily installed, with the lower end located below the expected drawdown, the tube could be connected up to a pressure system and pressure gauge or manometer. These readings could then be converted to give the correct static readings in feet of water.

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* from measurements supplied by Pacific Water Wells Ltd.

Table 1 gives the theoretical drawdowns that might be expected in Well No. 3 for different pumping rates and for different durations of time. To these results of course must be added the additional drawdown caused by well inefficiency and well interference which, for the higher pumping rates may, as previously noted, more than double the theoretical drawdown value.

The drawdown due to "well interference" can be computed for a second identical well placed for example at 38 feet, 450 feet and 1,000 feet from Well No. 3. If Well No. 3 is pumped continuously for 24 hours at say 1,667 Imperial gallons per minute (2,000 U.S. gallons per minute) then the theoretical drawdowns that might be expected in a second identical well due to interference from the No. 3 well are tabulated in Table 2. Again, these values may differ considerably from the values measured in the field, due to the variables involved, and the assumptions made in the theoretical model.

Appendix 1 includes additional information on the well, the pump testing, figures 1-4, the coefficient of transmissibility (T), and other information. Appendix 2 is a tabulation of the pump testing data.

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attachments.

TABLE 1

Discharge (Q) of No. 3 well in Imperial gallons per minute	Time (t) in days since continuous pumping started	Theoretical drawdown in feet in Well No.3 no allowance is made for reduced well efficiency or well interference. For higher pumping rates 1,000 - 1500 Imp. gals.per min., these factors may more than double the theoretical drawdown values given below.
374	126/1440	2.66 (actual D.D.= 4.29)
719	1183/1440	5.85 (actual D.D.= 9.37)
932	1140/1440	7.57 (actual D.D.=13.36)
932	1	7.68
1000	1	8.24
1000	100	10.40
1500	1	12.36
1500	100	15.60
1667 (2,000 U.S.)	1	13.74
1667	100	17.35

TABLE 2

Discharge (Q) of No. 3 well in Imperial gallons per minute	Distance (r) from the test well in feet, of a second identical well	Theoretical drawdown in feet, in a second identical well, due to well interference from No. 3 well. (after a 24 hour period)
1667	38	9.29
1667	450	5.6
1667	1000	4.4

187
84
53

Appendix 1 - Details of the Pumping Test, etc., Made on White Rock Well No. 3

Notes on Well No. 3

The following notes on the construction of Well No. 3 were supplied to me by Mr. Nelson of Pacific Water Wells Ltd.

The bottom of the well screen is set at 408 feet and the top of the screen is at 373 feet. The 35 feet long screen is made of stainless steel, with a slot size of 150, and a nominal screen diameter of 12 inches. The well casing is 16 inches. A Byron Jackson shaft drive turbine pump with a 10-inch diameter pump column has been installed in the well. The pump was driven for the test with a 200 H.P. diesel caterpillar engine. The water flow was measured by the orifice method using a 10-inch diameter outflow pipe connected to a 6-inch orifice.

The log of No. 3 well is not available for this report however the logs of Nos. 1 and 2 wells are discussed by Mr. Livingston in his memo to Mr. V. Raudsepp, Chief Engineer, Water Investigations Branch, dated March 29th, 1965, File No. 0239016. The logs of both these wells appear similar, although the driller thought conditions were better at Well No. 1 than at Well No. 2. The logs show two till layers, one at the surface 80-90 feet thick, the second from 317-368 feet. Separating the till layers are sands, gravels and clays containing wood specimens. Below the second till, are water-bearing sands and gravels. The transmissibility is high at this location, but it may vary considerably due to facies changes, especially if the formation represents in part an ice contact deposit.

Notes on Pumping Test of Well No. 3

The pump test data were recorded by Mr. Gulliver and myself and are attached as Appendix 2. The pump was run at three different rates during the 24½ hour test period; a vertical plastic tube attached in the usual manner to the pipe and orifice assembly, recorded a head of water varying between 9½ and 10 inches, which from the orifice tables (p.153 Missouri Water Well Handbook) is equivalent to a discharge of 433-445 U.S. gallons per minute. This rate is equivalent to 361-371 Imperial gallons per minute. To this flow rate must also be added the flow out of the cooling tube for the pump; this was measured at 7 gallons per minute The total pumping rate at this level is therefore 368-378 Imperial gallons per minute, and an average value of 374 Imperial gallons per minute was selected for the calculations. In a similar manner, the second pumping step or rate was calculated at 719 Imperial gallons per minute and the third step at 932 Imperial gallons per minute (see Appendix 2).

The calculation of drawdown required a number of corrections (see Appendix 2) Firstly for the stretching that took place in the electric indicator line when it became stuck, and secondly for an adjustment in the line measurements at a join which had to be made in the field. The total corrections for the two sources of error came to 0.5 foot (see Appendix 2). On the morning of October 26th the electric indicator line failed due to a short circuit and it became necessary to replace it with a second line which was measured up by Mr. Nelson and myself in the field. These line measurements were checked subsequently with a chain in the office and found to be correct.

Before the drawdown could be effectively established, it was necessary to determine a zero static level to which all other readings could be related. It became obvious after the test had started that well interference from the No. 2 well was affecting the drawdown and that the zero static datum could not be established until after the recovery had been completed, and readings could be taken of the static when all pumps were shut off. A provisional datum of 327.95 feet was therefore adopted for reference during the actual test and subsequently, a minimum drawdown of 327.20 feet recorded at 6.45 p.m. on October 26th, while No. 2 well was shut off, was accepted as the zero drawdown datum for the pump test calculations. Readings were also taken at intervals during the following two days.

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Similarly for Observation Well No. 1, a minimum static level was recorded at the same time as in Well No. 3 at 325.84 feet and this value was taken for the zero drawdown datum. The concrete floor of the pumphouse, adjacent to the well head, was taken as the reference point for all measurements in Well No. 1. During the pump test, a check was made on the electric indicator line in Well No. 1 and a difference of 0.13 foot was noted between measurements made with reference to a tape mark on the line and those made with the footage counter. The necessary corrections for this error were made from 12:10 p.m. on October 26th (see Appendix 2).

Well Interference and the Coefficient of Transmissibility 'T'

Well interference from Well No. 2 has to a considerable extent masked the results obtained from the No. 3 well during the pumping test. A chart recorder connected to the water supply line from Well No. 2 shows the periods that Well No. 2 was pumping and this chart has been an aid in interpreting the results of well interference. From Figs. 1 and 2 (groundwater pumping test file) the relationship of time (t) in minutes and (s) drawdown in feet have been plotted on semi-logarithmic paper according to the modified non-equilibrium method of Jacob. The change in drawdown ΔS during each successive pumping step appears from the figures to be close to zero. However, the last pumping step was only held for 277 minutes and the trend is not so clear at this pumping rate. What is apparent however from figures 1 and 2, is the rise in static levels of 0.77 feet which occurred in both wells when the pump in No. 2 well shut down and well interference stopped. No values for the coefficient of transmissibility (T) were calculated from figures 1 and 2.

An analyses of the recovery data by the Theis recovery method in figures 3 and 4 gave several values for (T). In both figures 3 and 4, the recovery curve has three segments. The first two segments unfortunately are masked by the interference of Well No. 2. In figures 3 (Well No. 3), the early segment indicates $T = 2.12 \times 10^5$ Imperial gallons per day per foot width, and the second segment indicates $T = 5.78 \times 10^5$ Imperial gallons per day per foot width. Fortunately, Well No. 2 shut down just before the completion of the recoveries in Well Nos. 1 and 3 and the third segment of the recovery curve in Well No. 3 indicates $T = 2.84 \times 10^5$ Imperial gallons per day per foot width. Similarly, the third segment of the recovery curve in figure 4 (Well No. 1) indicates $T = 3.46 \times 10^5$ Imperial gallons per day per foot width. The break in the recovery curves in both figures at the point where the pump cuts off in Well No. 2 is very prominent. The final segment in the recovery curves in both figures 3 and 4 would indicate that the total measurable recovery (eliminating well interference) is probably not more than one foot.

Curves drawn from drawdown and recovery data made during the earlier pumping test on Wells Nos 1 and 2 (see Mr. Livingston's memo of March 29th, 1965, File No. 0239016) also show two segments and gave values for T ranging from 2.24×10^5 - 3.44×10^5 U.S. gallons per minute. All the results obtained for T are in the same order, and a conservative value for $T = 2.50 \times 10^5$ Imperial gallons per day per foot width, has been chosen for the calculations made in these notes. The storage coefficient (S) was not obtained from the No. 3 pump test data, but a value of 3×10^{-4} used from the previous pumping test on Wells Nos. 1 and 2 was adopted for these calculations.

The values obtained from the pumping test results must be treated as approximations only, due to the assumptions that must be made in the calculations and to the variable geological conditions which exist in the field.

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APPENDIX II

WHITE ROCK NO. 3 WELL

"STEP DRAWDOWN" PUMPING TEST DATA FROM WELL NO. 3

Date of test:

October 25th-27th
(Static datum is top of 16-inch casing).

Time	Time (t) since start of pumping in mins.	Water level Readings in well in feet	Corrected water level readings in well in feet (see Appen. I)	Drawdown in well in feet (Revised zero D.D. datum (see A. I)	Time	Height of water in tube on discharge pipe (in inches)	U.S.gals. per min. discharge	Imp.gals per min. discharge	Tot. Im gpm (in 7 gpm f cooling line)
Tues. Oct.25									
13:30		327.45	327.95		Tues. Oct.25				
14:14	0	Start pump							
14:16	2	331.20	331.70	4.50					
14:18	4	331.34	331.84	4.64					
14:21	7	331.42	331.92	4.72					
14:25	11	331.56	332.06	4.86					
14.27		331.56	332.06						
14:29		331.57	332.07						
14:31	17	331.62	332.12	4.92	14:33	9 3/4	439	366	373
14:35	21	331.65	332.15	4.95	14,36	9 7/8	442	368	275
14:39	25	331.74	332.24	5.04	14:42	10	445	371	378
14:45		331.74	332.24		14:48	10	445	371	378
14:50	36	331.77	332.27	5.07					
14:54		331.78	332.28						
15:01		331.77	332.27		15:03	9 7/8	442	368	375
15:06		331.76	332.26		15:07	10.	445	371	378
15:12		331.74	332.24		15:14	9 7/8	442	368	375
15:20	66	331.76	332.26	5.06	15:21	9 5/8	436	363	370
15:26		331.74	332.24		15:29	9 3/4	439	366	373
15:36		331.80	332.30		15:38	9 3/4	439	366	373
15:46	92	331.77	332.27	5.07	15:44	9 3/4	439	366	373
15:55	101	331.72	332.22	5.02	15;56	9 1/2	433	361	368
16:03		331.70	332.20		16:05	9 3/4	439	366	373
16:07		331.71	332.21		16:10	9 3/4	439	366	373
16:20	126	331.76	332.26	5.06	16:20	9 3/4	439	366	373
16:25	131	336.67	337.17	4.97	16:25	37	857	714	721
16:27	133	336.68	337.18	9.98	16:27	37	857	714	721
16:30	136	336.63	337.13	9.93					
16:34	140	336.71	337.21	10.01	16:34	37	857	714	721
16:37	143	336.77	337.27	10.07	16:39	36 3/4	854	711	718
16:40		336.77	337.27		16:42	36 3/4	854	711	718
16:44		336.78	337.28		16:44	36 3/4	854	711	718
16:52		336.78	337.28		16:53	36 1/2	852	710	717
17:06		336.80	337.30		17:07	36 7/8	856	713	720
17:17	183	336.78	337.28	10.08	17:19	36 7/8	856	713	720
17:35		336.75	337.25						
17:46		336.79	337.29		17,46	36 3/4	854	711	718
18:07		336.81	337.31		18:05	36 3/4	854	711	718
18:30	256	336.77	337.27	10.07	18:30	36 1/2	852	710	717
19:00	286	336.77	337.27	10.07	19:00	36 1/2	852	710	717
19:55	341	336.10	336.60	9.40	20:00	36 3/4	854	711	718
20:10	356	335.97	336.47	9.27	20:10	36 3/4	854	711	718
20:35	381	336.00	336.50	9.30	20,37	36 3/4	854	711	718
20:52	398	336.13	336.63	9.43	20,55	37 5/8	853	710	717

"STEP DRAWDOWN" PUMPING TEST DATA FROM WELL NO. 3

Time	Time (t) since Start of pumping in mins.	Water level Readings in well in feet	Corrected water level readings in well in feet (see Appen.I)	Drawdown in well in feet (Revised zero D.D. datum (see App.I)	Time	Height of water in tube on discharge pipe (in inches)	U.S.gals. per min. discharge	Imp.gals. per min. discharge	Totl.Imp. gpm (incl. 7 gpm fro cooling li	
Tues. Oct.25										
21:01		336.06	336.56		21:03	37 1/4	859	716	723	
21:12	418	336.045	336.54	9.34	21:12	37	857	714	721	
22:12		336.05	336.55		22:12	37	857	714	721	
22:43		336.03	336.53		22:43	37	857	714	721	
23:03		336.03	336.53		23:00	37 1/4	859	716	723	
23:30	556	336.00	336.50	9.30	23.30	37 1/4	859	716	723	
Oct.26										
00:12		336.03	336.53		00:12	37	857	714	721	
01:10	656	336.05	336.55	9.35	01:10	37	857	714	721	
02:30		336.09	336.59		02:30	37 1/4	859	716	723	
04:50	876	335.95	336.45	9.25	04:50	36 1/2	852	710	717	
06:48		335.95	336.45		06:55	36 3/4	854	711	718	
07:40	1046	335.97	336.47	9.27	07:40	36 1/2	852	710	717	
08:40	1106	336.54	337.04	9.84	08:40	36 3/8	851	709	716	
08:47	1113	336.55	337.05	9.85	08:50	37 1/8	858	715	722	
Changed electric line indicators										
10:20	1146	337.42	336.42	10.22						
10:28	1214	337.40	337.40	10.20	10:30	36 5/8	853	710	717	
10:57	1243	337.32	337.32	10.12	10:57	36 7/8	856	713	720	
11:03	1249	341.00	341.00	13.80	11:00	59 3/4	1066	888	895	
11:06	1252	341.17	341.17	13.97	11:04	65 1/2	1110	925	932	
11:08		341.17	341.17		11:07	65 1/2	1110	925	932	
11:12		341.23	341.23		11:09	65 1/2	1110	925	932	
11:16	1262	341.22	341.22	14.02	11:14	65 1/2	1110	925	932	
11:20	1266	341.32	341.32	14.12	11:25	65 1/2	1110	925	932	
11:30		341.33	341.33		11:30	65 1/2	1110	925	932	
11:41		341.37	341.37		11:41	65 1/2	1110	925	932	
11:50	1296	341.42	341.42	14.22	11:50	65 1/2	1110	925	932	
12:00		341.40	341.40		12:00	65 1/2	1110	925	932	
12:14		341.43	341.43		12:14	65 1/2	1110	925	932	
12:24		341.35	341.35		12:24	65 1/2	1110	925	932	
12:31	1337	341.44	341.44	14.24	12:31	65 1/2	1110	925	932	
12:36	1342	341.36	341.35	14.16	12:46	65 1/2	1110	925	932	
13:08		341.38	341.38		13:11	65 1/2	1110	925	932	
13:32		341.35	341.35		13:34	65 1/4	1108	923	930	
14:04	1430	341.38	341.38	14.18	14:06	65 1/2	1110	925	932	
14:25	1451	341.32	341.32	14.12						
14:43	1469	341.33	341.33	14.13	14:43	65.0	1106	921	928	
14:44	1470	pump stopped								

Second step 719 (avg.) Imp. gallons/minute

Third Step 932 (avg.) Imp. gallons/minute

WHITE ROCK NO. 3 WELL

RECOVERY READINGS FROM WELL NO. 3

Time	Time (t) since start of pumping (in mins.)	Time (t') since pumping stopped (in mins.)	Value of t/t'	Water level readings in well in feet	Drawdown in feet (For revised zero DD. datum see Appen. I)
Wed. Oct. 26					
14:44	1470	00	Pump stopped		
14:45	1471	1	1471	325.24	+ 1.96
14:46	1472	2	736	325.85	+ 1.35
14:46½	1472½	2½		326.50	0.70
14:47	1473	3	491	327.96	0.76
14:47½	1473½	3½		328.63	1.43
14:48	1474	4	368.5	329.015	1.81
14:49	1475	5	295	328.98	1.78
14:50	1476	6	246	328.95	1.75
14:51	1477	7	211	328.89	1.69
14:53	1479	9	164.3	328.80	1.60
14:54	1480	10	148	328.70	1.50
14:57				328.67	
14:57½	1483½	13½	109.8	328.60	1.40
14:59				328.57	
15:00	1486	16	92.7	328.50	1.30
15:02				328.48	
15:04	1490	20	74.5	328.40	1.20
15:04				328.43	
15:06	1492	22	67.8	328.38	1.18
15:11½				328.35	
15:17	1503	33	45.6	328.29	1.09
15:18				328.24	
15:22				328.22	
15:23½				328.25	
15:25	1511	41	36.9	328.19	0.99
15.29				328.17	
15:30				328.18	
15:43				328.14	
15:50				328.13	
15:57	1543	73	21.15	328.10	0.90
16:02				328.08	
16:11				328.08	
16:20	1566	96	16.3	328.08	0.88
16:52	1598	128	12.5	327.64	0.44
16:55	1601	131	12.24	327.58	0.38
16:57	1603	133	12.06	327.50	0.30
16:58	1604	134	11.98	327.49	0.29
17:01	1607	137	11.74	327.44	0.24
17:12	1618	148	10.92	327.35	0.15
17:23	1629	159	10.24	327.28	0.08
17:33	1639	169	9.68	327.27	0.07
17:45	1651	181	9.13	327.25	0.05
18:02	1668	198	8.42	327.22	0.02
18:45	1711	241	7.10	327.20	0.00
20:54	1840	370	4.97	327.20	0.00
22:52	1958	488	4.01	328.03	0.83
23:54	2020	550	3.67	328.06	0.86
Thurs. Oct.27					
06:27	2413	943	2.56	327.30	0.10
09:27	2593	1123	2.305	327.72	0.52
09:28	2594	1124	2.305	327.78	0.58
09:32	2598	1128	2.304	327.83	0.63
09:33	2599	1129	2.302	327.85	0.65
09:35	2601	1131	2.300	327.88	0.68
09:44	2610	1140	2.290	327.97	0.77
13:32	2838	1368	2.075	328.04	0.84
14:33	2899	1429	2.03	328.02	0.82
19:46	3212	1742	1.84	328.00	0.80

WHITE ROCK NO. 3 WELL

RECOVERY READINGS FROM WELL NO. 3

Time	Time (t) since start of pumping (in mins.)	Time (t′) since pumping stopped (in mins.)	Value of t/t′	Water level readings in well in feet	Drawdown in feet (For revised zero D.D. datum see Appendix I)
Fri. Oct. 28					
09:21	4027	2557	1.575	327.96	0.76
09:38	4044	2574	1.570	328.00	0.80
10:26	4092	2622	1.555	328.02	0.82

READINGS TAKEN ON OBSERVATION WELL NO. 1 DURING " STEP DRAWDOWN" TEST

Date of Test: October 25th-27th

Time	Time t since start of pumping	Water level readings in well in feet (a)	Drawdown in feet a- 325.84
Tues. Oct. 25			
			0.71
13:30?		326.55	Initial static - not corrected for well interference
14:14	Start pump		(Revised static at minimum recorded well interference = 325.84)
14:15	1	327.80	1.96
14:17	3	327.89	2.05
14:20	6	327.90	2.06
14:22	8	328.08	2.24
14:25	11	328.10	2.26
14:26	12	328.10	2.26
14:28	14	328.13	
14:29	15	328.16	
14:30	16	328.20	2.36
14:31	17	328.20	
14:33	19	328.23	
14:34	20	328.25	
14:36	22	328.26	2.42
14:42		328.30	
14:45	31	328.30	2.46
14:50		328.32	
14:55	41	328.33	2.49
15:00		328.33	
15:05		328.33	
15:12	58	328.35	2.51
15:20		328.36	
15:25		328.37	
15:30	76	328.37	2.53
15:35		328.39	
15:48		328.39	
15:57	103	328.39	2.55
16:05		328.40	
16:20	126	328.40	2.56
16:24	130	329.70	3.86
16:25	131	329.80	3.96
16:26		329.89	
16:27	133	329.90	4.06
16:28		329.90	
16:29		329.94	
16:30	136	329.96	4.12
16:31		329.98	
16:32	138	330.04	4.20
16:34		330.08	
16:35	141	330.10	4.26
16:36		330.12	
16:38		330.14	
16:44		330.19	
16:45	151	330.20	4.36
16:54		330.26	
16:57	163	330.30	4.46
17:16	182	330.29	4.45
17:30		330.33	
17:53		330.35	
18:10		330.35	
18:25	251	330.35	4.51
18:50		330.35	
19:50	336	329.60	3.76
20:30		329.55	
20:48		329.57	
21:05		329.55	
21:30	436	329.55	3.71
22:10		329.55	

READINGS TAKEN ON OBSERVATION WELL NO. 1 DURING "STEP DRAWDOWN" TEST

Time	Time t since start of pumping	Water level readings in well in feet	Corrected water level readings in well (+0.13)*	Drawdown in feet	
Tues. Oct.25					
22:40		329.55			
23:00		329.55			
23:26	552	329.54		3.70	
Wed. Oct.26					
00:05		329.54			
01:10		329.54			
02:30	736	329.53		3.69	
04:50		329.52			
06:50		329.55			
07:15		329.54			
07:50	1056	329.55		3.71	
10:35	1221	330.40		4.56	
10:54		330.39			
11:03	1249	331.23		5.39	
11:05		331.30			
11:06	1252	331.39		5.55	
11:07		331.39			
11:08	1254	331.40		5.56	
11:09		331.45			
11:10	1256	331.47		5.63	
11:12		331.49			
11:14		331.50			
11:15	1261	331.50		5.66	
11:16		331.51			
11:17		331.53			
11:18		331.53			
11:28	1274	331.60		5.76	
11:36		331.63			
11:45		331.67			
11:57	1303	331.68		5.84	
12:10	1316	331.69	331.82	5.98	
12:20		331.69	331.82		
12:30	1336	331.69	331.82	5.98	*See Appen. I for explanation.
12:45		331.70	331.83		
13:13		331.70	331.83		
13:20	1386	331.70	331.83	5.99	
14:35			331.83		
14:40	1466		331.83	5.99	
14:44	1470	Pump stopped			

RECOVERY READINGS ON WELL NO. 1

Time	Time (t) since start of pumping in mins.	Time t' since pumping stopped in mins.	Value of t/t'	Water level readings in well in feet	Corrected water level readings in well in feet	Drawdown in feet a- 325.84
Wed. Oct.26						
14:44	1470	0	Pump stopped			
14:46	1472	2	736	327.55	327.68	1.84
14:50	1476	6	246	327.53	327.66	1.82
14:55	1481	11	134.6	327.38	327.51	1.67
14:56	1482	12	123.5	327.30	327.43	1.59
14:58	1484	14	106	327.27	327.40	1.56
14:59	1485	15	99.0	327.22	327.35	1.51
14:59½				327.20	327.33	
15:00				327.19	327.32	
15:01	1487	17	87.4	327.15	327.28	1.44
15:01				327.13	327.26	
15:03				327.09	327.22	
15:04	1490	20	74.5	327.05	327.18	1.34
15:05				327.00	327.13	
15:08	1494	24	62.3	326.95	327.08	1.24
15:13				326.95	327.07	
15:19	1505	35	43.0	326.82	326.95	1.11
15:27	1513	43	24.8	326.75	326.88	
15:45	1531	61	25.1	326.73	326.86	1.02
15:53				326.69	326.82	
16:06	1552	82	18.93	326.66	326.79	0.95
16:20	1566	96	16.3	326.66	326.79	0.95
17:17	1623	153	10.61		325.96	0.12
17:25	1631	161	10.14		325.96	0.12
17:26	1632	162	10.08		325.93	0.09
17:33	1639	169	9.69		325.91	0.07
17:40	1646	176	9.35		325.91	0.07
17:46	1652	182	9.09		325.89	0.05
17:56	1662	192	8.67		325.89	0.05
18:49	1715	245	7.00		325.84	0.00
21:55	1901	431	4.42		325.89	0.05
22:45	1951	481	4.06		326.73	0.89
23:45	2011	541	3.71		326.77	0.93
Thurs. Oct. 27						
06:16	2402	932	2.58		325.95	0.11
09:27	2593	1123	2.31		326.23	0.39
09:35	2601	1131	2.30		326.58	0.74
09:37					326.58	
09:40	2606	1136	2.295		326.59	0.75
09:43					326.61	
09:46	2612	1142	2.282		326.64	0.80
13:30	2836	1366	2.075		326.78	0.94
14:15	2881	1411	2.044		326.78	0.94
19:37	3203	1733	1.845		326.76	0.92 *See Appendix I for explanation
Fri. Oct. 28						
09:15	4021	2551	1.576		326.67	0.83
09:26	4032	2562	1.573		326.71	0.87
09.42	4048	2578	1.570		326.74	0.90

K+E SEMI-LOGARITHMIC 359-73LG
KEUFFEL & ESSER CO. MADE IN U. S. A.
3 CYCLES X 300 DIVISIONS

pump N°2 on — pump N°2 off — pump N°2 on

374 Imp gals per min

d = 5.0

d_1 = 4.25

719 Imp gals per min

d_2 = 4.85

432 Imp gals per min

(s) Drawdown in feet

WATER INVESTIGATIONS BRANCH
WATER RESOURCES SERVICE
DEPT. OF LANDS, FORESTS AND WATER RESOURCES
VICTORIA, B.C.

Pacific Water Wells Ltd.
Pump Test on Well N°3
McBeth Rd, White Rock
Relationship of (t) time
in minutes and (s) drawdown
in feet in Well N°3
(Modified non-equilibrium method
of Jacob)

Figure 1

1 10 100 1000

(t) time since start of pump test in minutes

K+E SEMI-LOGARITHMIC 359-73LC
KEUFFEL & ESSER CO. MADE IN U. S. A.
3 CYCLES X 10CO DIVISIONS

Pumped at 2 cfs

Pumped at 3 cfs

Pumped at 2 cfs

Prince George Water Wells Ltd.
Pumping test on Well No. 3
Mt. Bertha Rd., White Rock.
Relationship of (t) time
in minutes and (s) drawdown
in feet in observation well No. 1
(Modified non equilibrium method
of Jacob)

WATER INVESTIGATIONS BRANCH
WATER RESOURCES SERVICE
DEPT. OF LANDS, FORESTS AND WATER RESOURCES
VICTORIA, B.C.

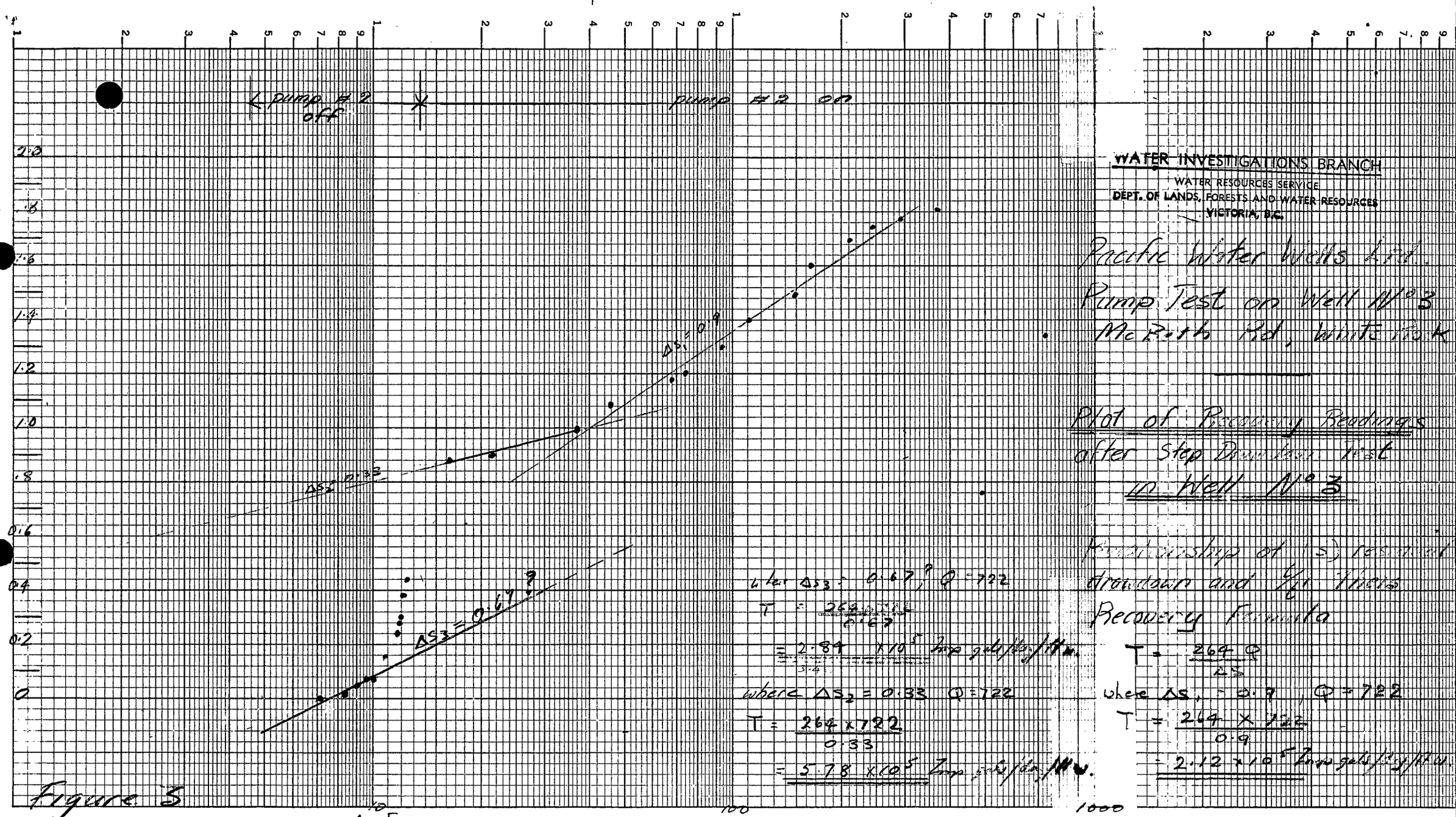
Figure 2

(s) Drawdown in feet

(t) time since start of pumping in minutes

10 100 1000 10,000

KEUFFEL & ESSER CO., N. Y. NO. 359H-71
Semi-Logarithmic, 3 Cycles × 10 to the inch, 5th lines accented.
MADE IN U. S. A.



WATER INVESTIGATIONS BRANCH
WATER RESOURCES SERVICE
DEPT. OF LANDS, FORESTS AND WATER RESOURCES
VICTORIA, B.C.

Pacific Water Wells Ltd.
Pump Test on Well No 3
McRobb Rd, White Rock

Plot of Recovery Readings
after Step Drawdown Test
on Well No 3

Relationship of (s) residual drawdown and t/t' Time Recovery Formula

$T = \frac{264\,Q}{\Delta s}$

where $\Delta s_1 = 0.9$, $Q = 722$

$T = \frac{264 \times 722}{0.9}$

$= 2.12 \times 10^5$ Imp gals/day/ft.

where $\Delta s_3 = 0.67$, $Q = 722$

$T = \frac{264 \times 722}{0.67}$

$= 2.84 \times 10^5$ Imp gals/day/ft.

where $\Delta s_2 = 0.33$ $Q = 722$

$T = \frac{264 \times 722}{0.33}$

$= 5.78 \times 10^5$ Imp gals/day/ft.

Figure 5

KEUFFEL & ESSER CO., N. Y. NO. 359H-71
Semi-Logarithmic, 3 Cycles × 10 to the inch, 5th lines accented.
MADE IN U. S. A.

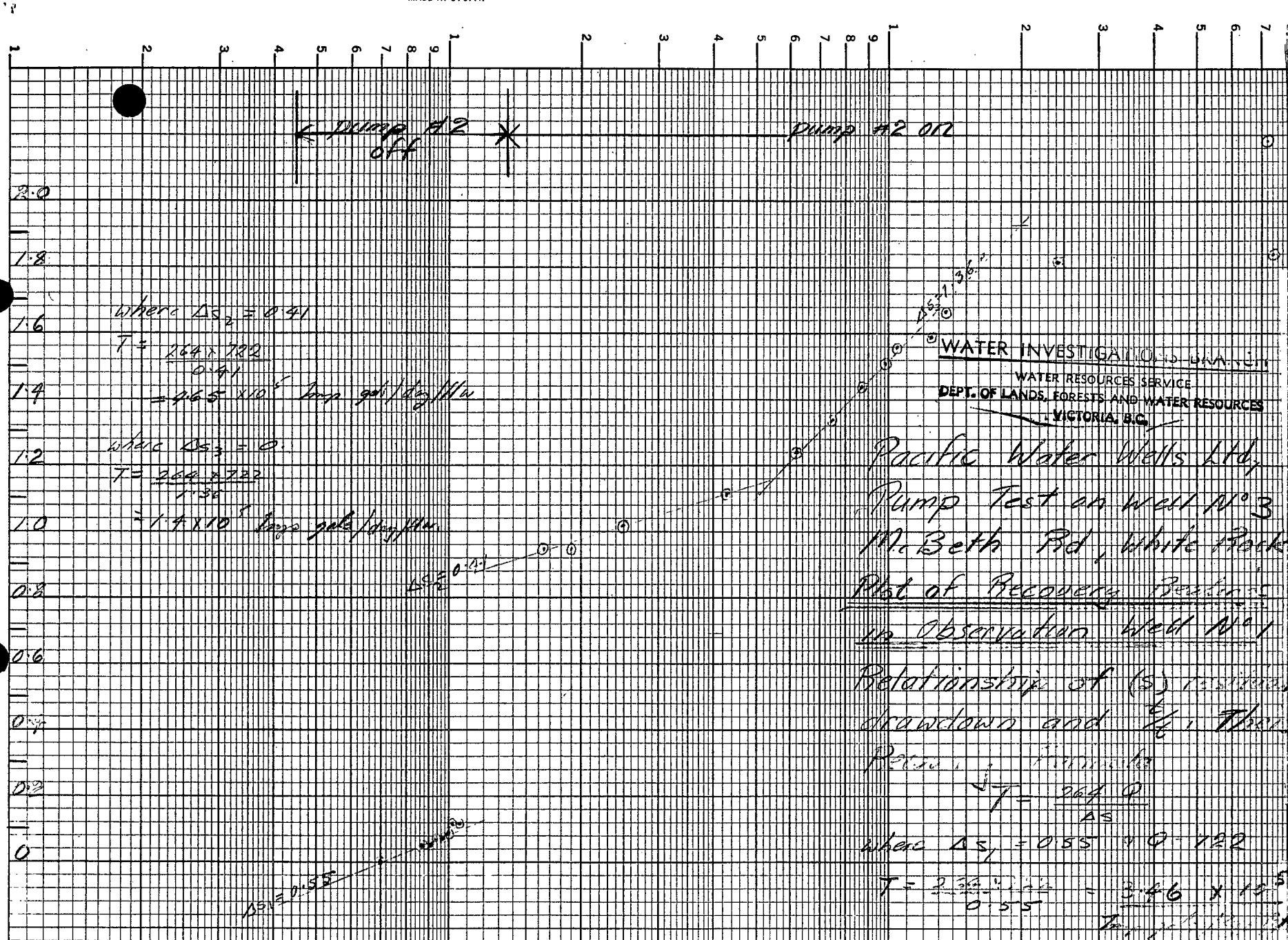


Figure 4

s, Residual Drawdown (ft.)