API LNAPL Transmissivity Workbook

Calculation of LNAPL Transmissivity from Baildown Test Data

STEP 1: RESET OUTPUT SUMMARY

RESET

STEP 2: ENTER DATA & VIEW FIGURES

STEP 3: CHOOSE WELL CONDITIONS

Unconfined

Confined

Perched

STEP 4: LNAPL TRANSMISSIVITY SUMMARY

Output Summary

Mean LNAPL Transmissivity (ft^2/d)

0.03

Standard Deviation (ft^2/d)

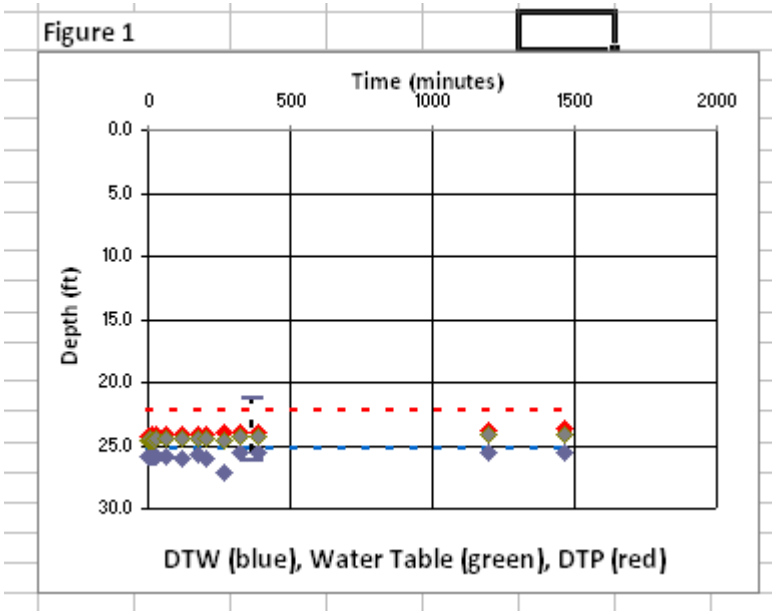
0.01

Coefficient of Variation

0.41

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Well Designation:	EX1	Beckett and Lyverre (2002)																				
2	Date:	18-Sep-12																					
3																							
4	Ground Surface Elev (ft msl)	101.6	Enter These Data		Draudaun																		
5	Top of Caring Elev (ft msl)	100.3			Adjurtment																		
6	Well Caring Radiur, r_a (ft):	0.333	r_{a1}		(ft)																		
7	Well Radiur, r_w (ft):	0.500			0																		
8	LNAPL Specific Yield, S_y:	0.175																					
9	LNAPL Density Ratio, β_n:	0.754																					
10	Top of Screen (ft bgr):	14.0																					
11	Bottom of Screen (ft bgr):	29.0																					
12	LNAPL Baildaun Vol. (gal.):	7.5																					
13	Effective Radiur, r_{e3} (ft):	0.368	Calculated Parameters																				
14	Effective Radiur, r_{e2} (ft):	0.321																					
15	Initial Caring LNAPL Vol. (gal.)	7.61																					
16	Initial Filter LNAPL Vol. (gal.):	1.67																					
17																							
18		Enter Data Here							Water Table	LNAPL			LNAPL								LNAPL	Ave.	
19									Depth	Draudaun		Average	Discharge	r_s	b_n	r_r			DTP	DTW	Volume	r_r	
20		Time (min)	DTP (ft btoc)	DTW (ft btoc)	DTP (ft bgr)	DTW (ft bgr)			(ft)	s_n (ft)		Time (min)	Q_n (ft^3/d)	(ft)	(ft)	(ft)			(ft bgr)	(ft bgr)	(gallons)	(ft)	
21	Initial Fluid Levels:	0	20.98	23.9	22.28	25.2			23.00						2.92								
22																							
23	Enter Test Data:	1	22.94	24.50	24.24	25.80			24.62	1.96					1.56						0	0.368	
24		2	22.93	24.50	24.23	25.80			24.62	1.95		1.5	6.118	1.96	1.57	0.368			24.24	25.80	0.03	0	
25		3	22.92	24.50	24.22	25.80			24.61	1.94		2.5	6.118	1.95	1.58	0.368			24.23	25.80	0.06	0.368	
26		4	22.92	24.50	24.22	25.80			24.61	1.94		3.5	0.000	1.94	1.58	0.368			24.22	25.80	0.06	0.735	
27		5	22.92	24.50	24.22	25.80			24.61	1.94		4.5	0.000	1.94	1.58	0.368			24.22	25.80	0.06	1.103	
28		7	22.92	24.52	24.22	25.82			24.61	1.94		6.0	6.118	1.94	1.60	0.368			24.22	25.81	0.13	1.655	
29		10	22.92	24.40	24.22	25.70			24.58	1.94		8.5	-24.471	1.94	1.48	0.368			24.22	25.76	-0.25	2.574	
30		15	22.90	24.52	24.20	25.82			24.60	1.92		12.5	17.130	1.93	1.62	0.368			24.21	25.76	0.19	4.045	
31		20	22.91	24.50	24.21	25.80			24.60	1.93		17.5	-3.671	1.93	1.59	0.368			24.21	25.81	0.10	5.884	
32		25	22.89	24.50	24.19	25.80			24.59	1.91		22.5	2.447	1.92	1.61	0.368			24.20	25.80	0.16	7.723	
33		30	22.88	24.50	24.18	25.80			24.58	1.90		27.5	1.224	1.90	1.62	0.368			24.19	25.80	0.19	9.561	
34		60	22.85	24.60	24.15	25.90			24.58	1.87		45.0	2.651	1.88	1.75	0.368			24.17	25.85	0.60	15.997	
35		120	22.82	24.80	24.12	26.10			24.61	1.84		90.0	2.345	1.85	1.98	0.368			24.14	26.00	1.33	32.545	
36		175	22.77	24.40	24.07	25.70			24.47	1.79		147.5	-3.893	1.81	1.63	0.368			24.10	25.90	0.22	53.690	
37		205	22.76	24.80	24.06	26.10			24.56	1.78		190.0	8.361	1.79	2.04	0.368			24.07	25.90	1.53	69.319	
38		265	22.74	25.90	24.04	27.20			24.82	1.76		235.0	11.420	1.77	3.16	0.368			24.05	26.65	5.08	85.868	
39		325	22.72	24.30	24.02	25.60			24.41	1.74		295.0	-16.110	1.75	1.58	0.368			24.03	26.40	0.06	107.932	
40		385	22.70	24.30	24.00	25.60			24.39	1.72		355.0	0.204	1.73	1.60	0.368			24.01	25.60	0.13	129.996	
41		1195	22.44	24.20	23.74	25.50			24.17	1.46		790.0	0.121	1.59	1.76	0.368			23.87	25.55	0.64	289.964	
42		1465	22.38	24.20	23.68	25.50			24.13	1.40		1330.0	0.136	1.43	1.82	0.368			23.71	25.50	0.83	488.544	
43					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	
44					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	
45					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	
46					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	

Figure 1


Time (minutes)
0
500
1000
1500
2000
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Depth (ft)
DTW (blue), Water Table (green), DTP (red)

Q_o (ft³/d)	s_o (ft)
0	0
0	0

Drawdown Adjust.	
Δs_o (ft)	0

Figure 3

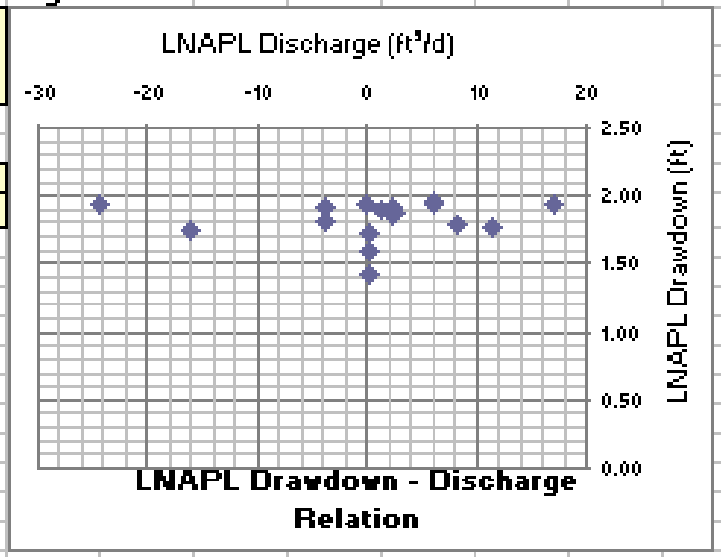
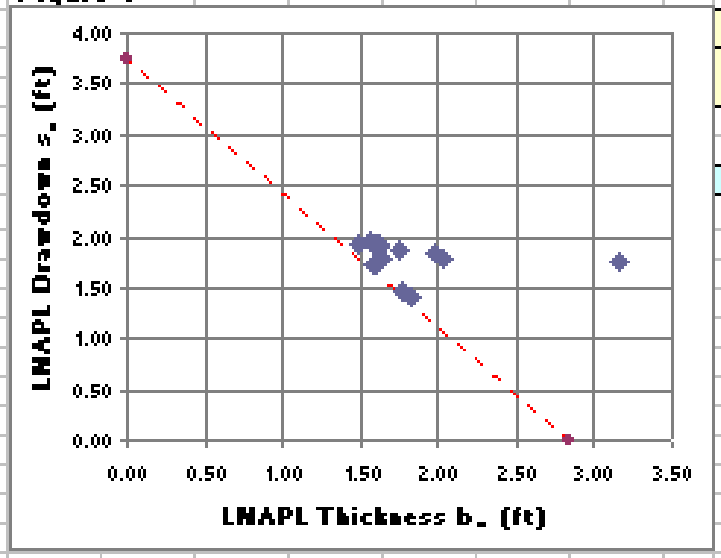


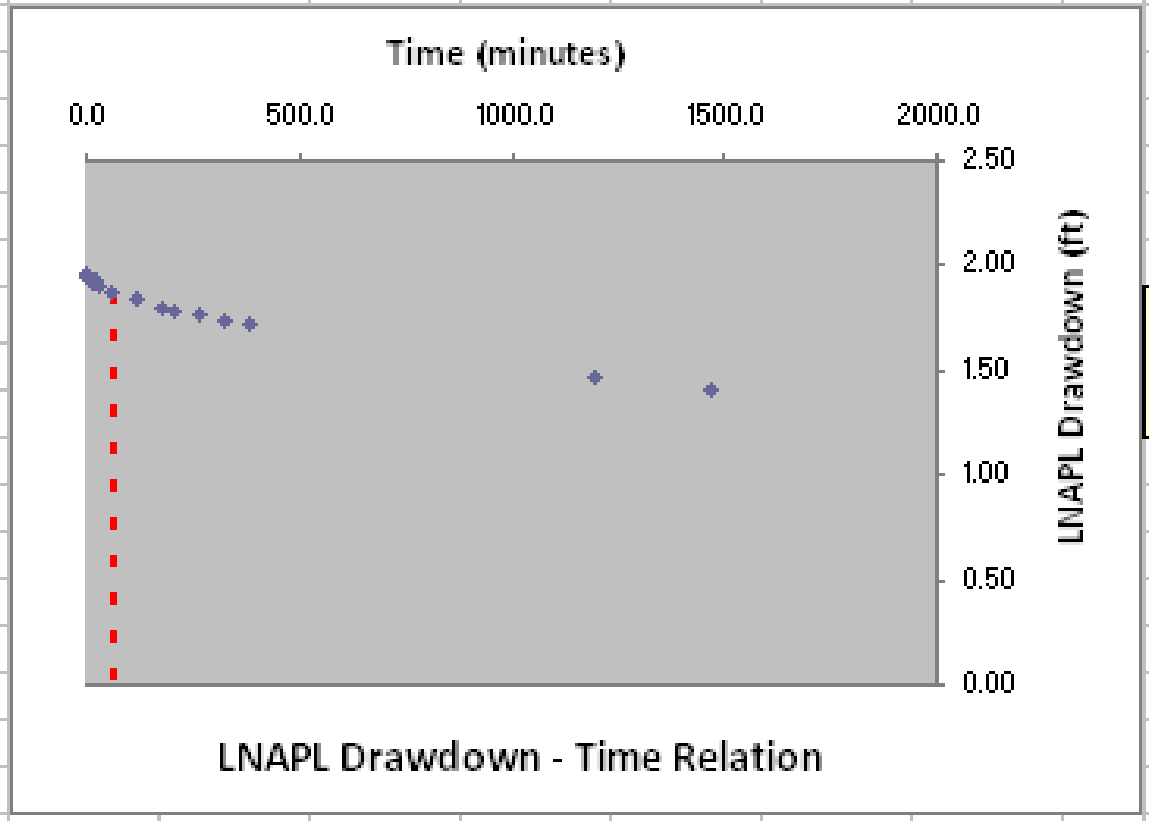
Figure 4



b_o	s_o
2.85	0
0	3.75

J-ratio	-1.316

Figure 10



t (min)	s_n (ft)
70	1.85
70	0

Generalized Bouwer and Rice (1976)

Well Designation:	EW1
Date:	18-Sep-12

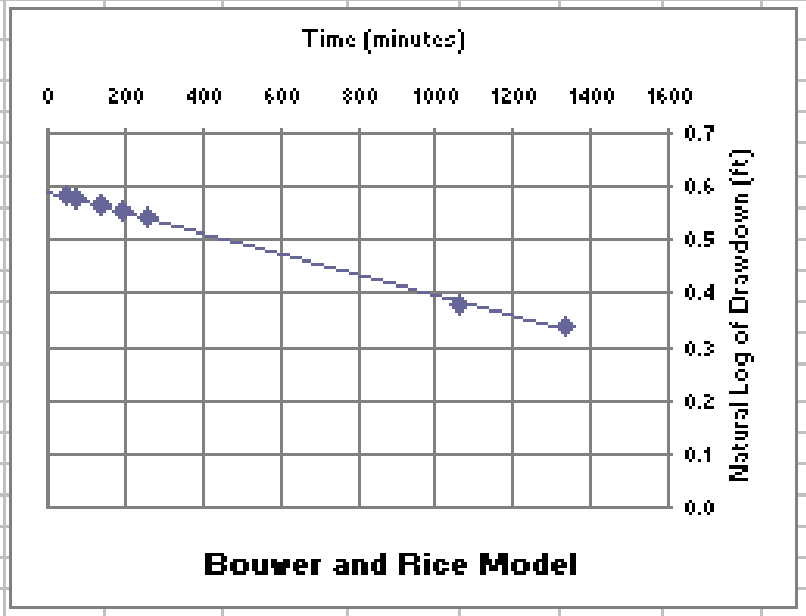
$$T_n = \frac{r_c^2 \ln(R/r_w) \ln(s_n(t_1)/s_n(t))}{2(-J)(t - t_1)}$$

Enter early time cut-off for least-squares model fit

$Time_{cut}$ 130 <- Enter or change value here

Model Results: T_n (ft²/d) 0.02 +/- 0.00 ft²/d

L_e/r_c	7.9
C	1.11
R/r_c	4.44
J-Ratio	-1.316
Coef. Of Variation	0.01



C coefficient calculated from Eq. 6.5(c) of Butler, The Design, Performance, and Analysis of Slug Tests, CRC Press, 2000.

Cooper and Jacob (19

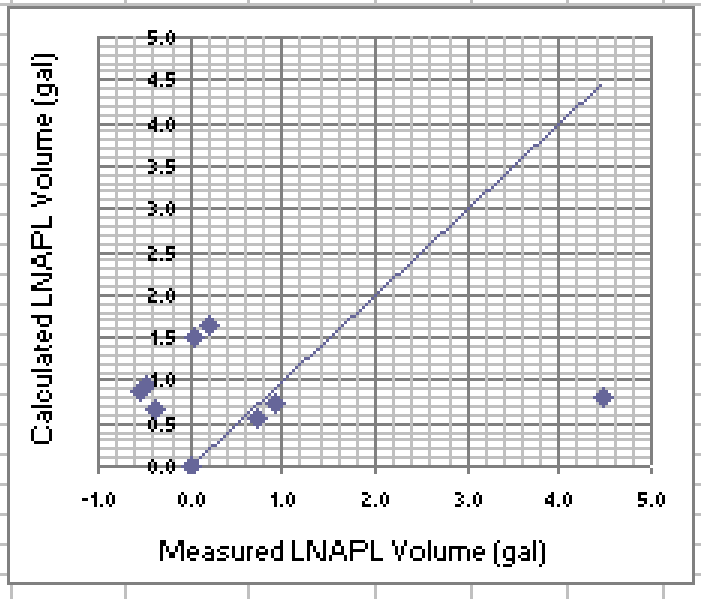
Well Designation:	EX1
Date:	18-Sep-12

$$V_n(t_j) = \sum_{j}^{j} \frac{4\pi T_n s_j}{\ln\left(\frac{2.25 T_n t_j}{r_c^2 S_n}\right)} \Delta t_j$$

Enter early time cut-off for least-squares model fit

$Time_{cut}$ (min):	70	<-- Enter or change value here
Time Adjustment (min):	45	
Trial S_n:	0.008	<-- Enter 4 for default or enter S_n value
Root-Mean-Square Error:	4.774	<-- Minimize this using "Solver"
	0.008	<-- Working S_n
Trial T_n (ft^2/d):	0.020	<-- By changing T_n through "Solver"
		Add constraint T_n > 0.00001

Model Result T_n (ft^2/d): **0.02**



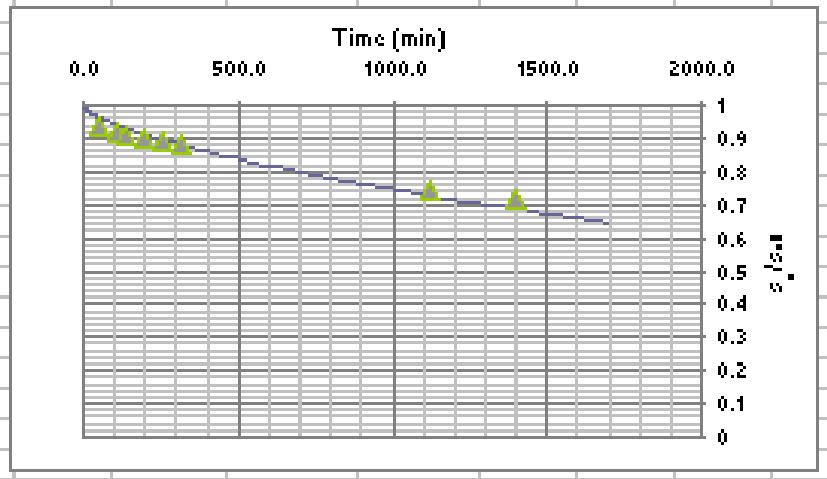
Cooper, Bredehoeft and Papadopulos (1967)

Well Designation:	EX1
Date:	18-Sep-12

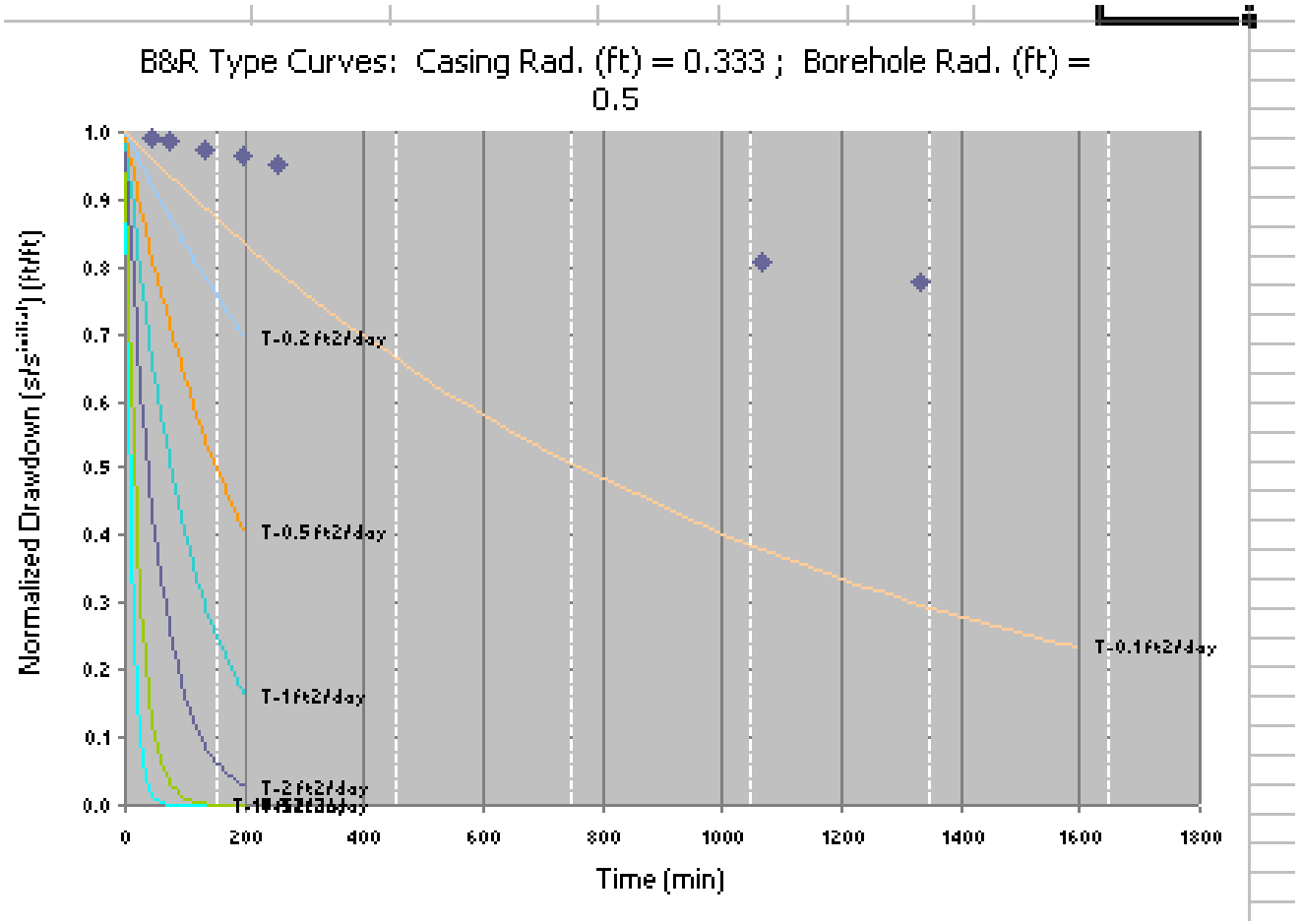
Enter early time cut-off for least-squares model fit

$Time_{cut}$ (min):	70	<-- Enter or change values here
Initial Drawdown s_o (ft):	1.96	
Trial S_o:	0.010	<-- Enter 0 for default
Root-Mean-Square Error:	0.058	<-- Minimize this using "Solver"
Trial T_o (ft^2/d):	0.040	<-- By changing T_o through "Solver"
	0.010	<-- Working S_o Add constraint $T_o > 0.00001$
Model Result	T_o (ft^2/d) = 0.04	

T_{min}	3
T_{max}	1700



J-Ratio
-1.316


B&R Type Curves: Casing Rad. (ft) = 0.333 ; Borehole Rad. (ft) = 0.5
Normalized Drawdown (s/s'[initial]) (ft/ft)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
T-0.2 ft2/day
T-0.5 ft2/day
T-1 ft2/day
T-2 ft2/day
T-0.1 ft2/day
0
200
400
600
800
1000
1200
1400
1600
1800
Time (min)

API LNAPL Transmissivity Workbook

Calculation of LNAPL Transmissivity from Baildown Test Data

STEP 1: RESET OUTPUT SUMMARY

RESET

STEP 2: ENTER DATA & VIEW FIGURES

STEP 3: CHOOSE WELL CONDITIONS

Unconfined

Confined

Perched

STEP 4: LNAPL TRANSMISSIVITY SUMMARY

Output Summary

Mean LNAPL Transmissivity (ft^2/d)

0.28

Standard Deviation (ft^2/d)

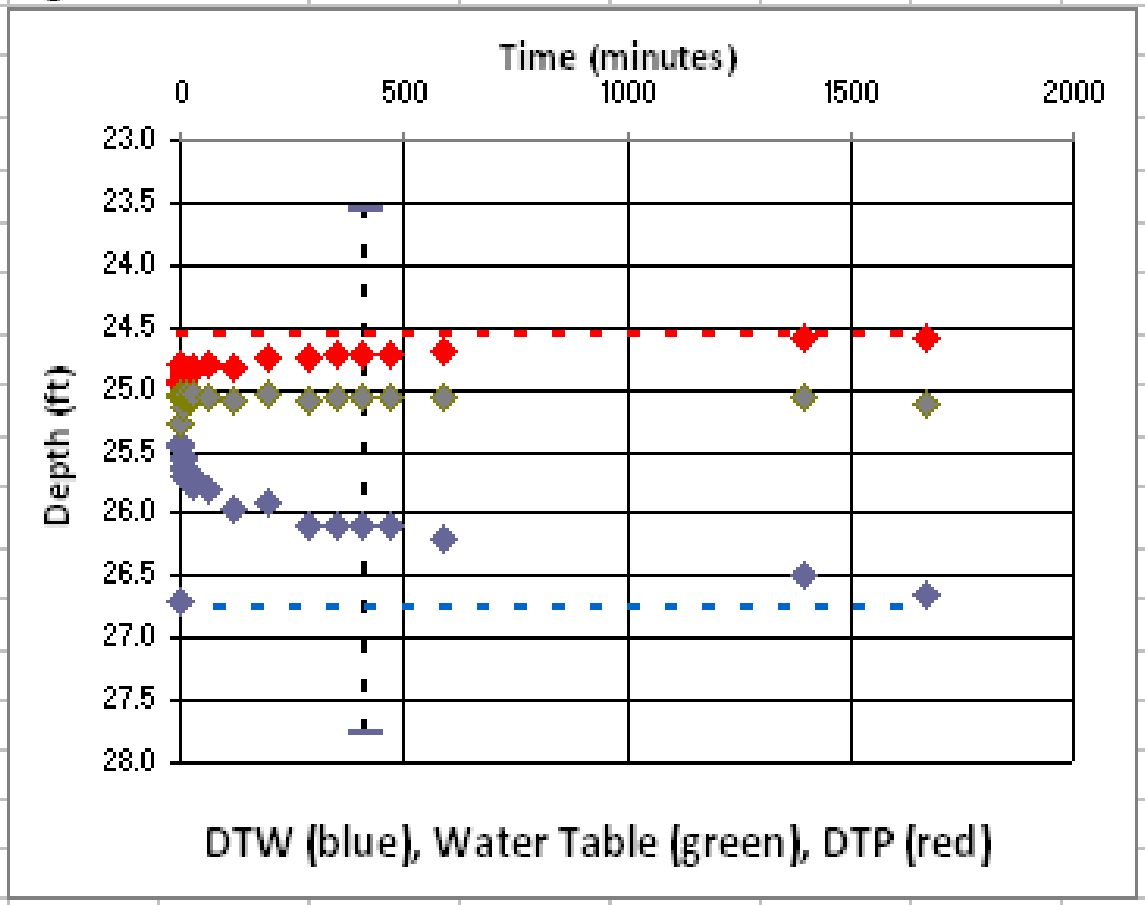
0.20

Coefficient of Variation

0.72

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Well Designation:	MW3	Beckett and Lyverre (2002)																				
2	Date:	18-Sep-12																					
3																							
4	Ground Surface Elev (ft msl)	102.0	Enter These Data		Drawdown																		
5	Top of Casing Elev (ft msl)	101.7			Adjustment																		
6	Well Casing Radius, r_c (ft):	0.083	r_{c1}		(ft)																		
7	Well Radius, r_w (ft):	0.260			0																		
8	LNAPL Specific Yield, S_y:	0.175																					
9	LNAPL Density Ratio, ρ_r:	0.754																					
10	Top of Screen (ft bgs):	18.5																					
11	Bottom of Screen (ft bgs):	28.5																					
12	LNAPL Baildown Vol. (gal.):	3.0																					
13	Effective Radius, r_{e1} (ft):	0.132	Calculated Parameters																				
14	Effective Radius, r_{e2} (ft):	0.122																					
15	Initial Casing LNAPL Vol. (gal.)	0.35																					
16	Initial Filter LNAPL Vol. (gal.):	0.55																					
17																							
18		Enter Data Here							Water Table	LNAPL			LNAPL								LNAPL	Ave.	
19									Depth	Drawdown		Average	Discharge	r_e	b_e	r_c			DTP	DTW	Volume	r_c	
20		Time (min)	DTP (ft btoc)	DTW (ft btoc)	DTP (ft bgs)	DTW (ft bgs)			(ft)	s_e (ft)		Time (min)	Q_o (ft^3/d)	(ft)	(ft)	(ft)			(ft bgs)	(ft bgs)	(gallons)	(ft)	
21	Initial Fluid Levels:	0	24.26	26.45	24.56	26.75			25.10						2.19								
22																							
23	Enter Test Data:	2.5	24.65	25.15	24.95	25.45			25.07	0.39					0.50						0	0.132	
24		3	24.62	25.14	24.92	25.44			25.05	0.36		2.8	3.169	0.38	0.52	0.132			24.94	25.45	0.01	0	
25		3.25	24.65	25.13	24.95	25.43			25.07	0.39		3.1	-12.677	0.38	0.48	0.132			24.94	25.44	-0.01	0.050	
26		3.5	24.65	25.15	24.95	25.45			25.07	0.39		3.4	6.338	0.39	0.50	0.132			24.95	25.44	0.00	0.083	
27		4	24.65	25.23	24.95	25.53			25.09	0.39		3.8	12.677	0.39	0.58	0.132			24.95	25.49	0.03	0.132	
28		5	24.65	25.26	24.95	25.56			25.10	0.39		4.5	2.377	0.39	0.61	0.132			24.95	25.55	0.05	0.232	
29		5.5	24.65	25.40	24.95	25.70			25.13	0.39		5.3	22.184	0.39	0.75	0.132			24.95	25.63	0.10	0.331	
30		6	24.67	25.33	24.97	25.63			25.13	0.41		5.8	-14.261	0.40	0.66	0.132			24.96	25.67	0.07	0.397	
31		7	24.58	25.35	24.88	25.65			25.07	0.32		6.5	8.715	0.36	0.77	0.132			24.93	25.64	0.11	0.496	
32		8	24.58	25.35	24.88	25.65			25.07	0.32		7.5	0.000	0.32	0.77	0.132			24.88	25.65	0.11	0.629	
33		9	24.56	25.35	24.86	25.65			25.05	0.30		8.5	1.585	0.31	0.79	0.132			24.87	25.65	0.12	0.761	
34		10	24.57	25.33	24.87	25.63			25.06	0.31		9.5	-2.377	0.30	0.76	0.132			24.87	25.64	0.11	0.893	
35		11	24.56	25.35	24.86	25.65			25.05	0.30		10.5	2.377	0.30	0.79	0.132			24.87	25.64	0.12	1.026	
36		12	24.55	25.34	24.85	25.64			25.04	0.29		11.5	0.000	0.29	0.79	0.132			24.86	25.65	0.12	1.158	
37		13	24.55	25.35	24.85	25.65			25.05	0.29		12.5	0.792	0.29	0.80	0.132			24.85	25.65	0.12	1.290	
38		15	24.54	25.40	24.84	25.70			25.05	0.28		14.0	2.377	0.28	0.86	0.132			24.85	25.68	0.15	1.489	
39		17	24.54	25.38	24.84	25.68			25.05	0.28		16.0	-0.792	0.28	0.84	0.132			24.84	25.69	0.14	1.753	
40		20	24.54	25.40	24.84	25.70			25.05	0.28		18.5	0.528	0.28	0.86	0.132			24.84	25.69	0.15	2.084	
41		25	24.54	25.48	24.84	25.78			25.07	0.28		22.5	1.268	0.28	0.94	0.132			24.84	25.74	0.18	2.614	
42		30	24.53	25.40	24.83	25.70			25.04	0.27		27.5	-1.109	0.27	0.87	0.132			24.84	25.74	0.15	3.275	
43		60	24.51	25.50	24.81	25.80			25.05	0.25		45.0	0.317	0.26	0.99	0.132			24.82	25.75	0.20	5.591	
44		120	24.52	25.65	24.82	25.95			25.10	0.26		90.0	0.185	0.25	1.13	0.132			24.82	25.88	0.26	11.547	
45		195	24.45	25.60	24.75	25.90			25.03	0.19		157.5	0.021	0.22	1.15	0.132			24.79	25.93	0.27	20.479	
46		288	24.45	25.80	24.75	26.10			25.03	0.19		241.5	0.170	0.19	1.35	0.132			24.75	26.00	0.35	31.596	

Figure 1


Time (minutes)
0
500
1000
1500
2000
23.0
23.5
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
28.0
Depth (ft)
DTW (blue), Water Table (green), DTP (red)

Q_o (ft³/d)	s_o (ft)
0	0
0	0

Drawdown Adjust.	
Δs_o (ft)	0

Figure 3

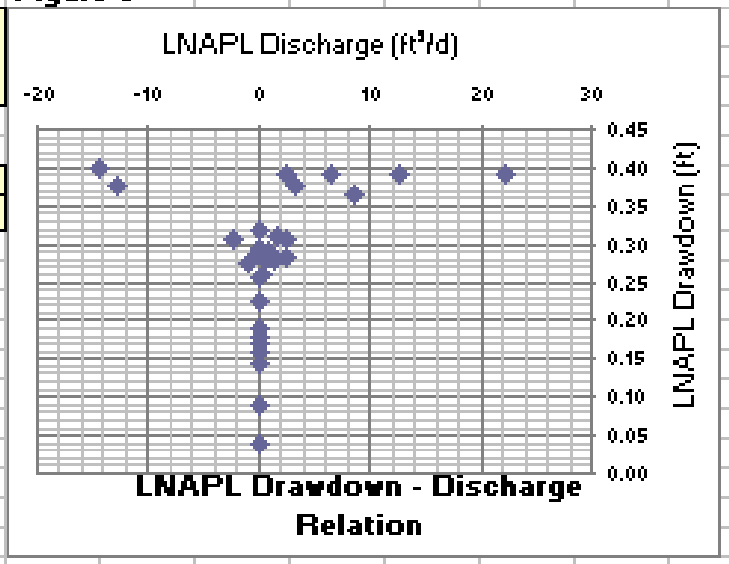
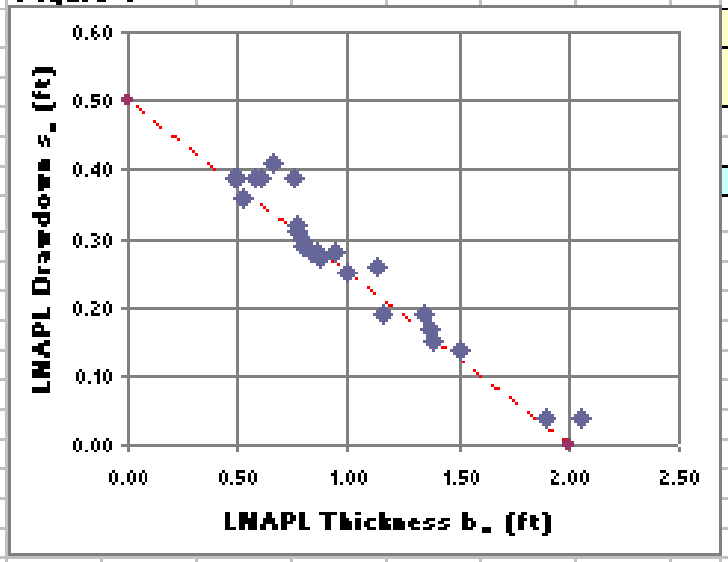


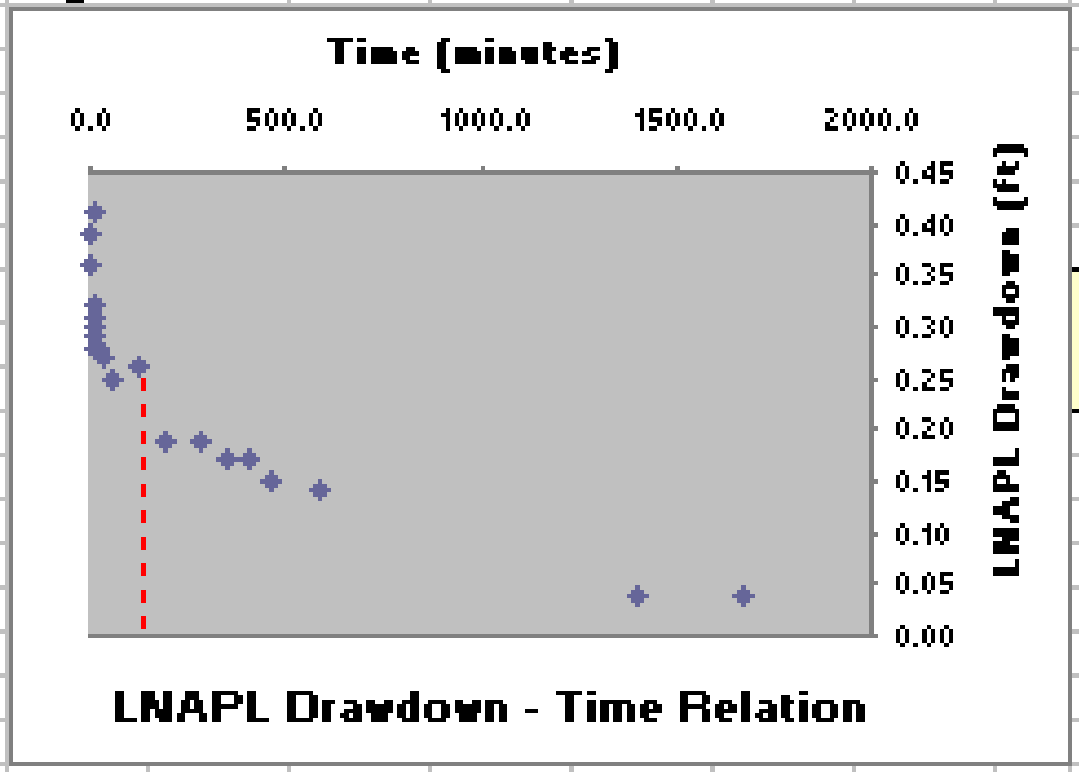
Figure 4



b_o	s_o
2	0
0	0.5

J-ratio	-0.250

Figure 10



t(min)	s_n(ft)
130	0.25
130	0

Enter early time cut-off for least-squares model fit

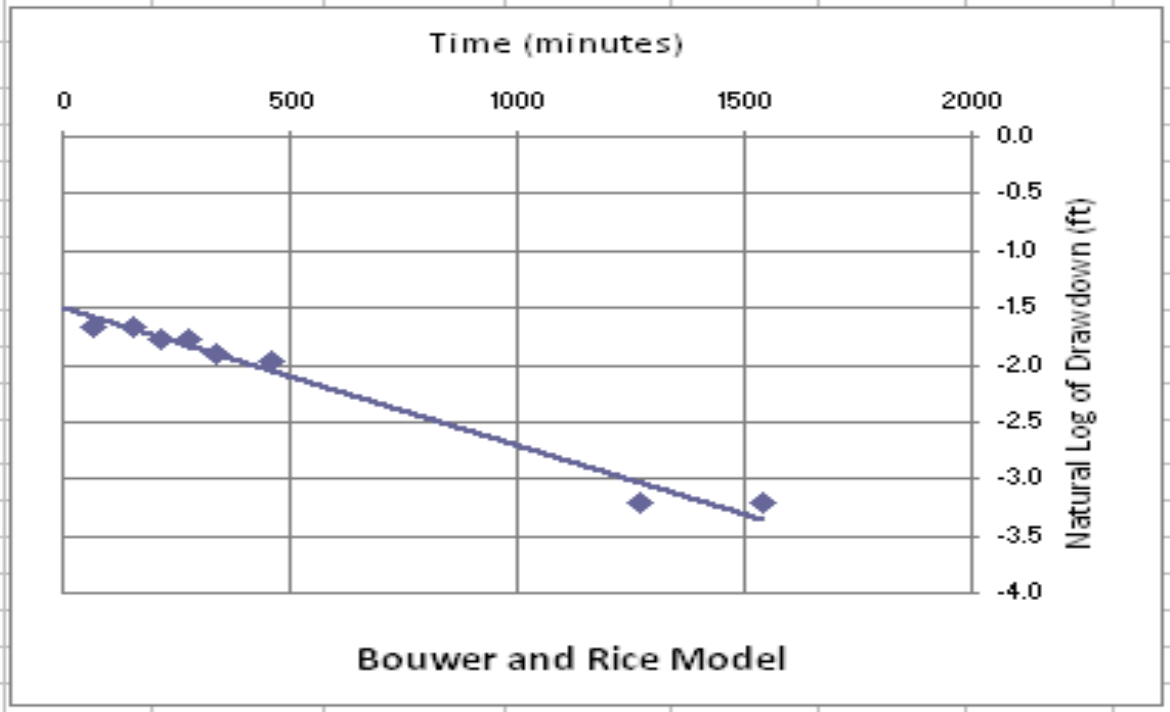
$Time_{cut}$	130	<- Enter or change value here

Model Results:	T_n (ft^2/d) = 0.13	+/-	0.01	ft^2/d

L_e/r_c
16.5
C
1.45
R/r_c
8.04

J-Ratio
-0.250

Coef. Of Variatio
0.06



Cooper and Jacob (19

$$V_w(t_j) = \sum_{j}^{j} \frac{4\pi T_w s_j}{\ln\left(\frac{2.25 T_w t_j}{r_c^2 S_w}\right)} \Delta t_j$$

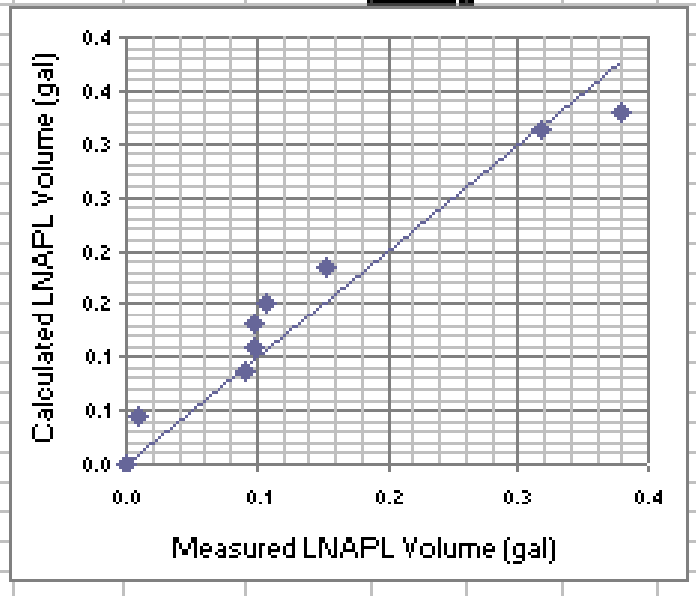
Well Designation:	MW3
Date:	18-Sep-12

Enter early time cut-off for least-squares model fit

Time$_{cut}$ (min):	130	<-- Enter or change values here
Time Adjustment (min):	85	
Trial S_w:	0.010	<-- Enter 0 for default or enter S_w value
Root-Mean-Square Error:	0.088	<-- Minimize this using "Solver"
	0.010	<-- Working S_w
Trial T_w (ft²/d):	0.200	<-- By changing T_w through "Solver"

Add constraint T_w > 0.00001

Model Result T_w (ft²/d): **0.20**



Cooper, Bredehoeft and Papadopulos (1967)

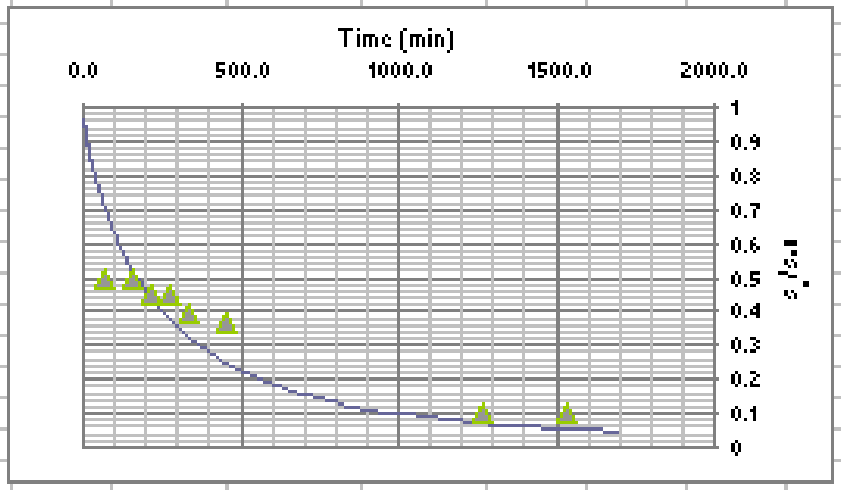
Well Designation:	MW3
Date:	18-Sep-12

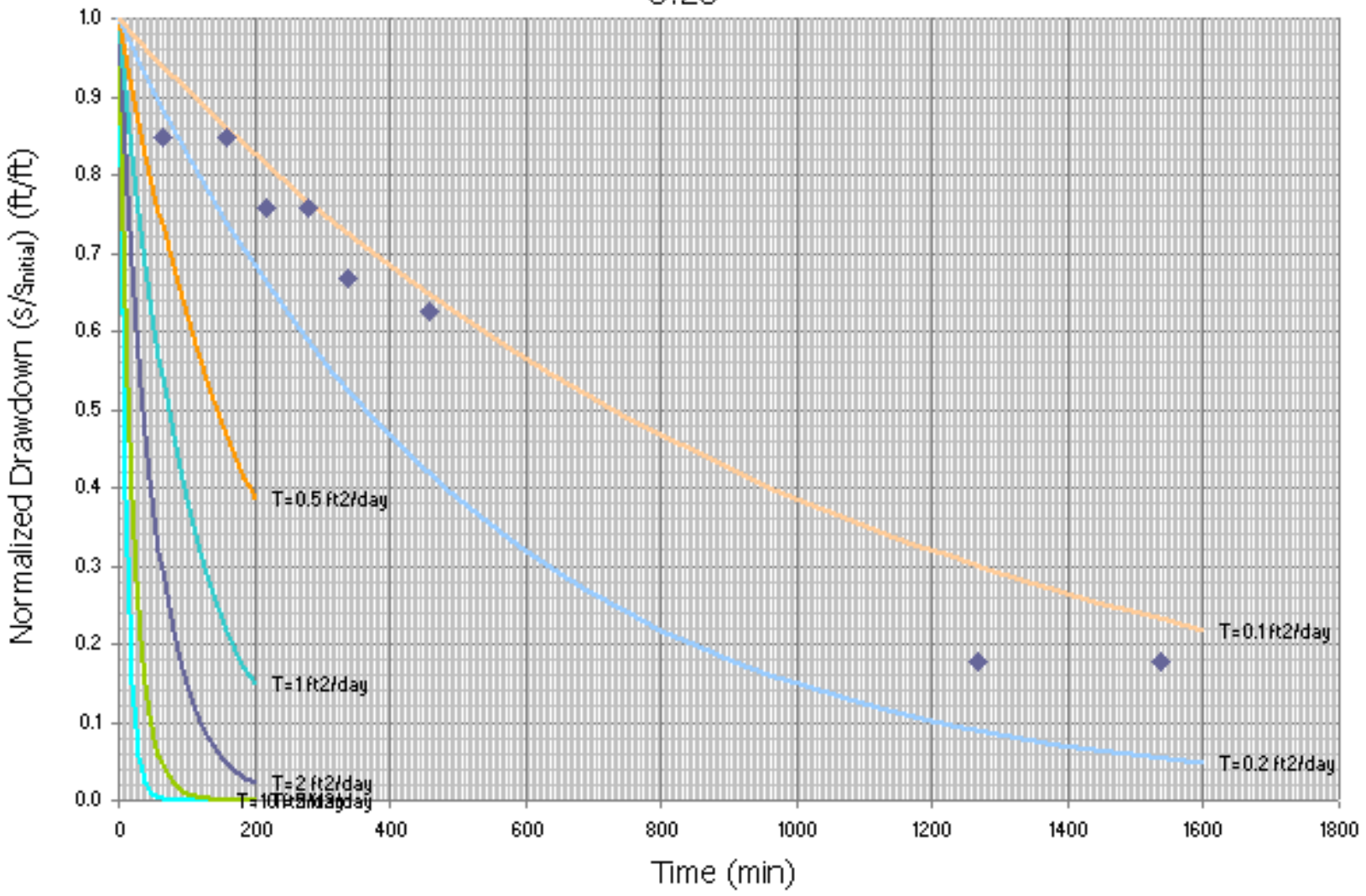
Enter early time cut-off for least-squares model fit

$Time_{cut}$ (min):	130	<-- Enter or change value here
Initial Drawdown s_o (ft):	0.38	
Trial S_o:	0.010	<-- Enter 0 for default
Root-Mean-Square Error:	0.274	<-- Minimize this using "Solver"
Trial T_o (ft^2/d):	0.500	<-- By changing T_o through "Solver"
	0.010	<-- Working S_o Add constraint $T_o \geq 0.00001$
Model Result	T_o (ft^2/d) = 0.50	

T_{min}	3
T_{max}	1700

J-Ratio
-0.250




B&R Type Curves: Casing Rad. (ft) = 0.083 ; Borehole Rad. (ft) = 0.26
Normalized Drawdown (s/sinitial) (ft/ft)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
200
400
600
800
1000
1200
1400
1600
1800
Time (min)
T=0.5 ft2/day
T=1 ft2/day
T=2 ft2/day
T=0.1 ft2/day
T=0.2 ft2/day

API LNAPL Transmissivity Workbook

Calculation of LNAPL Transmissivity from Baildown Test Data

STEP 1: RESET OUTPUT SUMMARY

RESET

STEP 2: ENTER DATA & VIEW FIGURES

STEP 3: CHOOSE WELL CONDITIONS

Unconfined

Confined

Perched

STEP 4: LNAPL TRANSMISSIVITY SUMMARY

Output Summary

Mean LNAPL Transmissivity (ft^2/d)

1.22

Standard Deviation (ft^2/d)

1.55

Coefficient of Variation

1.27

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Well Designation:	EW3	Beckett and Lyverse (2002)																				
2	Date:	18-Sep-12																					
3																							
4	Ground Surface Elev (ft msl)	101.6	Enter These Data		Draudaun																		
5	Top of Caring Elev (ft msl)	100.3			Adjustment																		
6	Well Caring Radius, r_w (ft):	0.333	r_{w1}		(ft)																		
7	Well Radius, r_w (ft):	0.500			0																		
8	LNAPL Specific Yield, S_y:	0.175																					
9	LNAPL Density Ratio, ρ_r:	0.754																					
10	Top of Screen (ft bgs):	14.0																					
11	Bottom of Screen (ft bgs):	29.0																					
12	LNAPL Baildown Vol. (gal.):	3.0																					
13	Effective Radius, r_{e1} (ft):	0.368	Calculated Parameters																				
14	Effective Radius, r_{e2} (ft):	0.233																					
15	Initial Caring LNAPL Vol. (gal.)	6.31																					
16	Initial Filter LNAPL Vol. (gal.):	1.38																					
17																							
18		Enter Data Here							Water Table	LNAPL			LNAPL								LNAPL	Ave.	
19									Depth	Draudaun		Average	Discharge	r_e	b_e	r_e			DTP	DTW	Volume	r_e	
20		Time (min)	DTP (ft btoc)	DTW (ft btoc)	DTP (ft bgs)	DTW (ft bgs)			(ft)	s_e (ft)		Time (min)	Q_e (ft^3/d)	(ft)	(ft)	(ft)			(ft bgs)	(ft bgs)	(gallons)	(ft)	
21	Initial Fluid Levels:	0	23.58	26	24.88	27.3			25.48						2.42								
22																							
23	Enter Test Data:	0.5	26.20	26.80	27.50	28.10			27.65	2.62					0.60						0	0.368	
24		1.5	25.96	27.30	27.26	28.60			27.59	2.38		1.0	452.718	2.50	1.34	0.368			27.38	28.35	2.35	0	
25		2	25.89	26.90	27.19	28.20			27.44	2.31		1.8	-403.776	2.35	1.01	0.368			27.23	28.40	1.30	0.276	
26		3	25.78	26.70	27.08	28.00			27.31	2.20		2.5	-55.060	2.26	0.92	0.368			27.14	28.10	1.02	0.552	
27		4	25.62	27.20	26.92	28.50			27.31	2.04		3.5	403.776	2.12	1.58	0.368			27.00	28.25	3.11	0.919	
28		5	25.55	26.20	26.85	27.50			27.01	1.97		4.5	-568.957	2.01	0.65	0.368			26.89	28.00	0.16	1.287	
29		6	25.40	26.40	26.70	27.70			26.95	1.82		5.5	214.124	1.90	1.00	0.368			26.78	27.60	1.27	1.655	
30		7	25.25	26.40	26.55	27.70			26.83	1.67		6.5	91.767	1.75	1.15	0.368			26.63	27.70	1.75	2.023	
31		10	25	26.30	26.30	27.60			26.62	1.42		8.5	30.589	1.55	1.30	0.368			26.43	27.65	2.22	2.758	
32		15	24.70	25.85	26.00	27.15			26.28	1.12		12.5	-18.353	1.27	1.15	0.368			26.15	27.38	1.75	4.229	
33		20	24.50	25.80	25.80	27.10			26.12	0.92		17.5	18.353	1.02	1.30	0.368			25.90	27.13	2.22	6.068	
34		30	24.25	26.15	25.55	27.45			26.02	0.67		25.0	36.707	0.80	1.90	0.368			25.68	27.28	4.13	8.826	
35		42	24.11	25.80	25.41	27.10			25.83	0.53		36.0	-10.706	0.60	1.69	0.368			25.48	27.28	3.46	12.871	
36		55	24.03	25.30	25.33	26.60			25.64	0.45		48.5	-19.765	0.49	1.27	0.368			25.37	26.85	2.13	17.468	
37		115	23.83	25.40	25.13	26.70			25.52	0.25		85.0	3.059	0.35	1.57	0.368			25.23	26.65	3.08	30.890	
38		175	23.76	25.20	25.06	26.50			25.41	0.18		145.0	-1.326	0.22	1.44	0.368			25.10	26.60	2.67	52.955	
39		235	23.71	25.10	25.01	26.40			25.35	0.13		205.0	-0.510	0.16	1.39	0.368			25.04	26.45	2.51	75.019	
40		1045	23.60	25.80	24.90	27.10			25.44	0.02		640.0	0.612	0.08	2.20	0.368			24.96	26.75	5.08	234.986	
41		1315	23.581	25.78	24.88	27.08			25.42	0.00		1180.0	-0.002	0.01	2.20	0.368			24.89	27.09	5.08	433.567	
42					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	
43					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	
44					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	
45					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	
46					#N/A	#N/A			#N/A	#N/A		0.0	#N/A	#N/A	#N/A	0.000			#N/A	#N/A	#N/A	0.000	

HOME | Data | Figures | B&R | C&J | CB&P | B&R Type Curve | Flowchart

Q_o (ft³/d)	s_o (ft)
0	0
0	0

Drawdown Adjust.	
Δs_o (ft)	0

Figure 3

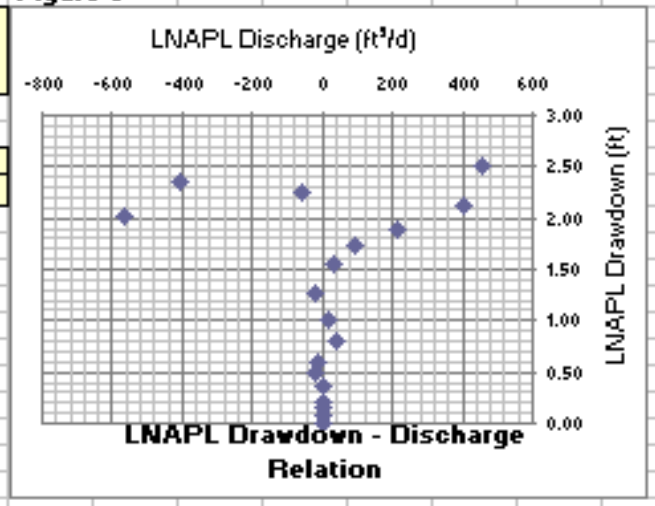
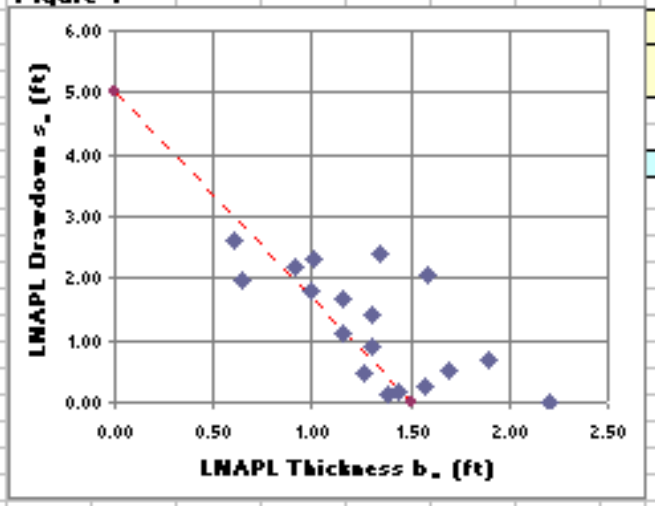


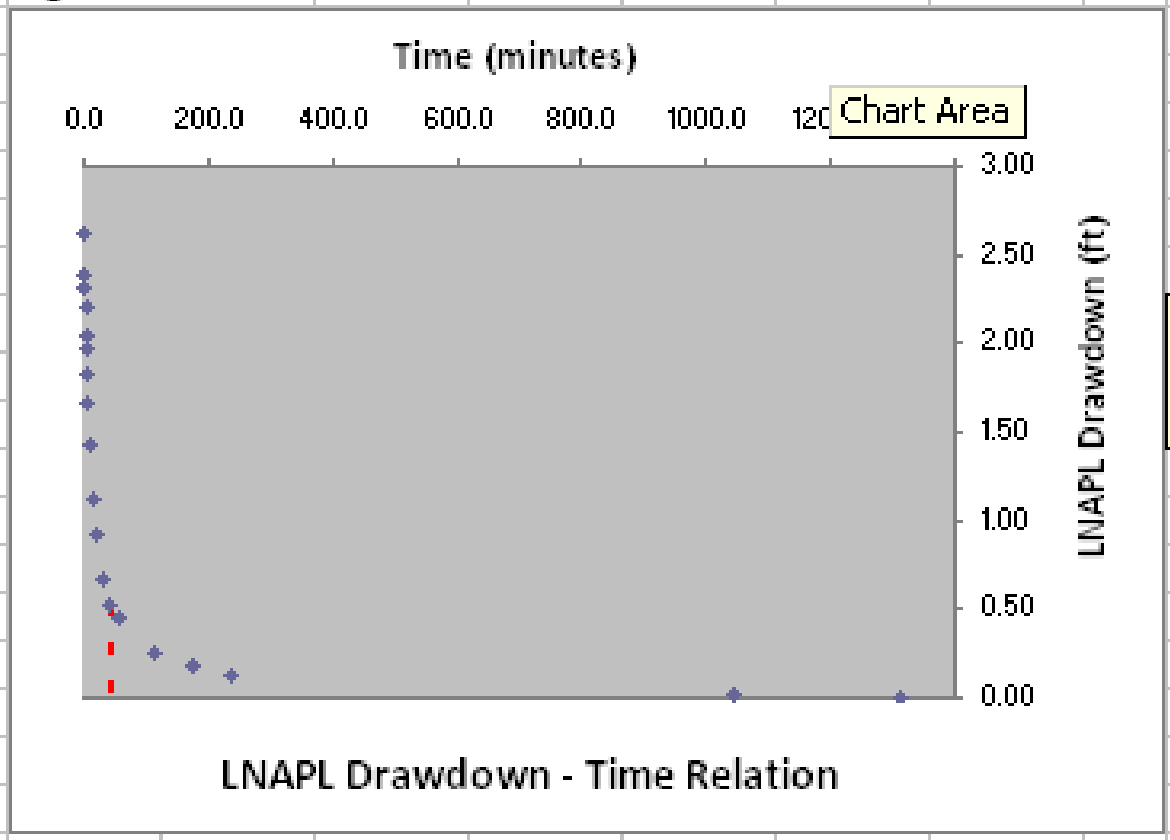
Figure 4



b_o	s_o
1.5	0
0	5

J-ratio	-3.333

Figure 10



t (min)	s_n (ft)
45	0.5
45	0

Generalized Bouwer and Rice (1976)

Well Designation:	EX3
Date:	18-Sep-12

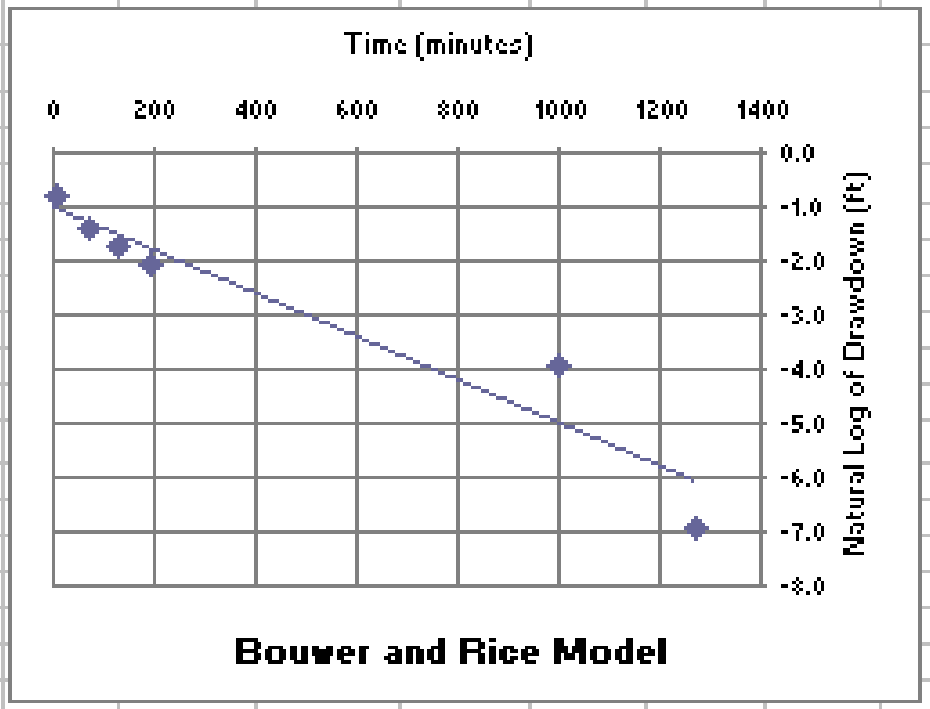
$$T_n = \frac{r_c^2 \ln(R/r_c)\ln(s_n(t_1)/s_n(t))}{2(-J)(t-t_1)}$$

Enter early time cut-off for least-squares model fit

$Time_{cut}$	45	<-- Enter or change value here	

Model Results:	T_n (ft²/d)	0.16	+/-	0.02	ft²/d

L_e/r_c	6.6
C	1.05
R/r_c	3.83
J-Ratio	-3.333
Coef. Of Variation	0.15



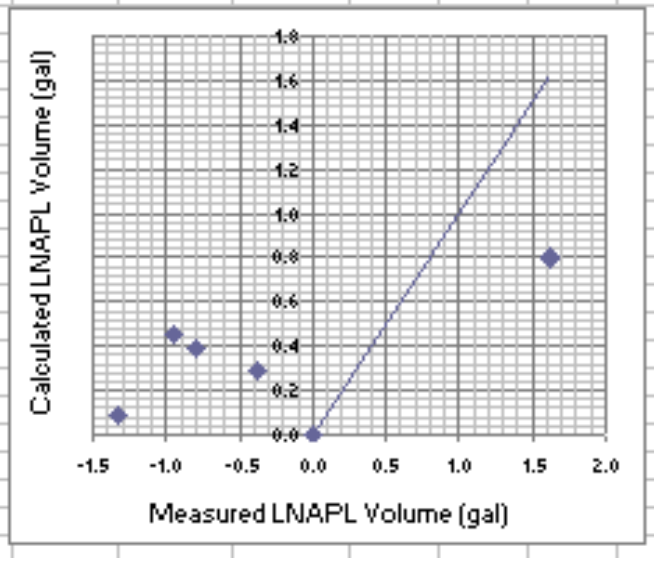
Cooper and Jacob (19

Well Designation:	EW3
Date:	18-Sep-12

$$V_n(t_j) = \sum_{j}^{j} \frac{4\pi T_n s_j}{\ln\left(\frac{2.25 T_n t_j}{r_c^2 S_n}\right)} \Delta t_j$$

Enter early time cut-off for least-squares model fit

$Time_{cut}$ (min):	45	<-- Enter or change value here
Time Adjustment (min):	30	
Trial S_n:	0.010	<-- Enter 4 for default or enter S_n val
Root-Mean-Square Error:	2.681	<-- Minimize this using "Solver"
	0.010	<-- Working S_n
Trial T_n (ft^2/d):	0.500	<-- By changing T_n through "Solver"
		Add constraint $T_n > 0.00001$
Model Result	T_n (ft^2/d): 0.50	



Cooper, Bredehoeft and Papadopulos (1967)

Well Designation:	EX3
Date:	18-Sep-12

Enter early time cut-off for least-squares model fit

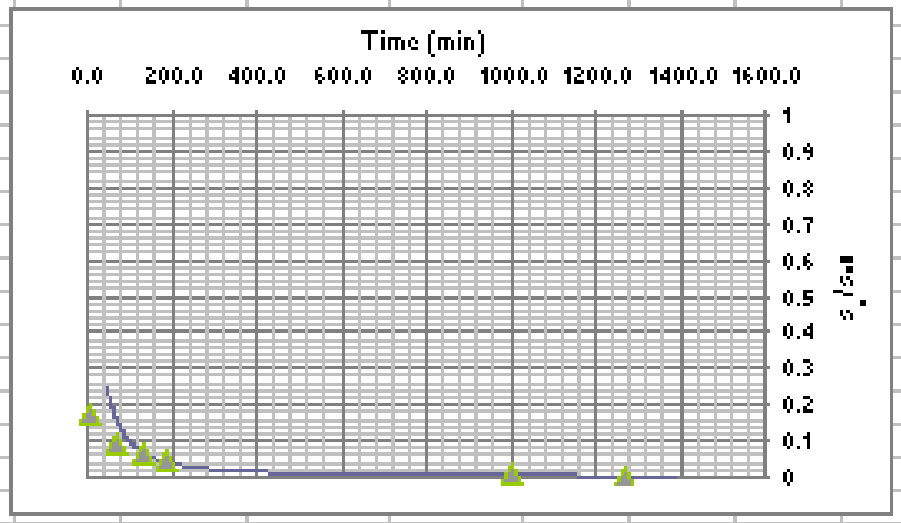
$Time_{cut}$ (min):	45	<-- Enter or change values here
Initial Drawdown s_o (ft):	2.62	
Trial S:	0.008	<-- Enter 0 for default
Root-Mean-Square Error:	0.467	<-- Minimize this using "Solver"
Trial T (ft^2/d):	3.000	<-- By changing T through "Solver"
	0.008	<-- Working S

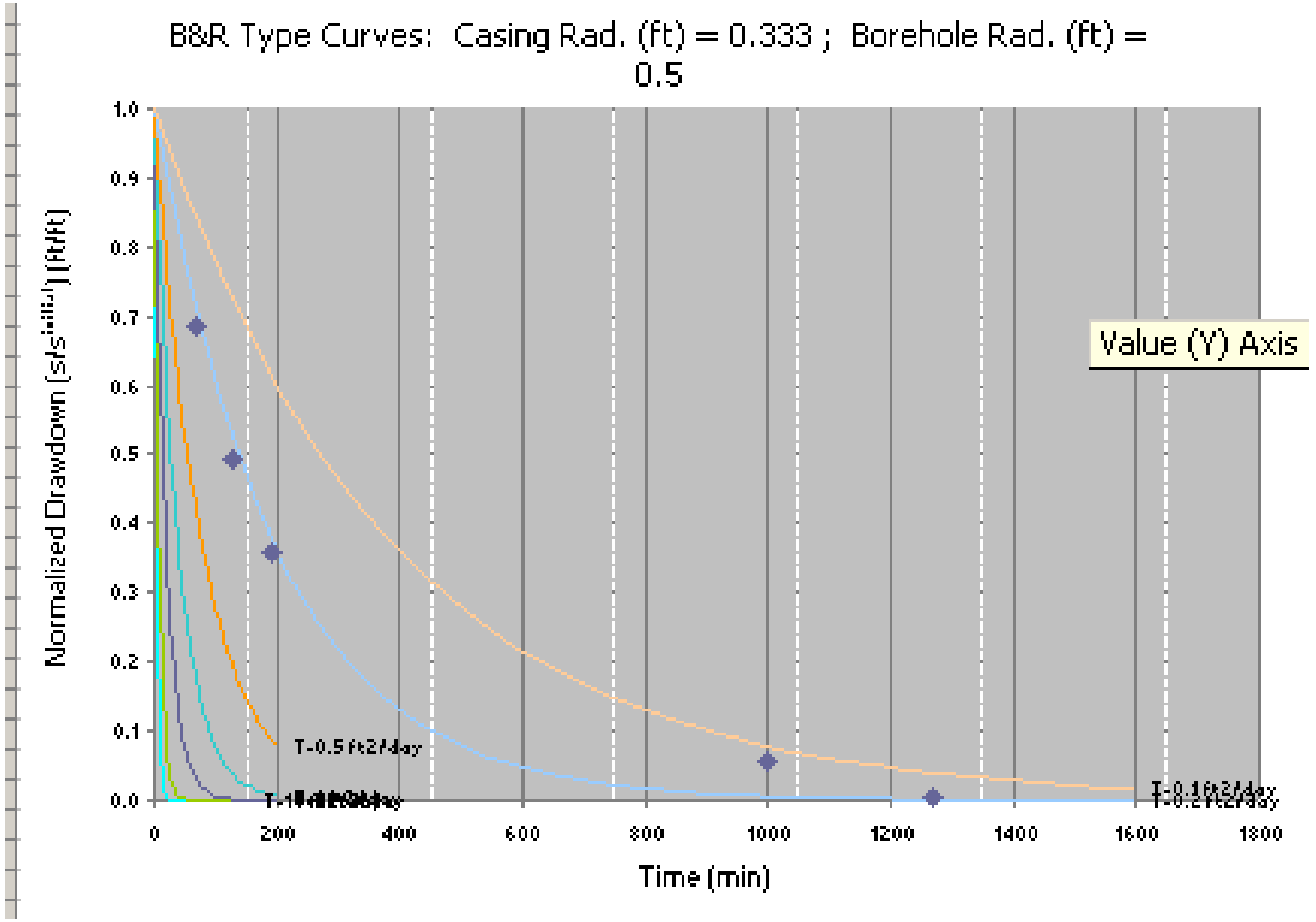
Add constraint $T_n > 0.00001$

Model Result T (ft^2/d) = **3.00**

T_{min}	45
T_{max}	1400

J-Ratio: -3.333




B&R Type Curves: Casing Rad. (ft) = 0.333 ; Borehole Rad. (ft) = 0.5
Normalized Drawdown (s/s'') (ft/ft)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
200
400
600
800
1000
1200
1400
1600
1800
Time (min)
Value (Y) Axis
T=0.5 ft2/day

API LNAPL Transmissivity Workbook

Calculation of LNAPL Transmissivity from Baildown Test Data

STEP 1: RESET OUTPUT SUMMARY

RESET

STEP 2: ENTER DATA & VIEW FIGURES

STEP 3: CHOOSE WELL CONDITIONS

Unconfined

Confined

Perched

STEP 4: LNAPL TRANSMISSIVITY SUMMARY

Output Summary

Mean LNAPL Transmissivity (ft^2/d)

0.01

Standard Deviation (ft^2/d)

0.01

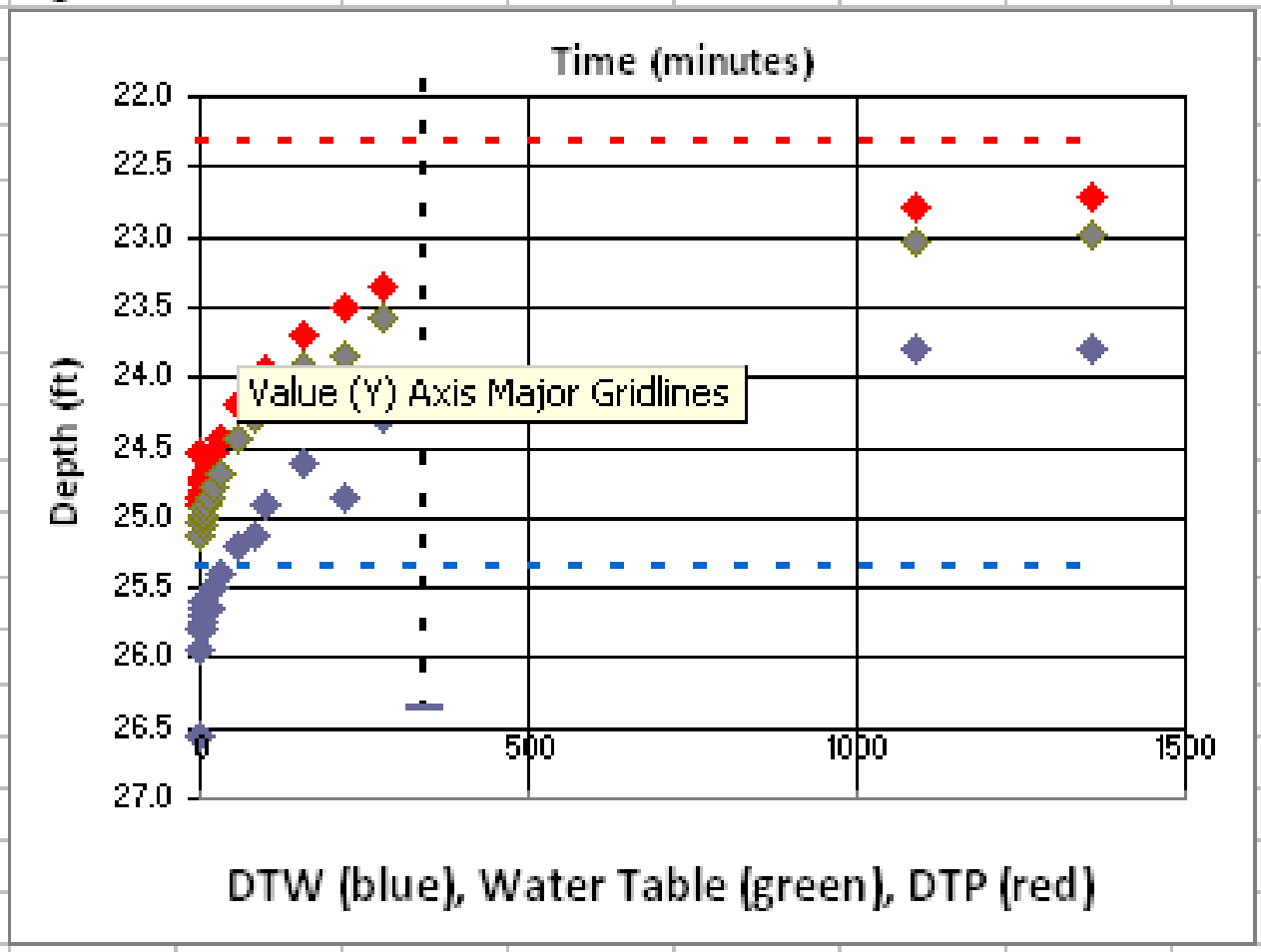
Coefficient of Variation

1.17

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Well Designation:	MW103	Beckett and Lyverse (2002)											
2	Date:	18-Sep-12												
3														
4	Ground Surface Elev (ft msl)	100.2	Enter These Data		**Drawdown**									
5	Top of Casing Elev (ft msl)	99.9			**Adjustment**									
6	Well Casing Radius, r_c (ft):	0.083	r_{e1}		**(ft)**									
7	Well Radius, r_w (ft):	0.260			0									
8	LNAPL Specific Yield, S_y:	0.175												
9	LNAPL Density Ratio, ρ:	0.754												
10	Top of Screen (ft bgs):	15.0												
11	Bottom of Screen (ft bgs):	35.0												
12	LNAPL Baildown Vol. (gal.):	3.0												
13	Effective Radius, r_{e3} (ft):	0.132	Calculated Parameters											
14	Effective Radius, r_{e2} (ft):	#NUM!												
15	Initial Casing LNAPL Vol. (gal.):	0.49												
16	Initial Filter LNAPL Vol. (gal.):	0.76												
17														
18		**Enter Data Here**							Water Table	LNAPL			LNAPL	
19									Depth	Drawdown		Average	Discharge	s_n
20		Time (min)	DTP (ft btoc)	DTW (ft btoc)	DTP (ft bgs)	DTW (ft bgs)			(ft)	s_n (ft)		Time (min)	Q_n (ft^3/d)	(ft)
21	Initial Fluid Levels:	0	22.02	25.05	22.32	25.35			23.07					
22														
23	Enter Test Data:	0.5	24.24	26.25	24.54	26.55			25.03	2.22				
24		1	24.60	25.50	24.90	25.80			25.12	2.58		0.8	-175.888	2.40
25		2	24.55	25.65	24.85	25.95			25.12	2.53		1.5	15.846	2.56
26		3	24.51	25.50	24.81	25.80			25.05	2.49		2.5	-8.715	2.51
27		4	24.50	25.35	24.80	25.65			25.01	2.48		3.5	-11.092	2.49
28		5	24.47	25.40	24.77	25.70			25.00	2.45		4.5	6.338	2.47
29		6	24.44	25.45	24.74	25.75			24.99	2.42		5.5	6.338	2.44
30		7	24.42	25.30	24.72	25.60			24.94	2.40		6.5	-10.300	2.41
31		10	24.37	25.37	24.67	25.67			24.92	2.35		8.5	3.169	2.38

HOME | Data | Figures | B&R | C&J | CB&P | B&R Type Curve | Flowchart

Figure 1


Time (minutes)
22.0
22.5
23.0
23.5
24.0
24.5
25.0
25.5
26.0
26.5
27.0
Depth (ft)
Value (Y) Axis Major Gridlines
0
500
1000
1500
DTW (blue), Water Table (green), DTP (red)

Q_n (ft^3/d)	s_n (ft)
0	2.2
15	2.7

Drawdown Adjust.	
Δs_n (ft)	0

Figure 3

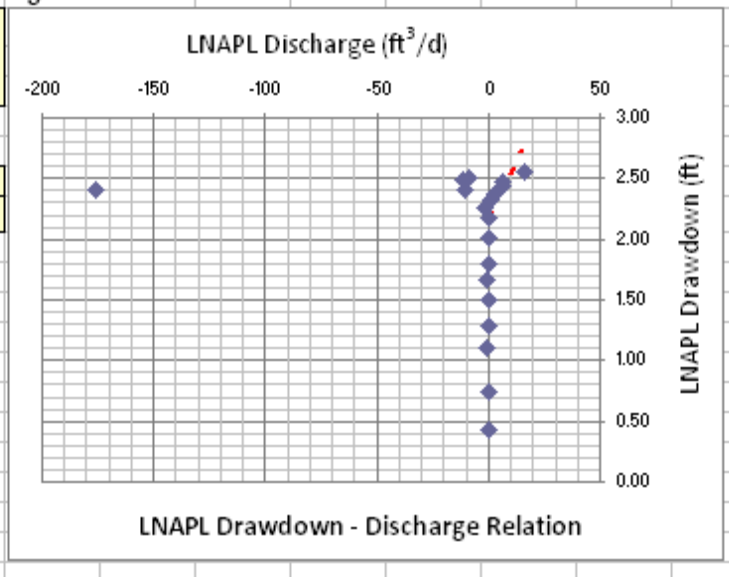
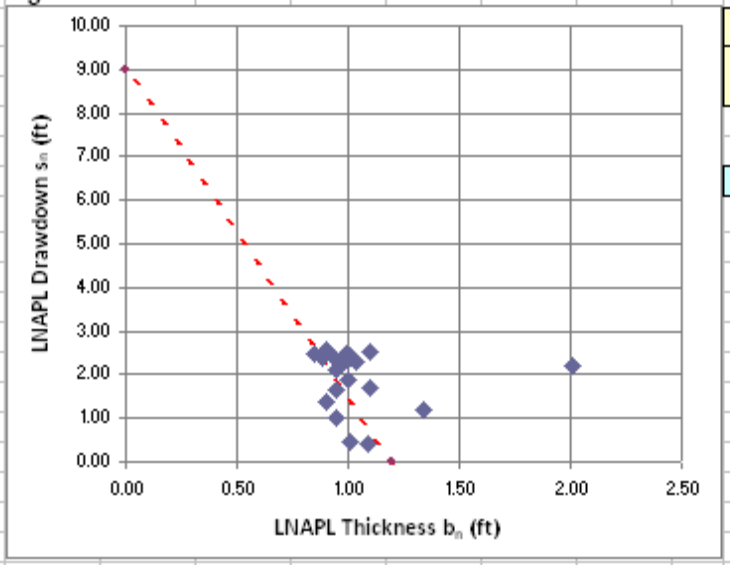


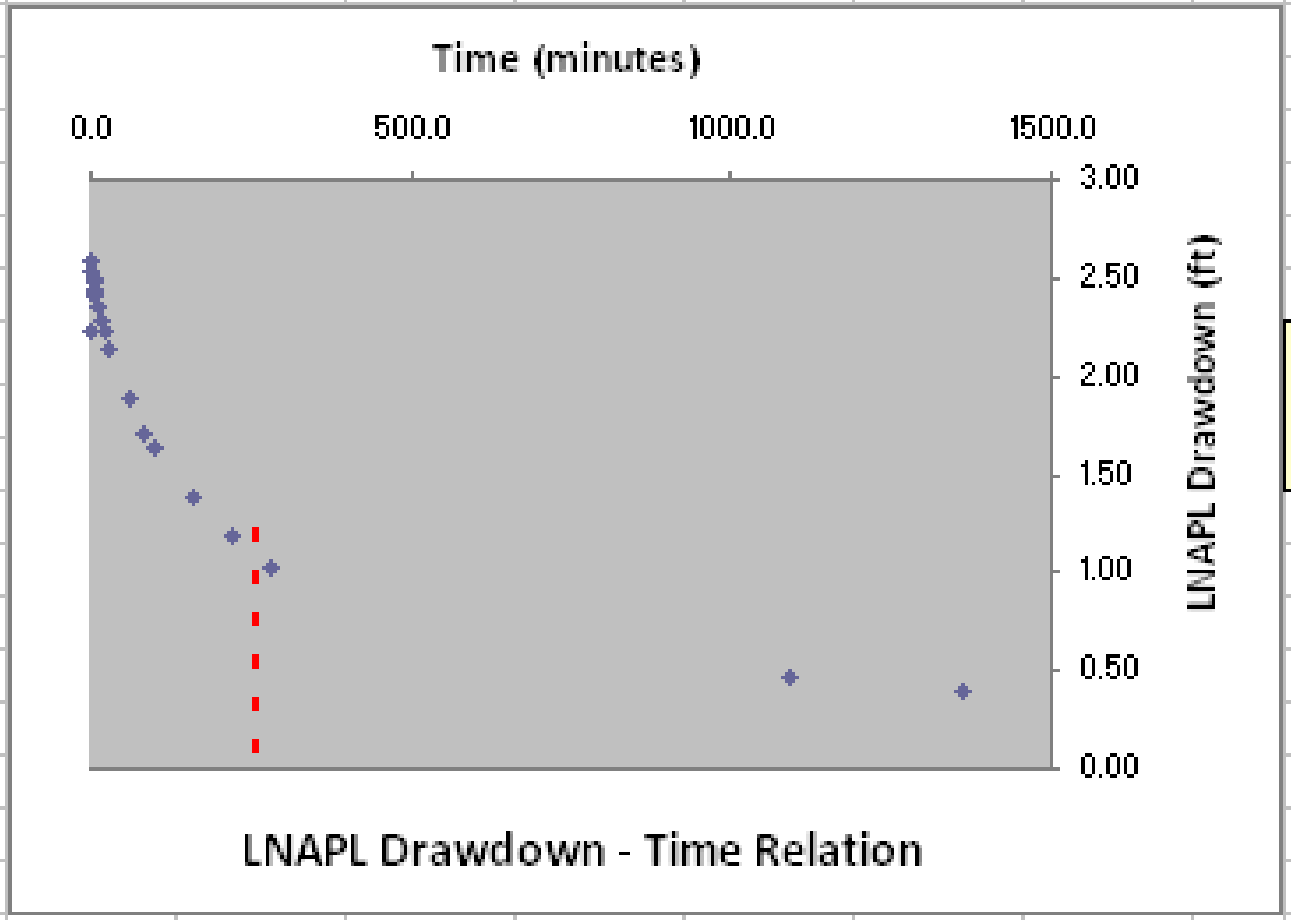
Figure 4



b_n	s_n
1.2	0
0	9

J-ratio	-7.500

Figure 10



t (min)	s_n (ft)
260	1.2
260	0

Generalized Bouwer and Rice (1976)

Well Designation:	MW103
Date:	18-Sep-12

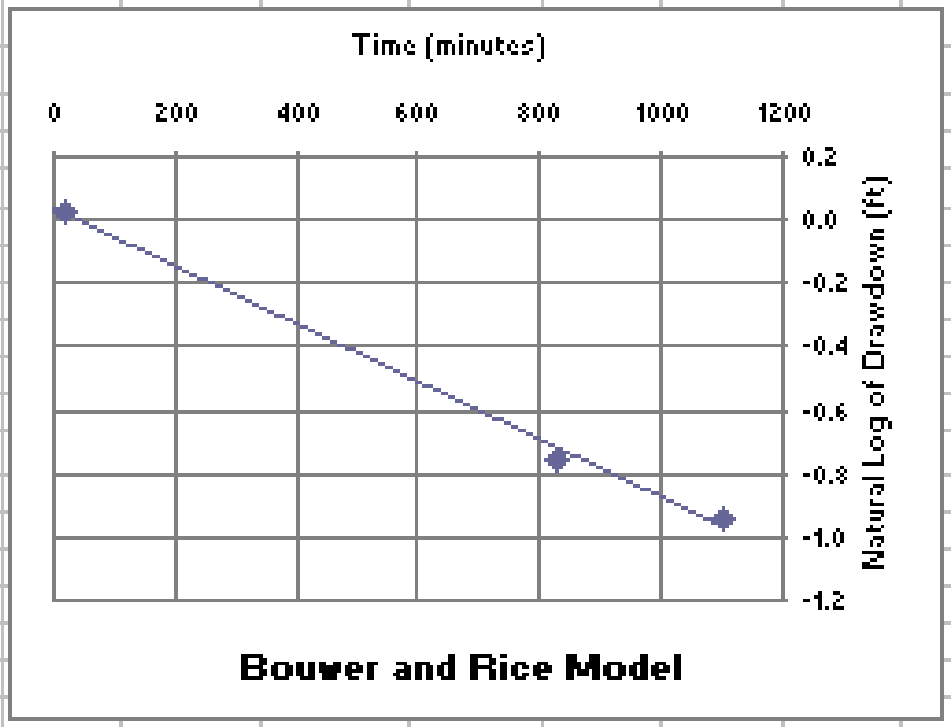
$$T_n = \frac{r_c^2 \ln(R/r_w)\ln(s_n(t_1)/s_n(t))}{2(-J)(t-t_1)}$$

Enter early time cut-off for least-squares model fit

Time$_{cut}$ = 260 <- Enter or change value here

Model Results: T_n (ft²/d) 0.00 +/- 0.00 ft²/d

L/r$_w$	22.9
C	1.71
R/r$_w$	10.47
J-Ratio	-7.500
Coef. Of Variation	0.06



Cooper and Jacob (1946)

$$V_n(t_j) = \sum_{j}^{j} \frac{4\pi T_n s_j}{\ln\left(\frac{2.25 T_n t_j}{r_c^2 S_n}\right)} \Delta t_j$$

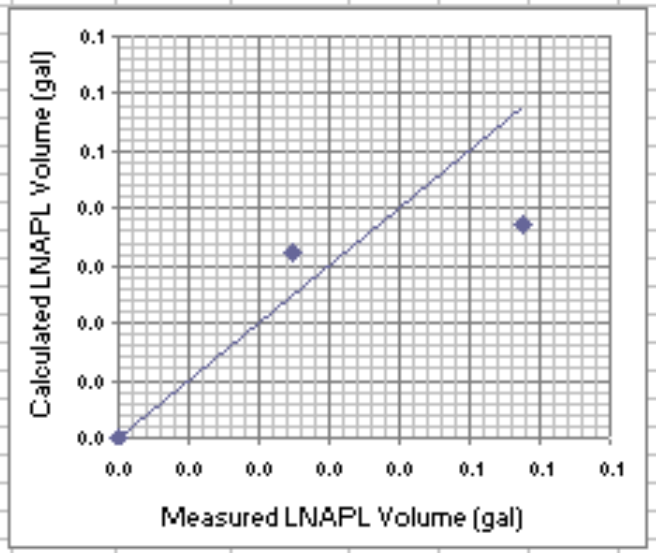
Well Designation:	MW103
Date:	18-Sep-12

Enter early time cut-off for least-squares model fit

Time$_{cut}$ (min):	260	<-- Enter or change values here
Time Adjustment (min):	170	
Trial S$_n$:	0.008	<-- Enter 0 for default or enter S$_n$ value
Root-Mean-Square Error:	0.022	<-- Minimize this using "Solver"
	0.008	<-- Working S$_n$
Trial T$_n$ (ft^2/d):	0.002	<-- By changing T$_n$ through "Solver"

Add constraint T$_n$ > 0.00001

Model Result T$_n$ (ft^2/d): **0.00**



Cooper, Bredehoeft and Papadopulos (1967)

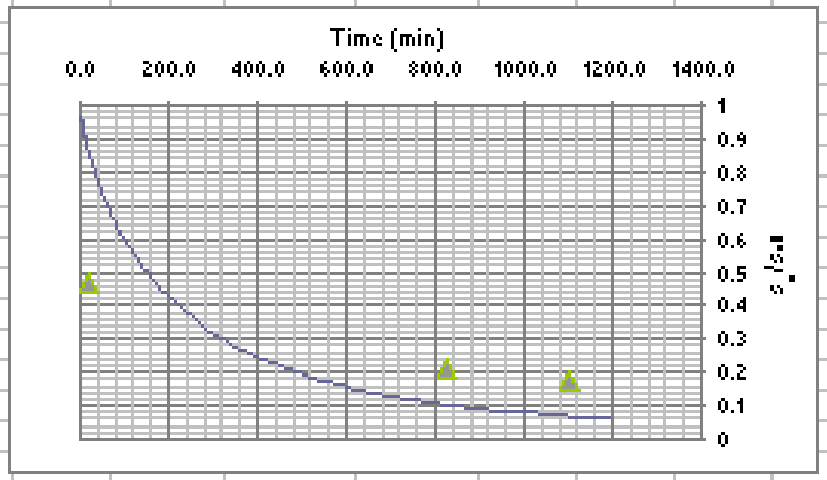
Well Designation:	MW103
Date:	18-Sep-12

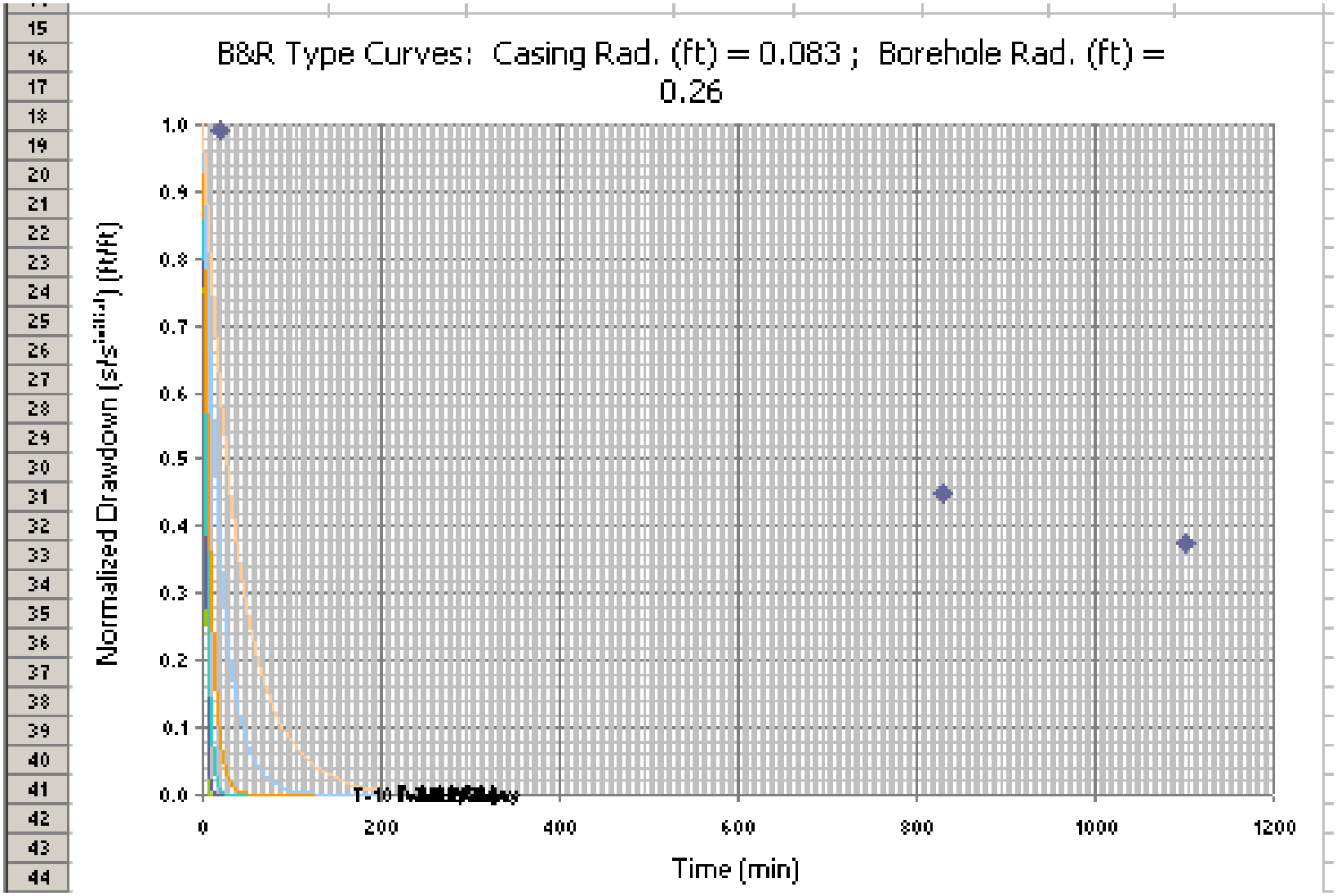
Enter early time cut-off for least-squares model fit

$Time_{cut}$ (min):	260	<-- Enter or change values here
Initial Drawdown s_o (ft):	2.22	
Trial S:	0.008	<-- Enter 0 for default
Root-Mean-Square Error:	0.421	<-- Minimize this using "Solver"
Trial T (ft^2/d):	0.020	<-- By changing T through "Solver"
	0.008	<-- Working S Add constraint Tn > 0.00001
Model Resul T (ft^2/d) =	0.02	

T_{min}	3
T_{max}	1200

J-Ratio
-7.500




B&R Type Curves: Casing Rad. (ft) = 0.083 ; Borehole Rad. (ft) = 0.26
Normalized Drawdown (s/s'initial) (ft/ft)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
200
400
600
800
1000
1200
Time (min)