

Analytical_DistanceDrawdown—An Excel workbook for predicting drawdown in a Theis aquifer

Drawdowns are predicted as function of distance with the Theis ([1935](#)) solution in the Analytical_DistanceDrawdown.xlsm workbook (Figure 1). Ranges of storage coefficient (S), transmissivity (T), time (t), and flow rate (Q) are specified in columns B and C. User-defined units are specified in column E. Individual S, T, time, and Q are specified and changed with sliders in column F. A critical drawdown can be specified, which is annotated on the plot (Figure 1).

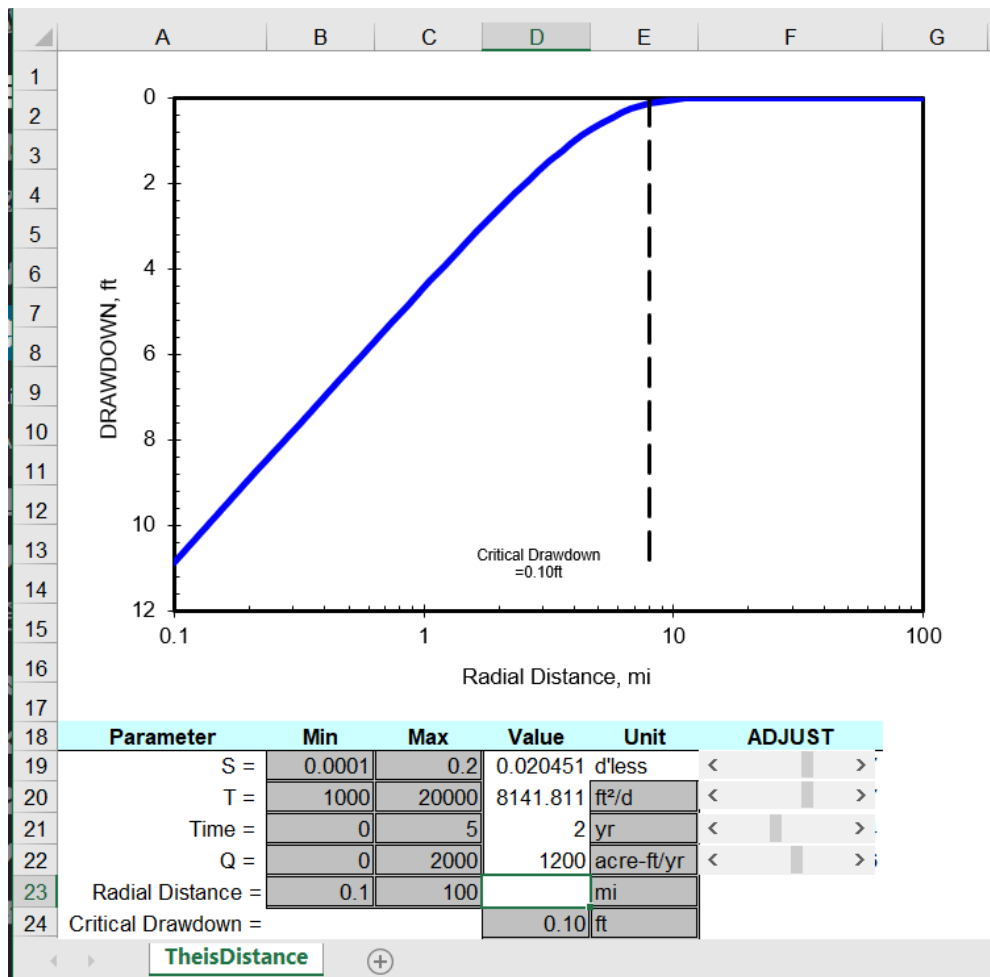


Figure 1.—Distance-drawdown plot and controls in Analytical_DistanceDrawdown.xlsm. Analytical_DistanceDrawdown.xlsm and explanatory PDF can be downloaded with the following link.

References

Halford, K.J. and E.L. Kuniansky 2002, Documentation of spreadsheets for the analysis of aquifer pumping and slug test data, USGS OF 02-197

<https://pubs.usgs.gov/of/2002/ofr02197/>

Theis, C.V., 1935, The relation between the lowering of the Piezometric surface and the rate and duration of discharge of a well using ground-water Storage:

Transactions of the American Geophysical Union, v. 16, no. 2, p. 519–524,

<https://doi.org/10.1029/TR016i002p0051b9>.

Analytical_DistanceDrawdown.xlsm Workbook

The workbook consists of a visible page, *TheisDistance*, and a hidden page, *CONTROL*. The hidden *CONTROL* page contains code for calculating distance drawdown and converting units. Users should not need to edit the page. All user action occur on the *TheisDistance* page (Figure 2). Ranges of storage coefficient (S), transmissivity (T), time (t), and flow rate (Q) are specified in columns B and C. User-defined units are specified in column E. Individual S, T, time, and Q are specified and changed with sliders in column F. A critical drawdown can be specified, which is annotated on the plot.

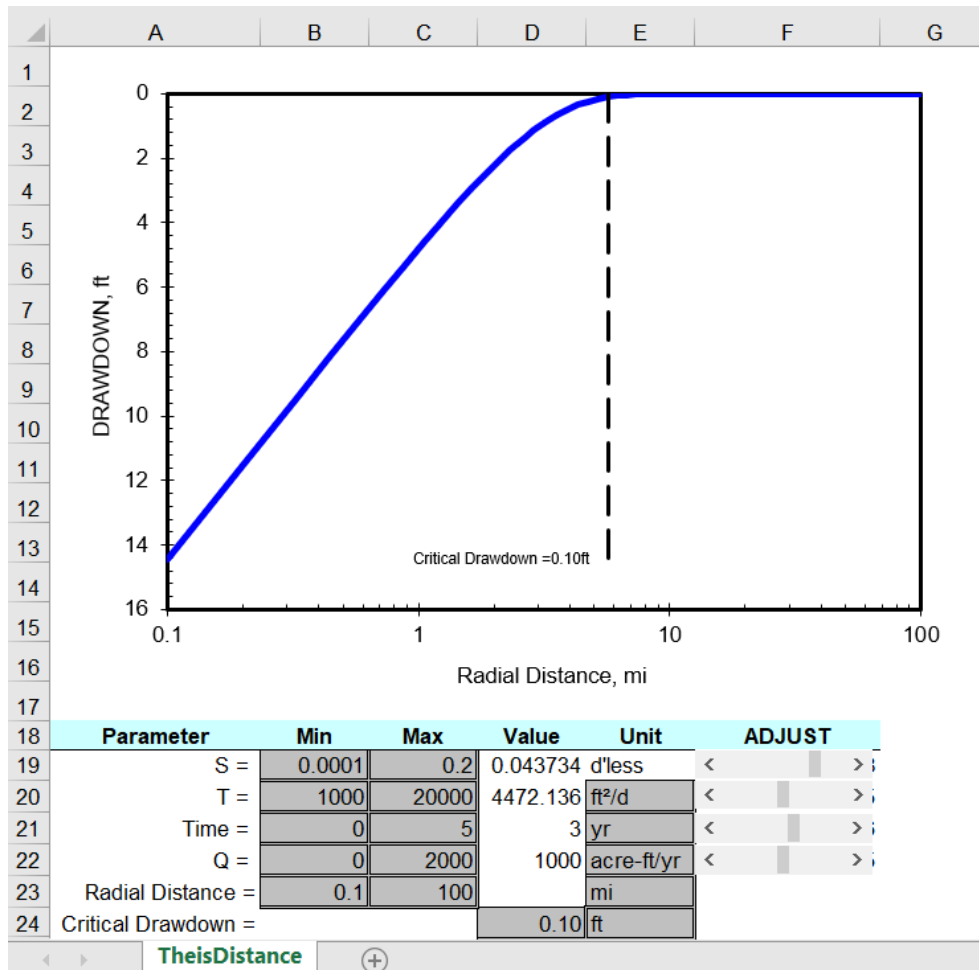


Figure 2.—User controls for *Analytical_DistanceDrawdown.xlsm* workbook.

Predict Distance-Drawdown

Ranges of storage coefficient (S), transmissivity (T), time (t), and flow rate (Q) are specified in columns B and C.

Range of radial distances (row 23) defines extent of plotted drawdowns.

	A	B	C
18	Parameter	Min	Max
19	S =	0.0001	0.2
20	T =	1000	20000
21	Time =	0	5
22	Q =	0	2000
23	Radial Distance =	0.1	100
24	Critical Drawdown =		

Units of T, time, and Q are selected from pull-down menus in column E.

	A	B	C	D	E
18	Parameter	Min	Max	Value	Unit
19	S =	0.0001	0.2	0.043734	d'less
20	T =	1000	20000	4472.136	ft ² /d
21	Time =	0	5	3	yr
22	Q =	0	2000	1000	acre-ft/yr
23	Radial Distance =	0.1	100		mi
24	Critical Drawdown =			0.10	ft

Units of radial distance are selected from a pull-down menu in cell E23.

Units range from ft to mi so that potential effects of an aquifer test and groundwater development can be estimated quickly.

	A	B	C	D	E
18	Parameter	Min	Max	Value	Unit
19	S =	0.0001	0.2	0.043734	d'less
20	T =	1000	20000	4472.136	ft ² /d
21	Time =	0	5	3	yr
22	Q =	0	2000	1000	acre-ft/yr
23	Radial Distance =	0.1	100		mi
24	Critical Drawdown =			0.10	ft

Specific values of S, T, time, and Q used in the distance-drawdown plot appear in column D.

Move sliders in column F to change values in column D.

	A	B	C	D	E	F
	Parameter	Min	Max	Value	Unit	ADJUST
	S =	0.0001	0.2	0.043734	d'less	< >
	T =	1000	20000	8141.811	ft ² /d	< >
	Time =	0	5	3	yr	< >
	Q =	0	2000	1000	acre-ft/yr	< >
	Radial Distance =	0.1	100		mi	< >

Units of simulated drawdown and critical drawdown are selected from a pull-down menu in cell E24.

	A	B	C	D	E
18	Parameter	Min	Max	Value	Unit
19	S =	0.0001	0.2	0.043734	d'less
20	T =	1000	20000	4472.136	ft ² /d
21	Time =	0	5	3	yr
22	Q =	0	2000	1000	acre-ft/yr
23	Radial Distance =	0.1	100		mi
24	Critical Drawdown =			0.10	ft