



Evaluating QC test thresholds with Excel pivot tables and charts

For an actual example, download the file called
'PIVOTCHART_DATA_QC_Hunting_AW_20140422_20190425'
(sorry, it's large!)

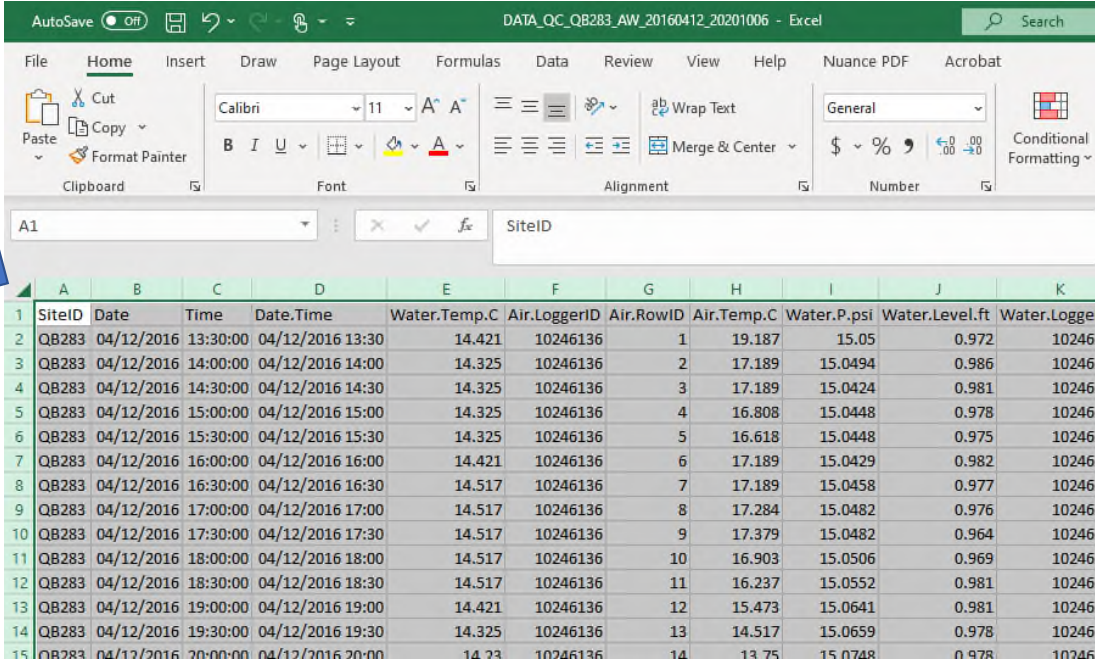
Open the aggregated csv file. Save it as an Excel file.

Name	Date modified	Type
 DATA_QC_QB283_AW_20160412_20201006	02/04/2021 8:26 PM	Microsoft Excel C...
 DATA_QC_QB283_AW_20160412_20201006_Report_Aggregate	02/04/2021 8:27 PM	Microsoft Word D...

Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

Click in the upper left corner of the spreadsheet

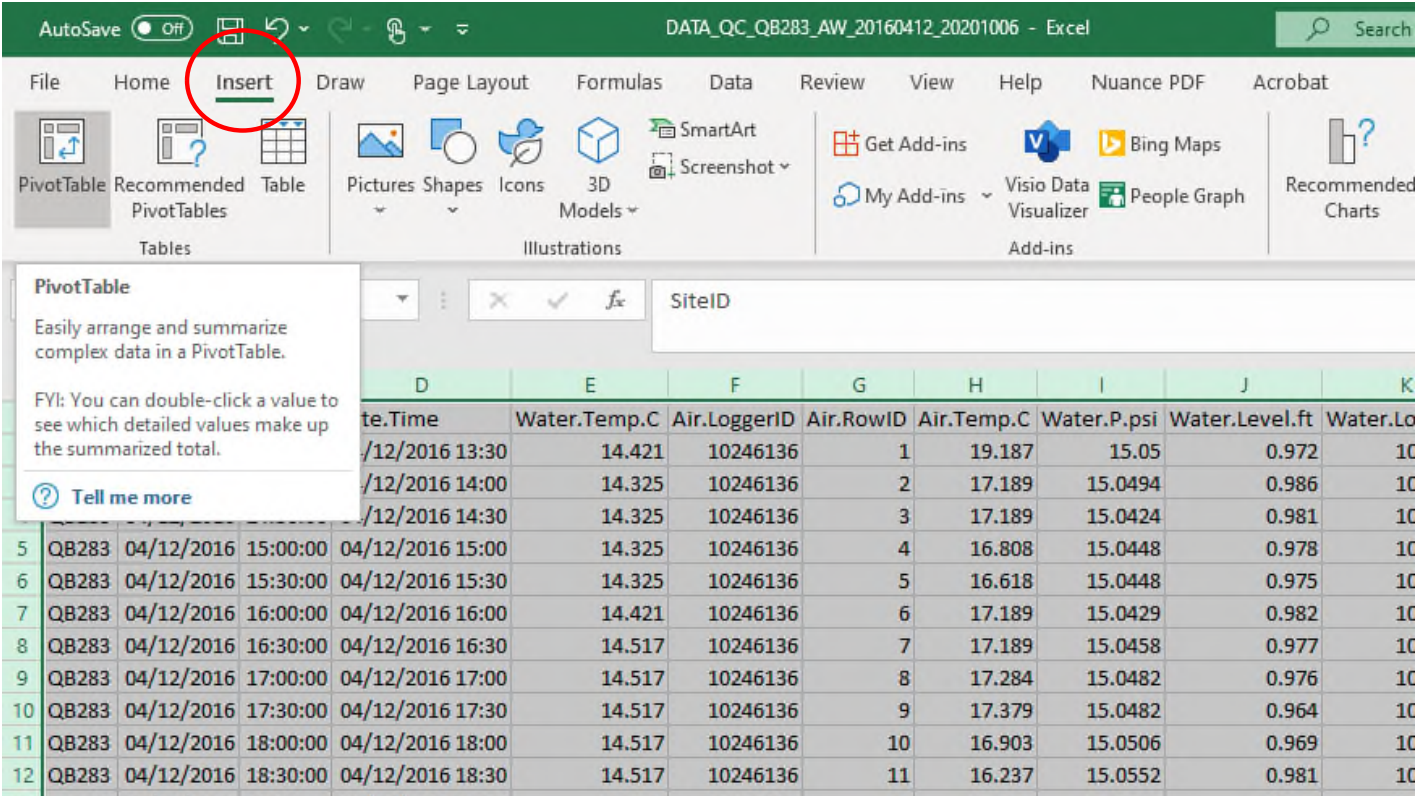
All the cells should become highlighted (in gray)



	A	B	C	D	E	F	G	H	I	J	K
1	SiteID	Date	Time	Date.Time	Water.Temp.C	Air.LoggerID	Air.RowID	Air.Temp.C	Water.P.psi	Water.Level.ft	Water.Logge
2	QB283	04/12/2016	13:30:00	04/12/2016 13:30	14.421	10246136	1	19.187	15.05	0.972	10246
3	QB283	04/12/2016	14:00:00	04/12/2016 14:00	14.325	10246136	2	17.189	15.0494	0.986	10246
4	QB283	04/12/2016	14:30:00	04/12/2016 14:30	14.325	10246136	3	17.189	15.0424	0.981	10246
5	QB283	04/12/2016	15:00:00	04/12/2016 15:00	14.325	10246136	4	16.808	15.0448	0.978	10246
6	QB283	04/12/2016	15:30:00	04/12/2016 15:30	14.325	10246136	5	16.618	15.0448	0.975	10246
7	QB283	04/12/2016	16:00:00	04/12/2016 16:00	14.421	10246136	6	17.189	15.0429	0.982	10246
8	QB283	04/12/2016	16:30:00	04/12/2016 16:30	14.517	10246136	7	17.189	15.0458	0.977	10246
9	QB283	04/12/2016	17:00:00	04/12/2016 17:00	14.517	10246136	8	17.284	15.0482	0.976	10246
10	QB283	04/12/2016	17:30:00	04/12/2016 17:30	14.517	10246136	9	17.379	15.0482	0.964	10246
11	QB283	04/12/2016	18:00:00	04/12/2016 18:00	14.517	10246136	10	16.903	15.0506	0.969	10246
12	QB283	04/12/2016	18:30:00	04/12/2016 18:30	14.517	10246136	11	16.237	15.0552	0.981	10246
13	QB283	04/12/2016	19:00:00	04/12/2016 19:00	14.421	10246136	12	15.473	15.0641	0.981	10246
14	QB283	04/12/2016	19:30:00	04/12/2016 19:30	14.325	10246136	13	14.517	15.0659	0.978	10246
15	QB283	04/12/2016	20:00:00	04/12/2016 20:00	14.33	10246136	14	13.75	15.0748	0.978	10246

Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

Insert
Pivot table



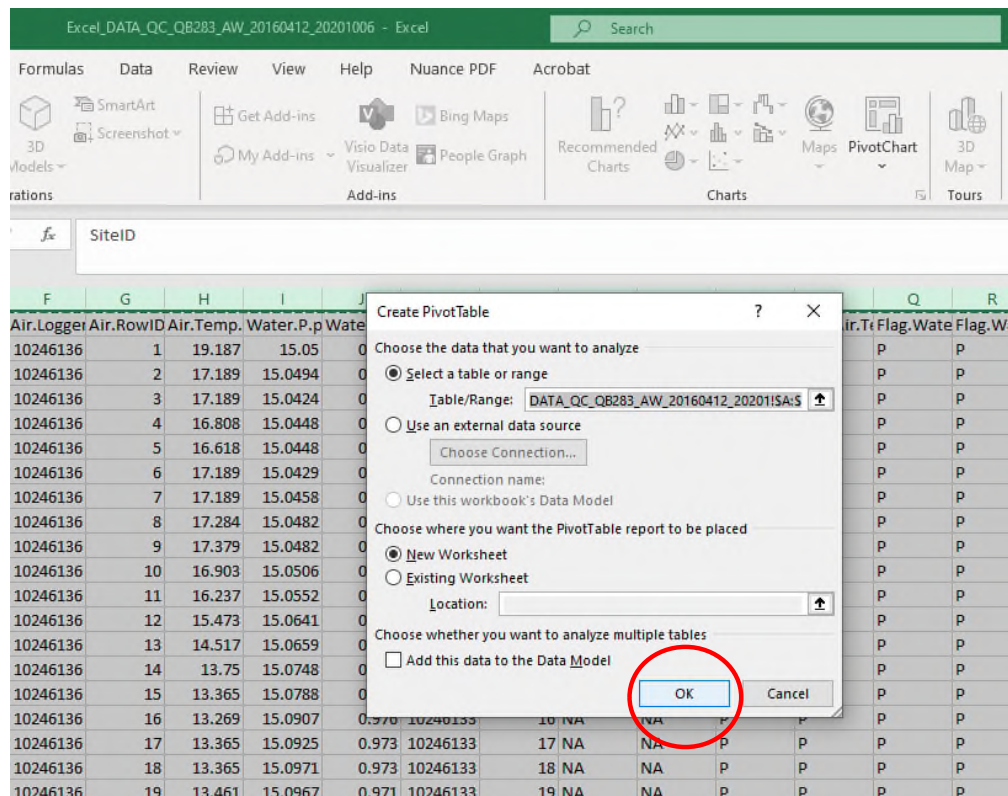
The screenshot shows the Microsoft Excel interface with the 'Insert' tab selected. A blue arrow points to the 'PivotTable' icon in the 'Tables' group. A tooltip for 'PivotTable' is displayed, explaining its function and providing a tip about double-clicking values. The background shows a data table with columns for time, temperature, and pressure.

PivotTable
Easily arrange and summarize complex data in a PivotTable.
FYI: You can double-click a value to see which detailed values make up the summarized total.
[Tell me more](#)

				D	E	F	G	H	I	J	K
				te.Time	Water.Temp.C	Air.LoggerID	Air.RowID	Air.Temp.C	Water.P.psi	Water.Level.ft	Water.Lo
				/12/2016 13:30	14.421	10246136	1	19.187	15.05	0.972	10
				/12/2016 14:00	14.325	10246136	2	17.189	15.0494	0.986	10
				/12/2016 14:30	14.325	10246136	3	17.189	15.0424	0.981	10
5	QB283	04/12/2016	15:00:00	04/12/2016 15:00	14.325	10246136	4	16.808	15.0448	0.978	10
6	QB283	04/12/2016	15:30:00	04/12/2016 15:30	14.325	10246136	5	16.618	15.0448	0.975	10
7	QB283	04/12/2016	16:00:00	04/12/2016 16:00	14.421	10246136	6	17.189	15.0429	0.982	10
8	QB283	04/12/2016	16:30:00	04/12/2016 16:30	14.517	10246136	7	17.189	15.0458	0.977	10
9	QB283	04/12/2016	17:00:00	04/12/2016 17:00	14.517	10246136	8	17.284	15.0482	0.976	10
10	QB283	04/12/2016	17:30:00	04/12/2016 17:30	14.517	10246136	9	17.379	15.0482	0.964	10
11	QB283	04/12/2016	18:00:00	04/12/2016 18:00	14.517	10246136	10	16.903	15.0506	0.969	10
12	QB283	04/12/2016	18:30:00	04/12/2016 18:30	14.517	10246136	11	16.237	15.0552	0.981	10

Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

Click 'ok'



Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

The screenshot shows the Microsoft Excel interface with the following details:

- File Name:** Excel_DATA_QC_QB283_AW_20160412_20201006 - Excel
- Task Pane:** PivotTable Fields
- Fields to Add:** Water.LoggerID, Water.RowID, Logger.Deployment, Flag.Date.Time, Flag.Water.Temp.C, Flag.Air.Temp.C, Flag.Water.P.psi, Flag.Water.Level.ft, Month, Day, ☒ Year, ☒ MonthDay, Flag.Gross.Water.Temp.C, Flag.Spike.Water.Temp.C, Flag.Pa.C.Water.Temp.C
- Drag fields between areas below:**
 - Filters:** (Empty)
 - Columns:** Year
 - Rows:** MonthDay
 - Values:** (Empty)
- PivotTable in Worksheet:**

Column Labels	2016	2017	2018	2019	2020 (blank)	Grand Total
Row Labels						
101						
102						
103						
104						
105						
106						
107						
108						
109						
110						
111						
112						
113						
114						
115						
116						
117						
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123						
124						
125						
126						
127						
128						
129						
130						
131						
201						
202						

Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

The screenshot shows an Excel spreadsheet with a PivotTable. The PivotTable is named 'Count of Water.Temp.C' and is located in the range A3:G34. The PivotTable has 'Row Labels' and 'Grand Total' columns. The data is organized by year (2016, 2017, 2018, 2019, 2020 (blank)) and a 'Grand Total' column. The values are counts of 'Water.Temp.C'.

The PivotTable Fields task pane is open on the right side of the screen. It shows a list of fields to add to the report. The 'Water.Temp.C' field is selected. A yellow callout box points to the 'Value Field Settings' option in the task pane, with the text 'Drag a parameter (in this example, Water Temp) into Value Field Settings'.

The PivotTable data is as follows:

Row Labels	2016	2017	2018	2019	2020 (blank)	Grand Total
101	48	48			48	144
102	48	48			48	144
103	48	48			48	144
104	48	48			48	144
105	48	48			48	144
106	48	48			64	160
107	48	48			96	192
108	48	48			96	192
109	48	48			96	192
110	48	48			96	192
111	48	48			96	192
112	48	48			96	192
113	48	48			96	192
114	48	48			96	192
115	48	48			96	192
116	48	48			96	192
117	48	48			96	192
118	48	48			96	192
119	48	48			96	192
120	48	48			96	192
121	48	48			96	192
122	48	48			96	192
123	48	48			96	192
124	48	48			96	192
125	48	48			96	192
126	48	48			96	192
127	48	48			96	192
128	48	48			96	192
129	48	48			96	192
130	48	48			96	192

Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

The screenshot displays the Microsoft Excel interface with a PivotTable and the Value Field Settings dialog box open. The PivotTable is named 'Max of Water.Temp.C' and is located in the range A3:L35. The PivotTable has 'Row Labels' in column A and 'Grand Total' in column L. The data is organized by year (2016, 2017, 2018, 2019, 2020) and a 'blank' category. The 'Max of Water.Temp.C' field is summarized by 'Max'.

The Value Field Settings dialog box is open, showing the 'Source Name' as 'Water.Temp.C' and the 'Custom Name' as 'Max of Water.Temp.C'. The 'Summarize Values By' section is set to 'Show Values As', and the 'Summarize value field by' section is set to 'Max'.

A yellow callout box with the text 'Under Value Field Settings, select Max (or Min)' points to the 'Max' option in the 'Summarize value field by' list.

The PivotTable Fields task pane on the right shows the 'Water.Temp.C' field selected and added to the 'Values' area. A blue arrow points from the 'Max of Water.Temp.C' field in the 'Values' area to the 'Max' option in the Value Field Settings dialog box.

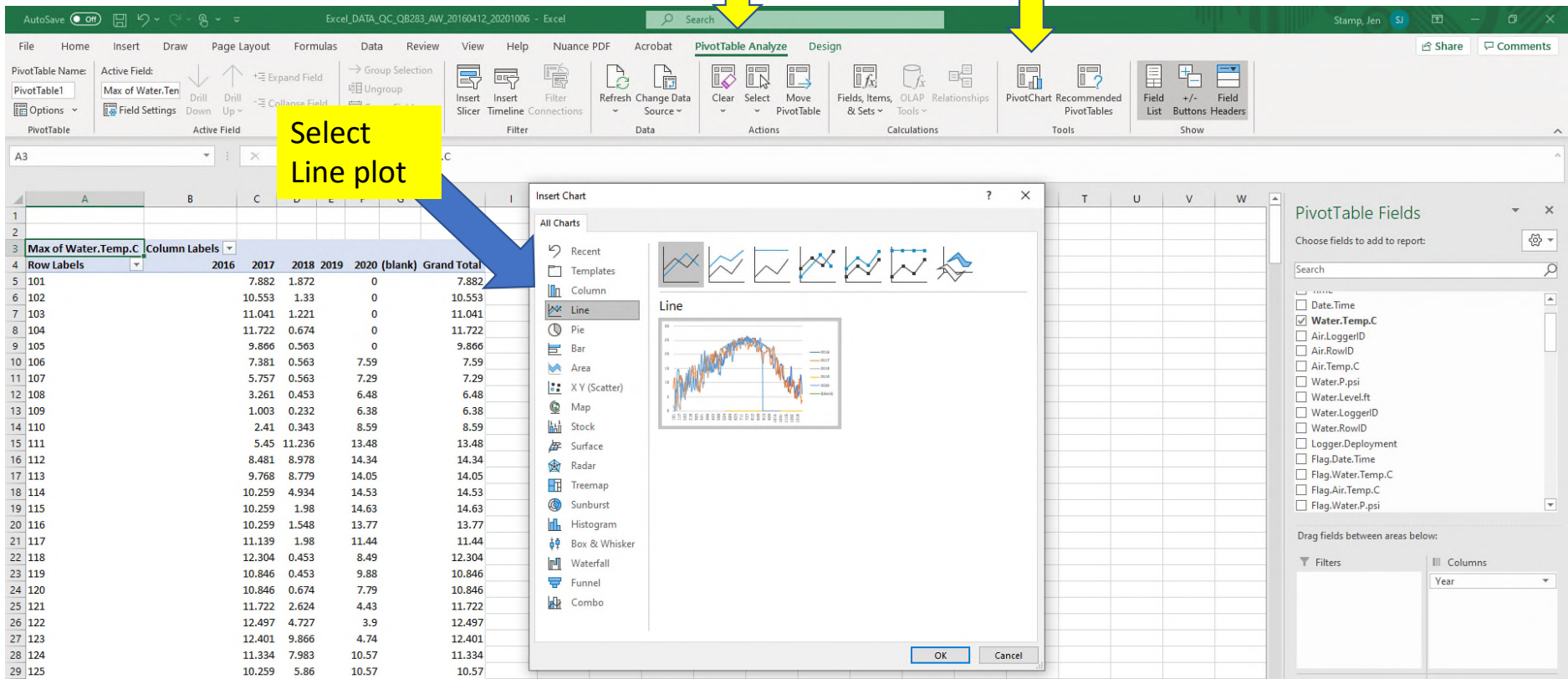
Row Labels	2016	2017	2018	2019	2020 (blank)	Grand Total
101	7.882	1.872	0	0	7.882	
102	10.553	1.33	0	0	10.553	
103	11.041	1.221	0	0	11.041	
104	11.722	0.674	0	0	11.722	
105	9.866	0.563	0	0	9.866	
106	7.381	0.563	7.59	7.59	7.59	
107	5.757	0.563	7.29	7.29	7.29	
108	3.261	0.453	6.48	6.48	6.48	
109	1.003	0.232	6.38	6.38	6.38	
110	2.41	0.343	8.59	8.59	8.59	
111	5.45	11.236	13.48	13.48	13.48	
112	8.481	8.978	14.34	14.34	14.34	
113	9.768	8.779	14.05	14.05	14.05	
114	10.259	4.934	14.53	14.53	14.53	
115	10.259	1.98	14.63	14.63	14.63	
116	10.259	1.548	13.77	13.77	13.77	
117	11.139	1.98	11.44	11.44	11.44	
118	12.304	0.453	8.49	12.304	12.304	
119	10.846	0.453	9.88	10.846	10.846	
120	10.846	0.674	7.79	10.846	10.846	
121	11.722	2.624	4.43	11.722	11.722	
122	12.497	4.727	3.9	12.497	12.497	
123	12.401	9.866	4.74	12.401	12.401	
124	11.334	7.983	10.57	11.334	11.334	
125	10.259	5.86	10.57	10.57	10.57	
126	11.625	4.831	9.09	11.625	11.625	
127	10.259	6.674	8.09	10.259	10.259	
128	7.28	9.472	7.59	9.472	9.472	
129	6.775	9.472	7.09	9.472	9.472	
130	6.674	7.582	7.49	7.582	7.582	
131	7.179	4.623	6.38	7.179	7.179	

Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

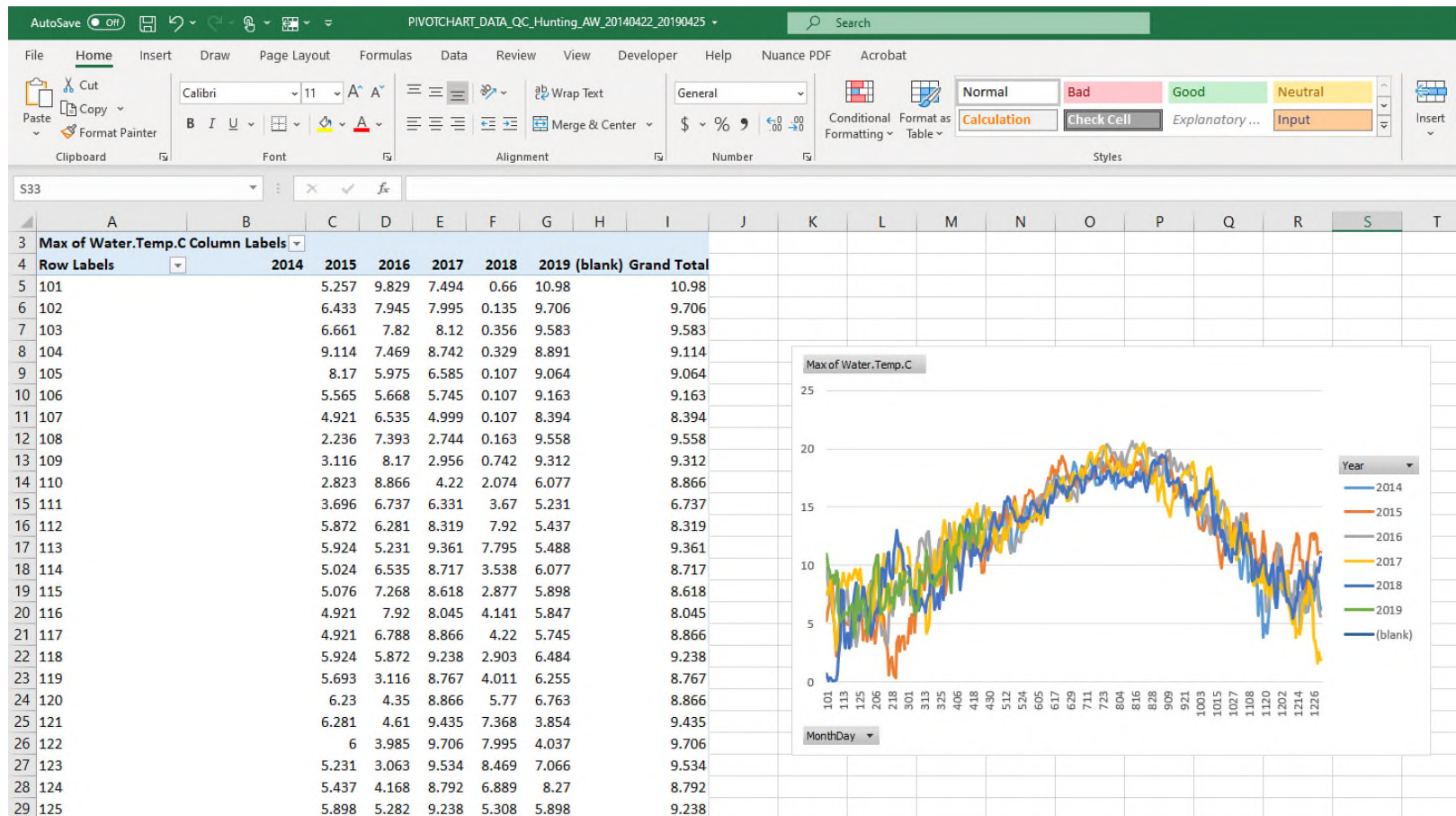
Click on PivotTable
Analyze tab

Click on Pivot Chart

Select
Line plot



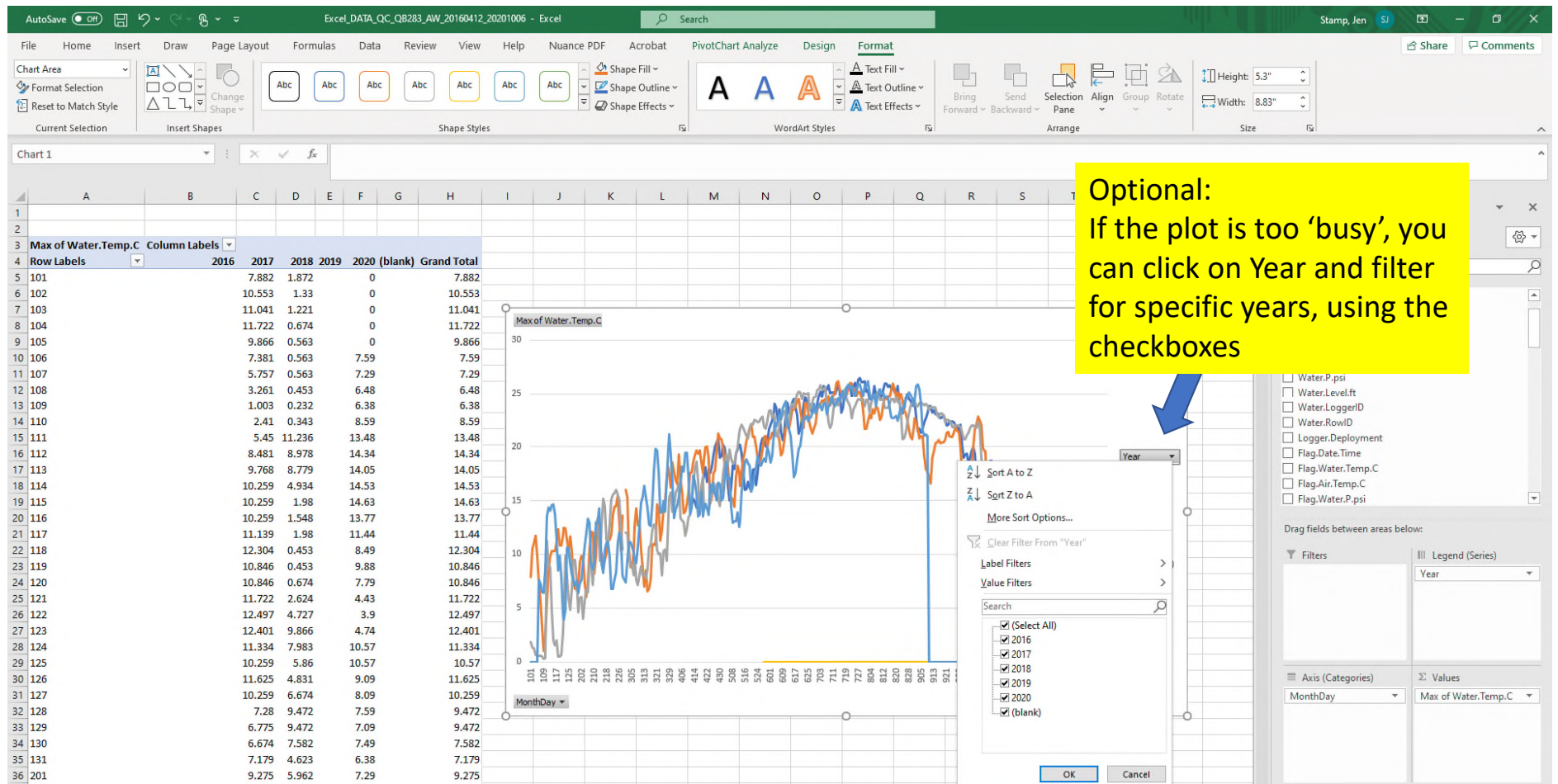
Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel



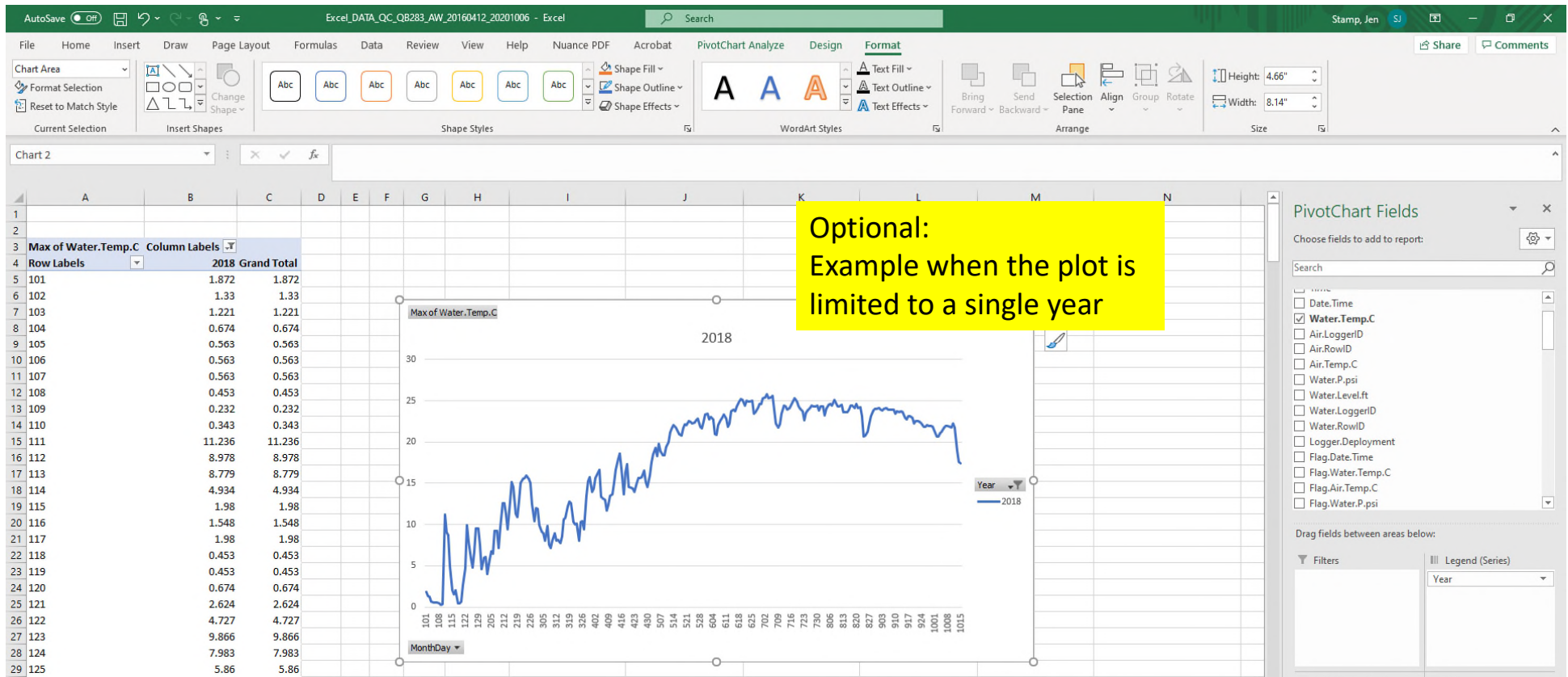
Evaluate the maximum and minimum values (in this example, maximum value for water temperature).

Do the default thresholds look appropriate for your site? If not, adjust them.

Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel



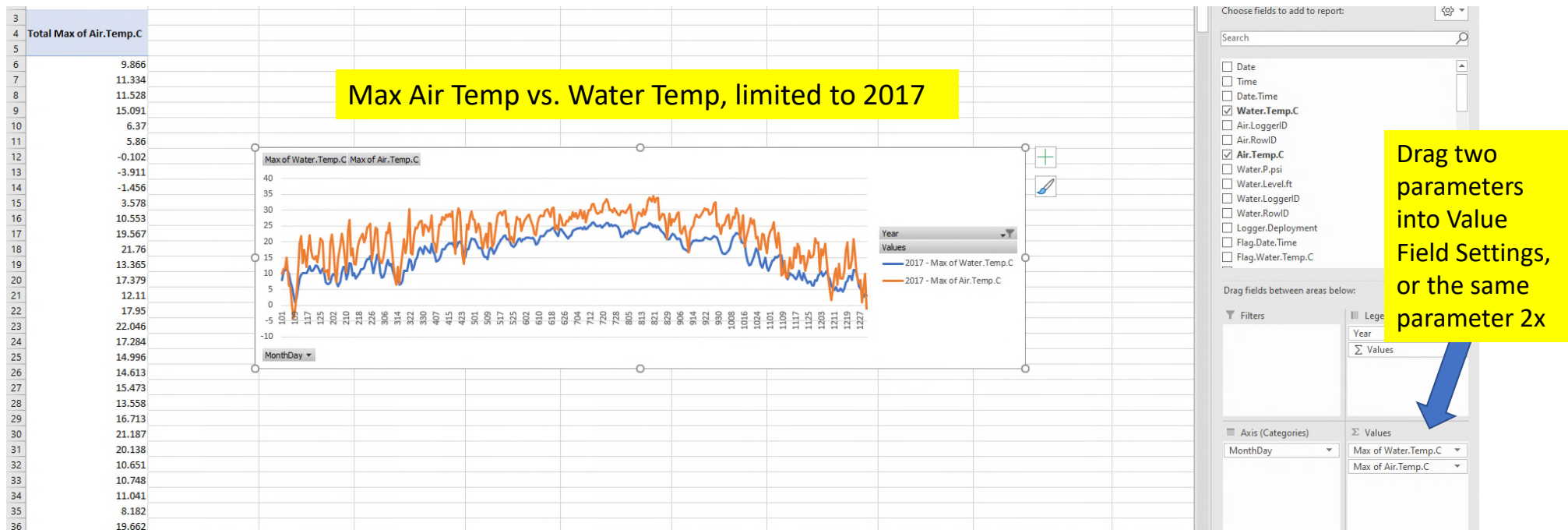
Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel



Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

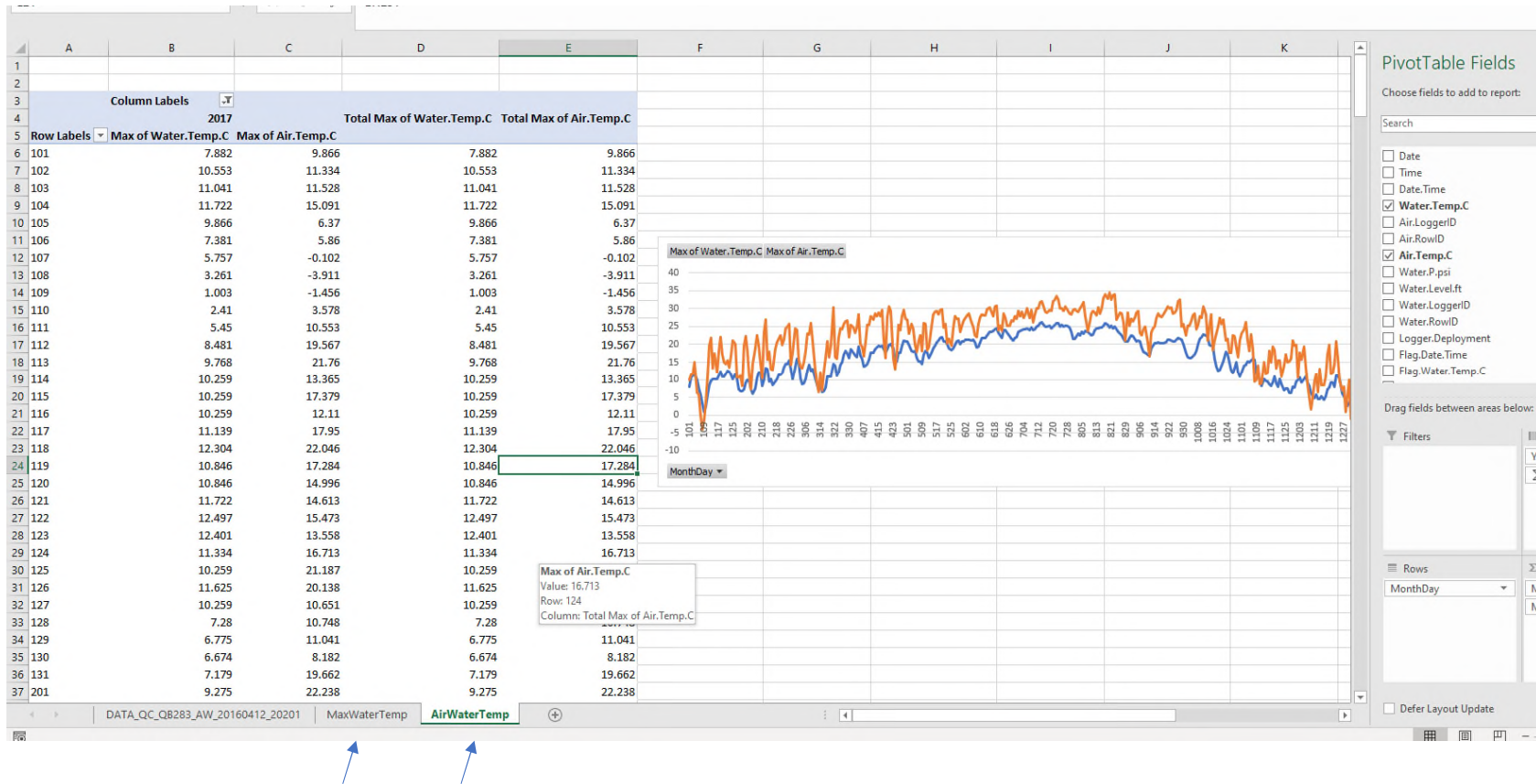
Optional:

You can also put two parameters in the Values box at once, or put the same parameter in twice (e.g., water temp 2x) and select max value for one and min for the other, and both will appear in the plot.



Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

As you create new pivot tables/charts, rename the worksheets (e.g., MaxWaterTemp)



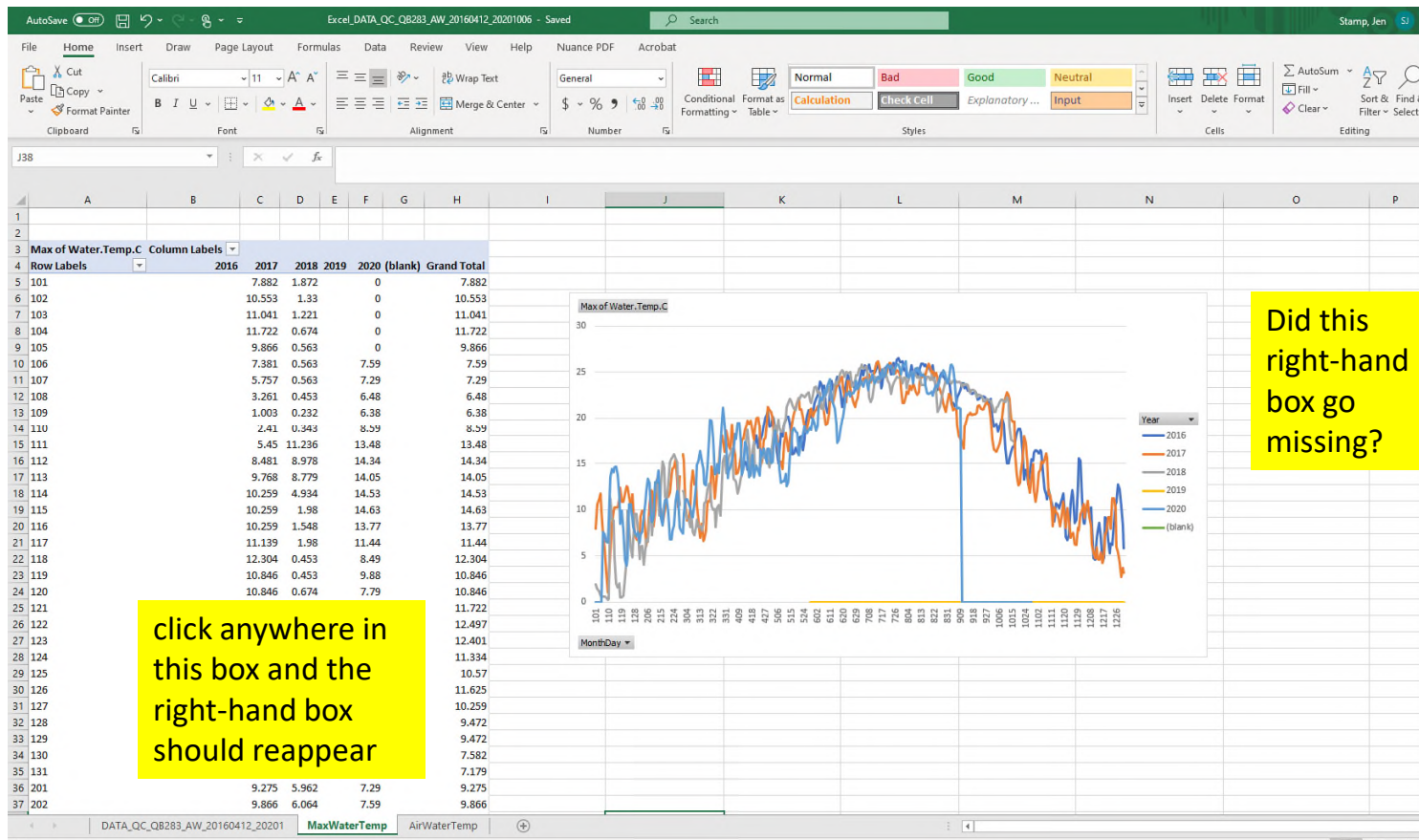
rename the worksheets (e.g., MaxWaterTemp)

For an example, see the Excel file 'PIVOTCHART_DATA_QC_Hunting_AW_20140422_20190425'

Evaluate the Unrealistic Values ('Gross range') thresholds with time series plots in Excel

Troubleshooting tip

If the box on the right-hand side disappears, click on the columns on the left-hand side and the right-hand box should reappear



Evaluating the Spike Test thresholds in Excel

Spike test evaluation

AutoSave Off PIVOTCHART_DATA_QC_Hunting_AW_20140422_20190425

File Home Insert Draw Page Layout Formulas Data Review View Developer

Clipboard Font Alignment

J4

	A	B	C	D	E	F	G	H	I
1	Date	Time	Year	MonthDay	Water.Temp.C	Water Spike	Air.Temp.C	Air Spike	
2	2014-04-22	11:00:00	2014	422	NA	#VALUE!	21.963	0.12	
3	2014-04-22	11:30:00	2014	422	NA	#VALUE!	21.843	#VALUE!	
4	2014-04-22	12:00:00	2014	422	11.078	0.073	NA	#VALUE!	
5	2014-04-22	12:30:00	2014	422	11.151	0.17	NA	#VALUE!	
6	2014-04-22	13:00:00	2014	422	11.321	0.073	NA	#VALUE!	
7	2014-04-22	13:30:00	2014	422	11.394	0.098	22.92	1.53	
8	2014-04-22	14:00:00	2014	422	11.492	0.145	21.39	0.884	
9	2014-04-22	14:30:00	2014	422	11.637	0.267	22.274	1.054	
99436	2019-04-25	05:00:00	2019	425	12.219	0.048	14.361	0.335	
99437	2019-04-25	05:30:00	2019	425	12.171	0.049	14.026	0.192	
99438	2019-04-25	06:00:00	2019	425	12.122	0.024	13.834	0.072	
99439	2019-04-25	06:30:00	2019	425	12.098	0.048	13.906	0.072	
99440	2019-04-25	07:00:00	2019	425	12.05	0.025	13.978	0.288	
99441	2019-04-25	07:30:00	2019	425	12.025	0.024	14.266	0.502	
99442	2019-04-25	08:00:00	2019	425	12.001	0.024	14.768	0.717	
99443	2019-04-25	08:30:00	2019	425	12.025	0.025	15.485	1.097	
99444	2019-04-25	09:00:00	2019	425	12.05	0.024	16.582	0.595	
99445	2019-04-25	09:30:00	2019	425	12.074	0.073	17.177	1.118	
99446	2019-04-25	10:00:00	2019	425	12.147	0.121	18.295	2.212	
99447	2019-04-25	10:30:00	2019	425	12.268	0.121	20.507	0.572	
99448	2019-04-25	11:00:00	2019	425	12.389	0.169	21.079	0.621	
99449	2019-04-25	11:30:00	2019	425	12.558	0.169	21.7	0.909	
99450	2019-04-25	12:00:00	2019	425	12.727	0.193	22.609	0.431	
99451	2019-04-25	12:30:00	2019	425	12.92	0.168	23.04	0.024	
99452	2019-04-25	13:00:00	2019	425	13.088		23.016		
99453									

Create a new worksheet

Copy and paste Date, Time, Year, MonthDay, and the desired parameters into the worksheet (in this example, Water.Temp.C and Air.Temp.C)

Create a new column for each parameter (in this example, WaterSpike and Air Spike, highlighted in yellow). Enter the absolute difference formula (cell above – cell below). In this example, where the water temperature data is in Col E, you start with this formula =ABS(E2-E3) and carry it to the bottom (the next cell should read ABS(E3-E4) and so on...

Delete the value in the last row since it doesn't have another value to compare to.

Create a pivot table and column plot – see next slide

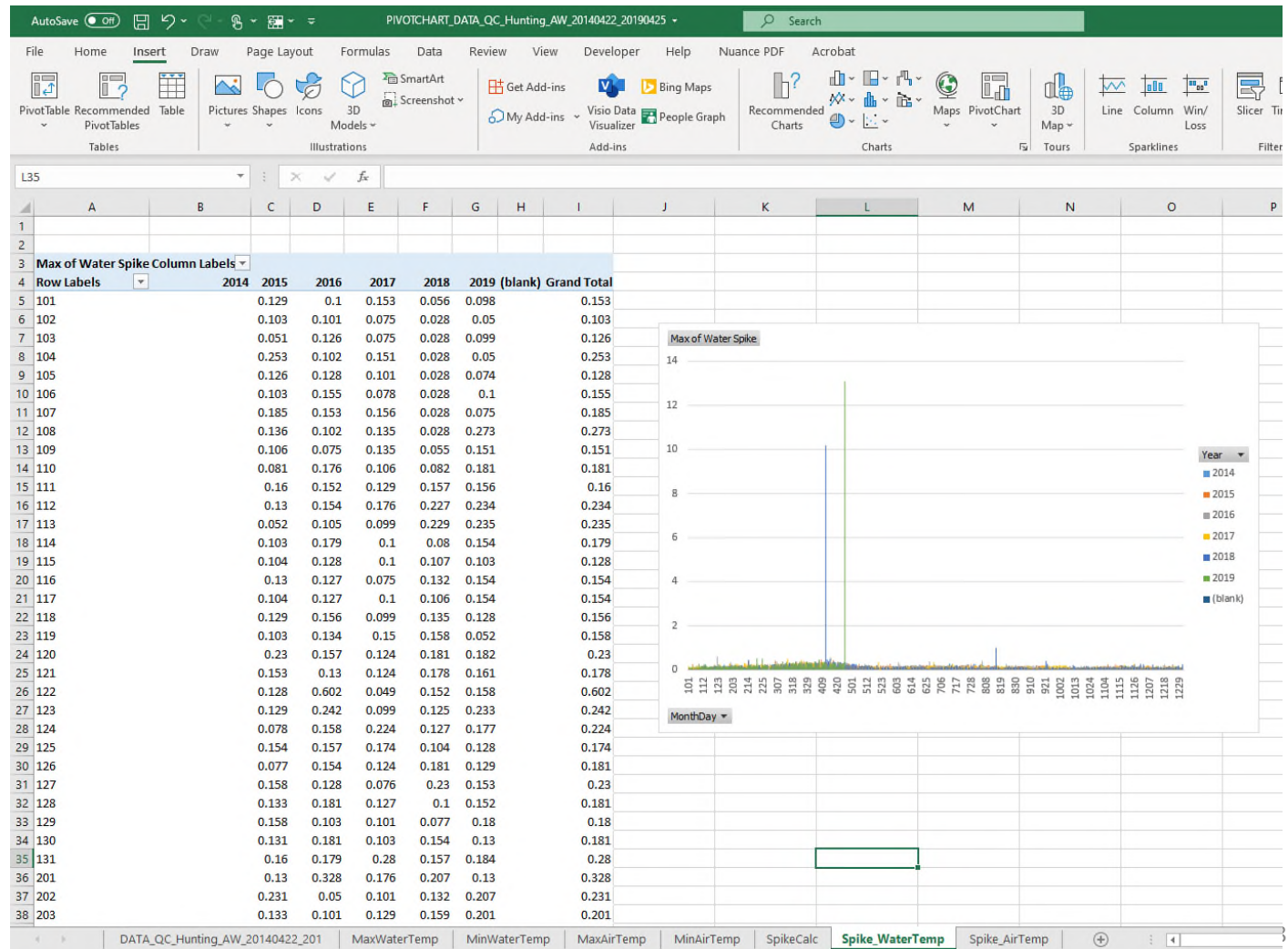
Spike test evaluation

To create the pivot table, follow the same instructions as above (see slides 3-9) except select 'Column plot' instead of 'Line plot'.

Evaluate the maximum values.

Do the default thresholds look appropriate for your site? If not, adjust them.

Sorry – these plots get to be slow and clunky because the Excel file is usually very large. But I find them helpful enough to be worth the time, at least currently.



Documentation

ThresholdsCheckWorksheet_Template_20220117						
File Home Insert Draw Page Layout Formulas Data Review View Developer Help Nuance PDF Acrobat						
<div> <div> <div>AutoSave Off</div> <div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> </div> <div> <div> <div>File</div> <div>Home</div> <div>Insert</div> <div>Draw</div> <div>Page Layout</div> <div>Formulas</div> <div>Data</div> <div>Review</div> <div>View</div> <div>Developer</div> <div>Help</div> <div>Nuance PDF</div> <div>Acrobat</div> </div> </div> </div>						
<div> <div> <div>Clipboard</div> <div> <div>Cut</div> <div>Copy</div> <div>Paste</div> <div>Format Painter</div> </div> </div> <div> <div>Font</div> <div> <div>Calibri</div> <div>11</div> <div>A⁺</div> <div>A⁻</div> <div>B</div> <div>I</div> <div>U</div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> </div> <div> <div>Alignment</div> <div> <div>Wrap Text</div> <div>Merge & Center</div> </div> </div> <div> <div>Number</div> <div> <div>General</div> <div>\$</div> <div>%</div> <div></div> <div></div> </div> </div> <div> <div>Conditional Formatting</div> <div>Format as Table</div> </div> </div>						
<div> <div>H26</div> <div> <div></div> <div></div> <div></div> </div> </div>						
A	B	C	D	E	F	G
1	Gross			New threshold(s)		
2	Analyte	Flag	Limit	Default		
3		Fail	Hi	> 30 deg C		
4	Temperature, Water (deg C)	Fail	Lo	< -2 deg C		
5		Suspect	Hi	> 25 deg C		
6		Suspect	Lo	< -0.1 deg C		
7		Fail	Hi	> 38 deg C		
8	Temperature, Air (deg C)	Fail	Lo	< -25 deg C		
9		Suspect	Hi	> 35 deg C		
10		Suspect	Lo	< -23 deg C		
11		Fail	Hi	> 17 psi		
12	Pressure, Water (psi)	Fail	Lo	< 13 psi		
13		Suspect	Hi	> 16.8 psi		
14		Suspect	Lo	< 13.5 psi		
15		Fail	Hi	> 15 psi		
16	Barometric Pressure, Air (psi)	Fail	Lo	< 13 psi		
17		Suspect	Hi	> 14.8 psi		
18		Suspect	Lo	< 13 psi		
19		Fail	Hi	> 10^5 ft		
20	Sensor Depth or Water Level (ft)	Fail	Lo	< -1 ft		
21		Suspect	Hi	> 1000 ft		
22		Suspect	Lo	< 0 ft		
23		Fail	Hi	> 10^5 ft3/s		
24	Discharge (ft3/s)	Fail	Lo	< -1 ft3/s		
25		Suspect	Hi	> 1000 ft3/s		
26		Suspect	Lo	< -1 ft3/s		
27		Fail	Hi	> 20 mg/L		
28	Dissolved oxygen (mg/L)	Fail	Lo	< 1 mg/L		
29		Suspect	Hi	> 18 mg/L		
30		Suspect	Lo	< 2 mg/L		
31		Fail	Hi	> 1500 uS/cm		
32	Conductivity (uS/cm)	Fail	Lo	< 10 uS/cm		
33		Suspect	Hi	> 1200 uS/cm		
34		Suspect	Lo	< 20 uS/cm		

Documentation

We provide a ‘threshold check’ worksheet that you can use to document threshold changes and the basis for those changes.

Download the Excel file
‘ThresholdsCheckWorksheet_Template_20220117’

Reminder –
Units are important! If you change from feet to meters or °C to °F, you will need to adjust the default QC test thresholds accordingly. The user can also modify the units in the Config file.