

Outline— Hydrologic Analysis with Excel, NGM September 10-11, 2019

Day 1

00_Topics_and_Approach

01_Excel-Navigation

- Configure Excel—Stop autosave, clear default directory, trusted locations, show developer tab in ribbon.
- Keyboard navigation and blocks of data, function keys, F2, F4, F8, F9, F11, and heavily used keyboard shortcuts such as, **Ctrl+1**.
- Status bar –Quick sampling functions—01_PRISM_4.0km.NV.xlsx.
- Paste special—Values, math, transpose—02_NamedRanges.xlsx.
- Named ranges and [data validation](#)—02_NamedRanges.xlsx.

02_AQ-SingleWell_PUMPING+FlowLOG

- Cooper-Jacob interpretation
- Recovery analysis
- Jacob—Lohman analysis of flowing wells
- Reporting transmissivity
- Complications from thermal expansion
- Conventional interpretation of flow logs
- Effects of vertical flow and turbulence on interpretation of flow logs

03_Excel-Plotting

- Create stacked bar and lines—01_BarLine.xlsx.
- Bar charts differentiate positive & negative—02_Departure.xlsx.
- XY Adding elements to charts –
Copy-paste, Direct entry in formula bar—03_XYmap.xlsx.
- Specify labels from ranges—04_FC_isotope_PAIRS.xlsx.
- Adding custom symbols to series by pasting—05_sir2012-5196_app3.xlsm.
- Digitize data with chart—06_Digitize_from_Picture-in-a-Chart.xlsx.
- Compute perimeter and area of polygon—07_XY_Perimeter+Area.xlsx.

04_AQ-SingleWell_SLUGS

- Uses and terminology
- Bouwer & Rice
- Oscillating or underdamped slug tests
- Interpreting recovery in tight formations

05_Excel-ConditionalFormatting

- Shade PRISM with generic flood—01_PRISM_4.0km.NV.xlsx.
- Controlled shading of PRISM—01_PRISM_4.0km.NV.xlsx.
- Introduce [INT](#) and [MOD](#) functions—02_CHV_StandardizedLOG.xlsm.
- Build standardized log with [remove duplicates](#), [conditional formatting](#), [MROUND](#), and [VLOOKUP](#) function—02_CHV_StandardizedLOG.xlsm.
- Apply functions in a scrap workbook to avoid stray named ranges.

06_Excel-Text+Logic_Functions

- Introduce [LEFT](#), [VALUE](#), [LEN](#), [FIND](#), [MID](#), [RIGHT](#), [IF](#), and [ISNUMBER](#) functions— 01_TextManipulate.xlsx.
- Introduce [SUBSTITUTE](#), [TEXT](#), and [HYPERLINK](#) functions— 01_TextManipulate.xlsx.
- If statements and logic— 02_IFplus.xlsx.
- Create scatter plot and categorize data — 03_TransmissivityDV3.xlsx.
- Error handling with IF statements— 04_ErrorHandling.xlsx

07_SIM-Geology+Hydrology

- Analysis of relation between transmissivity estimates from aquifer-tests and predicted hydraulic conductivity distributions from geohydrologic frameworks in southern Nevada.
- Field-scale estimates of flow measurements, K, or transmissivity are compared to fracture counts, fault effects, thickness of geohydrologic units, and depth.
- Recommendations for designing and calibrating groundwater-flow models.

Day 2

08_Excel-Regression

- Analyze specific conductance-chloride from Death Valley—
Regress in chart and duplicate with equations—01_linearQW.xlsx.
- Analyze log-transformed specific capacity-transmissivity relations and demonstrate limitations of regression equations—
02_Example_T-SC-DeathValley+OtherSCeqs.xlsx.

09_Excel-SeriesSEE-Sampler

- Demonstrate SeriesSEE, an Excel Add-In for analyzing time series or geophysical logs.
- Install and illustrate example with class.

10_Excel-IF-Histograms

- Create Google Earth cover of [PRISM](#) output for Nevada—
01_ARRAY_PRISM_4.0km.NV.xlsx & KMLmakeARRAY.GridPoly.v2.xlsm.
- Dynamically subsample [PRISM](#) output with [OFFSET](#) and [MATCH](#) functions—
01_ARRAY_PRISM_4.0km.NV.xlsx.
- Build histogram and sum cumulative precipitation volumes with [COUNTIF](#) and [SUMIF](#) functions—01_ARRAY_PRISM_4.0km.NV.xlsx.

11_ SIM-Geo2K_Calibration+ModelDiagnostics

- Illustrate creating and calibrating of groundwater model from southern Nevada
 - Distributing hydraulic conductivities with a geologic framework
 - Stress-response approach to calibrating flow models
 - Calibration criteria for steady-state model—Differences between simulated and measured water levels, water-level profiles, discharges, transmissivities.
 - Calibration criteria for transient model—Differences between simulated and measured water-level changes and spring flows. Illustrate with hydrographs mapped in Google Earth (KMZ files).
 - Mapping hydraulic-property distributions to KMZ files. Qualitatively evaluate where estimates “Look funny.”
- Map features with XY chart, add XY locator, and sample map area from Google Earth—Example_SS-ModelDiagnostics.

12_Excel-Solver

- Explain weighted sum-of-squares objective functions and parameter transforms necessary for using the [Solver](#) add-in— 00_ParameterEstimation+SOLVER.pptx.
- 2-parameter Theis example—01_Theis_Solution+Sensitivity.xlsm.
- 3-parameter Theis with image well for [analyzing aquifer test](#)— 02_TheisStream.xlsm.
- Estimate A, B, and C for a velocity index-stage relation— 03_Velocity-Stage-Relation.xlsm.
- Differences between regularization with zones and prior information— 04_RegularizeParameters-Compare.xlsm.

13_Excel-ReducingDATA

- Translate 3-column data to a table—Use [remove duplicates](#), [MATCH](#), and [OFFSET](#) functions—01_3columnQW.xlsx.
- Parse stream flow data with [text to columns](#)— 02_MuddyR_finish.xlsx.
- Reduce data with [pivot tables](#)— 02_MuddyR_finish.xlsx.
- Dynamically reduce with [MATCH](#) and [OFFSET](#) functions— 02_MuddyR_finish.xlsx.

14_AQ-MultipleWell+DrawdownEstimation

- Discuss interpretation of multiple-well aquifer with analytical and numerical tools.
- Present examples of detecting small drawdowns with water-level modeling.
- Demonstrate effects of additional wells and information with 2016 and 2018 carbonate-rock aquifer tests at Long Canyon.

15_Excel-Piper+Stiff-Plots

- Present tool for plotting Piper diagram and mapping Stiff plots with example from Southern Nevada.

16_Excel-AdvancedCharts

- Shaded area for pumping with [INT](#) and [MOD](#) functions— 01_ShadedXY.xlsx.

17_Excel-UserFunctions_WaterBalance

- Simulate pit lake with simple model of precipitation, ET, and groundwater inflow. Simulated stage solved with forward differences. Demonstrates interpolation in look-up tables — 01_WaterBalance.xlsm.
- Replicate pit lake model with user-defined function that iteratively solves for lake stage. Demonstrates ease of applying user-defined functions — 01_WaterBalance.xlsm.
- Demonstrates user-defined functions for determining if a XY location is inside or outside of a polygon and translating coordinates between UTM and latitude-longitude — InOut+UTM2LL_Functions.xlsm.
- Demonstrate user-defined functions for simulating drawdowns from variable pumping rates by superimposing Theis solutions — Theis_SuperTime.xlsm.