Ross Kushnereit PG is experienced in numerical flow and transport modeling for water resources applications for both surface and groundwater as well as model calibration and uncertatiny. Mr. Kushnereit has developed skills in model planning through utilizing geographical information systems, remote sensing, map analysis and composition. He has applied modeling codes such as MODFLOW, HEC-RAS and HEC-HMS. His software expreince also includes geographic information systems (GIS) through software such as QGIS and ESRI products. His programming languages include Python and GIT, which he applies to a variety of hydrogeologic data used for model development. More recently he has performed model calibration and uncertatiny analysis using the popular inversion software PEST++. He has worked independently and with teams, on a wide range of diverse and unique projects for state and local governments as well as federal clients.

Years of Experience: 10

Education:

* MS, 2017, Geology, University of Texas at San Antonio
* BS, 2015, Geological Sciences, Angelo State University

Professional Registrations/Affiliations:

* Professional Geologist (PG)

Professional History:

2023 – Present Sr. Hydrogeologist – Rock Solid Analytics LLC

2017 – 2023 Hydrogeologist – INTERA Incorporated, Austin, TX

2015 – 2017 Hydrologist – U.S. Geological Survey, San Antonio, TX

2014 – 2015 Student Hydrologist – U.S. Geological Survey, San Angelo, TX

2013 – 2015 Student Research Assistant – Angelo State University, San Angelo, TX

Specialized Training & Software:

* Python, GIT, LATEX
* PEST++, MODFLOW6, MODFLOW & MODFLOW-USG, MODPATH, MODPATH3DU, TTim, PEST, HEC-RAS
* FloPy, pyEMU, scikit-learn, GDAL, Geopandas, rasterio, Flask
* QGIS, Texmaker
* Windows, OSX, Linux

**Project Experience – Water Resources**

Uncertainty analysis to Sparta/Queen City/Carrizo/Wilcox Aquifer in the Groundwater Management Area 12 Groundwater Availability Model, around Milam and Burleson Counties, TX. 2021-2022. *Lead Modeler.* Used PEST-IES and pyemu to estimate uncertainty based on aquifer properties in the aquifers using well tests, and monitoring data that were not available during the creation of the original Groundwater Management Area (GMA) 12 model. This also helped to show uncertainty in the DFCs for the GMA12 region.

Culebra Tfields uncertainty analysis Milestone, U.S. Department of Energy - Sandia National Laboratories, Carlsbad, NM. 2021-2022. *Lead Modeler.* Starting from an initial set of 1,000 geostatistical realizations of transmissivity in the Culebra, PEST-IES was used to generate an ensemble of calibrated realizations based on pump test information as well as a new transient monitoring well distribution. These fields will then be used in Sandia’s risk management plan for representing radionuclide transport in the Culebra formation in the vicinity of the Waste Isolation Pilot Plant (WIPP) in Carlsbad New Mexico.

Updated to Simsboro Aquifer in the Groundwater Management Area 12 Groundwater Availability Model, Milam and Burleson Counties, TX. 2020. *Lead Modeler.* Used pest-ies to evaluate a new transmissivity field in the Simsboro aquifer using well test that were not available during the creation of the original Groundwater Management Area (GMA) 12 model.

Victoria County Groundwater Conservation District Geostatistics, Victoria County, TX. 2020 – 2021. *Lead Modeler.* Designed a geostatistical python package “skspatial” for interpolating water levels in the in the gulf coastal aquifer system using a combination of MODFLOW head results and measured water level data.

Post Oak Savannah Groundwater Conservation District Geostatistics, Milam and Burleson Counties, TX. 2020. *Lead Modeler.* Designed a geostatistical python package “skspatial” for interpolating water levels in the in the Carrizo Wilcox aquifer system using a combination of MODFLOW head results and measured water level data.

Culebra Release Point Reassessment Milestone, U.S. Department of Energy - Sandia National Laboratories, Carlsbad, NM. 2020. *Lead Modeler.* Preliminary assessment of addition to the Waste Isolation Pilot Plant (WIPP) in Carlsbad New Mexico. Used DTRKMF (particle tracking code from Sandia) to evaluate the amount of time required for particles to exit the property using an ensemble of calibrated hydrogeologic parameters.

Well Assessment, Evangeline-Laguna, San Patricio County, TX. 2019 – 2020. *Lead Modeler.* Constructed an unstructured grid MODFLOW USG model with GRIDGEN and GIS to model impacts of a wellfield in the area. The MODFLOW model was calibrated with PEST to match drawdown at several monitoring wells as well as matching the flow from each of the units the well was screened in. This was performed by using the CLN package in MODFLOW to produce flow measurements.

Culebra Release Point Reassessment Milestone, U.S. Department of Energy - Sandia National Laboratories, Carlsbad, NM. 2019. *Lead Modeler.* Preliminary assessment of addition to the WIPP in Carlsbad New Mexico. Used MODPATH to evaluate the amount of time required for particles to exit the property using an ensemble of calibrated hydrogeologic parameters.

Brackish Groundwater Identification and Development of a Flow and Transport Model, Victoria County Groundwater Conservation District, Victoria County, TX. 2018 – 2019. *Lead Modeler.* Designed a flow and transport model in the Gulf Coast Aquifer. Tasks included estimating the salinity at different depths using geophysical well logs, estimating the percentage of sand and clay in each formation, and modeling drawdown of fresh water from predictive pumping in brackish water. Simulations were conducted using FloPy with MODFLOW-NWT.

Aquifer Storage and Recovery, Post Oak Savannah Groundwater Conservation District, Milano, TX. 2018 – 2019. *Modeler.* Used the particle tracking program; mod-PATH3DU to estimate recoverability of artificial recharge in an unstructured multilayered model representing a portion of the GMA 12 groundwater availability model. Simulations were conducted using Python with MODFLOW-USG and mod-PATH3DU.

Pecos Valley Alluvium Model Calibration, Edwards Steeple-O/Turnkey Processing Solutions, Pecos County, TX. 2018. *Lead Modeler.* Calibration of a groundwater model representing the City of Crane’s wellfield in West Texas. Calibrations were made using transient water levels to predict future impacts on drawdown.

Aquifer Storage and Recovery Modeling, University of Texas, Austin, TX. 2018. *Lead Modeler.* Worked with students and professors at University of Texas (UT) to evaluate the use of particle tracking to estimate recoverability of artificial recharge. Hypothetical models were built using MODFLOW-NWT and MODPATH to compare with UT’s analytical solutions. The tests were all within 1% of each other which allowed for future testing with heterogenous aquifer conditions.

Quality Assurance of MODPATH and MODPATH3DU - U.S. Department of Energy - Hanford Site, CH2M Hill Plateau Remediation Company, Hanford, WA. 2018. *Modeler.* Designed quality assurance tests evaluating the accuracy of particle tracking programs like MODPATH and mod-PATH3DU for use in Hanford. Tests were designed to track forwards and backwards particles to compare with analytical solutions, such as the stagnation distance from a well or how a particle moves through heterogeneous hydraulic conductivity fields.

Brackish Groundwater Identification and Development of a Flow and Transport Model, Victoria Port Power, Victoria County, TX. 2017 – 2018. *Lead Modeler.* Designed a flow and transport model for an 80 x 80-mile model domain in the Texas Gulf Coast Aquifer system to estimate impacts of pumping a single well planned to be installed by Victoria Port Power. The impacts of interest include drawdown of the Lower and Upper Goliad Formations, and the change in total dissolved solids after pumping. Simulations were conducted using FloPy with MODFLOW-NWT and MODPATH along with geospatial tools such as GDAL and QGIS.

Pecos Valley Alluvium Modeling, Black Mountain Sand, West Texas. 2017. *Modeler.* Designed steady-state and transient model of the Pecos Valley Alluvium to estimate the impact of predicted pumping from sand mines using FloPy, with MODFLOW-NWT along with geospatial tools such as GDAL and QGIS.

Graphics for Plume Tracking - U.S. Department of Energy – Hanford Site, CH2M Hill Plateau Remediation Company, Hanford, WA. 2017 – 2018. *Analyst.* Utilized Python scripting to calculate UCL95 calculations and produce report quality graphics. The graphics were used for tracking plumes of dense non-aqueous phase liquid and light non-aqueous phase liquid through time under various remediation scenarios conducted with MODFLOW-NWT and MT3D.

Glasscock County Santa Rosa Well Spacing Evaluation, OXY USA, Glasscock County, TX. 2017. *Modeler.* Utilized TTim analytical solutions to optimize well spacings in the Santa Rosa Formation. TTim was coupled with geospatial analysis to develop several hypotheses of wellfield drawdown.

Subsidence Risk Modeling, Harris-Galveston Subsidence District, Harris County, TX. 2017. *Modeler.* Worked under the Vice President of Water Resources to develop a risk model of subsidence related to pumping for Harris County, this included using MODFLOW-NWT and the subsidence package to evaluate the impacts of development on land subsidence.

Bandera County Flood Mapping, Bandera County River Authority and Groundwater District, TX. 2017. *Lead Modeler.* Developed a one-dimensional (1D) HEC-RAS steady state flow model for the Medina River in Bandera County. Project activities included preparing a surface water model, designing floodway zones and automating the processing of hydrological data for model input to inform emergency response to the effects of flash flooding in South Central Texas.

Houston Groundwater Subsidence, City of Houston, TX. 2016 – 2017. *Analyst.* Team member of a 40-year, regional depiction of groundwater levels and subsidence of the coastal aquifer system for Harris County. Project activities included the automation of water level data processing, mapping contours of water levels in coastal aquifer system, time-series analysis and quantification, geostatistical and geospatial analysis, and ASCII table data processing.

Estimating Recharge into the Edwards Aquifer, Edwards Aquifer Authority/University of Texas - San Antonio, South Central, TX. 2016 – 2017. *Student Research Assistant.* Developed Python scripts for estimating annual recharge into the Edwards Aquifer to be used by the Edwards Aquifer Authority for water management. The original method was transcribed from a series of spreadsheets to allow of ease of data extraction from the U.S. Geological Survey (USGS) National Water Information Systems (NWIS). The code then was automated to allow for uncertainty analysis using a Monte Carlo sampling distribution to better understand the ranges of annual recharge to the aquifer caused by baseflow separations and large storm events.

San Antonio River Streamflow Depletion Model, San Antonio River Authority, South Central Texas. 2015 – 2017. *Modeler.* Team member of a three-year, surface-water/groundwater modeling analysis to estimate the impact of projected domestic and irrigation pumping on the San Antonio River. Tasks on the project included MODFLOW data preparation, geostatistical and geospatial modeling and analysis, geologic and hydrostratigraphic interpretation.

Fort Bliss Hydrogeological Atlas, U.S. Department of Defense, El Paso, TX. 2015 – 2017. *Database Manager.* Team member of a three-year, integrated assessment of historical and current water resources data for a hydrogeological atlas for Fort Bliss, Texas and surrounding facilities. Project activities included plotting water level data in three-dimensional (3D) to observe the differences in water levels between historical and recent data. Geochemical analysis performed with ArcGIS was also used to observe the effects of population growth in El Paso, Texas.

Hydrostratigraphic Mapping of Edwards/Trinity Units, Edward Aquifer Authority, South Central, TX. 2015 – 2017. *GIS Analyst.* Field mapping of Edwards and Trinity outcrops to develop a high resolution vectorized surface geology map to be used for both conceptual and numerical groundwater modeling of the Edwards Aquifer.

Integrated Hydrologic Risk and Assessment Model Analysis, U.S. Federal Emergency Management Agency, Corsicana, TX. 2015 – 2016. *Modeler.* Team member of a two-year, integrated surface water model analysis to evaluate streamflow and reservoir elevation for multiple lakes for Federal Emergency Management Agency. Project activities included climate data munging; time-series analysis and quantitation; geostatistical and geospatial modeling and analysis; ASCII data processing; and HEC-HMS data preparation.

Research and Analysis of the Aquifers in the Permian Basin, Angelo State University, San Angelo TX. 2013 – 2015. *Student Research Assistant.* Collected and analyzed data related to the conceptual groundwater model development and of the upwelling of brackish water to aquifers above the Permian Basin. This research was provided to the Rocker B. Ranch in Regan and Upton Counties, Texas to provide insight on the effects of water quality in shallow aquifers caused by secondary oil recovery of deep Permian reservoirs.

**Publications, Presentations, and Reports**

Kushnereit, R.K., Yan, T., and Johnson, P.B., 2019. Culebra Release Point Reassessment Milestone Report (WBS 4.4.2.3.1). Austin, TX: INTERA, October 17, 2019. ERMS 572133.Young, S. C., Kushnereit, R. K., Simulations of Groundwater Flow and Transport to Support the Permit Application for a Brackish Water Well for Victoria Port Power, Victoria, TX, February 2018.

Kushnereit, R. K., Calibrating and Automating Recharge Estimates into the Edwards Aquifer, and Uncertainty Analysis using the Python Scripting Language and a Monte Carlo Sampling Technique, South-Central, Texas. Diss. The University of Texas at San Antonio, 2017.

Kushnereit, R. K. 2017. Methods and Introduction of an Automated Method Using the Python Scripting Language. U.S. Geological Survey Karst Interest Group Proceedings, San Antonio, TX, May 16 – 18, 2017, 81.

Kushnereit, R.K., Slattery, R.N., 2016. Using Python to Automate Recharge Estimates in the Edwards Aquifer, South-Central Texas. U.S. Geological Survey (USGS) Groundwater Conference presentation. Reno, Nevada.

Kushnereit, R.K., Ward, J.W. 2015. Modeling Hydro-Stratigraphy and Geochemical Analysis of the Rocker-B Ranch, West Texas. Cirus, ASU Undergraduate Research Journal, Vol.3, No3, submitted July 1, 2015.

Kushnereit, R.K, and Ward, J.W.\* Modeling Hydro-Stratigraphy and Geochemical Analysis of the Rocker-B Ranch, West Texas. ASU Undergraduate Research Symposium, April 2015.