

Indian Wells Valley Groundwater Basin

Hydrogeological Conceptual Model (HCM)
March 7, 2019



Introduction

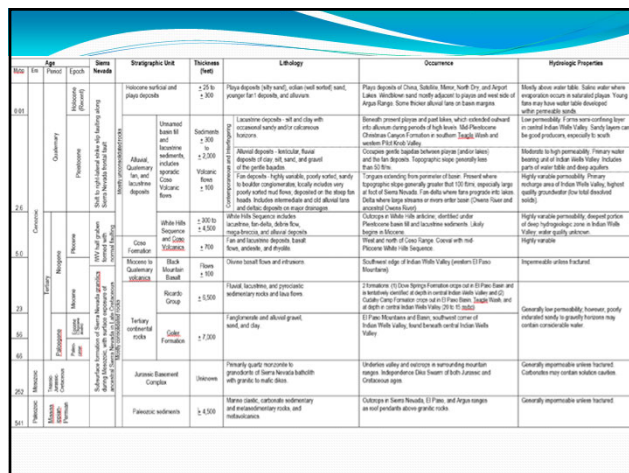
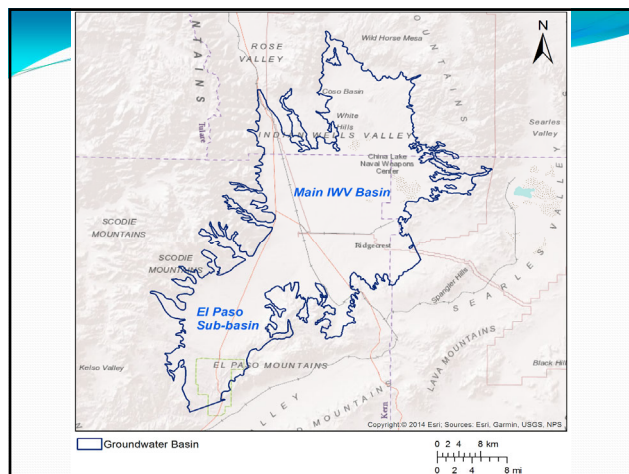
- The hydrogeological conceptual model (HCM) for the brackish groundwater study represents the **largest aggregation of digital geological and water quality data** that has been assembled to date.
- It will be **freely shared** with the Groundwater Authority-PAC-TAC-Water Resources Manager, the U.S. Navy, and the Desert Research Institute (DRI).
- It is meant to **complement the existing body of work** that has been compiled for the Basin.
- It is **not meant to replace or compete against** the work of others.

Purpose – Why do an HCM?

- As a **framework for understanding** the complex system beneath the ground surface:
 - **Soil types** - gravel, sand, silt, clay and where these different soils are located.
 - **Groundwater** – interaction with surface water (precipitation), depth, flow direction, flow speed, quality (fresh versus saline), pumping locations and quantities.
- An HCM is critical for **understanding the relationship** between these variables.
- An HCM is the **core framework for quantitative analysis** of changes (past, present, future) that may occur in a Basin due to pumping and climate change.

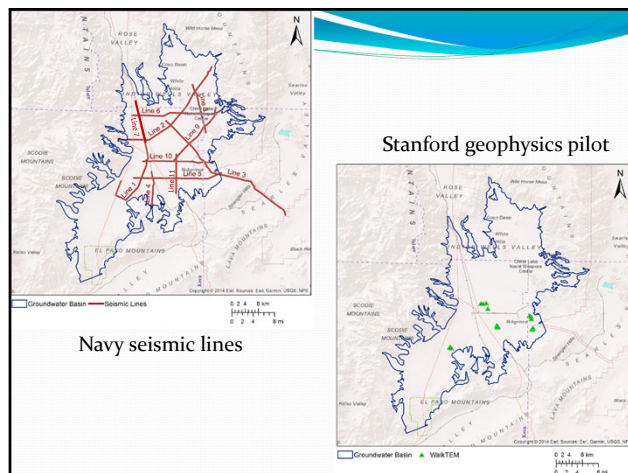
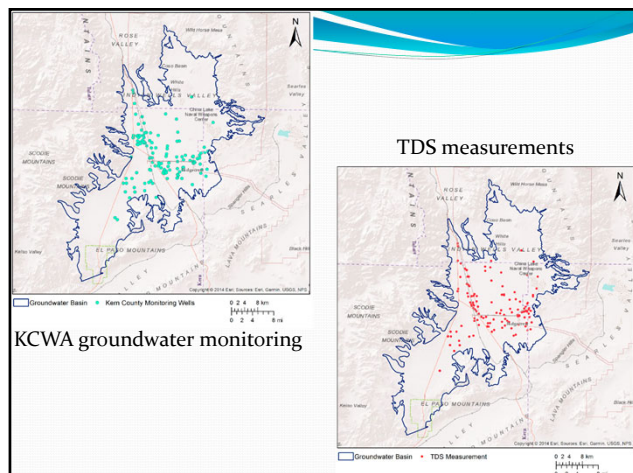
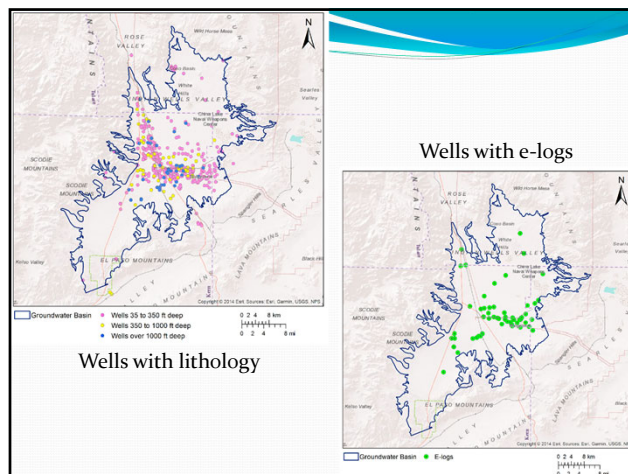
HCM Report Outline

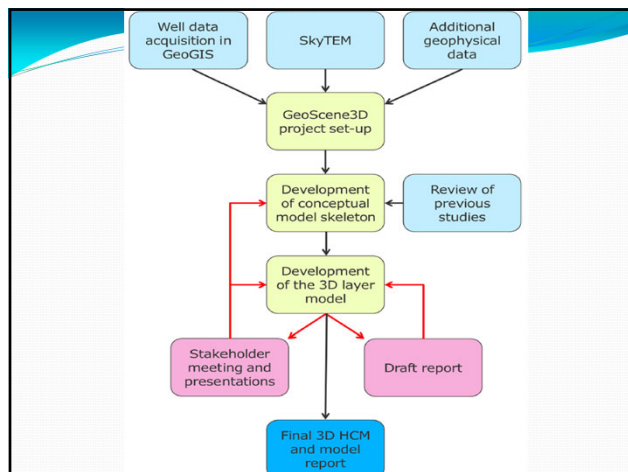
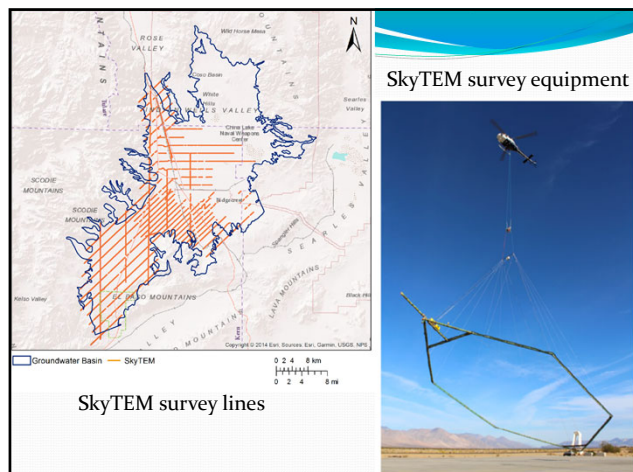
- Introduction
- Regional Geologic and Structural Setting
- Inventory of Available Data
- HCM Development
- Basin Geometry
- Principal Hydrogeologic Zones
- Uncertainty and Data Gaps
- References
- Appendices



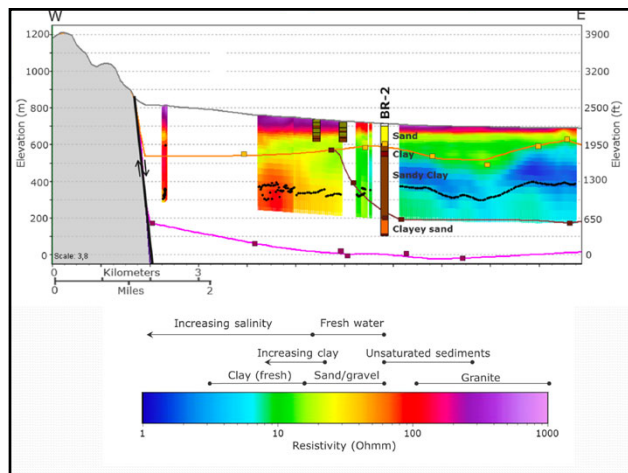
Data available

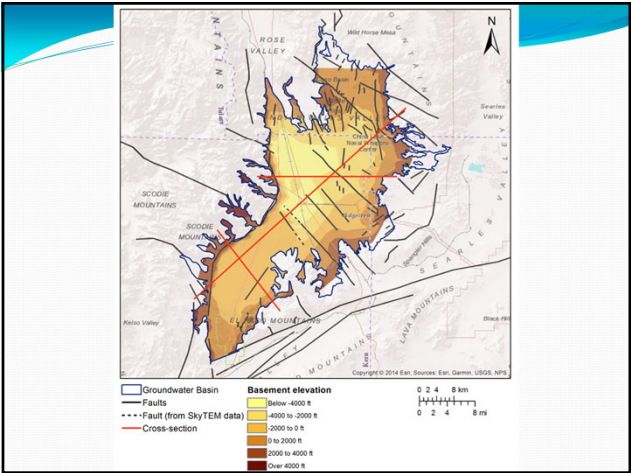
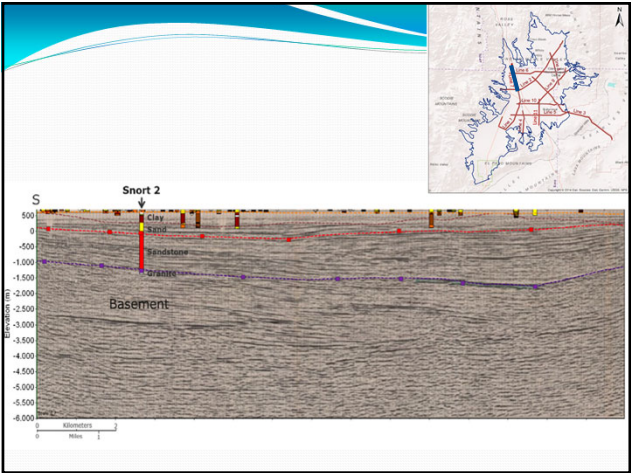
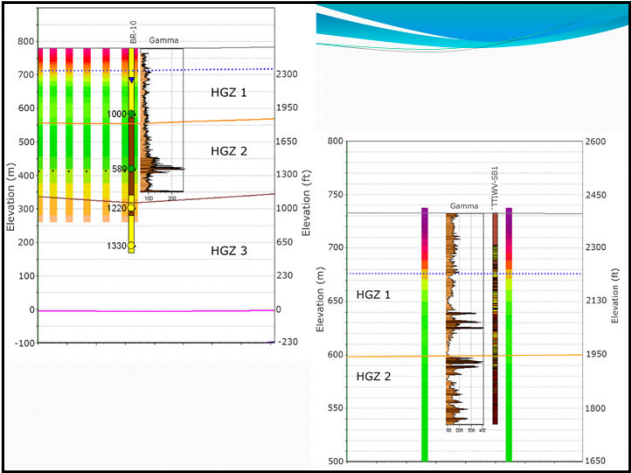
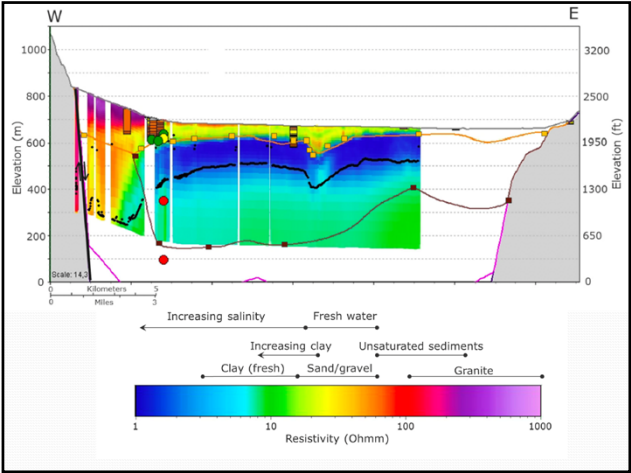
- 1050 wells with lithology
- 61 geophysical logs
- Groundwater level monitoring measurements collected by Kern County Water Agency at 111 wells at 338 screens
- 2006 total dissolved solids sample analyses from 563 wells
 - Most recent data used in 391 wells
- 11 seismic lines covering ~150 miles
- Five Stanford pilot test locations using surface time domain electromagnetics, surface and downhole magnetic resonance
- 500 linear miles of SkyTEM data collected via helicopter

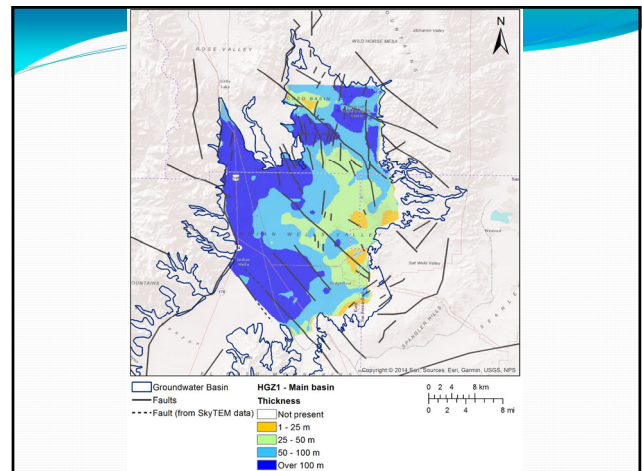
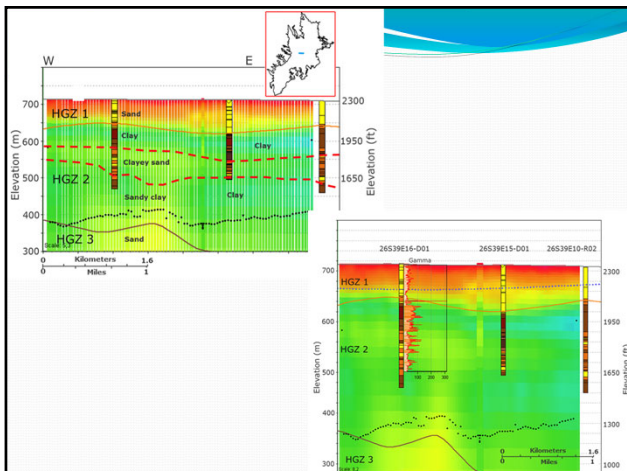
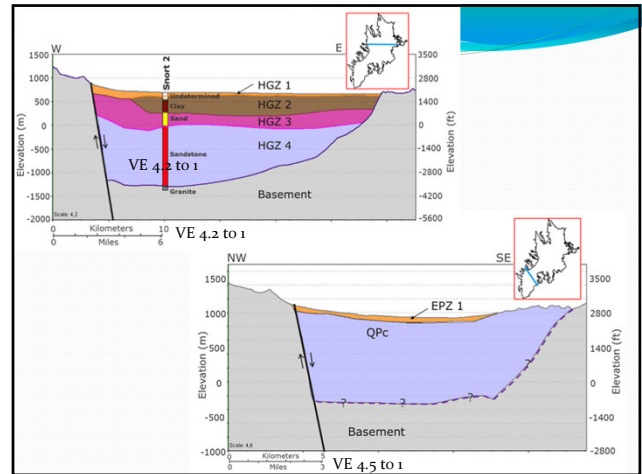
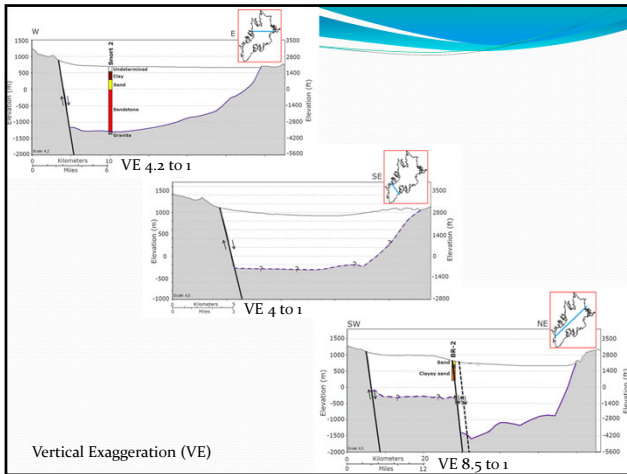


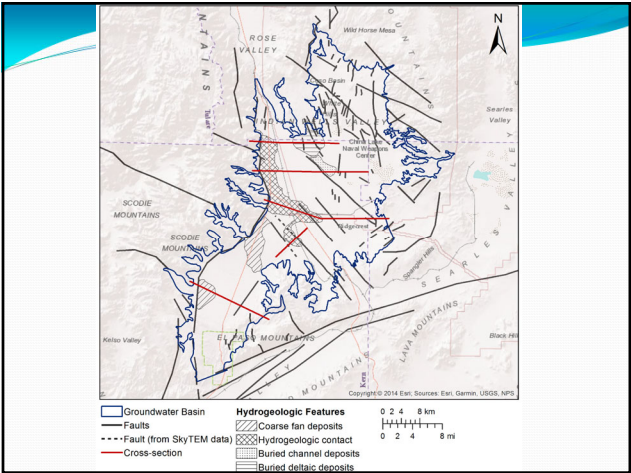
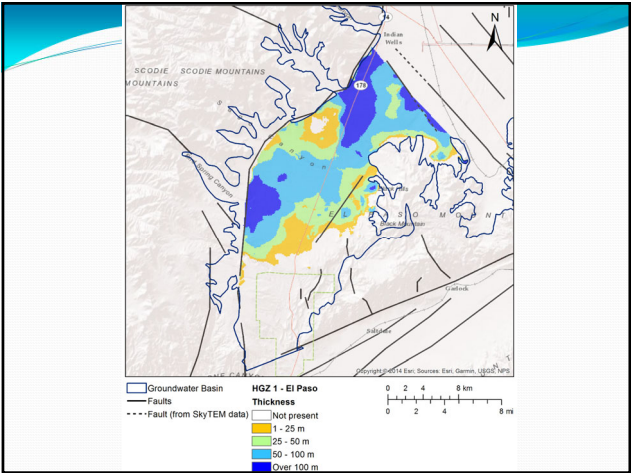
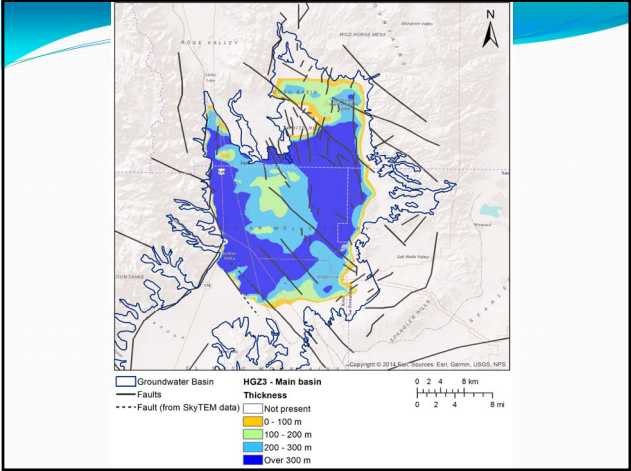
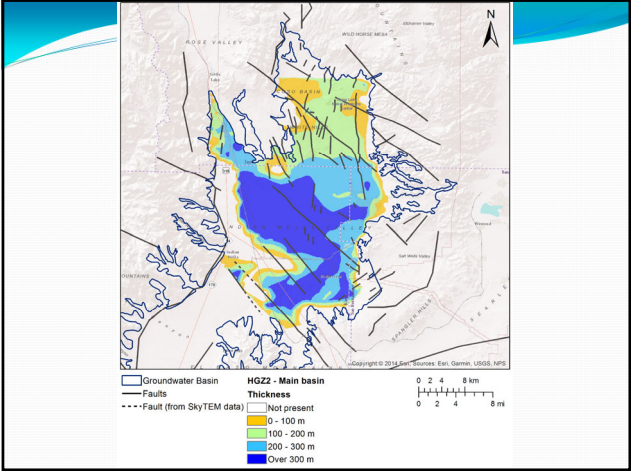


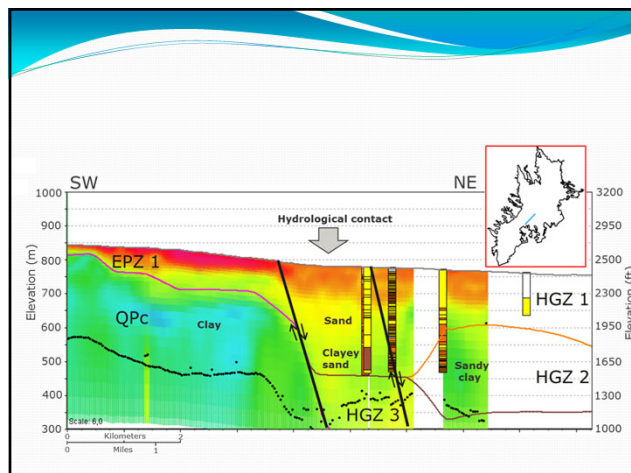
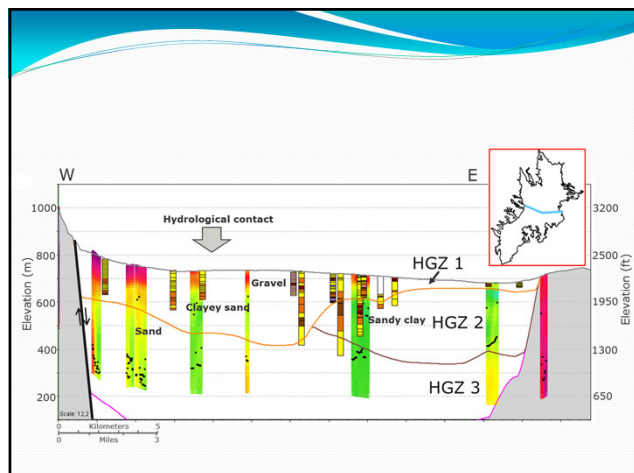
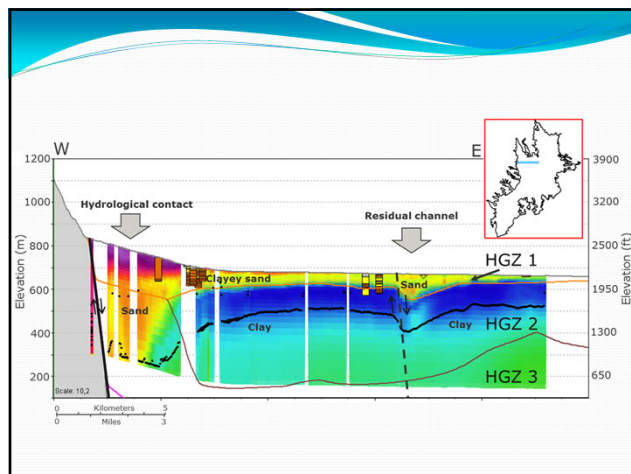
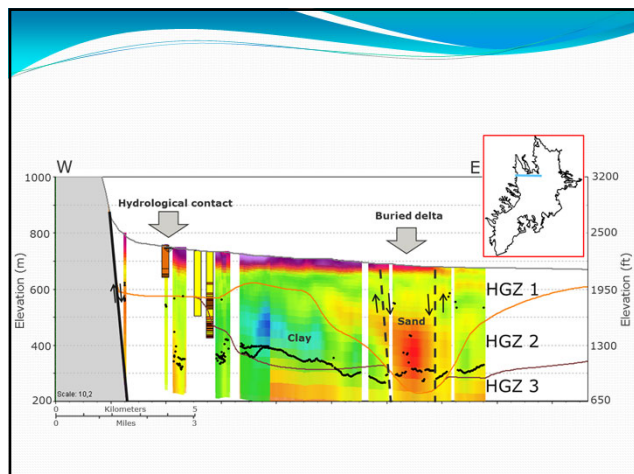
Lithological description from the driller's logs	Interpreted lithology	Thematic color
Fill, Top	Fill	Dark gray
Sand as the first descriptor, then followed only by gravel, cobble, boulder or rock (coarse sediment types)	Sand	Yellow
Gravel as the first descriptor, then followed by sand, cobble, boulder or rock (coarse sediments)	Gravel	Light red
Sand as the first descriptor, then containing clay or silt as a secondary descriptor	Clayey sand/silty sand	Orange
Clay or silt as the first descriptor, then containing sand and/or gravel as a secondary descriptor	Sandy clay/sandy silt	Brown
Clay and/or silt as the only descriptors	Dark brown	Dark brown
Tuff	Tuff	Tan
Basalt	Basalt	Black
Granite	Granite	Light gray
Conglomerate	Conglomerate	Purple
Sandstone	Sandstone	Dark red
Bedrock	Likely granite or basalt	Blue
Limestone	Limestone	Green
Unknown	Unknown	White

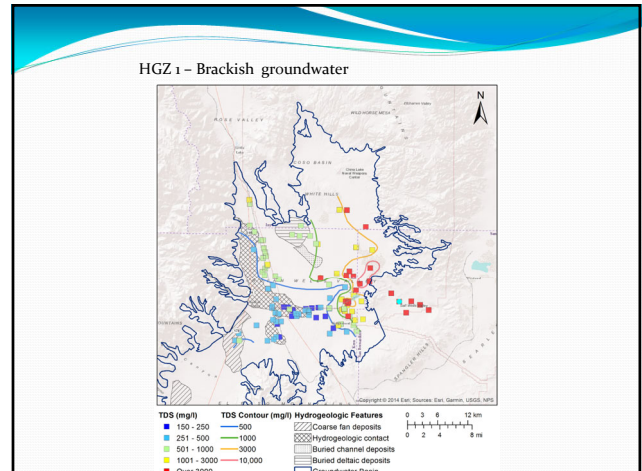
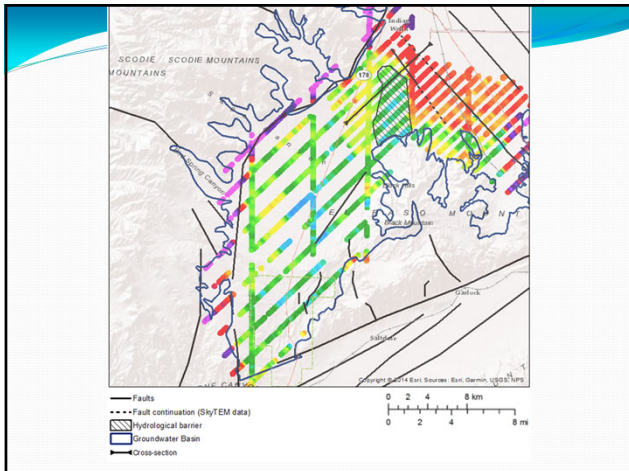
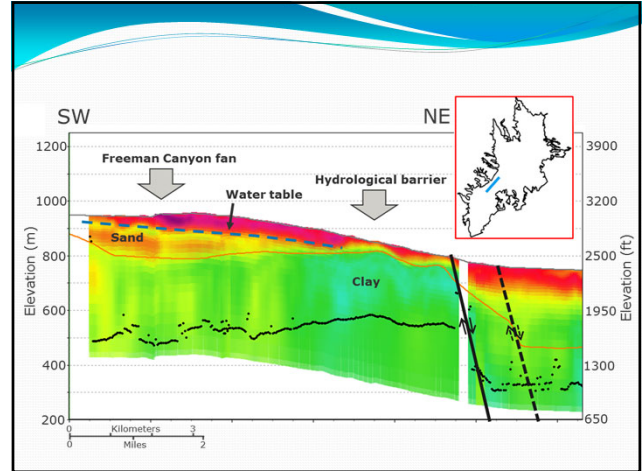
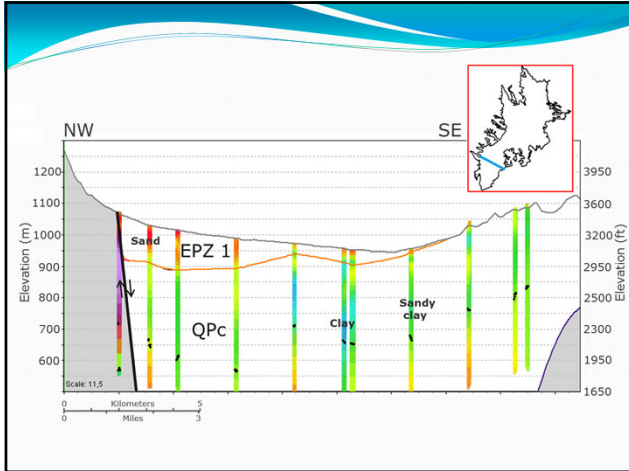




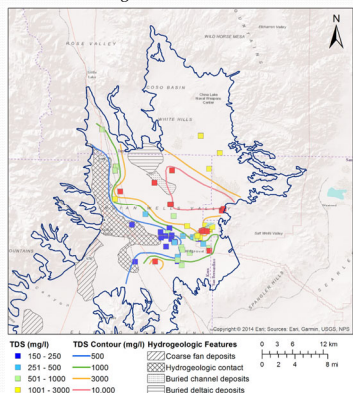




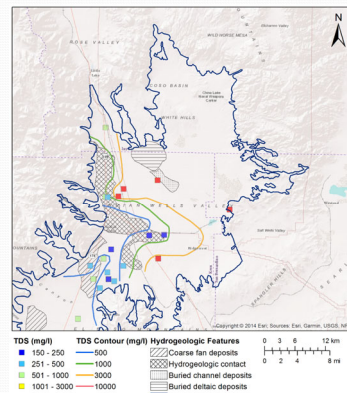




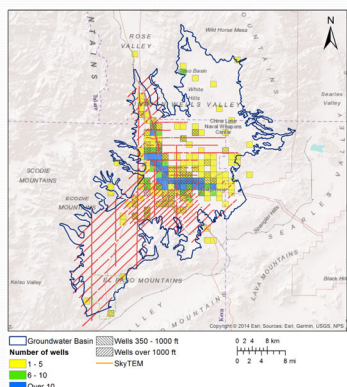
HGZ 2 – Brackish groundwater



HGZ 3&4 – Brackish groundwater



HCM Uncertainties



HCM Data Gaps

- El Paso Subarea
 - Spatial coverage lacking
 - Wells/e-logs to consolidated sediments and bedrock
- Main Basin
 - Spatial coverage north-east area
 - Along Sierra Nevada mountain coverage
- Whole Basin
 - Aquifer parameters (HC, T, S) from aquifer testing and flux measurements – largest need to reduce models uncertainty

Additional Data Needs

- Drilling deep wells in the El Paso area, along SNFF, and pilot areas for brackish study – include WQ & aquifer tests
- Seismic surveys in the El Paso sub-basin (obtain existing)
- Identify more wells in the northern part of the main basin area from which TDS measurements can be collected
- Identify any additional wells in the El Paso area from which TDS samples could be collected from
- Continue with the collection and updating of the well construction data and linking the different data sources with their respective wells and well coordinates

Summary

- The traditional hydrogeological conceptual model (HCM) for the brackish groundwater study represents the **largest aggregation of digital geological and water quality data** that has been assembled to date.
- The basement has been mapped in 3D, and four HGZs identified
- New knowledge from the SkyTEM and integrated data approach include mapping of subsurface features (fans, channels, faults) and approximate distribution and volume estimates of brackish water
- It will be **freely shared** with the Groundwater Authority, the Water Resources Manager, the U.S. Navy, and the Desert Research Institute (DRI).
- It is meant to **complement the existing body of work** that has been compiled for the Basin.
- It is a living model and readily updateable as more information becomes available

Next Steps

- Will Finalize the HCM after input received from TAC and at March 20 workshop
- The HCM and GeoGIS database will be made freely available to Groundwater Authority, TAC, PAC, Water Resources Manager, the U.S. Navy, and the Desert Research Institute (DRI).
- Refined geostatistical-based HCM later this year

Questions and Comments

