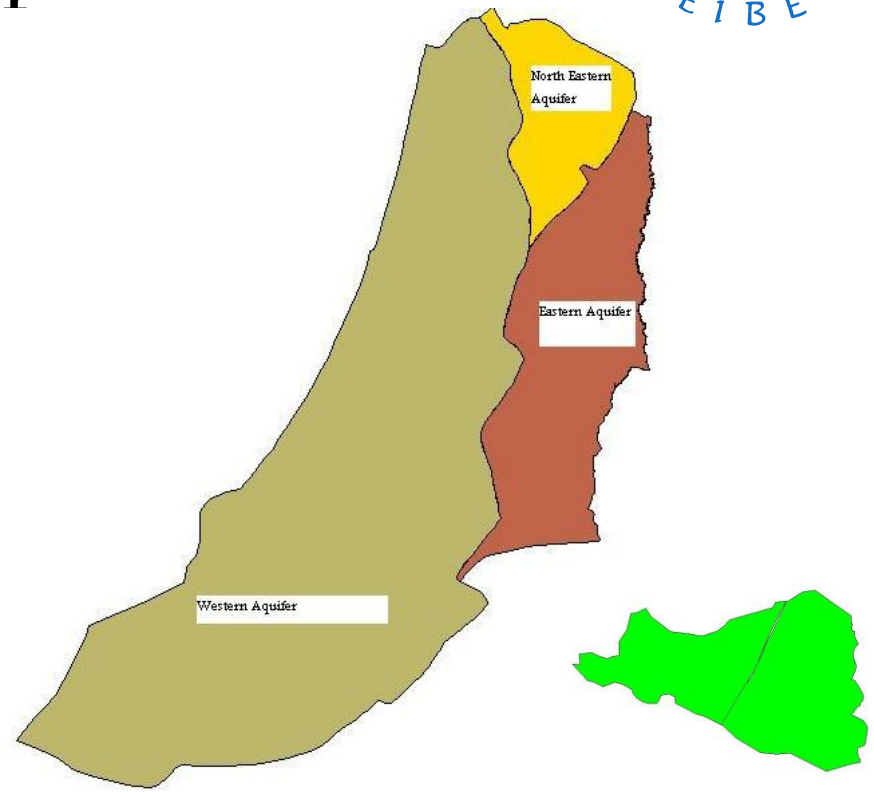
Titel: Groundwater Modeling in Al Malih Basin, Jordan Valley

M.Sc. Raghid Sabri

Co-Authors: Ghanem, M., Abu Madi, M., Merkel, B.

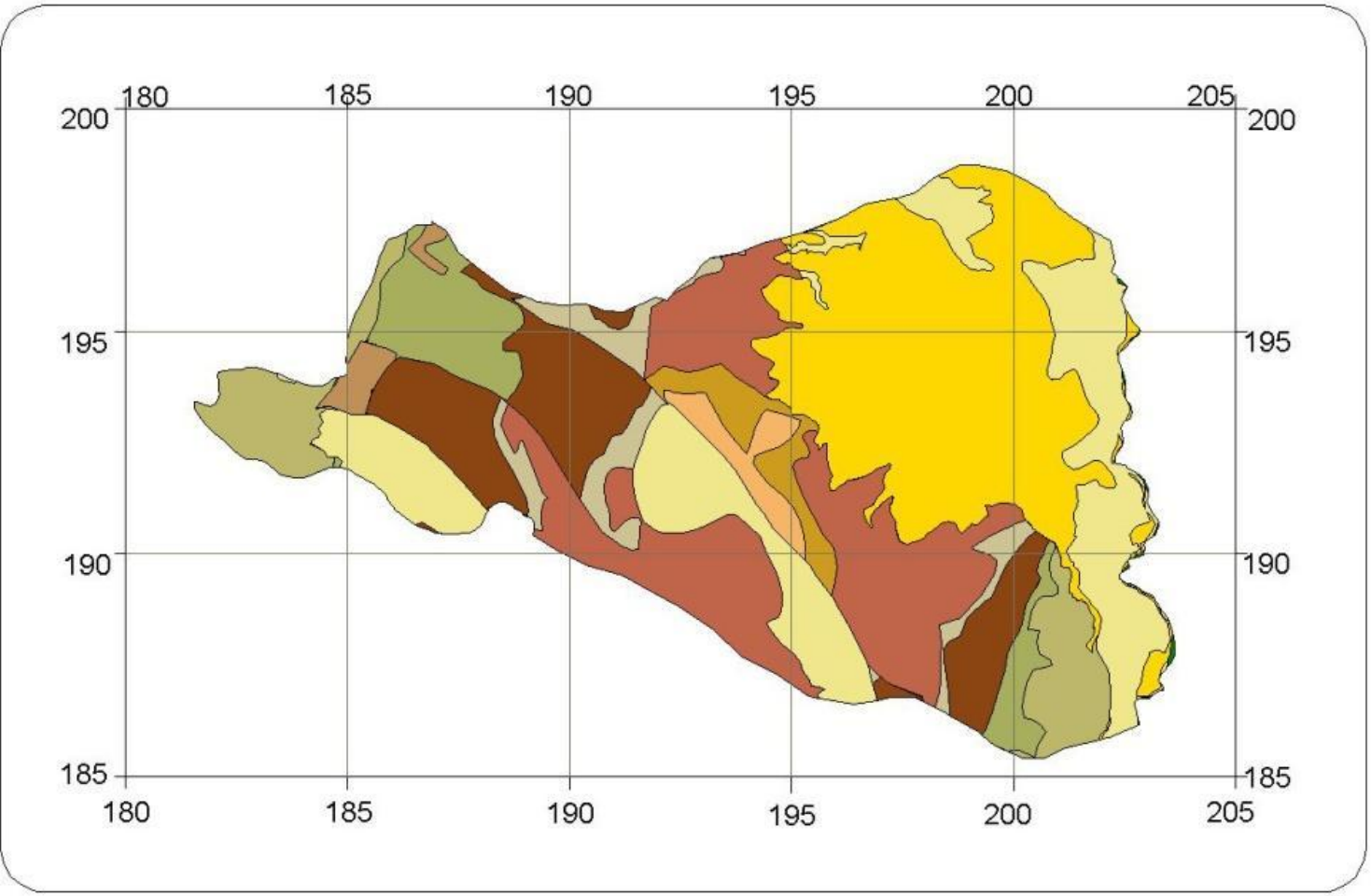
The University of Resources. Since 1765.

- Ground water in Palestine is the major source o‘ water.
- Three Aquifers
- the Eastern Aquifer h six basins
- Malih Basin



- The real extraction is 165 million m^3
- The safe yield estimated is 55-56 million m^3
- It aims to quantify the potentiality of al Malih basin
- To test the effect on the Jordan river

- Area estimated 140 km^2
- Eastern boundary the Jordan river
- The average temperature is between 18.1 C to 19.4 C
- The annual evaporation is 973 mm
- The average rainfall is 400 mm/year


180
185
190
195
200
205
200
195
190
185
N
W
E
S
Legend
Geology of Study Area
Albian
Beidha
Eocene
Jurassic
Lower Cenomania
Lower Cretaceous
Quaternary
Senonian
Turonian
Upper Cenomania

- 4 Agricultural wells
- 1 monitoring well

Al-Malih monitring well Litthology after (CH2MHILL, 2003)

meter below surface	Lithology	Aquifer type
5 – 30	Limestone/dolomitic marly with shale partings	Lower Cenomanian Age Aquifer
30 – 100	Clay , marl, dolomitic limestone	Albian Age Aquitard
100 – 178	Dolomite, dolomitic limestone	Albian Age Aquitard
178 – 240	Clay, marl, shale, marly limestone	Albian Age Aquitard
240 – 290	Limestone, dolomitic limestone	Albian Age Aquifer
290 – 403	Sand, unconsolidated, sandstone, shale	Neocomian Age Aquifer

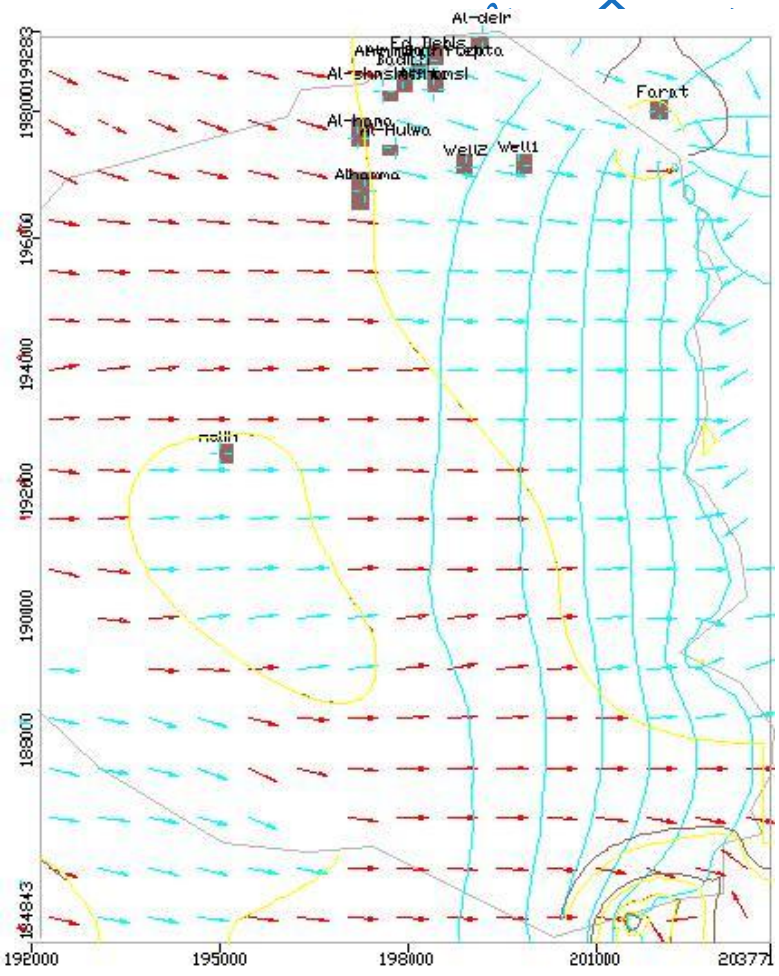
Transmisitivy	910 m^2/day (Fara well)
Kv	1.7 m/year
kH	5 m/year (Cretaceouse Tayser Volcanic)
Kv	1.3 m/year
kH	40m/year (Jurassic formation)
Recharge	0.2mm/day
Spring discharge	2.698 million m^3/year
Well abstraction	1.7958 million m^3/year
Recharge Wadi Al Malih	15 million m^3/year

- Uniform rectangular grid 50X50 m cell size
- Two layers (the first 200m, the second 300 m)
- Constant head boundary
- Steady state flow model over 30 years

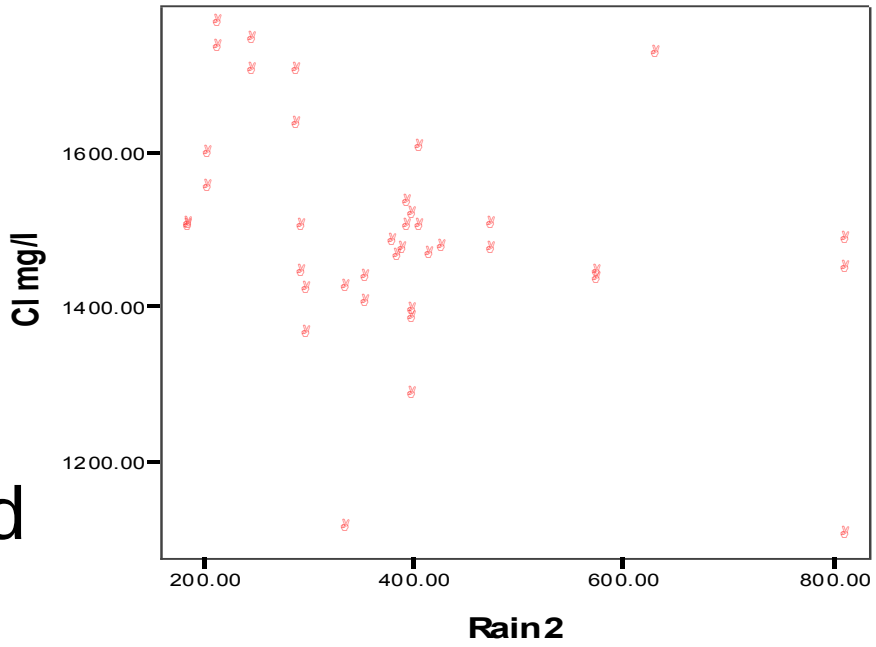
- Recharge value 7.9 million m^3/year
- Discharge value 2.8 million m^3/year
- The flow direction is towards the river
- The maximum iteration was 50 and the resulted maximum residual -17.2

The University of Resources. Since 1765.

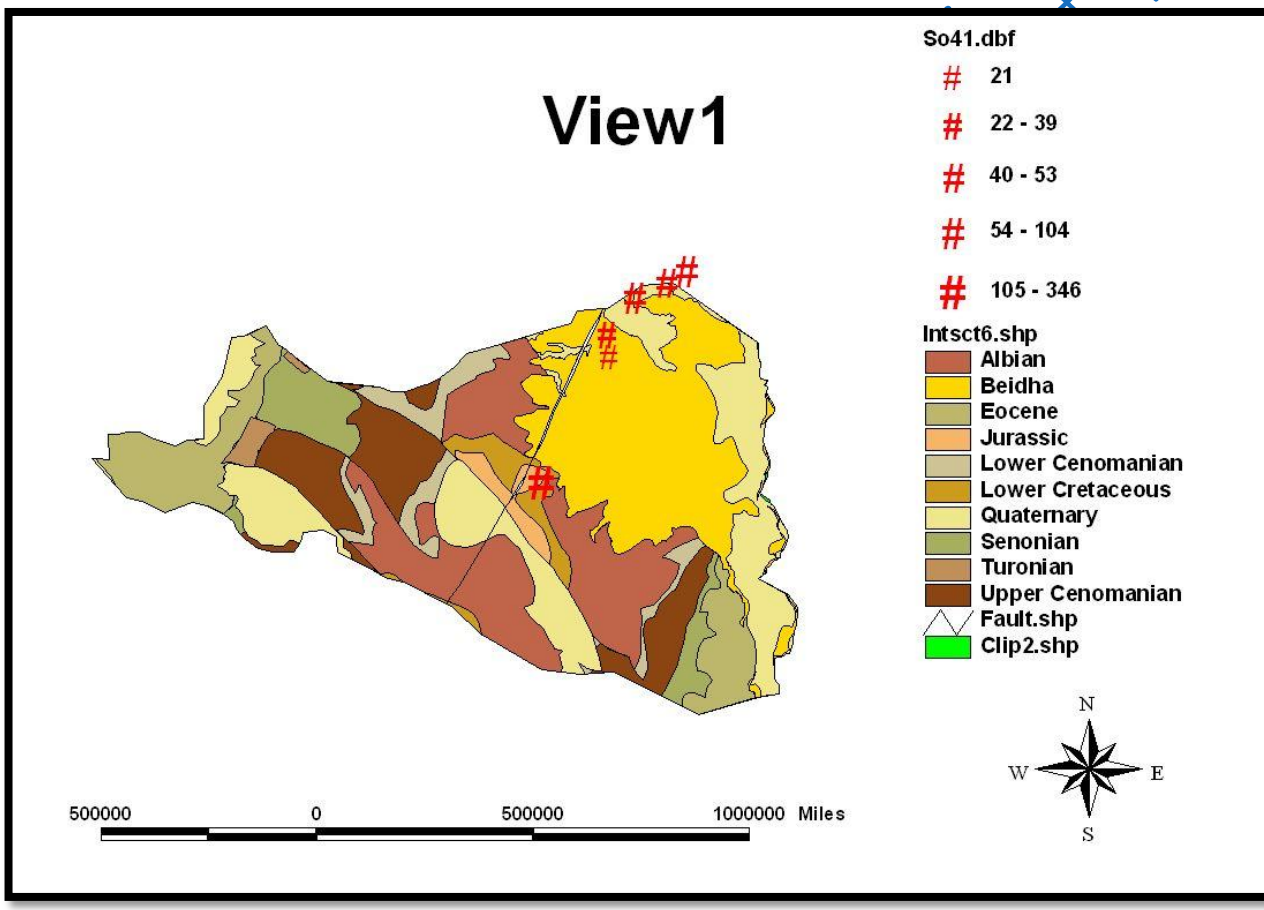
IN: Flow	OUT: Flow
Wells = 158040.00 [m³/year]	Wells = 2.8098 [mm³/year]
Recharge = 7.9483 [mm³/year]	Recharge = 0.00 [m³/year]
River Leakage = 0.65973 [mm³/year]	**River Leakage = 71885 [mm³/year]**
Total IN = 8.7661 [mm³/year]	



- The pearson correlation p=-0.4 had significant value of 0.05.
  - Match the quick response of the studied springs to precipitation in term of quantity



- No significant correlation between Sulfate and rainfall
- The highest value is related to H. Al Malih (Jurassic formation



- Jordan River is not affected by the discharge from the springs
- River leakage is much higher than the discharge
- The water quality is affected
- Artificial recharge is not recommended