

**The Hydraulics Research Center  
Second Annual Scientific Seminar**

**The Sediment Monitoring & Water  
Quality Program 2016**

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# Background

- Sediment Monitoring Program
  - ❑ HRC started in 1988
  - ❑ In collaboration with HRL Wallingford, UK 1988/90
  - ❑ Funded by Gezira Rehabilitation & Modernization (WB).
  - ❑ Covers 52 locations (Gezira Scheme & Blue Nile River).
  
- After discharge of HRL-Wallingford in 1990
  - ❑ HRS continued the Program
  - ❑ Program Extended to Covered more areas e.g. Rahad, Main Nile, Girba Dam ...
  - ❑ Budget by the Ministry
  - ❑ New equipment & devices (Turbidity –meter)

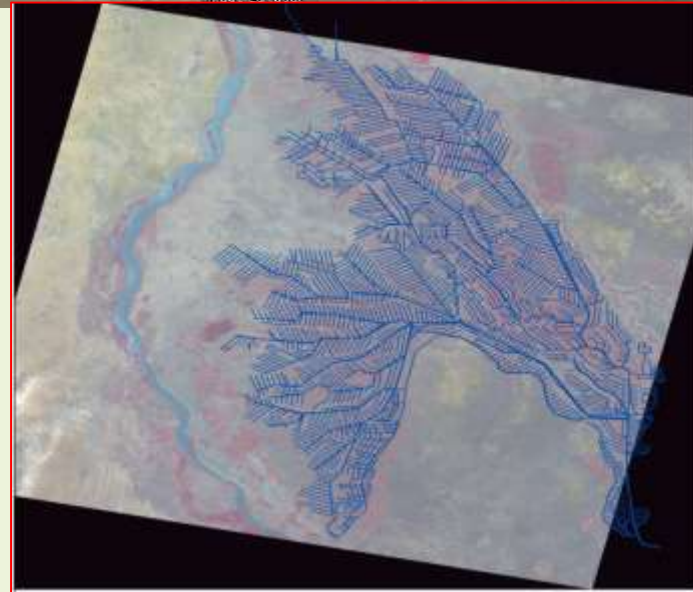
# Main Objectives

- Quantify the sediment entering Gezira irrigation scheme and its distribution.
- Establish correlations between the rate of river flows and sediment loads within the river Nile systems.
- Define the optimum filling dates for the Blue Nile reservoirs.



# Monitoring Stations

1. Main Nile at Dongla
2. Main Nile at Shambat Bridge/Tamanyiat
3. Atbara River d/s Khaushm Algirba Dam
4. Blue Nile at Khartoum
5. Blue Nile at Hantoub Bridge
6. Blue Nile downstream Sennar Dam
7. Blue Nile at Wad Elais
8. Gezira main canal at Sennar
9. Managil main canal at Sennar
10. Upstream Gezira main canal at 57
11. Downstream Gezira main canal at k57
12. Downstream Managil old canal at 57
13. Gezira main canal downstream Alturaby.



# Methodology

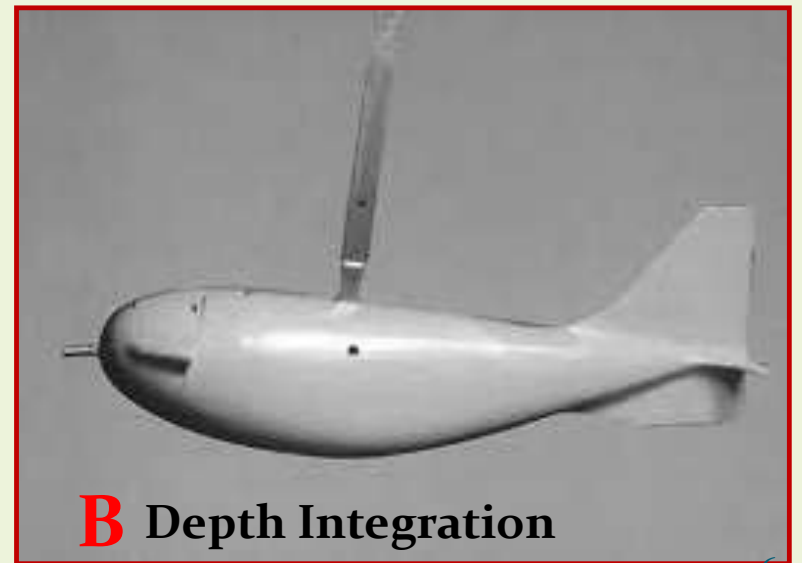
- ✓ Daily water samples during flood season
- ✓ Different sampling techniques
- ✓ Kept in labeled plastic bottles
- ✓ Transported to HRC Lab



**A** Dip sampling



**C** Point Integration



**B** Depth Integration

# Laboratory Analysis

**Samples analyzed to determine:**

- 1. Sediment Concentration**
- 2. Grain size distribution**

## **1. Sediment Concentration**

**Three methods are used:**

- **Classic Gravimetric method (20%)**
- **Turbidity Meter method (all)**
- **The volumetric method**

## **2. Grain size distribution**

- **Sieve analysis**
- **Hydrometer test  $< 63 \mu\text{m}$**



## Turbidity Meter Method

- New method
- Time saving
- Bench device.
- NTU (0.01 – 10,000)
- All samples analyzed



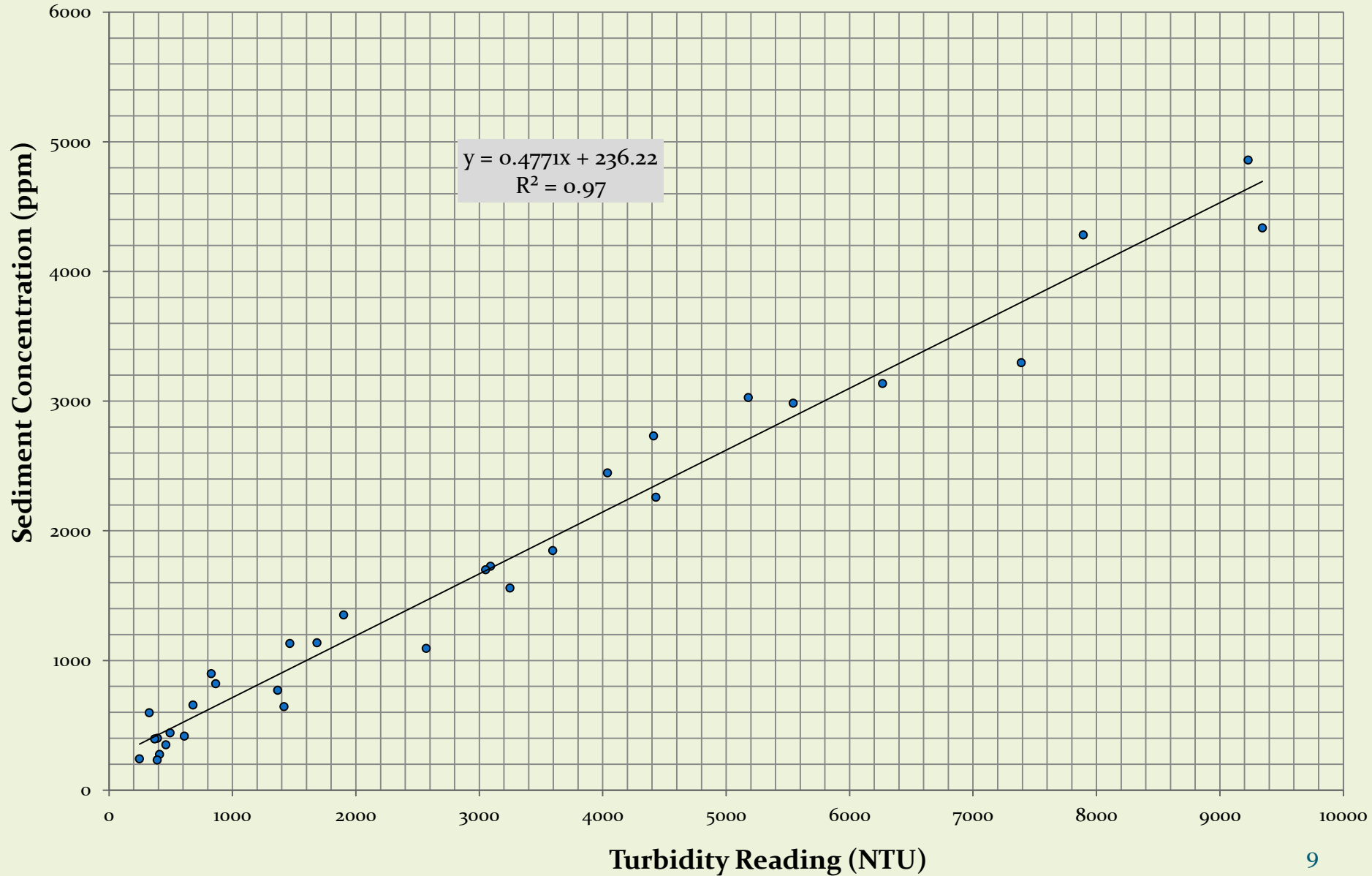
## The volumetric Method

- 1000 ml graduated cylinder
- Read after 6h, 24h, 48h, 72h
- Khushm El Girba Flushing

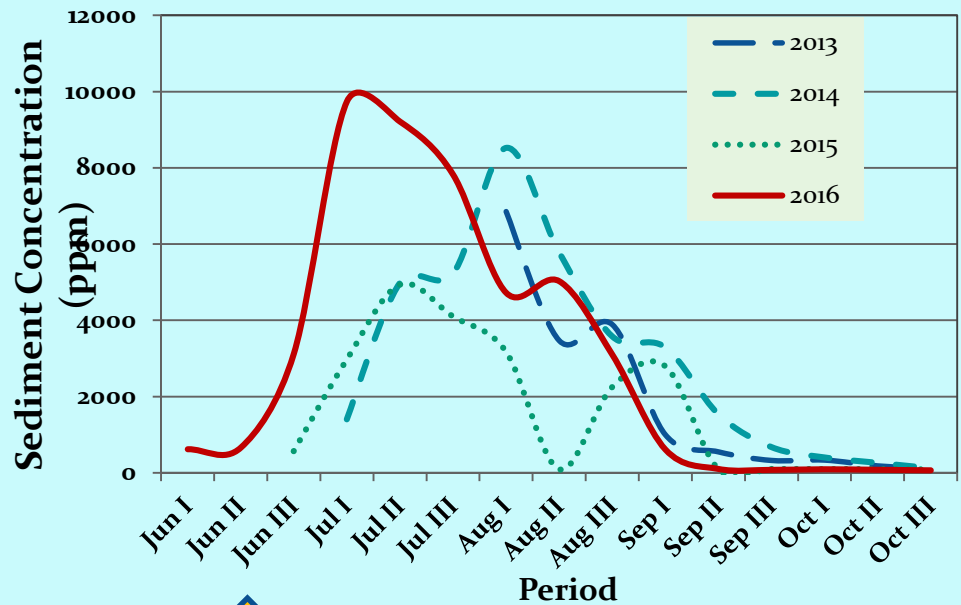
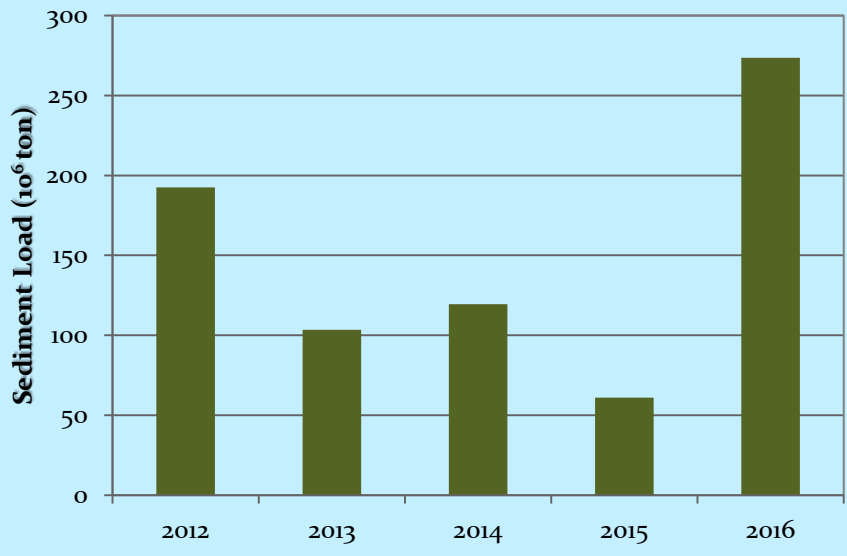




# Calibration of Turbidity meter/Hantoub

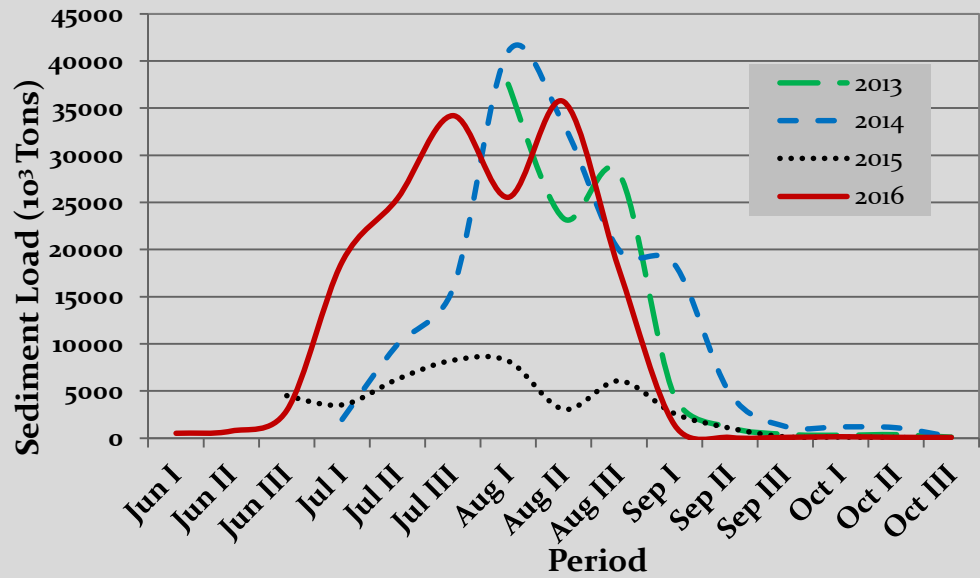
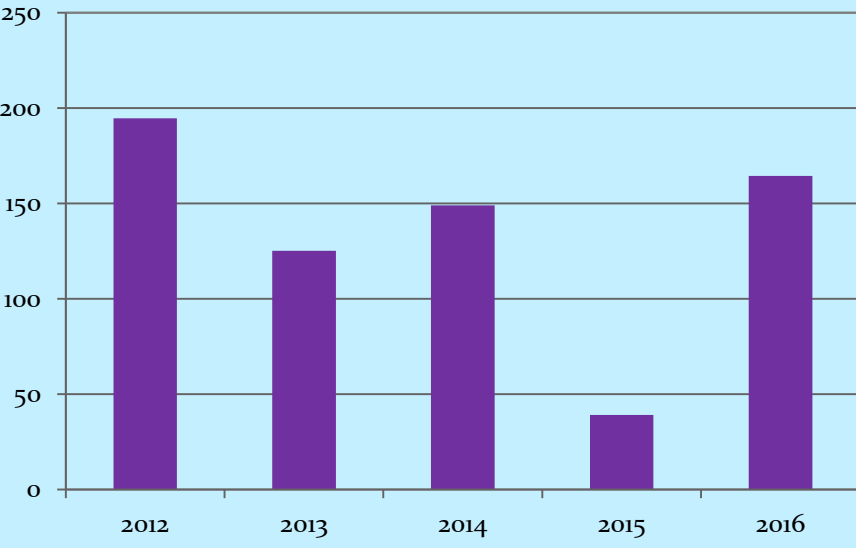


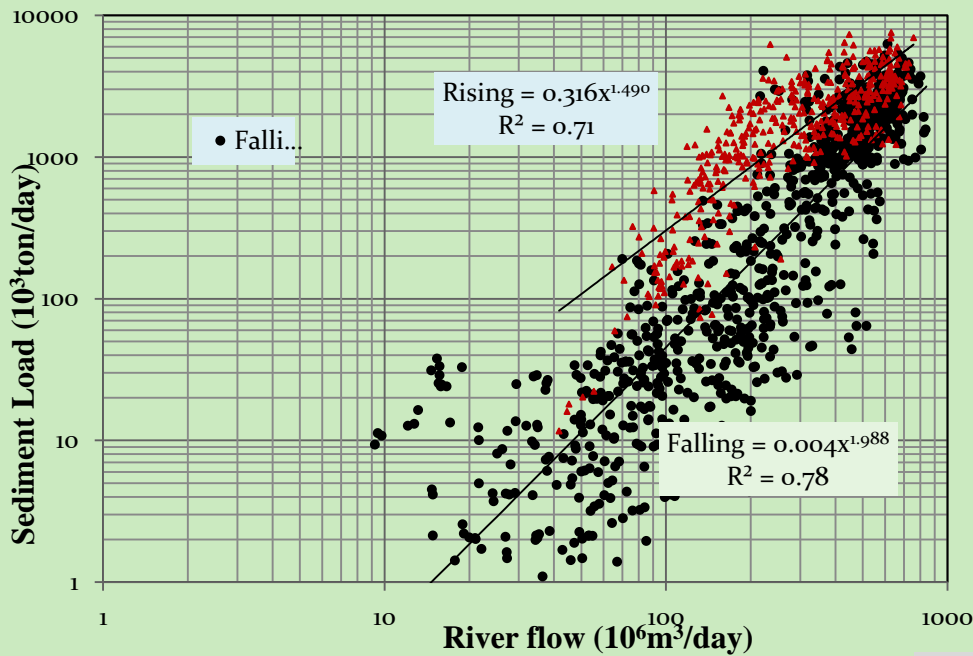
# Results:



Sed. Load      Wad Elais      Sennar

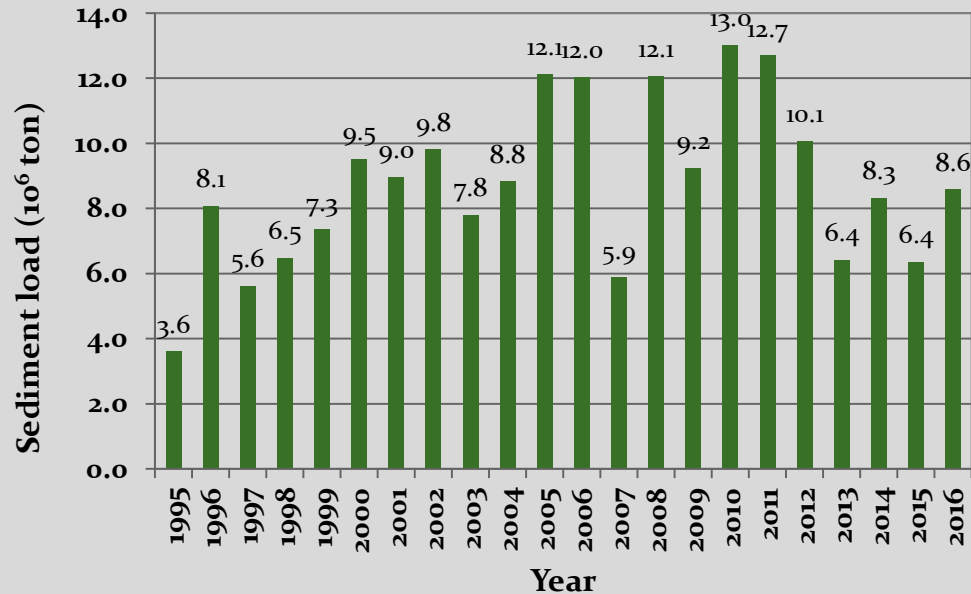
Sed. Conc.      d. load @ Sennar





Sediment load versus river flows  
 For Blue Nile and Sennar

Sediment Entering  
 Gezira Scheme



# Sediment Concentrations during Khushm El Girba Flushing

## Objectives:

1. Determine sediment con. entering & leaving
2. Compare different methods used in calculating sediment concentrations



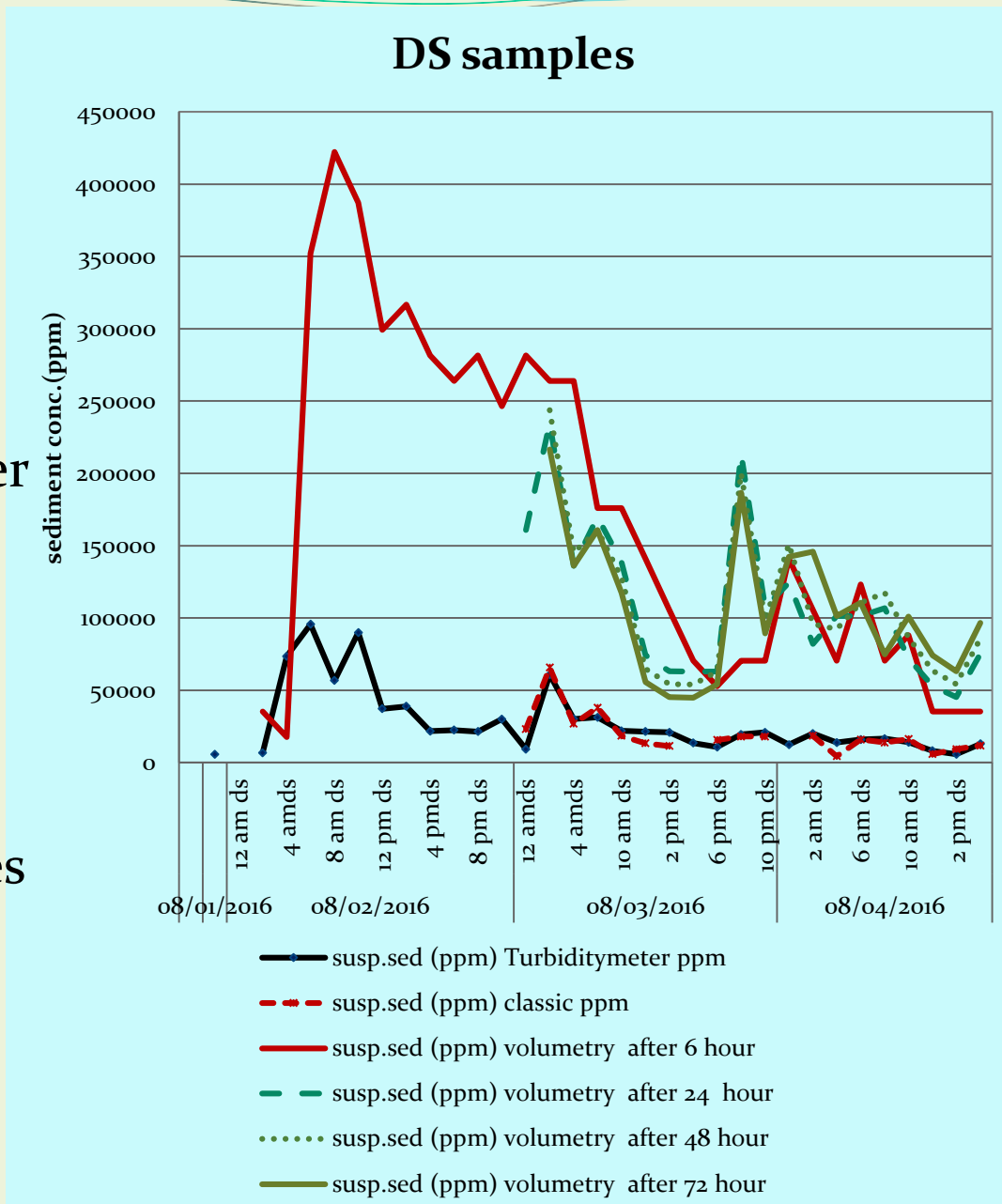
## Methodology

- Flushing 1 -4 August 2016
- Water samples every 2 h(US & DS)
- 66 samples collected
- Analyzed using 3 methods
  - *Classic Gravimetric method (20%)*
  - *Turbidity Meter method (all)*
  - *The volumetric method 6h, 24h, 48h, 72h*



# Results:

- Max sed. con 91,826 ppm
- Gravimetric /turbidity are accurate methods
- Volumetric method gave higher Sed. Con.
- 6h readings gave much higher Sed. Con.
- 24h, 48h, 72h gave closer values of SC
- Recommended Khushm El Girba increase readings to 24 h.

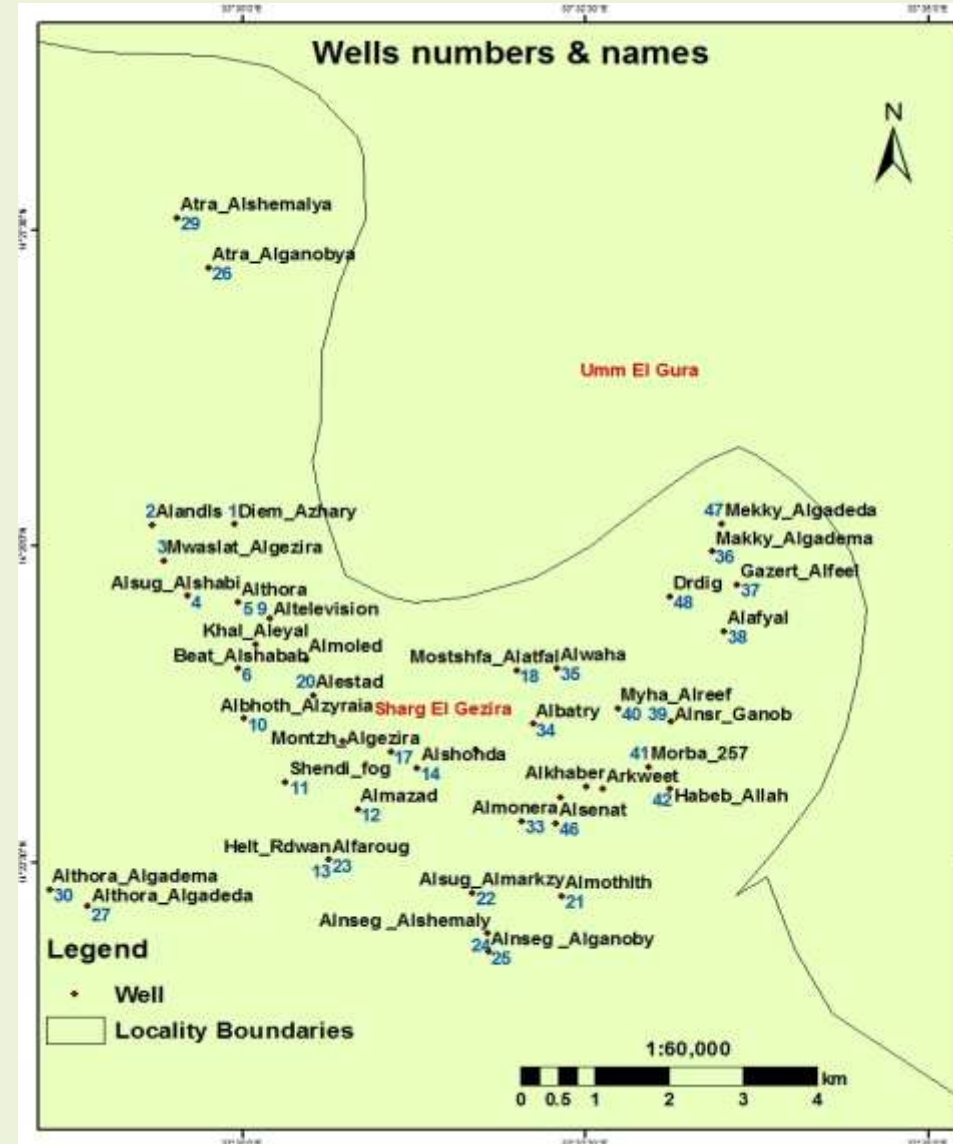


# Water quality study for Wad Medani wells

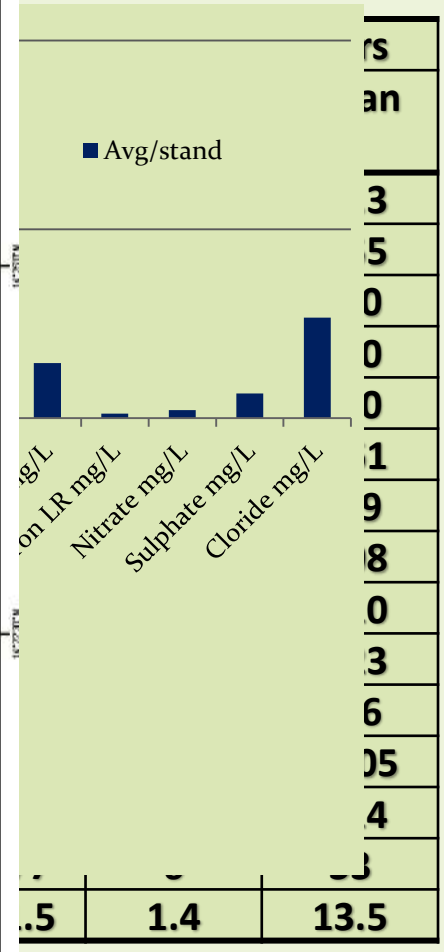
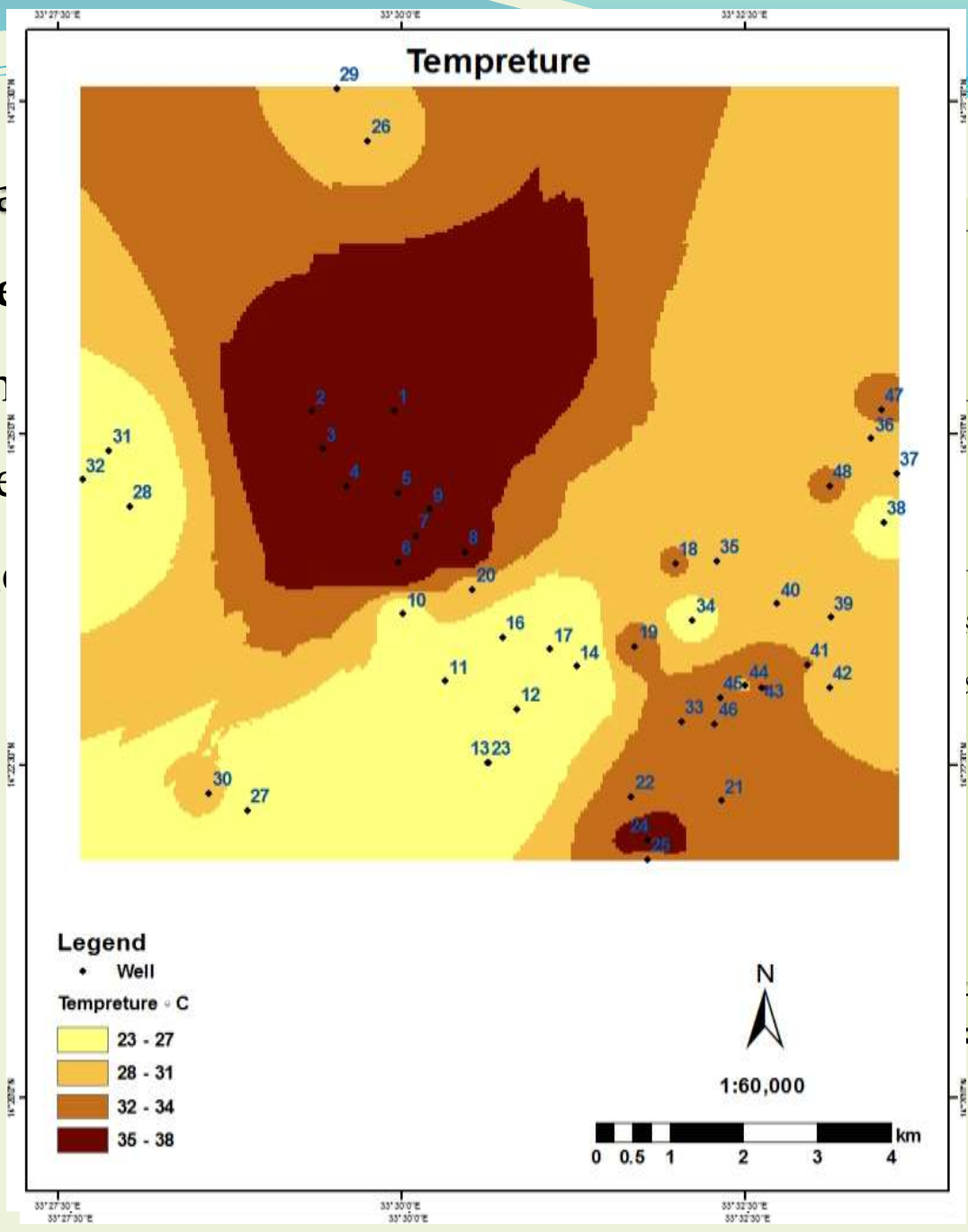
Water samples from 48 wells in Wad Medani locality 14 parameters were studied, using 3 types of equipments.

## Objective:

1. Study chemical properties of GW in wad Medani
2. Determine the spatial variation in water quality
3. Training of the HRC staff.



- 14 chemical parameters
- Equipment used**
1. Multi parameter
  2. Palintest spectrophotometer
  3. Turbidity meter



# Conclusions

- WHO standards is similar to the Sudanese standards.
- Wad Medani standard high turbidity, Alkalinity and Hardness.
- All other parameters falls within recommended ranges .
- High turbidity in 3 wells (Beit Alshbab, ARC, Alshohada)
- Hardness in one well - Montzh Al Gezira .
- There are wells that are nearly about to exceed the standards in PH.
- The high turbidity values may be due to operation and maintenance effects on the samples.
- All in All the ground water aquifer under Wad Medani **suitable as potable water.**





Thank you