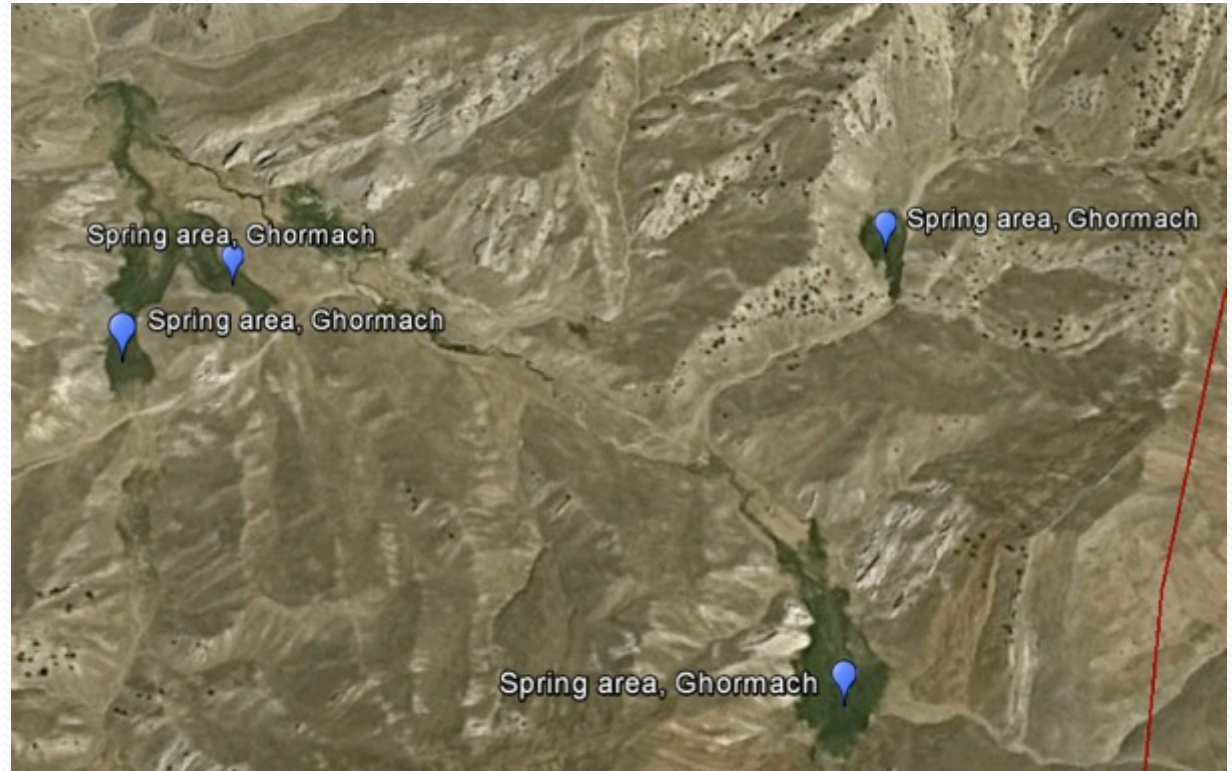


Using Existing Data

Types of data: Soviet maps

by: David Banks
Hydrogeologist and
thermogeologist



Google Earth

NORAD supported project in MRRD:
Capacity Building and Institutional Cooperation in the field of Hydrogeology for Faryab
Province , Afghanistan

Hydrogeological Survey

OBJECTIVE: To improve possibilities of successful and sustainable groundwater resources development:

1. A good functional database / GIS
- 2. Collation of all existing data**
3. Collection of additional hydrogeological data in the field
- 4. A web-based interactive hydrogeological atlas of Faryab**
5. A “paper format” Atlas

What are the prerequisites for A Hydrogeological Survey

Data on the existence and behaviour of water

- The level of the water table
- The quality of the groundwater
- The yield of groundwater
- Rivers (flow, elevation, quality)
- Rainfall/Snowfall (recharge)

What are the prerequisites for A Hydrogeological Survey

Data on the existence and behaviour of the rocks and sediments

- The outcrops of different rock types
- Their distribution with depth
- Their hydrogeological properties (transmissivity, storage, porosity)
- Their chemistry

What are the prerequisites for A Hydrogeological **Survey**

The location of these data (wells, boreholes, springs, karezes, rivers):

- In x and y dimensions (GPS location/grid reference)
- In z dimension (elevation and depth)
- In t dimension (when were the data collected?)
- Metadata (who collected the data, where were the samples analysed, who drilled the well?)

Background data

- Topographic / terrain elevation data
- Political data (province / district boundaries, major towns and cities)
- Other topographic data (road network)
- Geological outcrops, faults and contacts
- Outcrops of hydrogeological units (aquifers and aquitards)
- Hydrological data (river network)
- Meteorological data

Much of this data will already be available from the relevant Afghan Ministries / organs or from:

The USGS Afghanistan website at

<http://afghanistan.cr.usgs.gov/geospatial-reference-datasets>.

CD-ROMs and data provided with USGS Open File reports 2006-1038 and 2006-1179, also available at http://pubs.usgs.gov/of/2006/1179/Data_layers.html.



Topographic / elevation data

Various digital elevation models are available from the USGS Afghanistan website at <http://afghanistan.cr.usgs.gov/geospatial-reference-datasets>.

Political Boundaries

Numerous data sets exist on the internet showing province and district boundaries. At present, good Google Earth files can be found at Geocommons sites:

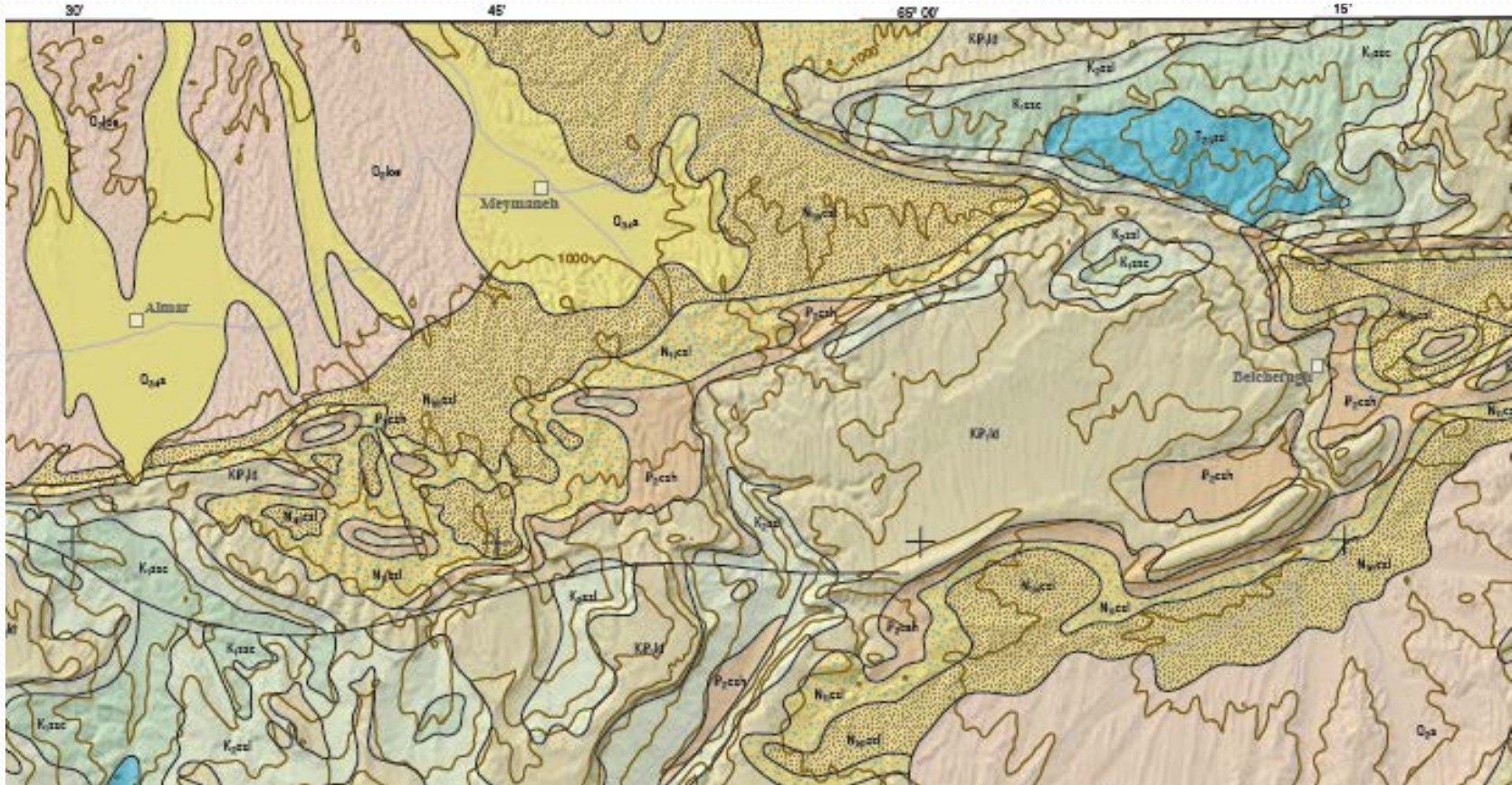
Provinces: <http://geocommons.com/maps/50121>,
<http://geocommons.com/overlays/23585>

Districts: <http://geocommons.com/maps/85379>,
<http://geocommons.com/maps/86639>,
<http://geocommons.com/overlays/72825.kml>.

Geological base-map

We recommend using the most recent Afghan Geological Survey USGS 1:250,000 scale geological maps.

Available at http://afghanistan.cr.usgs.gov/afghan_geo.php as pdf files or at http://pubs.usgs.gov/of/2006/1179/Data_layers.html as shape files.



Geological base-map

In addition, other files may be available, giving structure contours on specific horizons: e.g.

- The Palaeogene Ghory Formation at

<http://pubs.usgs.gov/of/2006/1179/shapezip/ghorydpafg.zip> or the

- top of Hauterivian sandstones (Qezeltash Formation) at

<http://pubs.usgs.gov/of/2006/1179/shapezip/qezeldpafg.zip>



Rivers & Surface Waters

The USGS data sources have basic outlines of Rivers as line files for GIS environments.

In Faryab, however, it has been found preferable to “trace” surface waters in the Google Earth environment, to save them as kml or kmz files and then import them into the relevant GIS environment.

Climate data - temperature

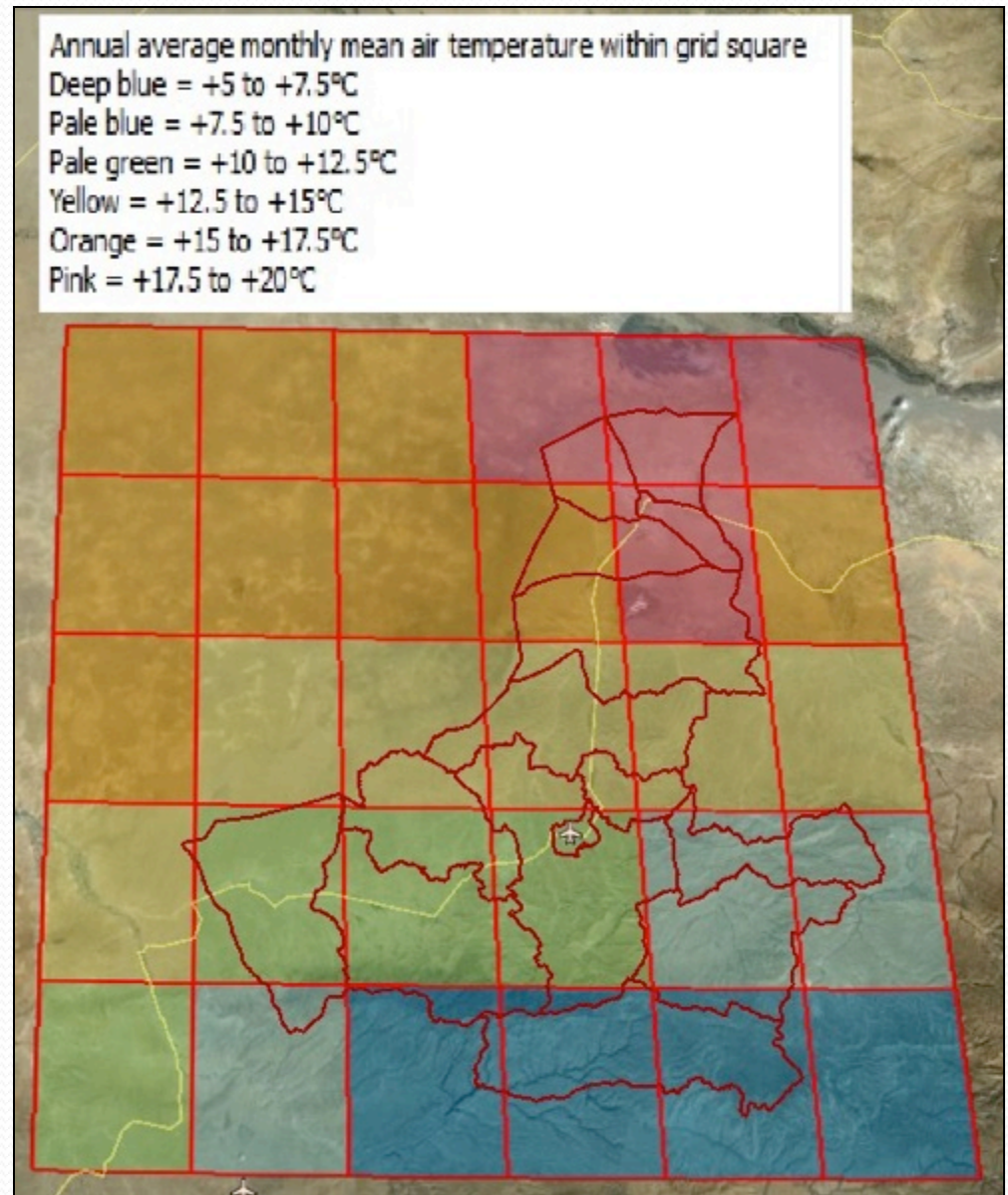
The best regional sources of meteorological data are found at the NOAA website

<http://www.esrl.noaa.gov/psd/data/gridded/data.ghcncams.html>

We have used the file:

<ftp://ftp.cdc.noaa.gov/Datasets/ghcncams/Derived/air.mon.1981-2010.ltm.nc>

The data are gridded at intervals of 0.5 degrees of longitude



Climate data - precipitation

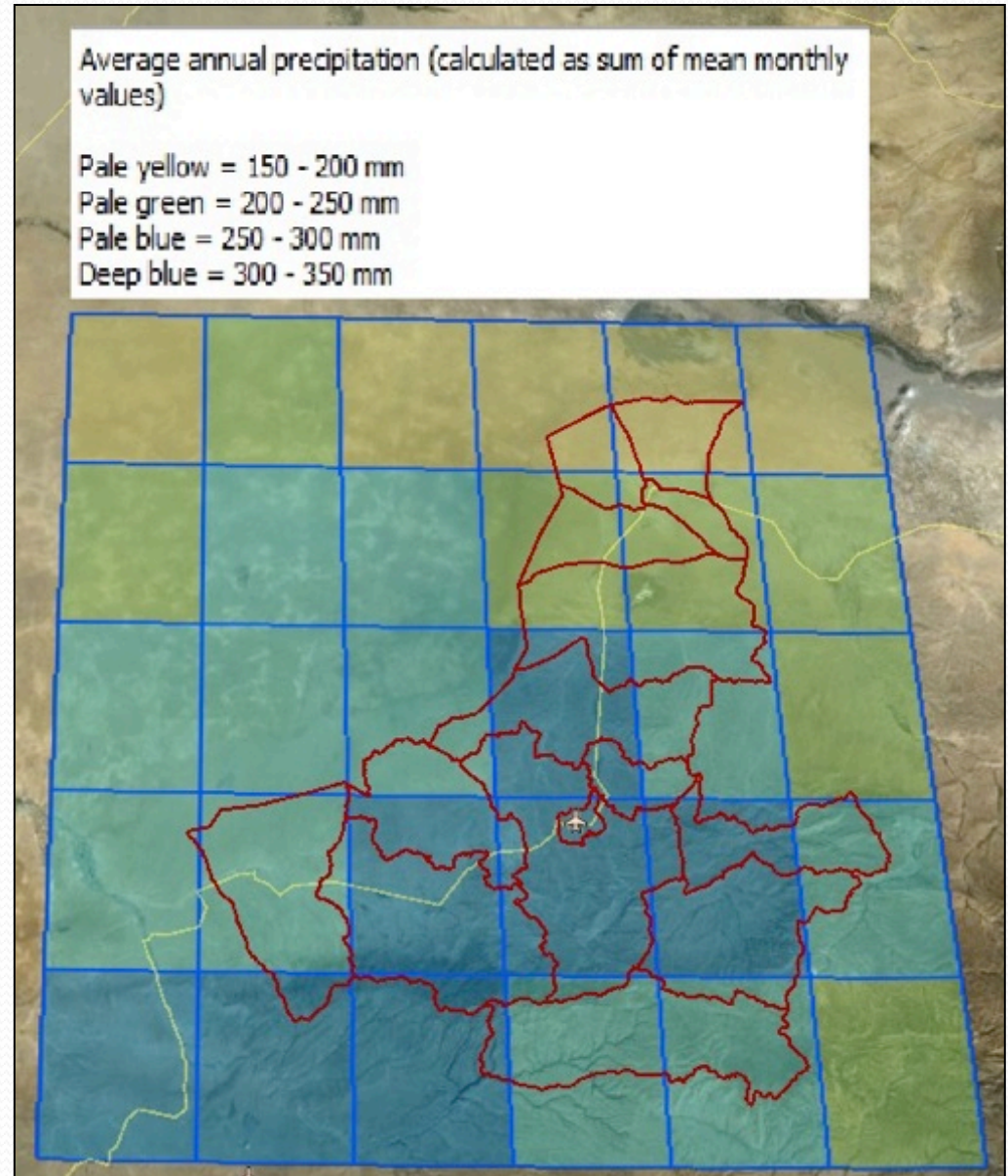
The best regional sources of meteorological data are found at the NOAA website

<http://www.esrl.noaa.gov/psd/data/gridded/data.gpcc.html>

We have used the file:

ftp://ftp.cdc.noaa.gov/Datasets/gpcc/full_v6/precip.mon.1981-2010.ltm.v6.nc.

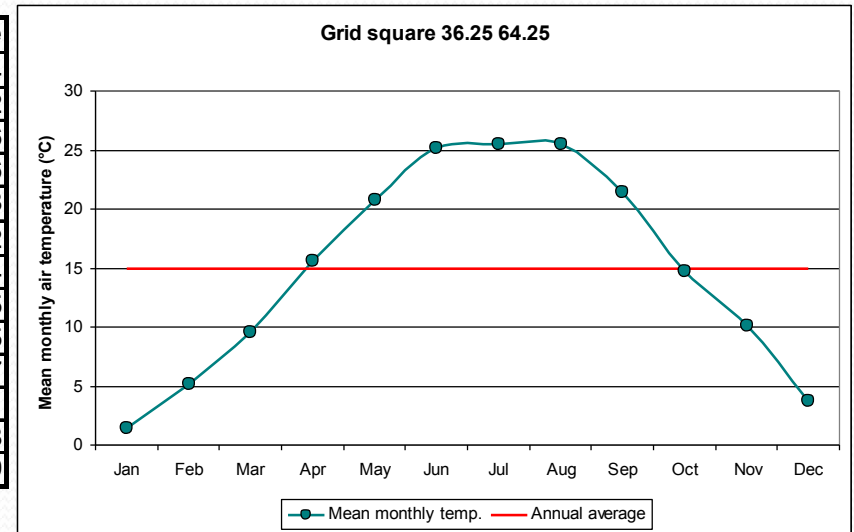
The data are gridded at intervals of 0.5 degrees of longitude



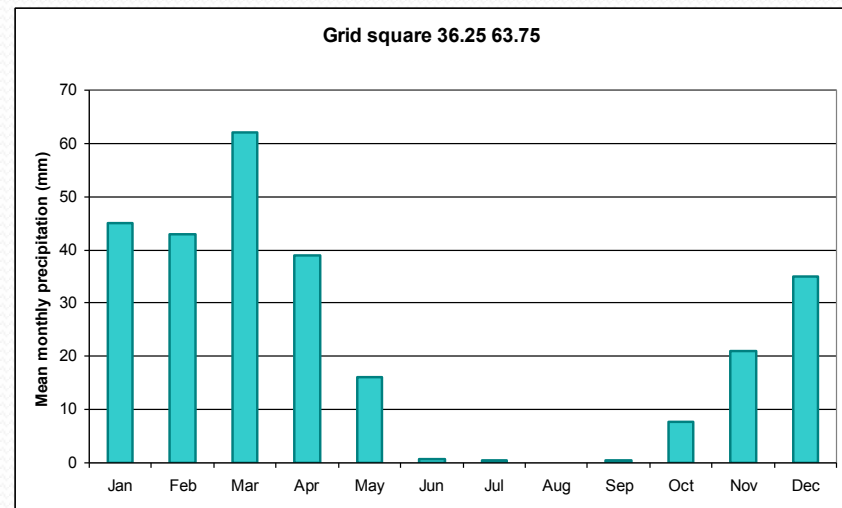
Climate data - detail

By clicking on a grid square, climate detail can be called up:

Mean Monthly temperature	
Jan	1.4
Feb	5.2
Mar	9.6
Apr	15.6
May	20.8
Jun	25.2
Jul	25.4
Aug	25.5
Sep	21.5
Oct	14.7
Nov	10.1
Dec	3.8
Annual average	14.9



Mean monthly precipitation (mm)	
Jan	45
Feb	43
Mar	62
Apr	39
May	16
Jun	0.73
Jul	0.37
Aug	0.013
Sep	0.41
Oct	7.6
Nov	21
Dec	35
Annual total	270.1

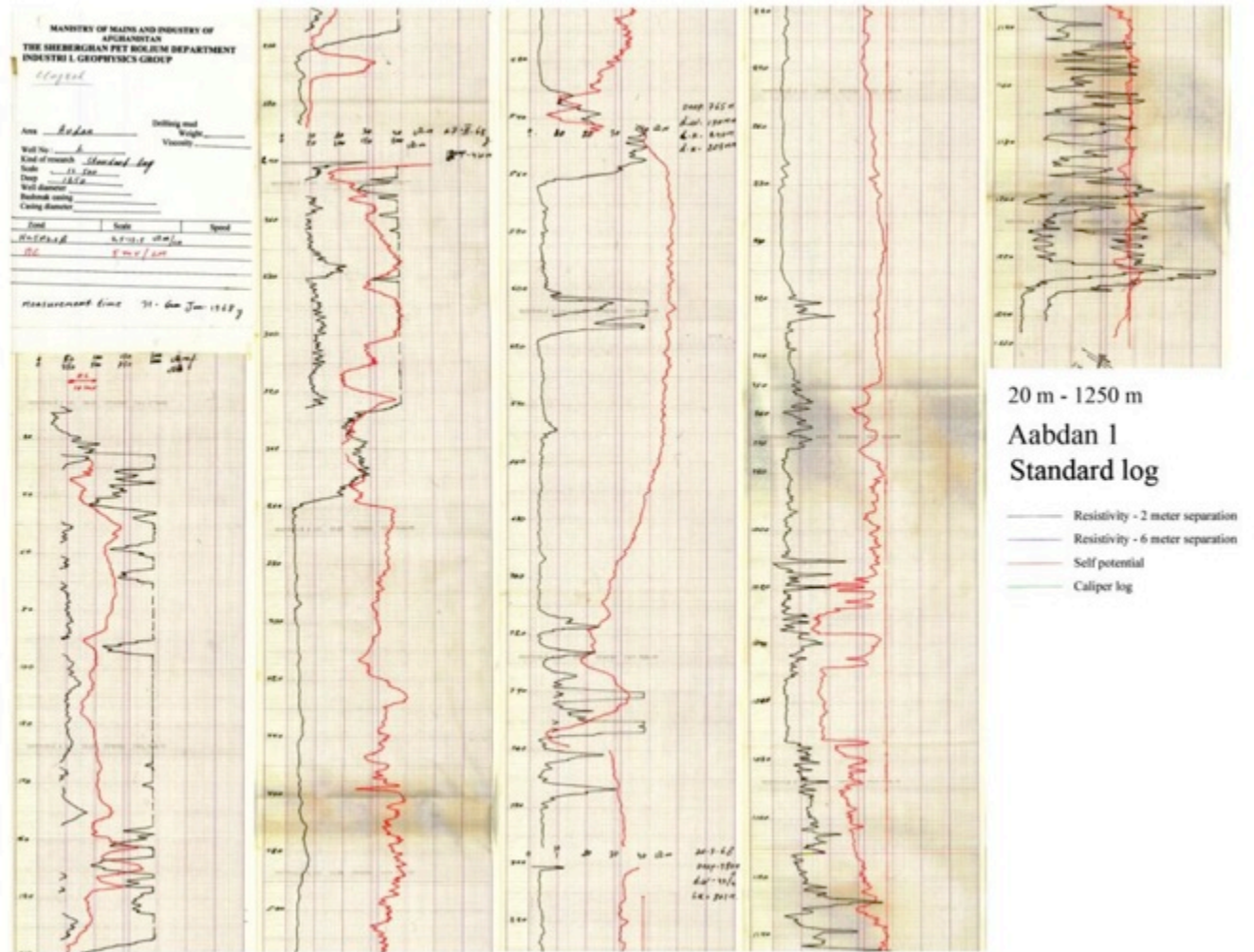


Waterpoint data collection

(Springs, karezes, wells, boreholes, meteorological stations, river stations)

- Ministries, at both national and provincial level
 - MRRD
 - MoM / Afghan Geological Survey
 - MAIL
 - MoEW
 - MUDA / CAWSS / AUWSSC
- NGOs, especially
 - DACAAR (main supplier)
 - INTERSOS
 - NCA
- UN organs, including UNICEF and possibly also UNHCR, FAO, UNDP, UNEP.
- Private drilling companies and consultancies
- International donors, lending organs and consultancies.
- US Geological Survey (who provide geophysical logs and details of hydrocarbon exploration boreholes via their own WebGIS at <http://afghanistan.cr.usgs.gov/flexviewer/>)
- Soviet maps

[\(http://afghanistan.cr.usgs.gov/flexviewer/\)](http://afghanistan.cr.usgs.gov/flexviewer/)



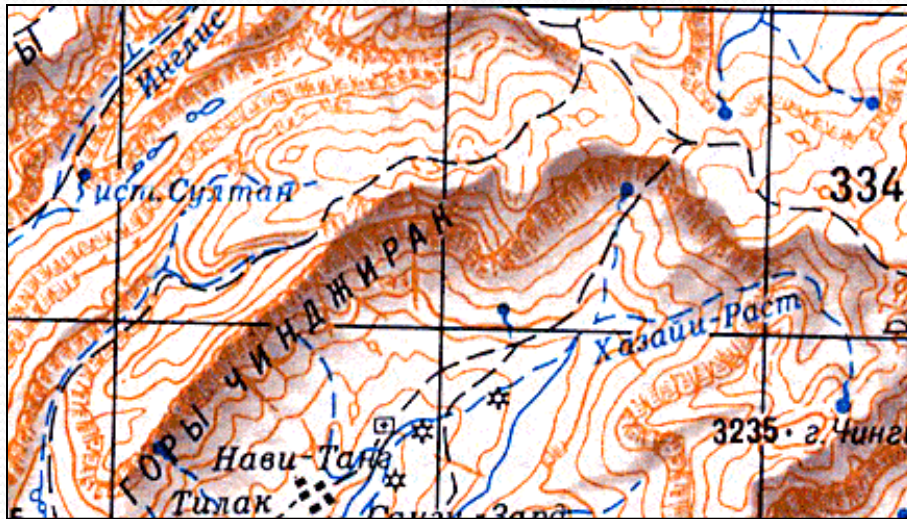
Soviet maps

Springs are shown as small blue circles with squiggly tails, and may be marked

род. = родник or *ист.* = источник

Wells (and also boreholes used for water supply) are typically marked

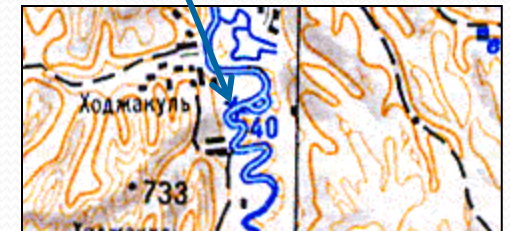
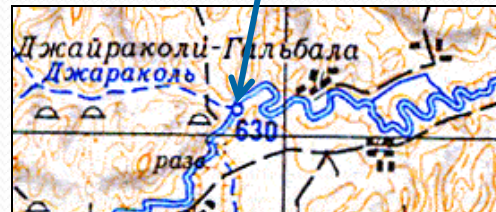
к. = колодец



Soviet maps also show:

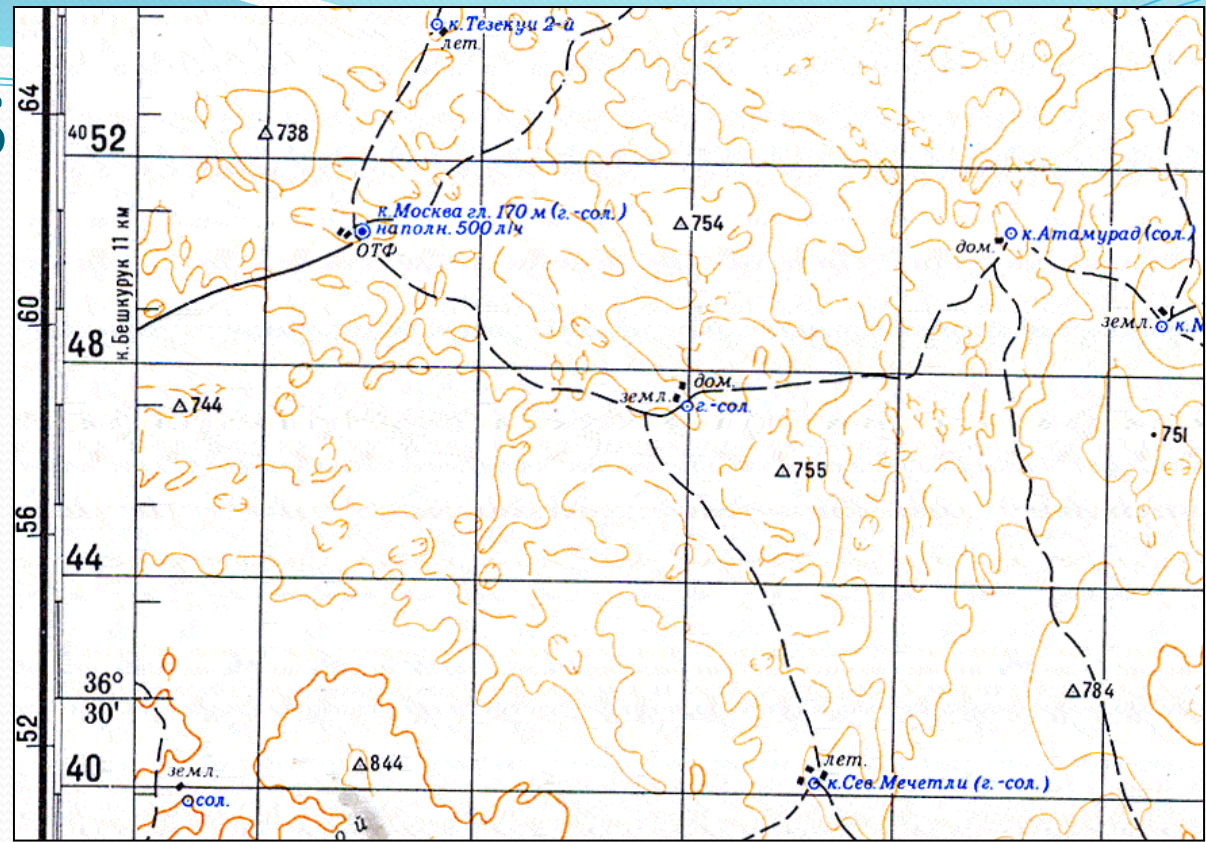
Elevations of river (m asl)

Width of river (m)



Soviet maps

вдхр. = водохранились =
reservoir or rainwater
cistern



Wells (and also boreholes used for water supply) are typically marked

к. = колодец

Boreholes (for water supply or exploratory purposes) may also be marked

скв. = скважина

Wells are typically marked with a blue circle, containing a small blue dot

Water quality may be marked as

сол. = соленая (salty) or *г.-сол.* = горько-соленая (bitter salty)

The well name may be followed by a depth *гл.* = глубина and a statement of yield

наполн. = filling / yield

л/ч = litres per hour

Hydrogeological map of the Soviet Union

- Provides detailed



- Provides detailed geological columns and water analyses.
- **Крыжановский, В.А. (editor) (1972).** Гидрогеология СССР: том 38: Туркменская ССР. Институт Геологии Совета Министров Туркменской ССР. Издат. Недра, Москва.
Hydrogeology of the USSR. Vol. 38. Turkmenistan. Nedra, Moscow. 565 pp.

Remote sensing (e.g. Springs)



Ghormach, in Google Earth

Remote sensing (e.g. karezes)

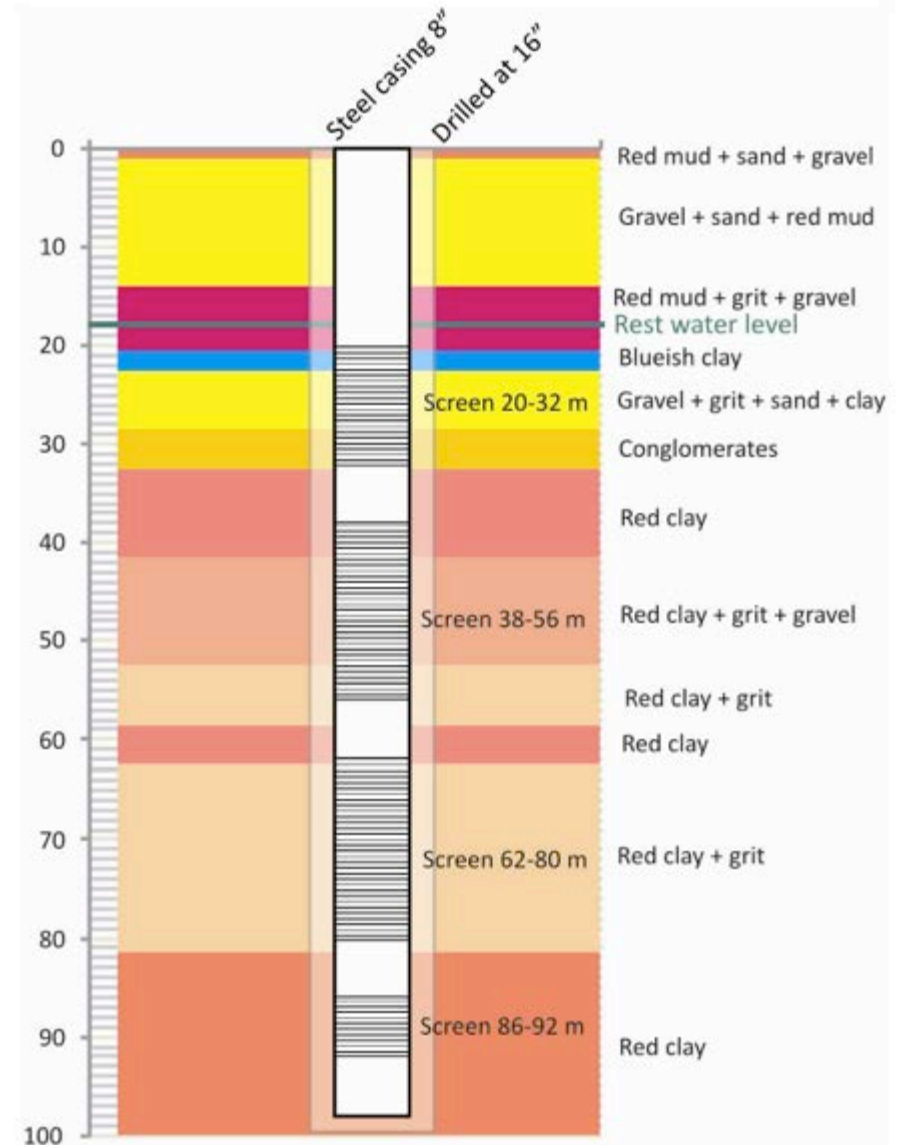
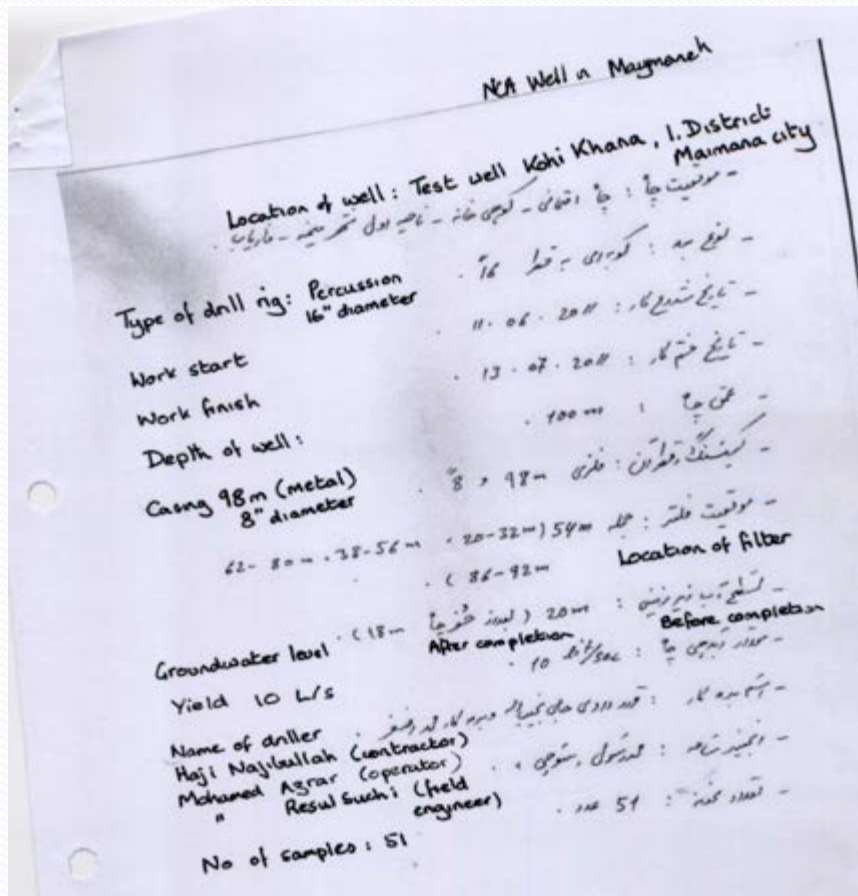


Near
Qalat, in
Google
Earth

Apart from this....

- We are left to go through, quality-control and collate:
 - Paper-based well logs (e.g. Those held by MRRD or in old UNICEF reports)
 - Digital data provided by, e.g. DACAAR or NCA

Paper data



DACAAR's databases

- The main water-point (WSG) database (management database)
- Borehole log database, held in the Schlumberger software *Hydrogeoanalyst*.
- Groundwater analysis database, maintained in the environment of the Schlumberger software *Aquachem*.
- For Faryab, an Excel file containing results of a rapid survey of groundwater electrical conductivity.
- Excel files for water level, electrical conductivity, temperature) for DACAAR's network of observation wells.
- Extraction of information from DACAAR reports

Digital data

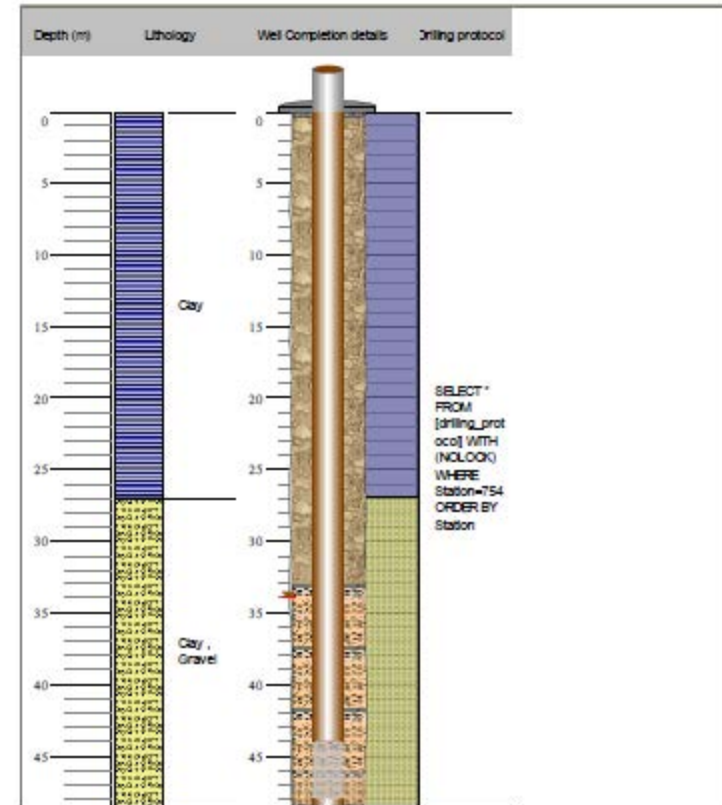
Faryab TWs pumping test data [Compatibility Mode] - M

No	Province Name	District Name	Village Name	Latitude Dec	Longitude Dec	Pipe Scheme Type	pumping test date	Pumping Test Period (Hour)	Di
1	Faryab	Maymana	Bibi Aina	35.90891	64.76765	Motorize	30/06/2008	5	
2	Faryab	Qaysar	Arzolik	35.68758	64.27822	Motorize	05/03/2008	8	
3	Faryab	Qaysar	Sar Asyab	35.68588	64.29919	Motorize	04/03/2008	4	
4	Faryab	Almar	Nughayli Bala	35.82441	64.56384	Motorize	06/03/2008	6	
5	Faryab	Almar	Bish Qara and Noqholi Payan	35.85794	64.52683	Motorize	29/05/2010	15	
6	Faryab	Almar	Sarf Ali	35.8076	64.51177	Tube Well	01/06/2010	13 min	
7	Faryab	Almar	Qara Tana	35.809	64.5606	Tube Well	01/06/2010	16 min	
8	Faryab	Almar	Shoran Shikhan	35.8326	64.55704	Tube Well	03/06/2010	5	
9	Faryab	Maymana	Maymana University	35.9077	64.78777	Tube Well	30/11/2011	6	
10	Faryab	Pashton Kc	Jamshidy Bala	35.8793	64.83953	Tube Well	19/03/2012	6	
11	Faryab	Shrin Taga Astana Valley (Mahad village)		36.15363	64.96008	Tube Well	08/09/2009	7	
12	Faryab	Shrin Taga Astana Valley (Gul Qudoq village)		36.13655	65.07095	Tube Well	09/11/2009	7	
13	Faryab	Shrin Taga Jalaier (Chokazie village)		36.3766	64.78998	Tube Well	24/12/2009	8.5	
14	Faryab	Shrin Taga Jalaier (Atomchi village)		36.2497	64.74518	Tube Well	07/02/2010	6	

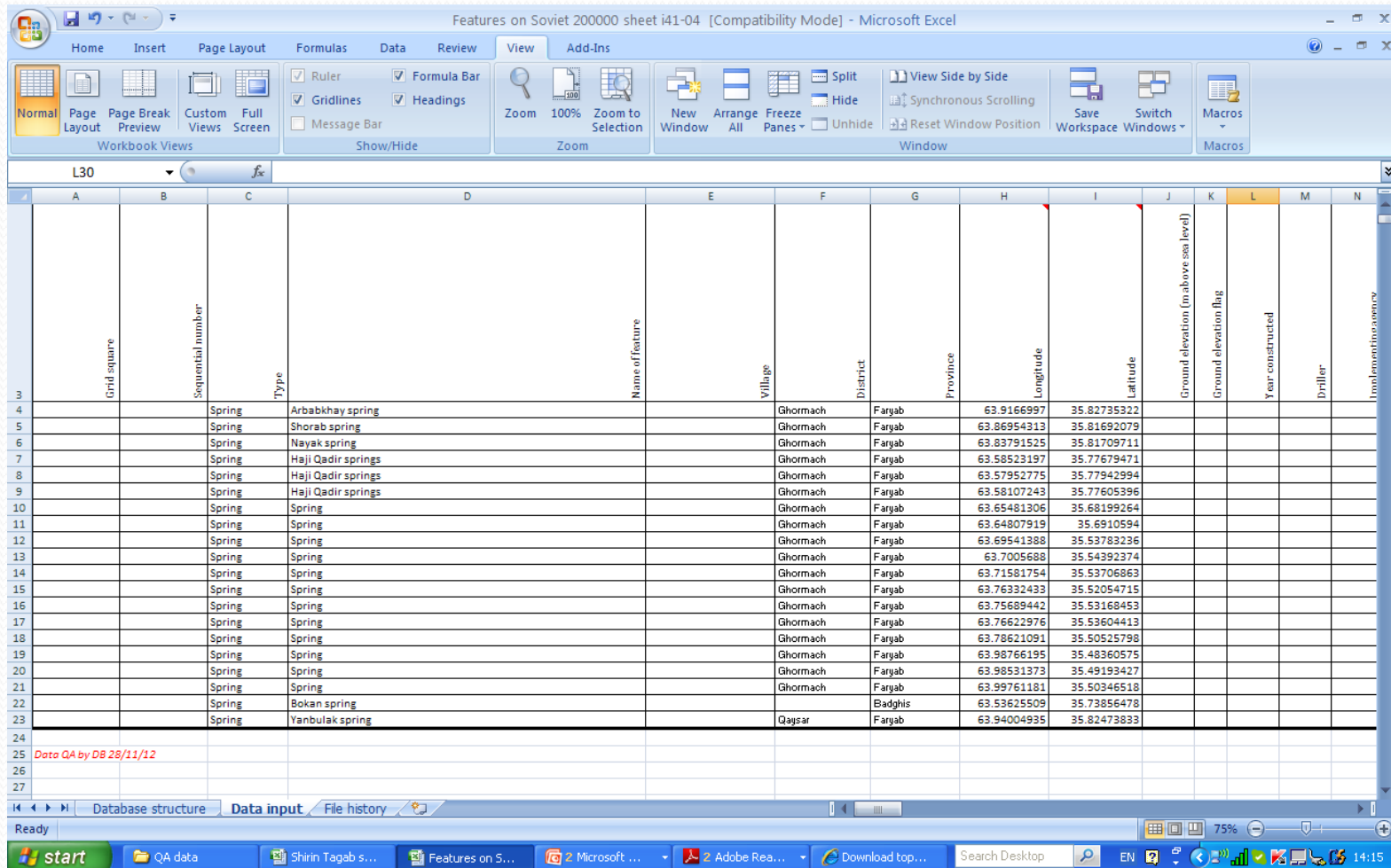
DACAAR
Water Supply Program

Borehole Log Report

Borehole S/NO: 761
Dist, Prov, WP Code, Year Imp: ALF-9-08



All data converted to standard Excel format



Features on Soviet 200000 sheet i41-04 [Compatibility Mode] - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Grid square	Sequential number	Type	Name of feature	Village	District	Province	Longitude	Latitude	Ground elevation (m above sea level)	Ground elevation flag	Year constructed	Driller	Implement/agency
3			Spring	Arbabkhay spring		Ghormach	Faryab	63.9166997	35.82735322					
4			Spring	Shorab spring		Ghormach	Faryab	63.86954313	35.81692079					
5			Spring	Nayak spring		Ghormach	Faryab	63.83791525	35.81709711					
6			Spring	Haji Qadir springs		Ghormach	Faryab	63.58523197	35.77679471					
7			Spring	Haji Qadir springs		Ghormach	Faryab	63.57952775	35.77942994					
8			Spring	Haji Qadir springs		Ghormach	Faryab	63.58107243	35.77605396					
9			Spring	Spring		Ghormach	Faryab	63.65481306	35.68199264					
10			Spring	Spring		Ghormach	Faryab	63.64807919	35.6910594					
11			Spring	Spring		Ghormach	Faryab	63.69541388	35.53783236					
12			Spring	Spring		Ghormach	Faryab	63.7005688	35.54392374					
13			Spring	Spring		Ghormach	Faryab	63.71581754	35.53706863					
14			Spring	Spring		Ghormach	Faryab	63.76332433	35.52054715					
15			Spring	Spring		Ghormach	Faryab	63.75689442	35.53168453					
16			Spring	Spring		Ghormach	Faryab	63.76622976	35.53604413					
17			Spring	Spring		Ghormach	Faryab	63.78621091	35.50525798					
18			Spring	Spring		Ghormach	Faryab	63.98766195	35.48360575					
19			Spring	Spring		Ghormach	Faryab	63.98531373	35.49193427					
20			Spring	Spring		Ghormach	Faryab	63.99761181	35.50346518					
21			Spring	Bokan spring		Badghis	Faryab	63.53625509	35.73856478					
22			Spring	Yanbulak spring		Qasgar	Faryab	63.94004935	35.82473833					
23														
24														
25														
26														
27														

Data QA by DB 28/11/12

Database structure Data input File history

Ready

start QA data Shirin Tagab s... Features on S... 2 Microsoft ... 2 Adobe Rea... Download top... Search Desktop EN 75% 14:15

The map displays the geological structure of the Qaysar area. Key features include:

- Geological Units:**
 - N_{1CS1} : Paleogene units, shown in light yellow.
 - Q_{2loe} : Quaternary units, shown in light pink.
 - Q_{34a} : Quaternary units, shown in light green.
 - K_{1SSC} : Cretaceous units, shown in light blue.
 - KP_{1d} : Paleogene units, shown in light orange.
- Locations:**
 - Sarchashma
 - Qala e Kohnah
 - Qaysar
 - Qeyfar
 - Khawaja Khorus
 - Yaka Pista
 - Birka
 - Qaruqol
 - Konjak Zoryan
 - Chechaktu (1)
 - Gawdar
 - Qala-i-Shadi
 - Sarchashma Tylan Khan
 - Rustam Khan
 - Deh Pitaw
 - Khetay
- Scale:** 1000 meters.