Training and Capacity building Course in Laboratory Quality Control

15-17 June 2013 at RuWatSIP

Sources of errors

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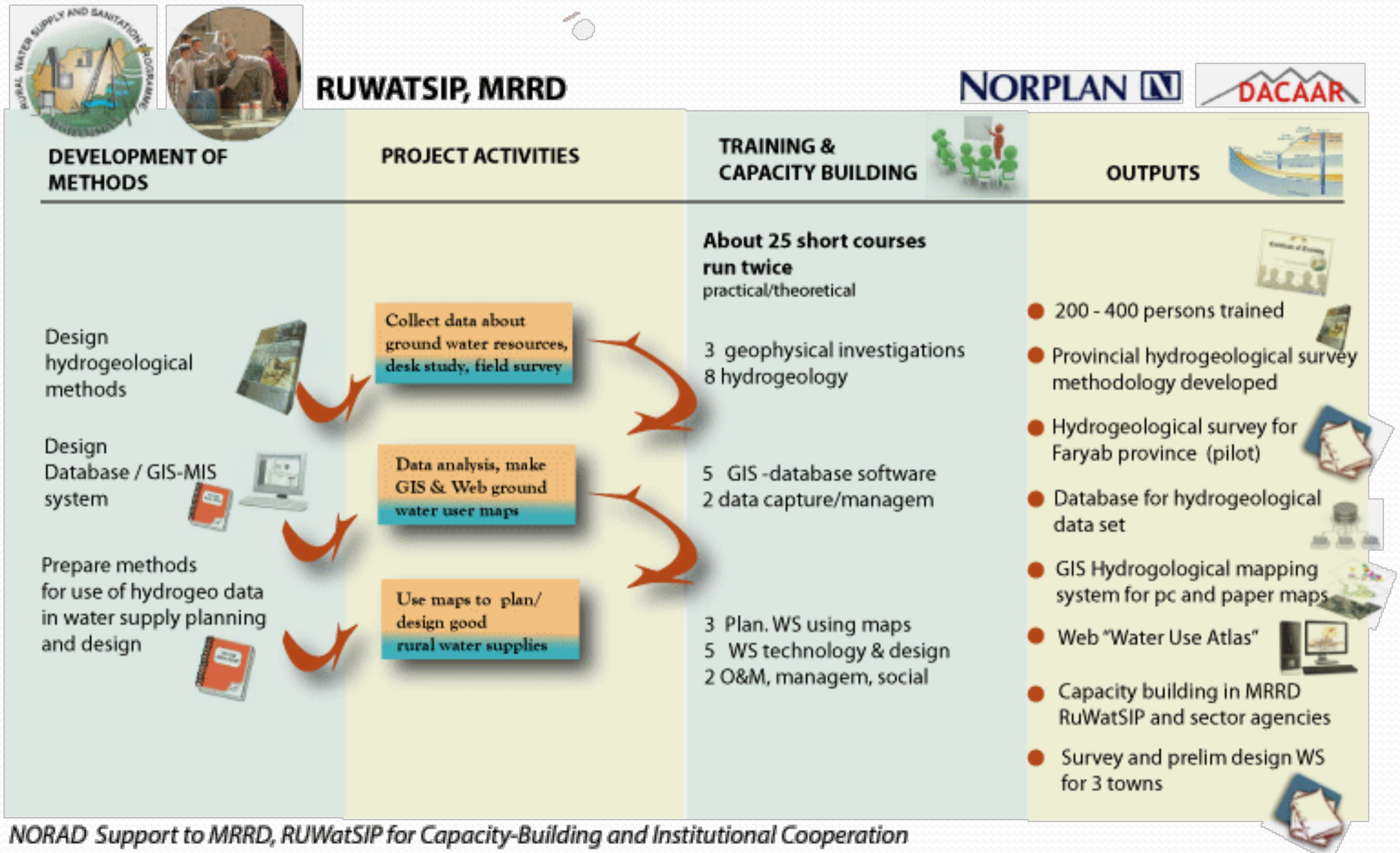
Project in MRRD covering Capacity Building and Institutional Cooperation in the field of Hydrogeology for Faryab Province Afghanistan

NORPLAN

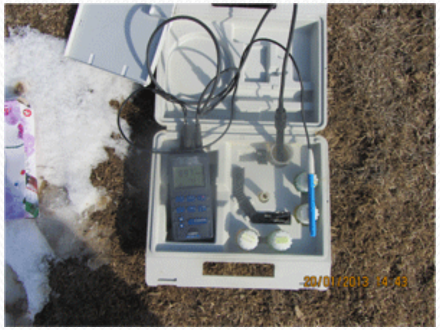
What we are asked to do?



NORAD Support to MRRD, RUWatSIP for Capacity-Building and Institutional Cooperation in the Field of Hydrogeology for Faryab Province, Project

Need for QC for labs?

- For water resource development



- For water supply to assure safe water is delivered

Sources of errors

- **HANDLING OF SAMPLE BEFORE REACHING LAB**
- Representative sample?
- Clean sample container
- Sample preserved
- Sample correctly marked and registered
- Satisfactory transport
- Written order of analysis given, types of analysis
- Sample registration as handed over to lab

Sources of errors

SAMPLE AT THE LAB, adm.

- Sample duly registered, documented
- All samples registered and stored satisfactorily
- Analytical report format prepared
- Superviser countersigned that analytical work is conducted in accordance to plan
- All updated analytical procedures available
- All staff working in the lab trained, supervised and certified for conducted specified analysis

Sources of errors

LAB ANALYTICA ISSUES

- Analytical method checked
- Chemicals fresh for use
- Dilution water free from contaminations?
- Glassware appropriately cleaned?
- Calibration conducted for each method
- Reference standards available and valid for use
- Sample analysed in duplicate, triplicate?
- Has the accuracy of the analytical method been tested, controlled?

Solution 1		TARGET	Kab1			Nor1	Kab2			TARGET	Kab1			Nor1	Kab2		
			A01	A02	A03		B3	B1	B2		A01	A02	A03		B3	B1	B2
EC	µS/cm		2950	2600	2570												
TDS	mg/L		2030	1789	1768												
Turbidity	NTU		1.8	1.8	2.35												
pH			7.31	6.75	6.6												
		Concentrations in mg/L								Concs in meq/L							
Total alkalinity	mg/L CaCO3		105	110	115												
P-Alk	mg/L CaCO3		75	90	90												
M-Alk	mg/L CaCO3		105	110	115	<2	44	42	36								
Alkalinity to pH4.5	mmol/L		2.1	2.2	2.3	<0.04	0.88	0.84	0.72	0.00	2.10	2.20	2.30	<0.04	0.88	0.84	0.72
HCO3	mg/L HCO3		0	0	0												
CO3	mg/L CO3		60	40	50												
OH	mg/L OH		45	70	65												
Chloride	mg/L	710.8	45	52	52	710	738	728	680	20.05	1.27	1.47	1.47	20.03	20.82	20.54	19.18
Sulphate	mg/L SO4	96.06	94	95	100	100	97	64	76	2.00	1.96	1.98	2.08	2.08	2.02	1.33	1.58
Sulphide	mg/L S		0	0	0												
Fluoride	mg/L		0.8	0.37	0.86						0.04	0.02	0.05				
Nitrate	mg/L NO3	62.01	9.64	7.76	6.6	62.0	5.9	5.0	5.2								
Nitrate	mg/L N	14.01	2.18	1.75	1.49	14	1.33	1.13	1.17	1.00	0.16	0.13	0.11	1.00	0.10	0.08	0.08
Phosphate	mg/L PO4		0.22	0.01	0.02												
Phosphate	mg/L P																
Boron	mg/L BO2		0.36	0.24	0.01												
Boron	mg/L B																
Bromide	mg/L		1.74	1.75	2.01						0.02	0.02	0.03				
Total hardness	mg/L CaCO3		115	110	115												
Calcium hardness	mg/L CaCO3		58	40	51												
Sodium	mg/L	459.8	114	135	151	450	518	571	536	20.00	4.96	5.87	6.57	19.57	22.53	24.84	23.31
Potassium	mg/L	1.955	10.8	8.6	2.1	8.8	6.2	5.0	5.6	0.05	0.28	0.22	0.05	0.23	0.16	0.13	0.14
Calcium	mg/L	20.04	23	16	20	18	28.8	27.2	30.4	1.00	1.15	0.80	1.00	0.90	1.44	1.36	1.52
Chromium (hex)	mg/L		0.01	0.02	0.04												
Magnesium	mg/L	24.31	22	29	23	22	28.42	30.16	24.94	2.00	1.81	2.39	1.89	1.81	2.34	2.48	2.05
Ammonium	mg/L NH4		0.1	0.07	0.03												
Ammonium	mg/L N																
Manganese	mg/L		0.001	0.001	0.002												
Copper	mg/L		0.28	0.4	0.5												
Aluminium	mg/L		0.01	0.01	0												
Total iron	mg/L		0	0	0												
Arsenic	mg/L		0	0	0												
Silica	mg/L SiO2		0.86	0.86	0.86												
Silicon	mg/L Si																
Sum cations	meq/L									23.05	8.19	9.28	9.51	22.51	26.47	28.80	27.03
Sum anions	meq/L									23.05	5.54	5.81	6.02	23.11	23.81	22.79	21.57
Ion balance error										0.00%	19.29%	22.98%	22.45%	-1.32%	5.29%	11.66%	11.23%
Checked by DB			√	√	√	√	√	√	√								

Ex-2

Solution 2		TARGET	Kab1	Nor1	Kab2	TARGET	Kab1	Nor1	Kab2
EC	µS/cm		973						
TDS	mg/L		669						
Turbidity	NTU		1.74						
pH			7.6	5.7	6.9				
		Concentrations in mg/L					Concs in meq/L		
Total alkalinity	mg/L $CaCO_3$		105						
P-Alk	mg/L $CaCO_3$		50						
M-Alk	mg/L $CaCO_3$		115		48				
Alkalinity to pH4.5	mmol/L	0	2.3	<0.04	0.96	0.00	2.30	<0.04	0.96
HCO_3	mg/L HCO_3		15						
CO_3	mg/L CO_3		100						
OH	mg/L OH		0						
Chloride	mg/L	285.4	37	250	184	8.05	1.04	7.05	5.19
Sulphate	mg/L SO_4	48.0	47	49	65	1.00	0.98	1.02	1.35
Sulphide	mg/L S		0						
Fluoride	mg/L	0.95	1.13	0.68		0.05	0.06		
Nitrate	mg/L NO_3	31.0	9.12	28.3	3.0				
Nitrate	mg/L N	7.01	2.06	6.4	0.68	0.50	0.15	0.46	0.05
Phosphate	mg/L PO_4		0.15						
Phosphate	mg/L P			<0.002					
Boron	mg/L BO_2		0.2						
Boron	mg/L B			<0.02					
Bromide	mg/L		1.95				0.02		
Total hardness	mg/L $CaCO_3$		145						
Calcium hardness	mg/L $CaCO_3$		170						
Sodium	mg/L	92.0	25	80	111.4	4.00	1.09	3.48	4.85
Potassium	mg/L	3.91	3.4	2.9	3.2	0.10	0.09	0.07	0.08
Calcium	mg/L	90.2	68	70	78.4	4.50	3.39	3.49	3.91
Chromium (hex)	mg/L		0.03	<0.001					
Magnesium	mg/L	12.2	16	12	13.92	1.00	1.32	0.99	1.15
Ammonium	mg/L NH_4		0						
Ammonium	mg/L N			<0.005					
Manganese	mg/L		0.001	<0.001					
Copper	mg/L		0.2	<0.003					
Aluminium	mg/L		0	0.018					
Total iron	mg/L		0	0.032					
Arsenic	mg/L		0						
Silica	mg/L SiO_2		0.28						
Silicon	mg/L Si			<0.01					
Sum cations	meq/L					9.60	5.88	8.03	9.98
Sum anions	meq/L					9.60	4.55	8.53	7.55
Ion balance error						0.00%	12.77%	-2.99%	13.88%
Checked by DB			√	√	√				

Ex-3

	Solution 3	TARGET	Kab1	Nor1	Kab2	TARGET	Kab1	Nor1	Kab2
EC	µS/cm		370						
TDS	mg/L		255						
Turbidity	NTU		1.32						
pH			7.96	7.9	7.2				
		Concentrations in mg/L				Concs in meq/L			
Total alkalinity	mg/L CaCO3		180						
P-Alk	mg/L CaCO3		60						
M-Alk	mg/L CaCO3		180		56				
Alkalinity to pH4.5	mmol/L	1	3.6	1.057	1.12	1.00	3.60	1.06	1.12
HCO3	mg/L HCO3		60						
CO3	mg/L CO3		120						
OH	mg/L OH		0						
Chloride	mg/L	72.7	12	57	72	2.05	0.34	1.61	2.03
Sulphate	mg/L SO4	24.0	25	26	33	0.50	0.52	0.54	0.69
Sulphide	mg/L S		0						
Fluoride	mg/L	1.9	1.27	1.4		0.10	0.07		
Nitrate	mg/L NO3	12.4	4.96	13.7	3.7				
Nitrate	mg/L N	2.80	1.12	3.1	0.84	0.20	0.08	0.22	0.06
Phosphate	mg/L PO4		0.3						
Phosphate	mg/L P			0.003					
Boron	mg/L BO2		0.15						
Boron	mg/L B			<0.02					
Bromide	mg/L		1.93				0.02		
Total hardness	mg/L CaCO3		88						
Calcium hardness	mg/L CaCO3		86						
Sodium	mg/L	23.0	86	21	19.3	1.00	3.74	0.91	0.84
Potassium	mg/L	5.87	4.3	4.4	4.1	0.15	0.11	0.11	0.10
Calcium	mg/L	44.1	34	35	44.0	2.20	1.70	1.75	2.20
Chromium (hex)	mg/L		0.02	<0.001					
Magnesium	mg/L	6.08	6	6.3	5.8	0.50	0.49	0.52	0.48
Ammonium	mg/L NH4		0						
Ammonium	mg/L N			<0.005					
Manganese	mg/L		0.001	<0.001					
Copper	mg/L		0.36	<0.003					
Aluminium	mg/L		0	0.012					
Total iron	mg/L		0.05	0.015					
Arsenic	mg/L		0						
Silica	mg/L SiO2		0.5						
Silicon	mg/L Si			<0.01					
Sum cations	meq/L					3.85	6.04	3.29	3.62
Sum anions	meq/L					3.85	4.63	3.43	3.90
Ion balance error						0.00%	13.26%	-2.03%	-3.72%
Checked by DB			√	√	√				

Thank you.

- I trust we can be better