

Figure 118-01 Silti - Dalocha - Kura Kolisa - Site 1

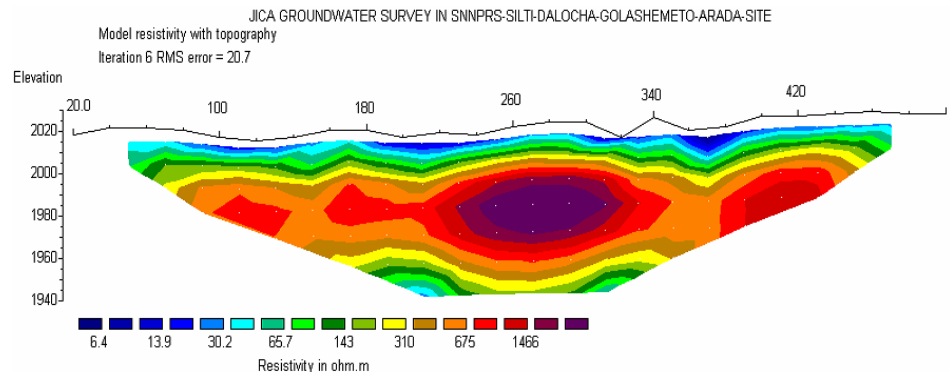


Figure 119-02 Silti - Dalocha - Golana Shemeto - Arada

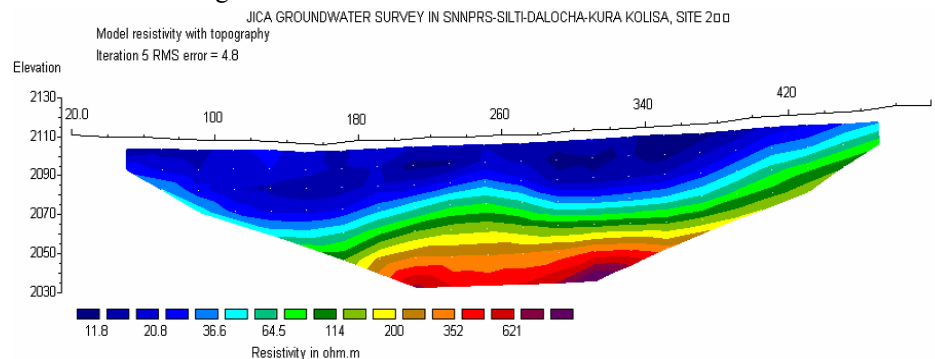


Figure 118-02 Silti - Dalocha - Kura Kolisa - Site 2

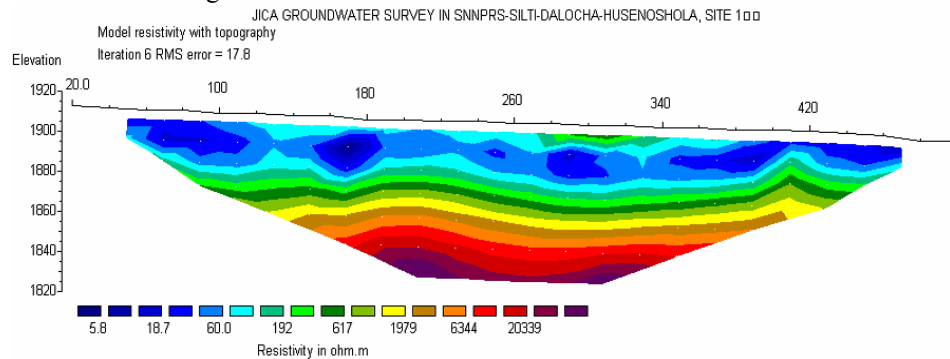


Figure 120-01 Silti - Dalocha - Husend Shola - Site 1

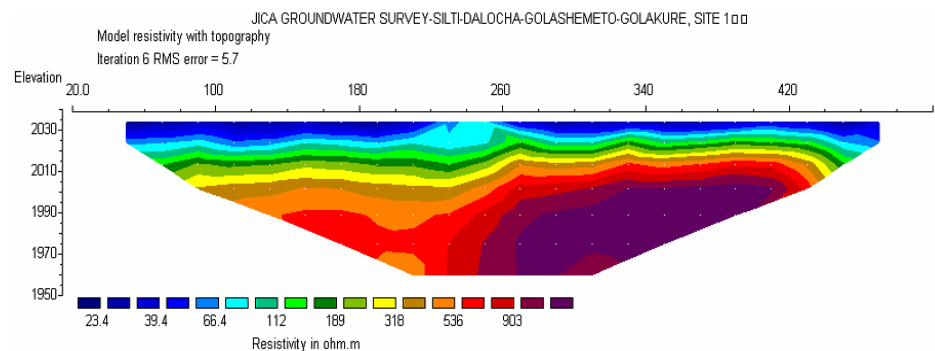


Figure 119-01 Silti - Dalocha - Golana Shemeto - Golakure

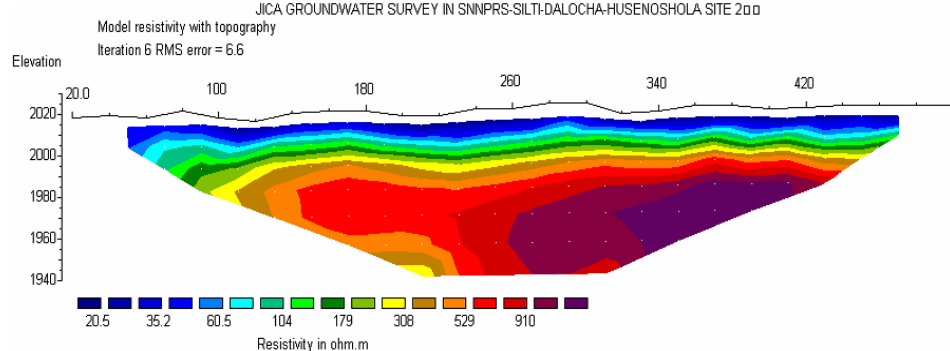


Figure 120-02 Silti - Dalocha - Husend Shola - Site 2

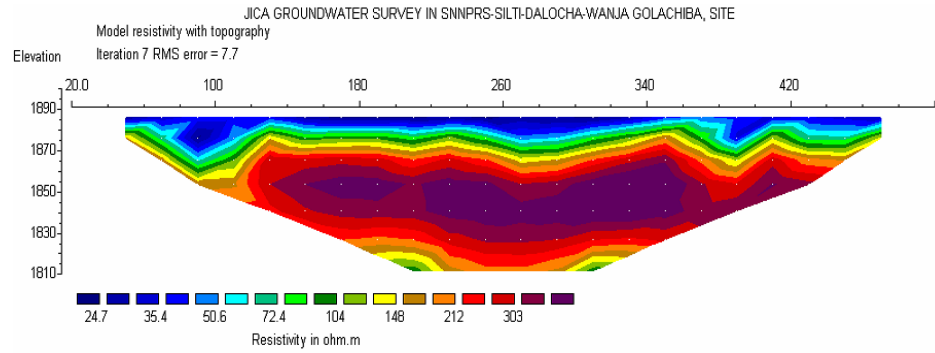


Figure 121-01 Silti - Dalocha - Waneja Golachiba - Site 1

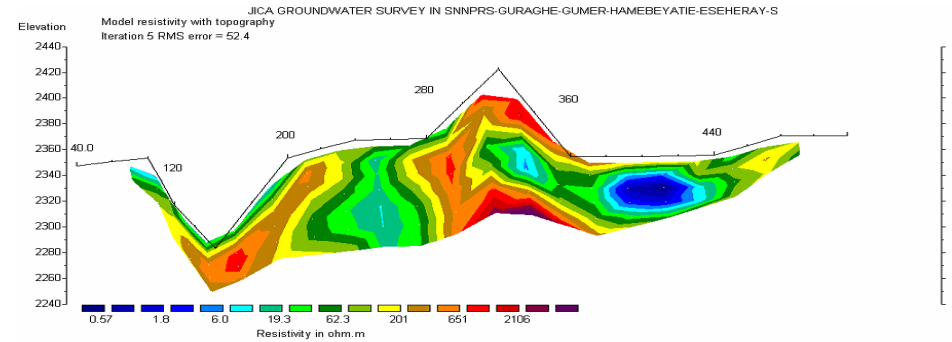


Figure 122-02 Gurage- Gumer- Hamebeyata - Escheray

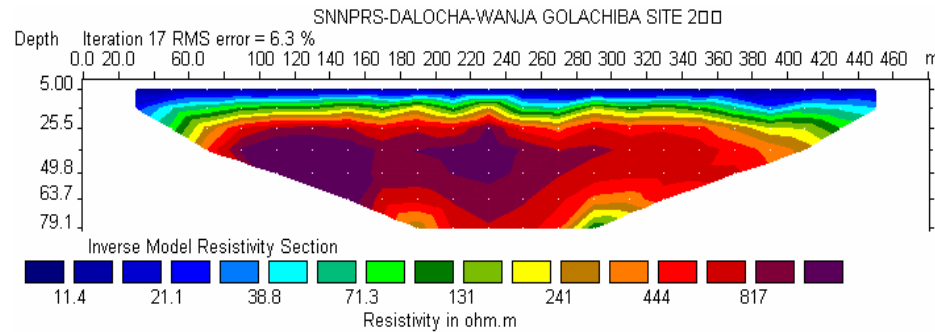


Figure 121-02 Silti - Dalocha - Waneja Golachiba - Site 2

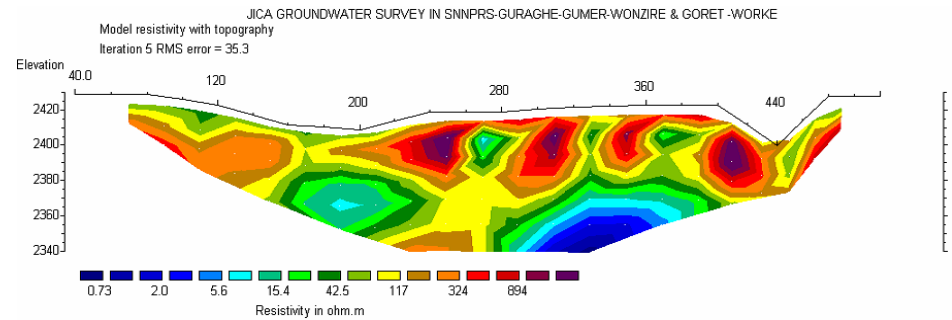


Figure 123-01 Gurage- Gumer- Wenwzerana Gorate - Workeffa

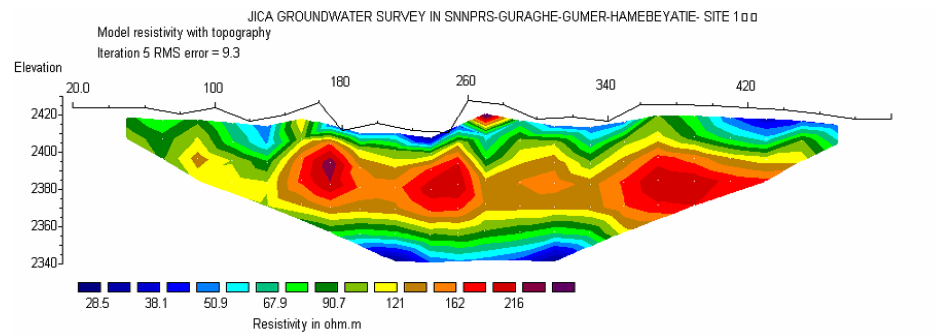


Figure 122-01 Gurage- Gumer- Hamebeyata - Site 1

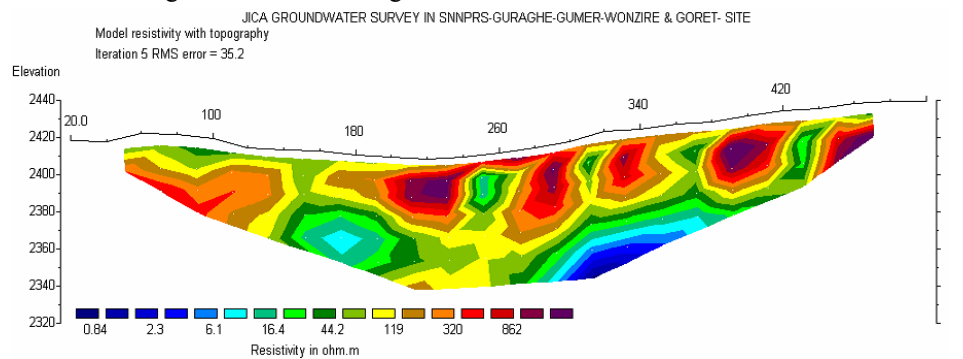


Figure 123-02 Gurage- Gumer- Wenwzerana Gorate - Site 2

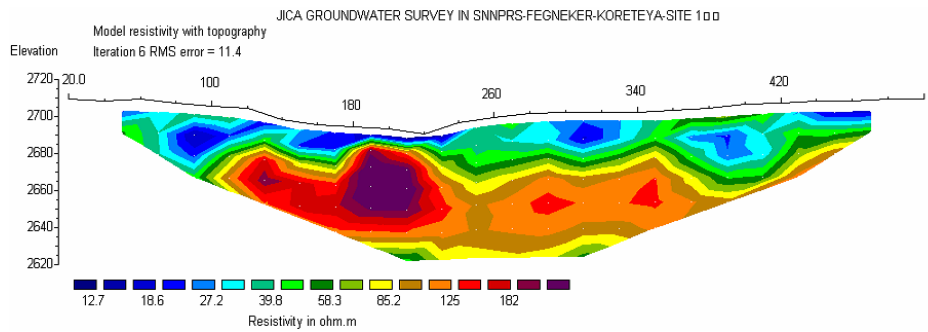


Figure 125-01 Gurage- Gumer- Fegnekir - Koreteya

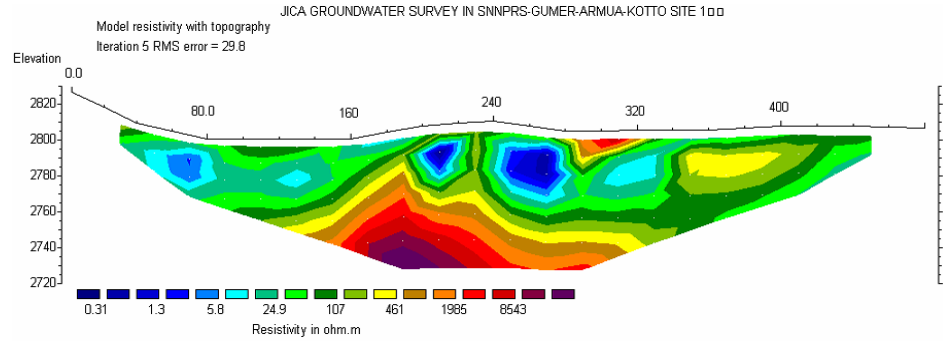


Figure 126-01 Gurage- Gumer- Aremua - Kotto

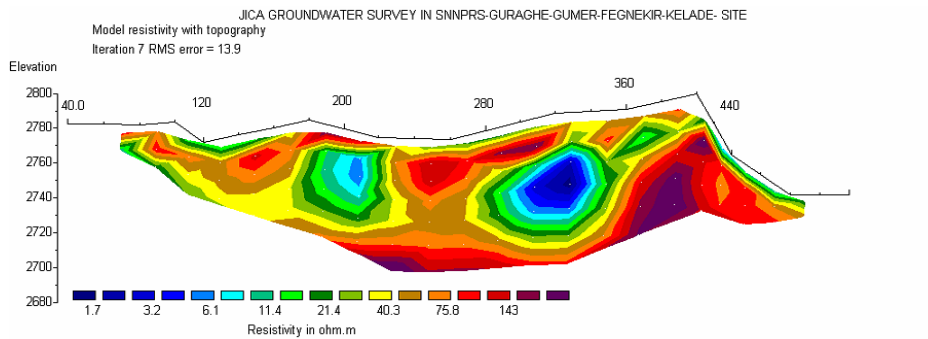


Figure 125-02 Gurage- Gumer- Fegnekir - Kelade

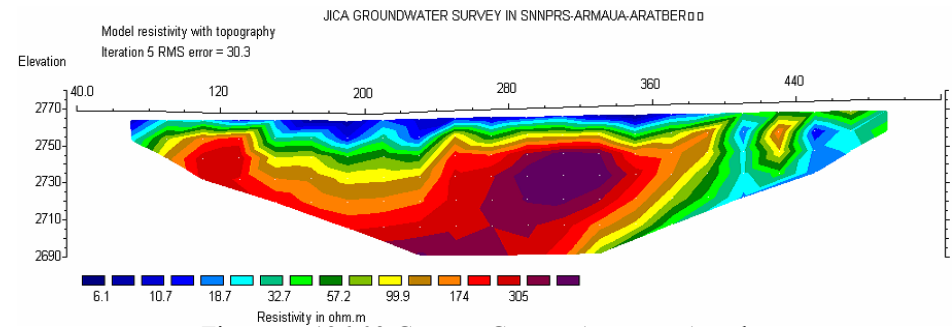


Figure 126-02 Gurage- Gumer- Aremua - Arateber

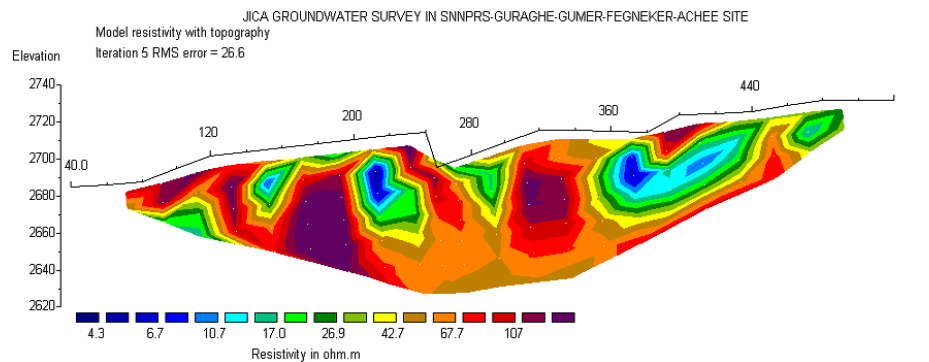


Figure 125-03 Gurage- Gumer- Fegnekir - Achee

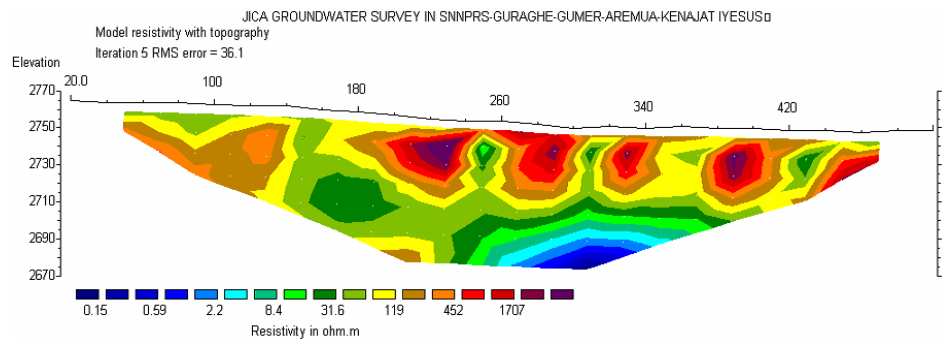


Figure 126-03 Gurage- Gumer- Aremua - Kenajat Iyesus

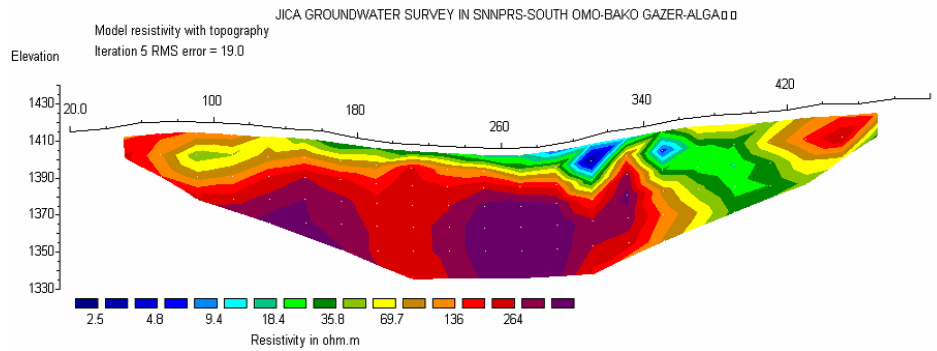


Figure 127 South Omo - Backo Gazer- Alga - Hulatenga Meda

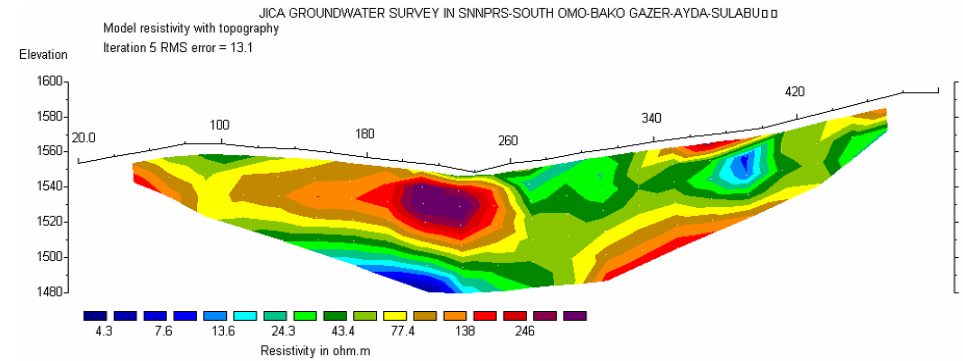


Figure 130-01 South Omo - Backo Gazer- Ayda - Sulabu

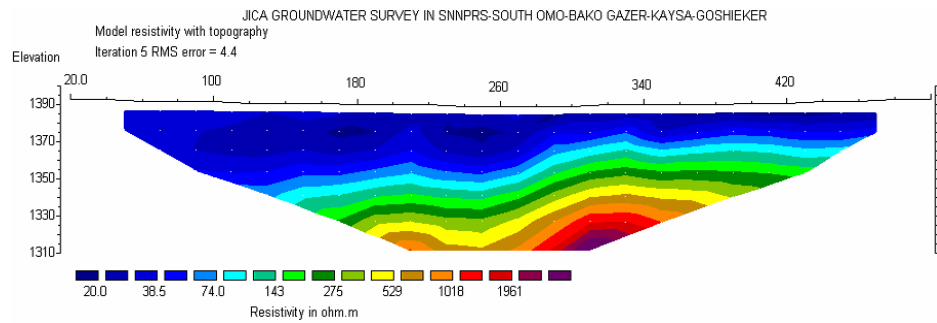


Figure 128-01 South Omo - Backo Gazer- Kaysa - Goshler

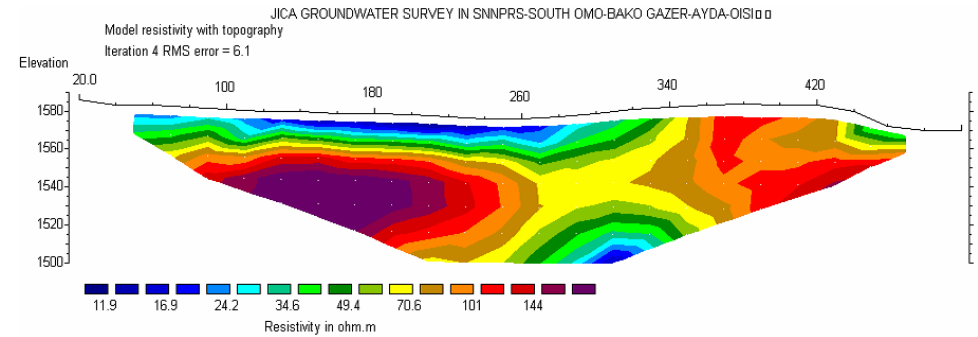


Figure 130-02 South Omo - Backo Gazer- Ayda - Oishi

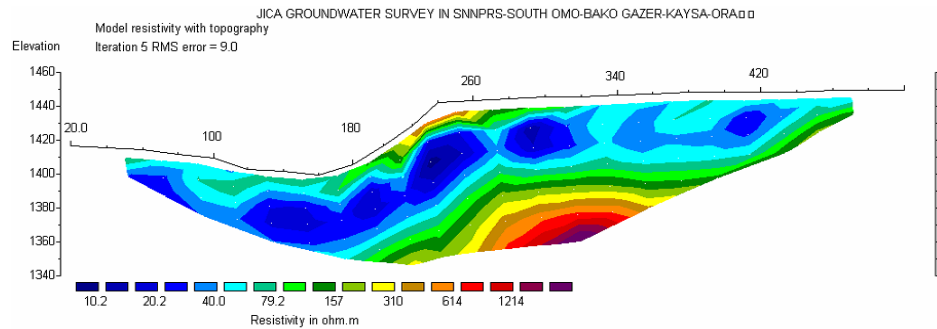
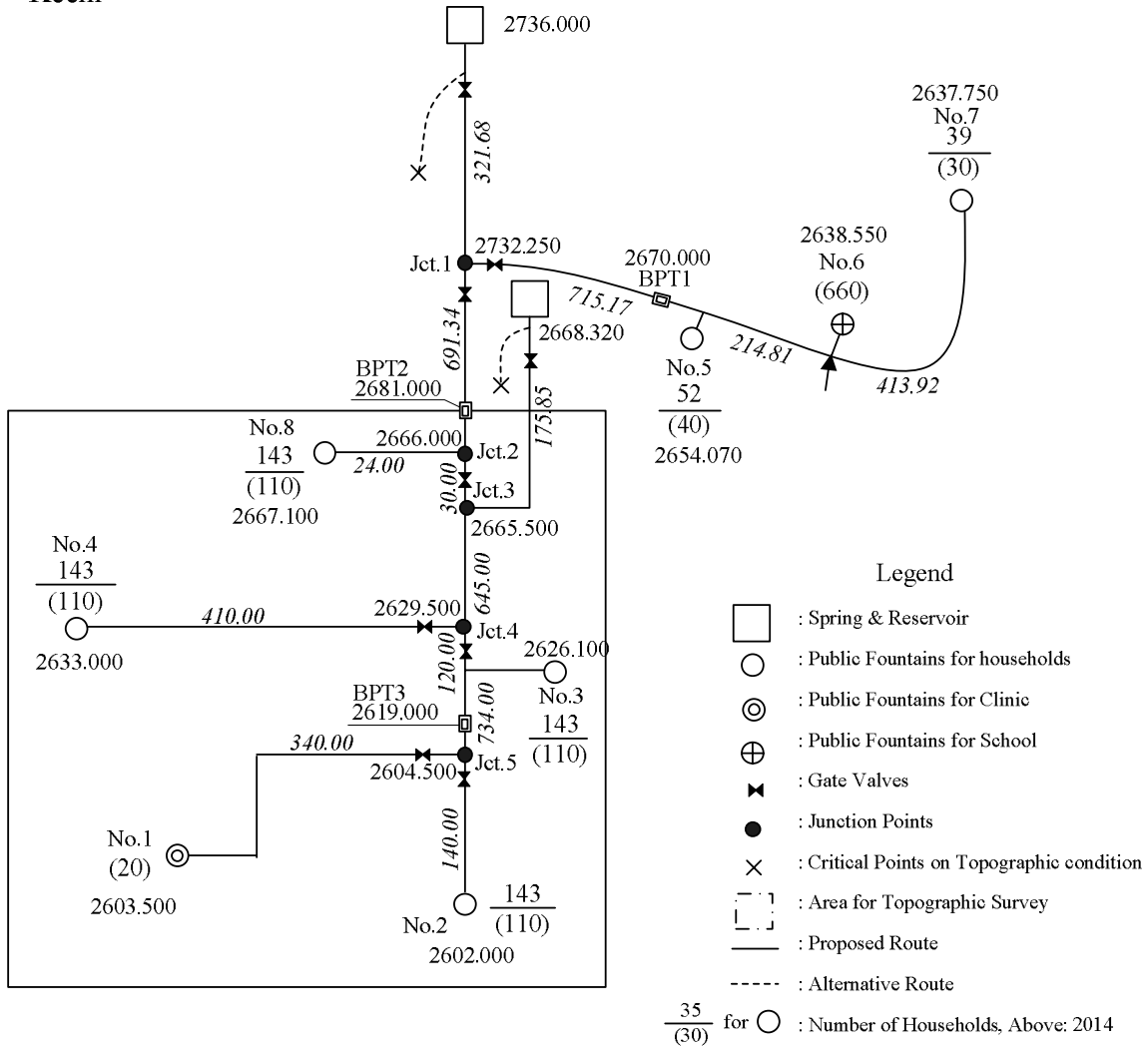


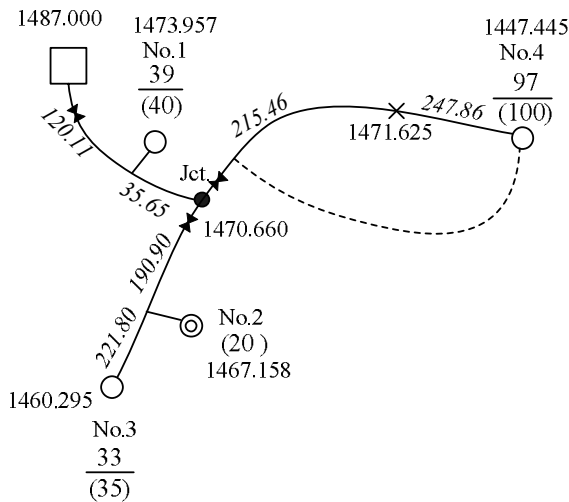
Figure 128-02 South Omo - Backo Gazer- Kaysa - Ora

Kechi



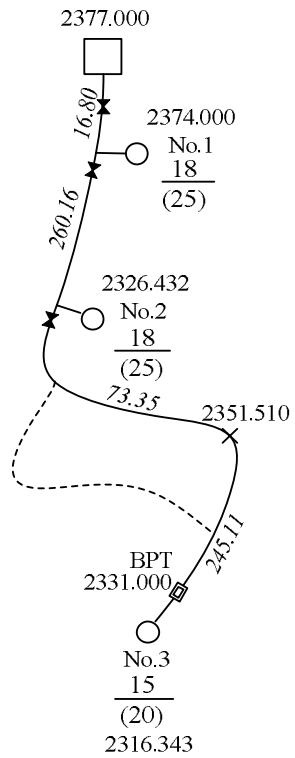
$\frac{35}{(30)}$ for \bigcirc : Number of Households, Above: 2014
 Below: 2004
 (660) for \oplus : Number of Students
 (20) for \odot : Number of Visitors to Medical Clinic
 $\underline{340.00}$: Pipe Distance
 1471.625 : Ground Elevation

Waruma Kessa



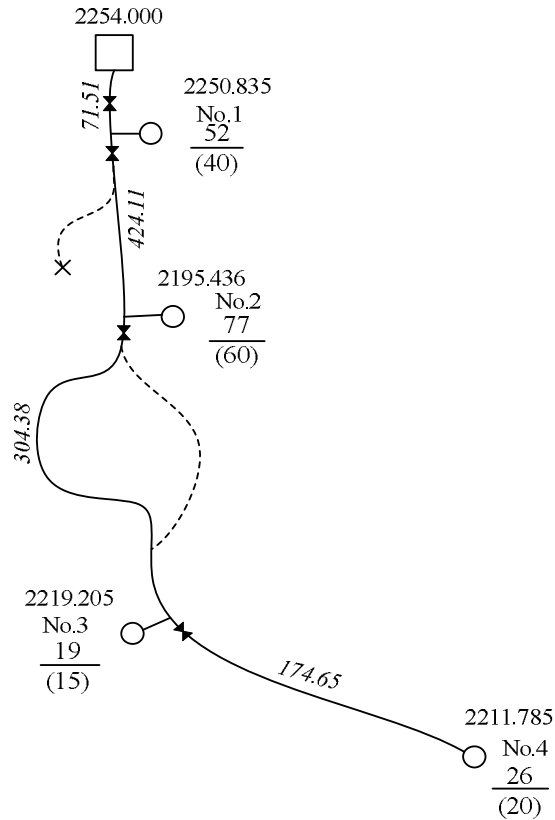
選定路線概要図 (Kechi および Waruma Kessa)

Arusi Bale



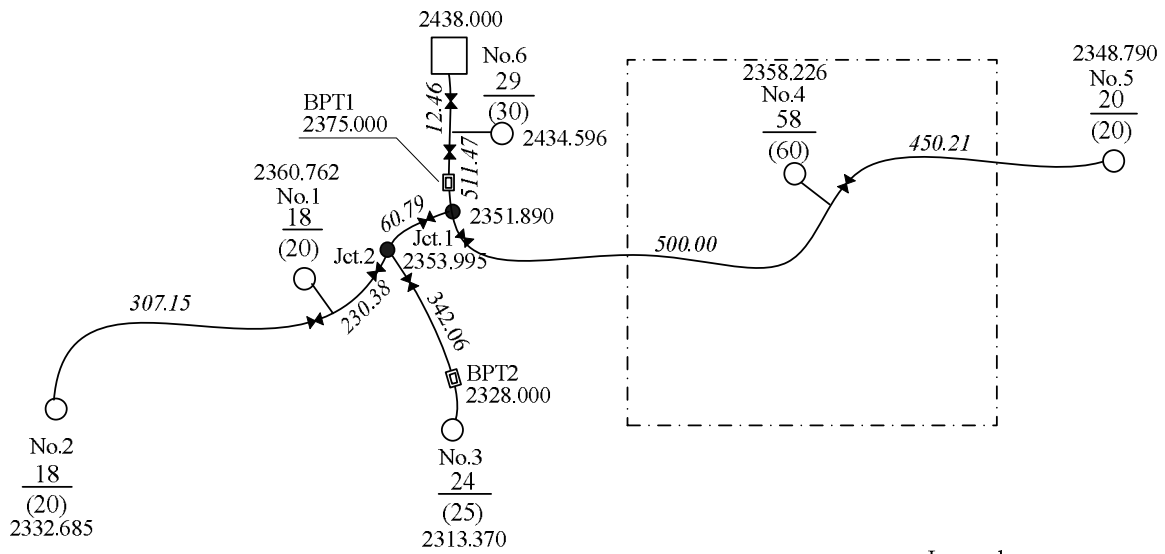
- ### Legend
- : Spring & Reservoir
 - : Public Fountains for households
 - ⊙ : Public Fountains for Clinic
 - ⊕ : Public Fountains for School
 - : Gate Valves
 - : Junction Points
 - × : Critical Points on Topographic condition
 - : Area for Topographic Survey
 - : Proposed Route
 - : Alternative Route
 - $\frac{35}{(30)}$ for : Number of Households, Above: 2014
Below: 2004
 - (660) for ⊕ : Number of Students
 - (20) for ⊙ : Number of Visitors to Medical Clinic
 - 340.00 : Pipe Distance
 - 1471.625 : Ground Elevation

Arusi Bale (Billille)



選定路線概要図 (Arusi Bale)

Gudumu (Soso)



Legend

- : Spring & Reservoir
- : Public Fountains for households
- ⊙ : Public Fountains for Clinic
- ⊕ : Public Fountains for School
- ✕ : Gate Valves
- : Junction Points
- × : Critical Points on Topographic condition
- : Area for Topographic Survey
- : Proposed Route
- : Alternative Route

$\frac{35}{(30)}$ for : Number of Households, Above: 2014

Below: 2004

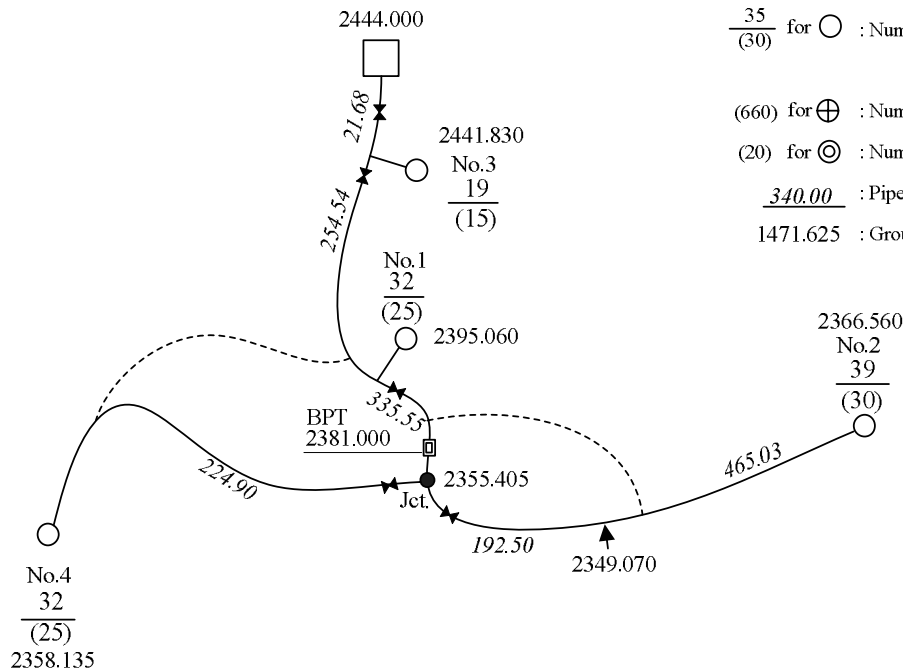
(660) for ⊕ : Number of Students

(20) for ⊙ : Number of Visitors to Medical Clinic

340.00 : Pipe Distance

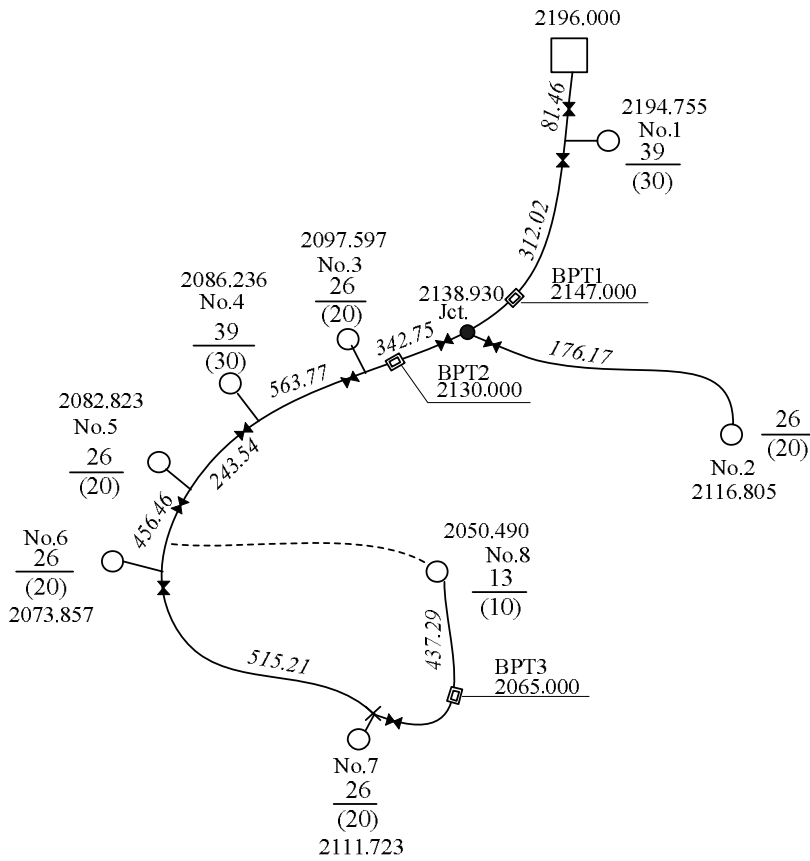
1471.625 : Ground Elevation

Gudumu (Urgmo)



選定路線概要図 (Gudumu)

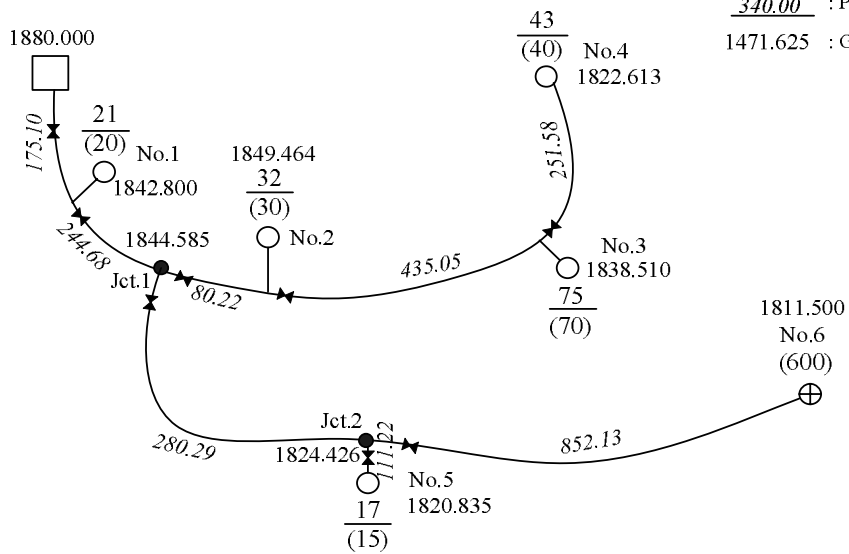
Ofa (Yoge)



Legend

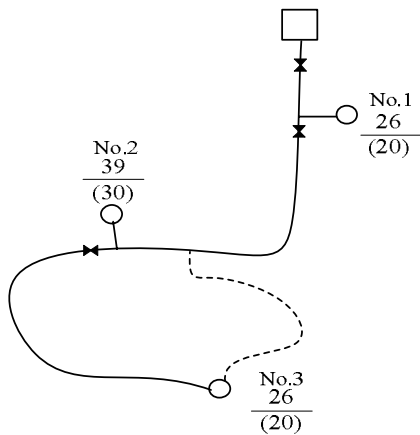
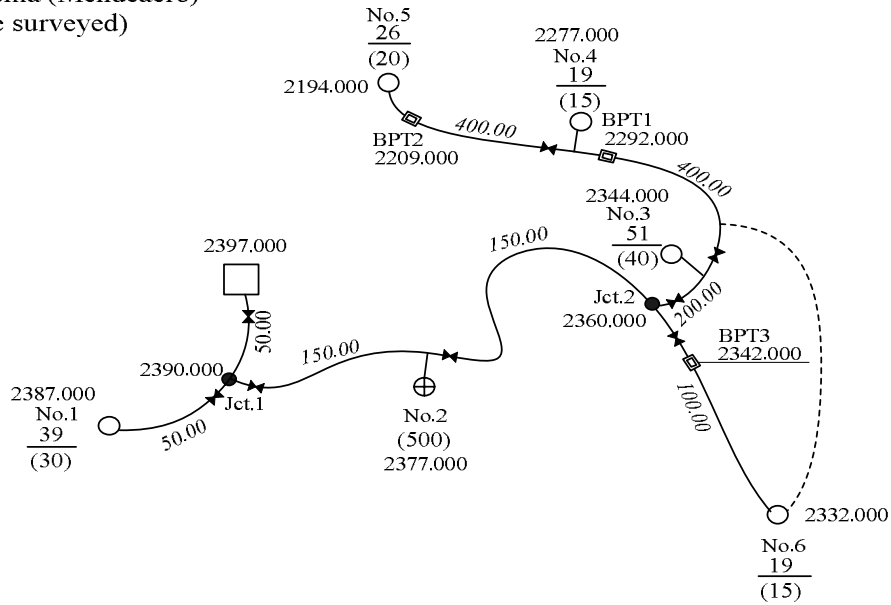
- : Spring & Reservoir
- : Public Fountains for households
- : Public Fountains for Clinic
- : Public Fountains for School
- : Gate Valves
- : Junction Points
- : Critical Points on Topographic condition
- : Area for Topographic Survey
- : Proposed Route
- : Alternative Route
- $\frac{35}{(30)}$ for : Number of Households, Above: 2014
Below: 2004
- (660) for : Number of Students
- (20) for : Number of Visitors to Medical Clinic
- $\frac{340.00}{}$: Pipe Distance
- 1471.625 : Ground Elevation

Sengeti



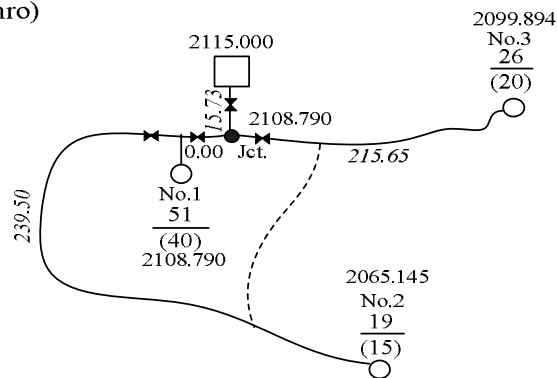
選定路線概要図 (Ofa および Sengeti)

Ades Altema (Mendeaero)
(Not to be surveyed)

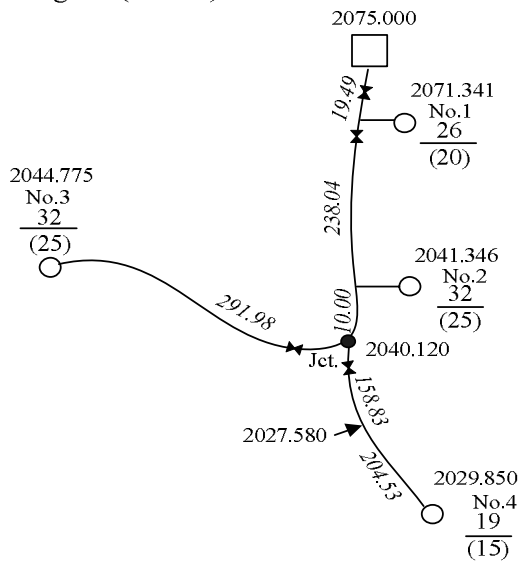


- : Spring & Reservoir
- : Public Fountains for households
- : Public Fountains for Clinic
- : Public Fountains for School
- : Gate Valves
- : Junction Points
- : Critical Points on Topographic condition
- : Area for Topographic Survey
- : Proposed Route
- : Alternative Route
- $\frac{35}{(30)}$ for : Number of Households. Above: 2014
Below: 2004
- (660) for : Number of Students
- (20) for : Number of Visitors to Medical Clinic
- 340.00 : Pipe Distance
- 1471.625 : Ground Elevation

L/Arguba (Hamro)



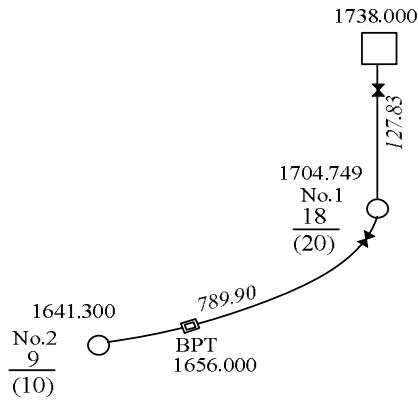
L/Arguba (Abello)



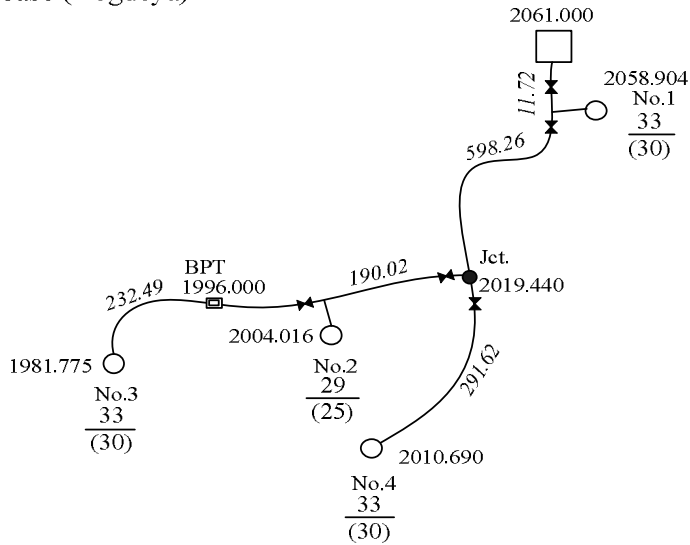
Legend

- : Spring & Reservoir
- : Public Fountains for households
- : Public Fountains for Clinic
- : Public Fountains for School
- : Gate Valves
- : Junction Points
- : Critical Points on Topographic condition
- : Area for Topographic Survey
- : Proposed Route
- : Alternative Route
- $\frac{35}{(30)}$ for : Number of Households, Above: 2014
Below: 2004
- (660) for : Number of Students
- (20) for : Number of Visitors to Medical Clinic
- $\underline{340.00}$: Pipe Distance
- 1471.625 : Ground Elevation

Walayte (Elcola)



Busabaso (Kogdeya)



選定路線概要図 (L/Arugba、Walayte および Busabaso)

7.7

地下水開発ポテンシャル評価結果

地下水開発ポテンシャル評価結果(1/6)

No. in the original list	Scheme #.	Zone	Woreda	Kebele	Village name	Geology	Drilling method	Bases of groundwater development potential and well ability		Groundwater development potential	Depth of Aquifer		Static Water Level	Yield	Draw down	Depth of pump	Depth below pump	Drilling depth	East			North								
								Hydrogeological survey	2D-Electric sounding		Top	Bottom							GL-m	l/s	m	GL-m	m	GL-m	D	M	S	D	M	S
1	001-1	Dawero	Tocha	Kechi Idigit -> Kechi	Dhula	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	59	57	7	5	4						
					Bochi	Basalt	DTH	○	○	fair	35.0	80.0	35.0	0.2	10.0	50.0	10.0	60.0	36	59	0	7	1	32						
					Site 3	Basalt	DTH	○	○	poor	35.0	75.0	35.0	0.2	10.0	50.0	10.0	60.0	36	59	6	7	2	56						
2	002-1	Dawero	Tocha	Goradoba	Site 1	Basalt	DTH	○	○	poor	35.0	70.0	35.0	0.2	7.5	47.5	10.0	57.5	37	0	50	7	5	30						
					Site 2	Basalt	DTH	○	○	poor	35.0	70.0	35.0	0.2	7.5	47.5	10.0	57.5	37	0	42	7	5	11						
3	Dawero	Tocha	Shechikale		Site 1	Site for spring utilization																								
					Site 2	Site for spring utilization																								
4	004-1	Dawero	Tocha	Aba Dahi -> Aba	Merara	Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	36	54	4	7	11	15						
					Merara#2	Basalt	DTH	○	○	fair	35.0	70.0	40.0	0.2	7.5	52.5	10.0	62.5	36	54	38	7	10	43						
					Sheki	Basalt	DTH	○	○	fair	35.0	70.0	40.0	0.2	7.5	52.5	10.0	62.5	36	55	6	7	10	27						
5	Dawero	Tocha	Kechi		Site 1	Site for spring utilization																								
					Site 2	Site for spring utilization																								
6	Dawero	Tocha	Shushuri		Site 1	Site for spring utilization																								
					Site 2	Site for spring utilization																								
7	Dawero	Tocha	Medihanalem		Site 1	Site for spring utilization																								
					Site 2	Site for spring utilization																								
					Site 3	Site for spring utilization																								
8	008-1	Dawero	Tocha	Wara Gessa	Site 1	Basalt	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	3	37	7	9	53						
					Site 2	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	3	40	7	9	32						
					Angella site3	Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	37	4	9	7	9	34						
9	Dawero	Tocha	Waruma Kessa	Site 1	Site for spring utilization																									
10	010-1	Dawero	Tocha	Waruma Kessa	Galicha	Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	37	2	9	7	10	14						
					Koka	Basalt	DTH	○	○	good	35.0	85.0	35.0	0.2	5.0	45.0	10.0	55.0	37	3	12	7	9	59						
					Yota	Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	37	1	10	7	10	21						
11	011-1	Dawero	Tocha	Gorika	Doma	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	59	52	7	10	21						
					Gello	Basalt	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	36	59	52	7	10	21						
					Kedhema Doba	Basalt	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	36	58	36	7	10	10						
12	012-1	Dawero	Tocha	Aba	Gerga Mareka	Basalt	DTH	○	○	fair	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	36	53	7	7	11	0						
					Gerga Mendida	Basalt	DTH	○	○	poor	35.0	70.0	40.0	0.2	12.5	57.5	10.0	67.5	36	53	44	7	11	23						
					Gerega Worza	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	52	16	7	10	51						
Dawero		Tocha	Subtotal				20											1142.5												
13	013-1	Dawero	Loma	Loma Bota -> Loma Borge	Polasa	Tuff	DTH	○	○	fair	35.0	75.0	37.5	0.2	7.5	50.0	10.0	60.0	37	14	20	6	57	46						
					Borze	Tuff	DTH	○	○	fair	35.0	75.0	37.5	0.2	7.5	50.0	10.0	60.0	37	14	25	6	59	20						
14	Dawero	Loma	Kawcha	Site 1	Replaced																									
15	015-1	Dawero	Loma	Gufo Gato	Dobo	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	13	27	6	51	34						
					Gufo	Tuff	DTH	○	○	poor	35.0	80.0	40.0	0.2	10.0	55.0	10.0	65.0	37	13	47	6	52	3						
					Bosa #1	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	13	31	6	52	45						
					Bosa #2	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	13	28	6	53	4						
					Tala	Tuff	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	13	46	6	53	30						
					Han Ashi	Tuff	DTH	○	○	fair	35.0	70.0	37.5	0.2	10.0	52.5	10.0	65.0	37	13	54	6	53	54						
16	Dawero	Loma	Yeli Chawla	Site 1	Replaced																									
17	017-1	Dawero	Loma	Lala Ambe	Hole #1	Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	37	20	12	6	57	14						
					Holo #2	Basalt	DTH	○	○	fair	35.0	80.0	37.5	0.2	10.0	52.5	10.0	62.5	37	19	40	6	58	12						
					Markalo I	Basalt	DTH	○	○	fair	35.0	70.0	40.0	0.2	10.0	55.0	10.0	65.0	37	20	12	6	57	14						
					Markalo II	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	20	12	6	57	14						
					Lawshe	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	20	29	6	57	31						
18	018-1	Dawero	Loma	Dissa	Dalbo	Trachy Basalt	DTH	○	○	poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	7	28	6	47	23						
					Bondoro	Trachy Basalt	DTH	○	○	poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	7	24	6	48	4						
					Kossa	Trachy Basalt	DTH	○	○	poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	7	5	6	48	20						
					Chachew	Trachy Basalt	DTH	○	○	poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	7	56	6	47	32						

添付7.7-1

地下水開発ポテンシャル評価結果(2/6)

No. in the original list	Scheme #.	Zone	Woreda	Kebele	Village name	Geology	Drilling method	Bases of groundwater development potential and well ability		Groundwater development potential	Depth of Aquifer		Static Water Level	Yield	Draw down	Depth of pump	Depth below pump	Drilling depth	East			North								
								Hydrogeological survey	2D-Electric sounding		Top	Bottom							GL-m	l/s	m	GL-m	m	GL-m	D	M	S	D	M	S
	018-5				UFO	Trachy Basalt	DTH	○		poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	8	15	6	48	1						
	018-6				Besini	Trachy Basalt	DTH	○		poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	8	41	6	48	37						
	018-7				Ketama	Trachy Basalt	DTH	○		poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	8	43	6	48	14						
19	019-1	Dawero	Loma	Loma Bale	Bergi	Tuff	DTH	○	○	poor	50.0	80.0	50.0	0.2	5.0	60.0	10.0	70.0	37	14	3	6	55	21						
	019-2				Gegeta	Tuff	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	37	12	26	6	55	6						
	019-3				Gegeta #2	Tuff	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	12	36	6	55	5						
	019-4				Gegeta #3	Tuff	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	12	54	6	54	51						
	019-5				Chabala	Tuff	DTH	○	○	fair	35.0	80.0	37.5	0.2	7.5	50.0	10.0	60.0	37	13	2	6	55	4						
	019-6				Chabala #2	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	13	18	6	55	0						
20		Dawero	Loma	Arga Bacho	Replaced	replaced																								
	Dawero	Loma	Subtotal				26											1497.5												
21	021	Dawero	Esara	Duzi	Site 1	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	58	8	6	53	27						
22	022	Dawero	Esara	Gego	Site 1	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	2	38	6	53	20						
23		Dawero	Esara	Arusi Bale	Site 1	Site for spring utilization																								
					Site 2	Site for spring utilization																								
24		Dawero	Esara	Arusi Bale	Site 1	Site for spring utilization																								
25		Dawero	Esara	Gudumu	Site 1	Site for spring utilization																								
					Site 2	Site for spring utilization																								
26		Dawero	Esara	Guzi -> Duzi	Site 1	Site for spring utilization																								
					Site 2	Site for spring utilization																								
27	027-1	Dawero	Esara	Hagali 02	Site 1	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	4	30	6	53	30						
	027-2				Site 2	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	4	16	6	53	41						
28		Dawero	Esara	Ofa	Site 1	Site for spring utilization																								
					Site 2	Site for spring utilization																								
29		Dawero	Esara	Sengeti	Site 1	Site for spring utilization																								
30	030-1	Dawero	Esara	Dalba 3/Dali/	Site 1	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	59	56	6	59	43						
	030-2				Site 2	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	0	40	6	59	28						
	030-3				Site 3	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	0	49	6	59	2.2						
	030-4				Site 4	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	59	35	6	59	55						
31	031-1	Dawero	Esara	Bale	Site 1	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	0	56	6	54	0						
	031-2				Site 2	Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	37	0	39	6	54	30						
	031-3				Site 3	Basalt	DTH	○	○	fair	35.0	75.0	42.5	0.2	7.5	55.0	10.0	65.0	37	0	33	6	53	49						
	031-4				Site 4	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	0	33	6	53	45						
	031-5				Site 5	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	1	1	6	53	41						
	031-6				Site 6	Basalt	DTH	○	○	fair	35.0	70.0	40.0	0.2	10.0	55.0	10.0	65.0	37	0	49	6	53	49						
	031-7				Site 7	Basalt	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	0	50	6	54	9						
	031-8				Site 8	Basalt	DTH	○	○	poor	35.0	80.0	42.5	0.2	7.5	55.0	10.0	65.0	36	59	13	6	53	45						
	031-9				Site 9	Basalt	DTH	○	○	poor	35.0	80.0	35.0	0.2	7.5	47.5	10.0	57.5	37	0	50	6	54	8.6						
	031-10				Site 10	Basalt	DTH	○	○	poor	35.0	80.0	35.0	0.2	7.5	47.5	10.0	57.5	37	0	49	6	53	49						
32	032-1	Dawero	Esara	Aruse Bale	Site 1	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	59	35	6	53	49						
	032-2				Site 2	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	59	55	6	53	55						
	Dawero	Esara	Subtotal				20											1135.0												
	Dawero		Subtotal				66											3775.0												
33	033-1	Sidama	Hula	Chiro Ne	Site 1	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	38	11	6	27	2.7						
	033-2				Site 2	Tuff & Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	37	21	6	27	1.5						
34	034-1	Sidama	Hula	Worema	Site 1	Acidic Vol	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	29	46	6	32	22						
	034-2				Site 2	Acidic Vol	DTH	○		poor	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	30	53	6	30	0.3						
35	035-1	Sidama	Hula	Gansa	Site 1	Acidic Vol	DTH	○	○	fair	35.0	80.0	42.5	0.2	7.5	55.0	10.0	65.0	38	29	10	6	31	17						
	035-2				Site 2	Acidic Vol	DTH	○		poor	35.0	80.0	40.0	0.2	7.5	52.5	10.0	62.5	38	29	35	6	30	48						
36		Sidama	Hula	Sukie Bonbie	Replaced																									

地下水開発ポテンシャル評価結果(3/6)

No. in the original list	Scheme #.	Zone	Woreda	Kebele	Village name	Geology	Drilling method	Bases of groundwater development potential and well ability		Groundwater development potential	Depth of Aquifer		Static Water Level	Yield	Draw down	Depth of pump	Depth below pump	Drilling depth	East			North								
								Hydrogeological survey	2D-Electric sounding		Top	Bottom							GL-m	l/s	m	GL-m	m	GL-m	D	M	S	D	M	S
37	037	Sidama	Hula	Sede	Site 1	Basalt	DTH	○	○	poor	35.0	70.0	35.0	0.2	10.0	50.0	10.0	60.0	38	43	28	6	28	50						
38		Sidama	Hula	Bedesa Chechu	Replaced																									
39	039	Sidama	Hula	Damlo Chercha	Site 1	Basalt	DTH	○		poor	35.0	70.0	35.0	0.2	7.5	47.5	10.0	57.5	38	43	28	6	27	32						
40	040	Sidama	Hula	Abayie Qeraro	Site 2	Basalt	DTH	○		poor	35.0	70.0	35.0	0.2	7.5	47.5	10.0	57.5	38	42	51	6	24	52						
41	041	Sidama	Hula	Menisa Wacho	Site 3	Basalt	DTH	○		poor	35.0	70.0	35.0	0.2	7.5	47.5	10.0	57.5	38	44	32	6	27	13						
42		Sidama	Hula	Abayie Adola	Replaced																									
43	043	Sidama	Hula	Hobena Ganegawa	Site 1	Tuff	DTH	○		poor	35.0	70.0	35.0	0.2	7.5	47.5	10.0	57.5	38	35	49	6	36	10						
44	044	Sidama	Hula	Deleya	Site 1	Tuff & Basalt	DTH	○	○	fair	35.0	80.0	40.0	0.2	7.5	52.5	10.0	62.5	38	41	2	6	26	30						
45	045	Sidama	Hula	Adahie	Site 1	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	35	15	6	37	45						
		Sidama	Hula	Subtotal			13											755.0												
46	046-1	Gedeo	Yirga Chaffe	Hafursa worabi	Utalcha	Tuff	DTH	○	○	poor	60.0	70.0	60.0	0.2	5.0	70.0	10.0	80.0	38	10	15	6	8	40						
	046-2				Gunmissa	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	11	12	6	9	24						
47	047-1	Gedeo	Yirga Chaffe	Konga (Konga1)	Kongo	Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	12	18	6	7	16						
	047-2			(Konga2)	Dembi bekercha	Tuff & Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	12	42	6	8	9						
48	048-1	Gedeo	Yirga Chaffe	Wote	Wetle Megenagne	Tuff	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	12	7	6	5	26						
	048-2			(Wote2)	Boyti	Tuff	DTH	○	○	fair	35.0	75.0	40.0	0.2	7.5	52.5	10.0	62.5	38	12	10	6	6	1						
49	049-1	Gedeo	Yirga Chaffe	Chelba (Chelba2)	Didimicha	Tuff	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	12	4	6	15	32						
	049-2				Hubune	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	12	17	6	14	59						
50	050-1	Gedeo	Yirga Chaffe	Chito (chito)	Chito	Tuff	DTH	○	○	fair	35.0	75.0	40.0	0.2	10.0	55.0	10.0	65.0	38	12	39	6	13	40						
	050-2				Habere	Tuff	DTH	○	○	fair	35.0	75.0	37.5	0.2	7.5	50.0	10.0	60.0	38	13	1	6	13	27						
51	051	Gedeo	Yirga Chaffe	Oru Batala (orubatala)	Togetu	Tuff	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	13	47	6	10	7						
52	052	Gedeo	Yirga Chaffe	Resity	Tesiti	Tuff	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	7	37	6	5	18						
53	053	Gedeo	Yirga Chaffe	Tutuity	Tutuity Bashe	Basalt	DTH	○	○	poor	55.0	75.0	55.0	0.2	5.0	65.0	10.0	75.0	38	11	48	6	15	48						
54	054	Gedeo	Yirga Chaffe	Adame	Suke	Tuff	DTH	○	○	fair	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	13	8	6	10	55						
55	055	Gedeo	Yirga Chaffe	Birbisa Kala	Birbisa Kala	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	13	31	6	7	26						
56	059	Gedeo	Yirga Chaffe	Chirku	Chirku	Tuff	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	7	11	6	9	35						
57	057	Gedeo	Yirga Chaffe	Dako	Sukitu	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	12	22	6	16	38						
58	058	Gedeo	Yirga Chaffe	Udessa	Dogosoke	Basalt	DTH	○		poor	40.0	75.0	40.0	0.2	5.0	50.0	10.0	60.0	38	8	13	6	7	6						
59	059	Gedeo	Yirga Chaffe	Kedida	Timishu Ketema	Tuff	DTH	○		poor	40.0	75.0	40.0	0.2	5.0	50.0	10.0	60.0	38	6	40	6	6	3						
		Gedeo	Yirga Chaff	Subtotal			19											1122.5												
60	060-1	Hadiya	Lemo	Bukuna chachey	Galora	Tuff & Ash	Mud	○	○	very poor	50.0	80.0	55.0	0.2	15.0	75.0	10.0	80.0	37	47	20	7	34	20						
	060-2				Mahalashe	Tuff & Ash	Mud	○	○	fair	35.0	75.0	42.5	0.2	12.5	60.0	10.0	70.0	37	48	18	7	33	22						
61	061-1	Hadiya	Lemo	Hayse	Bandama	Tuff & Ash	Mud	○	○	very poor	50.0	80.0	55.0	0.2	15.0	75.0	10.0	80.0	37	52	5	7	29	46						
	061-2				Sadane	Tuff & Ash	Mud	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	37	52	49	7	29	40						
62	062-1	Hadiya	Lemo	Lereba	Witto	Tuff & Ash	Mud	○	○	good	32.5	75.0	32.5	0.2	7.5	45.0	10.0	55.0	37	49	54	7	30	22						
	062-2			(Girba)	Mahal	Tuff & Ash	Mud	○	○	poor	35.0	80.0	40.0	0.2	12.5	57.5	10.0	67.5	37	50	16	7	30	57						
63	063-1	Hadiya	Lemo	Ana (Badulaa)	Bachelo	Tuff	Mud	○	○	fair	35.0	75.0	40.0	0.2	12.5	57.5	10.0	67.5	37	57	48	7	36	39						
	063-2			(Lameje)	Site 2	Tuff	Mud	○	○	fair	35.0	80.0	42.5	0.2	10.0	57.5	10.0	67.5	37	57	49	7	35	14						
64	064-1	Hadiya	Lemo	Achamo	Danfa	Tuff & Ash	Mud	○	○	very poor	60.0	80.0	60.0	0.2	10.0	75.0	10.0	80.0	38	2	15	7	40	46						
	064-2				Duna	Tuff & Ash	Mud	○	○	poor	60.0	80.0	60.0	0.2	5.0	70.0	10.0	80.0	38	1	57	7	40	10						
65		Hadiya	Lemo	Doisha Hule	Replaced																									
66	066-1	Hadiya	Lemo	Lafto Lenka	Lafto Lenka	Tuff & Ash	Mud	○	○	poor	35.0	75.0	40.0	0.2	12.5	57.5	10.0	67.5	37	58	57	7	40	21						
	066-2				Site 2	Tuff & Ash	Mud	○		poor	35.0	75.0	40.0	0.2	12.5	57.5	10.0	67.5												
67	067-1	Hadiya	Lemo	Homa Gare	Gido	Tuff & Ash	Mud	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	59	48	7	35	5						
	067-2			(kobo)	Biba	Tuff	Mud	○	○	poor	35.0	60.0	35.0	0.2	12.5	52.5	10.0	62.5	38	0	19	7	34	26						
68		Hadiya	Shashogo	Doisha Kenema	Canceled at I/C meeting																									
69		Hadiya	Misha	Wesgehta 1&2	Canceled at I/C meeting																									
		Hadiya	Lemo	Subtotal			14											955.0												
70	070-1	Wolaita	Bolosore	Anchurcho Dege	Nagibo	Tuff	DTH	○	○	good	32.5	70.0	32.5	0.2	7.5	45.0	10.0	55.0	37	40	7	6	59	32						
	070-2			(Mehal Dogie)	Number one	Tuff	DTH	○	○	poor	60.0	80.0	60.0	0.2	5.0	70.0	10.0	80.0	37	40	9	6	58	42						

地下水開発ポテンシャル評価結果(4/6)

No. in the original list	Scheme #.	Zone	Woreda	Kebele	Village name	Geology	Drilling method	Bases of groundwater development potential and well ability		Groundwater development potential	Depth of Aquifer		Static Water Level GL-m	Yield l/s	Draw down m	Depth of pump GL-m	Depth below pump m	Drilling depth GL-m	East			North			
								Hydrogeological survey	2D-Electric sounding		Top	Bottom							D	M	S	D	M	S	
71	070-3				Koisha Weybo	Ash	Mud	○	○	very poor	60.0	80.0	60.0	0.2	10.0	75.0	10.0	80.0	37	41	33	7	0	2	
	071-1	Wolaita	Bolosore	Dmaba Zamina	Chare	Tuff	DTH	○	○	poor	35.0	60.0	35.0	0.2	10.0	50.0	10.0	60.0	37	39	11	6	57	31	
	071-2				Hagaza	Tuff	DTH	○	○	fair	35.0	80.0	42.5	0.2	12.5	60.0	10.0	70.0	37	39	29	6	58	55	
	071-3				Boko- II	Tuff	DTH	○	○	poor	35.0	50.0	35.0	0.2	5.0	45.0	10.0	50.0	37	38	35	6	58	46	
	071-4				Waraza	Tuff	DTH	○	○	poor	35.0	50.0	35.0	0.2	5.0	45.0	10.0	50.0	37	38	53	6	57	14	
72	072-1	Wolaita	Bolosore	Dubo	Ocha	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	40	48	7	4	14	
	072-2			(Meattee)	Mante	Tuff	DTH	○	○	poor	55.0	75.0	55.0	0.2	5.0	65.0	10.0	75.0	37	41	35	7	6	3	
	072-3			(Sulta)	Sute	Tuff	DTH	○	○	poor	35.0	80.0	42.5	0.2	12.5	60.0	10.0	70.0	37	41	23	7	4	1	
73	073-1	Wolaita	Bolosore	Ademancho	Bakala Suke	Tuff & Ignimbrite	DTH	○	○	fair	35.0	75.0	42.5	0.2	7.5	55.0	10.0	65.0	37	47	42	7	3	13	
	073-2				Arfita Suke	Tuff & Ignimbrite	DTH	○	○	poor	35.0	60.0	35.0	0.2	7.5	47.5	10.0	57.5	37	47	57	7	2	50	
74	074-1	Wolaita	Bolosore	Gara Gubo -> Gara Godo	Hago #1	Tuff & Ash	Mud	○	○	poor	35.0	80.0	42.5	0.2	10.0	57.5	10.0	67.5	37	46	37	7	4	49	
	074-2				Hago #2 (Bekela)	Tuff & Ash	Mud	○	○	poor	35.0	75.0	40.0	0.2	12.5	57.5	10.0	67.5	37	46	41	7	4	21	
	074-3			(Gara)	Tokisa	Tuff & Ash	Mud	○	○	fair	35.0	75.0	42.5	0.2	5.0	52.5	10.0	62.5	37	45	47	7	3	55	
	074-4				Godo	Tuff & Ash	Mud	○	○	fair	55.0	80.0	37.5	0.2	7.5	50.0	10.0	60.0	37	45	40	7	4	44	
75	075-1	Wolaita	Bolosore	Wermuma (Bitale)	Betale	Tuff	Mud	○	○	poor	60.0	80.0	60.0	0.2	5.0	70.0	10.0	80.0	37	43	51	7	6	0	
	075-2			(Gashoba)	Gosho Basa	Tuff	Mud	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	44	15	7	6	34	
	075-3			(Wermuma)	Wurmuma	Tuff	Mud	○	○	poor	35.0	70.0	42.5	0.2	12.5	60.0	10.0	70.0	37	42	48	7	7	2	
	075-4				Hangada	Tuff	Mud	○	○	good	35.0	75.0	35.0	0.2	7.5	47.5	10.0	57.5	37	41	56	7	5	54	
76	076-1	Wolaita	Bolosore	Gununo (Degecho)	Gegecho	Tuff	DTH	○	○	fair	35.0	80.0	40.0	0.2	7.5	52.5	10.0	62.5	37	40	5	6	56	5	
	076-2				Offa	Tuff	DTH	○	○	good	35.0	75.0	37.5	0.2	5.0	47.5	10.0	57.5	37	38	44	6	56	19	
	076-3				Lower Busha	Tuff	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	40	19	6	56	42	
77	077-1	Wolaita	Bolosore	Bomebea (Sengama)	Sunganna	Tuff	DTH	○	○	fair	35.0	65.0	35.0	0.2	7.5	47.5	10.0	57.5	37	32	40	7	8	51	
	077-2				Bombe #2	Tuff	DTH	○	○	fair	35.0	75.0	35.0	0.2	12.5	52.5	10.0	62.5	37	35	25	7	8	20	
	077-3				Mahal Bombe	Tuff	DTH	○	○	poor	35.0	70.0	42.5	0.2	10.0	57.5	10.0	67.5	37	35	1	7	9	6	
78	078	Wolaita	Bolosore	Adila	Chamma	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	37	49	7	8	49	
79	079	Wolaita	Bolosore	Farwocha(Woyati)	Oyati	Tuff	DTH	○	○	poor	35.0	70.0	42.5	0.2	12.5	60.0	10.0	70.0	37	36	39	7	7	12	
80	080	Wolaita	Bolosore	Chama henbeacho	Koisha Manisa	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	40	43	7	8	20	
81	081	Wolaita	Bolosore	Matila Hibeche	Mahal Matala	Tuff	Mud	○	○	poor	35.0	75.0	42.5	0.2	12.5	60.0	10.0	70.0	37	39	11	7	9	32	
82	082	Wolaita	Bolosore	Achura	Balada	Tuff,Ash	Mud	○	○	poor	35.0	70.0	35.0	0.2	10.0	50.0	10.0	60.0	37	41	29	7	9	54	
			Subtotal																						
83	083	Wolaita	Kindo Koyesha	Doge Mashedo	Odoro	Tuff	DTH	○	○	poor	35.0	60.0	42.5	0.2	7.5	55.0	10.0	60.0	37	37	52	6	53	46	
84	084	Wolaita	Kindo Koyesha	Doge Shakisho	Gadala	Tuff	DTH	○	○	fair	35.0	75.0	40.0	0.2	7.5	52.5	10.0	62.5	37	37	59	6	56	43	
85	085	Wolaita	Kindo Koyesha	Doge Sarosa -> Doge Laros	Genbela	Trachy Basalt	DTH	○	○	fair	35.0	70.0	40.0	0.2	7.5	52.5	10.0	60.0	37	35	27	6	57	20	
		Wolaita Kindo Koyesha	Subtotal																						
		Wolaita	Subtotal																						
86	086	K.tembaro	Anegacha	WenejlaAmcho wato	Site 1	Ash, Tuff	Mud	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	37	51	22	7	26	43	
87	087	K.tembaro	Anegacha	Bonga	Gorta	Tuff & Ash	Mud	○	○	fair	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	55	55	7	21	45	
88	088	K.tembaro	Anegacha	Lume suticho	Site 1	Tuff & Ash	Mud	○	○	poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	46	53	7	18	28	
89	089	K.tembaro	Anegacha	Uetuge	Utugae	Ignimbrite, Tuff	Mud	○	○	very poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	48	36	7	21	35	
90	090	K.tembaro	Anegacha	Jeba Dodoba	Mehal Tote	Ash, Tuff	Mud	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	50	37	7	23	35	
		K.tembaro Anegacha	Subtotal																						
91		Derashe	Special Woreda	Ades Altema	Site 1		Site for spring utilization																		
92		Derashe	Special Woreda	Ades Altema	Site 1		Site for spring utilization																		
93		Derashe	Special Woreda	Walassa	Site 1		Site for spring utilization																		
94		Derashe	Special Woreda	L/Holte	Site 1		Site for spring utilization																		
95		Derashe	Special Woreda	L/Arguba (kora)	Site 1		Site for spring utilization																		
96		Derashe	Special Woreda	L/Arguba (hamro)	Site 1		Site for spring utilization																		
97		Derashe	Special Woreda	L/Arguba (Abello)	Site 1		Site for spring utilization																		
98		Derashe	Special Woreda	Walayte	Site 1		Site for spring utilization																		
99		Derashe	Special Woreda	Walayte	Site 1		Site for spring utilization																		

添付7.7-4

地下水開発ポテンシャル評価結果 (5/6)

No. in the original list	Scheme #.	Zone	Woreda	Kebele	Village name	Geology	Drilling method	Bases of groundwater development potential and well ability		Groundwater development potential	Depth of Aquifer		Static Water Level	Yield	Draw down	Depth of pump	Depth below pump	Drilling depth	East			North								
								Hydrogeological survey	2D-Electric sounding		Top	Bottom							GL-m	l/s	m	GL-m	m	GL-m	D	M	S	D	M	S
100		Derashe	Special Woreda	Busabaso	Site 1		Site for spring utilization																							
101		Derashe	Special Woreda	Busabaso	Site 1		Site for spring utilization																							
Drerashe		Subtotal																												
102		Silti	Silty	Aedebrwelwya Ageta	Replaced																									
103	103-01	Silti	Silty	Bozie Sabola	Sabola	Basalt	DTH	○	○	good	32.5	75.0	32.5	0.2	7.5	45.0	10.0	55.0	38	19	29	8	1	42						
	103-02				Shebaiban	Basalt	DTH	○	○	good	32.5	75.0	32.5	0.2	7.5	45.0	10.0	55.0	38	20	9	8	2	21						
104	104-01	Silti	Silty	Aegodie Lobriera	Yafanafu	Basalt	DTH	○	○	poor	55.0	75.0	55.0	0.2	5.0	65.0	10.0	75.0	38	20	4	8	2	35						
	104-02				Lobriere	Basalt	DTH	○	○	good	35.0	80.0	37.5	0.2	5.0	47.5	10.0	57.5	38	21	52	8	4	2						
	103-03				Kabrabaka	Alluvium	Mud	○	○	poor	60.0	75.0	60.0	0.2	5.0	70.0	10.0	75.0	38	21	7	8	3	35						
105		Silti	Silty	Dobo Bedeno	Replaced																									
106	106-01	Silti	Silty	Senene Gerierar	Senena gerera	Tuff	DTH	○	○	fair	35.0	70.0	45.0	0.2	10.0	60.0	10.0	70.0	38	20	39	8	0	43						
	106-02				Korame	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	21	41	8	1	31						
107	107-01	Silti	Silty	Weliya Sidest	Muntuso	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	19	6	8	0	33						
	107-02				Tash	Tuff	DTH	○	○	fair	35.0	75.0	35.0	0.2	7.5	47.5	10.0	57.5	38	19	36	8	0	43						
108	108-01	Silti	Silty	Koto Balosd	Baja	Tuff	DTH	○	○	very poor	35.0	75.0	35.0	0.2	7.5	47.5	10.0	57.5	38	18	36	7	59	22						
	108-02				Mahal Abzana	Tuff	DTH	○	○	good	32.5	75.0	32.5	0.2	7.5	45.0	10.0	55.0	38	20	0	7	59	31						
	108-03				Chalalaka	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	19	25	7	59	28						
109	109-01	Silti	Silty	Asano Degderiea	Mahal Baja #1	Tuff	DTH	○	○	fair	35.0	80.0	37.5	0.2	12.5	55.0	10.0	65.0	38	17	34	7	58	50						
	109-02				Dugudarera	Tuff	DTH	○	○	good	32.5	75.0	32.5	0.2	7.5	45.0	10.0	55.0	38	17	7	7	58	0						
	109-03				Mahal Baja #2	Tuff	DTH	○	○	good	35.0	70.0	35.0	0.2	7.5	47.5	10.0	57.5	38	18	0	7	58	51						
	109-04				Mahal Baja #3	Tuff	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	17	55	7	58	29						
110		Silti	Silty	Abezana	Replaced																									
111	111-01	Silti	Silty	Daniecho Mukerie	Daate	Tuff	DTH	○	○	fair	35.0	70.0	35.0	0.2	7.5	47.5	10.0	57.5	38	15	39	7	57	23						
	111-02				Elobal	Tuff	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	38	16	43	7	57	49						
	111-03				Wajir	Tuff	DTH	○	○	poor	35.0	70.0	40.0	0.2	12.5	57.5	10.0	67.5	38	15	45	7	58	34						
	111-04				Mukkare	Tuff	DTH	○	○	fair	35.0	70.0	35.0	0.2	10.0	50.0	10.0	60.0	38	15	12	7	58	3						
		Silti	Subtotal				20											1195.0												
112	112-1	Silti	Dalocha	Laygnaw Yedi Angamoyedia	Site 1	Tuff & Ash	Mud	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	38	3	57	7	48	26						
	112-2				Site 2	Tuff & Ash	Mud	○	○	good	32.5	75.0	32.5	0.2	7.5	45.0	10.0	55.0	38	3	57	7	47	39						
113	113-1	Silti	Dalocha	Acherayi Konecho	Site 1	Tuff & Ash	Mud	○	○	fair	35.0	75.0	37.5	0.2	5.0	47.5	10.0	57.5	38	9	39	7	49	55						
	113-2				Site 2	Tuff & Ash	Mud	○	○	fair	35.0	75.0	35.0	0.2	7.5	47.5	10.0	57.5	38	11	10	7	49	21						
114	114-1	Silti	Dalocha	Bureka	Gibe	Soil, Ash	Mud	○	○	fair	35.0	55.0	35.0	0.2	7.5	47.5	10.0	57.5	38	15	40	7	49	15						
	114-2				Yiseche Angelu	Rhyolite	Mud	○	○	very poor	35.0	50.0	35.0	0.2	7.5	47.5	10.0	58.5	38	15	48	7	48	22						
115	115-1	Silti	Dalocha	Gemama	Site1	Ignimbrite & Ash	Mud	○	○	poor	35.0	50.0	35.0	0.2	5.0	45.0	10.0	55.0	38	14	10	7	50	14						
	115-2				Site2	Ignimbrite & Ash	Mud	○	○	very poor	55.0	75.0	55.0	0.2	12.5	72.5	10.0	75.0	38	13	45	7	50	10						
116	116-1	Silti	Dalocha	Koro	Chimt	Ignimbrite & Ash	Mud	○	○	very poor	55.0	75.0	55.0	0.2	12.5	72.5	10.0	75.0	38	16	43	7	50	2						
	116-2				Site 2	Ignimbrite & Ash	Mud	○	○	poor	55.0	75.0	55.0	0.2	5.0	65.0	10.0	75.0	38	16	8	7	51	51						
117	117-1	Silti	Dalocha	Korogalay	Site 1	Ignimbrite & Ash	Mud	○	○	poor	35.0	80.0	40.0	0.2	15.0	60.0	10.0	70.0	38	15	28	7	49	53						
	117-2				Site 2	Ignimbrite & Ash	Mud	○	○	poor	60.0	80.0	60.0	0.2	5.0	70.0	10.0	80.0	38	15	31	7	50	33						
118	118-1	Silti	Dalocha	Kura Kolisa	Site 1	Ignimbrite & Ash	Mud	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	38	17	28	7	52	55						
	118-2				Site 2	Ignimbrite & Ash	Mud	○	○	poor	32.5	55.0	32.5	0.2	7.5	45.0	10.0	55.0	38	18	13	7	52	10						
119	119-1	Silti	Dalocha	Golana Shemeto	Golakure	Ignimbrite & Ash	Mud	○	○	very poor	55.0	75.0	55.0	0.2	10.0	70.0	10.0	75.0	38	17	17	7	51	20						
	119-2				Arada	Ignimbrite & Ash	Mud	○	○	poor	55.0	75.0	55.0	0.2	5.0	65.0	10.0	75.0	38	17	3	7	51	45						
120	120-1	Silti	Dalocha	Husend Shola	Site 1	Tuff & Ash	Mud	○	○	poor	30.0	40.0	30.0	0.2	5.0	40.0	10.0	50.0	38	20	10	7	48	25						
	120-2				Site 2	Tuff & Ash	Mud	○	○	very poor	30.0	40.0	30.0	0.2	12.5	47.5	10.0	50.0	38	18	8	7	49	50						
121	121-1	Silti	Dalocha	Waneja Golachiba	Site 1	Tuff & Ash	Mud	○	○	very poor	35.0	50.0	30.0	0.2	12.5	47.5	10.0	50.0	38	21	59	7	48	54						
	121-2				Site 2	Tuff & Ash	Mud	○	○	very poor	35.0	50.0	30.0	0.2	12.5	47.5	10.0	50.0	38	20	41	7	48	55						
		Silti	Dalocha	Subtotal			20											1231.0												
		Silti	Subtotal				40											2426.0												
122	122-1	Gurage	Gumer	Hamebeyata	Site 1	Tuff	Mud	○	○	poor	55.0	75.0	55.0	0.2	5.0	65.0	10.0	75.0	37	54	34	7	59	14						

添付7.7-5

地下水開発ポテンシャル評価結果(6/6)

No. in the original list	Scheme #.	Zone	Woreda	Kebele	Village name	Geology	Drilling method	Bases of groundwater development potential and well ability		Groundwater development potential	Depth of Aquifer		Static Water Level	Yield	Draw down	Depth of pump	Depth below pump	Drilling depth	East			North								
								Hydrogeological survey	2D-Electric sounding		Top	Bottom							GL-m	l/s	m	GL-m	m	GL-m	D	M	S	D	M	S
	122-2				Escheray	Tuff	Mud	○	○	poor	35.0	80.0	40.0	0.2	12.5	57.5	10.0	67.5	37	54	18	8	0	19						
	122-3				Site 3	Tuff	Mud	○		poor	35.0	80.0	40.0	0.2	12.5	57.5	10.0	67.5	37	54	6	7	59	7.9						
123	123-1	Gurage	Gumer	Wenwzerana Gorate	Workeffa	Tuff	Mud	○	○	fair	50.0	80.0	50.0	0.2	5.0	60.0	10.0	70.0	37	55	13	7	59	33						
	123-2			{Wonzire & Goret}	Site 2	Tuff	Mud	○	○	fair	50.0	70.0	50.0	0.2	5.0	60.0	10.0	70.0	37	55	8	7	59	43						
	123-3				Site 3	Tuff	Mud	○		poor	50.0	70.0	50.0	0.2	5.0	60.0	10.0	70.0	37	55	13	7	59	33						
124	124-1	Gurage	Gumer	Zara	Site 1	Ignimbrite, tuff	DTH	○		poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	56	16	8	0	24						
	124-2				Site 2	Ignimbrite, tuff	DTH	○		poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	56	49	8	0	28						
	124-3				Site 3	Tuff	Mud	○		poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	37	55	33	8	0	36						
125	125-1	Gurage	Gumer	Fegnekir	Koreteya	Tuff	Mud	○	○	fair	35.0	75.0	40.0	0.2	7.5	52.5	10.0	62.5	37	58	32	7	58	33						
	125-2				Kelade	Tuff	Mud	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	57	50	7	57	20						
	125-3				Achee	Tuff	Mud	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	37	58	40	7	58	33						
126	126-1	Gurage	Gumer	Aremua	Kotto	Tuff	Mud	○	○	poor	35.0	50.0	35.0	0.2	5.0	45.0	10.0	55.0	38	0	48	7	56	48						
	126-2				Arateber	Tuff	Mud	○	○	poor	55.0	75.0	55.0	0.2	5.0	65.0	10.0	75.0	38	0	15	7	57	32						
	126-3				Kenajat Iyesus	Tuff	Mud	○	○	fair	40.0	75.0	40.0	0.2	7.5	52.5	10.0	62.5	37	59	41	7	58	15						
	Gurage	Gumer	Subtotal				15											950.0												
127	127	South Omo	Backo Gazer	<u>Aynalem -> Alga</u>	<u>Hulatenga Meda</u>	Granite	DTH	○	○	poor	35.0	60.0	40.0	0.2	5.0	50.0	10.0	60.0	36	33	1	5	47	1						
128	128-1	South Omo	Backo Gazer	<u>Tanbale -> Kaysa</u>	<u>Goshler</u>	Basalt	DTH	○	○	fair	35.0	55.0	35.0	0.2	5.0	45.0	10.0	55.0	36	37	48	5	42	32						
	128-2				<u>Ora</u>	Basalt	DTH	○	○	good	35.0	80.0	35.0	0.2	5.0	45.0	10.0	55.0	36	37	2	5	44	10						
129	129-1	South Omo	Backo Gazer	<u>Aydamr -> Muti</u>	<u>Wolsher</u>	Basalt	DTH	○		poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	36	32	11	5	56	12						
	129-2				<u>Zaddo</u>	Basalt	DTH	○		poor	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	36	32	25	5	56	20						
130	130-1	South Omo	Backo Gazer	<u>Aldemer -> Ayda</u>	<u>Sulabu</u>	Basalt	DTH	○	○	good	35.0	70.0	35.0	0.2	5.0	45.0	10.0	55.0	36	34	0	5	54	37						
	130-2				<u>Oishi</u>	Basalt	DTH	○	○	good	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	34	9	5	54	50						
131	131	South Omo	Backo Gazer	<u>Lofit -> Gazer</u>	<u>Goldat</u>	Basalt	DTH	○		poor	35.0	75.0	35.0	0.2	5.0	45.0	10.0	55.0	36	34	40	5	53	36						
	South Omo	Backo Gazer	Subtotal				8											445.0												
		Total					214	214	167									12846.0												

DTH:150, Mud:64

7.8 採用ポンプ形式

採用ポンプ形式

本計画ではハンドポンプつき浅井戸建設という目的から；

- 最大揚程が 40m の Afri-dev タイプ
- 最大要程が 60m の Afri-deep タイプ

以上のハンドポンプを採用する方針となっている。

【検討方法】

積算に必要なそれぞれのタイプの数量は、既存使用から対象地域の静水位を推定して下記のように決定した。

使用データ：ユニセフが実施した井戸掘削記録のうち当該対象地域のもの

データの選別：次のデータを検討対象外とした。

1. 空井戸
2. 掘削深度 20m 以下、80m 以上

以上のデータ(122)をもちいて、静水位頻度分布を求めた（次図）

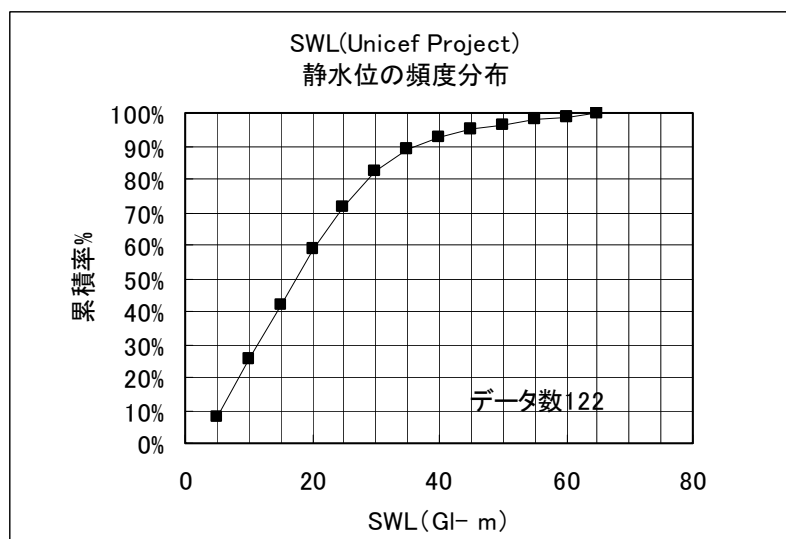
また、次の水位降下を考慮した。

1. 揚水による水位降下：5m 程度
2. 乾季の水位降下：10m

【ポンプタイプ】

採用するポンプタイプの数量比は下記のとおり

静水位	乾期の想定水位	乾期の動水位	ポンプタイプ	静水位頻度
20m 以上	30m 以上	35m 以上	Afri-deep	40%
20m 以下	30m 以下	35m 以下	Afri-dev	60%



以上

7.9 ユニセフ既存井戸データ

ユニセフ支援による既存井戸データベース

No.	Site name	Wereda	Zone	Easting	Northing	Altitude (m)	Source statuses	Constr.compl. Date	Donor Name	Depth(mt)	SWL (m.b.g.l)	Source yiled (l/s)	Pump cat.	Pump. Postion (m)	Caing type	Casing Diam.
1	Well No 1	Bena Tsemay	South Omo	37257547	592926		SHW	2002/9/4	UNICEF	40					PVC	
2	Well No 2	Hammer	"	37207901	555392		SHW	18/04/02	UNICEF	40	13.5	0.8	Afridev	38	PVC	4"
3	Well No 3	Hammer	"	37207026	554761		SHW	20/07/02	"	30	7.5	1	Afridev	29	PVC	4"
4	Well No 4	Bena Tsemay	"				SHW	27/04/02	"	33	15	1	Afridev	30	PVC	4"
5	Well No 5	Bena Tsemay	"				SHW	29/04/02	"	33.5	8	1.5	Afridev	30	PVC	4"
6	Well No 6	Hammer	"	362304	43539		SHW	2002/11/6	"	30	4.5	3	Afridev	25	PVC	4 1/2"
7	Doria 2,W.No. 8	Hammer	"	37228105	5212000		SHW	14/06/02	"	30	6	2.5	Afridev	25	PVC	4 1/2"
8	Doria 1,W.No. 7	Hammer	"	228175	521085		SHW	13/06/02	"	39	4.8	3			PVC	
9	Well No 9	Hammer	"	37229797	523707		SHW	19/06/02	"	27	7	0.8	Afridev	25	PVC	4 1/2"
10	Well No 10	Hammer	South Omo	37231490	543963		SHW	27/06/02	"	26.5	13.5	1	Afridev	26	PVC	4 1/2"
11	Tima Gurda W.No 11	Hammer	"	3722301	557036		SHW	2002/5/7	"	51	28	1.5	Afridev	45	PVC	4 1/2"
12	Well No 12	Hammer	"	37218539	55397		SHW	2002/10/7	"	53	25	1.5	Afridev	45	PVC	4"
13	Well No 13	Hammer	"	37219235	554469		SHW	2002/12/7	"	51	28	1	Afridev	43	PVC	4"
14	Silarga Well No. 14	Hammer	"	37219616	557715		SHW	17/07/02	"	41	27	1	Afridev	40	PVC	4"
15	Tinishu Boria W.No15	Hammer	South Omo	37220547	557491		SHW	21/07/02	"	38.2	24	1.5	Afridev	34	PVC	4"
16	Bela W.No 16	Hammer	"				SHW	27/07/02	"	11					PVC	
17	Lebela W.No 17	Hammer	"	3722527	54826		SHW	30/07/02	"	27	4	2	Afridev	24	PVC	4"
18	Arna W.No. 18	Hammer	"				SHW	2002/2/8	"	25.5	14	1.5	Afridev	24	PVC	4"
19	Near the clinic W.No. 19	Salamago	"	37183142	688162		SHW	13/08/02	"	21	5	1.5	Afridev	20	PVC	4"
20	Near police st. W.No.20	Salamago	"	3718260	688088		SHW	15/08/02	"	64		0.1			PVC	
21	Near Hana river W.No 21	Salamago	"	37183069	687813		SHW	17/08/02	"	27	26	0.1			PVC	
22	At the back of Hostel school W.No. 22	Salamago	"	37183235	688349		SHW	20/08/02	"	15.5	13.5	0.1			PVC	
23	Well No. 23	Salamago	"	37178650	689122		SHW	28/08/02	"	19					PVC	
24	Gerbiber	Siltie	Siltie				"	29/11/95 E.C	"	24	3.72		Afridev	21.4		4"
25	Megdcl	Siltie	Siltie				"	1/12/95 E.C	"	31	16.3		Afridev	27.66		4"
26	Mahel Eyekochs	Siltie	Siltie				"	4/13/95 E.C	"	44			Afridev	37.02		4"
27	Kito	Siltie	Siltie				"	2/13/95 E.C	"	32	21.1		Afridev	28.65		4"
28	Sullan	Lanfuro	"				"	15/12/95 E.C	"	64	23.7		Afridev	56.55		4"
29	Gebaba	Lanfuro	"				"	20/12/95 E.C	"	60	22.6		Afridev	53.76		4"
30	Gebrias	Lanfuro	"				"	24/12/95 E.C	"	18	5			14.7		4"
31	Tache Mukera	Lanfuro	"				"	29/12/95 E.C	"	21	9.8			14.7		4"
32	Agam & Dengez	Lanfuro	"				"	25/12/95 E.C	"	40	9.4			31.44		4"
33	Titi & Chumbul	Lanfuro	"				"	26/12/95 E.C	"	38	19.25			28.65		4"
34	Meccy project	Meskan	Gurague				"	10/01/96 E.C	"	10				7.65		4"
35	Zemzem aecbi School	Sodo	Gurague				"	13/01/96 E.C	"	36				28.65		4"
36	Labo	Soro	Hadiya				"		"	73	63	0.3			PVC	4"
37	Kolle	Lemo	Hadiya				"		"	49	23.7	1.5 2			PVC	4"
38	Adsholara	Soro	Hadiya				"		"	58	38.3	2			"	4"
39	Stna	Lemo	Hadiya				"	25/8/03	"	72.8					"	4"
40	Mehal tomko	Lemo	Hadiya				"	28/8/03	"	55	22.4	0.5 1			"	4"
41	Mehal tomko	Lemo	Hadiya				"	2003/2/9	"	76	40.6	0.5			"	4"
42	Tuka	Lemo	Hadiya				"	2003/6/9	"	42	10	2			"	4"
43	Masamo	Lemo	"				"	Oct.14/03	"	78.7	64	1 1.5			"	4"
44	Eoldere	Lemo	"				"		"	37	17.6	2 2.5			"	4"
45	Lan Tuka	"	"				"	2003/5/9	"	89					"	4"
46	Teaher's Residence (Gonto)	Alminch Zuria	Gamo Goffa				"	30/09/95 E.C	"	34	8.4	1.5	Afridev	27	PVC	4"
47	Gonto chamo(W.No.3)	Alminch Zuria	Gamo Goffa				"	04/10/95E.C	"	16	6	0.3	Indian Mark II	12	PVC	4"
48	Dugo	Alminch Zuria	Gamo Goffa	32900	644730		"	07/10/95 E.C	"	18	2.6	2	Afridev	12	PVC	4"
49	Budin No 3	Mirabe Abya	Gamo Goffa	361711	71509		"	17/09/95 E.C	"	43	22.5	0.5	Indian Mark III	40	PVC	4"

ユニセフ支援による既存井戸データベース

No.	Site name	Wereda	Zone	Easting	Northing	Altitude (m)	Source statues	Constr.compl. Date	Donor Name	Depth(mt)	SWL (m.b.g.l)	Source yiled (l/s)	Pump cat.	Pump. Position (m)	Caing type	Casing Diam.
50	Shaita	Mirabe Abya	Gamo_Goffa	360843	712870		"	20/09/95 E.C	"	48	35	0.5	Indian Mark II	44	PVC	4"
51	Keme	Mirabe Abya	Gamo_Goffa	361792	712543		"	24/09/95 E.C	"	52	29.7	0.6	Indian Mark II	46	PVC	4"
52	Ganta	Mirabe Abya	Gamo_Goffa				"	11/10/95 E.C	"	8	1.6	2.5	Afridev	6	PVC	4"
53	Shaita	Mirabe Abya	Gamo_Goffa	360843	712870		"	13/09/95 E.c	"	51	34.7				PVC	
54	Luda	Alminch_Zuria	Gamo_Goffa				"	02/10/95 E.C	"	15						
55	Done Bicha	Alminch_Zuria	Gamo_Goffa	328319	647943		"	14/10/95 E.C	"	6	1	1.2	Afridev	2.8	PVC	4"
56	Yochie	Alminch_Zuria	Gamo_Goffa				"	10/10/95 E.C	"	25	2.2	1	Afridev	18	PVC	4"
57	Ganjule (Mehal mela)	Alminch_Zuria	Gamo_Goffa	330935	649080		"	13/10/95 E.C	"	8	1.15		Afridev	5	PVC	4"
58	School _ compound (Gonto)	Alminch_Zuria	Gamo_Goffa	329097	643637		"	28/09/95 E.C	"	25	10.4	2	Afridev	18	PVC	4"
59	Mehal_Bicha	Alminch_Zuria	Gamo_Goffa	328048	648741		"	14/10/95 E.C	"	16	2	3	Afridev	12	PVC	4"
60	Block 4	Deramalo	Gamo_Goffa	307704	696723		"	16/11/95 E.C	"	24						
61	Block 7	Deramalo	Gamo_Goffa	308416	69662		"	03/11/95 E.C	"	22						
62	Warueake	Deramalo	Gamo_Goffa				"	10/11/95 E.C	"	22	2.8	5	Afridev	18	PVC	4"
63	Wamala	Deramalo	Gamo_Goffa	309866	703517		"	19/11/95 E.C	"	13	6.7	0.3	Afridev	8	PVC	4"
64	Block - 1	Deramalo	Gamo_Goffa	307450	696787		"	2/11/95 E.C	"	16	4	0.2	Afridev	7.5	PVC	4"
65	Walacha	Deramalo	Gamo_Goffa	311065	700164		"	10/11/95 E.C	"	25	11.1	0.5	Afridev	18	PVC	4"
66	Hafero	Wonago	Gedeo	381847	61922		"		"	73	30.5				PVC	5"
67	Sokiche	Wonago	Gedeo	381512	61548		"		"	52	17.4				PVC	4"
68	Sokiche	Wonago	Gedeo	381514	61532		"		"	59.5	28.6				PVC	5"
69	Kercha village	Wonago	Gedeo	381535	61938		"		"	52	19				PVC	5"
70	Fara Village	Wonago	Gedeo	381645	62007		"		"	72					PVC	5"
71	Saga	Bensa	Sidama	420760	715353		"	Apr. 7/03	"	49	13	0.25	Afridev	36	PVC	4"
72	Hollo sole	Hulla	Sidama	353425	63452		"	Apr. 11/03	"	40	8		Afridev	32	PVC	4"
73	Hankudino (Budussa)	Bensa	Sidama	384941	62557		"	Apr. 8/03	"	52	24		Indian mark II	48	PVC	4"
74	Woma1	Boricha	Sidama	352404	65357		"	Apr. 19/03	"	64	40.7		Indian mark III	57	PVC	4"
75	Woma2	Boricha	Sidama	424541	764119		"	Apr.23/03	"							
76	Arro	Boricha	Sidama	470980	764085		"	May 1/03	"	61	56					
77	Unit 3_2 camp	Awassa	Sidama	431060	780015		"	May 3/03	"	37	19.7		Afridev	32	PVC	4"
78	Udo Gorfamo	Awassa	Sidama				"	May 8/03	"	58	34		Indian mark II	45	PVC	4"
79	Udo Bulancho	Awassa	Sidama				"	May 6/03	"	52	29		Indian mark II	42		4"
80	Gonowa	Awassa	Sidama				"	May 11/03	"	58	39			48	PVC	4"
81	Gurie jibito 1st	Aleta wondo	Sidama	430035	728438		"	Mar. 14/03	"	56	13.8		Indian mark II	39	PVC	5"
82	Bisadime shaba	Aleta wondo	Sidama	420635	732564		"	Mar. 21/03	"	95	70		Indian mark III	82	PVC	4"
83	Ariama	Aleta wondo	Sidama				"	Mar. 26/03	"	91	21		Indian mark III	75	PVC	4"
84	Gurie jibito 2nd	Aleta wondo	Sidama				"	Mar. 28/03	"	42.6	26	0.3_0.25	Indian mark II	39	PVC	5"
85	Adille debo	Sodo	Gurage	451127	900107		"	24/5/95	"	58	28.6	2			PVC	5"
86	Deteka area1	Sodo	Gurage	498705	896898		"	23/5/95	"	44	18.8	3			PVC	5"
87	Deteka area2	Sodo	Gurage				"	23/01/03	"	40.6	20	2			PVC	5"
88	Gogeti	Sodo	Gurage				"	28/5/95	"	48	20.3	3	Indian mark II	42	UPVC	127mm
89	Meraes # 2	Meskan	Gurage	442948	897069		"	1995/12/5	"	24.5	14				PVC	125mm
90	Hanas Gebiye	Meskan	Gurage	444749	998561		"	1995/8/5	"	14.8	4	>10			PVC	125mm
91	Meymen sefer	Meskan	Gurage	444332	899113		"	1995/9/5	"	43	8	>5			PVC	125mm
92	Mender # 2(1)	Meskan	Gurage	442065	891503		"	1995/9/4	"	28	14.2	3			PVC	100mm
93	Mender # 2(2)	Meskan	Gurage	444035	591782		"	1995/10/4	"	35	14.6	3			PVC	100mm
94	Buta seter1	Meskan	Gurage	444974	391416		"	14/04/95	"	37	13.8	3			PVC	125mm
95	Bease sefer2	Meskan	Gurage	444437	890548		"	1992/12/4	"	34	14.3	3			PVC	125mm
96	Shabo sefer1	Meskan	Gurage	441990	892195		"		"	40	17	3			PVC	125mm
97	Shabo seter2	Meskan	Gurage	445017	889303		"	17/4/95	"	40	17.6	3			PVC	125mm
98	Shabo sefer3	Meskan	Gurage	445764	889614		"	18/4/95	"	40	17.6	3			PVC	125mm
99	Didahalibe W.No. 2	Mareko	Gurage				"	31/12/02	"	40.6	8	3.5			PVC	
100	Dida Halibo W. No 1	Mareko	Gurage				"	30/12/02	"	41.6	18	2			PVC	5"

ユニセフ支援による既存井戸データベース

No.	Site name	Wereda	Zone	Easting	Northing	Altitude (m)	Source statuses	Constr.compl. Date	Donor Name	Depth(mt)	SWL (m.b.g.l)	Source yiled (l/s)	Pump cat.	Pump. Postion (m)	Caing type	Casing Diam.
101	Waja Jane Damera W.No 1	Mareko	Gurage	-	-		"	2003/2/1	"	35.6	13.35	2.5	-	-	PVC	5"
102	Damera W.No 2	Mareko	Gurage	-	-		"	2003/3/1	"	37.6	13.85	3	-	-	PVC	5"
103	Wanze Akalaloi	Mareko	Gurage	-	-		"	14/01/03	"	45.1	20.25	3.5	-	-	PVC	5"
104	Hollo sole	Mareko	Gurage	-	-		'	24/01/03	'	36.6	10.25	2.5	-	-	PVC	5"
105	Hankudino (Budussa)	Mareko	Gurage	-	-		'	28/02/03	'	31.6	8.6	2	-	-	PVC	5"
106	Tekore	Kadida Gamela	KT						'	40	17	2.5	Afridev	27	PVC	4"
107	Futurea	Kadida Gamela	KT						'	30	6	3	Afridev	27	PVC	4"
108	Deneka	Kadida Gamela	KT							49.5	26	2.5	Afridev	27	PVC	4"
109	Wonko	Kadida Gamela	KT							32	1.5	3	Afridev	24	PVC	4"
110	Ambomsa	Kadida Gamela	KT							72	51	0.5				
111	Azedebo	Kadida Gamela	KT							42	6	3	Afridev	24	PVC	4"
112	Amercho	Angacha	KT							42	6	3	Afridev	27	PVC	4"
113	Bucha(Gubena)	Angacha	KT							47.5	26	3	Afridev		PVC	4"
114	Geremba	Angacha	KT							49	17	2	Afridev		PVC	4"
115	Bucha(Aresha)	Angacha	KT							64	38	1				
116	Bonga	Angacha	KT							79	17	2.5	Afridev		PVC	4"
117	Scecoshol	Kindokosha	Wolayita	349771	768266	1999				54.8	39	0.3	Indian Mark II	51	PVC	4"
118	Doga Shecoshoz	Kindokosha	Wolayita	352567	765615	2042				82	58	0.8	Indian Mark II	48	PVC	4"
119	Ueshamino	Kindokosha	Wolayita							74	47.6	1	Indian Mark II	48	PVC	4"
120	Guneno	Boloso Sora	Wolayita							70						
121	Shomba	Sodo Zuria	Wolayita							78	38	5	Indian Mark II	48	PVC	4"
122	Doga Shakes	Kindokosha	Wolayita	351041	766606	2021				82	42	1	Indian Mark II	61	PVC	4"
123	Guneno Ushamio	Boloso Sora	Wolayita							61	25	6	Indian Mark II	48	PVC	4"
124	Doge Shomeso Sch.	Kindokosha	Wolayita							82						
125	Kuto Serpela	Sodo Zuria	Wolayita							64	27	6	Indian Mark II	48	PVC	4"
126	Shamba	Sodo Zuria	Wolayita							62.5	38.4	2	Indian Mark II		PVC	4"
127	Shamba School	Sodo Zuria	Wolayita							62	38	2	Indian Mark II		PVC	4"
128	Sisota	Kochore	Gedeo	409680	664454	1718				78			Indian MarkII		PVC	4"
129	Sigiga1	Kochore	Gedeo	407764	663613	1835				42	25		Afridev		PVC	4"
130	Sigiga2	Kochore	Gedeo	406764	663405	1747				56	31.7		Afridev		PVC	4"
131	Anchebe	Kochore	Gedeo	408236	660558	1811				55	25.6		Afridev		PVC	4"
132	Biloya1	Kochore	Gedeo	406722	670682	1894				54	36.6		Afridev		PVC	4"
133	Biloya2	Kochore	Gedeo	406410	670326	1856				66	13.7		Afridev		PVC	4"
134	Karasoditi1	Wonago	Gedeo	413708	695853	1960				64	47.5		Indian Mark II		PVC	4"
135	Karasoditi2	Wonago	Gedeo	413468	696744	1927				57	31.7		Afridev		PVC	4"
136	Thokicha	Wonago	Gedeo	420351	697553	1673				64	43.9		Afridev		PVC	4"
137	Dila Gumble1	Shebedino	Sidama	435862	756068	1804				52	18.2		Afridev		PVC	4"
138	Dila Gumble2	Shebedino	Sidama	435856	757401	1818				64	28.9		Afridev		PVC	4"
139	Dila Gumble3	Shebedino	Sidama	436407	758028	1808				52	21.3		Afridev		PVC	4"
140	Sedequa	Shebedino	Sidama	439416	756559	1841				40	21.3		Afridev		PVC	4"
141	Teremesa	Shebedino	Sidama	439939	757691	1849				55	15.8		Afridev		PVC	4"
142	Chelbesa1	Dale	Sidama	421200	740964	1607				34	6.4		Afridev		PVC	4"
143	Chelbesa2	Dale	Sidama	421443	743041	1612				34	7.6		Afridev		PVC	4"
144	Chelbesa3	Dale	Sidama	421256	742626	1619				28	6.4		Afridev		PVC	4"
145	Chelbesa4	Dale	Sidama	421096	741854	1613				34	13.7		Afridev		PVC	4"
146	Dessie	Dale	Sidama	423170	741213	1611				52			Afridev		PVC	4"
147	Wonenta	Dale	Sidama	429933	743188	1772				125	80				PVC	4"
148	Gelowacho1	Dara	Sidama	427522	713051	1937				45	18.6		Afridev		PVC	4"
149	Gelowacho2	Dara	Sidama	426694	713727	1937				100	61		Afridev		PVC	4"
150	Dibicha1	Aleta wondo	Sidama	423780	718812	1600				38	18.3		Afridev		PVC	4"
151	Dibicha2	Aleta wondo	Sidama	424134	718233	1608				54	30.8		Afridev		PVC	4"

7.10 エチオピア国飲料水水質基準

THE FEDERAL DEMOCRATIC REPUBLIC OF **ETHIOPIA**
MINISTRY OF WATER RESOURCES

**SPECIFICATION FOR
ETHIOPIAN DRINKING WATER
QUALITY GUIDELINES**

*September 2002
Addis Ababa*

PREFACE

The development of tailor made national water quality guideline is necessary to promote and protect the public health, prevent and control diseases as well as to address the water quality concerns of the country. This guideline is developed on the basis of latest publications of WHO Guidelines for Drinking Water Quality Volumes- 1, 2, 3 and Addendum of volume-1 and taking into consideration a variety of local factors such as geographical, socio-economic and environmental conditions.

It is believed that this guideline is used as Ethiopian Drinking Water Quality Guideline encompassing recommendations for water quality requirement that will be fit for human consumption and other domestic purposes as well as water quality monitoring.

This guideline is dynamic and has to be improved and updated with new findings and developments in the field. Therefore, constructive comments and suggestions are always welcome.

1.0 SCOPE

This tailor made guideline value, developed on the principles of risk-benefit approach or acceptable risk, represents the concentration of the constituents that does not result in any significant risk to the health of the consumer over the Ethiopian lifetime of consumption.

2.0 APPLICATION

This guideline applies to microbiological, physical, chemical, radiological quality of drinking water. It is relevant to all domestic water uses such as drinking, food preparation and personal hygiene.

3.0 REQUIREMENTS

The basic quality requirements for drinking water are illustrated as follows: -

- 3.1 The drinking water shall be free from any diseases causing pathogenic organisms and concentration of toxic chemical compounds that have adverse effect on human health (as prescribed in **Tables-1, 2 and 5**).
- 3.2 The drinking water shall be fairly clear (i.e., of low turbidity and color) and contain no compounds that cause offensive taste and odor and free of substances and organisms that cause corrosion or encrustation of water supply system as presented in **Table-3**.
- 3.3 When the guideline values are exceeded, it should only be a signal to investigate and take remedial action. Short-term exposure, however, does not necessarily mean that the water is unsuitable for consumption. The amount by which, and the period for which, the guideline value can be exceeded without affecting public health depends upon the specific substance involved and its concentration.

A continuous effort should be made to maintain drinking water quality at the highest possible level. Although the guideline value recommends the quality of water acceptable for consumption, it does not imply that the quality of drinking water should be degraded to the recommended level.

All desirable parameters and substances should be examined whenever a doubt arises. When a new water supply source develops it has to be examined before any supply.

In order to keep the uniformity of measurement results units of microbiological quality, physical parameters, chemical constituents and radioactive substances should be the same as presented in **Tables-1, 2,3,4 and 5**.

Table-1 Bacteriological Quality

No.	Substance	Guideline Value (G _N)	Remark
A Treated Water Entering the Distribution System			
1	<i>E.coli</i> or thermo tolerant Coliform bacteria	0/100 ml	Membrane filtration is recommended for low turbid water
2	Total Coliform Bacteria	0/100 ml	93.0 % of samples examined throughout the year
B Treated Water In the Distribution System			
1	<i>E.coli</i> or thermo tolerant Coliform bacteria	0/100 ml	Membrane filtration is recommended for low turbid water
2	Total Coliform Bacteria	0/100 ml	93.0 % of samples examined throughout the year

Table-2 Chemicals of Health Significance

No.	Substance	Guideline (G _N) (mg/l)	Remark (Health Effect)
A Inorganic Constituents			
1	Arsenic	0.01 (P)	High incidence of skin & possibly other cancers
2	Barium	1.8	Increase blood pressure & suspect of cardiovascular diseases
3	Boron	0.3	Long-term exposure leads to gastrointestinal irritation
4	Cadmium	0.003	Kidney is the main target organ of toxicity
5	Chromium	0.10	Carcinogenicity suspect of chromium (VI) compounds
6	Copper	5	Acute gastric irritation & liver cirrhosis from long-term exposure
7	Cyanide	0.07	Acute toxicity is high. Effects on thyroid & particularly the nervous system on long-term exposure occurred.
8	Fluoride	3.0	At low conc. prevent dental carries. At high conc. increase risk of dental fluorosis, & much higher conc. leads to skeletal fluorosis.
9	Lead	0.02	Toxic to both the central & peripheral nervous systems, including subencephalopathic neurological effects.
10	Manganese	0.8	Neurotoxicity and other toxic effects
11	Mercury (total)	0.001	The kidney is the main target for inorganic Hg, whereas methyl-mercury affects mainly the central nervous system.
12	Nitrate (as NO ₃ ⁻)	50	Causes methaemoglobinaemia in infants and suspect of certain form of cancer risk
13	Nitrite (as NO ₂ ⁻)	6.0	” ” ” ”
14	Selenium	0.01	Long-term exposure cause toxic effect on nails, hairs and liver.
B Organic Constituents			
B1	Aromatic hydrocarbons	(µg/l)	
1	Benzene	10	Acute exposure at high conc. affects the central nervous system. At lower conc. it is toxic to haematopoietic system. Carcinogenic to humans (Group-1)
2	Benzo[a]pyrene	0.7	It causes cancer and induces tumors at the site of administration.
B2	Chlorinated alkanes		
1	Carbon tetrachloride	2	Possibly carcinogenic to humans (Group-2B)
2	1,2-dichloroethane	30	Possibly carcinogenic to humans (Group-2B)
B3	Chlorinated ethenes		
1	1,1-Dichloroethene	30	Potentially carcinogenic (Group-3)
2	Trichloroethene	70(P)	Potentially carcinogenic (Group-3)
3	Tetrachloroethene	40	Possibly carcinogenic to humans (Group-2B)

Table-2 (Cont.)

No.	Substance	Guideline (G _N) (mg/l)	Remark (Health Effect)
C Pesticides			
		(μ g/l)	Remark (Health Effect)
1	DDT	2	Possibly carcinogenic to humans (Group-2B)
2	Aldrine/Deldrine	0.03	Potentially carcinogenic (Group-3)
3	Chlordane	0.2	Possibly carcinogenic to humans (Group-2B)
4	Pentachlorophenols	9 (P)	Potentially carcinogenic to lab animals.
5	2,4-D	30	Possibly carcinogenic to humans (Group-2B)
D Disinfectant & Disinfectant By-products			
D1	Disinfectant	(mg/l)	Remark (Health Effect)
1	Chlorine	5	<ul style="list-style-type: none"> For effective chlorination, free residual chlorine 0.5 mg/l after 30 min of contact time & pH<8 Potentially carcinogenic (Group-3)
D2	Disinfectant By-products	(μg/l)	
D2.1	Chlorophenol		
1	2,4,6-Trichlorophenol	200	Possibly carcinogenic to humans (Group-2B)
D2.2	trihalomethane		
1	Chloroform	200	Possibly carcinogenic to humans (Group-2B)

• P - Provisional guideline value (see WHO, Vol-1, p178)

• Group - is the IARC classification (see WHO, Vol-1, p35)

• The sum of the ratio of the concentration of (NO₃ & NO₂ to its respective guideline values should not exceed 1.

Table-3 Substances and Parameters that may Give Rise to Complaints from Consumers

No.	Substance	Guideline Value (G _N) (mg/l)	Remark (Adverse Effect)
A Physical Parameters			
1	True Color	22	Unpleasing appearance
2	Odor	Non-Objectionable	Unappealing to drink
3	Test	Non-Objectionable	Unappealing to drink
4	Temperature	Non-Objectionable	High temperature may enhance growth of micro organisms & may increase test, odor, color & corrosion
5	Turbidity	7	Stimulate after growth & cause objectionable appearance
B Inorganic Constituents			
1	Aluminum	0.4	Deposition of aluminum hydroxide flocks in pipes & exacerbation of discoloration of water by iron
2	Ammonia	2	Objectionable odor
3	Chloride	533	Undesirable taste
4	Copper	2	Increase corrosion of GI & steel fittings, staining laundry & sanitary ware and give rise taste problem.
5	Hardness	392*	Based on 300 as Reference WHO recommendation
6	Hydrogen Sulfide	0.07	Objectionable rotten egg odour
7	Iron	0.4	Cause reddish-brown color, promote iron-bacteria & stain laundry & plumbing fixtures
8	Manganese	0.13	Stain laundry & plumbing fixtures and give rise to undesirable taste to beverages. Deposited as black precipitate in pipes. Certain micro organisms concentrate to give taste, odor, & turbidity problem.
9	Dissolved Oxygen	-	Low DO encourage for anaerobic reaction & formation of NO ₂ , H ₂ S giving rise to odor. It also increase Fe(II).
10	pH	6.5 – 8.5	High pH imparts taste & soapy feel, while low pH cause corrosion. Preferably <8.0 for effective disinfection
11	Sodium	358	Undesirable taste
12	Sulfate	483	Causes noticeable taste & corrosion of pipes
13	TDS	1776	Undesirable taste
14	Zinc	6	Imparts astringent taste & opalescent and develop a greasy film on boiling.
B Disinfectants & Disinfectant by-products			
	Disinfectants	(µg/l)	
1	Chlorine	600 – 1000	Taste and odour problem

* There is no as such any Guideline figure set by WHO. However the maximum recommended value of 300 is taken for calculation.

Table-4 Chemicals not of Health Significance at Concentration Normally Found in Drinking Water

No.	Substance	Guideline Value (G _N)	Remark
1	Asbestos		U
2	Silver		U
3	Tin		U

U – It is unnecessary to recommend a health-based guideline value, because they are not hazardous to human health at concentrations normally found in drinking water.

Table-5 Radioactive Constituents of Drinking Water

No.	Substance	Screening Value (Bq/litre)	Remark (Health Effect)
1	Gross alpha activity	0.1	<ul style="list-style-type: none"> If a screening value exceeded, more detail radionuclide analysis is necessary. WHO & other countries' is the same value. The main concern is Cancer
2	Gross beta activity	1	

4.0 SAMPLING TECHNIQUE

The detail procedure for preservation and handling of samples is presented in WHO, Vol-3 chapter-4 and ISO Water- Sampling- Part 3: Reference No. 5667-3:1994(E).

4.1 General Requirement For Bacteriological Sampling

Sampling for bacteriological examination should be carried out using sterile container of glass or polyethylene. Samples should be preserved under low temperature of 2 to 5 °C during storage and transport. The time between sampling and analysis should not exceed 6 hours, and 24 hours is considered the absolute maximum. If ice is not available, the transport time must not exceed 2 hours.

The bacteriological test should be accompanied with turbidity and free residual chlorine and pH where chlorination is applied. The minimum recommended frequency of sampling and analysis for on spot and piped distribution water supply schemes are given in Table-6 and Table-7 respectively.

Table-6 Minimum Frequency of Sampling and Analysis of On-spot Distribution Water Schemes

Sources & Mode of supply	Minimum frequency of sampling & Analysis		Remarks
	Bacteriological	Physico-chemical	
HDW & shallow well with HP	Sanitary protection Bacteriological test only if situation demands	Once initially, thereafter as situation demands	The situation requiring testing are change in environmental conditions, outbreak of water born diseases, or increase in incidents of water born diseases
BH-with HP	Once initially, thereafter as situation demands	Once initially, thereafter as situation demands	Ditto
Protected spring	Once initially, thereafter as situation demands	Periodically for residual chlorine if water is chlorinated	Ditto

BH = Borehole, HDW = Hand-dug-well, HP = Hand-pump

Table-7 Minimum Sample Numbers for Piped Drinking Water in the Distribution System

Group	Pop served	No of Annual samples
1	<5000	2
2	5000-100,000	(Pop/5000) x 6
3	>100,000	(Pop/ 10,000) + 120

4.2 General Requirement for Physico-Chemical Sampling

In general samples for physico-chemical analysis are recommended to be stored in a clean glass or polyethylene bottles at a low temperature in the dark (see **Table-8**). It is essential that the container should not be a cause of contamination and absorb or adsorb the constituents to be determined.

Table-8 Allocation of Physico-chemical Parameters (of interest) to the Type of Preservation

No.	Preservation by	Suitable for	Not Suitable for	Remarks
1	Acidification to pH<2	Alkali metals Aluminum Ammonia Arsenic Alkali earth metal Nitrate Total hardness Phosphorus, total Heavy metal	Cyanide Sulfides Carbonates, bicarbonates, CO2 Nitrites	Don't use sulfuric acid for Calcium and lead. Don't use hydrochloric acid for silver, lead and mercury. Don't use nitric acid for tin.
2	Cooling to 2°C to 5°C	Alkalinity Ammonia Conductivity Nitrate Nitrite Odour Orthophosphates Sulfates Total residue		

Every newly developed source has to be tested for full physico-chemical analysis before any service. Then after, the sampling for piped system should be carried out in such a way that one sample should be taken every two years for ground water sources such as borehole, shallow-tube-well and spring.

Surface water intended for water supply source should be sampled at least 6 times per year per site to detect the maximum and minimum concentration of interest. Then after two full physico-chemical analyses per year is recommended.

In all water sources when situation demands testing should be done for important parameters. These special situations are change in environmental condition, outbreak of water born diseases or increase of water born diseases.

4.3 Identification and Records

The source of the sample and the conditions under which it was collected should be recorded and attached to the bottle immediately after filling. At least the following information should be included with the sample (See **Figure-1**).

Figure-1 Suggested Form to Accompany Water Samples

Water-quality monitoring program		
SAMPLING DATA		
1	Region	
2	Zone	
3	Wereda	
4	Town/Village	
5	Sampling site	
6	Source	
7	Nature of sample (Treated or non-treated)	
8	Residual chlorine	
9	Date of sampling	
10	Time of sampling	
11	Sampled by (Organization)	

5.0 TESTING METHODS

The following test methods are selected mainly from ISO (International Organization for Standardization), based on WHO recommendation, to serve as reference test methods, in which every water quality laboratory in the country should develop towards it (see Table-9 to Table-13). International Organization for Standardization (ISO) is a worldwide federation of national standards bodies (ISO member bodies).

Table-9 Bacteriological Quality of Drinking Water

1	SUBSTANCE	REFERENCE	TEST METHOD
1	<i>E.coli</i> or thermo tolerant Coliform bacteria	ISO 9308-1:1990 or	Determination & enumeration of coliform organisms, thermo-tolerant <i>coliform</i> organisms and presumptive <i>escherchia coli</i> – Part 1: Membrane filtration method
		ISO 9308-2:1990	Determination & enumeration of coliform organisms, thermo-tolerant <i>coliform</i> organisms and presumptive <i>escherchia coli</i> – Part 2: Multiple Tube (MPN) method
2	Total Coliform bacteria	ISO 9308-1:1990 or	Determination & enumeration of coliform organisms, thermo-tolerant <i>coliform</i> organisms and presumptive <i>escherchia coli</i> – Part 1: Membrane filtration method
		ISO 9308-2:1990	Determination & enumeration of coliform organisms, thermo-tolerant <i>coliform</i> organisms and presumptive <i>escherchia coli</i> – Part 2: Multiple Tube (MPN) method

- Membrane filtration is recommended for low turbidity water

Table-10 Substances and Parameters that May Give Rise to Complaints from Consumers

1	SUBSTANCE	REFERENCE	TEST METHOD
A	Physical Parameters		
1	True Color	ISO 7887:1984(E)	Examination and Determination of Color
2	Odor	WHO, Vol-2, p358	Panel evaluation
3	Test	WHO, Vol-2, p358	Panel evaluation
4	Turbidity	ISO 7027:1990(E)	Determination of Turbidity
B	Inorganic constituents		
1	Aluminum	ISO 12020:1997(E)	Determination of Aluminum AAS method
2	Ammonia	ISO 7150-2:1986(E)	Determination of Ammonium Part2: Automated spectrophotometric method
3	Chloride	ISO 9297:1989(E)	Determination of Chloride – silver nitrate titration with chromate indicator (Mohr's method)
4	Copper	ISO 8280:1986(E)	Flam Absorption Spectrophotometric method
5	Hardness	ISO 6059:1984	Determination of the sum of calcium and magnesium - EDTA titrimetric method
6	Hydrogen Sulfide	WHO, Vol-2, p243	Methylene blue colorimetric method
7	Iron	ISO 6332:1988(E)	Determination of Iron - Spectrometric Method using 1,10-phenanthroline
8	Manganese	ISO 6333:1986(E)	Determination of Manganese Formaldoxime spectrometric method
9	DO	WHO, Vol-2, p324	Electrochemical probe or dissolved oxygen meter
10	pH	ISO 10523:1990(E)	Determination of pH
11	Sodium	ISO 9964-3: 1993(E)	Determination of Sodium and potassium by flam emission spectrophotometry
12	Sulfate	ISO 9280:1990(E)	Gravimetric method
13	TDS	WHO, Vol-2, p367	Conductivity probe
14	Zinc	ISO 8288:1986(E)	Flam Absorption Spectrophotometric method
B	Disinfectant		
1	Chlorine	ISO 7393-2:1985(E)	Determination of free chlorine and total chlorine using N,N-diethyly-1, 4 phylenediamine, for routine control process

Table-11 Chemicals Of Health Significance

1	SUBSTANCE	REFERENCE	TEST METHOD
A	Inorganic Constituents		
1	Arsenic	ISO 6595:1982(E)	Determination of total Arsenic – silver diethyl dithiocarbonate spectrophotometric method
2	Barium	WHO, vol-2, p175	AAS, using either direct aspiration into an air-acetylene flame or atomization in a furnace.
3	Boron	ISO 9390:1990(E)	Determination of Borate – spectrophotometric method using Azomethine-H
4	Cadmium	ISO 5961:1994(E) ISO 8288:1986(E)	Determination of cadmium – by AAS method Flam Absorption Spectrophotometric method
5	Chromium	ISO 11083:1994(E)	Determination of chromium (vi) – spectrometric method using 1,5-diphenylcarbazine
6	Copper	ISO 8288:1986(E)	Flam Absorption Spectrophotometric method
7	Cyanide	ISO 6703:1984(E)	Determination of cyanide- Part 1: Determination of total cyanide
8	Fluoride	ISO 10359-1:1992(E)	Electrochemical probe method - for potable and lightly polluted water
9	Lead	ISO 8288:1986(E)	Flam Absorption Spectrophotometric method
10	Manganese	ISO 6333:1986(E)	Determination of Manganese Formaldoxime spectrometric method
11	Mercury (total)	ISO 9965-3: 9984(E)	Determination of total mercury- by flameless AAS – method after digestion with bromine
12	Nitrate (as NO ₃ ⁻)	ISO 7890-3:1988(E)	Determination of nitrate- Part 3:spectrometric method using sulfosalicylic acid.
13	Nitrite (as NO ₂ ⁻)	ISO 6777:1984(E)	Determination of nitrite - Molecular Absorption spectrometric method
14	Selenium	ISO 9965:1993(E)	Determination of Selenium – AAS method (hydride technique)
B	Organic Constituents		
B1	Aromatic hydrocarbons		
1	Benzene	WHO, Vol-2, p462	A purge and trap gas chromatographic procedure with photoionization detection
2	Benzo[a]pyrene	WHO, Vol-2, p496	Gas chromatography in conjunction with mass spectrographic
B2	Chlorinated alkanes		
1	Carbon tetrachloride	WHO, Vol-2, p390	A purge and trap gas chromatography
2	1,2-dichloroethane	WHO, Vol-2, p411	A purge and trap gas chromatographic procedure
B3	Chlorinated ethenes		
1	1,1-Dichloroethene	WHO, Vol-2, p432	A purge and trap gas chromatographic procedure
2	Trichloromethene	WHO, Vol-2, p445	A purge and trap gas chromatographic procedure
3	Tetrachloroethene	WHO, Vol-2, p453	A purge and trap gas chromatographic procedure

Table-11 (Cont.)

C	Pesticides	Reference	Test Method
1	DDT	WHO, Vol-2, p639	Gas Chromatography with electron-capture detector.
2	Aldrine/Deldrine	WHO, Vol-2, p604	Extraction with pentane followed by Gas Chromatography with electron-capture detector
3	Chlordane	WHO, Vol-2, p628	Extraction with pentane followed by gas chromatography with electron capture detector
4	Pentachlorophenols	ISO 8165-1:1992(E)	Determination of selected monovalent phenols Part1: Gas-chromatographic method after enrichment by extraction
D	Disinfectant & disinfectant bi-product		
D1	Disinfectant		
1	Chlorine	ISO 7393-2:1985(E)	Determination of free chlorine and total chlorine using N,N-diethyly-1, 4 phylenediamine, for routine control process
D2	Disinfectant By-products		
D2.1	Chlorophenol		
1	2,4,6-Trichlorophenol	ISO 8165-1:1992(E)	Determination of selected monovalent phenols-Part 1: Gas chromatographic method after enrichment by extraction
D2.2	Trihalomethane		
1	Chloroform	WHO, Vol-2, p850	Gas chromatography- with detection by flame ionization, electron-capture, or mass spectroscopy

Table-12 Chemicals not of Health Significance at Concentration normally Found In Drinking Water

1	SUBSTANCE	REFERENCE	TEST METHOD
1	Asbestos	WHO, Vol-2, p168	Transmission electron microscopy (TEM) with identification by energy depressive X-ray analysis and selected-area electron diffraction (TEM/SAED)
2	Silver	WHO, vol-2, p339	Spectrographic and colorimetric method with diithi-zone
3	Tin	WHO, vol-2, p361	AAS either direct aspiration into a flame or furnace technique

Table-13 Radioactive Constituents of Drinking Water

¹	SUBSTANCE	REFERENCE	TEST METHOD
1	Gross alpha activity	ISO 9696:1992	Measurement of Gross Alpha activity in non-saline water - thick source method.
2	Gross beta activity	ISO 9697:1992	Measure of gross beta activity in non-saline water

6.0 SANITARY INSPECTION

Sanitary survey and WQ analysis are complementary activities that should be conducted by both the water supply agency as well as surveillance agency. The sanitary inspection forms, prepared in the form of checklist, are possible to determine an overall measure of the sanitary state of the supply.

6.1 Frequency of Sanitary Inspection

One of the most important surveys is that undertaken when new water sources are developed. When alternative water sources are under consideration, each should be surveyed. The guiding principle is that no new water supply should be approved without a sanitary inspection. Routine surveys of existing supplies should be undertaken periodically as stated in **Table-14** by the community, water supplier and surveillance agency.

Table-14 Minimum Annual Frequency of Sanitary Survey

¹	Source & Mode of Supply	Community	Water-supply Agency	Surveillance Agency
1.0	On Spot supply			
1.1	Hand-dug well (Without windlass)	6	-	-
1.2	Hand-dug well (With windlass)	6	-	-
1.3	Dug well with hand-pump	4	-	0.5
1.4	Shallow & deep tube well with hand-pump	4	-	0.5
1.5	Gravity spring	4	-	0.5
2.0	Piped Supply			
2.1	Groundwater with & without chlorination	-	0.5	0.5
2.2	Treated surface water with chlorination:			
	<5,000 Pop	-	0.5	0.5
	5,000 to 20,000 Pop	-	1	0.5
2.3	Distribution system of piped supply	-	6	0.5