

KOBO BH-01 HYDRAULICS													
Kobo( WG9)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.03	120	80	0.125	4.6	2.45	2.3				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.98	19.62	0.9	1.9	5.98	19.62	0.6	0.15	5.98	19.62	0.3
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.98	19.62	1.8				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.98	19.62	0.686	0.15	5.98	19.62	0.274				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.03	0.15	1.70	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.34			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,446.00	1,456.00	10	54.17	76	32						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		76	108.00	6"	30	100m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	7	350					

KOBO BH-02 HYDRAULICS													
Kobo( WG23)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.04778	120	62.78	0.15	3.5	2.71	5.5				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	7.32	19.62	1.1	1.9	7.32	19.62	0.7	0.15	7.32	19.62	0.4
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	7.32	19.62	2.2				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	7.32	19.62	0.839	0.15	7.32	19.62	0.409				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.04778	0.15	2.71	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	5.55			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,403.00	1,413.00	10	47.78	73	49						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		73	172.01	8"	45	85m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	12	515					

KOBO BH-03 HYDRAULICS													
Kobo( WG28)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.06	120	100	0.2	2.1	1.91	2.1				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.65	19.62	0.6	1.9	3.65	19.62	0.4	0.15	3.65	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.65	19.62	1.1				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.65	19.62	0.419	0.15	3.65	19.62	0.102				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.06	0.2	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.08			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,425.00	1,435.00	10	21.46	38	32						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		38	216.00	6"	30	120m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	9	368					

KOBO BH-04 HYDRAULICS													
Kobo( WG29)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.06	120	100	0.2	2.1	1.91	2.1				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.65	19.62	0.6	1.9	3.65	19.62	0.4	0.15	3.65	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.65	19.62	1.1				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.65	19.62	0.419	0.15	3.65	19.62	0.102				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.06	0.2	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.08			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,436.00	1,446.00	10	11.68	29	26						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		29	216.00	6"	30	120m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	17	6	287					

KOBO BH-05 HYDRAULICS													
Kobo( WG31)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.02436	120	39.36	0.125	1.5	1.99	0.4				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.94	19.62	0.6	1.9	3.94	19.62	0.4	0.15	3.94	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.94	19.62	1.2				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.94	19.62	0.452	0.15	3.94	19.62	0.119				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.02436	0.2	0.78	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	0.39			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,430.00	1,440.00	10	24.36	39	14						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		39	87.70	6"	15	60m, 4X6 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	3	166					

KOBO BH-06 HYDRAULICS													
Kobo( WG32)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.0432	120	54.86	0.15	2.6	2.45	4.6				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.98	19.62	0.9	1.9	5.98	19.62	0.6	0.15	5.98	19.62	0.3
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.98	19.62	1.8				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.98	19.62	0.686	0.15	5.98	19.62	0.274				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.0432	0.15	2.45	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.60			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,420.00	1,430.00	10	39.86	62	40						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		62	155.52	8"	45	75m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	9	368					

KOBO BH-07 HYDRAULICS													
Kobo( WG33)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.051	120	80	0.2	1.3	1.62	1.5				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	2.64	19.62	0.4	1.9	2.64	19.62	0.3	0.15	2.64	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	2.64	19.62	0.8				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	2.64	19.62	0.303	0.15	2.64	19.62	0.053				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.051	0.2	1.62	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.54			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,428.00	1,438.00	10	45.2	60	46						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		60	183.60	8"	45	80m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	10	445					

KOBO BH-08 HYDRAULICS													
Kobo( WG40)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.04045	120	108	0.15	4.5	2.29	1.0				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.24	19.62	0.8	1.9	5.24	19.62	0.5	0.15	5.24	19.62	0.2
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.24	19.62	1.6				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.24	19.62	0.601	0.15	5.24	19.62	0.210				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.04045	0.2	1.29	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.00			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,412.00	1,422.00	10	54.17	74	45						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		74	145.62	8"	45	130m, 4X50 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	11	445					

KOBO BH-09 HYDRAULICS													
Kobo( WG41)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.056	120	68	0.2	1.3	1.78	1.8				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.18	19.62	0.5	1.9	3.18	19.62	0.3	0.15	3.18	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.18	19.62	1.0				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.18	19.62	0.365	0.15	3.18	19.62	0.077				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.056	0.2	1.78	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.83			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,421.00	1,431.00	10	33.14	49	41						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		49	201.60	8"	45	90m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	10	406					

KOBO BH-10 HYDRAULICS													
Kobo( WG42)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.058	120	60	0.2	1.2	1.85	2.0				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.41	19.62	0.5	1.9	3.41	19.62	0.3	0.15	3.41	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.41	19.62	1.0				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.41	19.62	0.391	0.15	3.41	19.62	0.089				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.058	0.2	1.85	120	10.67*L* Q1.852 /(C1.852* D4.87)	0.0029	1.96			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,418.00	1,428.00	10	24.54	40	33						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		40	208.80	6"	30	80m, 4X16 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	8	396					

KOBO BH-11 HYDRAULICS													
Kobo( WG43)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.075	120	100	0.2	3.2	2.39	3.1				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.71	19.62	0.9	1.9	5.71	19.62	0.6	0.15	5.71	19.62	0.2
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.71	19.62	1.7				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.71	19.62	0.654	0.15	5.71	19.62	0.249				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.075	0.2	2.39	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.15			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,418.00	1,428.00	10	28.12	49	55						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		49	270.00	8"	45	120m, 4X50 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	14	560					

KOBO BH-12 HYDRAULICS													
Kobo( WG34)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.052	120	56.25	0.15	3.7	2.94	6.5				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	8.67	19.62	1.3	1.9	8.67	19.62	0.8	0.15	8.67	19.62	0.6
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	8.67	19.62	2.7				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	8.67	19.62	0.994	0.15	8.67	19.62	0.574				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.052	0.15	2.94	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.49			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,438.00	1,448.00	10	41.25	68	54						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		68	187.20	8"	45	76m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	17	12	548					

KOBO BH-13 HYDRAULICS													
Kobo( HG5)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.05	120	58	0.15	3.6	2.83	6.0				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	8.01	19.62	1.2	1.9	8.01	19.62	0.8	0.15	8.01	19.62	0.5
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	8.01	19.62	2.5				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	8.01	19.62	0.919	0.15	8.01	19.62	0.491				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.05	0.15	2.83	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.03			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,436.00	1,446.00	10	34.3	60	45						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		60	180.00	8"	45	80m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	17	9	442					

KOBO BH-14 HYDRAULICS													
Kobo( HG11)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.05	120	80	0.15	4.9	2.83	6.0				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	8.01	19.62	1.2	1.9	8.01	19.62	0.8	0.15	8.01	19.62	0.5
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	8.01	19.62	2.5				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	8.01	19.62	0.919	0.15	8.01	19.62	0.491				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.05	0.15	2.83	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.03			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,437.00	1,447.00	10	35.17	62	47						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		62	180.00	8"	45	100m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	14	12	451					

KOBO BH-15 HYDRAULICS													
Kobo( HG13)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.05	120	80	0.15	4.9	2.83	6.0				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	8.01	19.62	1.2	1.9	8.01	19.62	0.8	0.15	8.01	19.62	0.5
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	8.01	19.62	2.5				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	8.01	19.62	0.919	0.15	8.01	19.62	0.491				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.05	0.15	2.83	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.03			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,425.00	1,435.00	10	31.61	59	44						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		59	180.00	8"	45	100m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	10	434					

KOBO BH-16 HYDRAULICS													
Kobo( HG26)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.085	120	90	0.2	3.6	2.71	4.0				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	7.33	19.62	1.1	1.9	7.33	19.62	0.7	0.15	7.33	19.62	0.4
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	7.33	19.62	2.2				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	7.33	19.62	0.840	0.15	7.33	19.62	0.411				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.085	0.2	2.71	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.97			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,450.00	1,460.00	10	31.2	55	70						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		55	306.00	8"	55	110m, 4X50 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	15	638					

KOBO BH-17 HYDRAULICS													
Kobo( HG28)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.055	120	100	0.2	1.8	1.75	1.8				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.07	19.62	0.5	1.9	3.07	19.62	0.3	0.15	3.07	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.07	19.62	0.9				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.07	19.62	0.352	0.15	3.07	19.62	0.072				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.055	0.2	1.75	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.77			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,491.00	1,501.00	10	34.54	50	42						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		50	198.00	8"	45	120m, 4X50 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	10	406					

KOBO BH-18 HYDRAULICS													
Kobo( HG29)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.08	120	110	0.2	4.0	2.55	3.5				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	6.49	19.62	1.0	1.9	6.49	19.62	0.6	0.15	6.49	19.62	0.3
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	6.49	19.62	2.0				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	6.49	19.62	0.744	0.15	6.49	19.62	0.322				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.08	0.2	2.55	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.55			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,488.00	1,498.00	10	39.16	62	74						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		62	288.00	8"	75	130m, 4X70 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	14	26	952					

KOBO BH-19 HYDRAULICS													
Kobo( HG37A)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.05	120	44.76	0.15	2.7	2.83	6.0				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	8.01	19.62	1.2	1.9	8.01	19.62	0.8	0.15	8.01	19.62	0.5
		Reducer				Water Meter		1475					
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	8.01	19.62	2.5				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	8.01	19.62	0.919	0.15	8.01	19.62	0.491				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.05	0.15	2.83	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.03			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,475.00	1,485.00	10	29.76	55	38						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		55	180.00	8"	45	65m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	14	10	379					

KOBO BH-20 HYDRAULICS													
Kobo( HG43)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.029	120	64	0.15	1.4	1.64	2.2				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	2.70	19.62	0.4	1.9	2.70	19.62	0.3	0.15	2.70	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	2.70	19.62	0.8				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	2.70	19.62	0.309	0.15	2.70	19.62	0.056				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.029	0.15	1.64	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.20			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,375.00	1,385.00	10	38.01	54	23						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		54	104.40	6"	30	85m, 4X16 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	5	258					

KOBO BH-21 HYDRAULICS

Kobo( PHG6)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.07	120	40.85	0.2	1.1	2.23	2.8					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	4.97	19.62	0.8	1.9	4.97	19.62	0.5	0.15	4.97	19.62	0.2	
	Reducer				Water Meter								
	K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	4.97	19.62	1.5					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.07	0.2	2.23	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.77				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,407.00	1,417.00	10	25.85	43	43							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	43	252.00	8"	45	61m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	13	556						

KOBO BH-22 HYDRAULICS

Kobo( PHG 8)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.0464	120	80	0.125	10.4	3.78	5.3					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	14.31	19.62	2.2	1.9	14.31	19.62	1.4	0.15	14.31	19.62	1.6	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	14.31	19.62	4.4					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	14.31	19.62	1.641	0.15	14.31	19.62	1.566					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.0464	0.15	2.63	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	5.25				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,434.00	1,444.00	10	37.93	76	53							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	76	167.04	8"	45	93m, 4X35 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	13	556						

KOBO BH-23 HYDRAULICS

Kobo( PHG9)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.0535	120	107	0.15	7.4	3.03	6.8					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	9.17	19.62	1.4	1.9	9.17	19.62	0.9	0.15	9.17	19.62	0.6	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	9.17	19.62	2.8					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	9.17	19.62	1.052	0.15	9.17	19.62	0.644					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.0535	0.15	3.03	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.84				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,440.00	1,450.00	10	27.52	59	44							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	59	192.60	8"	45	127m, 4X50 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	11	474						

KOBO BH-24 HYDRAULICS

Kobo( PHG10)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.0595	120	107	0.2	2.2	1.89	2.1					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	3.59	19.62	0.5	1.9	3.59	19.62	0.3	0.15	3.59	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	3.59	19.62	1.1					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.0595	0.2	1.89	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.05				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,447.83	1,457.83	10	30.88	48	43							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	48	214.20	8"	45	127m, 4X50 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	17	9	417						

KOBO BH-25 HYDRAULICS

Kobo( PHG16)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.025	120	59.05	0.125	2.4	2.04	1.7					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	4.15	19.62	0.6	1.9	4.15	19.62	0.4	0.15	4.15	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	4.15	19.62	1.3					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	4.15	19.62	0.476	0.15	4.15	19.62	0.132					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.025	0.15	1.42	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.67				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,450.00	1,460.00	10	44.05	61	23							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	61	90.00	6"	30	79m, 4X16mm <sup>2</sup>								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	14	6	236						

KOBO BH-26 HYDRAULICS

Kobo( ALTW-1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.052	120	60.19	0.125	9.6	4.24	6.5					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	17.97	19.62	2.7	1.9	17.97	19.62	1.7	0.15	17.97	19.62	2.5	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	17.97	19.62	5.5					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	17.97	19.62	2.061	0.15	17.97	19.62	2.470					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.052	0.15	2.94	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.49				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,425.00	1,435.00	10	45.19	88	57							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	88	187.20	8"	55	80m, 4X35 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	15	638						

KOBO BH-27 HYDRAULICS

Kobo( ALTW2)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.048	120	74.05	0.15	4.2	2.72	5.6					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	7.39	19.62	1.1	1.9	7.39	19.62	0.7	0.15	7.39	19.62	0.4	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	7.39	19.62	2.3					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.048	0.15	2.72	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	5.59				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,395.00	1,405.00	10	59.05	85	61							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	85	172.80	8"	55	94m, 4X50 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	18	13	626						

KOBO BH-28 HYDRAULICS

Kobo( ALTW-3)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.05	120	50.76	0.15	3.1	2.83	6.0					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	8.01	19.62	1.2	1.9	8.01	19.62	0.8	0.15	8.01	19.62	0.5	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	8.01	19.62	2.5					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	8.01	19.62	0.919	0.15	8.01	19.62	0.491					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.05	0.15	2.83	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.03				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,422.00	1,432.00	10	35.76	61	46							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	61	180.00	8"	45	71m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	15	11	445						

KOBO BH-29 HYDRAULICS

Kobo( ALPW1)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.053	120	87.09	0.15	5.9	3.00	1.7				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	9.00	19.62	1.4	1.9	9.00	19.62	0.9	0.15	9.00	19.62	0.6
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	9.00	19.62	2.8				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	9.00	19.62	1.033	0.15	9.00	19.62	0.620				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.053	0.2	1.69	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.66			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,460.00	1,470.00	10	72.09	97	78						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		97	190.80	8"	75	117m, 4X70 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	16	764					

KOBO BH-30 HYDRAULICS

Kobo( MGTW-1)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.062	120	49.38	0.2	1.1	1.97	2.2				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.90	19.62	0.6	1.9	3.90	19.62	0.4	0.15	3.90	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.90	19.62	1.2				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.90	19.62	0.447	0.15	3.90	19.62	0.116				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.062	0.2	1.97	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.21			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,524.00	1,534.00	10	34.38	51	47						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		51	223.20	8"	45	70m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	17	11	504					

KOBO BH-31 HYDRAULICS

Kobo( MGTW-2)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.057	120	51.47	0.2	1.0	1.82	1.9					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	3.30	19.62	0.5	1.9	3.30	19.62	0.3	0.15	3.30	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	3.30	19.62	1.0					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	3.30	19.62	0.378	0.15	3.30	19.62	0.083					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.057	0.2	1.82	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.89				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,491.00	1,501.00	10	36.47	52	44							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	52	205.20	8"	45	72m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	15	11	445						

KOBO BH-32 HYDRAULICS

Kobo( MGTW3)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.025	120	106.2	0.125	4.4	2.04	1.7					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	4.15	19.62	0.6	1.9	4.15	19.62	0.4	0.15	4.15	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	4.15	19.62	1.3					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	4.15	19.62	0.476	0.15	4.15	19.62	0.132					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.025	0.15	1.42	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.67				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,435.00	1,445.00	10	91.2	110	42							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	110	90.00	8"	45	126m, 4X50 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	17	9	417						

KOBO BH-33 HYDRAULICS

Kobo( MGPW1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.072	120	47.09	0.2	1.4	2.29	2.9					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	5.26	19.62	0.8	1.9	5.26	19.62	0.5	0.15	5.26	19.62	0.2	
	Reducer				Water Meter								
	K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	5.26	19.62	1.6					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.072	0.2	2.29	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.92				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,400.00	1,410.00	10	32.09	50	55							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	50	259.20	8"	45	67m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	15	14	560						

KOBO BH-34 HYDRAULICS

Kobo( MGPW2)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.064	120	57.33	0.2	1.4	2.04	2.3					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	4.15	19.62	0.6	1.9	4.15	19.62	0.4	0.15	4.15	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	4.15	19.62	1.3					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	4.15	19.62	0.476	0.15	4.15	19.62	0.132					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.064	0.2	2.04	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.35				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,420.00	1,430.00	10	42.33	59	53							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	59	230.40	8"	45	77m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	15	14	560						

KOBO BH-35 HYDRAULICS

Kobo( SWTW2)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.06	120	70.45	0.2	1.5	1.91	2.1					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	3.65	19.62	0.6	1.9	3.65	19.62	0.4	0.15	3.65	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	3.65	19.62	1.1					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	3.65	19.62	0.419	0.15	3.65	19.62	0.102					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.06	0.2	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.08				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,428.00	1,438.00	10	55.45	72	53							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	72	216.00	8"	55	90m, 4X35 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	15	638						

KOBO BH-36 HYDRAULICS

Kobo( TG 3)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.052	120	71	0.15	4.7	2.94	6.5					
	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	8.67	19.62	1.3	1.9	8.67	19.62	0.8	0.15	8.67	19.62	0.6	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	8.67	19.62	2.7					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	8.67	19.62	0.994	0.15	8.67	19.62	0.574					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.052	0.15	2.94	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.49				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,394.00	1,404.00	10	41.9	70	55							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	70	187.20	8"	45	91m, 4X35 mm²								
PV Specification	Peak power (Wp)	Max. power current(lmp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	15	14	560						

KOBO BH-37 HYDRAULICS

Kobo( TG4)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.055	120	110	0.2	2.0	1.75	1.8					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	3.07	19.62	0.5	1.9	3.07	19.62	0.3	0.15	3.07	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	3.07	19.62	0.9					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	3.07	19.62	0.352	0.15	3.07	19.62	0.072					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.055	0.2	1.75	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.77				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,387.00	1,397.00	10	35.57	52	43							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	52	198.00	8"	45	130m, 4X50 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	10	434						

KOBO BH-38 HYDRAULICS

KOBO BH-38 HYDRAULICS													
Kobo (PG4)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.03	120	115	0.125	6.7	2.45	2.3				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.98	19.62	0.9	1.9	5.98	19.62	0.6	0.15	5.98	19.62	0.3
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.98	19.62	1.8				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.98	19.62	0.686	0.15	5.98	19.62	0.274				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.03	0.15	1.70	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.34			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,409.00	1,419.00	10	37.47	61	28						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		61	108.00	8"	30	135m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	7	291					

KOBO BH-39 HYDRAULICS

Kobo ( PG5)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.02	120	62.52	0.1	5.1	2.55	8.0					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	6.49	19.62	1.0	1.9	6.49	19.62	0.6	0.15	6.49	19.62	0.3	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	6.49	19.62	2.0					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	6.49	19.62	0.744	0.15	6.49	19.62	0.322					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.02	0.1	2.55	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	7.96				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,405.00	1,415.00	10	47.52	76	23							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	76	72.00	6"	30	82m, 4X16 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	14	6	236						

KOBO BH-40 HYDRAULICS

Kobo (PG6)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.043	120	110	0.15	5.1	2.43	4.6				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.93	19.62	0.9	1.9	5.93	19.62	0.6	0.15	5.93	19.62	0.3
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.93	19.62	1.8				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.93	19.62	0.680	0.15	5.93	19.62	0.269				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.043	0.15	2.43	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.56			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,377.00	1,387.00	10	29.41	54	32						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		54	154.80	6"	30	130m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	8	396					

KOBO BH-41 HYDRAULICS

Kobo( TATW-1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.043	120	110	0.15	5.1	2.43	4.6					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	5.93	19.62	0.9	1.9	5.93	19.62	0.6	0.15	5.93	19.62	0.3	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	5.93	19.62	1.8					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	5.93	19.62	0.680	0.15	5.93	19.62	0.269					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.043	0.15	2.43	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.56				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1588	1,598.00	10	22.16	46	30							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	46	154.80	6"	30	58m, 4X16 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	18	8	396						

KOBO BH-42 HYDRAULICS

Kobo( TATW-2)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.062	120	50.76	0.2	1.1	1.97	2.2					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	3.90	19.62	0.6	1.9	3.90	19.62	0.4	0.15	3.90	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	3.90	19.62	1.2					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	3.90	19.62	0.447	0.15	3.90	19.62	0.116					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.062	0.2	1.97	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.21				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,571.00	1,581.00	10	35.76	52	49							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	52	223.20	8"	45	71m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	14	13	129						

KOBO BH-43 HYDRAULICS													
Kobo( HCKTW2)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.06	120	26.59	0.2	0.6	1.91	2.1				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.65	19.62	0.6	1.9	3.65	19.62	0.4	0.15	3.65	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.65	19.62	1.1				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.65	19.62	0.419	0.15	3.65	19.62	0.102				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.06	0.2	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.08			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1450	1,460.00	10	11.59	27	24						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		27	216.00	6"	30	46m, 4X16mm <sup>2</sup>							
	PV Specification	Peak power (Wp)	Max. power current(lmp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	6	270					

KOBO BH-44 HYDRAULICS

Kobo( HCKTW3)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.066	120	43.25	0.2	1.1	2.10	10.1					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	4.42	19.62	0.7	1.9	4.42	19.62	0.4	0.15	4.42	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	4.42	19.62	1.4					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	4.42	19.62	0.507	0.15	4.42	19.62	0.149					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.066	0.15	3.74	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	10.09				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,423.00	1,433.00	10	28.25	53	52							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	53	237.60	8"	45	63m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	15	14	560						

KOBO BH-45 HYDRAULICS

Kobo( HCKTW4)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.0603	120	60.35	0.2	1.3	1.92	2.1					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	3.69	19.62	0.6	1.9	3.69	19.62	0.4	0.15	3.69	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	3.69	19.62	1.1					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	3.69	19.62	0.423	0.15	3.69	19.62	0.104					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.0603	0.2	1.92	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.10				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,459.00	1,469.00	10	45.35	61	56							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	61	217.08	8"	45	80m, 4X35 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	15	14	560						

KOBO BH-46 HYDRAULICS

Kobo( HCKTW5)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.019	120	149.5	0.125	3.7	1.55	2.4					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	2.40	19.62	0.4	1.9	2.40	19.62	0.2	0.15	2.40	19.62	0.0	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	2.40	19.62	0.7					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	2.40	19.62	0.275	0.15	2.40	19.62	0.044					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.019	0.125	1.55	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.44				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,406.00	1,416.00	10	134.5	152	44							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	152	68.40	8"	45	169m, 4X70 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	17	9	417						

KOBO BH-47 HYDRAULICS

Kobo( Mekoy PW1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.0413	120	39.25	0.15	1.7	2.34	4.2					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	5.47	19.62	0.8	1.9	5.47	19.62	0.5	0.15	5.47	19.62	0.2	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	5.47	19.62	1.7					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	5.47	19.62	0.627	0.15	5.47	19.62	0.229					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.0413	0.15	2.34	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.23				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,484.00	1,494.00	10	24.25	44	28							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	44	148.68	6"	30	59m, 4X16 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	17	6	287						

KOBO BH-48 HYDRAULICS

Kobo( MEKOY PW2)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.03	120	50.64	0.125	2.9	2.45	2.3					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	5.98	19.62	0.9	1.9	5.98	19.62	0.6	0.15	5.98	19.62	0.3	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	5.98	19.62	1.8					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	5.98	19.62	0.686	0.15	5.98	19.62	0.274					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.03	0.15	1.70	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.34				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,470.00	1,480.00	10	35.64	55	25							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	55	108.00	6"	30	71m, 4X16 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	6	270						

KOBO BH-49 HYDRAULICS

Kobo( JRTW1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.062	120	51.18	0.2	1.1	1.97	2.2					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	3.90	19.62	0.6	1.9	3.90	19.62	0.4	0.15	3.90	19.62	0.1	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	3.90	19.62	1.2					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	3.90	19.62	0.447	0.15	3.90	19.62	0.116					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.062	0.2	1.97	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.21				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,461.00	1,471.00	10	36.18	52	49							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	52	223.20	8"	45	71m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	14	13	487						

KOBO BH-50 HYDRAULICS

Kobo( JRTW2)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.05	120	50.55	0.15	3.1	2.83	6.0					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	8.01	19.62	1.2	1.9	8.01	19.62	0.8	0.15	8.01	19.62	0.5	
	Reducer				Water Meter								
	K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	8.01	19.62	2.5					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.05	0.15	2.83	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.03				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,490.00	1,500.00	10	35.55	61	46							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	61	180.00	8"	45	71m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	10	434						

KOBO BH-51 HYDRAULICS

Kobo( STW1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.055	120	46.97	0.15	3.4	3.11	7.2					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	9.70	19.62	1.5	1.9	9.70	19.62	0.9	0.15	9.70	19.62	0.7	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	9.70	19.62	3.0					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	9.70	19.62	1.112	0.15	9.70	19.62	0.719					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.055	0.15	3.11	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	7.20				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,421.00	1,431.00	10	31.97	61	50							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	61	198.00	8"	45	67m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	11	474						

KOBO BH-52 HYDRAULICS

Kobo( STW2)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.033	120	118.82	0.125	8.2	2.69	2.8				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	7.24	19.62	1.1	1.9	7.24	19.62	0.7	0.15	7.24	19.62	0.4
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	7.24	19.62	2.2				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	7.24	19.62	0.830	0.15	7.24	19.62	0.401				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.033	0.15	1.87	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.79			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,450.00	1,460.00	10	103.82	130	65						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		130	118.80	8"	55	139m, 4X70 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	15	638					

KOBO BH-53 HYDRAULICS

Kobo( JwTW1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.068	120	40.7	0.2	1.1	2.17	2.6					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	4.69	19.62	0.7	1.9	4.69	19.62	0.5	0.15	4.69	19.62	0.2	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	4.69	19.62	1.4					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	4.69	19.62	0.538	0.15	4.69	19.62	0.168					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.068	0.2	2.17	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.63				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,180.00	1,190.00	10	25.7	43	44							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	43	244.80	8"	45	61m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	18	10	488						

KOBO BH-55 HYDRAULICS

Kobo( JwTW2)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.04	120	78.3	0.15	3.2	2.26	1.0					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	5.13	19.62	0.8	1.9	5.13	19.62	0.5	0.15	5.13	19.62	0.2	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	5.13	19.62	1.6					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.04	0.2	1.27	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	0.98				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,200.00	1,210.00	10	63.3	81	49							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	81	144.00	8"	45	98m, 4X35 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	15	14	560						

KOBO BH-55 HYDRAULICS

Kobo( SRTW1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.05	120	78.28	0.15	4.8	2.83	6.0					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	8.01	19.62	1.2	1.9	8.01	19.62	0.8	0.15	8.01	19.62	0.5	
	Reducer				Water Meter								
	K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	8.01	19.62	2.5					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	8.01	19.62	0.919	0.15	8.01	19.62	0.491					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.05	0.15	2.83	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.03				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,346.00	1,356.00	10	63.28	90	56							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	90	180.00	8"	55	100m, 4X50 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	15	638						

KOBO BH-57 HYDRAULICS

Kobo(DH/BH2 )													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.041	120	42.65	0.15	1.8	2.32	4.2					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	5.39	19.62	0.8	1.9	5.39	19.62	0.5	0.15	5.39	19.62	0.2	
	Reducer				Water Meter								
	K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	5.39	19.62	1.6					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.041	0.15	2.32	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.18				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	2,446.00	2,456.00	10	27.65	48	29							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	48	147.60	6"	30	62m, 4X16mm <sup>2</sup>								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	17	6	287						

KOBO BH-57 HYDRAULICS

Kobo( SNBH1)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.042	120	30.65	0.15	1.4	2.38	4.4					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	5.65	19.62	0.9	1.9	5.65	19.62	0.5	0.15	5.65	19.62	0.2	
	Reducer				Water Meter								
	K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	5.65	19.62	1.7					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	5.65	19.62	0.648	0.15	5.65	19.62	0.244					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.042	0.15	2.38	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.37				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,192.00	1,202.00	10	15.65	36	23							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	36	151.20	6"	30	51m, 4X16mm <sup>2</sup>								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	5	229						

KOBO BH-58 HYDRAULICS

KOBO BH-58 HYDRAULICS													
Kobo( GKBH1)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.035	120	30.65	0.15	1.0	1.98	3.1				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.93	19.62	0.6	1.9	3.93	19.62	0.4	0.15	3.93	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.93	19.62	1.2				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.93	19.62	0.450	0.15	3.93	19.62	0.118				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.035	0.15	1.98	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.12			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		2,557.00	2,567.00	10	40.32	57	30						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		57	126.00	6"	30	75m, 4X16mm <sup>2</sup>							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	8	352					

KOBO BH-59 HYDRAULICS

Kobo( THG43)													
Fricational Head Loss													
Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
	10.67	0.029	120	80	0.125	4.3	2.36	2.2					
Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve				
	K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
	0.75	5.59	19.62	0.9	1.9	5.59	19.62	0.5	0.15	5.59	19.62	0.2	
	Reducer				Water Meter								
	K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7					
	1.5	0.00	19.62	0.00	6	5.59	19.62	1.7					
	90 degree bends				Gate valve								
	K	V^2	2g	Hf8	K	V^2	2g	Hf9					
	0.75	5.59	19.62	0.641	0.15	5.59	19.62	0.239					
Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
	100	steel	0.029	0.15	1.64	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.20				
Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
	Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
	1,375.00	1,385.00	10	38.01	59	26							
Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
	59	104.40	6"	30	100m, 4X25 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)						
	540	12.97	41.65	13.85	16	6	270						

KOBO BH-60 HYDRAULICS

Kobo( TWJ3)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.06	120	100	0.2	2.1	1.91	2.1				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.65	19.62	0.6	1.9	3.65	19.62	0.4	0.15	3.65	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.65	19.62	1.1				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.65	19.62	0.419	0.15	3.65	19.62	0.102				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.06	0.2	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.08			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,433.00	1,443.00	10	23.92	41	37						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		41	216.00	6"	30	120m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	8	396					

BORENA BH-01 HYDRAULICS												
NBTW-6 (El-Dima Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.071	120	138	0.2	4.0	2.26	2.8			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve		
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	5.11	19.62	0.8	1.9	5.11	19.62	0.5	0.15	5.11	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	5.11	19.62	1.6			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	5.11	19.62	0.586	0.15	5.11	19.62	0.200			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.071	0.2	2.26	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.84		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)						
		908.00	918.00	10	59.25	79.91	75					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		80	255.6	8"	75	76 m, 4X95 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14	26	952.00				

## Borena BH-2

NBTW-5 (Mermerro Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.05	120	110	0.15	6.7	2.83	6.0			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	8.01	19.62	1.2	1.9	8.01	19.62	0.8	0.15	8.01	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	8.01	19.62	2.5			
	Total Dynamic Head	90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	8.01	19.62	0.919	0.15	8.01	19.62	0.491			
		Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	Total Dynamic Head(m)						
		1,000.00	1,010.00	10	50.86	80	55					
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/roughness	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.05	0.15	15.00	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.03		
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		80	180	8"	55	130m,4x50mm2						
	PV Specification	Peak power (Wp)	Max. power current	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14	19	701				

## Borena BH-3

NBTW-12 (Maika Sadeka Wellfield)	Frictional Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.046	120	147	0.15	7.7	2.60	1.3			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	6.78	19.62	1.0	1.9	6.78	19.62	0.7	0.15	6.78	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)^2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	6.78	19.62	2.1			
	Total Dynamic Head	90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	6.78	19.62	0.778	0.15	6.78	19.62	0.352			
		Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	Total Dynamic Head(m)						
		740.00	750.00	10	85.73	110	71					
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/roughness	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.046	0.2	2.60	120	$10.67 \cdot L \cdot Q^{1.852} / (C^{1.852} \cdot D^{4.87})$	0.0029	1.27		
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		110	165.6	8"	75	167m,4x95mm2						
	PV Specification	Peak power (Wp)	Max. power current	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14.00	26	952				

BORENA BH-04 HYDRAULICS												
NBW-8 (Urallo Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.041	120	160	0.15	6.8	2.32	4.2			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve		
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	5.39	19.62	0.8	1.9	5.39	19.62	0.5	0.15	5.39	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	5.39	19.62	1.6			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	5.39	19.62	0.618	0.15	5.39	19.62	0.222			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.041	0.15	2.32	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.18		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)						
		1,252.00	1,262.00	10	128.11	153	75					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		153	147.6	8"	75	180 m, 4X95 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14.00	26	952				

BORENA BH-05 HYDRAULICS												
NBTW-9 (Gelchet Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.04	120	148	0.15	6.0	2.26	4.0			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve		
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	5.13	19.62	0.8	1.9	5.13	19.62	0.5	0.15	5.13	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	5.13	19.62	1.6			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	5.13	19.62	0.588	0.15	5.13	19.62	0.201			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.04	0.15	2.26	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.99		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)						
		1,121.00	1,131.00	10	113.63	137	75					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		137	144	8"	75	168 m, 4X95 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14	26	952				

BORENA BH-06 HYDRAULICS												
BH2WF1V1 (Utalio Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.0318	120	113.49	0.15	3.0	1.80	2.6			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve		
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	3.24	19.62	0.5	1.9	3.24	19.62	0.3	0.15	3.24	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	3.24	19.62	1.0			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	3.24	19.62	0.372	0.15	3.24	19.62	0.080			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.0318	0.15	1.80	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.61		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)						
		1,241.00	1,251.00	10	93.49	111	55					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		111	114.48	8"	55	133m, 4X50 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14	26	952				

BORENA BH-07 HYDRAULICS													
UTALO WF1V6 (Yabelo Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.028	120	159	0.125	8.1	2.28	2.1				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.21	19.62	0.8	1.9	5.21	19.62	0.5	0.15	5.21	19.62	0.2
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.21	19.62	1.6				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.21	19.62	0.598	0.15	5.21	19.62	0.208				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.028	0.15	1.59	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.06			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,252.00	1,262.00	10	107	131	45						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		131	100.8	8"	45	179m, 4X70 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	14	26	952					

BORENA BH-08 HYDRAULICS												
Utao WF2V2 (Yabelo Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.028	120	160	0.125	8.1	2.28	2.1			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	5.21	19.62	0.8	1.9	5.21	19.62	0.5	0.15	5.21	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	5.21	19.62	1.6			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	5.21	19.62	0.598	0.15	5.21	19.62	0.208			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.028	0.15	1.59	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.06		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,258.00	1,268.00	10	127	151	59					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		151	100.8	8"	55	180m, 4X70 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14	26	952				

BORENA BH-09 HYDRAULICS												
NBW-11 (Liso Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.0272	120	140	0.125	6.8	2.22	2.0			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	4.92	19.62	0.8	1.9	4.92	19.62	0.5	0.15	4.92	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	4.92	19.62	1.5			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	4.92	19.62	0.564	0.15	4.92	19.62	0.185			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.0272	0.15	1.54	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.95		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		950.00	960.00	10	125.24	148	56					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		148	97.92	8"	55	160m, 4X70 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14	26	952				

BORENA BH-10 HYDRAULICS												
NGW-2 (Gelchet Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.022	120	198	0.1	19.1	2.80	1.3			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	7.85	19.62	1.2	1.9	7.85	19.62	0.8	0.15	7.85	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	7.85	19.62	2.4			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	7.85	19.62	0.901	0.15	7.85	19.62	0.472			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.022	0.15	1.25	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.32		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,214.00	1,224.00	10	157.72	194	60					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		194	79.2	8"	55	220m, 4X95 mm²						
	PV Specification	Peak power (Wp)	Max. power current(lmp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	17	17	765				

BORENA BH-11 HYDRAULICS													
Bokku-moyale (Miyo Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.016	120	76	0.08	12.1	3.18	5.3				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	10.14	19.62	1.6	1.9	10.14	19.62	1.0	0.15	10.14	19.62	0.8
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	10.14	19.62	3.1				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	10.14	19.62	1.163	0.15	10.14	19.62	0.786				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.016	0.1	2.04	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	5.27			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,243.00	1,253.00	10	43.87	80	18						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		80	57.6	6"	30	218m, 4X16 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	17	6	287					

BORENA BH-12 HYDRAULICS												
kella qufa (Gomole Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.015	120	56	0.08	7.9	2.99	4.7			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	8.91	19.62	1.4	1.9	8.91	19.62	0.9	0.15	8.91	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	8.91	19.62	2.7			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	8.91	19.62	1.022	0.15	8.91	19.62	0.608			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.015	0.1	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.67		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,493.00	1,503.00	10	18.2	48	10					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		48	54	6"	30	218m, 4X16 mm²						
	PV Specification	Peak power (Wp)	Max. power current(lmp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14	3	129				

BORENA BH-13 HYDRAULICS												
Dusse#2 ( Wachile Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.013	120	100	0.08	10.8	2.59	3.6			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	6.70	19.62	1.0	1.9	6.70	19.62	0.6	0.15	6.70	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	6.70	19.62	2.0			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	6.70	19.62	0.768	0.15	6.70	19.62	0.343			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.013	0.1	1.66	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.59		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,107.00	1,117.00	10	23.33	53	10					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		53	46.8	8"	11	120m, 4X10 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	15	5	215				

BORENA BH-14 HYDRAULICS												
Boku-moyale (unicef) ( M'io Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.013	120	76	0.08	8.2	2.59	3.6			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve		
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	6.70	19.62	1.0	1.9	6.70	19.62	0.6	0.15	6.70	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	6.70	19.62	2.0			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	6.70	19.62	0.768	0.15	6.70	19.62	0.343			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.013	0.1	1.66	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.59		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,243.00	1,253.00	10	43.87	71	13					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		71	46.8	8"	15	120m, 4X10 mm²						
	PV Specification	Peak power (Wp)	Max. power current(lmp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	17	5	243				

BORENA BH-15 HYDRAULICS												
Dusse#3 ( Wachile Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.008	120	100	0.08	4.4	1.59	4.3			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve		
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	2.54	19.62	0.4	1.9	2.54	19.62	0.2	0.15	2.54	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	2.54	19.62	0.8			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	2.54	19.62	0.291	0.15	2.54	19.62	0.049			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.008	0.08	1.59	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.33		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,109.00	1,119.00	10	44.75	65	7					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		65	28.8	6"	7.5	120m, 4X10 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	16	3	147				

BORENA BH-16 HYDRAULICS													
Golole ( Tattale Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.008	120	132	0.065	16.0	2.41	4.3				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.82	19.62	0.9	1.9	5.82	19.62	0.6	0.15	5.82	19.62	0.3
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.82	19.62	1.8				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.82	19.62	0.667	0.15	5.82	19.62	0.259				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.008	0.08	1.59	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.33			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,109.00	1,119.00	10	54	89	10						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		89	28.8	6"	11	152m, 4X10 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	3	147					

BORENA BH-17 HYDRAULICS													
Chokasa ( Yabello Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.007	120	70	0.08	2.4	1.39	3.4				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	1.94	19.62	0.3	1.9	1.94	19.62	0.2	0.15	1.94	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	1.94	19.62	0.6				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	1.94	19.62	0.223	0.15	1.94	19.62	0.029				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.007	0.08	1.39	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.38			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,550.00	1,560.00	10	40	57	6						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		57	25.2	6"	5.5	90m, 4X4 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	17	2	113					

BORENA BH-18 HYDRAULICS													
H/Samaro (Dire Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.0063	120	76	0.065	5.9	1.90	2.8				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.61	19.62	0.6	1.9	3.61	19.62	0.3	0.15	3.61	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.61	19.62	1.1				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.61	19.62	0.414	0.15	3.61	19.62	0.100				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.0063	0.08	1.25	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.78			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,396.00	1,406.00	10	63.93	85	8						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		85	22.68	6"	11	96m, 4X10 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	4	212					

BORENA BH-19 HYDRAULICS													
H/Samaro (Dire Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.01772	120	168	0.1	10.9	2.26	6.4				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.10	19.62	0.8	1.9	5.10	19.62	0.5	0.15	5.10	19.62	0.2
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.10	19.62	1.6				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.10	19.62	0.584	0.15	5.10	19.62	0.199				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.01772	0.1	2.26	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.36			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,307.00	1,317.00	10	115.14	146	32						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		146	63.792	6"	30	188m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	17	11	504					

BORENA BH-20 HYDRAULICS													
NBW-7 (Hobok Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.015	120	228	0.08	32.2	2.99	4.7				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	8.91	19.62	1.4	1.9	8.91	19.62	0.9	0.15	8.91	19.62	0.6
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	8.91	19.62	2.7				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	8.91	19.62	1.022	0.15	8.91	19.62	0.608				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.015	0.1	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.67			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		873.00	883.00	10	175.45	229	52						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		229	54	8"	55	248m, 4X95 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	12	515					

BORENA BH-21 HYDRAULICS													
GW2 (Galchet Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.015	120	134	0.1	6.4	1.91	4.7				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.65	19.62	0.6	1.9	3.65	19.62	0.4	0.15	3.65	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.65	19.62	1.1				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.65	19.62	0.419	0.15	3.65	19.62	0.102				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.015	0.1	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.67			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,130.00	1,140.00	10	124.32	148	31						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		148	54	6"	30	154m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	14	560					

BORENA BH-22 HYDRAULICS													
GW4 (Galchet Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.015	120	168	0.1	8.0	1.91	4.7				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.65	19.62	0.6	1.9	3.65	19.62	0.4	0.15	3.65	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.65	19.62	1.1				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.65	19.62	0.419	0.15	3.65	19.62	0.102				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.015	0.1	1.91	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.67			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,125.00	1,135.00	10	120	145	31						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		145	54	6"	30	150m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	14	560					

BORENA BH-23 HYDRAULICS													
GW3 (Galchet Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.014	120	139	0.1	5.8	1.78	4.1				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	3.18	19.62	0.5	1.9	3.18	19.62	0.3	0.15	3.18	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	3.18	19.62	1.0				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	3.18	19.62	0.365	0.15	3.18	19.62	0.077				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.014	0.1	1.78	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.11			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,132.00	1,142.00	10	129	151	30						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		151	50.4	6"	30	159m, 4X35 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	12	515					

BORENA BH-24 HYDRAULICS													
NGW1 (Galchet Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.013	120	193	0.08	20.9	2.59	3.6				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	6.70	19.62	1.0	1.9	6.70	19.62	0.6	0.15	6.70	19.62	0.3
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	6.70	19.62	2.0				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	6.70	19.62	0.768	0.15	6.70	19.62	0.343				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.013	0.1	1.66	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.59			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,136.00	1,146.00	10	172.1	212	39						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		212	46.8	6"	30	213m, 4X95 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	15	718					

BORENA BH-25 HYDRAULICS													
NBW-3 (Tataile Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.01111	120	202	0.08	16.4	2.21	2.7				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	4.89	19.62	0.7	1.9	4.89	19.62	0.5	0.15	4.89	19.62	0.2
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	4.89	19.62	1.5				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	4.89	19.62	0.561	0.15	4.89	19.62	0.183				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.01111	0.1	1.42	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.68			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,232.00	1,242.00	10	128.93	162	27						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		162	40.00	6"	30	222m, 4X50 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	17	7	330					

BORENA BH-26 HYDRAULICS													
NBW-4 (Mermero Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.01019	120	223	0.08	15.4	2.03	6.8				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	4.11	19.62	0.6	1.9	4.11	19.62	0.4	0.15	4.11	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	4.11	19.62	1.3				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	4.11	19.62	0.472	0.15	4.11	19.62	0.129				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.01019	0.08	2.03	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.77			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,097.00	1,107.00	10	140.43	176	27						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		176	36.68	6"	30	243m, 4X50 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	12	515					

BORENA BH-27 HYDRAULICS													
NBW-10 (Gelchet Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.018	120	190	0.1	12.7	2.29	6.6				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	5.26	19.62	0.8	1.9	5.26	19.62	0.5	0.15	5.26	19.62	0.2
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	5.26	19.62	1.6				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	5.26	19.62	0.603	0.15	5.26	19.62	0.211				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.018	0.1	2.29	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.55			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		995.00	1,005.00	10	165.97	199	54						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		199	64.80	8"	55	210m, 4X95 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	3	147					

BORENA BH-28 HYDRAULICS												
Mexi (M'ro Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.014	120	56	0.1	2.3	1.78	4.1			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	3.18	19.62	0.5	1.9	3.18	19.62	0.3	0.15	3.18	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	3.18	19.62	1.0			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	3.18	19.62	0.365	0.15	3.18	19.62	0.077			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.014	0.1	1.78	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.11		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,205.00	1,215.00	10	16	35	7					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		35	50.40	6"	11	76m, 4X6 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	16	3	147				

BORENA BH-29 HYDRAULICS												
Mexi (M'ro Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.006	120	75	0.08	1.9	1.19	2.5			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	1.43	19.62	0.2	1.9	1.43	19.62	0.1	0.15	1.43	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	1.43	19.62	0.4			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	1.43	19.62	0.164	0.15	1.43	19.62	0.016			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.006	0.08	1.19	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.54		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,476.00	1,486.00	10	66.59	82	7					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		82	21.60	6"	7.5	95m, 4X6 mm²						
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	18	2	120				

BORENA BH-30 HYDRAULICS														
Mermero(Taitale Wellfield)	Fricational Head Loss													
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)					
		10.67	0.006	120	232	0.08	6.0	1.19	2.5					
	Dynamic Head loss of fittings at borehole headwork	90 degree bends					Check valve			Gate valve				
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5	
		0.75	1.43	19.62	0.2	1.9	1.43	19.62	0.1	0.15	1.43	19.62	0.0	
		Reducer				Water Meter								
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7					
		1.5	0.00	19.62	0.00	6	1.43	19.62	0.4					
		90 degree bends					Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9					
		0.75	1.43	19.62	0.164	0.15	1.43	19.62	0.016					
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]				
		100	steel	0.006	0.08	1.19	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.54				
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw							
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)							
		1,056.00	1,066.00	10	214	234	21							
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable								
		234	21.60	6"	30	250m, 4X50 mm²								
PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)							
	540	12.97	41.65	13.85	18	8	396							

BORENA BH-31 HYDRAULICS													
Mermero(Taitalle Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.0056	120	120	0.065	7.5	1.69	2.2				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	2.85	19.62	0.4	1.9	2.85	19.62	0.3	0.15	2.85	19.62	0.1
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	2.85	19.62	0.9				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	2.85	19.62	0.327	0.15	2.85	19.62	0.062				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.0056	0.08	1.11	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	2.23			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,374.00	1,384.00	10	71.7	93	8						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		93	20.16	6"	11	140m, 4X10 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	4	188					

BORENA BH-32 HYDRAULICS													
Mermero(Taitalle Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.005	120	68	0.065	3.5	1.51	1.8				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	2.27	19.62	0.3	1.9	2.27	19.62	0.2	0.15	2.27	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	2.27	19.62	0.7				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	2.27	19.62	0.261	0.15	2.27	19.62	0.039				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.005	0.08	1.00	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.81			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,536.00	1,546.00	10	30	47	4						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		47	18.00	6"	4	88m, 4X6 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	6	3	55					

BORENA BH-33 HYDRAULICS													
Mermero(Taitalle Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.005	120	56	0.065	2.8	1.51	1.8				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve			Gate valve				
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	2.27	19.62	0.3	1.9	2.27	19.62	0.2	0.15	2.27	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	2.27	19.62	0.7				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	2.27	19.62	0.261	0.15	2.27	19.62	0.039				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.005	0.08	1.00	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.81			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,580.00	1,590.00	10	38.7	55	4						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		55	18.00	6"	4	76m, 4X6 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	15	2	100					

BORENA BH-34HYDRAULICS													
Mermero(Taitalle Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.0047	120	204	0.065	9.2	1.42	4.4				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	2.01	19.62	0.3	1.9	2.01	19.62	0.2	0.15	2.01	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	2.01	19.62	0.6				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	2.01	19.62	0.230	0.15	2.01	19.62	0.031				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.0047	0.065	1.42	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	4.44			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,351.00	1,361.00	10	181.4	206	15						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		206	16.92	6"	15	224m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	16	4	188					

BORENA BH-35 HYDRAULICS													
Mermero(Taitalle Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.0042	120	168	0.065	6.2	1.27	3.6				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	1.60	19.62	0.2	1.9	1.60	19.62	0.2	0.15	1.60	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	1.60	19.62	0.5				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	1.60	19.62	0.184	0.15	1.60	19.62	0.020				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.0042	0.065	1.27	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.60			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,011.00	1,021.00	10	148	169	11						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		169	15.12	6"	11	188m, 4X25 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
540		12.97	41.65	13.85	15	4	121						

BORENA BH-36 HYDRAULICS													
Mermero(Taitalle Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.004	120	70	0.065	2.4	1.21	3.3				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	1.45	19.62	0.2	1.9	1.45	19.62	0.1	0.15	1.45	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	1.45	19.62	0.4				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	1.45	19.62	0.167	0.15	1.45	19.62	0.016				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.004	0.065	1.21	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.29			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,385.00	1,395.00	10	31	48	3						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		48	14.40	6"	4	90m, 4X6 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	5	4	59					

## BORENA BH-37 HYDRAULICS

BORENA BH-37 HYDRAULICS													
Mermero(Taitale Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.004	120	56	0.065	1.9	1.21	3.3				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	1.45	19.62	0.2	1.9	1.45	19.62	0.1	0.15	1.45	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	1.45	19.62	0.4				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	1.45	19.62	0.167	0.15	1.45	19.62	0.016				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.004	0.065	1.21	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.29			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,587.00	1,597.00	10	47	63	4						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		63	14.40	6"	4	76m, 4X6 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	1	74					

BORENA BH-38 HYDRAULICS													
Mermero(Taitale Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.004	120	72	0.065	2.4	1.21	3.3				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	1.45	19.62	0.2	1.9	1.45	19.62	0.1	0.15	1.45	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	1.45	19.62	0.4				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	1.45	19.62	0.167	0.15	1.45	19.62	0.016				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.004	0.065	1.21	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	3.29			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,390.00	1,400.00	10	59	76	5						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		76	14.40	6"	4	92m, 4X6 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	14	2	93					

## BORENA BH-39 HYDRAULICS

BORENA BH-39 HYDRAULICS													
Mermero(Taitalle Wellfield)	Fricational Head Loss												
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)				
		10.67	0.003	120	60	0.05	4.3	1.53	6.9				
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve			
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g	Hf5
		0.75	2.34	19.62	0.4	1.9	2.34	19.62	0.2	0.15	2.34	19.62	0.0
		Reducer				Water Meter							
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7				
		1.5	0.00	19.62	0.00	6	2.34	19.62	0.7				
		90 degree bends				Gate valve							
		K	V^2	2g	Hf8	K	V^2	2g	Hf9				
		0.75	2.34	19.62	0.268	0.15	2.34	19.62	0.042				
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]			
		100	steel	0.003	0.05	1.53	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	6.94			
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw						
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)						
		1,521.00	1,531.00	10	42	65	3						
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable							
		65	10.80	6"	4	80m, 4X6 mm²							
	PV Specification	Peak power (Wp)	Max. power current(Imp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)					
		540	12.97	41.65	13.85	18	1	74					

BORENA BH-40 HYDRAULICS												
Mermero(Taitalle Wellfield)	Fricational Head Loss											
	Fricational Head Loss	Constatnt	Q(m3/s)	C	L (m) Pump position	D (m)	Hfr1	V in riser pipe(m/s)	Hf Pressure line(m)			
		10.67	0.0028	120	194	0.05	12.1	1.43	1.7			
	Dynamic Head loss of fittings at borehole headwork	90 degree bends				Check valve				Gate valve		
		K	V^2	2g	Hf3	K	V^2	2g	Hf4	K	V^2	2g
		0.75	2.04	19.62	0.3	1.9	2.04	19.62	0.2	0.15	2.04	19.62
		Reducer				Water Meter						
		K	(V1^2-V2)/2	2g	Hf6	K	v^2	2g	Hf7			
		1.5	0.00	19.62	0.00	6	2.04	19.62	0.6			
		90 degree bends				Gate valve						
		K	V^2	2g	Hf8	K	V^2	2g	Hf9			
		0.75	2.04	19.62	0.233	0.15	2.04	19.62	0.032			
	Delivery pipe Loss	length(M)	Type	Discharge [m3/s]	Diameter [m]	Velocity [m/s]	Friction Coefficient/rou	Formula	Friction Coefficient	Dynamic Loss [m]		
		100	steel	0.0028	0.065	0.84	120	10.67*L* Q1.852 / (C1.852* D4.87)	0.0029	1.70		
	Total Dynamic Head	Borehole head eleva (m asl)	Wet-well Inlet elevation (masl)	Elevation difference	Dynamic water level	Total Dynamic Head(m)	Pump Kw					
		Z1	Z2	H elev(m)	DWL(m)	H(m)	P(KW)					
		1,134.00	1,144.00	10	171.43	197	8					
	Pump Specification	Head(m)	Flow Rate(m3/hr)	Size of Pump	Power(kw)	Motor cable						
		197	10.08	6"	4	80m, 4X6 mm²						
	PV Specification	Peak power (Wp)	Max. power current(lmp)	Max. power voltage (Vmp)	Short circuit current (A)	Number of cells in series	Number of cells in parallel	Total ground coverage (m2)				
		540	12.97	41.65	13.85	14	3	129				