III-6 Withdrawal

The two drilling machines finished drilling work on 3rd and 9th November, 1981, and immediately casing pipes were drawn out and the drilling machines and other fixtures were dismantled.

All these machines and other things were transported to the Geological Survey Department at Lobatse on 5 t trucks. Most part of them were stored provisionally under sheets of waterproof canvas.

III-7 Records of Work

Such records of work as the analysis of the time of dirlling work and drilling performance are set forth in Table 7, 8, 9, 10, 11 and Fig. 9.

Table 7. Drilling equipment

Item	Model	Quantity	Specification	
Drilling Machine	TD-1G (Tone Boring, Co.)	2 sets	Capacity: Dimensions: Height; Length; Width; Weight:	AW Rod 150 m 1,190 mm 1,250 mm 800 mm 390 kg
	Swivel Head		Spindle speed:	135, 270, 560 r.p.m.
	Hoist		Hoisting capacity,	Max. 850 kg
	Oil Pump		Capacity: Max. pressure:	0～26 ℓ/min. 70 kg/cm^2
	NS-110C (YANMER)	2	Diesel engine Revolution: Related power:	 2,200 r.p.m. 11 PS
Drilling Pump	NAS-2 (Tone)	2	Cylinder bore dia.: Delivery volume: Max. pressure: Stroke:	63 mm 62 ℓ/min. 70 kg/cm^2 160 r.p.m.
	NS-75C (YANMER)	2	Diesel engine Revolution: Related power:	 2,200 r.p.m. 7.5 PS
Derick	Tripod (KYOEI)	2	Steel pipe Max. load capacity:	 3,000 kg
Drill Rod		80 4	AW – 3 m AW – 1.5 m	
Casing Pipe		10 4 35 4 4	73 mm – 3 m 73 mm – 1.5 m 63 mm – 3 m 63 mm – 1.5 m 63 mm – 0.5 m	
Double Core Tube	DN-AW	4	DN 65 – 1.5 m	
Double Core Tube	DN-AW	5	DN 55 – 2 m	
Single Core Tube		2	74 mm – 0.3 m	
Single Core Tube		3	74 mm – 1.5 m	

Table 8. Consumables used

	Light oil	Gasoline	Mobil oil	Grease	Cement	Bentonite
	ℓ	ℓ	ℓ	kg	bag	bag
GSJ - 1	236	44	3	1.5	3	3
GSJ - 2	308	58	2	1	3	4
GSJ - 3	308	58	7	1	5	4
GSJ - 4	254	48	1.5	1.5	3	3
GSJ - 5	236	44	6	1.5	3	2
GSJ - 6	217	41	1.5	2.0	3	3
GSJ - 7	308	58	5	1.5	10	4
GSJ - 8	290	55	5	2	3	3
GSJ - 9	293	55	1	1.5	10	4
GSJ - 10	257	48	1.5	1.5	7	8
GSJ - 11	214	40	5	2	3	4
GSJ - 12	198	37	0.5	1.5	6	4
GSJ - 13	180	34	25	2	3	3
GSJ - 14	210	39	25	2	3	4
GSJ - 15	213	40	2	1.5	3	5
GSJ - 16	272	51	5	1	10	3
GSJ - 17	236	44	7	2.5	3	2
GSJ - 18	254	48	7	2.5	4	2
Total	4,484	842	110	30	85	65

Table 9-1 Operational results of drill hole, GSJ-1

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Oct. 22, '81 ~ Oct. 23, '81	2	2		21
	Drilling	Oct. 24, '81 ~ Oct. 30, '81	7	7		73.5
	Removing	Oct. 31, '81 ~ Oct. 31, '81	1	1		8
	Total	Oct. 22, '81 ~ Oct. 31, '81	10	10		102.5

Drilling Length	Planned Length	100.00 m			
	Increase in Length	0.20 m	Core Length	99.80 m
	Length Drilled	100.20 m	Core Recovery	99.6%

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 100.20	99.6	99.6

Working Time	Drilling	78°00′	46.4 %	40 %
	Accompanying Works	90°00′	53.5%	46.1%
	Repairing		%	%
	Total	168°00′	100%	86.1%
	Removing: Preparation	18°00′		9.2%
	Removing: Moving	9°00′		4.6%
	Others			
	Grand Total	195°00′		100%

Drilling Efficiency

100.20/10	Total Length / Drilling Period	10.02 m/Day
100.20/10	Total Length / Working Days	10.02 m/Day
100.20/7	Total Length / Net Drilling Days	14.31 m/Day
73.5/100.20	Net Drilling Workers / Total Length	0.73 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	2.00 m	31.00 m	67.20 m
Core Length	2.00 m	31.00 m	66.80 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 2.00 m	1.99 %	100 %
	63 mm : 33.00 m	32.93 %	90%

Remarks

Table 9-2 Operational results of drill hole, GSJ-2

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Oct. 15, '81 ~ Oct. 15, '81	1	1		13
	Drilling	Oct. 16, '81 ~ Oct. 25, '81	10	10		100
	Removing	Oct. 26, '81 ~ Oct. 26, '81	1	1		8
	Total	Oct. 15, '81 ~ Oct. 26, '81	12	12		121

Drilling Length	Planned Length	100.00 m			Core Recovery for each 100 m section		
	Increase in Length	0.60 m	Core Length	92.50 m	Depth m	Section %	Total %
	Length Drilled	100.60 m	Core Recovery	91.9%	0 ~ 100.60	91.9	91.9

Working Time	Drilling	84°00′	40 %	21 %	Drilling Efficiency			
	Accompanying Works	108°00′	51.4%	47.3%	100.60/12	Total Length / Drilling Period	8.38 m/Day	
	Repairing	18°00′	8.5%	7.8%	100.60/12	Total Length / Working Days	8.38 m/Day	
	Total	210°00′	100%	92.1%	100.60/10	Total Length / Net Drilling Days	10.06 m/Day	
	Removing: Preparation	9°00′		3.9%	100/100.60	Net Drilling Workers / Total Length	0.99 men/m	
	Removing: Moving	9°00′		3.9%	Drilled Length by Bit Size			
	Others				Bit Size	75 mm	66 mm	56 mm
	Grand Total	228°00′		100%	Drilled Length	6.00 m	24.00 m	70.60 m
Inserted Casing Pipe	Pipe Size & Inserted Length	Inserted Length / Drilling Length		Recovery of Casing Pipe	Core Length	5.80 m	16.10 m	70.60 m
	73 mm : 6.00 m	5.96 %		100 %	Remarks			
	63 mm : 30.00 m	29.82 %		100%				

Table 9-3 Operational results of drill hole, GSJ-3

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Oct. 4, '81 ~ Oct. 5, '81	2	2		21
	Drilling	Oct. 6, '81 ~ Oct. 13, '81	8	8		84
	Removing	Oct. 14, '81 ~ Oct. 14, '81	1	1		8
	Total	Oct. 4, '81 ~ Oct. 14, '81	11	11		113

Drilling Length	Planned Length	100.00 m		
	Increase in Length	0.50 m	Core Length	89.55 m
	Length Drilled	100.50 m	Core Recovery	89.1 %

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 100.50	89.1	89.1

Working Time	Drilling		76°00'	39.5 %	34.7 %
	Accompanying Works		116°00'	60.4 %	52.9 %
	Repairing			%	%
	Total		192°00'	100 %	87.6 %
	Removing	Preparation	18°00'		8.2 %
		Moving	9°00'		4.1 %
	Others				
	Grand Total		219°00'		100 %

Drilling Efficiency

100.50/11	Total Length / Drilling Period	9.14 m/Day
100.50/11	Total Length / Working Days	9.14 m/Day
100.50/8	Total Length / Net Drilling Days	12.56 m/Day
84/100.50	Net Drilling Workers / Total Length	0.84 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	7.50 m	32.50 m	60.50 m
Core Length	2.50 m	31.40 m	55.65 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 7.50 m	7.46 %	60 %
	63 mm : 40.00 m	39.8 %	100 %

Remarks

Table 9-4 Operational results of drill hole, GSJ-4

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Sep. 30, '81 ~ Oct. 1, '81	2	2		16
	Drilling	Oct. 2, '81 ~ Oct. 9, '81	8	8		84
	Removing	Oct. 10, '81 ~ Oct. 10, '81	1	1		8
	Total	Sep. 30, '81 ~ Oct. 10, '81	11	11		108

					Core Recovery for each 100 m section		
Drilling Length	Planned Length	100.00 m					
	Increase in Length	0.20 m	Core Length	97.65 m	Depth m	Section %	Total %
	Length Drilled	100.20 m	Core Recovery	97.4 %	0 ~ 100.20	97.4	97.4

Working Time	Drilling	106°00'	55.2 %	46.2 %
	Accompanying Works	86°00'	44.7 %	37.5 %
	Repairing		%	%
	Total	192°00'	100 %	83.8 %
	Removing: Preparation	18°00'		7.8 %
	Removing: Moving	9°00'		3.9
	Others			
	Grand Total	229		100 %

Drilling Efficiency		
100.20/11	Total Length / Drilling Period	9.11 m/Day
100.20/11	Total Length / Working Days	9.11 m/Day
100.20/8	Total Length / Net Drilling Days	12.55 m/Day
84/100.20	Net Drilling Workers / Total Length	0.84 men/m

Drilled Length by Bit Size			
Bit Size	75 mm	66 mm	56 mm
Drilled Length	2.20 m	37.40 m	60.60 m
Core Length	2.00 m	35.05 m	60.60 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 2.50 m	2.49 %	100 %
	63 mm : 40.00 m	39.92 %	92 %

Remarks

Table 9-5 Operational results of drill hole, GSJ-5

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Oct. 11, '81 ~ Oct. 12, '81	2	2		21
	Drilling	Oct. 13, '81 ~ Oct. 20, '81	8	8		81.5
	Removing	Oct. 21, '81 ~ Oct. 21, '81	1	1		8
	Total	Oct. 11, '81 ~ Oct. 21, '81	11	11		110.5

Drilling Length	Planned Length	100.00 m		
	Increase in Length	0.40 m	Core Length	95.15 m
	Length Drilled	100.40 m	Core Recovery	94.7 %

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 100.40	94.7	94.7

Working Time	Drilling		95°00′	53.9 %	46.7 %
	Accompanying Works		81°00′	46.0 %	39.9 %
	Repairing			%	%
	Total		176°00′	100 %	86.6 %
	Removing	Preparation	18°00′		8.8 %
		Moving	9°00′		4.4 %
	Others				
	Grand Total		203°00′		100 %

Drilling Efficiency

100.40/11	Total Length / Drilling Period	9.13 m/Day
100.40/11	Total Length / Working Days	9.13 m/Day
100.40/8	Total Length / Net Drilling Days	12.55 m/Day
81.5/100.40	Net Drilling Workers / Total Length	0.81 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	2.30 m	25.20 m	72.90 m
Core Length	2.00 m	20.60 m	72.55 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 2.30 m	2.29 %	100 %
	63 mm : 27.50 m	27.39 %	100 %

Remarks

Table 9-6 Operational results of drill hole, GSJ-6

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Sep. 25, '81 ~ Sep. 26, '81	2	2		16
	Drilling	Sep. 27, '81 ~ Oct. 2, '81	6	6		63
	Removing	Oct. 3, '81 ~ Oct. 3, '81	1	1		8
	Total	Sep. 25, '81 ~ Oct. 3, '81	9	9		87

Drilling Length	Planned Length	100.00 m		
	Increase in Length	1.50 m	Core Length	98.50 m
	Length Drilled	101.50 m	Core Recovery	97.0 %

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 101.50	97	97

Working Time	Drilling		66°00′	45.8 %	38.5 %
	Accompanying Works		78°00′	54.1 %	45.6 %
	Repairing			%	%
	Total		144°00′	100 %	84.2 %
	Removing	Preparation	18°00′		10.5 %
		Moving	9°00′		5.2 %
	Others				
	Grand Total		171°00′		100 %

Drilling Efficiency

101.50/9	$\frac{\text{Total Length}}{\text{Drilling Period}}$	11.28 m/Day
101.50/9	$\frac{\text{Total Length}}{\text{Working Days}}$	11.28 m/Day
101.00/6	$\frac{\text{Total Length}}{\text{Net Drilling Days}}$	16.92 m/Day
63/101.50	$\frac{\text{Net Drilling Workers}}{\text{Total Length}}$	0.62 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	3.00 m	27.00 m	71.50 m
Core Length	1.50 m	25.70 m	71.30 m

	Pipe Size & Inserted Length	$\frac{\text{Inserted Length}}{\text{Drilling Length}}$	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 3.00 m	2.95 %	100 %
	63 mm : 30.00 m	29.55 %	100 %

Remarks

Table 9-7 Operational results of drill hole, GSJ-7

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Sep. 17, '81 ~ Sep. 18, '81	2	2		16
	Drilling	Sep. 19, '81 ~ Sep. 28, '81	10	10		100
	Removing	Sep. 29, '81 ~ Sep. 29, '81	1	1		8
	Total	Sep. 17, '81 ~ Sep. 29, '81	13	13		124

					Core Recovery for each 100 m section		
Drilling Length	Planned Length	100.00 m			Depth m	Section %	Total %
	Increase in Length	0.20 m	Core Length	91.75 m	0 ~ 100.20	91.5	91.5
	Length Drilled	100.20 m	Core Recovery	91.5 %			

						Drilling Efficiency		
Working Time	Drilling		83°00′	42.3 %	37.2 %			
	Accompanying Works		104°00′	53.0 %	46.6 %	100.20/13	Total Length / Drilling Period	7.71 m/Day
	Repairing		9°00′	4.5 %	4.0 %	100.20/13	Total Length / Working Days	7.71 m/Day
	Total		196°00′	100 %	87.8 %	100.20/10	Total Length / Net Drilling Days	10.02 m/Day
	Removing	Preparation	18°00′		8.0 %	100/100.20	Net Drilling Workers / Total Length	1.00 men/m
		Moving	9°00′		4.0 %	Drilled Length by Bit Size		
	Others					Bit Size	75 mm	66 mm	56 mm
	Grand Total		223°00′		100 %	Drilled Length	7.00 m	39.65 m	53.55 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe	Core Length	6.50 m	34.30 m	50.95 m
Inserted Casing Pipe	73 mm : 7.00 m	6.98 %	100 %	Remarks			
	63 mm : 46.80 m	46.7 %	85 %				

Table 9-8 Operational results of drill hole, GSJ-8

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Sep. 14, '81 ~ Sep. 15, '81	2	2		21
	Drilling	Sep. 16, '81 ~ Sep. 23, '81	8	8		84
	Removing	Sep. 24, '81 ~ Sep. 24, '81	1	1		8
	Total	Sep. 14, '81 ~ Sep. 24, '81	11	11		113

Drilling Length	Planned Length	100.00 m			
	Increase in Length	0.30 m	Core Length	92.55 m	
	Length Drilled	100.30 m	Core Recovery	92.2 %	

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 100.30	92.2	92.2

Working Time	Drilling		90°00′	46.8 %	41.0 %
	Accompanying Works		102°00′	53.1 %	46.5 %
	Repairing			%	%
	Total		192°00′	100 %	83.6 %
	Removing	Preparation	18°00′		8.2 %
		Moving	9°00′		4.1 %
	Others				
	Grand Total		219°00′		100%

Drilling Efficiency

100.30/11	Total Length / Drilling Period	9.12 m/Day
100.30/11	Total Length / Working Days	9.12 m/Day
100.30/8	Total Length / Net Drilling Days	12.54 m/Day
84/100.30	Net Drilling Workers / Total Length	0.84 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	2.00 m	38.00 m	60.30 m
Core Length	2.00 m	34.20 m	56.35 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 2.00 m	1.99 %	100 %
	63 mm : 40.00 m	39.88 %	85 %

Remarks

Table 9-9 Operational results of drill hole, GSJ-9

<table>
<tr><td colspan="3"></td><td colspan="3">Period</td><td>Number of Days</td><td>Actual Working Days</td><td>Day off</td><td>Total Number of Workers</td></tr>
<tr><td rowspan="4">Working Period</td><td colspan="2">Preparation</td><td colspan="3">Sep. 6, '81 ~ Sep. 7, '81</td><td>2</td><td>2</td><td></td><td>16</td></tr>
<tr><td colspan="2">Drilling</td><td colspan="3">Sep. 8, '81 ~ Sep. 15, '81</td><td>8</td><td>8</td><td></td><td>83.5</td></tr>
<tr><td colspan="2">Removing</td><td colspan="3">Sep. 16, '81 ~ Sep. 16, '81</td><td>1</td><td>1</td><td></td><td>8</td></tr>
<tr><td colspan="2">Total</td><td colspan="3">Sep. 6, '81 ~ Sep. 16, '81</td><td>11</td><td>11</td><td></td><td>107.5</td></tr>
<tr><td rowspan="3">Drilling Length</td><td colspan="2">Planned Length</td><td colspan="3">100.00 m</td><td colspan="4">Core Recovery for each 100 m section</td></tr>
<tr><td colspan="2">Increase in Length</td><td>0.20 m</td><td>Core Length</td><td>94.20 m</td><td>Depth m</td><td colspan="2">Section %</td><td>Total %</td></tr>
<tr><td colspan="2">Length Drilled</td><td>100.20 m</td><td>Core Recovery</td><td>94.0 %</td><td>0 ~ 100.20</td><td colspan="2">94.0</td><td>94.0</td></tr>
<tr><td rowspan="8">Working Time</td><td colspan="2">Drilling</td><td>67°30′</td><td>35.1 %</td><td>30.8 %</td><td colspan="4">Drilling Efficiency</td></tr>
<tr><td colspan="2">Accompanying Works</td><td>124°30′</td><td>64.8 %</td><td>56.8 %</td><td>100.20/11</td><td>Total Length / Drilling Period</td><td colspan="2">9.11 m/Day</td></tr>
<tr><td colspan="2">Repairing</td><td></td><td>%</td><td>%</td><td>100.20/11</td><td>Total Length / Working Days</td><td colspan="2">9.11 m/Day</td></tr>
<tr><td colspan="2">Total</td><td>192°00′</td><td>100 %</td><td>87.6 %</td><td>100.20/8</td><td>Total Length / Net Drilling Days</td><td colspan="2">12.53 m/Day</td></tr>
<tr><td rowspan="2">Removing</td><td>Preparation</td><td>18°00′</td><td></td><td>8.2 %</td><td>83.5/100.20</td><td>Net Drilling Workers / Total Length</td><td colspan="2">0.83 men/m</td></tr>
<tr><td>Moving</td><td>9°00′</td><td></td><td>4.1 %</td><td colspan="4">Drilled Length by Bit Size</td></tr>
<tr><td colspan="2">Others</td><td></td><td></td><td></td><td>Bit Size</td><td>75 mm</td><td>66 mm</td><td>56 mm</td></tr>
<tr><td colspan="2">Grand Total</td><td>219°00′</td><td></td><td>100 %</td><td>Drilled Length</td><td>6.00 m</td><td>35.85 m</td><td>58.35 m</td></tr>
<tr><td rowspan="4">Inserted Casing Pipe</td><td colspan="2">Pipe Size & Inserted Length</td><td colspan="2">Inserted Length / Drilling Length</td><td>Recovery of Casing Pipe</td><td>Core Length</td><td>1.70 m</td><td>34.25 m</td><td>58.25 m</td></tr>
<tr><td colspan="2">73 mm : 6.00 m</td><td colspan="2">5.98 %</td><td>100 %</td><td colspan="4" rowspan="3">Remarks</td></tr>
<tr><td colspan="2">63 mm : 36.00 m</td><td colspan="2">35.92 %</td><td>83 %</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td></td></tr>
</table>

Table 9-10 Operational results of drill hole, GSJ-10

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Sep. 4, '81 ~ Sep. 5, '81	2	2		20
	Drilling	Sep. 6, '81 ~ Sep. 12, '81	7	7		73.5
	Removing	Sep. 13, '81 ~ Sep. 13, '81	1	1		8
	Total	Sep. 4, '81 ~ Sep. 13, '81	10	10		101.5

Drilling Length	Planned Length	100.00 m			
	Increase in Length	1.00 m	Core Length	84.30 m	
	Length Drilled	101.00 m	Core Recovery	83.4 %	

Core Recovery for each 100 m section		
Depth m	Section %	Total %
0 ~ 101.00	83.4	83.4

Working Time	Drilling	71°00'	42.2 %	36.4 %	
	Accompanying Works	97°00'	57.7 %	57.7 %	
	Repairing		%	%	
	Total	168°00'	100 %	86.1 %	
	Removing	Preparation	18°00'		9.2 %
		Moving	9°00'		4.6 %
	Others				
	Grand Total	195°00'		100 %	

Drilling Efficiency		
101.00/10	Total Length / Drilling Period	10.10 m/Day
101.00/10	Total Length / Working Days	10.10 m/Day
101.00/7	Total Length / Net Drilling Days	14.43 m/Day
73.5/101.00	Net Drilling Workers / Total Length	0.73 men/m

Drilled Length by Bit Size			
Bit Size	75 mm	66 mm	56 mm
Drilled Length	13.50 m	32.50 m	55.00 m
Core Length	5.40 m	28.15 m	50.75 m

Inserted Casing Pipe	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
	73 mm : 13.50 m	13.37 %	77 %
	63 mm : 46.00 m	45.54 %	87 %

Remarks

Table 9-11 Operational results of drill hole, GSJ-11

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Aug. 27, '81 ~ Aug. 27, '81	1	1		8
	Drilling	Aug. 28, '81 ~ Sep. 2, '81	6	6		63
	Removing	Sep. 3, '81 ~ Sep. 3, '81	1	1		8
	Total	Aug. 27, '81 ~ Sep. 3, '81	8	8		79

					Core Recovery for each 100 m section		
Drilling Length	Planned Length	100.00 m			Depth m	Section %	Total %
	Increase in Length	0.05 m	Core Length	76.90 m	0 ~ 100.05	76.8	76.8
	Length Drilled	100.05 m	Core Recovery	76.8 %			

						Drilling Efficiency	
Working Time	Drilling		61°00′	42.3 %	37.6 %		
	Accompanying Works		83°00′	57.6 %	51.2 %	100.05/8 $\frac{\text{Total Length}}{\text{Drilling Period}}$	12.51 m/Day
	Repairing			%	%	100.05/8 $\frac{\text{Total Length}}{\text{Working Days}}$	12.51 m/Day
	Total		144°00′	100 %	88.8 %	100.05/6 $\frac{\text{Total Length}}{\text{Net Drilling Days}}$	16.75 m/Day
	Removing	Preparation	9°00′		5.5 %	63/100.05 $\frac{\text{Net Drilling Workers}}{\text{Total Length}}$	0.63 men/m
		Moving	9°00′		5.5 %		
	Others						
	Grand Total		162°00′		100 %		

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	9.00 m	21.00 m	70.05 m
Core Length	2.00 m	11.95 m	62.95 m

	Pipe Size & Inserted Length	$\frac{\text{Inserted Length}}{\text{Drilling Length}}$	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 9.00 m	8.99 %	66 %
	63 mm : 30.00 m	29.98 %	100 %

Remarks

Table 9-12 Operational results of drill hole, GSJ-12

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Aug. 19, '81 ~ Aug. 20, '81	2	2		16
	Drilling	Aug. 21, '81 ~ Aug. 25, '81	5	5		47.5
	Removing	Aug. 26, '81 ~ Aug. 26, '81	1	1		13
	Total	Aug. 19, '81 ~ Aug. 26, '81	8	8		76.5

Drilling Length	Planned Length	100.00 m			Core Recovery for each 100 m section		
	Increase in Length	0.10 m	Core Length	89.35 m	Depth m	Section %	Total %
	Length Drilled	100.10 m	Core Recovery	89.2 %	0 ~ 100.10	89.2	89.2

Working Time	Drilling		55°00′	45.8 %	37.4 %	Drilling Efficiency			
	Accompanying Works		65°00′	54.1 %	44.2 %	100.10/8	Total Length / Drilling Period	12.51 m/Day	
	Repairing			%	%	100.10/8	Total Length / Working Days	12.51 m/Day	
	Total		120°00′	100 %	81.6 %	100.10/5	Total Length / Net Drilling Days	20.02 m/Day	
	Removing	Preparation	18°00′		12.2 %	47.5/100.10	Net Drilling Workers / Total Length	0.47 men/m	
		Moving	9°00′		6.1 %	Drilled Length by Bit Size			
	Others					Bit Size	75 mm	66 mm	56 mm
	Grand Total		147°00′		100 %	Drilled Length	9.00 m	18.00 m	73.10 m

Inserted Casing Pipe	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe	Core Length	3.80 m	14.05 m	71.50 m
	73 mm : 9.00 m	8.99 %	100 %	Remarks			
	63 mm : 27.00 m	26.98 %	100 %				

Table 9-13 Operational results of drill hole, GSJ-13

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Aug. 5, '81 ~ Aug. 7, '81	3	3		24
	Drilling	Aug. 8, '81 ~ Aug. 15, '81	8	8		81.5
	Removing	Aug. 16, '81 ~ Aug. 16, '81	1	1		8
	Total	Aug. 5, '81 ~ Aug. 16, '81	12	12		113.5

Drilling Length	Planned Length	100.00 m		
	Increase in Length	0.30 m	Core Length	95.65 m
	Length Drilled	100.30 m	Core Recovery	95.3 %

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 100.30	95.3	95.3

Working Time	Drilling	75°00′	40.3 %	33.7 %
	Accompanying Works	111°00′	59.6 %	50.0 %
	Repairing		%	%
	Total	186°00′	100 %	83.7 %
	Removing: Preparation	27°00′		12.1 %
	Removing: Moving	9°00′		4.0 %
	Others			
	Grand Total	222°00′		100 %

Drilling Efficiency

100.30/12	Total Length / Drilling Period	8.36 m/Day
100.30/12	Total Length / Working Days	8.36 m/Day
100.30/8	Total Length / Net Drilling Days	12.54 m/Day
81.5/100.30	Net Drilling Workers / Total Length	0.81 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	5.20 m	38.80 m	56.30 m
Core Length	2.20 m	37.15 m	56.30 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 5.50 m	5.48 %	100 %
	63 mm : 44.00 m	43.87 %	100 %

Remarks

Table 9-14 Operational results of drill hole, GSJ-14

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Aug. 5, '81 ~ Aug. 7, '81	3	3		18
	Drilling	Aug. 8, '81 ~ Aug. 17, '81	10	10		73
	Removing	Aug. 18, '81 ~ Aug. 18, '81	1	1		8
	Total	Aug. 5, '81 ~ Aug. 18, '81	14	14		99

Drilling Length	Planned Length	100.00 m		
	Increase in Length	0 m	Core Length	88.25 m
	Length Drilled	100.00 m	Core Recovery	88.2 %

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 100.00	88.2	88.2

Working Time	Drilling		77°00′	52.0 %	42.7 %
	Accompanying Works		71°00′	47.9 %	39.4 %
	Repairing			%	%
	Total		148°00′	100 %	82.2 %
	Removing	Preparation	24°00′		13.3 %
		Moving	8°00′		4.4 %
	Others				
	Grand Total		180°00′		100 %

Drilling Efficiency

100.00/14	Total Length / Drilling Period	7.14 m/Day
100.00/14	Total Length / Working Days	7.14 m/Day
100.00/10	Total Length / Net Drilling Days	10.00 m/Day
73/100.00	Net Drilling Workers / Total Length	0.73 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	3.50 m	26.50 m	70.00 m
Core Length	1.00 m	19.35 m	67.90 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 3.50 m	3.50 %	100 %
	63 mm : 30.00 m	30.00 %	100 %

Remarks

Table 9-15 Operational results of drill hole, GSJ-15

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Aug. 17, '81 ~ Aug. 18, '81	2	2		16
	Drilling	Aug. 19, '81 ~ Aug. 24, '81	6	6		63
	Removing	Aug. 25, '81 ~ Aug. 25, '81	1	1		8
	Total	Aug. 17, '81 ~ Aug. 25, '81	9	9		87

Drilling Length	Planned Length	100.00 m		
	Increase in Length	0.20 m	Core Length	92.05 m
	Length Drilled	100.20 m	Core Recovery	91.8 %

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 100.20	91.8	91.8

Working Time	Drilling		66°00′	45.8 %	38.5 %
	Accompanying Works		78°00′	54.1 %	45.6 %
	Repairing			%	%
	Total		144°00′	100 %	84.2 %
	Removing	Preparation	18°00′		10.5 %
		Moving	9°00′		5.2 %
	Others				
	Grand Total		171°00′		100 %

Drilling Efficiency

100.20/9	Total Length / Drilling Period	11.13 m/Day
100.20/9	Total Length / Working Days	11.13 m/Day
100.20/6	Total Length / Net Drilling Days	16.70 m/Day
63/100.20	Net Drilling Workers / Total Length	0.63 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	5.00 m	40.16 m	55.04 m
Core Length	0.70 m	36.31 m	55.04 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 5.00 m	4.99 %	100 %
	63 mm : 45.50 m	45.40 %	100 %

Remarks

Table 9-16 Operational results of drill hole, GSJ-16

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Aug. 26, '81 ~ Aug. 27, '81	2	2		16
	Drilling	Aug. 28, '81 ~ Sep. 4, '81	8	8		84
	Removing	Sep. 5, '81 ~ Sep. 5, '81	1	1		8
	Total	Aug. 26, '81 ~ Sep. 5, '81	11	11		108

					Core Recovery for each 100 m section		
Drilling Length	Planned Length	100.00 m			Depth m	Section %	Total %
	Increase in Length	0.20 m	Core Length	98.55 m	0 ~ 100.20	98.3	98.3
	Length Drilled	100.20 m	Core Recovery	98.3 %			

Working Time	Drilling		75°00′	39.0 %	34.2 %
	Accompanying Works		117°00′	60.9 %	53.4 %
	Repairing			%	%
	Total		192°00′	100 %	87.6 %
	Removing	Preparation	18°00′		8.2 %
		Moving	9°00′		4.1 %
	Others				
	Grand Total		219°00′		100 %

Drilling Efficiency		
100.20/11	Total Length / Drilling Period	9.11 m/Day
100.20/11	Total Length / Working Days	9.11 m/Day
100.20/8	Total Length / Net Drilling Days	12.55 m/Day
84/100.20	Net Drilling Workers / Total Length	0.84 men/m

Drilled Length by Bit Size			
Bit Size	75 mm	66 mm	56 mm
Drilled Length	8.40 m	34.00 m	57.80 m
Core Length	6.90 m	34.00 m	57.65 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 8.50 m	8.48 %	64 %
	63 mm : 42.50 m	42.41 %	100 %

Remarks

Table 9-17 Operational results of drill hole, GSJ-17

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Oct. 27, '81 ~ Oct. 28, '81	2	2		21
	Drilling	Oct. 29, '81 ~ Nov. 3, '81	6	6		63
	Removing	Nov. 4, '81 ~ Nov. 4, '81	1	1		8
	Total	Oct. 27, '81 ~ Nov. 4, '81	9	9		92

Drilling Length	Planned Length	100.00 m			
	Increase in Length	0.80 m	Core Length	97.55 m	
	Length Drilled	100.80 m	Core Recovery	96.7 %	

Core Recovery for each 100 m section

Depth m	Section %	Total %
0 ~ 100.80	96.7	96.7

Working Time	Drilling	85°00′	59.0 %	49.7 %	
	Accompanying Works	59°00′	40.9 %	34.5 %	
	Repairing		%	%	
	Total	144°00′	100 %	84.2 %	
	Removing	Preparation	18°00′		10.5 %
	Removing	Moving	9°00′		5.2 %
	Others				
	Grand Total	171		100 %	

Drilling Efficiency

100.80/9	Total Length / Drilling Period	11.20 m/Day
100.80/9	Total Length / Working Days	11.20 m/Day
100.80/6	Total Length / Net Drilling Days	16.8 m/Day
63/100.80	Net Drilling Workers / Total Length	0.63 men/m

Drilled Length by Bit Size

Bit Size	75 mm	66 mm	56 mm
Drilled Length	5.50 m	26.50 m	68.80 m
Core Length	5.50 m	23.25 m	68.80 m

	Pipe Size & Inserted Length	Inserted Length / Drilling Length	Recovery of Casing Pipe
Inserted Casing Pipe	73 mm : 5.50 m	5.45 %	100 %
	63 mm : 32.00 m	31.74 %	100 %

Remarks

Table 9-18 Operational results of drill hole, GSJ-18

		Period	Number of Days	Actual Working Days	Day off	Total Number of Workers
Working Period	Preparation	Nov. 1, '81 ~ Nov. 1, '81	1	1		8
	Drilling	Nov. 2, '81 ~ Nov. 9, '81	8	8		84
	Removing	Nov. 10, '81 ~ Nov. 10, '81	1	1		16
	Total	Nov. 1, '81 ~ Nov. 10, '81	10	10		108

Drilling Length	Planned Length	100.00 m			Core Recovery for each 100 m section			
	Increase in Length	0.20 m	Core Length	86.70 m	Depth m	Section %		Total %
	Length Drilled	100.20 m	Core Recovery	86.5 %	0 ~ 100.20	86.5		86.5
Working Time	Drilling	69°00′	35.9 %	32.8 %	Drilling Efficiency			
	Accompanying Works	123°00′	64.0 %	58.5 %	100.20/10	Total Length / Drilling Period		10.02 m/Day
	Repairing		%	%	100.20/10	Total Length / Working Days		10.02 m/Day
	Total	192°00′	100 %	91.4 %	100.20/8	Total Length / Net Drilling Days		12.55 m/Day
	Removing: Preparation	9°00′		4.2 %	84/100.20	Net Drilling Workers / Total Length		0.84 men/m
	Removing: Moving	9°00′		4.2 %	Drilled Length by Bit Size			
	Others				Bit Size	75 mm	66 mm	56 mm
	Grand Total	210°00′		100 %	Drilled Length	2.00 m	29.00 m	69.20 m
Inserted Casing Pipe	Pipe Size & Inserted Length	Inserted Length / Drilling Length		Recovery of Casing Pipe	Core Length	1.80 m	20.45 m	64.45 m
	73 mm : 2.00 m	1.99 %		100 %	Remarks			
	63 mm : 31.00 m	30.93 %		70 %				

Table 10. Summary operational data of each drill hole

Drill hole No.	Drilling Period	Drilling Length	Core		No. of Drilling Shift			Drilling Speed		Remarks
			Length	Recovery	Drilling	Others	Total	*m/shift	**m/shift	
		m	m	%						
GSJ-1	Oct. 22, '81 ~ Oct. 31, '81	100.20	99.80	99.6	14	3	17	7.16	5.89	
GSJ-2	Oct. 15, '81 ~ Oct. 26, '81	100.60	92.50	91.9	16	4	20	6.29	5.03	
GSJ-3	Oct. 4, '81 ~ Oct. 14, '81	100.50	89.55	89.1	16	3	19	6.28	5.29	
GSJ-4	Sep. 30, '81 ~ Oct. 10, '81	100.20	97.65	97.4	16	3	19	6.26	5.27	
GSJ-5	Oct. 11, '81 ~ Oct. 21, '81	100.40	95.15	94.7	14	4	18	7.17	5.58	
GSJ-6	Sep. 25, '81 ~ Oct. 3, '81	101.50	98.50	97.0	12	3	15	8.46	6.77	
GSJ-7	Sep. 17, '81 ~ Sep. 29, '81	100.20	91.75	91.5	17	4	21	5.89	4.77	
GSJ-8	Sep. 14, '81 ~ Sep. 24, '81	100.30	92.55	92.2	16	3	19	6.27	5.28	
GSJ-9	Sep. 6, '81 ~ Sep. 16, '81	100.20	94.20	94.0	16	3	19	6.26	5.27	
GSJ-10	Sep. 4, '81 ~ Sep. 13, '81	101.00	84.30	83.4	14	3	17	7.21	5.94	
GSJ-11	Aug. 27, '81 ~ Sep. 3, '81	100.05	76.90	76.8	12	2	14	8.34	7.15	
GSJ-12	Aug. 19, '81 ~ Aug. 26, '81	100.10	89.35	89.2	10	3	13	10.01	7.70	
GSJ-13	Aug. 5, '81 ~ Aug. 16, '81	100.30	95.65	95.3	16	4	20	6.27	5.02	
GSJ-14	Aug. 5, '81 ~ Aug. 18, '81	100.00	88.25	88.2	17	5	22	5.88	4.55	
GSJ-15	Aug. 17, '81 ~ Aug. 25, '81	100.20	92.05	91.8	12	3	15	8.35	6.68	
GSJ-16	Aug. 26, '81 ~ Sep. 5, '81	100.20	98.55	98.3	15	4	19	6.68	5.27	
GSJ-17	Oct. 27, '81 ~ Nov. 4, '81	100.80	97.55	96.7	12	3	15	8.40	6.72	
GSJ-18	Nov. 1, '81 ~ Nov. 10, '81	100.20	86.70	86.5	16	2	18	6.26	5.57	
Total		1,806.95	1,660.95	91.9	261	59	320	6.92	5.65	

* Drilled per one shift covering net drilling operations.
** Drilled per one shift covering total works conducted.

Table 11. Consumed bits

Hole No. \ Bit Type		75 mm		66 mm		56 mm		Remarks
		Metal		Bit	Reamer	Bit	Reamer	
GSJ-1	Length Quantity	2.00 1		31.00 3	31.00 1	67.20 8.5	67.20 2	
GSJ-2	Length Quantity	6.00 0.5		24.00 2	24.00 1.5	70.60 9	70.60 2.5	
GSJ-3	Length Quantity	7.50 1		32.50 2	32.50 1	60.50 7	60.50 2	
GSJ-4	Length Quantity	2.20 1.5		37.40 3.5	37.40 1	60.60 12	60.60 2	
GSJ-5	Length Quantity	2.30 1.5		25.20 3	25.20 1	72.90 20	72.90 2	
GSJ-6	Length Quantity	3.00 1		27.00 2	27.00 1	71.50 6	71.50 1.5	
GSJ-7	Length Quantity	7.00 0.5		39.65 2.5	39.65 1	53.55 5	53.55 1	
GSJ-8	Lenght Quantity	2.00 1		38.00 2	38.00 1	60.30 4.5	60.30 2	
GSJ-9	Length Quantity	6.00 1		35.85 2	35.85 0.5	58.35 6	58.35 2	
GSJ-10	Length Quantity	13.50 1		32.50 2	32.50 1	55.00 4.5	55.00 2	
GSJ-11	Length Quantity	9.00 0.5		21.00 2	21.00 0.5	70.05 5.5	70.05 2	
GSJ-12	Length Quantity	9.00 1		18.00 3	18.00 1	73.10 6	73.10 2.5	
GSJ-13	Length Quantity	5.20 1		38.80 2	38.80 1	56.30 4.5	56.30 1.5	
GSJ-14	Length Quantity	3.50 1.50		26.50 3	26.50 1	70.00 6	70.00 1	
GSJ-15	Length Quantity	5.00 1		40.16 3	40.16 1	55.04 6	55.04 1.5	
GSJ-16	Length Quantity	8.40 1		34.00 3	34.00 1.5	57.80 6.5	57.80 1	
GSJ-17	Length Quantity	5.50 1		26.50 3	26.50 1	68.80 6	68.80 1	
GSJ-18	Length Quantity	2.00 1		29.00 2	29.00 1	69.20 17	69.20 1.5	
Total	Length Quantity	99.10 18		557.06 45	557.06 18	1150.79 130	1150.79 30	
Length/Bit		5.51		12.38	30.95	8.85	38.36	
Bits/Hole		1		2.5	1	7.2	1.67	

Fig 9-1 PROGRESS RECORD OF DRILLING GSJ-1

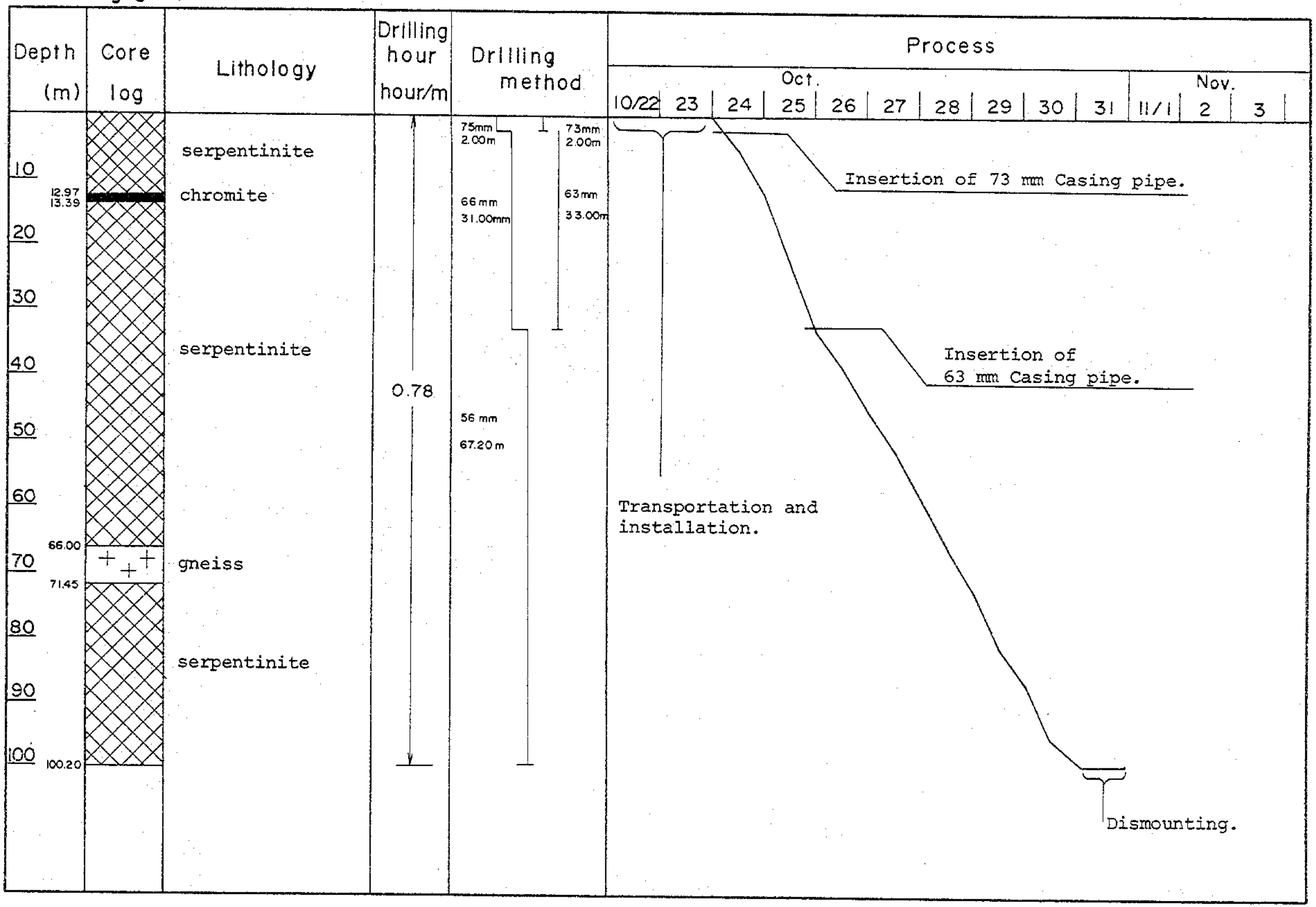


Fig 9 - 2

PROGRESS RECORD OF DRILLING GSJ — 2

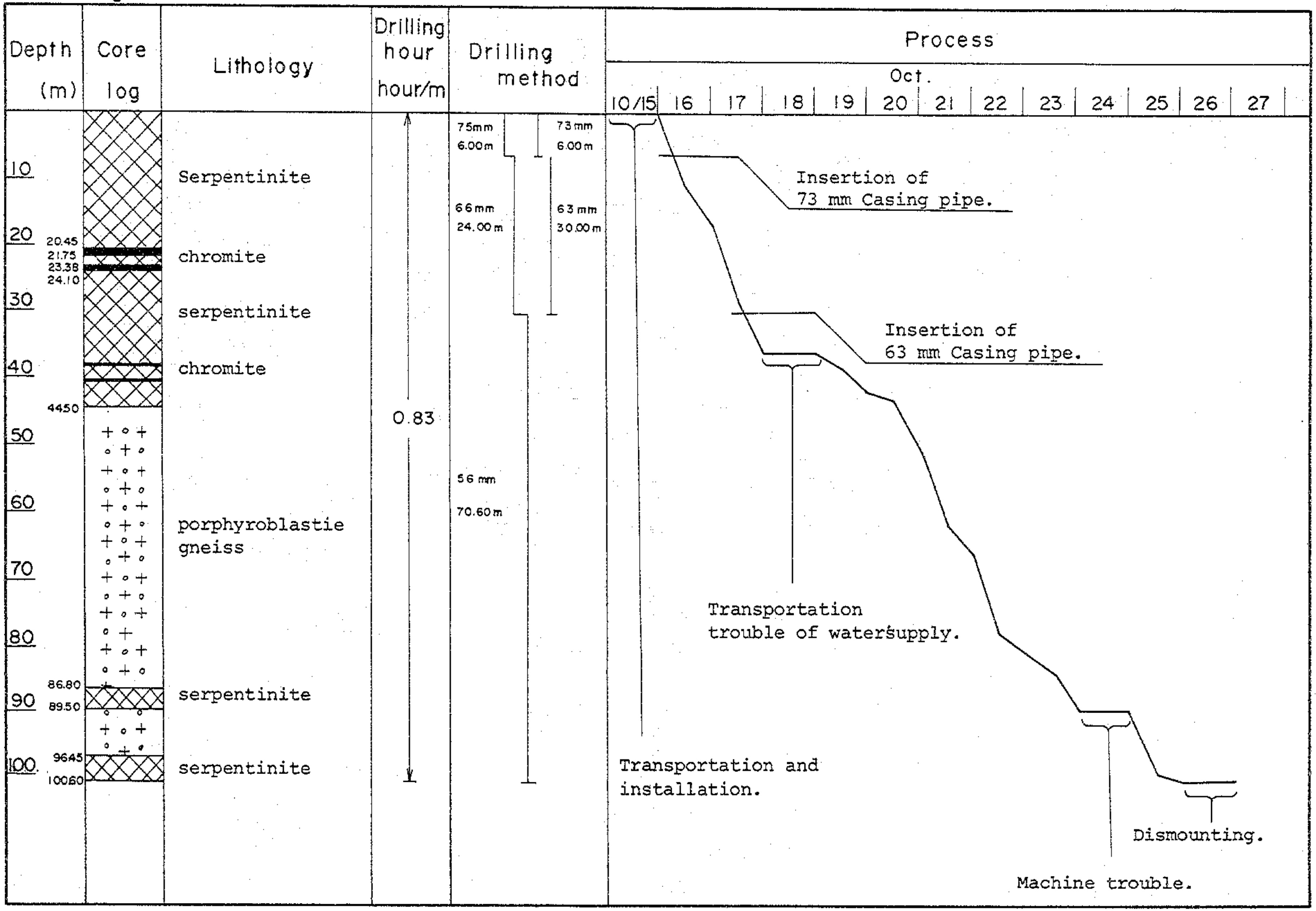


Fig 9-3 PROGRESS RECORD OF DRILLING GSJ — 3

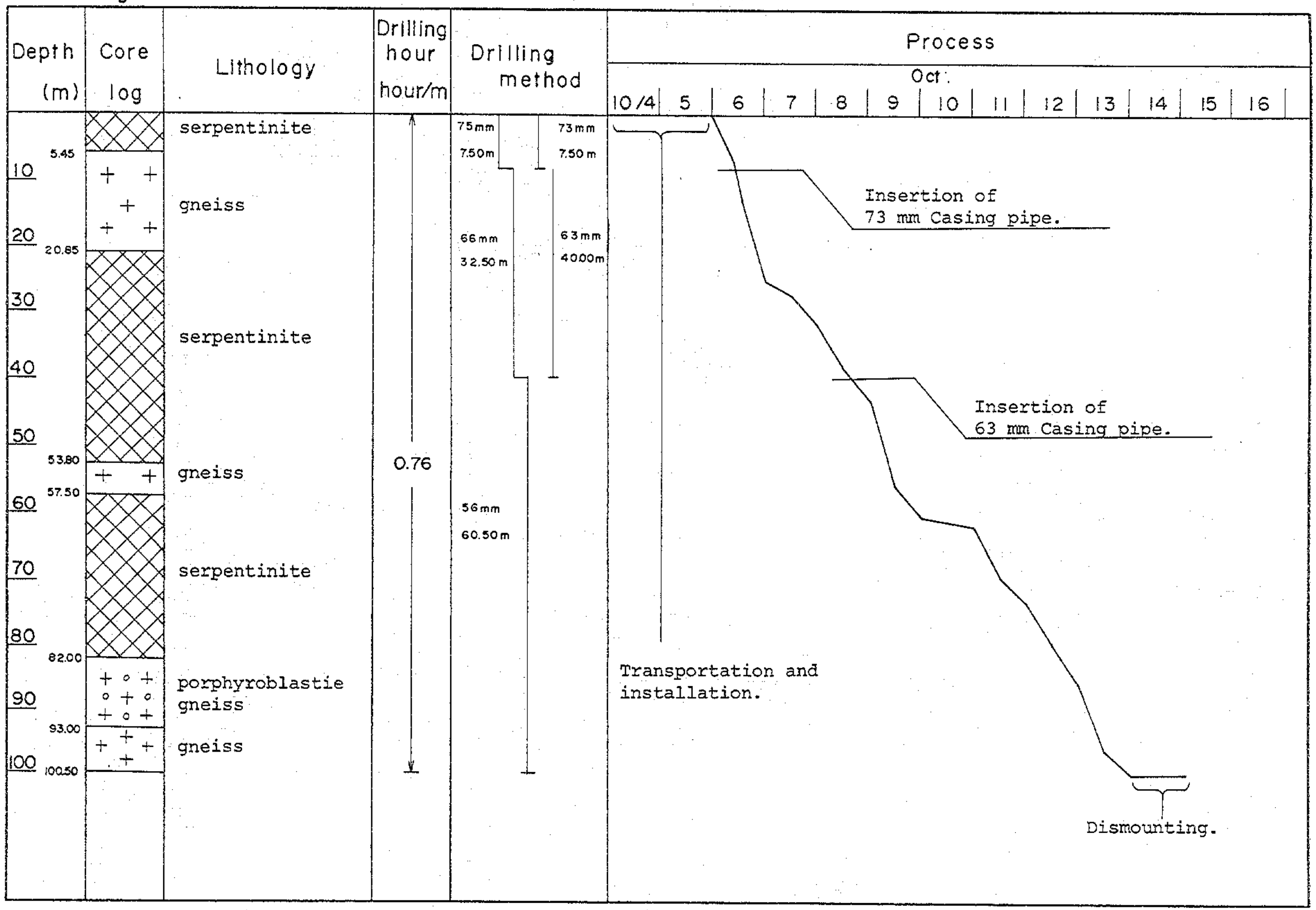


Fig9-4

PROGRESS RECORD OF DRILLING GSJ — 4

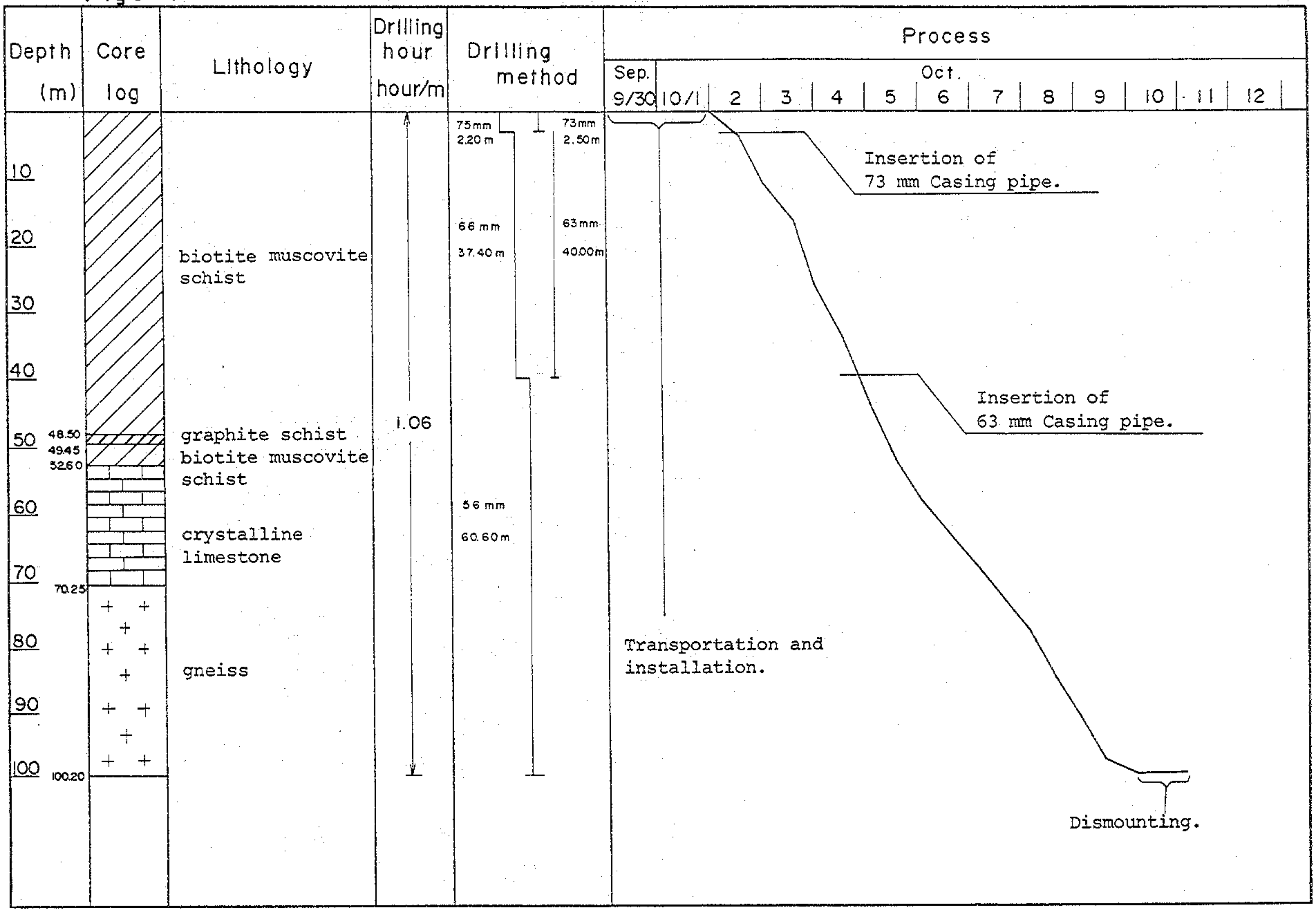


Fig 9-5 PROGRESS RECORD OF DRILLING GSJ — 5

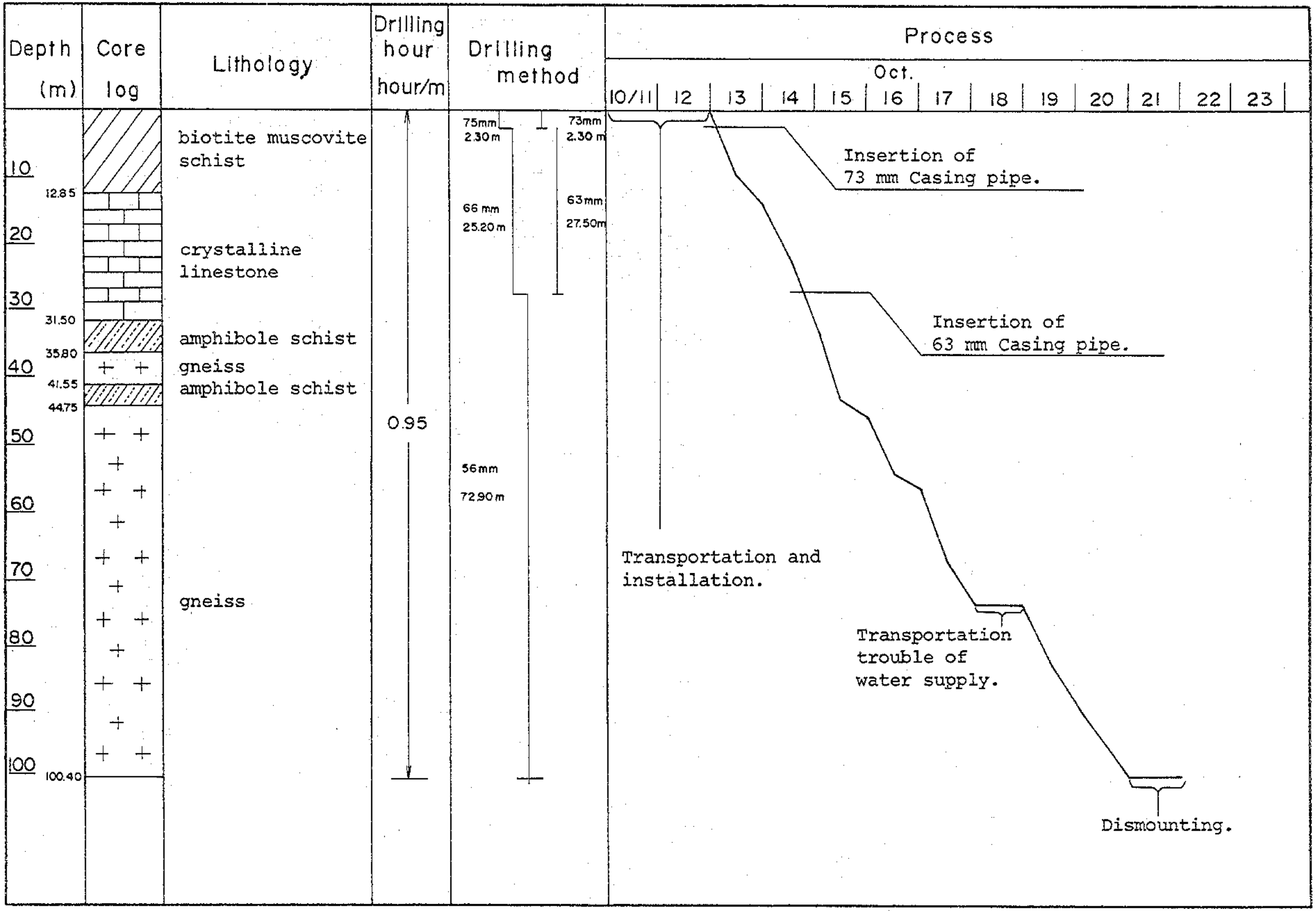


Fig 9-6 PROGRESS RECORD OF DRILLING GSJ — 6

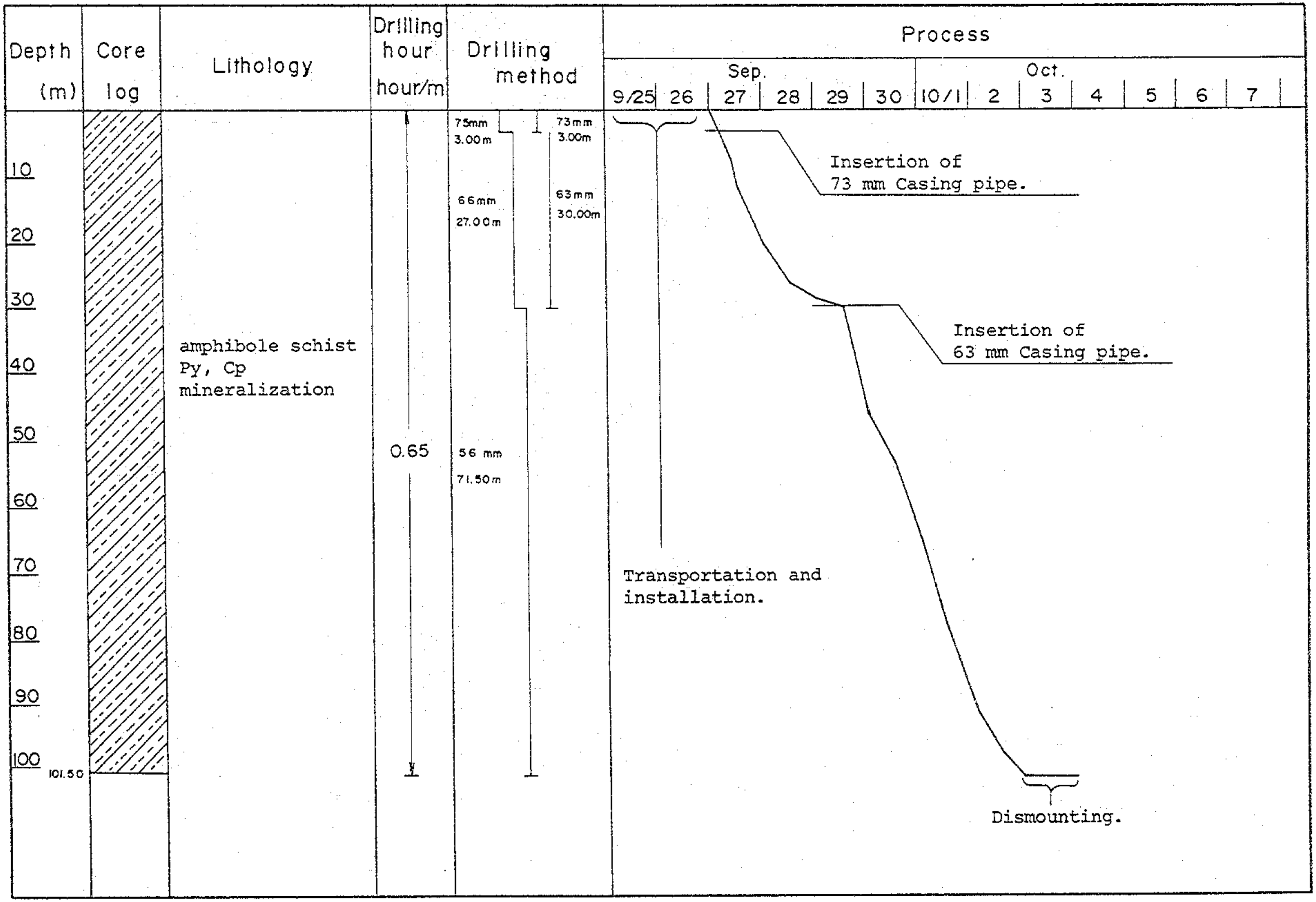


Fig 9-7 PROGRESS RECORD OF DRILLING GSJ — 7

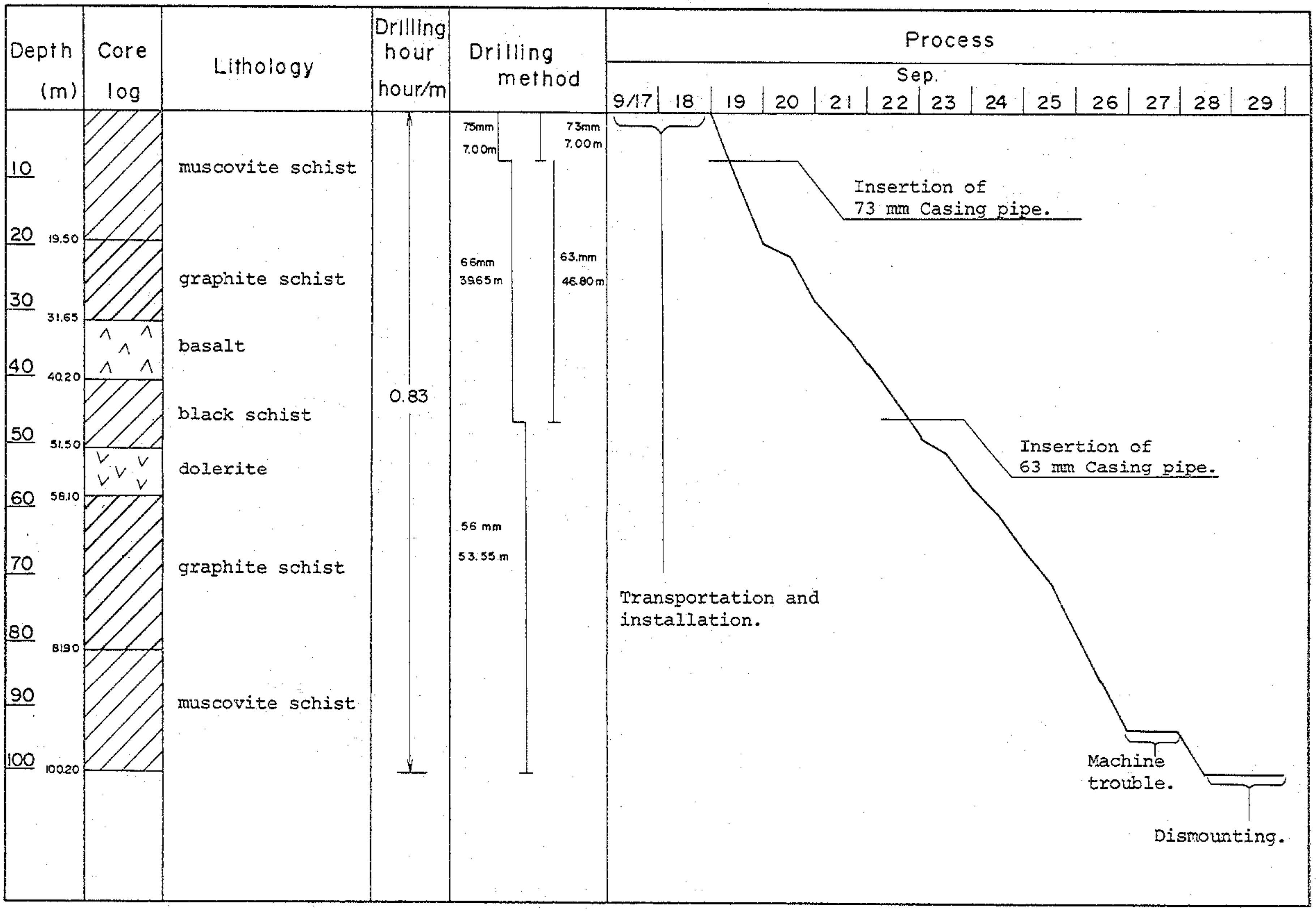


Fig 9-8

PROGRESS RECORD OF DRILLING GSJ — 8

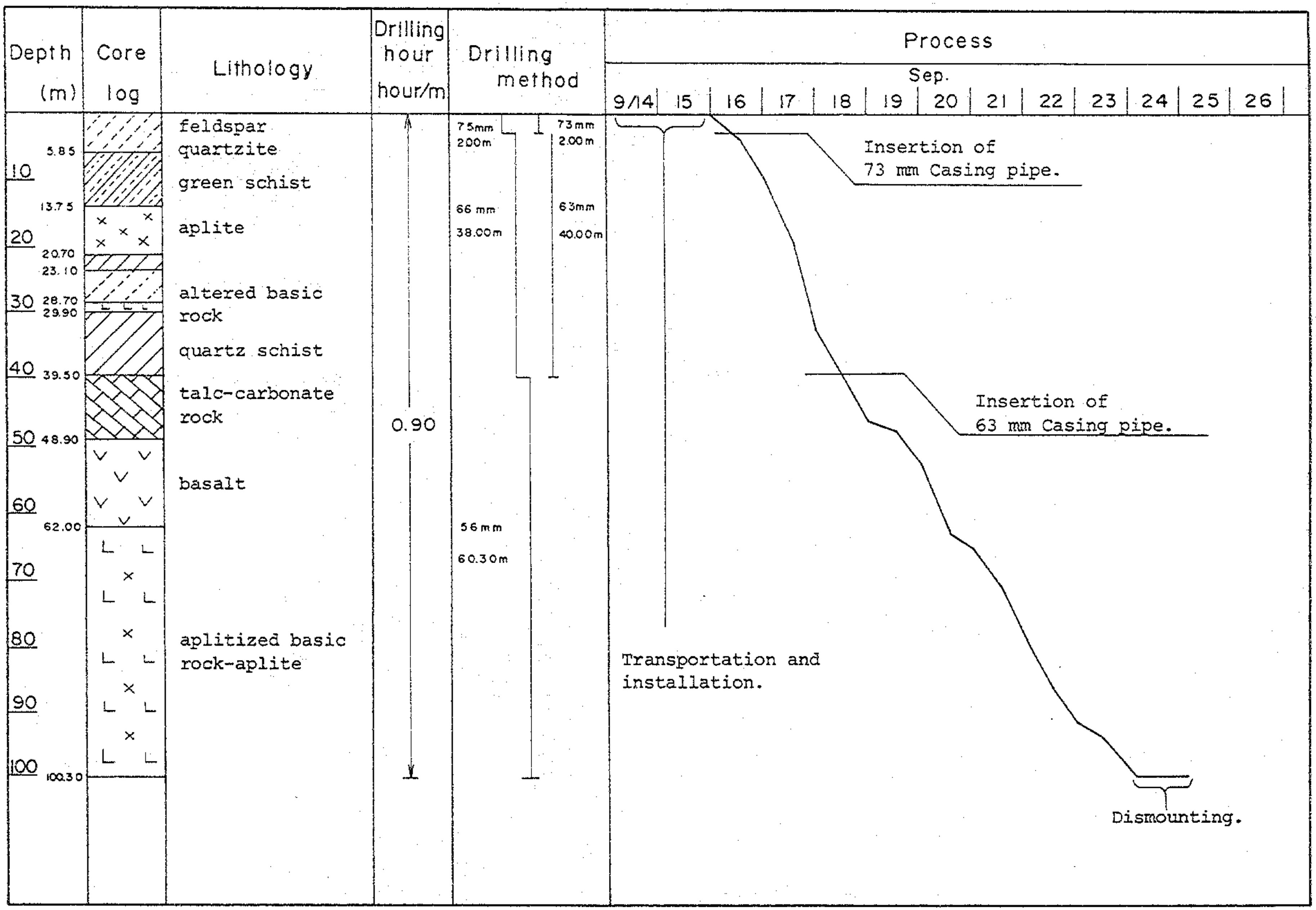


Fig 9-9

PROGRESS RECORD OF DRILLING GSJ — 9

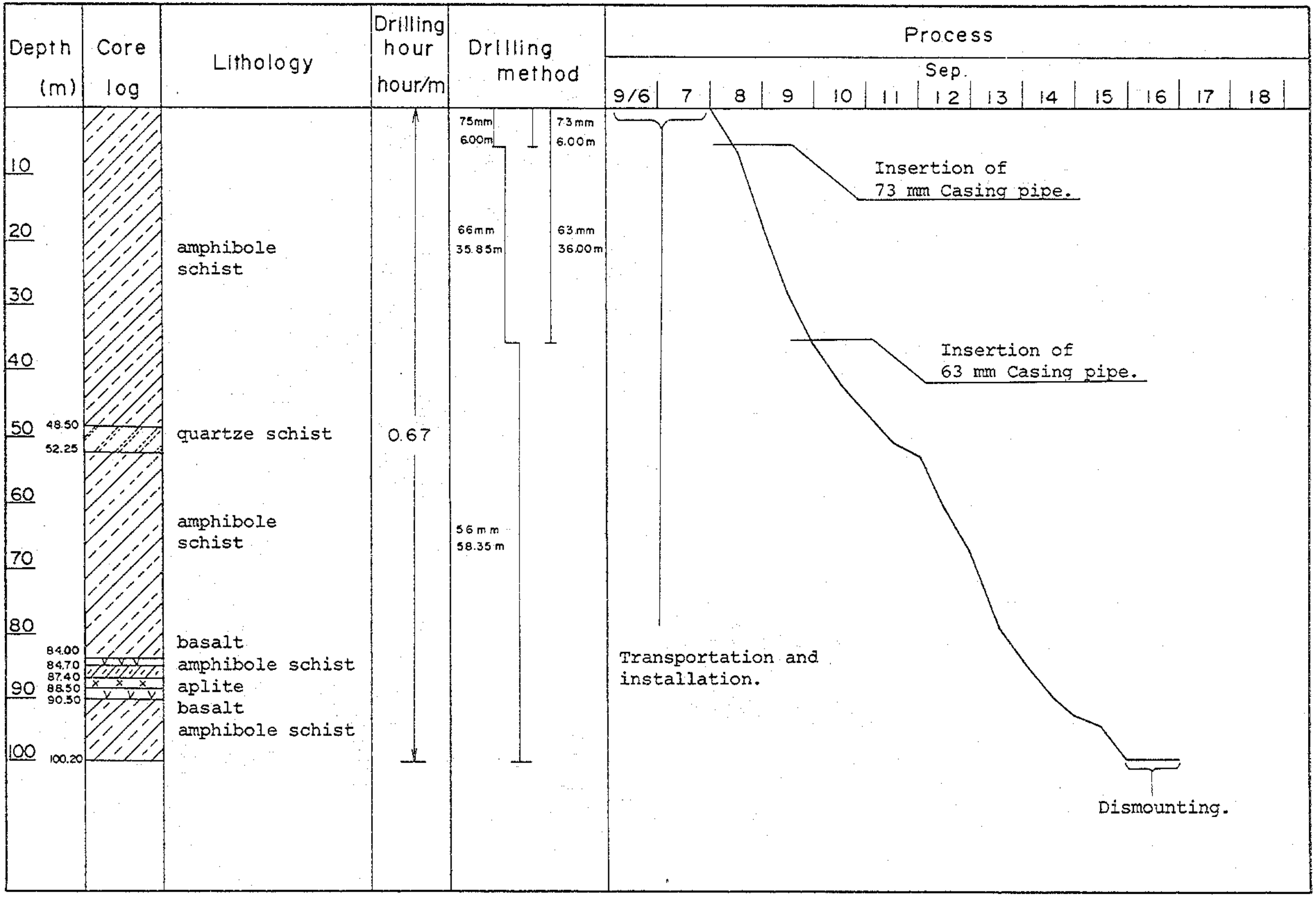


Fig 9-10 PROGRESS RECORD OF DRILLING GSJ—10

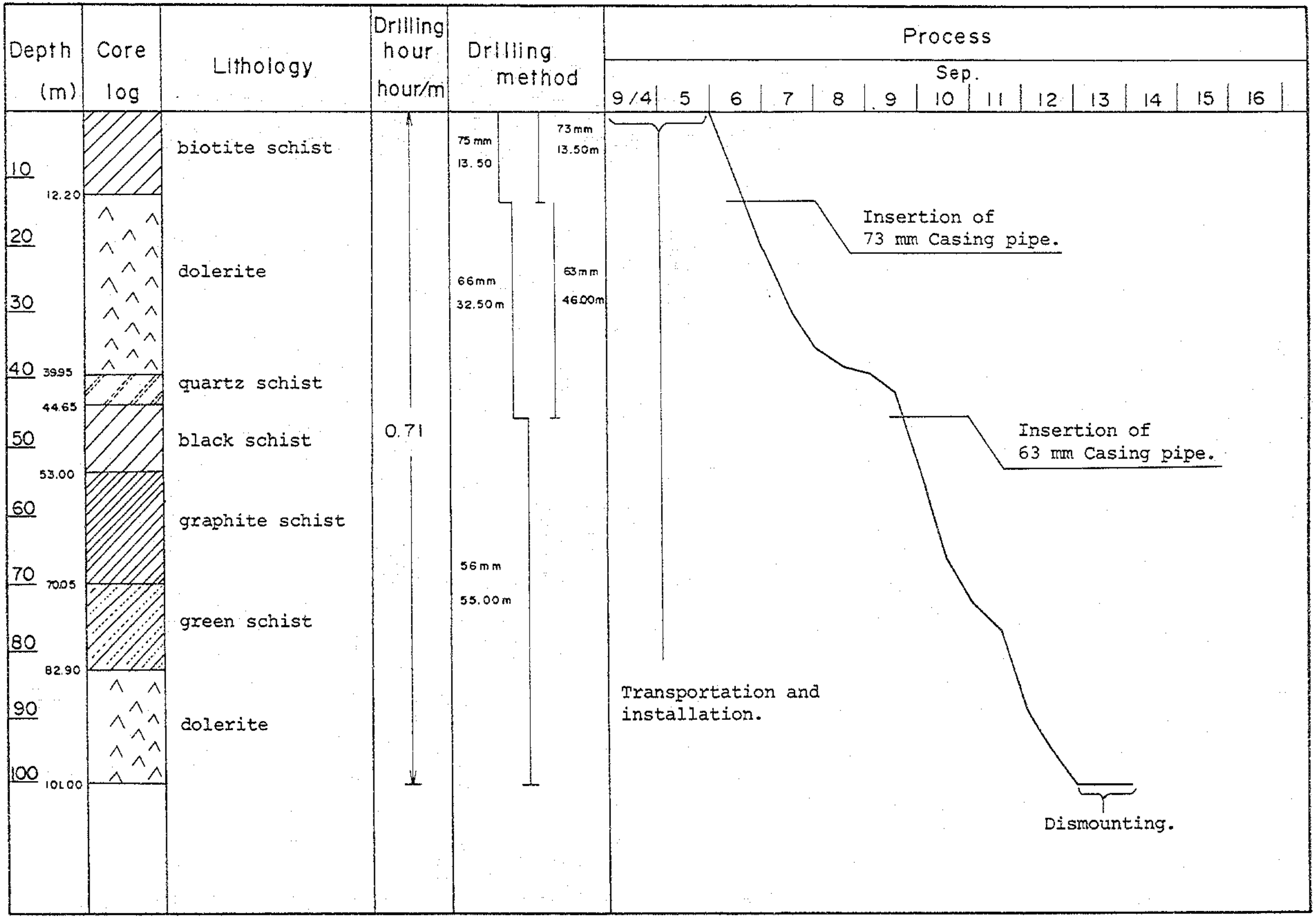


Fig 9-11 PROGRESS RECORD OF DRILLING GSJ — 11

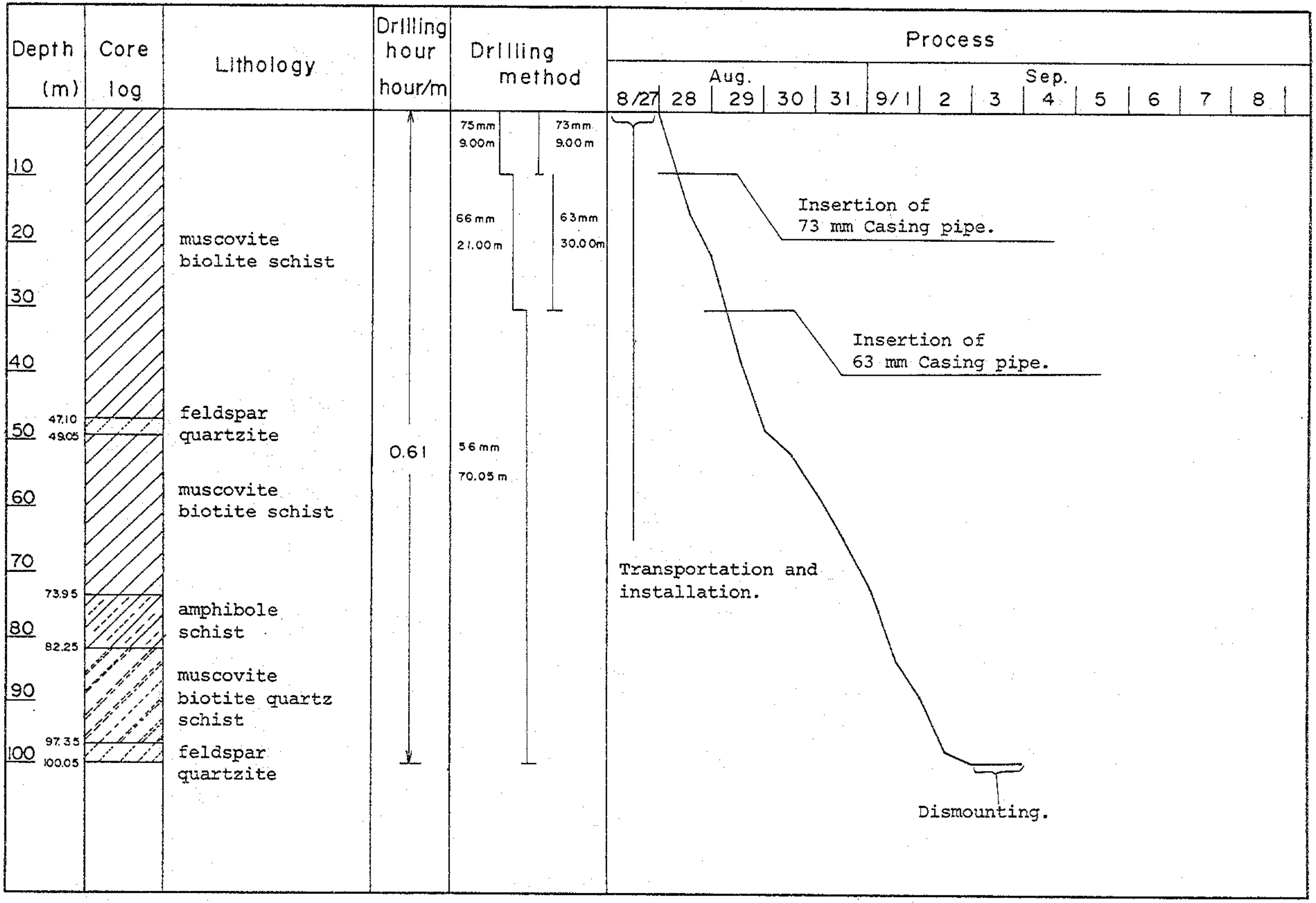


Fig 9-12

PROGRESS RECORD OF DRILLING GSJ—12

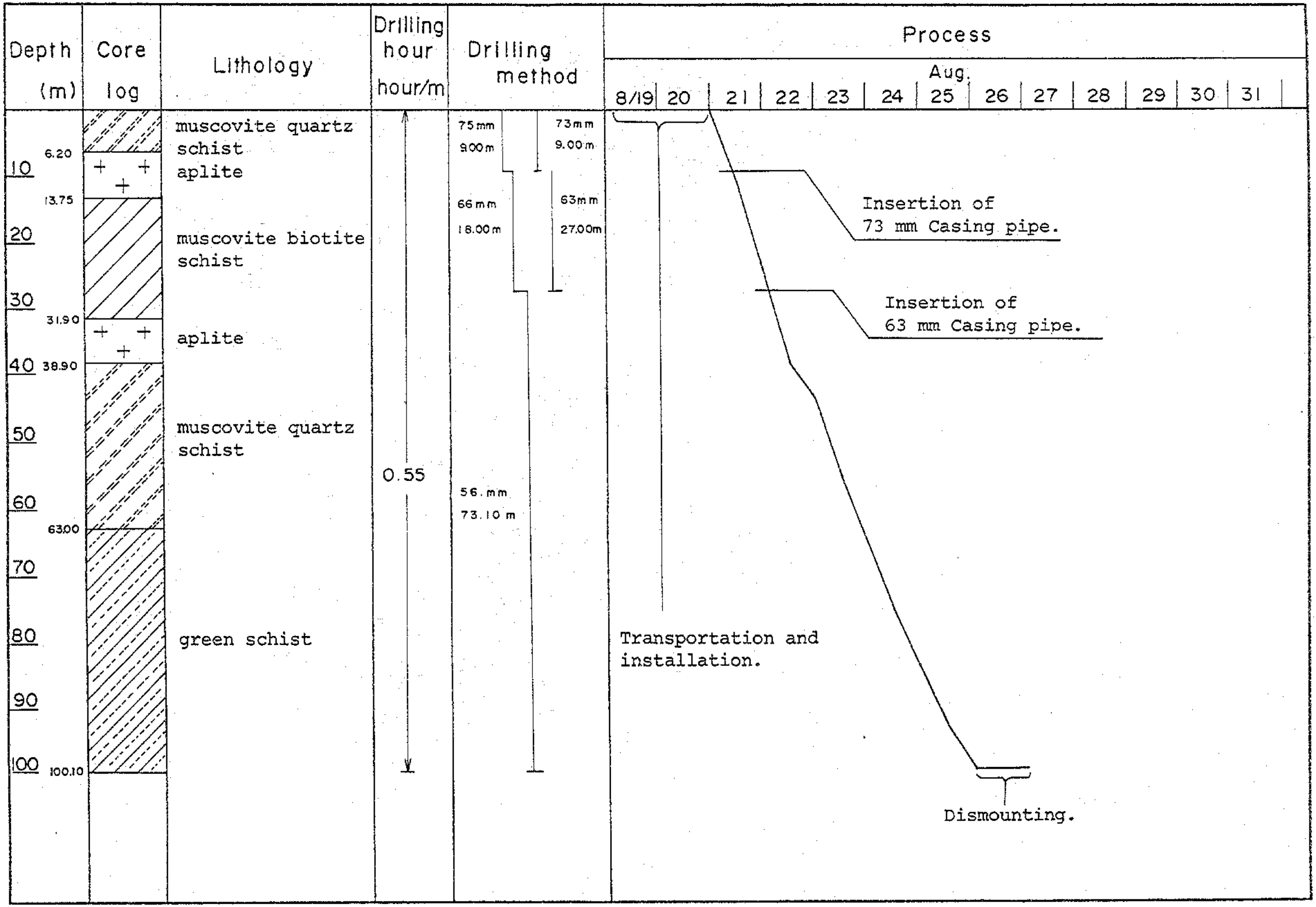


Fig9-13

PROGRESS RECORD OF DRILLING GSJ—13

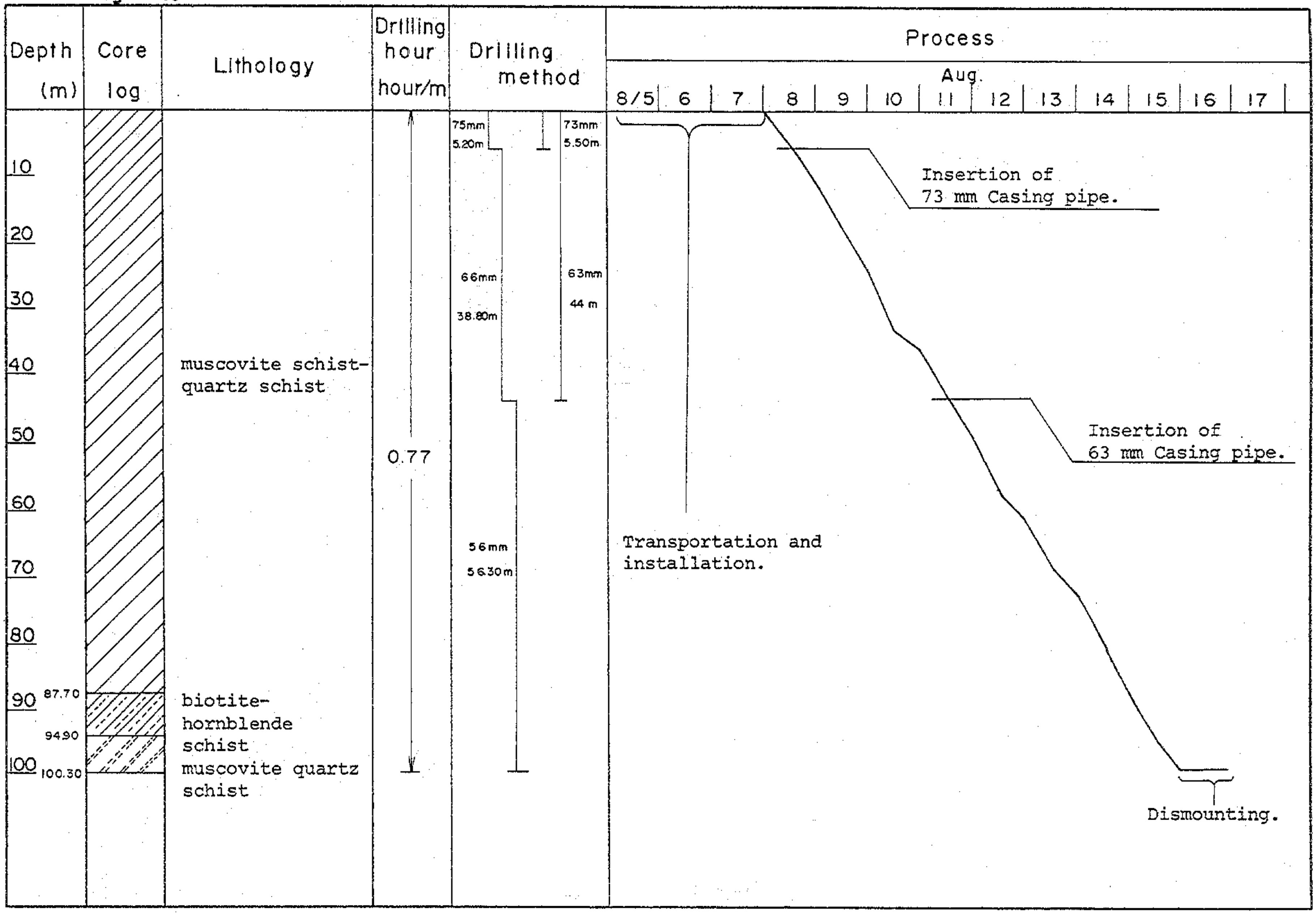


Fig 9-14

PROGRESS RECORD OF DRILLING GSJ—14

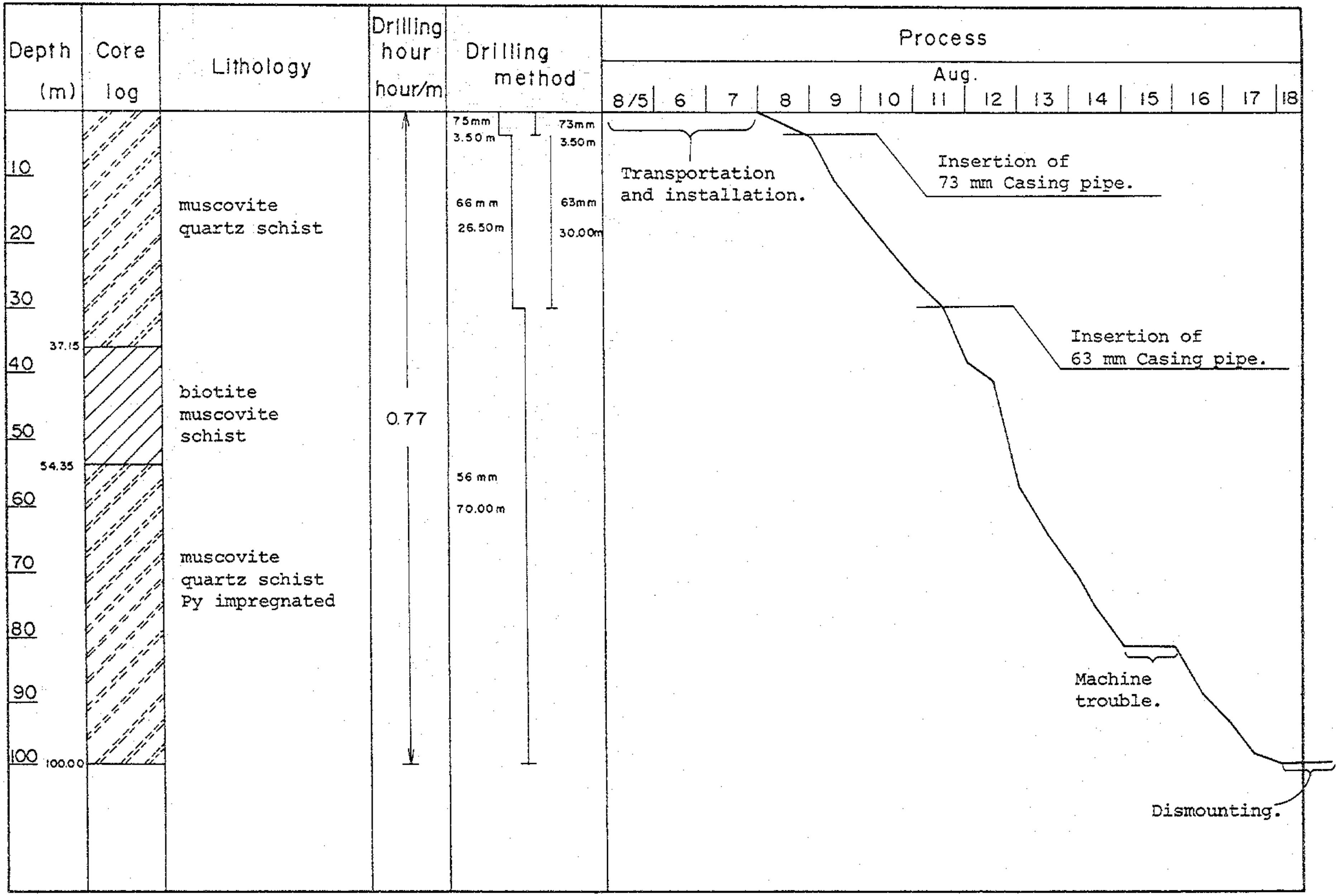


Fig 9-15 PROGRESS RECORD OF DRILLING GSJ—15

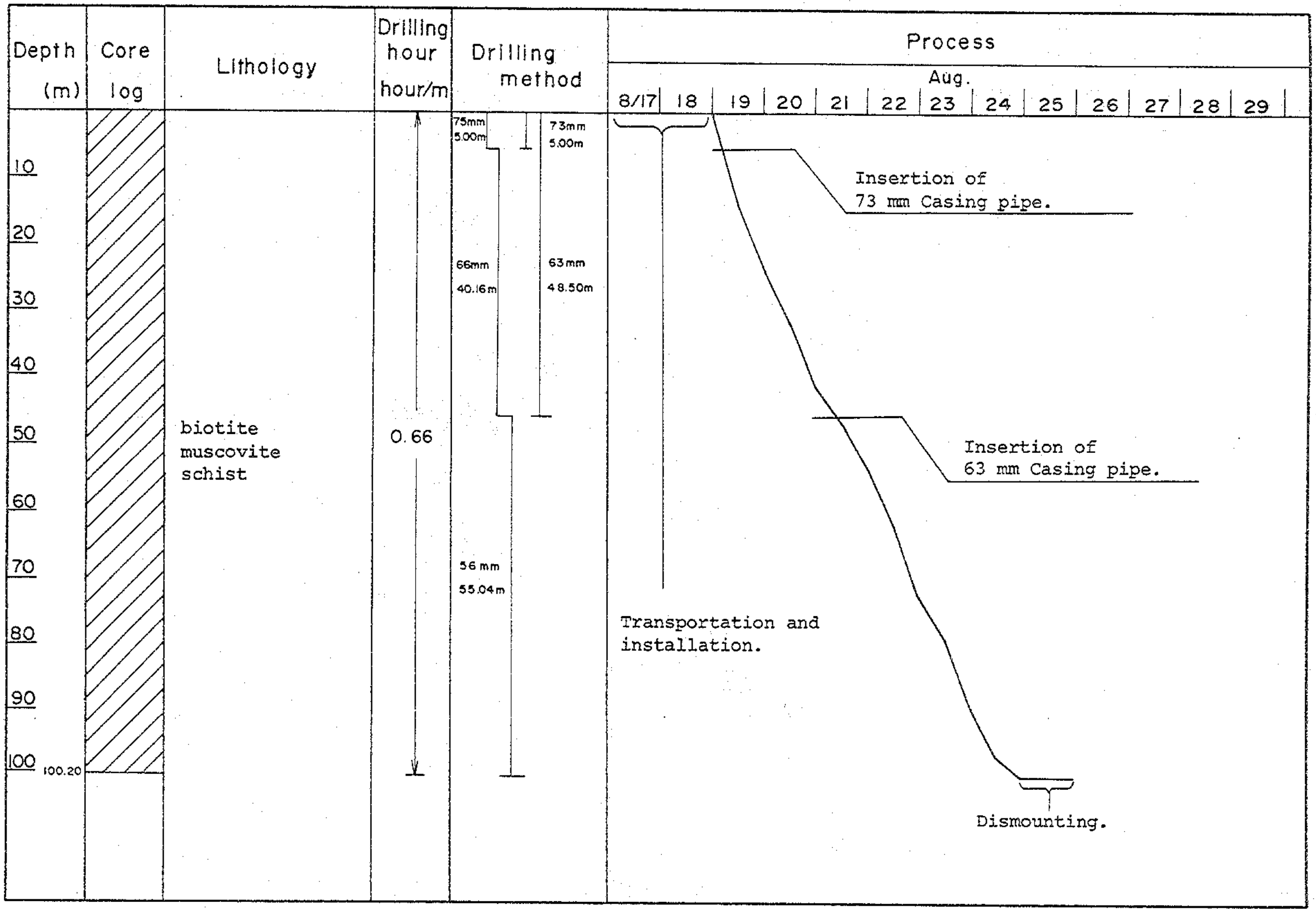


Fig 9-16 PROGRESS RECORD OF DRILLING GSJ—16

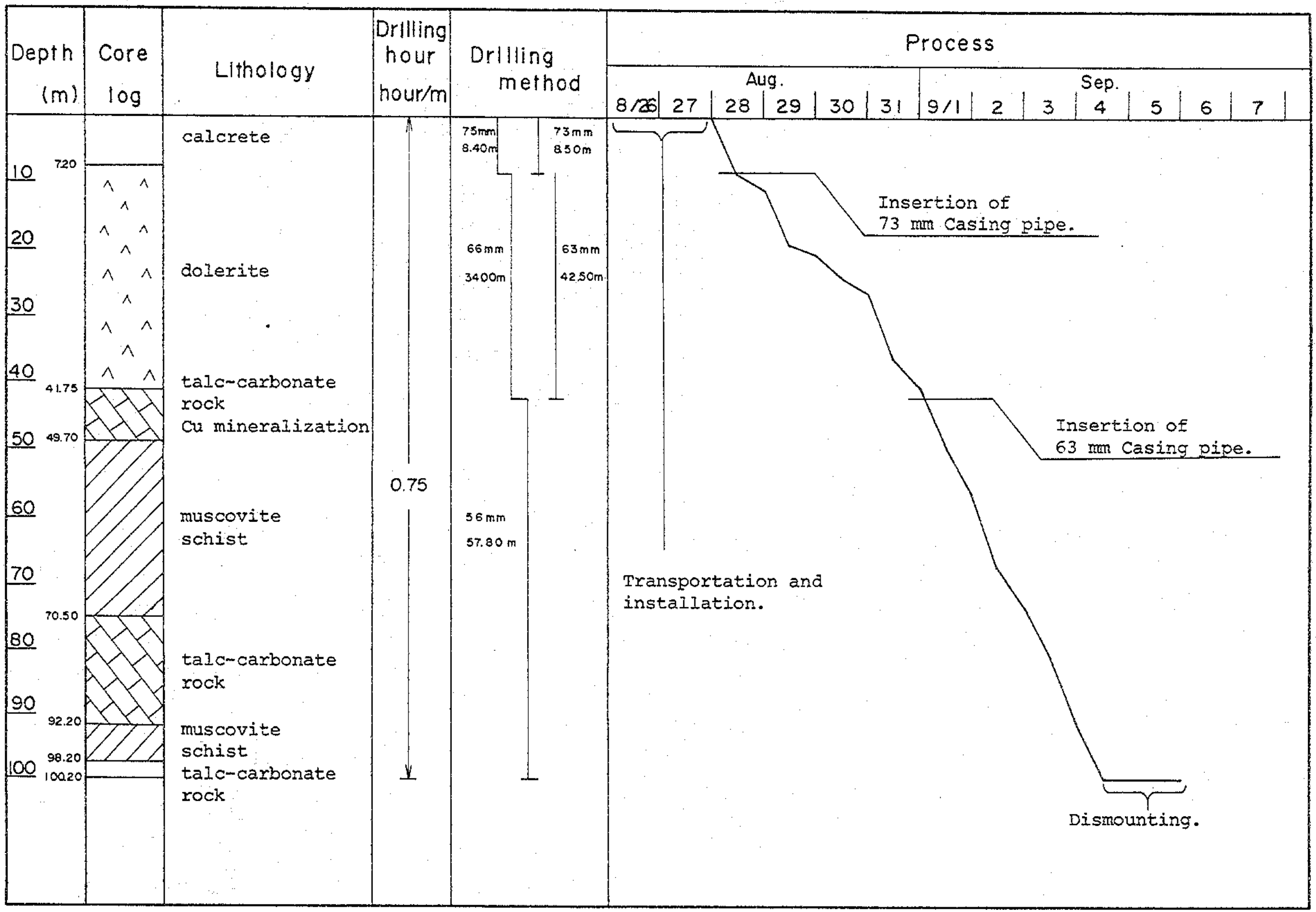


Fig 9-17 PROGRESS RECORD OF DRILLING GSJ—17

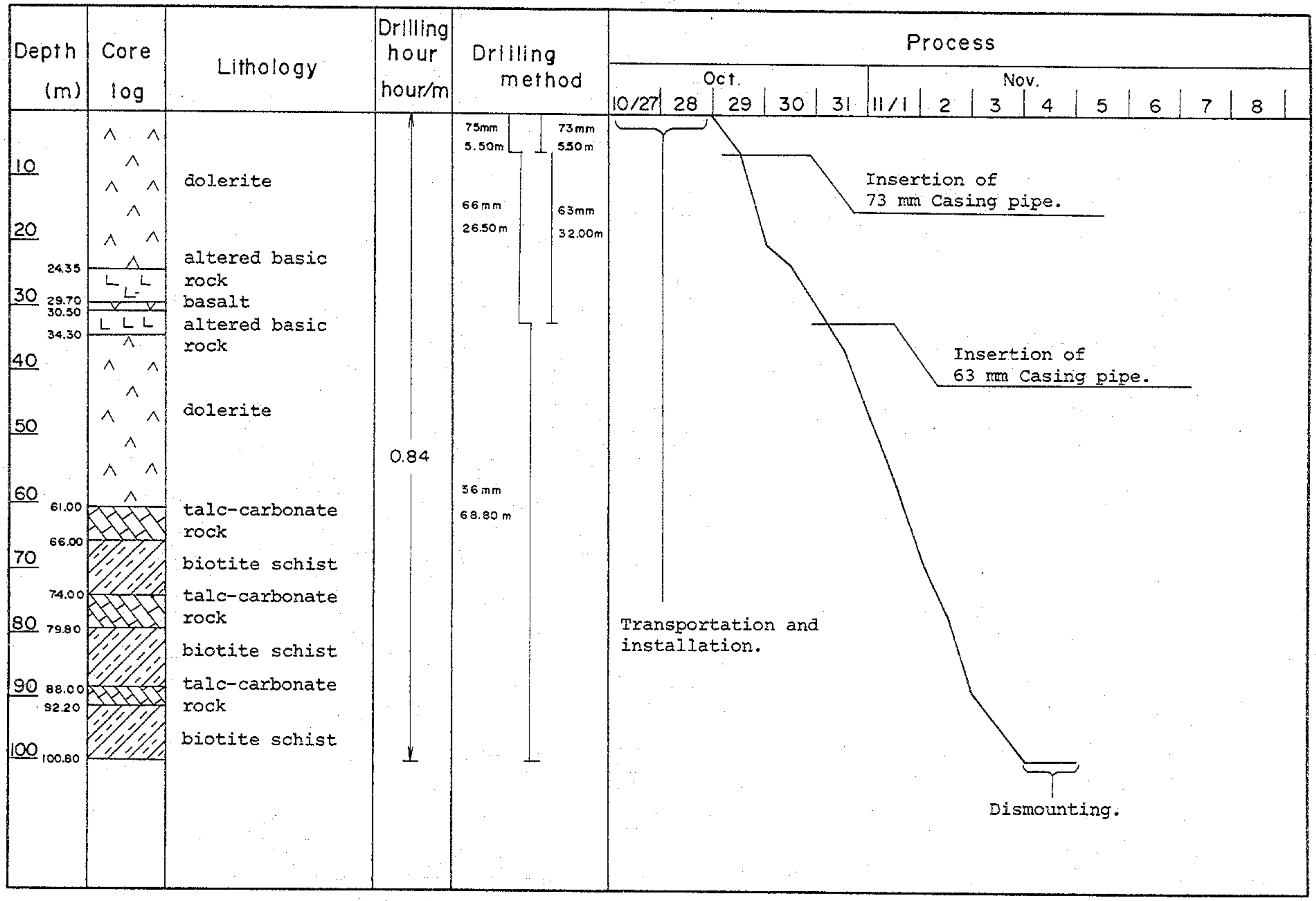
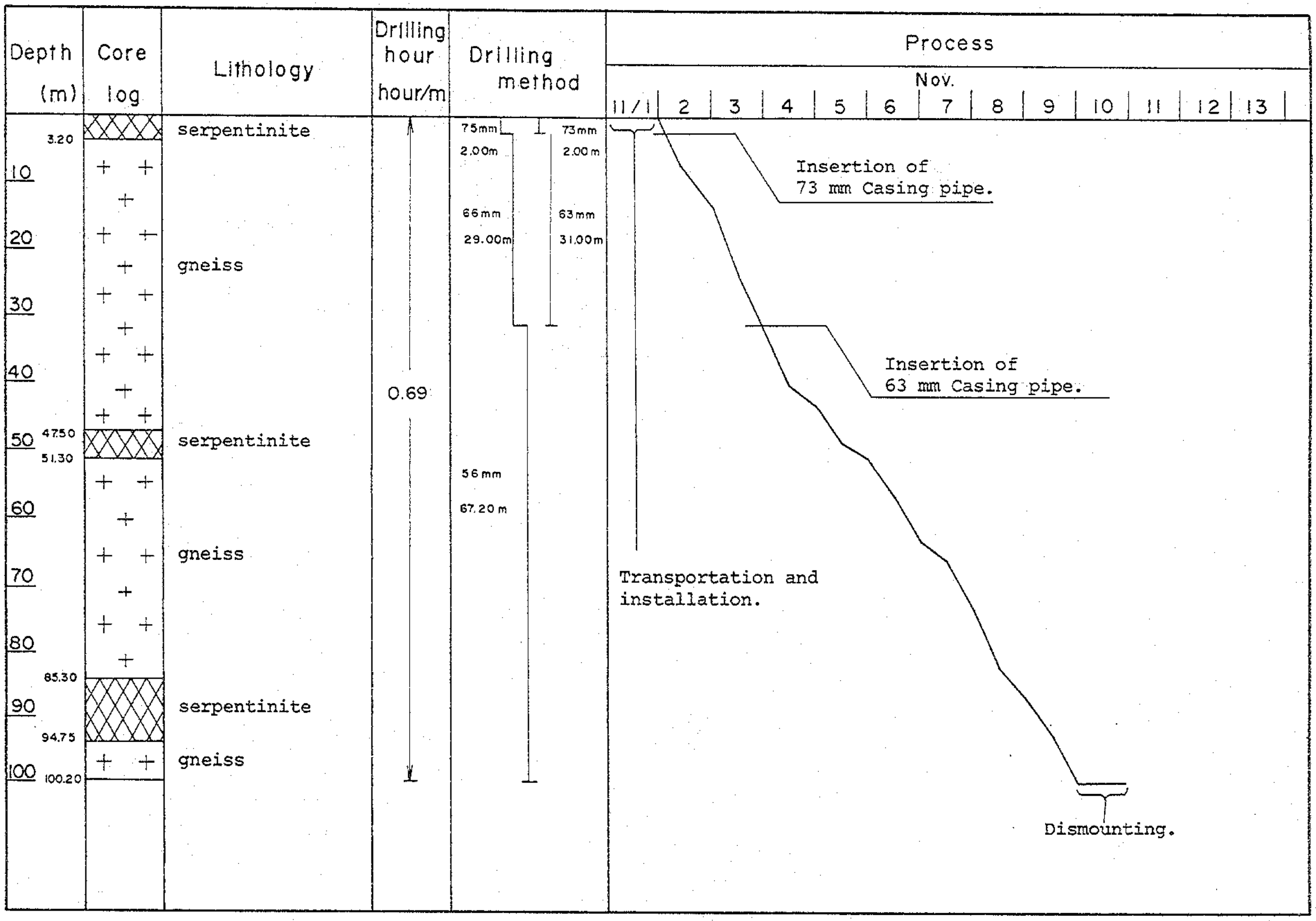


Fig9-18 PROGRESS RECORD OF DRILLING GSJ-18



Part IV. Synthetic Analysis

Out of the copper mineral indication area and chromite deposits area as the objects of the 1981 survey, the former is the one that was selected as one of the areas with the highest possibility of occurrence of deposits as the results of the 2nd year survey, particularly those of the geophysical and geochemical prospecting. While the chromite deposits area is the one where outcrops, though in a small extent, were confirmed by the surveys of two years. Both of these are borne in a particular geological horizon.

Out of the copper mineral indication areas, an area that has similar geological conditions to those of the Matsitama deposits group lying about 5 km to the south of the present survey area, as its extension, and also has some indications, was selected and surveyed principally by means of drilling.

The result of the survey for each of the subdivided areas is described as follows. Table 12 summarizes the result.

Area I: As the result of the geological survey and drilling, the remarkable mineralization was not confirmed. The indications by the geophysical prospecting are presumed to be attributable to graphite schist and sulfide.

Area II: As the result of drilling that was made for an anomaly area of class A picked up by the geochemical survey, extensive dissemination of chalcopyrite and pyrite was confirmed. As for the lighology the country rock is amphibole schist of the Matsitama schist and metasedimentary group, and belongs to the same group and has the same lithology as the country rock of the Matsitama deposits group. This is considered the most promising area, as copper indications are observed in the neighborhood in addition to the above facts.

Area III: Four holes were drilled, weak mineral indications were found in one of them; rocks are graphite schist, dykes of basalt, and rock altered from basalt, which are presumed to be the source of the indications by the geophysical prospecting.

Area IV: As the result of drilling aimed at anomaly areas by the geophysical prospecting and geochemical anomaly areas, compratively extensive dissemination of pyrite and also copper indications, though little, were found. Since over an area on the west side of this drilling area floats containing copper minerals are scattered and also this year's geochemical anomalies tend to extend toward west, one can see hope for occurrence of the Matsitama type of ore deposit.

Drilling by the former trench where there is a copper mineral outcrop which is only rarely seen in this area, disclosed mineral indications similar to the copper indications observed in the trench. In the geology as observed in the trench and drill cores, intrusions of basalt, strong aplitization, alteration, and weathering have made geology so complicated. The copper mineralization is surmised to be attributable to basalt. There being no anomalies as the results of geophysical and geochemical prospecting.

Chromite deposits are found in ultrabasic rocks. These rocks are not distributed in a sizable manner, excluding the areas of deposits A to D and the surroundings of the area of deposits E and F. Concealed rock bodies are presumed to be of a small size from the condition of floats.

Chromite ore bodies are all of a small size, lenticular or pod-shaped, and lack definite trend. This is accounted for by the assumption that they have been controlled by the minor structure of their country rock.

The drilling, which was aimed at the lower extension of the ore bodies, failed to seize the extension, reaching different ore body.

Generally speaking from the results of the drilling and trenching, the size of an ore body is judged to be 0.5 to 1.0 m in thickness, 5 to 10 m in length, and several meters in the dip direction. Such small-size ore bodies are scattered in ultrabasic rock. Exploration in 1981 was directed mainly to the north side of ore bodies, but there is the possibility of ore bodies occurring on the south side, considering the above-mentioned fact. However, since the ore bodies are small and show no clear structural characteristics, it would be appropriate to extend exploration ranges while confirming the ore body by trenching from the outcrop.

As for the area of deposits A to D, if they could be regarded as an aggregate of small ore bodies, some amount of ore reserves would be anticipated.

Table 12 Result of prospecting, Phase III

Area		No. of drill hole	Phase I, II (1979, 1980)				Ground follow-up geophysical survey				Phase III (1981)			Drilling				
			Geology	Mineralization	Geochemical anomaly Z_1 score (A, B class)	Air-borne anomaly	Conductor	Polarizable	Magnetic association	Probable primary source	Geology	Geochem. anomaly Z_1 scores	Magnetic anomaly	No. of drill hole	Rock	Mineralization (m) Copper	Pyrite	Chromite
Copper area	I	4	B	–	–	M-23A	Bed rock	Yes	Yes	Graphite	amp sch, calcrete, gn mica sch, ls	–	–	4	mica sch, gn, ls, graph sch, quartzite, amp sch	–	52.60-70.25 (17.65)	–
		5	B	–	–	M-23A	Bed rock	Yes	Yes	Graphite				5	mica sch, gn, ls, graph sch quartzite, amp sch	–	38.83-30.85 (0.02)	–
	II	6	A	Copper showing	A	–	–	–	–	–	amp sch, mica sch, quartzite	–	–	6	amp sch	20.00-101.50 (81.50)		–
	III	7	A	–	B	M-7A	Multiple bed rock	Yes	Yes *	Graphite	amp sch, mica sch, calcrete, black turf soil covers widely	–	–	7	mica sch, graph sch, dolerite, green sch	–	–	–
		8	A	–	(B)	M-10, (M-7B)	Multiple bed rock	Yes	Yes	Sulf + Graph				8	aplitized basic rock, aplite talc-carb rock, dolerite	–	–	–
		9	A	–		M-7B	Bed rock	Yes	No	Sulf + Graph				9	amp sch, basalt, quartzite, talc-carb rock	69.60-75.00 (5.40)	69.60-82.00 (12.40)	–
		10	A	–	(B)	M-7C	Bed rock	Yes	No	Sulf + Graph				10	dolerite, graph sch, mica sch, q sch, green sch.	–	70.60-79.00 (8.40)	–
	IV-(1)	11	A	–		M-4	Bed rock	Yes	No	Sulfide	quartzite, mica sch amp sch. ls, dolerite, floats of quartzite with green copper	At the western part of Area IV-(1) A, B class of anomalies were detected	–	11	mica sch, q sch, amp sch, quartzite	79.35-81.20 (1.85)	–	–
		12	A	–	A	M-4	–	–	–	–				12	mica sch, q sch, green sch, quartzite	–	79.70-83.40 (3.70)	–
		13	A	–		M-3	Bed rock	Yes	No	Sulfide				13	mica sch. q sch hb sch.	–	55.45-87.70 (32.25) 95.10-100.30 (5.20)	–
		14	A	–		M-3	Bed rock	Yes	No	Sulfide				14	q sch, mica sch, quartzite	–	54.35-100.00 (45.65)	–
		15	A	–	A	–	–	–	–	–				15	mica sch	–	–	–
	IV-(2)	16	A	Copper occurrence	–	–	–	–	–	–	quartzite, mica sch, dolerite,	–	dolerite NW direction	16	Dolerite, talc-carb rock, mica sch, aplite, some skarn minerals	41.75-47.50 (5.75)	–	–
		17	A	Copper occurrence	–	–	–	–	–	–				17		30-50-34.80 (4.30) 64.00-66.00 (2.00)	–	–
Chrome area		1	B	Chromite occurrence	–	–	–	–	–	–	serp, gn, amp sch 5 deposits, many showings and floats of chromite were found. Each serp body is small in scale	–	Most of serp bodies are less than 30 m, in width, Dolerite dykes were catched clearly.	1	serp, gn, chromite	–	–	12.97-13.39 (0.42)
		2	B	Chromite occurrence	–	–	–	–	–	–				2	serp, chromite, gn	–	–	20.45-21.75 (1.30) 23.38-24.10 (0.72) 38.10-38.45 (0.35) 40.10-40.33 (0.23)
		3	B	Chromite occurrence	–	–	–	–	–	–				3	serp, gn	–	–	–
		18	B	Chromite occurrence	–	–	–	–	–	–				18	gn, serp	–	–	–

Geology A: Matsitama schist and metasedimentary group

B: Mosetse river gneiss group

Phase III (1981)														
Geology	Geochem. anomaly Z_1 scores	Magnetic anomaly	Drilling									Source of anomalies for Phase III	Conclusion	Priority for future exploration
			No. of drill hole	Rock	Mineralization (m)				Note	Assay max. %				
					Copper	Pyrite	Chromite	Graphite		Cu	Cr_2O_3			
amp sch, calcrete, gn mica sch, ls	–	–	4	mica sch, gn, ls, graph sch, quartzite, amp sch	–	52.60-70.25 (17.65)	–	45.80-49.45 (3.65) 53.70-54.10 (0.40)	Graphite: only a little	–	–	sulfide (?) graphite (?)	No copper mineralization	
			5	mica sch, gn, ls, graph sch quartzite, amp sch	–	38.83-30.85 (0.02)	–	14.60-14.70 (0.10)	Graphite: only a little	–	–	?		
amp sch, mica sch, quartzite	–	–	6	amp sch	20.00-101.50 (81.50)		–	–	py, cp, hm: imp. or in q vein	0.228	–	sulfide	Copper mineralization is weak, but wide. Biggest potentiality for copper deposit.	1
amp sch, mica sch, calcrete, black turf soil covers widely	–	–	7	mica sch, graph sch, dolerite, green sch	–	–	–	9.05-25.30 (6.25) 28.90-31.65 (2.75) 40.20-51-50 (11.30) 58.15-81.90 (23.75)	–	–	–	graphite	Sulfide mineralization and graphite schist was confirmed	3
			8	aplitized basic rock, aplite talc-carb rock, dolerite	–	–	–	–	strong aplitization	–	–	?		
			9	amp sch, basalt, quartzite, talc-carb rock	69.60-75.00 (5.40)	69.60-82.00 (12.40)	–	–	py.cp imp. and in q vein	0.113	–	sulfide (?)		
			10	dolerite, graph sch, mica sch, q sch, green sch.	–	70.60-79.00 (8.40)	–	49.35-70.05 (20.70)	py: weak imp	–	–	graphite		
quartzite, mica sch amp sch. ls, dolerite, floats of quartzite with green copper	At the western part of Area IV-(1) A, B class of anomalies were detected	–	11	mica sch, q sch, amp sch, quartzite	79.35-81.20 (1.85)	–	–	–	native copper	0.022	–	?	No copper mineralization except native copper was found, but wide pyritization are observed. Results of geological, geochemical and geophysical surveys show suitable environments for copper mineralization. Further explorations are preferable for this area	2
			12	mica sch, q sch, green sch, quartzite	–	79.70-83.40 (3.70)	–	–	py: weak imp.	–	–	?		
			13	mica sch. q sch hb sch.	–	55.45-87.70 (32.25) 95.10-100.30 (5.20)	–	–	py: weak imp.	–	–	?		
			14	q sch, mica sch, quartzite	–	54.35-100.00 (45.65)	–	–	py: imp > in q vein	–	–	sulfide		
			15	mica sch	–	–	–	–	–	–	–	?		
quartzite, mica sch, dolerite,	–	dolerite NW direction	16	Dolerite, talc-carb rock, mica sch, aplite, some skarn minerals	41.75-47.50 (5.75)	–	–	–	bo, cc, cp, malachite	0.172		sulfide	Copper mineralization seems to be related with leaching of basalt and it seems to be small scale.	
			17		30-50-34.80 (4.30) 64.00-66.00 (2.00)	–	–	–	bo, cc, cp, malachite	0.620	–	sulfide		
serp, gn, amp sch 5 deposits, many showings and floats of chromite were found. Each serp body is small in scale	–	Most of serp bodies are less than 30 m, in width, Dolerite dykes were catched clearly.	1	serp, gn, chromite	–	–	12.97-13.39 (0.42)	–	massive chromite, with some magnetite	–	27.30	–	Surface scale of unit deposit 10 m x 1 m (max.) Chromite layers hit by drilling seem to be accessory ones, but not the main ore bodies.	4
			2	serp, chromite, gn	–	–	20.45-21.75 (1.30) 23.38-24.10 (0.72) 38.10-38.45 (0.35) 40.10-40.33 (0.23)	–	massive chromite, with some magnetite	–	31.70	–		
			3	serp, gn	–	–	–	–	–	–	–	–		
			18	gn, serp	–	–	–	–	–	–	–	–		

Part V. Conclusion and Proposition

For this year, the survey was conducted on the area that had been selected as an area with high potentialities of occurrence of copper ore deposits and the area where outcrops of chromite had been confirmed and an increase in chromite reserves was expected. The survey consisted of primarily drilling, and in addition geological survey, handy magnetic prospecting, and geochemical survey over the surroundings of the drilling points.

The purpose of this year's survey over the copper mineral indication area consisted in confirmation of the indications and finding their size, ore grade and other properties by conducting geophysical and geochemical prospecting, drilling and other activities, to make comprehensive evaluation of this area and to find the principle for future prospecting work.

On the other hand, the purpose on the chromite deposits area consisted inf inding the conditions of the mineral occurrence and confirming the indications in surroundings of outcrops by making a geological survey, trenching, drilling, handy magnetic prospecting and other activities centering on outcrops.

The conclusion from the results of this year's survey is set forth as follows:

1. As for the geology in the survey area, new facts which should lead to a change in the past view were not found because the survey area for this year was limited and also there are few outcrops.

2. The copper mineral indication area was divided into four, Area I to IV.

Area I is located on the fold of the strata of the Mosetse river gneiss group. Drilling (GSJ-4 and 5) was made for geophysical indications, pyritization was found, but copper mineralization was not confirmed.

In Area II, drilling (GSJ-6) was made to probe a geochemical anomaly. As a result, mineralization of pyrite, chalcopyrite and hematite was found in amphibole schist in the Matsitama schist and metasedimentary group. The mineralization was weak but extensive; on the surface too, copper indications were observed near the drilling point.

In Area III, drilling (GSJ-7 to 10) was made for indications by the geophysical prospecting, principally. Weak mineralization of pyrite and chalcopyrite was confirmed in GSJ-9 and the existence of graphite schist was confirmed in GSJ-7 and 10.

The work in Area IV included the drilling (GSJ-11 to 15) made for geochemical and geophysical anomalies which had been picked up in an area extending from the middle to the west and the drilling (GSJ-16 and 17) made by the side of the former trench on the east side.

In the former drilling (GSJ-14) relatively wide dissemination of pyrite was revealed, and native copper too was found, though in a very small quantity (GSJ-11). Geochemical survey was carried out as a continuation of the 2nd year survey over an area of 12 km^2 at the south-west end of the survey area, resulting in the finding that anomalies of class B which include those of class A extend westward. On the surface too copper indications were confirmed at several places.

On the other hand, as the result of drilling (GSJ-16 and 17) to follow up the mineral indications in the trench made by A.A.C. in the southeast of the survey area, the indication were confirmed but the rock was found to be an complication of weathered rock, intrusive rock and altered rock, not allowing determination of the geology. The original rock of the altered rock where mineral indications were observed is considered basalt, and if the mineralization originates from basalt it should be of a small scale.

3. In this year's survey the greater part of drilling was intended for the indications detected by the ground geophysical prospecting which was conducted overlapping with anomaly areas picked up by airborne geophysical prospecting.

As the result, graphite was found in GSJ-4, 7, 10 and 13, which is judged to be the cause of the said indications by the geophysical prospecting. The other anomalies are presumed to be the reflection of geology including dykes or the like or a difference in lithofacies, but it cannot be definitely said. Remarkable mineral indications were not found in any of these drill holes. The geophysical indications are inferred to be mainly attributable to geological units.

Drilling made for the target of geochemical anomalies resulted in finding mineral indications in all the drill holes, though they are weak;

4. Chromite is borne in ultrabasic rock presumably in a lenticular or pod-like form. The scale of the ore bodies is 0.5 to 1.0 m in width and 5 to 10 m in length. The ore grade is: 32 to 36% in Cr_2O_3, 17 to 19% in T.Fe, 11 to 13% in Al_2O_3, 11 to 15% in MgO and 7 to 11%

in SiO_2. These small ore bodies occur in a scattered manner. The individual ore bodies lack definite trend, making one assume that they have been controlled by the local structure of the country rock, ultrabasic rock.

5. From the above-mentioned result of the survey, in the copper mineral indication areas, Area II and the western part of Area IV are considered promising.

As for Area II, the facts that the drilling revealed copper mineralization ranging widely, that copper mineral indications on the surface as well as geochemical anomalies have been found, and that such mineralization and indications are within the Matsitama shcist and metasedimentary group, on whose horizon the Matsitama deposit is borne, suggest the following work:

Geochemical survey on fine grid pattern centering on GSJ-6 should be made to narrow down the prospecting area, and an horizontal and vertical extent of the mineralization areas should be confirmed by drilling holes about 100 m in depth.

About Area IV, the facts that some anomaly areas have been picked up by the geochemcial survey, that copper mineral indications have been found on the surface too, and that the Matsitama schist and metasedimentary group is distributed there, suggest: prospecting should be made on these indications by means of drilling holes about 100 m in depth for the purpose of confirming mineral occurrences.

6. As for the chromite deposit area, since the strike of ore bodies varies and their extension is difficult to presume, the prospecting extent should be expanded by making trenching to confirm the size, shape and ore grade of ore bodies, which is to be advanced together with shallow drilling combined for the purpose.

REFERENCES

References

(1) Baldock J.W. et al 1977 Resources inventory of Botswana; metallic minerals, mineral fuels and diamonds, Mineral Resources Report No. 4, Geol. Surv. Bots.

(2) Bennett, J.D. 1970 Geological map of Mosetse-Matsitama area, Geol. Surv. Bots.

(3) Durey, H.J. 1974 Report on the exploration of the Mapatsi area, January to September 1974. Unpublished BCL report.

(4) Durey, H.J. 1974 Report on the exploration of Mosupe area. Unpublished BCL report.

(5) Lintern, B.C. 1973 Report on the copper deposits of Bushman area. Unpublished BCL report.

(6) Litherland, M. 1975 The geology of the area around Maitengwe, Sebina and Tshesebe, northeast and central districts, Botswana. Geol. Surv. Bots.

(7) MMAJ and JICA 1980 Report on geological survey of the northeastern Botswana. Phase I.

(8) MMAJ and JICA 1981 Report on geological survey of the northeastern Botswana. Phase II.

(9) Stansfield, G. 1973 The geology of the area around Dukwe and Tlalamabele, central district, Botswana. Geol. Surv. Bots.

(10) Strugnell, S.R. 1974 Final report Bushman regional area, May 1972 to June 1974.

(11) Suwa, K., Yairi, K. 1979 Africa, "Earth Science", Vol. 16, Geology of the world. Iwanami (in Japanese).

APPENDICES

Apex. 1. Legend

- quartzite
- quartz schist
- black schist, muscovite schist, biotite schist
- biotite schist (porphyroblastic)
- graphite schist
- limestone
- amphibole schist
- green schist
- gneiss
- gneiss (porphyroblastic)

- quartz vein
- aplite, pegmatite, granite
- basalt
- dolerite
- altered basic rock
- serpentinite
- talc-carbonate rock
- aplitized basic rock with skarn
- chromite
- <40° dip of schistosity and gneissosity

Abbreviation of mineral is same as that of Apex. 4 and 5.

Apex. 1-1 CORE LOG GSJ-1 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
0–1.20		1.20				overburden			brown soil, floats of serpentinite.
1.20–12.97		12.97				serpentinite	serpentinization		same as 13.97-66.00 m
12.97–13.39		13.39	S-47	0.42	27.3 22.9 8.7 14.5 11.6 /	chromite		chr	massive chromite
13.39–50 (10, 20, 30, 40, 50)		50° 44.50 45.20				serpentinite	serpentinization act.bi (44.50–45.20)		serpentinite greyish green - dark green massive - foliated generally rich in magnetite generally strongly serpentinized, talcosed, some carbonated, weakly epidotized. secondary actinolite or/and biotite formation at places 44.50-45.20m, 50.60-51.75m 54.50-55.80m, 56.70-58.60m 59.00-66.00m, 78.95-81.05m 82.65-84.90m bi-mus Granite 58.60-59.00m replacing serpentinite aplite 64.60-64.80m replacing serpentinite

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
50–66.00 (60)		50.60 51.75 54.50 55.80 56.70 58.60 59.00 64.60 64.80 66.00					serpentinization act.bi ep bi tour bi act. bi		
66.00–71.45 (70)		45° 60° 71.45				hb gneiss			porphyroblastic gneiss granitic composition porphyroblast: fs
71.45–100.20 (80, 90, 100)		73.85 74.25 50° 78.95 81.05 82.65 84.90 86.00 100.20				serpentinite	ep serpentinization ep act.bi ep bi		same as 13.97-66.00 m

Apex. I - 2 CORE LOG GSJ - 2 S = 1/200

Depth (m)	Boundary (m) / Dip	Samp. No	Width (m)	Cr_2O_3	T.Fe	Al_2O_3	MgO	SiO_2	Pt	Rock name	Alteration	Mineralization	Remarks
0 – 1.20	1.20									overburden			light brownish grey soil, calcretized, floats of chr
1.20 – 20.45	20.45									serpentinite	serpentinization		serpentinite brownish grey - greenish grey, massive - foliated generally rich in magnetite generally strongly surpentinized, talcosed, subordinately carbonated secondary actinolite or/and biotite formation at places. 43.45-44.50m 86.80-89.50m 96.45-98.20m 100.00-100.60m
20.45 – 21.75	21.75	S-48	1.30	31.7	19.7	11.4	14.1	10.4	0.0	chromite		cr	massive chromite. 2cm at the upper contact, magnetism is strong, while 5cm at the lower contact, it is weak. Middle part has no magnetism
21.75 – 23.38	23.38									serpentinite	serp		
23.38 – 24.10	24.10	S-49	0.72	30.2	20.0	9.7	13.9	11.5	0.0	chromite		cr	massive chromite 2cm at upper and lower contact, magnetism is strong, but the rest is non-magnetic
24.10 – 38.10	38.10									serpentinite	serpentinization		
38.10 – 38.45	38.45	S-50	0.35	26.7	21.9	8.2	14.7	12.3	/	chromite		cr	massive chromite magnetism is strong at upper and lower contact, the rest is non-magnetic.
38.45 – 40.10	40.10			serpentinite						serpentinite	serp		
40.10 – 40.33	40.33	S-51	0.23	17.0	20.0	10.8	19.3	18.0	/	chromite			massive chromite
40.33 – 44.50	43.45 44.50									serpentinite	serp ↔ bi		
44.50 – 86.80	80° 80° 55° 65° 86.80									hb-bi gneiss			porphyroblastic gneiss granitic composition mafic hb>bi 44.50 - 55.20m 63.20 - 86.80m bi>hb 55.20 - 63.20m 77.45 - 86.80 porphyroblast: fs gneissosity very clear
86.80 – 89.50	89.50									serpentinite	serp ↔ act. bi		
89.50 – 96.45	65° 70° 96.45									bi-hb gneiss			same as 44.50-86.80m bi>hb 89.50-95.10m hb>bi 95.10-96.45m
96.45 – 100.60	98.20 100.60									serpentinite	serp ↔ act. bi bi		

Assay % (Pt g/t)

Apex. I -3 CORE LOG GSJ - 3 S = 1/200

Depth (m)	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
	1.20				overburden			brown soil floats of Q, chr
	4.90				serpentinite			brown soil
	5.45				aplite			
10, 20	< 35° 20.85				gt-bi-hb gneiss			granitic composition mafic mafic hb > bi > gt fine-coarse grained color index: 10-15% gt: transparent pale brown 0.3-0.5 mm
	23.00 25.00				serpentinite	serpentinization, act		
30, 40	47.40				serpentinite	serpentinization		peridotite origin serpentinite
50						act		

Depth (m)	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Pt g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
	53.80				serpentinite	serpentinization		
	54.75 55.20 56.00 56.40 < 40° 57.50				hb gneiss			porphyroblast: feldspar 54.75-55.02m aplite 56.00-56.40m serpentinite
60, 70, 80	64.75 69.50 79.50 81.45				serpentinite	serpentinization; bi; act.bi		peridotite origin serpentinite
90	< 55° 92.50				hb-bi gneiss			porphyroblastic gneiss granitic composition bi > hb porphyroblast: fs generally 3-5 mm max. 10 mm gneissosity very clear
100	< 65° 100.50				gneiss			light grey, felsitic composition gneissosity is not clear, it looks like aplite, some thin layers of biotite 98.70-99.00 aplite

CORE LOG GSJ－4 S＝1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		2.20				overburden			brown soil floats of Q.
10		< 25° 17.60				bi-mus schist			light grey very rich in mica schistosity: very clear
		19.00 19.75				quartzite			18.60-19.60m some wollastonite
20 30 40		19.80 27.25 27.45 28.60 29.10 29.85 29.90 < 30° 35.60 35.70 37.40 37.45 39.28 39.42 39.85 39.90 40.35 40.40 < 30° 45.80				mus-bi schist			dark grey q > fs > bi > mus schistosity very clear porphyroblast pale brown-grey less than 1cm garnet, feldspar q veins: barren
		49.45				graphite schist			black amount of grahoite is only a little.
50						bi schist			

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		50.40 51.25				limestpne			crystalline
		52.60				black schist			black schist-phyllite
60		53.70 54.10 < 20° 65.40				limestone		py	white-light grey crystalline. some silicification wollastonite: max. 10 mm 61.50-70.25 m rich in wollastonite pyrite parallel-subparallel to bedding 20° (biotite thin layer) 65.40-66.90 m many pyrite layers 53.70-54.10 m graphite schist
		< 20° 66.90	1.50	S-52	0.029 0.004 0.002 //				
70		70.25							
80 90 100		75.67 75.72 79.80 80.10 81.30 81.72 92.75 93.30 100.80				bi gneiss			gneiss-schist granitic composition mafic: bi hard, q veins: barren 81.30-81.72m aplitic granite

Apex. I -5 CORE LOG GSJ-5 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.70 2.30				overburden			pale brown soil and calcrete.
		3.50 6.10				bi schist			bi > mus. upper part: calcretized schistosity: very clear
		7.30				mus schist			
10		9.85				black schist			
		< 20° 12.85				bi-mus schist			
20 30		14.30 14.60 14.70 15.00 15.90 16.50 < 20° 31.50				limestone		I py	white-light grey crystalline, mainly massive some silicification wollastonite. 18.45-19.00m siliceous ls with wollastonite. 28.40-31.50m rich in wollastonite pyrite layers 30.83-30.85m 14.30-14.60m graphite schist (?) 14.70-15.00m quartzite 15.90-16.50m black schist
		< 15° 35.80				bi-amp schist			bi = hb 1-4 mm
40		< 25° 41.55				hb-bi gneiss			gneiss-schist light grey granitic composition fine grained
		44.75				amp schist			minor folding
50		< 15°							

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
60 70 80		51.30 51.50 54.60 55.40 < 20° < 50° 82.95				bi gneiss			gneiss-schist granitic composition gneissosity (schistosity) very clear. fine-coarse grained several veins-dykes. q veins: barren 2.30-3.50m 51.30-51.50m 54.60-55.40m aplite: 82.95-83.35m 89.20-89.30m 91.10-91.20m granite: 89.45-87.95m 91.60-91.75m 96.70-96.90m 98.10-98.40m
		83.35 < 20° 87.45 87.95				hb-bi gneiss			porphysoblastic gneiss granitic composition porphyroblast: fs
90 100		89.20 89.30 91.10 91.20 91.60 91.75 < 30° 96.70 96.90 98.10 98.40 100.40				bi gneiss			same as 44.75-82.95 m aplite 82.90-89.30m 91.10-91.20m granite 87.45-87.95m 91.60-91.75m 96.70-96.90m 98.10-98.40m

Apex. I -6 CORE LOG GSJ-6 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		1.50								overburden			brown soil floats of Q.
10		<55° <60° 20.00											dark green generally schistosity is very clear. dip of schistosity 0-30m 55°,30-101.5m 40° from horizontal. some epidote 61.70-62.70m,89.90-92.40m 12.10-12.90m amp schist becomes clayey. some carbonate veinlets 69.10-69.15m,72.30-73.90m Py.Cp.hm > malachite Py.Cp. impregnated > within hm-q veinlets hm-q veinlets with or without Py, Cp. width 0.05-3cm about 50 veinlets generally veinlets are accompanied by Py or/and Cp. generally they are parallel-subparallel to schistosity. Cu content 26.00-29.00m Cu 0.178% 94.00-97.00m Cu 0.228%
20		23.00	S-53	3.00	0.039	0.000	0.007	0.0	0	amp schist			
		26.00	S-54	3.00	0.046	0.000	0.007	0.0	0				
		<50° 29.00	S-55	3.00	0.178	0.000	0.006	0.0	0				
30		32.00	S-56	3.00	0.043	0.000	0.007	0.0	0				
	Q	33.80 34.50 35.00	S-57	3.00	0.029	0.000	0.006	//	//				
		38.00	S-58	3.00	0.041	0.000	0.005	//	//				
40		38.90 39.40 <40° 41.00	S-59	3.00	0.066	0.000	0.004	//	//		act.chl		
		44.00	S-60	3.00	0.025	0.000	0.004	//	//				
		47.00	S-61	3.00	0.043	0.000	0.006	//	//				
50		50.00	S-62	3.00	0.034	0.000	0.004	0.0	0				

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		53.00	S-63	3.00	0.054	0.001	0.005	//	//	amp schist			
		56.00	S-64	3.00	0.050	0.001	0.004	//	//				
		59.00	S-65	3.00	0.023	0.001	0.004	//	//				
60		<40° 61.70	S-66	2.70	0.023	0.001	0.006	//	//				
		63.70	S-67	2.00	0.028	0.001	0.005	//	//				
		66.10	S-68	3.30	0.045	0.002	0.005	//	//				
70		70.00	S-69	3.00	0.029	0.003	0.004	//	//				
		73.00	S-70	3.00	0.037	0.002	0.005	//	//				
		76.00	S-71	3.00	0.045	0.002	0.005	//	//				
		79.00	S-72	3.00	0.036	0.002	0.007	//	//				
80		<35° 82.00	S-73	3.00	0.083	0.002	0.006	//	//				
		85.00	S-74	3.00	0.041	0.002	0.006	//	//				
	Q	86.15 86.80 88.00	S-75	3.00	0.073	0.002	0.007	//	//				
90		91.00	S-76	3.00	0.052	0.001	0.007	//	//				
		94.00	S-77	3.00	0.036	0.001	0.004	0.0	0				
		97.00	S-78	3.00	0.228	0.001	0.006	//	//				
100		<40° 101.50	S-79	4.50	0.063	0.001	0.007	//	//				

Assay % (Au, Ag g/t)

Apex. I-7 CORE LOG GSJ-7 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au, Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		2.00				overburden			black turf soil floats of Q, schist
		<40° 9.15				bi-mus schist			up to 5.90m slime slime contains some garnet(?)
10		11.40				black schist			pelitie
		19.05				mus schist			pale purplish schist pelitic, phyllitic
20		<35° 25.30				graphite schist			same as 58.15-81.90 m
		<35° 28.90				mus schist			pale purplish schist pelitic, phyllitic
		29.55				graphite schist			graphite (?)
30		30.20				basalt			
		31.65				graphite schist			graphite schist - black schist
40		40.20				basalt			fs phenocryst max. 3 cm 28.90-29.55m, 31.65-32.90m weathering, clayish 36.05-36.75 m soft, yellowish green, serpentinization
		<25° 45.70				graphite schist			45.70-46.45m aplite
50		46.45							same as 58.15-81.90 m

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au, Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		51.50							51.50-52.50m, 57.30-58.15m chilled margin
		58.15				dolerite			dolerite - microgabbro very fresh
60		59.00 59.15							59.00-59.15m quartzite
70 80		<40° <40° 81.90				graphite schist			amount of graphite is only a little abrasived by fingers, then they become dark grey it has weak electric conductivity sometimes, not often. pelitic, it looks like slate
		<30° 84.50				mus-bi-amp schist			
		87.65 87.70 89.90 90.20				mus schist			
90		91.10 91.60 93.25				green schist			q veins w=2cm parallel to schistosity
		<40° 95.65				mus schist			
		96.15				green schist			
		98.65				bi-mus schist			
100		100.20				green schist			

Apex. I - 8 CORE LOG GSJ - 8 S = 1/200

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.50				overburden			
		1.80 2.25 5.85				quartzite			fs quartzite or aplite 1.80-2.25 m aplite
		8.30				green schist			green basic rock (basalt?) origin
10		10.20				aplite			white, fs > q
		13.75				green schist			same as 5.85-8.30 m
20		20.70				aplite			white fs > q
		22.35				bi-mus-q schist			basic rock origin (?)
		28.70				aplite			white fs > q
30		29.90				altered basic rock			yellowish green
		< 70° 32.90				amp-bi-q schist			
		39.50				q-schist			pale brown-brownish grey weak magnetism basic rock origin (?) aplitization
40		43.30 43.65 46.50 46.60 48.90				talc-carbonate rock	tc carb chl		yellowish and purplish green alteration product from basalt 43.30-43.60m, 46.50-46.80m fs megaphenocryst bearing basalt remains
50						aplitized			49.90-50.20 m

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		51.00				basalt			basalt with megaphenocryst remains
		55.60 56.30 56.85				basalt	chl sil		darkgrey-black-dark green phenocryst: fs max. 3 cm 55.60-56.30 m aplite
						aplitized basalt			basalt has been aplitized 50%.
60		61.10 61.34 62.00				basalt			61.10-61.34 m granite
70 80 90 100		95.00 96.70 100.30				aplitized basic rock | aplite			reddish pink-greenish grey -green strong aplitization relict of basic rock (basalt?) 5-95% i.e. aplite replaces basic rock 95-5% 95.00-96.70 m bi quartzite or aplite

 CORE LOG GSJ - 9 S = 1/200

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
0–2.00		2.00				overburden			brown soil, calcrete, floats of Q.
2.00–48.50	Q at 9.40–9.45, 26.95–27.70, 27.80–29.10, 29.20, 34.00, 36.30, 42.15–42.85, 43.15, 46.20	7.50, 7.53, 9.40, 9.45, < 20°, < 25°, 26.90, 26.95, 27.70, 27.80, 29.10, 29.20, 33.95, 34.00, 36.05, 36.30, 37.90, < 30°, 41.85, 42.15, 42.85, 43.15, 46.10, 46.20, 48.50				amp schist	chl to carb (2.00–37.90)		see remarks below

Remarks (2.00–50 m):

greenish yellow-greyish green-grey
fine-coarse grained
schistosity very clear 20°-50° from horizontal.

alteration
chlorite, talc-carbonate, epidote, tourmaline
- chl-talc-carb 2.00-37.90 m
- talc-carb 64.85-66.45 m, 83.60-84.00 m
- some epidote 72.00-77.00 m
- tourmaline 55.15-55.30 m tour-q vein; 72.20-72.40 m tour-fs-q-vein with some ep and py.
- carbonate 5.0-9.0 m veinlet-network

q veins
width 1-30 cm
with or without sulfide

aplite veins
7.50-7.53 m
87.40-88.15 m

36.20-37.90 m some clay
40.90-43.60 m core is taken as slime

Depth (m)	Core log	Boundary (m) Dip	Samp No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
50–52.25		< 50°, 52.25				bi-q schist			
52.25–64.85	Q at 55.30	55.15, 55.30, < 20°, 64.85				amp schist	tour (55.15–55.30)		mineralization 69.50-82.00 m py > cp impregnation > within q vein. cu content 69.60-75.00 m cu: 0.113%
64.85–66.45		66.45				talc-carbonate rock	ta-carb		
66.45–84.00	Q at 73.10–74.80	69.60, 72.00, 73.10, 74.80, 75.00, 77.00, 82.00, 83.60, 84.00				amp schist	ep tour; ta-carb (83.60–84.00)	py cp	same as 2.00-64.85 m
69.60–75.00			S-80	5.40	0.113 0.000 0.006 / /				
75.00–82.00			S-81	7.00	0.059 / / / /				
84.00–84.70	V V	84.70				basalt			phenocryst fs max 7 mm
84.70–87.40		87.40				amp schist			
87.40–88.15	× ×	88.15				aplite			
88.15–90.50	V V	90.50				basalt			phenocryst: fs max 7 mm
90.50–91.80		91.80				quartzite			with some fs (aplite?)
91.80–100.20		< 50°, 100.20				amp schist			

Apex. I -10   CORE LOG   GSJ-10   S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.85				overburden			black turf
10		12.00				bi schist			core is taken as slime fs. Q >> bi > gt (?)
20 30 40		12.25 12.70 13.00 20.90 21.50 23.10 23.35 23.60 23.85 24.65 24.80 31.30 31.50 39.95				dolerite	chl - ta - carb		yellowish grey medium grained chilled margin 12.20-16.50m, 38.10-39.95m composed of fs. cpx, mt as main primary minerals without megaphenocryst of fs alteration chl, talc, carb weathering many aplite veins white.
		40° 44.65				q schist			core is taken as fragment
50		49.35				black schist			schist or black massive slate (?) with small amount of graphite

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		52.55				graphite schist			
		53.60				aplite			
60 70		55.40 64.65 65.00 65.55 66.00 68.00 68.25 70.05 70.60				graphite schist			53.60-53.80 m high grade graphite 53.75-53.80 m fixed carbon 66.8% volatile material 7.3% ash 24.8% 53.60-55.45 m with many q veinlets 55.45-69.75 m core is taken as slime amount of graphite is only a little in slime many aplite veins
80		60° 40° 79.00 35° 82.90				green schist	chl - ta - carb		pale greenish grey- dark green, generally schistosity is very clear some relict of basic rock remains, i.e., basic rock origin some magnetism, 70.60-79.00 m very weak pyritization
90 100		101.00				dolerite			dark greenish grey dolerite-microgabbro without megaphenocryst of fs. medium-strong magnetism.

Apex.I-11 CORE LOG GSJ-11 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
0–1.50		1.50				overburden			
1.50–13.80	Q	9.40 10.00 13.80				mus-bi schist			1.50-5.00 m core is taken as slime bi > mus amount of mica changes by places. schistosity: very clear q vein: barren
13.80–35.00	Q	< 30° 27.10 27.20 35.00				mus-bi-q schist			schistosity: very clear q vein: barren
35.00–47.10		< 25° 47.10				mus-bi schist			
47.10–49.05		< 20° 49.05				quartzite			fs quartzite with some mus >> bi

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
–55.65	Q	51.45 51.50 55.65				mus-bi schist			schistosity: very clear q vein: barren
55.65–73.80	Q	56.70 56.95 < 25° 69.95 70.05 < 35° 73.80				mus-bi-q schist			55.65-60.95 m coarse grained q veins: barren
73.80–79.35	Q	73.95 75.35 75.65 79.35	S-82		0.006 0.000 0.007 / /	amp schist			coarse grained some ep a little gt 79.35-81.20 m native copper along crack Cu: 0.022%
79.35–81.20		< 40° 81.20	S-83		0.022 / / 0.0 0			native cu	
81.20–82.45	Q	81.50 82.25 82.45	S-84		0.050 / / / /				
82.45–97.35	Q	87.30 87.65 < 20° 97.35				mus-bi-q schist	kaol		85.90-86.00m sericite rich 87.30-87.65m sericite schist with some kaolinite
97.35–100.05		100.05				quartzite			fs quartzite

Apex. I -12 CORE LOG GSJ - 12 S = 1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.20				overburden			calcretized soil
		6.20				mus-q schist			5.20-5.40m bi schist
10		13.75				aplite			schist is replaced by aplite but schist remains at places. many q veins.
		<45° 18.20				mus-bi schist			greenish grey with brownish tint schistosity very clear mus. bi. very rich
20		23.30				bi-mus schist			geenish grey 1.20-25.80m, 44.50-63.60m black small dot, graphite (?) amount of it is only a little, but distributes
		25.80				mus quartzite			grey. schistosity not clear
30	Q	<40° 27.60 28.20 29.05 29.25 29.65 29.75 31.90				bi-mus schist			greenish grey aplite veins q vein: barren
		33.20 34.00 <30° 38.70				aplite			white aplite with relict of schist. 33.20-34.00m mus-q schist, grey 36.00-37.20m limonitization after Py
40		44.50				mus-q schist			brownish grey
50	Q	<40° 48.30 48.80							greenish grey q veins: barren

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
60	Q Q	50.25 50.40 <25° 55.00 55.20 63.60				bi-mus-q schist			
70		<20° 79.70				bi-mus green schist			greenish grey mica rich bi > mus > chl, talc (?) basic rock origin (?) 79.70-83.40m strong aplitization very weak pyritization
80		<25° 83.40						py	
90 100		<20° 100.10							

Apex. I-13 CORE LOG GSJ-13 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		1.20				overburden			
10 20		< 20° 12.20 12.30 13.60 13.70 14.30 14.40 23.40				bi-mus schist			greyish brown-brownish grey q veins: barren
		23.70 < 40° 27.50				mus-bi schist			brownish grey
30		37.10				bi-mus schist			pale brownish grey
40		< 35° 43.60				mus-bi schist			pale brownish grey
		46.20				mus-bi-q schist			light grey
50		49.30				mus-bi schist			brownish grey

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
		< 25° 55.45				bi-mus-q schist			light grey
60 70 80		56.80 56.85 < 20° < 25° 87.70				mus schist		py	light grey-dark grey weak pyritization. very small amount of graphite (?) exist. amount of pyrite is only a little.
90		88.65 89.20 94.90				bi-hb-schist			greenish grey 88.65-89.20m bi schist
100		95.10 < 30° 100.30				mus-bi schist		py	dark grey weak pyritization.

Apex. I -14 CORE LOG GSJ - 14 S = 1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		1.50								overburden			q rich
		3.50								aplite			white
		< 30°											brownish grey q >> fs >>> bi schistosity: very clear
10										mus-q schist			
		17.30											
20													brownish grey with greenish tint
		< 25°											
30										bi-mus-q schist			
		< 50°											
		37.15											
40													pale greenish grey
		42.40											
	Q	42.50											
		42.90											
	Q	43.40								bi-mus schist			
50		< 40°											

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		51.90								bi-mus schist			
	Q	52.40											
		54.35											
			S-85	5.35	0.002	0.000	0.002	0.0	0				light grey
60		60.00								mus-q schist			54.35-100.00 m pyrite impregnated >> py bearing q veinlets.
			S-86	5.00	0.010	/	/	/	/				
		< 30°											
		65.00											
			S-87	5.00	0.004	0.000	0.003	/	/				
70		70.00											
		70.85										py	light grey
		72.25											q veins: barren
	Q	72.95	S-88	5.00	0.004	/	/	/	/				
		73.50											
	Q	73.70											74.70-75.60 m mus-q schist
		75.00								quartzite			
		75.60											
			S-89	5.00	0.004	0.000	0.002	0.0	0				
		79.25											
80		80.00											greenish grey
		< 25°								mus-q schist			
			S-90	5.00	0.002	/	/	/	/				
		84.15											
		85.00								quartzite			light grey
		85.80								bi schist			brownish grey
		87.70	S-91	5.00	0.002	0.000	0.005	/	/				light grey
90		90.00								quartzite			
		92.95	S-92	5.00	0.001	/	/	/	/				
													brown very rich in bi
		95.00								bi schist			
		95.55											grey
			S-93	5.00	0.008	0.000	0.003	0.0	0	mus-q-schist			
		< 20°											
100		100.00											

Apex. I -15 CORE LOG GSJ-15 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cu Pb Zn Au Ag	Rock name	Alteration	Mineralization	Remarks
0–1.50		1.50				overburden			
1.50–7.00		< 40° 7.00				bi-mus schist			pale greenish grey.
7.00–10.30	Q	8.30 8.40 10.30				mus-bi schist			yellowish brown q vein: barren
10.30–40.80	x x Q	< 30° 22.15 22.45 23.10 35.70 36.60 < 45° 40.80				bi-mus schist			pale greenish grey schistosity: very clear mus >> bi > ep very small black dot are contained widely but its amount is only a little (1.50-100.20m) → graphite (?) q vein: barren 22.15-22.45m aplite 35.70-36.60m mus-bi schist
40.80–42.60		42.60				mus-bi schist			
42.60–51.60	x x	43.00 < 30° 51.60				bi-mus-schist			same as 10.30-40.80m 42.60-43.00m pegmatite
51.60–61.80	Q Q	51.75 56.50 56.60 < 35° 61.80				bi-mus schist			q veins: barren
61.80–65.50		65.50				mus-bi schist			biotite very rich
65.50–100.20	Q Q Q	65.90 66.00 < 25° < 40° 93.15 93.65 94.85 95.87 < 25° 100.20				bi-mus schist			same as 10.30-40.80m q veins: barren

Apex. I -16 CORE LOG GSJ - 16 S = 1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		1.70								overburden			calcrete
		7.20								calcretized rock			white original rock: unclear. mus. schist (?)
		8.40								pegmatite			
10 20 30 40		41.75								dolerite			dark grey-greenish grey fresh. many steep cracks. composed mainly of fs and transparent cpx by microscopic obserbation.
		42.40	S-94	0.65	0.564	0.000	0.004	0.0	/	talc-carbonate rock	talc - carb		dark green, yellowish green, red brown, greasy lustre, chl, talc, carb, ep, diop, some gt, mica Cu mineralization Bo. Cc, Cp, malachite occur as impregnated grains.
		45.00	S-95	2.60	0.162	0.000	0.007	/	/				
		47.50	S-96	2.50	0.103	0.000	0.007	0.0	0				
50		49.70	S-97	2.20	0.172	0.000	0.005	/	/				

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au, Ag g/t) Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		55.25								mus schist	chl ep amp		pale brownish grey q > fs > mus. schistosity: not so clear, rather massive homogenous sandstone origin 49.70-55.25 pale green layers of chl, ep, amp.
60 70		70.50											
80 90		92.20								talc-carbonate rock			this rock is divided into 2 facies. 1) talc-carbonate facies richer in ferromagnesian minerals than carbonate. same as 41.75-49.70m. 70.50-71.40m 71.75-72.20m 73.25-75.30m 76.50-79.40m 80.50-81.50m 2) carbonate rich facies richer in carbonate than ferromagnesian minerals. red brown, pink, white carbonate: crystalline. 71.40-71.75m 72.20-73.25m 75.30-76.50m 79.40-80,50m 81.50-92.20m minerals in both facies are same, but amount is different.
		98.20								mus schist			same as 49.70-70.50m
		99.05								talc-carb. rock			
		99.65								mus schist			
100		100.20								talc-carb. rock			

CORE LOG GSJ-17 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
		1.60								overburden			dark brownish grey soil.
10, 20		23.10								dolerite			dary grey-greenish grey fresh. many steep cracks.
		24.35								aplite			basic rock remains (10%)
		29.70	S-98	5.35	0002	0000	0.007	/	/	aplitized basic rock with skarn	cpx gt		yellowish green altered basic rock some schistosity, along which q, apl veinlets intruded. aplitization
30		30.50								basalt			phenocryst of fs: 7 mm
		32.40	S-99	1.90	0.025	0.000	0.005	/	/	aplitized basic rock with skarn	cpx gt		pale greenish grey altered basic rock with strong aplitization. skarn mineral: gt, ep. diop. secendary Cu mineral, Cc, Bo, Cp (impregnated) malachite (film) Cu content 32.40-33.40m Cu=0.620% 33.40-34.80m Cu=0.110%
		33.40	S-100	1.00	0.620	0.000	0.005	0.0	0				
		34.80	S-101	1.40	0.111	0.000	0.003	/	/				
40, 50										dolerite			dark grey-greenish grey fresh. many steep cracks.

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Cu	Pb	Zn	Au	Ag	Rock name	Alteration	Mineralization	Remarks
60		61.00								dolerite			
		64.00								bi-talc-carbonate rock			green-greenish brown greasy. brown banding (biotite) altered products of basic rock (?)
		66.00	S-102	2.00	0.021	0,000	0.005	/	/			py	
70		74.00								bi schist			greyish brown schistosity: very clear biotite very rich bi-talc-carb alteration is weaker than bi-talc-carbonate rock.
		79.20								bi-talc-carbonate rock	bi ta carb		same as 61.00-66.00m
80		84.05								mus-bi schist			brownish grey same as 66.00-74.00m
		84.15								q			q vein: barren
		88.00								mus-bi schist			
90		92.00								bi-talc-carbonate rock			same as 61.00-66.00m
		93.70								mus-bi schist			very pale greenish grey same as 64.00-74.00m
		93.90								q			q veints: barren
		97.20								mus-bi schist			
		97.30								q			
		98.50								mus-bi schist			
		98.55								q			
100		100.80								mus-bi schist			

 CORE LOG GSJ-18 S=1/200

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
		1.50				overburden			brown soil, floats of Q, chromite, serpentinite
		3.20				serpentinite			
10, 20, 30		< 30°, < 30°, < 60°, < 70°, 34.00				gt-bi-hb gneiss			granitic composition composed of gt, bi, hb, q, fs coarse grained color index: 10-15% gt: transparent pale brown 0.3-0.5 mm
40		< 75°, 42.40				gt-bi-hb gneiss			porphyroblastic gneiss granitic composition mafic gt>bi>hb coarse grained porphyroblast: fs
		44.90				aplite			grey
		47.50				gt-bi-hb gneiss			amount of gt is less than above, color index: 30%
50		50.00				serpentinite	Serpentinization		47.50-50.00 m rich in talc 50.00-51.30 m secondary bi, act

Depth (m)	Core log	Boundary (m) Dip	Samp. No	Width (m)	Assay % (Au,Ag g/t) Cr_2O_3 T.Fe Al_2O_3 MgO SiO_2 Pt	Rock name	Alteration	Mineralization	Remarks
		< 80°, 51.30					ser-act.bi		
60, 70		53.30, 53.62, < 50°, < 50°, 77.80				gt-bi-hb gneiss			same as 3.20-34.00 m 53.30-53.62 m dark green amphibole
80		< 40°, 81.25, 81.70, 89.40, 85.30				bi-hb gneiss		py	dioritic composition color index: 35% 81.25-81.70m, 84.40-85.30m granitic composition 85.30m just contact
90		86.80, 92.60, 94.75				serpentinite	act, serpintinization, act		85.30-86.80m, 92.60-94.75m actinolite 86.80-92.60 m talc
100		< 60°, 100.20				gt-bi-hb gneiss			same as 3.20-34.00 m

Apex. 2. Analytical data

Apex. 2-1 Analytical data on copper ore

Sample No.	Location	Sample	Assays % (Au, Ag, g/t)					Remarks
			Cu	Pb	Zn	Au	Ag	
S-1	X5.5, Y4.1	float	5.74	–	–			M-3 anomaly Floats of green copper
S-2	X5.5, Y4.1	float	5.10	–	–			
S-3	X5.5, Y4.1	float	5.84	–	–			
S-4	X5.6, Y4.16	float	5.45	0.003	0.022	0.0	3	
S-5	X4.2, Y15.3	float	0.36	–	–			NNW 1 km from GSJ-6 Outcrop of quartzite with green copper
S-6	X2.0, Y1.02	float	8.14	0.008	0.018			SW of M-4 anomaly, float of green copper

Apex. 2-2. Analytical data on chromite ore

Sample No.	Location	Sampling width (m)	Assays % (Pt g/t)						Cr/Fe	Remarks
			Cr_2O_3	T.Fe	Al_2O_3	MgO	SiO_2	Pt		
S- 7	X6.12, Y23.00	float	33.5	17.8	12.2	13.7	9.7		1.3	
S- 8	X5.23, Y23.53	float	32.9	17.7	11.3	14.9	10.2		1.3	
S- 9	X5.13, Y23.90	float	36.6	16.9	13.3	13.2	7.5		1.5	
S-10	X4.90, Y23.73	float	27.8	20.8	6.7	15.9	11.9		0.9	magnetite rich
S-11	X5.02, Y23.46	float	35.9	16.9	13.2	13.5	8.0		1.5	
S-12	X4.66, Y23.31	float	32.3	19.9	10.1	13.8	8.4		1.1	
S-13	X4.67, Y23.31	float	32.1	18.8	11.8	13.3	10.0		1.2	
S-14	X4.73, Y23.25	float	18.5	22.3	7.0	17.8	16.8		0.6	magnetite rich
S-15	X5.59, Y23.99	float	33.2	16.6	13.5	15.0	10.1		1.4	
S-16	X5.61, Y23.99	float	37.0	17.7	13.5	12.3	6.6		1.4	
S-17	X6.13, Y23.85	float	37.9	18.3	13.6	11.5	5.7		1.4	
S-18	X6.13, Y23.86	float	33.0	20.1	12.2	11.7	8.4		1.1	

Sample No.	Location	Sampling width (m)	Assays % (Pt g/t)						Cr/Fe	Remarks
			Cr_2O_3	T. Fe	Al_2O_3	MgO	SiO_2	Pt		
S-19	X5.93, Y23.83	float	35.6	18.3	11.9	12.3	7.4		1.3	
S-20	X5.95, Y23.83	float	35.2	16.9	13.2	13.2	8.2		1.4	
S-21	X5.89, Y23.18	float	36.1	16.8	13.6	12.8	7.0		1.5	
S-22	X5.66, Y24.71	float	37.6	18.4	13.2	11.2	6.2		1.4	
S-23	X5.60, Y23.89	float	36.3	16.8	12.9	13.2	7.3		1.5	
S-24	X5.40, Y21.85	float	32.3	20.6	12.4	10.6	7.6		1.1	
S-25	X5.47, Y23.87	float	36.3	17.6	12.6	11.8	6.7		1.4	
S-26	X6.45, Y24.10	float	35.2	16.4	12.6	13.4	8.7		1.5	
S-27	X5.04, Y24.69	float	34.6	17.0	12.9	13.2	7.9		1.4	
S-28	X4.95, Y24.49	float	36.5	16.4	13.8	13.3	7.0		1.5	
S-29	X4.90, Y24.50	float	35.2	16.7	13.4	13.5	8.1		1.4	
S-30	X4.90, Y24.48	float	34.9	16.3	13.1	13.7	8.8		1.5	
S-31	X4.95, Y24.61	float	39.8	17.0	13.9	12.5	5.8		1.6	
S-32	X4.93, Y24.63	float	36.6	16.9	13.5	13.6	8.9		1.5	
S-33	X4.52, Y25.02	float	36.6	17.1	13.1	13.5	8.0		1.5	
S-34	X5.15, Y24.33	float	34.1	16.8	12.9	14.1	9.7		1.4	
S-35	X5.25, Y24.08	float	38.0	18.7	13.1	11.2	5.9		1.4	
S-36	X5.24, Y23.81	float	39.2	16.9	13.5	12.9	6.2		1.6	
S-37	X5.27, Y23.88	0.60	35.1	17.7	12.1	13.6	9.4		1.4	Trench 2
S-38	X5.27, Y23.88	1.50	33.9	16.9	12.2	15.3	9.9		1.4	Trench 3
S-39	X5.28, Y23.88	0.80	31.5	16.8	10.9	15.1	11.1	0.0	1.3	Trench 4
S-40	X5.29, Y23.89	0.80	35.3	19.2	13.1	11.3	7.8		1.3	Trench 6
S-41	X5.30, Y23,89	1.00	36.1	18.0	13.1	12.0	7.5		1.4	Trench 8
S-42	X5.34, Y23.92	1.40	38.4	18.1	13.0	12.2	6.5		1.5	Trench 10
S-43	X5.34, Y23.92	2.20	35.8	19.3	11.7	12.5	7.9	0.0	1.3	Trench 11

Sample No.	Location	Sampling width (m)	Assays % (Pt g/t)						Cr/Fe	Remarks
			Cr_2O_3	T.Fe	Al_2O_3	MgO	SiO_2	Pt		
S-44	X5.34, Y23.93	2.00	34.2	18.6	12.2	13.5	8.9		1.3	Trench 12
S-45	X4.67, Y23.32	1.20	32.6	18.5	12.2	13.9	9.6		1.2	Trench 14
S-46	X4.66, Y23.31	1.70	30.1	21.0	10.8	13.9	10.6		1.0	Trench 15

Apex. 2-3. Analytical data on core (Chromite)

Sample No.	No. of drill hole	Sampling width (m)	Assay % (Pt g/t)						Cr/Fe	Remarks
			Cr_2O_3	T.Fe	Al_2O_3	MgO	SiO_2	Pt		
S-47	GSJ-1	0.42	27.3	22.9	8.7	14.5	11.6		0.8	
S-48	GSJ-2	1.30	31.7	19.7	11.4	14.1	10.4	0.0	1.1	
S-49	GSJ-2	0.72	30.2	20.0	9.7	13.9	11.5	0.0	1.0	
S-50	GSJ-2	0.35	26.7	21.9	8.2	14.7	12.3		0.8	Core has strong magnetism Rich in magnetite
S-51	GSJ-2	0.23	17.0	20.0	10.8	19.3	18.0		0.6	

Apex. 2-4. Analytical data on core (Copper)

Sample No.	No. of drill hole	Sampling width (m)	Assay % (Au, Ag g/t)					Remarks
			Cu	Pb	Zn	Au	Ag	
S-52	GSJ-4	1.50	0.029	0.004	0.002			Pyrite in limestone
S-53	GSJ-6	3.00	0.039	0.000	0.007	0.0	0	Py, Cp in amphibole schist
S-54	GSJ-6	3.00	0.046	0.000	0.007	0.0	0	Py, Cp in amphibole schist
S-55	GSJ-6	3.00	0.178	0.000	0.006	0.0	0	Cp, Py in amphibole schist
S-56	GSJ-6	3.00	0.043	0.000	0.007	0.0	0	Py, Cp in amphibole schist
S-57	GSJ-6	3.00	0.029	0.000	0.006			Py, Cp in amphibole schist
S-58	GSJ-6	3.00	0.041	0.000	0.005			Py, Cp in amphibole schist
S-59	GSJ-6	3.00	0.066	0.000	0.004			Py, Cp in amphibole schist
S-60	GSJ-6	3.00	0.025	0.000	0.004			Py, Cp in amphibole schist

Sample No.	No. of drill hole	Sampling width (m)	Assay % (Au, Ag g/t)					Remarks
			Cu	Pb	Zn	Au	Ag	
S-61	GSJ-6	3.00	0.043	0.000	0.006			Py, Cp in amphibole schist
S-62	GSJ-6	3.00	0.034	0.000	0.004	0.0	0	Py, Cp in amphibole schist
S-63	GSJ-6	3.00	0.054	0.001	0.005			Py, Cp in amphibole schist
S-64	GSJ-6	3.00	0.050	0.001	0.004			Py, Cp in amphibole schist
S-65	GSJ-6	3.00	0.023	0.001	0.004			Py, Cp in amphibole schist
S-66	GSJ-6	2.70	0.023	0.001	0.006			Py, Cp in amphibole schist
S-67	GSJ-6	2.00	0.028	0.001	0.005	0.0	0	Py, Cp in amphibole schist
S-68	GSJ-6	3.30	0.045	0.002	0.005			Py, Cp in amphibole schist
S-69	GSJ-6	3.00	0.029	0.003	0.004			Py, Cp in amphibole schist
S-70	GSJ-6	3.00	0.037	0.002	0.005			Py, Cp in amphibole schist
S-71	GSJ-6	3.00	0.045	0.002	0.005			Py, Cp in amphibole schist
S-72	GSJ-6	3.00	0.036	0.002	0.007			Py, Cp in amphibole schist
S-73	GSJ-6	3.00	0.083	0.002	0.006			Py, Cp in amphibole schist
S-74	GSJ-6	3.00	0.041	0.002	0.006			Py, Cp in amphibole schist
S-75	GSJ-6	3.00	0.073	0.002	0.007			Py, Cp in amphibole schist
S-76	GSJ-6	3.00	0.052	0.001	0.007			Py, Cp in amphibole schist
S-77	GSJ-6	3.00	0.036	0.001	0.004	0.0	0	Py, Cp in amphibole schist
S-78	GSJ-6	3.00	0.228	0.001	0.006			Cp, Py in amphibole schist
S-79	GSJ-6	4.50	0.063	0.001	0.007			Py, Cp in amphibole schist
S-80	GSJ-9	5.40	0.113	0.000	0.006			Cp, Py in amphibole shcist
S-81	GSJ-9	7.00	0.059	–	–			Py, Cp in amphibole schist
S-82	GSJ-11	5.40	0.006	0.000	0.067			
S-83	GSJ-11	1.70	0.022	–	–	0.0	0	Native Copper
S-84	GSJ-11	0.75	0.050	–	–			
S-85	GSJ-14	5.65	0.002	0.000	0.002	0.0	0	Pyrit impregnation

Sample No.	No. of drill hole	Sampling width (m)	Assay % (Au. Ag g/t)					Remarks
			Cu	Pb	Zn	Au	Ag	
S-86	GSJ-14	5.00	0.010	–	–			Pyrite impregnation
S-87	GSJ-14	5.00	0.004	0.000	0.003			Pyrite impregnation
S-88	GSJ-14	5.00	0.004	–	–			Pyrite impregnation
S-89	GAJ-14	5.00	0.004	0.000	0.002	0.0	0	Pyrite impregnation
S-90	GSJ-14	5.00	0.002	–	–			Pyrite impregnation
S-91	GSJ-14	5.00	0.002	0.000	0.005			Pyrite impregnation
S-92	GSJ-14	5.00	0.001	–	–			Pyrite impregnation
S-93	GSJ-14	5.00	0.008	0.000	0.003	0.0	0	Pyrite impregnation
S-94	GSJ-16	0.65	0.564	0.000	0.004	0.0	1	Secondary copper ore
S-95	GSJ-16	2.60	0.162	0.000	0.007			Secondary copper ore
S-96	GSJ-16	2.50	0.103	0.000	0.007	0.0	0	Secondary copper ore
S-97	GSJ-16	2.20	0.172	0.000	0.005			Secondary copper ore
S-98	GSJ-17	5.35	0.002	0.000	0.007			Secondary copper ore
S-99	GSJ-17	1.90	0.025	0.000	0.005			Secondary copper ore
S-100	GSJ-17	1.00	0.620	0.000	0.005	0.0	0	Secondary copper ore
S-101	GSJ-17	1.40	0.111	0.000	0.003			Secondary copper ore
S-102	GSJ-17	2.00	0.021	0.000	0.005			Secondary copper ore

Apex. 2-5. Analytical data on core (Graphite)

Sample No.	No. of drill hole	Sampling width (m)	Assay %					Remarks
			Fixed carbon	Volatile material	Ash	Moisture	Fe_2O_3	
103	GSJ-10	0.05	66.8	7.3	24.8	1.1	5.86	Flake graphite Best quality at all

Apex. 3. **Analytical data (Soil)**

Sample No.	Location	Assay PPM			Sample No.	Location	Assay PPM		
		Cu	Pb	Zn			Cu	Pb	Zn
1	X1.01, Y1.02	106	3	46	25	X1.08, Y7.08	79	4	43
2	X1.00, Y1.25	79	4	43	26	X1.42, Y1.02	114	3	45
3	X1.00, Y1.50	65	4	38	27	X1.42, &1.23	64	4	39
4	X1.00, Y1.75	82	6	57	28	X1.42, Y1.50	36	5	36
5	X1.00, Y2.00	62	5	44	29	X1.44, Y1.75	109	11	84
6	X1.00, Y2.25	92	6	58	30	X1.45, Y2.00	42	4	47
7	X1.00, Y2.50	52	4	54	31	X1.45, Y2.20	73	6	56
8	X1.00, Y2.75	45	6	40	32	X1.50, Y2.44	56	6	61
9	X1.00, Y3.00	45	8	58	33	X1.52, Y2.76	66	5	58
10	X1.00, Y3.27	59	4	52	34	X1.52, Y3.00	59	6	44
11	X1.00, Y3.53	56	5	63	35	X1.53, Y3.17	81	9	80
12	X1.00, Y3.77	89	6	65	36	X1.53, Y3.44	48	7	57
13	X1.00, Y4.02	61	9	68	37	X1.52, Y3.72	77	5	54
14	X1.00, Y4.30	36	4	48	38	X1.53, Y4.00	50	5	49
15	X1.00, Y4.55	51	4	55	39	X1.51, Y4.22	26	5	48
16	X1.00, Y4.79	66	5	51	40	X1.51, Y4.60	40	5	46
17	X1.01, Y5.07	104	5	40	41	X1.51, Y4.95	55	5	47
18	X1.01, Y5.31	61	8	57	42	X1.50, Y5.25	24	4	41
19	X1.01, Y5.60	32	4	34	43	X1.50, Y5.50	59	7	51
20	X1.01, Y5.87	79	9	48	44	X1.51, Y5.75	61	7	42
21	X1.02, Y6.15	76	7	42	45	X1.51, Y6.00	54	5	43
22	X1.03, Y6.40	46	6	38	46	X1.51, Y6.27	69	7	47
23	X1.05, Y6.74	42	5	33	47	X1.52, Y6.51	53	5	37
24	X1.06, Y6.85	60	4	3' 37	48	X1.52, Y6.77	41	5	36

Sample No.	Location	Assay PPM			Sample No.	Location	Assay PPM		
		Cu	Pb	Zn			Cu	Pb	Zn
49	X1.52, Y7.00	55	5	42	74	X2.07, Y7.10	41	7	33
50	X2.00, Y1.00	35	4	33	75	X2.55, Y1.00	33	5	33
51	X2.00, Y1.25	83	4	36	76	X2.55, Y1.25	74	8	54
52	X2.00, Y1.48	78	12	68	77	X2.55, Y1.50	62	8	55
53	X2.00, Y1.77	77	10	70	78	X2.55, Y1.76	74	9	73
54	X2.00, Y2.05	78	10	63	79	X2.55, Y2.00	90	15	127
55	X2.00, Y2.25	82	6	64	80	X2.55, Y2.25	66	6	61
56	X2.00, Y2.52	54	5	55	81	X2.55, Y2.48	39	6	57
57	X2.00, Y2.75	45	7	61	82	X2.56, Y2.72	40	6	47
58	X2.01, Y3.01	53	6	49	83	X2.60, Y2.95	33	7	46
59	X2.01, Y3.25	423	8	51	84	X2.55, Y3.00	59	9	61
60	X2.01, Y3.50	50	8	57	85	X2.53, Y3.25	70	8	62
61	X2.01, Y3.75	54	5	46	86	X2.53, Y3.50	52	8	50
62	X2.01, Y4.00	27	5	50	87	X2.53, Y3.75	29	7	42
63	X2.01, Y4.26	20	5	50	88	X2.00, Y3.95	18	6	43
64	X2.03, Y4.51	20	5	41	89	X2.50, Y4.00	20	4	42
65	X2.03, Y4.76	43	7	42	90	X2.48, Y4.25	16	4	36
66	X2.03, Y5.02	49	6	33	91	X2.48, Y4.50	25	5	38
67	X2.03, Y5.30	50	4	38	92	X2.48, Y4.75	42	4	31
68	X2.03, Y5.55	76	6	46	93	X2.50, Y5.00	18	4	25
69	X2.03, Y5.78	34	5	37	94	X2.50, Y5.25	56	4	38
70	X2.04, Y6.07	89	8	47	95	X2.50, Y5.50	47	4	37
71	X2.05, Y6.28	65	5	40	96	X2.50, Y5.75	55	4	40
72	X2.05, Y6.54	52	7	38	97	X2.50, Y6.00	99	9	50
73	X2.06, Y6.80	38	5	33	98	X2.50, Y6.25	74	6	44

Sample No.	Location	Assay PPM			Sample No.	Location	Assay PPM		
		Cu	Pb	Zn			Cu	Pb	Zn
99	X2.50, Y6.50	68	10	41	124	M-3 anomaly	9	5	17
100	X2.50, Y6.75	61	6	38	125	M-3 anomaly	15	5	22
101	X2.50, Y7.00	40	6	35	126	M-3 anomaly	74	7	40
102	M-3 anomaly	69	5	45	127	M-3 anomaly	53	4	37
103	M-3 anomaly	338	6	40	128	M-3 anomaly	37	5	27
104	M-3 anomaly	51	8	24	129	M-3 anomaly	27	4	33
105	M-3 anomaly	705	6	33	130	M-3 anomaly	23	11	24
106	M-3 anomaly	182	5	32	131	M-3 anomaly	20	5	25
107	M-3 anomaly	24	5	26	132	M-3 anomaly	16	5	23
108	M-3 anomaly	36	7	28	133	M-3 anomaly	51	10	36
109	M-3 anomaly	48	8	31	134	M-3 anomaly	57	10	37
110	M-3 anomaly	53	8	30	135	M-3 anomaly	34	7	27
111	M-3 anomaly	47	6	33	136	M-3 anomaly	25	6	23
112	M-3 anomaly	42	6	30	137	M-3 anomaly	25	5	22
113	M-3 anomaly	35	5	25	138	M-3 anomaly	25	6	19
114	M-3 anomaly	29	5	23	139	M-3 anomaly	17	5	18
115	M-3 anomaly	41	5	27	140	M-3 anomaly	22	4	31
116	M-3 anomaly	17	5	13	141	M-3 anomaly	66	4	34
117	M-3 anomaly	16	5	11	142	M-3 anomaly	222	4	40
118	M-3 anomaly	12	5	10	143	M-3 anomaly	64	4	42
119	M-3 anomaly	19	5	27	144	M-3 anomaly	1,060	12	37
120	M-3 anomaly	47	5	34	145	M-3 anomaly	57	7	29
121	M-3 anomaly	48	4	31	146	M-3 anomaly	61	5	34
122	M-3 anomaly	16	5	30	147	M-3 anomaly	89	4	30
123	M-3 anomaly	11	5	23	148	M-3 anomaly	61	4	25

Sample No.	Location	Assay PPM			Sample No.	Location	Assay PPM		
		Cu	Pb	Zn			Cu	Pb	Zn
149	M-3 anomaly	22	4	25	167	M-3 anomaly	40	5	27
150	M-3 anomaly	29	6	26	168	M-3 anomaly	22	7	22
151	M-3 anomaly	15	5	32	169	M-3 anomaly	47	6	31
152	M-3 anomaly	15	4	21	170	M-3 anomaly	62	7	38
153	M-3 anomaly	27	4	32	171	M-3 anomaly	62	8	36
154	M-3 anomaly	65	5	36	172	M-3 anomaly	75	9	39
155	M-3 anomaly	51	6	36	173	M-3 anomaly	71	8	41
156	M-3 anomaly	68	3	34	174	M-3 anomaly	69	7	42
157	M-3 anomaly	45	4	30	175	M-3 anomaly	61	9	41
158	M-3 anomaly	46	6	35	176	M-3 anomaly	68	8	49
159	M-3 anomaly	43	5	33	177	M-3 anomaly	67	8	47
160	M-3 anomaly	40	6	31	178	M-3 anomaly	80	8	50
161	M-3 anomaly	37	7	30	179	M-3 anomaly	81	8	49
162	M-3 anomaly	53	8	35	180	M-3 anomaly	82	9	52
163	M-3 anomaly	51	9	34	181	M-3 anomaly	73	8	50
164	M-3 anomaly	40	6	28	182	M-3 anomaly	86	9	52
165	M-3 anomaly	35	8	24	183	M-3 anomaly	100	9	57
166	M-3 anomaly	33	9	25					

Apex. 4. List of Microscopic Observation (Thin Section)

A-1 – A-40 : Geological sample
A-41 – A-74 : Drilling core sample

Abbreviation:

Mineral:

q	quartz	si	siderite
kf	potash feldspar	ep	epidote
pl	plagioclase	chl	chlorite
mus	muscovite	tour	tourmaline
bi	biotite	ser	sericite
hb	hornblende	serp	serpentine
act	actinolite	gt	garnet
hyp	hyperthene	lm	limonite
cpx	clinopyroxene	rt	rutile
op	opaque mineral	hm	hematite
mt	magnetite	ta	talc
chr	chromite	py	pyrite
ap	apatite	cha	chalcedony
zr	zircon	mal	malachite
sph	sphene	ol	olivine
ca	calcite	gr	graphite
do	dolomite	leu	leucoxene

Texture:

holo	holocrystalline	sac	saccharoidal
gran	granular	crypto	cryptocrystalline
sch	schistose	porb	porphyroblastic
gne	gneissose	oph	ophitic
mos	mosaic		

Symbol:

•	abundant	△	rare
o	common	×	very rare

A: Matsitama schist and metasedimentary group (upper, lower)
B: Mosetse river gneiss group (upper, lower)
U: Upper
L: Lower

Apex. 4-1 List of microscopic observation (Thin section – geological sample)

Sample				Rock	Mineral																																	Texture	Geology	Note
No.	Location X	Location Y	Kind, place		q	kf	pl	mus	bi	hb	act	hyp	cpx	mt op.	chr	ap	zr	sph	ca	do	si	ep	chl	mont	ser	serp	gar	lm	rt	hm	ta	py	leu	cha	mal	ol	gr			
A-1	5.50	23.95	float	amphibole schist							●			△															×									sch	B(U)	
2	5.00	23.62	outcrop	serpentinite										○											●						×								B(U)	
3	5.20	24.38	float	bi-hb gneiss	●		●		△	△								△				△																gne porb	B(U)	
4	6.50	23.25	float	calcrete	○		○												●			×																	B(L)	
5	6.40	23.86	float	serpentinite										○												●		△			×								B(U)	
6	5.30	23.74	float	serpentinite										●												●					×								B(U)	Polished section B-2
7	5.40	24.67	float	hb-gn (?)	●					●								△	●			△																	B(U)	Gn or alteration product of calcareous sediment
8	6.30	24.02	float	serpentinite										○									×			●		△			×								B(U)	
9	6.20	24.42	float	serpentinite														×					●					×			×								B(U)	
10	6.10	24.98	float	serpentinite										●									○			●					×								B(U)	
11	4.88	24.52	float	syenite		●	○			△						×		×				×																holo	B(U)	
12	8.41	2.41	float	mus schist	●		○	●										×																				sch	A(U)	
13	8.41	2.41	float	q schist	●			×										×																				sch	A(U)	
14	5.54	4.08	float	calcareous q schist	○														●									○							○				A(U)	
15	5.55	4.13	float	q schist	●		△	×						△																			×					sch	A(U)	
16	5.58	4.16	float	mus-bi-chl schist	○			△	○														●					△							△			sch	A(U)	
17	4.99	3.64	float	tour-q schist	●																	×		●				△	×									sch	A(U)	
18	4.73	2.91	float	fs quartzite	●	△	●																																A(U)	Cu 5.84% S-3, B-6
19	3.50	4.02	outcrop	calcareous q schist	●		△									×			●				△						×									sch	A(U)	Cu 5.45 S-4, B-7
20	6.64	8.52	float	chl schist										△		×		○					●						△									sch	A(L)	
21	5.00	9.50	float	amphibole schist	△		×			●												○							×									sch	A(L)	
22	4.81	10.44	float	calcareous schist	△			×											●																			sac	A(L)	
23	5.05	10.60	float	graphite schist	○			○															△					△									●		A(L)	
24	5.03	10.68	float	calcrete	○			×											●																				A(L)	
25	2.52	11.70	outcrop	limestone										×					●																			crypto	A(L)	
26	3.33	14.20	float	amphibole schist	△				×	●				△		×						●							×									sch	A(L)	
27	4.08	14.71	float	black schist	○			△											×				△						×									sch	A(L)	
28	3.00	14.70	float	q-chl schist	○			△															●						×									sch	A(L)	
29	8.40	2.40	trench	altered basic rock	●		●	△															△																A(U)	Sample from trench
30	8.40	2.40	trench	altered basic rock	△		△				△								●				●								○								A(U)	Sample from trench
31	4.60	23.29	float	serpentinite										△												●		×			×								B(L)	
32	2.00	1.20	float	amphibole schist	△		○		●					×								●											△					sch	A(U)	
33	2.50	1.00	float	amphibolite	△		○		●					△								×	×																A(U)	
34	2.50	5.80	float	fs quartzite	●		△												△										×										A(U)	
35	2.50	5.35	float	amphibolite	○		△			●									△			△											×						A(U)	
36	1.50	5.35	float	calcareous schist	△		×			△							×		●										×									sch	A(U)	
37	1.50	4.10	float	actinolite schist	△		×				●			△								×		○									×					sch	A(U)	
38	1.50	4.06	float	amphibolite	○		△			●												△											△						A(U)	
39	11.30	18.00	float	quartzite	●		×	×						△																								mosaic	B(U)	
40	11.10	17.85	float	quartzite	●			×								×												×										mosaic	B(U)	

Apex. 4-2 List of microscopic observation (Thin section of drilling core sample)

Sample			Rock	Mineral																																	Texture	Geology	Note
No.	Drill hole	Sampling depth (m)		q	kf	pl	mus	bi	hb	act	hyp	cpx	mt op	chr	ap	zr	sph	ca	do	si	ep	chl	tour	ser	serp	gt	lm	rt	hm	ta	py	leu	cha	mal	ol	qr			
A-41	GSJ-1	51.50	tourmaline			△		△					△								×	△	●				×											B(U)	
42	GSJ-2	20.75	chromite											●											○					△								B(U)	Cr_2O_3 31.70% S-48, B-14
43	GSJ-2	38.40	chromite											●				×							○			×		△								B(U)	Cr_2O_3 26.70% S-50, B-15
44	GSJ-2	67.15	hb gneiss	△		●			○						×						×	×		△				×									gne, porb	B(U)	
45	GSJ-2	100.20	serpentinite					○					△		△										●			△		△								B(U)	
46	GSJ-3	20.40	hb gneiss	○		●			●						△						△					△	×	×									gne	B(U)	
47	GSJ-3	33.00	serpentinite										△					○							●					×					△			B(U)	Peridotite origin
48	GSJ-3	46.40	serpentinite										△					○							●					●					○			B(U)	Peridotite origin
49	GSJ-3	55.75	hb gneiss	●		●		△	○				×		△	△						×		×			△										gne	B(U)	
50	GSJ-4	34.45	bi schist	●		×		●							×								×			×											sch		Porphyroblast: garnet
51	GSJ-4	38.55	bi schist	●		×		●							×			×					×			△	×										sch	B(U)	
52	GSJ-4	91.00	bi gneiss	●		○		○							△	×						×		×													gne	B(U)	
53	GSJ-6	47.55	amphibole schist			×		●					×					×			△		×														sch	A(L)	B-16,
54	GSJ-7	42.90	graphite schist	○									●			×	×					×					×											A(L)	
55	GSJ-7	78.55	graphite schist	△			●	△					●									△					△	×										A(L)	
56	GSJ-8	52.90	basalt			●						●	○									○															oph	A(L)	
57	GSJ-10	53.75	graphite schist	○			×						●					△									×									●	sch	A(L)	fixed carbon 66.8%, S-103, B-19
58	GSJ-11	34.80	bi-q schist	●				○					△		×	×							×					×									sch	A(U)	B-20
59	GSJ-12	66.00	mus-bi-chl schist	○			○	●					△			×		△				○	×														sch	A(U)	
60	GSJ-13	29.30	mus-bi schist	●		△	△	●					△		×	×		×				△	×					×									sch	A(U)	
61	GSJ-13	84.50	bi-mus schist	●		△	○	△					△					△										×									sch	A(U)	
62	GSJ-14	46.50	mus-bi schist				○	●					△								×	△	×					×									sch	A(U)	
63	GSJ-14	63.00	mus-q schist	●		×	○								×			×										×		△							sch	A(U)	Pyrite impregnation, B-22
64	GSJ-15	24.00	bi-act schist			△		●		●			△			×		△			×						×	×									sch	A(U)	
65	GSJ-15	38.00	bi-mus schist	●			●	●					△		×	×						△	×														sch	A(U)	
66	GSJ-16	27.50	dolerite	×		△		×	×			●	△		×			×				△								△							oph	A(U)	
67	GSJ-16	41.75	skarn									●	×					△				△								△								A(U)	after basic rock, Cu 0.564%, S-94, B-23
68	GSJ-16	66.00	bi-mus schist	●			○	△		anth △			△			×							×					×									sch	A(U)	anth: anthophyllite
69	GSJ-16	80.70	talc-carbonate rock															●				○								●		×						A(U)	
70	GSJ-16	90.85	talc-carbonate rock										×					●									×			○								A(U)	
71	GSJ-17	32.70	skarn					×				●			×			×				△				●												A(U)	skarn by aplitization of altered basic rock Cu 0.620 S-100, B-23
72	GSJ-17	65.00	talc-carbonate rock					△					△					●				○								○								A(U)	
73	GSJ-17	96.50	bi-mus schist	●			○	△							×							△								△		×					sch	A(U)	
74	GSJ-18	61.00	gt-bi-hb gneiss	○		●		△	○				△			×										△		×									gne	B(L)	

Apex. 5-1. List of Microscopic Observation (Polished Section – Geological Sample)

Sample No.	Location		Sample	Name	Description	Note
	X	Y				
B-1	4.90	23.73	Float	Chromite	Grain size 0.3–0.6 mm (range 0.03–1.0 mm). Reflectivity and iron content of the outer part of chromite is higher than those of the inner part. Sample has some magnetism.	Cr_2O_3 27.8% S-10
B-2	5.40	24.67	Float	Magnetite in serpentinite	mt grains (0.05–0.6 mm) fills the space of olivine (now chlorite). Periphery of mt is replaced by hm.	A-6
B-3	4.99	24.55	Float	mt-hm quartzite	hm > mt. mt : 0.1 mm, mt is replaced by hm.	
B-4	4.90	24.48	Float	Chromite	Grain size 0.2–0.4 mm (0.04–0.6 mm). Ore is crushed.	Cr_2O_3 34.9% S-30
B-5	5.50	4.10	Float	Green copper	Malachite and thin film of cc in schist	Cu 5.74% S-1
B-6	5.50	4.10	Float	Green copper	Malachite and cc fill the space of grains of schist.	Cu 5.84% A-14
B-7	5.60	4.16	Float	Green copper	Malachite and cc fill the space of grains of schist. cc : besides above, it show veinlet form.	A-16
B-8	2.00	1.02	Float	Green copper	Malachite and cc fill the space of grains of schist. cc : besides above, it show veinlet form.	Cu 8.14% S-6
B-9	1.50	3.65	Float	Green copper	Goethite ≫ cc	
B-10	5.27	23.88	Trench (T-3)	Chromite	Grain size 0.1–0.4 mm (0.04–0.6 mm).	Cr_2O_3 33.9% S-38
B-11	5.34	23.92	Trench (T-11)	Chromite	Grain size 0.1–0.3 mm (0.02–0.6 mm).	Cr_2O_3 35.8% S-43
B-12	4.66	23.31	Trench (T-15)	Chromite	Grain size 0.15 mm (0.02–0.6 mm).	Cr_2O_3 30.1% S-46

Abbreviation of term is same as that of Apex. 4.

Apex. 5-2. List of Microscopic Observation (Polished Section – Drilling Core Sample)

Sample No.	No. of drill hole	Depth (m)	Name	Description	Note
B-13	GSJ-1	13.20	Chromite	Grain size 0.3–0.6 mm (range 0.03–1.0 mm). Reflectivity and iron content of the outer part of chromite is higher than those of the inner part. Sample has some magnetism.	Cr_2O_3 27.3% S-47, A-42
B-14	GSJ-2	20.75	Chromite	Grain size 0.2–0.6 mm (0.04–0.8 mm). Chromite has not pleochroism, but has weak strange anisotropism (?).	Cr_2O_3 31.7% S-48, A-43
B-15	GSJ-2	38.40	Chromite	Grain size 0.2–0.6 mm (0.04–0.8 mm). Chromite has not pleochroism, but has weak strange anisotropism (?).	Cr_2O_3 26.7% S-50
B-16	GJS-6	47.55	Copper ore (amp schist)	cp ≫ py > hm, cc. cp 15 mm, py, hm cc in cp. py : euhedral grain or veinlet, cc 0.04–0.2 mm.	A-53
B-17	GSJ-6	55.80	Copper ore (amp schist)	hm > cp > py, hm : thin lamellar, radiated, L = 2 mm, cp : 0.1–0.4 mm, py : euhedral 0.3–0.7 mm.	
B-18	GSJ-6	82.80	Copper ore (amp schist)	hm ≫ cc, hm : 0.01–0.04 mm, impregnated in amphibole schist. cc is very small grain and is contained in hm.	
B-19	GSJ-10	53.75	Graphite (graphite schist)	Small grain of hm (0.01–0.3 mm) is contained in graphite schist. This graphite isn't polished smooth for identification.	Fixed carbon 66.8% S-103, A-57
B-20	GSJ-11	34.80	mus-bi-q schist	hm (0.03–0.3 mm) is destributed widely in this schist.	A-58
B-21	GSJ-11	79.65	Native copper (amp schist)	Native copper, hm in schist, native copper: fills the space of grain, 0.01–0.2 mm, hm : 0.002–1 mm.	
B-22	GSJ-14	63.00	Pyrite (mus-q schist)	py and hm : impregnated along schistosity. py ≫ hm, py : 0.02–3 mm, hm : 0.02 mm.	A-63
B-23	GSJ-16	41.75	Copper ore (talc-carbonate)	cc ≫ bo, cc : 0.02–0.4 mm, bo : 0.01 mm, in cc.	Cu 0.564% S-94, A-67
B-24	GSJ-17	32.70	Copper ore (skarn)	cc : 0.05–0.15 mm, many small grains of cc fill the space of skarn minerals.	Cu 0.620% S-100, A-71